# CITY OF BETHEL
# COMMUNITY PARKS AND RECREATION COMMITTEE
# MONDAY, FEBRUARY 10, 2025, 6:00 PM
# LOCATION: 300 CHIEF EDDIE HOFFMAN HIGHWAY, BETHEL, ALASKA

**JOIN MEETING AT ZOOM.US:**
**HTTPS://US06WEB.ZOOM.US/J/3350154000?PWD=HYFLQJB5BBF9IUAXHBN9SOZQAFWPLS.1&OMN=81314125060**
**MEETING ID: 335 015 4000**
**PASSCODE: 140569**
**US TOLL-FREE PHONE NUMBERS: 888 475 4499; 833 548 0276; 833 548 0282; 877 853 5257**

| MEMBERS | | STAFF |
|---|---|---|
| Brian Lefferts, Chair | Beverly Hoffman, Vice-Chair | Ex Officio Members |
| Mikayla Miller, Council Rep. | Jessica Pew | Jason Spann jsapp@cityofbethel.net |
| Michelle DeWitt | Sean Glasheen | Shane Iverson siverson@cityofbethel.net |
| Alternate 1, Jody Brand | Zeff Prina | Kayla Saddler ksaddler@cityofbethel.net |
| Alternate 2, Lisa Yancy | Stacey Rearden | |

## I. CALL TO ORDER

## II. ROLL CALL

A. Ex Officio Member's Attendance Log

## III. PEOPLE TO BE HEARD – FIVE MINUTES PER PERSON

A. Please submit written public comments to pwadmin@cityofbethel.net by 4:00 p.m. the day of the meeting.

## IV. APPROVAL OF AGENDA

## V. APPROVAL OF MEETING MINUTES

A. January 13, 2025 Meeting Minutes

## VI. UNFINISHED BUSINESS

A. Community Center Construction Project *Updates*!

B. Review of 2045 Comprehensive Plan/Identify Community Outreach Opportunities And Committee Goals (Pew/Lefferts)

C. Tribal Technical Assistance Request

D. Status for Deep Cleaning the YK Fitness Center shower & pool area (Hoffman)

## VII. NEW BUSINESS

A. Transition Plan - Contract Managed Facility to Parks and Rec Managed by the City (Hoffman)

B. Health Agenda

## VIII. EX OFFICIO REPORT

A. Manager's Reports January 2025

## IX. MEMBER COMMENTS

Posted <> at City Hall, AC Co., Swanson's, and the Post Office.

_____
Ex-Officio Staff

## X. ADJOURNMENT

Posted <> at City Hall, AC Co., Swanson's, and the Post Office.

_____
Ex-Officio Staff

# Community Parks and Recreation Committee 2025 Attendance

## Regular Meetings

| Member Name | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mikayla Miller | P | | | | | | | | | | | |
| Brian Lefferts | P | | | | | | | | | | | |
| Beverly Hoffman | P | | | | | | | | | | | |
| Jessica Pew | P | | | | | | | | | | | |
| Michelle DeWitt | E | | | | | | | | | | | |
| Sean Glasheen | P | | | | | | | | | | | |
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## Special Meetings

| Member Name | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mikayla Miller | | | | | | | | | | | | |
| Brian Lefferts | | | | | | | | | | | | |
| Beverly Hoffman | | | | | | | | | | | | |
| Jessica Pew | | | | | | | | | | | | |
| Michelle DeWitt | | | | | | | | | | | | |
| Sean Glasheen | | | | | | | | | | | | |
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|---|---|---|
| **Vacancy shall be declared by the body when a member:** | | |
| Fails to attend 3 regular meetings without being excused by the body | **P=Present** | Chair determines excused/unexcused |
| Fails to attend 3 special meetings without being excused by the body | **E=Excused** | during roll call. If a member disagrees with |
| **Vacancy may be declared by the body when a member:** | **U=Unexcused** | the the chair, a motion to overule the |
| Fails to attned 65% of regular meetings | | decision of the chair can be made. |

| | | |
|---|---|---|
| Fails to attend 65% of special meetigns. | | |

# City of Bethel, Alaska
## Community Parks and Recreation Committee Minutes

January 13, 2025 Regular Meeting Bethel, Alaska

**I. CALL TO ORDER:**

A regular Community Parks and Recreation Committee Meeting was held on January 13, 2025, via Zoom. called the meeting to order at 6:13 pm.

**II. ROLL CALL:**

Comprising a quorum of the committee, the following were present for Roll Call: Beverly Hoffman, Jessica Pew, Brian Lefferts, Mikayla Miller, Sean Glasheen

**III. PEOPLE TO BE HEARD:**

**IV. APPROVAL OF AGENDA:**

Motion to approve the agenda.

| | | |
|---|---|---|
| **MOVED BY:** | Beverly Hoffman | Motion to approve Agenda. |
| **SECONDED BY:** | Mikayla Miller | |
| **VOTE ON MOTION** | Motion carried by unanimous vote. | |

**V. APPROVAL OF MINUTES:**

**A. Meeting Minutes December 17, 2025**

| | | |
|---|---|---|
| **MOVED BY:** | Jessica Pew | Motion to approve Meeting Minutes. |
| **SECONDED BY:** | Mikayla Miller | |
| **VOTE ON MOTION** | Motion carried by unanimous vote. | |

**VI. UNFINISHED BUSINESS:**

A. Community Center Construction Project *Updates!*
B. Review of 2045 Comprehensive Plan/Identify Community Outreach Opportunities And Committee Goals.
C. Tribal Technical Assistance Request
D. Budget for deep cleaning the YK Fitness Center shower area and pool area.

**VII. NEW BUSINESS:**

**VIII. EX OFFICIO MEMBER REPORT:**

A. Manager's Reports December 2024

**IX. COMMITTEE MEMBER COMMENTS:**

Brian Lefferts: No comment
Beverly Hoffman: Thank you, Kayla, for being here & thank you for Lisa
Jessica Pew: No comments
Michelle DeWitt: No comments
Sean Glasheen: No comments

**X. ADJOURNMENT:**

| | | |
|---|---|---|
| **MOVED BY:** | Jessica Pew | Motion to adjourn. |
| **SECONDED BY:** | Mikayla Miller | |

| | |
|---|---|
| **VOTE ON MOTION** | Motion carried by unanimous vote. |

With no further business, meeting adjourned at 7:15 PM.

APPROVED THIS February 10, 2025

_____
Brian Lefferts
Committee Chair

_____
Kayla Saddler
Recorder of Minutes

ARCHITECTS ALASKA

AK Corp. Authorization AECC561

900 W. 5TH AVENUE, SUITE 403
ANCHORAGE, ALASKA 99501-2029
907.272.3567

**PROJECT NO.: 24048.01**




CIVIL ENGINEER
DOWL
5015 Business Park Boulevard,
Suite 4000 Anchorage, AK 99503

STRUCTURAL ENGINEER
BBFM Engineers
845 K Street
Anchorage, AK 99501

MECHANICAL ENGINEER
AMC Engineers
701 E. Tudor Road, Ste 250
Anchorage, AK 99503

ELECTRICAL ENGINEER
AMC Engineers
701 E. Tudor Road, Ste 250
Anchorage, AK 99503

CITY OF BETHEL

# Yukon Kuskokwim Community Center Expansion

**65% DESIGN DEVELOPMENT**

ISSUE DATE: 01-22-2025

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt

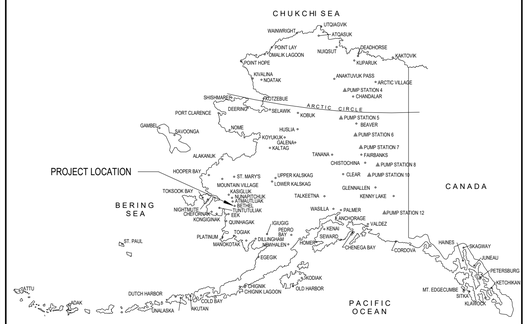
# ARCHITECTURAL ABBREVIATIONS

| | |
|---|---|
| & | AND |
| ∠ | ANGLE |
| @ | AT |
| CL | CENTERLINE |
| o | DEGREE |
| # | NUMBER |
| ABV | ABOVE |
| AC | ASPHALTIC CONCRETE |
| ACP | ACOUSTICAL CEILING PANEL |
| ACT | ACOUSTICAL CEILING TILE |
| ACOUS | ACOUSTICAL |
| ADD | ADDITION |
| AFF | ABOVE FINISH FLOOR |
| AHU | AIR HANDLING UNIT |
| ALT | ALTERNATE |
| ALUM | ALUMINUM |
| APPROX | APPROXIMATE |
| ARCH | ARCHITECTURAL |
| ASPH | ASPHALT |
| AVG | AVERAGE |
| BD | BOARD |
| BLDG | BUILDING |
| BLKG | BLOCKING |
| BLW | BELOW |
| BM | BENCH MARK |
| B.O. | BOTTOM OF |
| B.S. | BOTH SIDES |
| BTU | BRITISH THERMAL UNIT |
| BUR | BUILT-UP ROOF |
| CAB | CABINET |
| C.B. | CATCH BASIN |
| CEM | CEMENT |
| C.I. | CAST IRON |
| CIRC | CIRCULAR |
| CLG | CEILING |
| CLR. | CLEAR |
| C.M.P. | CORRUGATED METAL PIPE |
| CMU | CONCRETE MASONRY UNIT |
| COL | COLUMN |
| COMP | COMPOSITION |
| CONC | CONCRETE |
| CONSTR | CONSTRUCTION |
| CONT | CONTINUOUS |
| COOR | COORDINATE |
| CORR | CORRIDOR |
| C.R. | COLD ROLLED |
| C.R.C. | COLD ROLLED CHANNEL |
| C.T. | CERAMIC TILE |
| CTR | CENTER |
| DBL | DOUBLE |
| DEPT | DEPARTMENT |
| D.F. | DRINKING FOUNTAIN |
| DET | DETAIL |
| DIA | DIAMETER |
| DIAG | DIAGONAL |
| DIM. | DIMENSION |
| DISP | DISPENSER |
| DL | DEAD LOAD |
| DN. | DOWN |
| DS | DOWNSPOUT |
| DWG | DRAWINGS |
| E | EAST |
| (E) | EXISTING |
| EA | EACH |
| E.I.F.S. | EXTERIOR INSULATION & FINISH SYSTEM |
| ELEV | ELEVATION |
| ELEV | ELEVATOR |
| ELEC | ELECTRICAL |
| EMB | EMBOSSING |
| EQ | EQUAL |
| EQUIP | EQUIPMENT |
| E.G. | EACH SIDE |
| EXIST | EXISTING |
| EXP | EXPOSED |
| EXP.AGG. | EXPANSION EXPOSED AGGREGRATE |
| EXP.JT. | EXPANSION JOINT EXTERIOR |
| F.B. | FLAT BAR |
| F.D. | FLOOR DRAIN |
| FDN | FOUNDATION |
| F.E. | FIRE EXTINGUISHER |
| F.E.C. | FIRE EXTINGUISHER CABINET |
| FIN | FINISH |
| FF | FACTORY FINISH(ED) |
| FF | FINISH FLOOR |
| FLUOR | FLUORESCENT |
| F.O.B. | FACE OF BLOCK |
| F.O.F. | FACE OF FINISH |
| F.O.S. | FACE OF STUD |
| F.O. | FACE OF (Conc. etc.) |
| F.R.P. | FIBER REINFORCED PANEL |
| FRPF | FIREPROOFING |
| FRT | FIRE-RETARDENT TREATED |
| FT | FOOT OR FEET |
| FTG | FOOTING |
| FURR | FURRING |
| FUT | FUTURE |
| GA | GAUGE |
| GAL | GALLON |
| GALV | GALVANIZED |
| GB. | GRAB BAR |
| G.I. | GALVANIZED IRON |
| GL | GLASS |
| GT | GLASS TYPE |
| GWB | GYPSUM WALL BOARD |
| GYM | GYMNASIUM |
| GYP. | GYPSUM |
| H.B. | HOSE BIB |
| H.C. | HOLLOW CORE |
| HDWD | HARDWOOD |
| HDWR | HARDWARE |
| H.M. | HOLLOW METAL |
| H.M.F. | HOLLOW METAL FRAME |
| HORIZ | HORIZONTAL |
| H.P. | HIGH POINT |
| HR | HOUR |
| HT | HEIGHT |
| HW | HOT WATER |
| HWY | HIGHWAY |
| I.D. | INSIDE DIAMETER |
| ( " ) OR IN | INCHES |
| IHM | INSULATED HOLLOW METAL |
| INSUL | INSULATION |
| INT | INTERIOR |
| JAN | JANITOR |
| JT | JOINT |
| KIT | KITCHEN |
| LAB | LABORATORY |
| LAM | LAMINATE OR LAMINATED |
| LAV | LAVATORY |
| LB | POUND |
| LH | LEFT HAND |
| LL | LIVE LOAD |
| L.O.W. | LIMITS OF WORK |
| L.P. | LOW POINT |
| MAT'L | MATERIAL |
| MAX | MAXIMUM |
| MECH | MECHANICAL |
| MET OR MTL | METAL |
| MFR | MANUFACTURER |
| MH | MANHOLE |
| MIN | MINIMUM OR MINUTE |
| MISC | MISCELLANEOUS |
| M.O. | MASONRY OPENING |
| MULL | MULLION |
| N | NORTH |
| NE | NORTHEAST |
| NIC | NOT IN CONTRACT |
| NO | NUMBER |
| NOM | NOMINAL |
| NTS | NOT TO SCALE |
| NW | NORTHWEST |
| O | OVER |
| O.C. | ON CENTER |
| O.D. | OUTSIDE DIAMETER |
| OFD | OVERFLOW DRAIN |
| OFF | OFFICE |
| OFCI | OWNER FURNISHED, CONTRACTOR INSTALLED |
| OFOI | OWNER FURNISHED, OWNER INSTALLED |
| OH | OVERHEAD |
| OPNG | OPENING |
| OPP | OPPOSITE |
| PARA | PARALLEL |
| PART | PARTITION |
| PERF | PERFORATED |
| PERM | PERMANENT |
| PERP | PERPENDICULAR |
| P.I.C. | PRECAST INSULATED CONCRETE |
| PL | PLATE |
| P.LAM | PLASTIC LAMINATE |
| PLAST | PLASTER |
| PLYWD | PLYWOOD |
| PR | PAIR |
| PREFAB | PREFABRICATED |
| PRMA | PROTECTED MEMBRANE ROOF ASSEMBLY |
| PROJ | PROJECT |
| PT | POINT AND PAINT |
| P.T. | PRESERVATIVE TREATED |
| PTD | PAPER TOWEL DISPENSER |
| PVC | POLYVINYL CHLORIDE |
| R | RISER OR RADIUS |
| R.D. | ROOF DRAIN |
| REF | REFERENCE |
| REFR | REFRIGERATOR |
| REINF | REINFORCING |
| REQ | REQUIRED |
| R.H. | RIGHT HAND |
| R.L. | RAIN LEADER |
| RM | ROOM |
| R.O. | ROUGH OPENING |
| R.O.W. | RIGHT OF WAY |
| RTU | ROOF TOP UNIT |
| S | SOUTH |
| SAN | SANITARY |
| S.C. | SOLID CORE |
| SCHED | SCHEDULE |
| SE | SOUTHEAST |
| SECT | SECTION |
| SHEATH | SHEATHING |
| SHT | SHEET |
| SIM | SIMILAR |
| SND | SANITARY NAPKIN DISPENSER |
| SPEC | SPECIFICATIONS |
| SQ | SQUARE |
| S.S. | SANITARY SEWER |
| S.ST. | STAINLESS STEEL |
| STD | STANDARD |
| STL | STEEL |
| STOR | STORAGE |
| STRUCT | STRUCTURAL |
| ST.S | STORM SEWER |
| SUSP | SUSPENDED |
| SV | SHEET VINYL |
| SW | SOUTHWEST |
| SYM | SYMMETRICAL |
| TB | TACKBOARD |
| TBHM | THERMALLY- BROKEN HOLLOW METAL |
| TEL | TELEPHONE |
| TEMP | TEMPORARY |
| TERR | TERRAZZO |
| T&G | TONGUE AND GROOVE |
| THRU | THROUGH |
| T.O. | TOP OF (eg CONCRETE) |
| T.O.S. | TOP OF STEEL |
| TV | TELEVISION |
| TYP | TYPICAL |
| UAA | UNIVERSITY OF ALASKA ANCHORAGE |
| UL | UNDERWRITERS LABORATORY |
| UNFIN | UNFINISHED |
| UNO | UNLESS NOTED OTHERWISE |
| VCT | VINYL COMPOSITION TILE |
| VERT | VERTICAL |
| VEST | VESTIBULE |
| VR | VAPOR RETARDER |
| VTR | VENT THROUGH ROOF |
| W | WEST |
| W/ | WITH |
| WC | WATER CLOSET |
| WD | WOOD |
| W/O | WITHOUT |
| WP | WATERPROOF |
| WT | WEIGHT |

# PROJECT DESCRIPTION

THIS ADDITION IS A VB, ASSEMBLY 4 OCCUPANCY, THERE WILL NOT BE A FIRE SEPARATION NEEDED BETWEEN EXISTING AND ADDITION. THE ADDITION IS SET OFF THE EXISTING BUILDING 20 FEET AND THERE IS AN ABOVE GRADE WALKWAY CREATING A HORIZONTAL EXIT IN LIEU OF A FIRE WALL WITH A FULL FIRE SPRINKLER SYSTEM IN BOTH THE EXISTING STRUCTURE AND THE ADDTION. THE ADDITION WILL USE THE SAME OR SIMILAR BUILDING COMPONENTS AND FINISHES AS THE EXISTING RECREATION CENTER TO CREATE A COHESIVE FLOW BETWEEN THE EXISTING AND ADDITION, THIS PRODUCES A UNIFIED WHOLE FOR THE EXPANDED FACILITY. THE NEW WALKWAY EXTERIOR WILL REFLECT SIMILAR ELEMENTS AS THE EXISTING ENTRY RAMP WALKWAY. THE ADDITION IS ROUGHLY 14,430 TOTAL SQUARE FEET ON THE MAIN LEVEL WITH A MECHANICAL AND STORAGE MEZZANINE AT 1,850 SQUARE FEET. THE MAIN LEVEL ADDITION HOLDS THE GYM FOR SPORTING GAMES, RESTROOMS, AND STORAGE ROOM. ACCESS TO THE ADDITION MEZZANINE IS AT THE STORAGE ROOM STAIR. THE EXTERIOR WALLS, ROOF AND BELOW FLOOR SOFFIT ARE INSULATED METAL PANELS. EXTERIOR FINISHES TO MATCH THE EXISTING BUILDING. THE PANELS ARE SUPPORTED BY METAL GIRTS AND METAL STUDS ATTACHED TO STEEL STRUCTURE ON THERMAL PILES.

# STATE MAP




# VICINITY MAP




# DRAWING INDEX


**GENERAL**

G1.00 GENERAL NOTES, ABBREVIATIONS, LOCATION MAP AND SHEET INDEX
LS1.01 LIFE SAFETY PLANS

**CIVIL**

C100 OVERALL SITE PLAN
C101 SITE DETAILS
C200 GRADING AND DRAINAGE PL

**ARCHITECTURAL**

D1.01 DEMOLITION
A1.01 FLOOR PLANS
A1.02 REFLECTED CEILING PLANS
A1.03 ROOF PLAN
A2.01 EXTERIOR ELEVATIONS
A2.02 EXTERIOR ELAVATIONS
A3.01 BUILDING SECTIONS
A3.02 BUILDING SECTIONS
A3.03 WALL SECTIONS
A3.04 WALL SECTIONS
A4.01 ENLARGED PLANS AND INTERIOR ELEVATIONS
A4.02 ENLARGED PLANS AND INTERIOR ELEVATIONS
A4.03 EXTERIOR STAIR
A4.04 EXTERIOR STAIR
A4.05 INTERIOR STAIR
A5.01 EXTERIOR DETAILS
A5.02 EXTERIOR DETAILS
A5.03 ROOF DETAILS
A5.04 MIP DETAILS
A5.05 DOOR AND WINDOW DETAILS
A6.01 VERTICAL AND HORIZONTAL ASSEMBLIES
A6.02 FINISH AND DOOR SCHEDULES
A7.01 INTERIOR AND MISCELLANEOUS DETALS

**STRUCTURAL**

S0.01 GENERAL NOTES
S0.02 ABBREVIATIONS
S1.02 PILE PLAN
S1.12 LEVEL 1 FRAMING PLAN
S1.22 MEZZANINE FRAMING PLAN
S1.32 ROOF FRAMING PLAN
S2.01 BRACE FRAME ELEVATIONS
S2.05 BRACE FRAME ELEVATIONS
S2.06 BRACE FRAME ELEVATIONS
S5.01 DETAILS
S5.10 DETAILS
S5.11 DETAILS
S5.12 DETAILS
S6.01 SCHEDULES

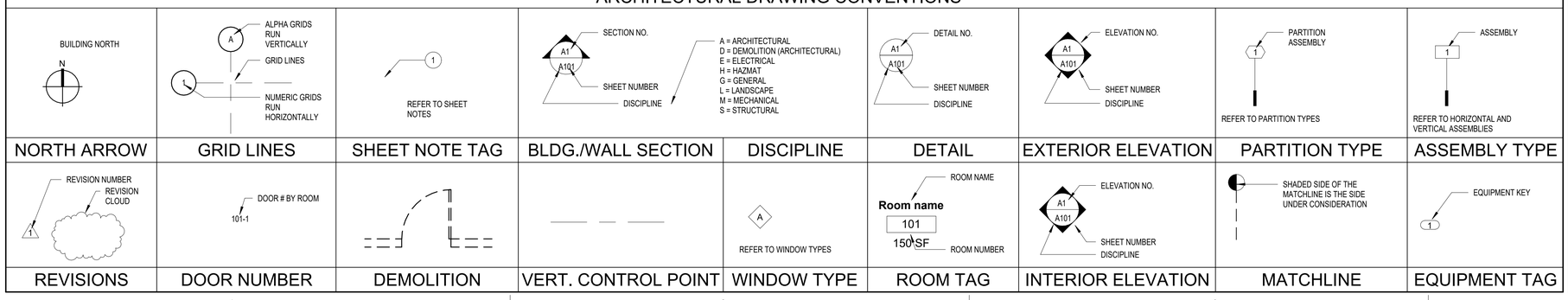
**MECHANICAL**

M0.01 LEGEND AND ABBREVIATIONS
M0.02 MECHANICAL SCHEDULES
M0.03 MECHANICAL SCHEDULES
M1.01 OVERALL PLAN - MECHANICAL
M1.02 EXISTING BUILDING - PARTIAL UNDERFLOOR PLAN - PLUMBING
M2.01 ENLARGED PLANS - PLUMBING
M3.00 UNDERFLOOR PLAN - PIPING
M3.01 MAIN LEVEL FLOOR PLAN - PIPING
M4.01 MAIN LEVEL FLOOR PLAN - VENTILATION
M5.01 ENLARGED PLANS AND SECTIONS - BOILER ROOM
M5.02 ENLARGED PLANS AND SECTIONS - FAN ROOM
M6.01 DIAGRAMS AND DETAILS - PLUMBING
M6.02 DIAGRAMS AND DETAILS - PLUMBING
M7.01 DIAGRAMS AND DETAILS - HEATING
M7.02 DIAGRAMS AND DETAILS - HEATING
M8.01 DIAGRAMS AND DETAILS - VENTILATION

**ELECTRICAL**

E0.01 LEGEND AND ABBREVIATIONS
E0.02 LIGHTING FIXTURE AND PANEL SCHEDULES
E1.01 OVERALL MAIN LEVEL FLOOR PLAN - ELECTRICAL
E2.01 MAIN FLOOR PLAN AND MEZZAINE LEVEL - LIGHTING
E3.01 MAIN LEVEL FLOOR PLAN - POWER
E4.01 MAIN LEVEL FLOOR PLAN - SPECIAL SYSTEMS
E5.01 ENLARGED PLANS - BOILER ROOM AND MEZZANINE FAN ROOM
E8.01 POWER ONE-LINE DIAGRAM


# ARCHITECTURAL DRAWING CONVENTIONS




# GENERAL PROJECT NOTES

1. ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH THE PROVISIONS OF THE BUILDING CODES OUTLINED ON THE LIFE SAFETY PLAN, AND ALL OTHER STATE AND LOCAL CODES, INCLUDING ALL AMENDMENTS.
2. ALL WORK SHALL CONFORM TO THE AMERICAN DISABILITIES ACT (A.D.A.) ACCESSIBILITY GUIDELINES FOR BUILDING AND FACILITIES (A.D.D.A.G.) AND A.N.S.I. 117.1 UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE TO FACE OF STUD, FACE OF CONCRETE, FACE OF C.M.U., TO CENTERLINE OF STRUCTURAL COLUMN, OR TO STRUCTURAL GRID-LINE UNLESS NOTED OTHERWISE.
4. DIMENSIONS NOTED AS 'CLEAR' (OR CLR.) SHALL BE TO FINISHED FACE.
5. DO NOT SCALE THE DRAWINGS TO OBTAIN CONSTRUCTION DIMENSIONS.

AECC561
ARCHITECTS ALASKA
900 W. 5th Avenue, Suite 403
Anchorage AK, 99501
907.272.3567
www.architectsalaska.com

65% DESIGN DEVELOPMENT

CITY OF BETHEL
Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

| | |
|---|---|
| Drawn by TB / DWL | Date 01-22-2025 |
| Checked DM | Job No. 24048.01 |

Sheet Contents
GENERAL NOTES, ABBREVIATIONS, LOCATION MAP AND SHEET INDEX

Sheet No.
**G1.00**

Plot Date Time: 1/22/2025 2:52:36 PM

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt

## BUILDING CODE INFORMATION

GENERAL PROJECT DESCRIPTION: CONSTRUCTION OF AN ADDITION METAL FRAMED BUILDING WHICH WILL SERVE AS AN EXERCISE MULTIPURPOSE FACILITY ADDITION TO THE EXISTING REC CENTER. THE BUILDING CONSTRUCTION TYPE V-B WITH (NON-FIRE RATED) PER TABLE 601, OCCUPANCY "A" WITH EXERCISE, ASSEMBLY, STORAGE, AND SUPPORT SPACES. (SECTION 502 CONSTRUCTION CLASSIFICATION; TABLE 601, FIRE-RESISTIVE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

THE BUILDING SHALL COMPLY WITH THE REQUIREMENTS OF THE 2021 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE STATE OF ALASKA.

**OCCUPANCY CLASSIFICATION:** (SECTION 302 OCCUPANCY CLASSIFICATION AND USE DESIGNATION)
GROUP A-4 - ASSEMBLY GATHERING OF PERSONS FOR PURPOSES SUCH AS CIVIC, SOCIAL, RECREATION, INDOOR SPORTING EVENTS WITH SPECTATOR SEATING

OCCUPANCY OF SPACES PER IBC 2021, TABLE 1004.5
ACCESSORY STORAGE, MECH. EQUIPMENT = 300 GROSS
EXERCISE ROOMS = 50 GROSS

**BUILDING HEIGHT AND NUMBER OF STORIES:** SECTION 504, HEIGHT PER TABLE 504.3 AND NUMBER OF STORIES PER TABLE 504.4)

| OCCUPANCY GROUPS: | ALLOWABLE BUILDING HEIGHT | NUMBER OF STORIES ABOVE GRADE |
|---|---|---|
| A (S) | 60 FEET | 2 |

ACTUAL HEIGHT= 43'-0" < 60'-0", OK
ACTUAL NUMBER OF STORIES = 1 STORY, OK

**BUILDING AREA**: (SECTION 506, TABLE 506.2)
ALLOWABLE BUILDING AREA TABULAR BUILDING AREA PER TABLE 506.2 OCC. A-4 = 24,000 SF

**FRONTAGE INCREASE:** (SECTION 506.3.3, TABLE 506.3.3)
PERCENTAGE OF BUILDING PERIMETER OPEN = 75 TO 100
OPEN SPACE (FEET) AWAY FROM BUILDING = 30 OR GREATER
FRONTAGE INCREASE FACTOR = 1.75 X 24,000 = 42,000 SF PER FLOOR

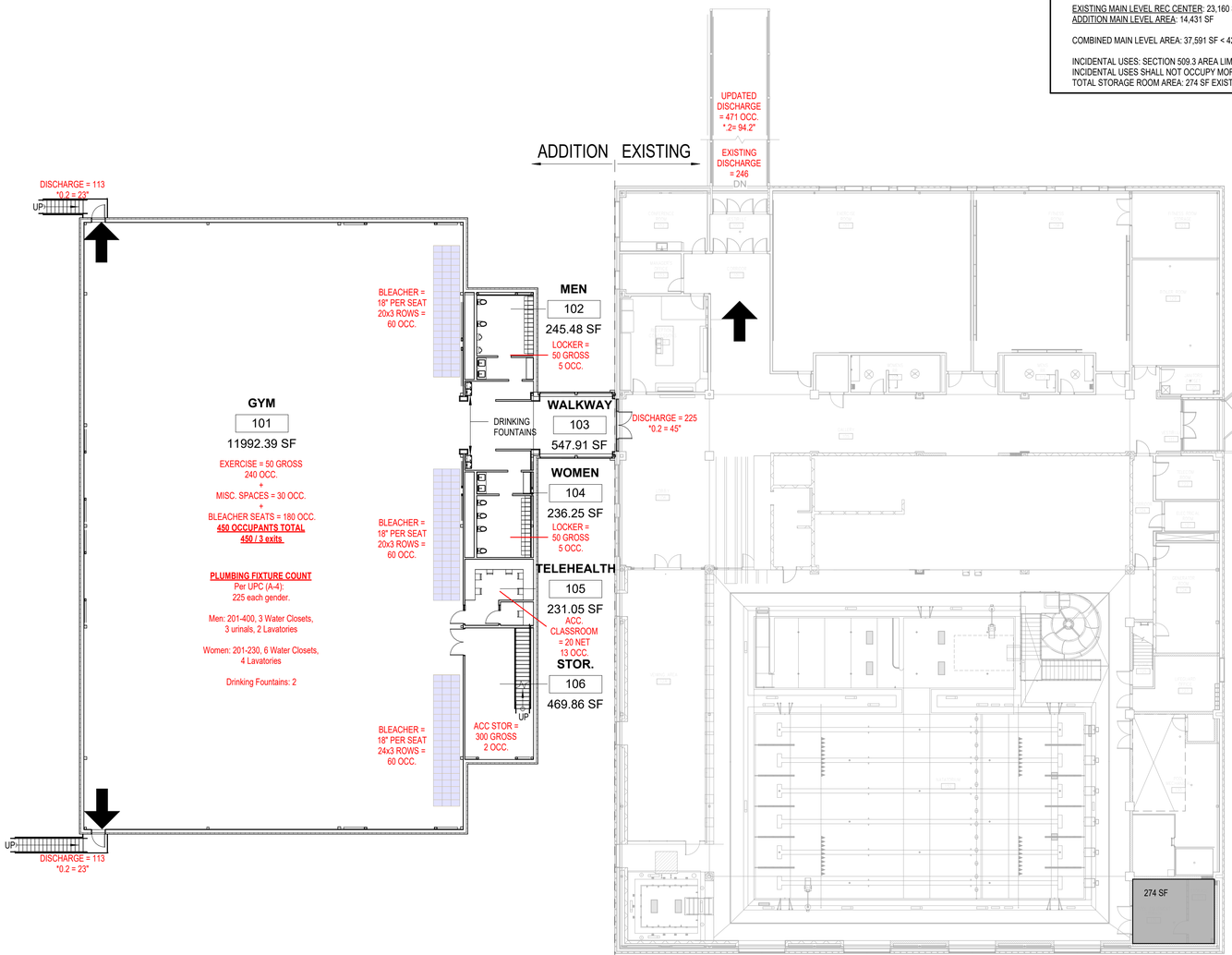
EXISTING MAIN LEVEL REC CENTER: 23,160 SF 13,960 + 1,655 = 15, 615
ADDITION MAIN LEVEL AREA: 14,431 SF

COMBINED MAIN LEVEL AREA: 37,591 SF < 42,000 SF, OK

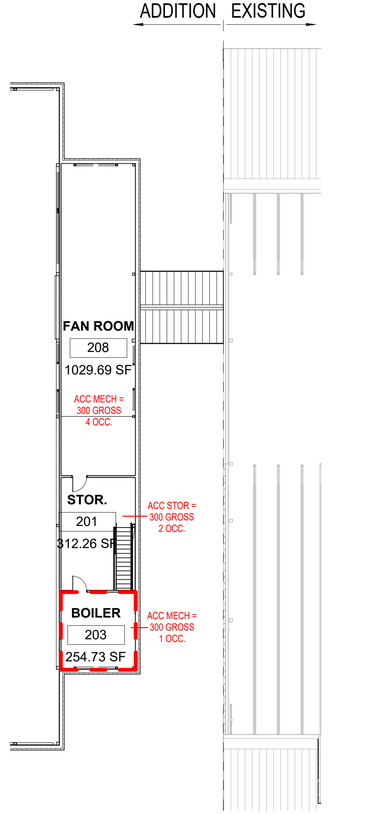
INCIDENTAL USES: SECTION 509.3 AREA LIMITATIONS
INCIDENTAL USES SHALL NOT OCCUPY MORE THAN 10 PERCENT OF THE BUILDING AREA OF THE STORY IN WHICH THEY ARE LOCATED.
TOTAL STORAGE ROOM AREA: 274 SF EXISTING +, 470 SF + 313 SF = 1,057 SF < 10%(3,760) OF 37,591 SF TOTAL, OK

## LIFE SAFETY PLAN LEGEND

- 1-HOUR FIRE RATED WALL SEE PARTITION TYPE _____
- EXIT SIGN LOCATION
- FE — FIRE EXTINGUISHER UL-RATED: 2A-10B:C
- KB — KNOX BOX LOCATION
- EXIT DISCHARGE




A1 / LS1.01 MAIN LEVEL LIFE SAFETY PLAN
1/16" = 1'-0"




A4 / LS1.01 MEZZANINE LEVEL LIFE SAFETY PLAN
1/16" = 1'-0"

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CITY OF BETHEL
# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

Revisions

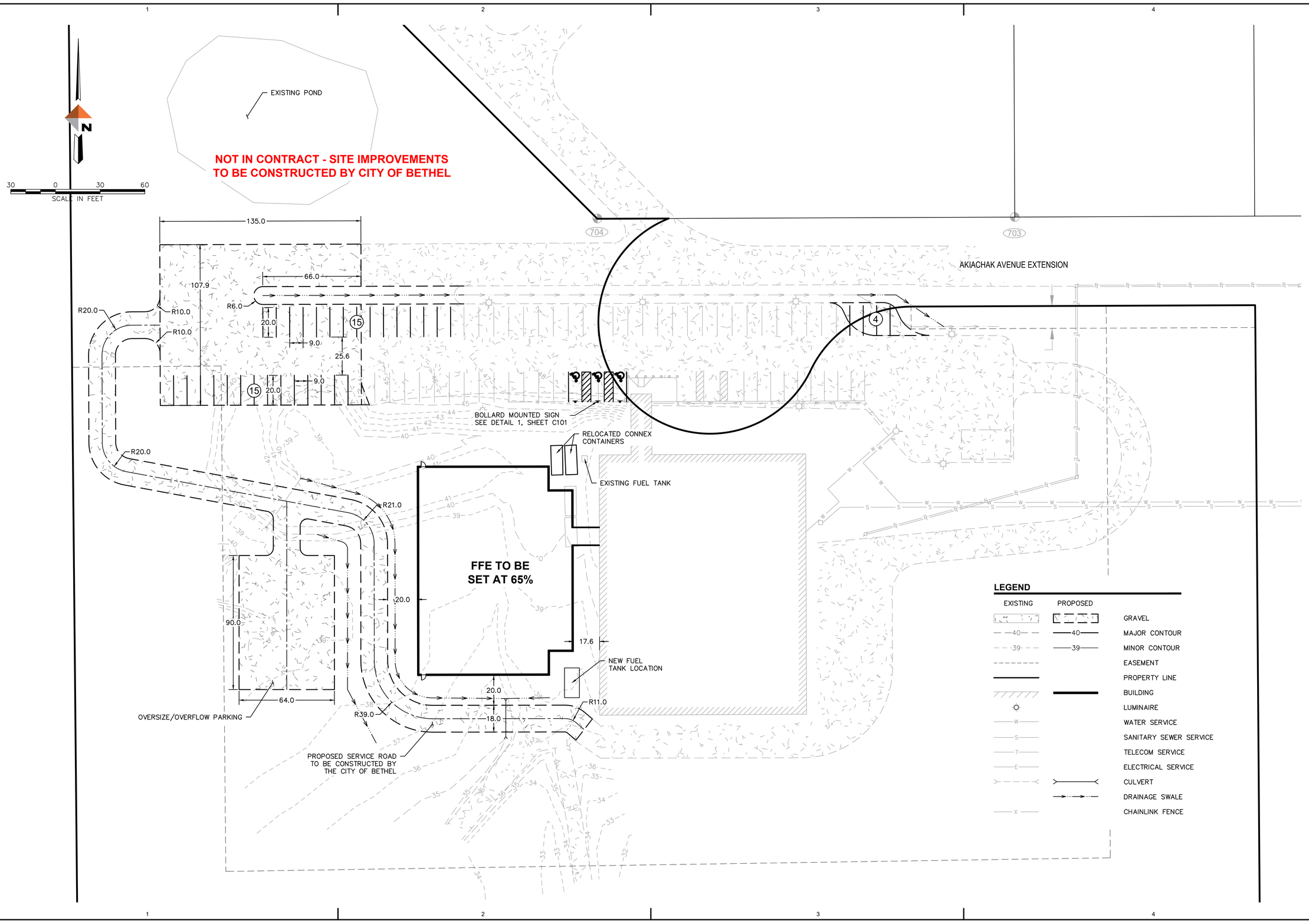
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| Checked DM | Job No. 24048.01 |

Sheet Contents
LIFE SAFETY PLANS

Sheet No.
**LS1.01**

Plot Date Time: 1/22/2025 2:52:39 PM




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# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

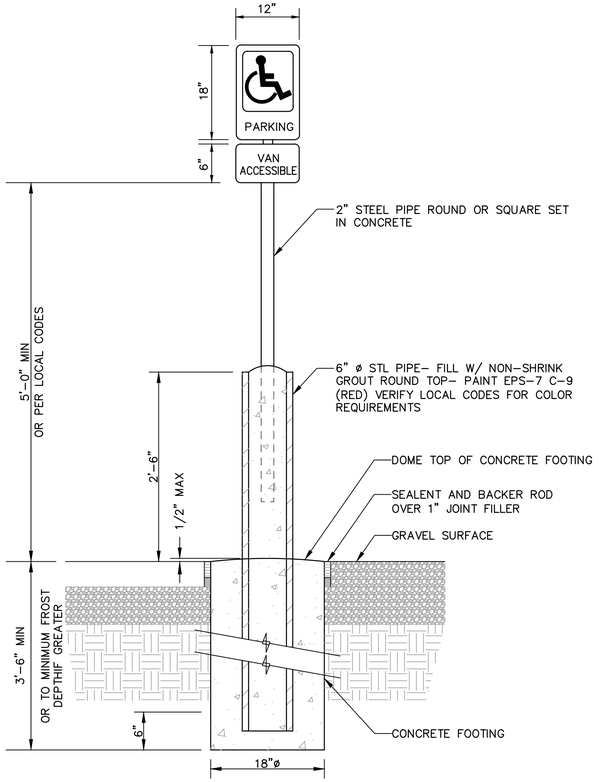
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| Checked CAN | Job No. 24048.01 |

Sheet Contents
OVERALL SITE PLAN

Sheet No.
**C100**

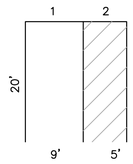
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SIGNS SHALL NOT BE MOUNTED ON DOORS OR WINDOWS AND CAN NOT BE MORE THAN TEN FEET FROM THE EDGE OF THE PARKING STALL.

SIGN SHALL BE CENTERED BETWEEN PARKING SPACE STRIPING (1 IN DIAGRAM). MOUNTING HEIGHTS FOR BUILDING ARE SAME AS THOSE FOR POLE MOUNTING INDICATED ON THIS SHEET.

INSTALL A NO PARKING SIGN CENTERED AT THE FRONT OF THE 5 FOOT WIDE ACCESS AISLE (2 IN DIAGRAM).




1 / C101 BOLLARD SIGN POST
NTS

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BETHEL, ALASKA

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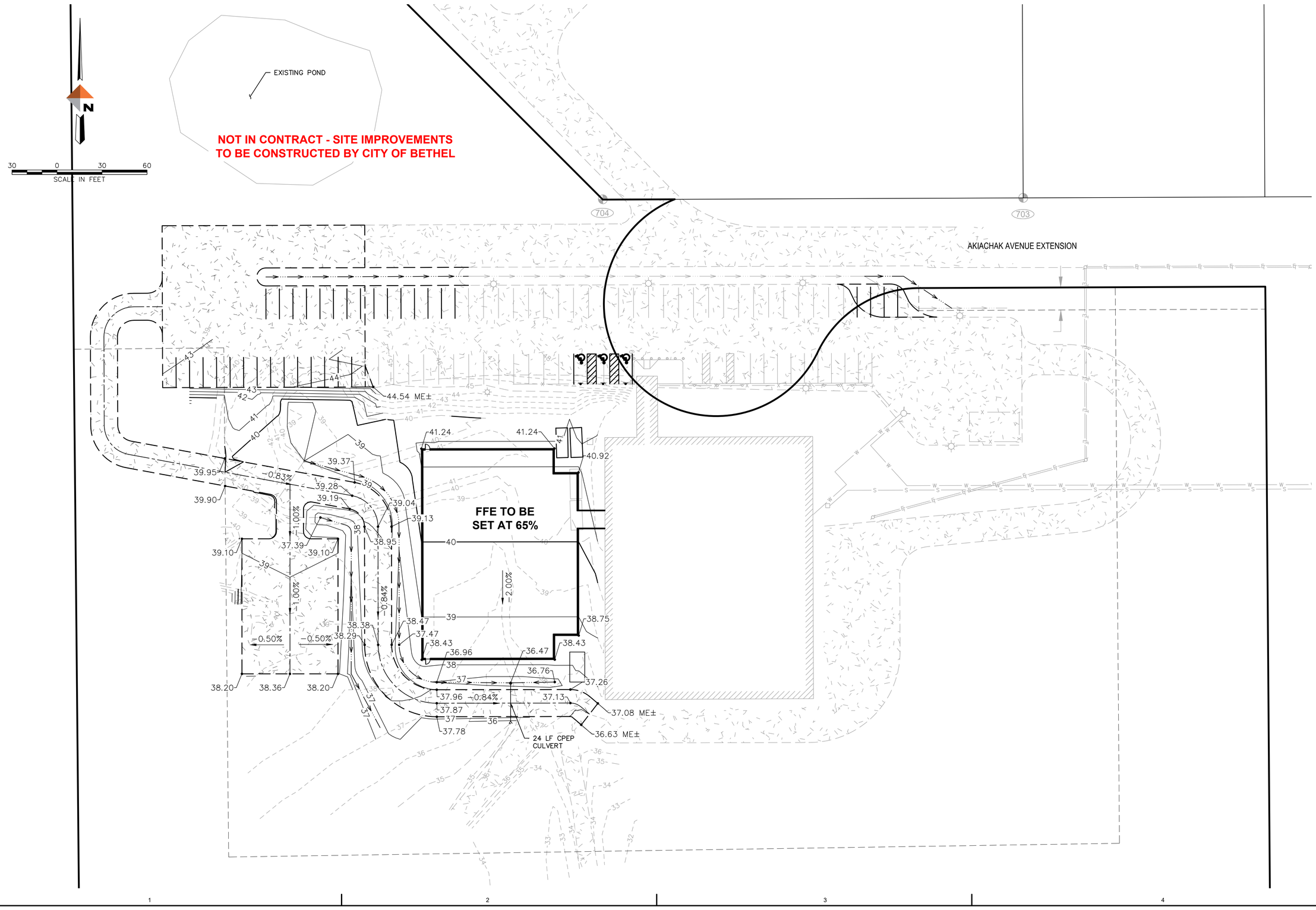
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Sheet Contents
SITE DETAILS

Sheet No.
**C101**

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CITY OF BETHEL

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BETHEL, ALASKA

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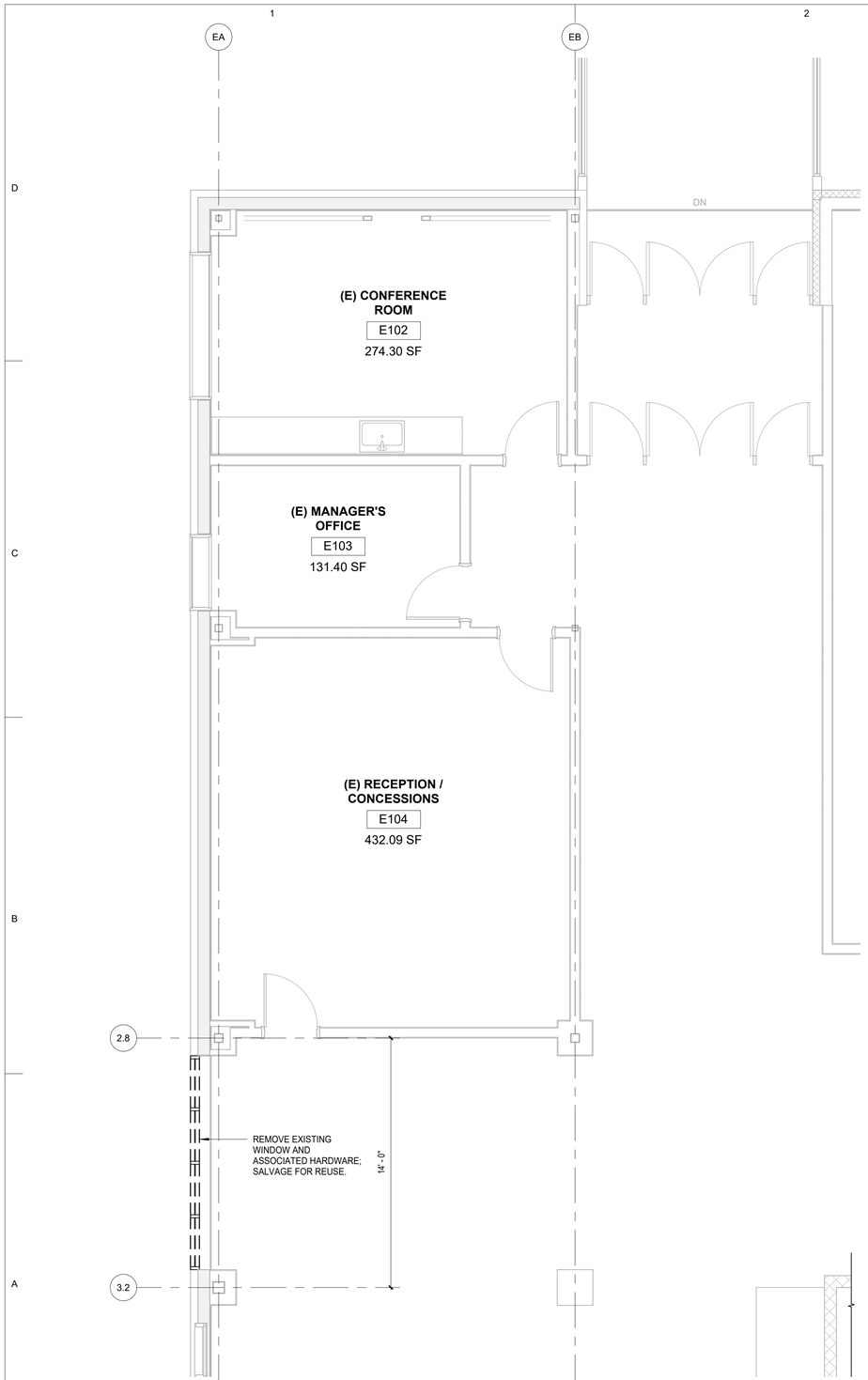
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Sheet Contents
GRADING AND DRAINAGE PLAN

Sheet No.
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A1 / D1.01 DEMOLITION PLAN
1/4" = 1'-0"

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# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

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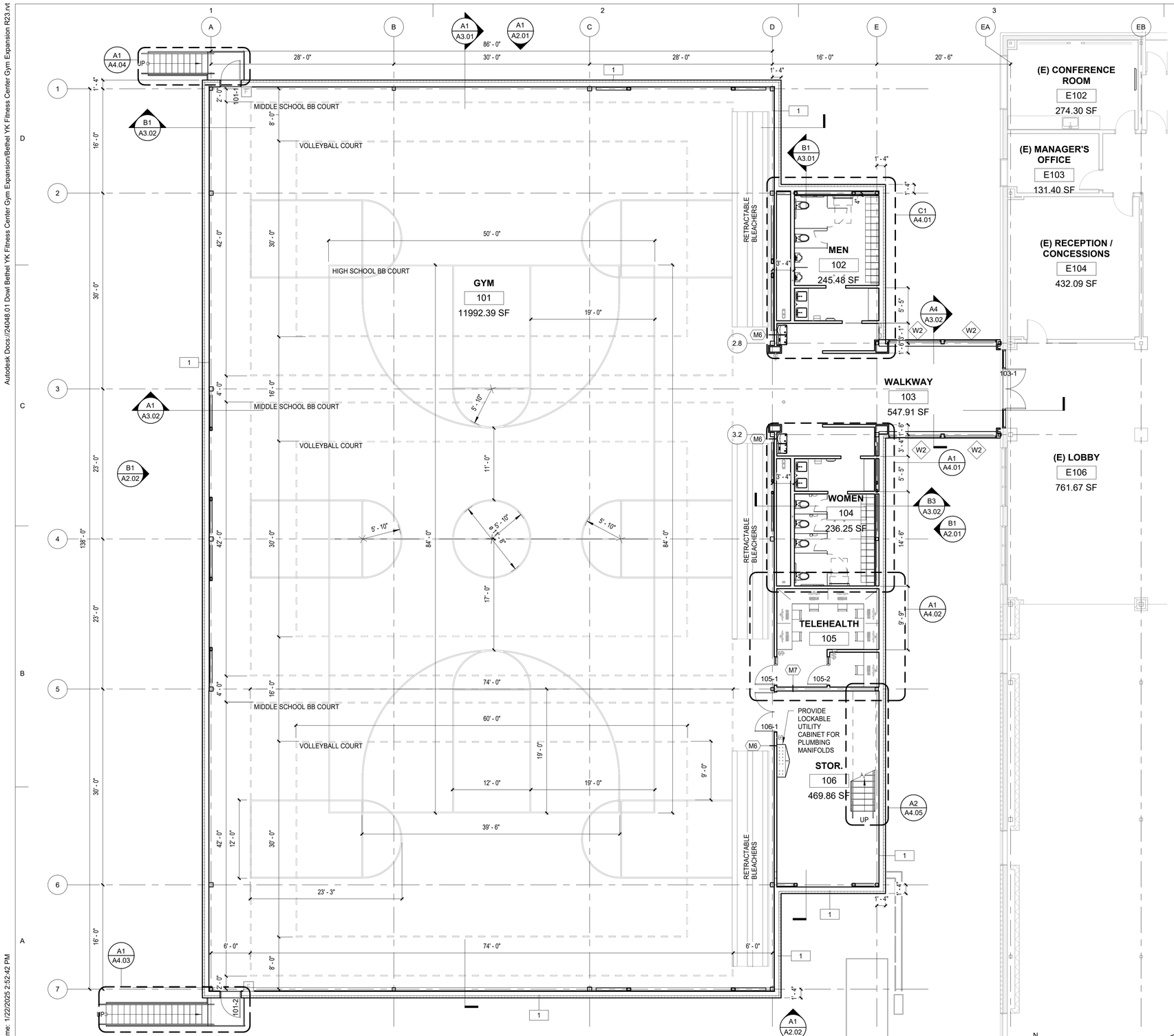
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DEMOLITION

Sheet No.
**D1.01**

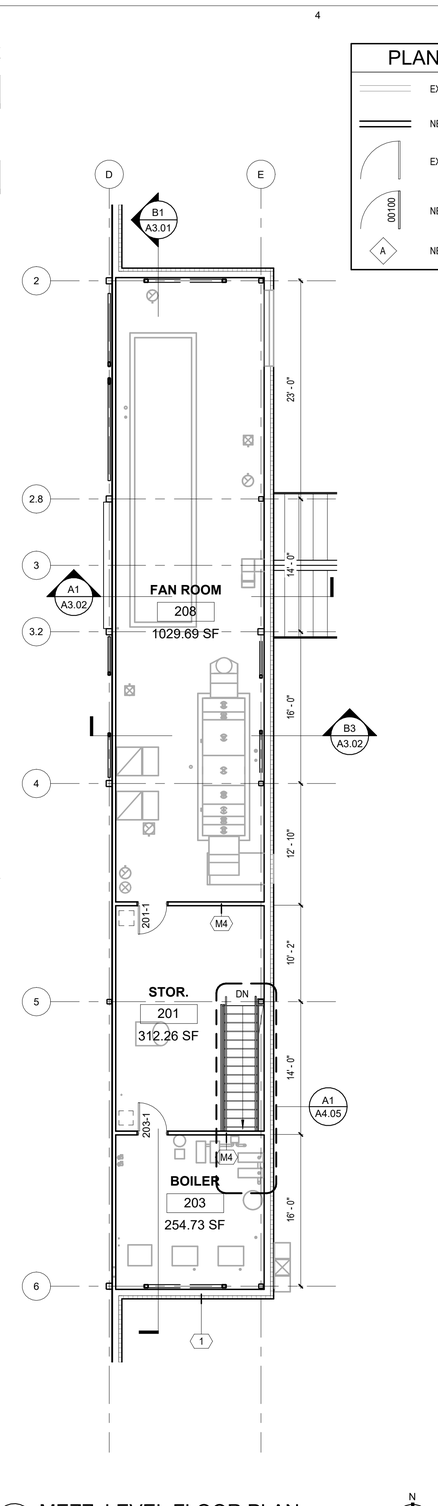
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Plot Date Time: 1/22/2025 2:52:42 PM




A1 / A1.01 MAIN LEVEL FLOOR PLAN
1/8" = 1'-0"




A2 / A1.01 MEZZ. LEVEL FLOOR PLAN
1/8" = 1'-0"

## PLAN LEGEND

- EXISTING WALLS TO REMAIN
- NEW WALLS
- EXISTING DOOR AND FRAME
- 00100 NEW DOOR AND FRAME
- A NEW WINDOW

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CITY OF BETHEL
# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

Revisions

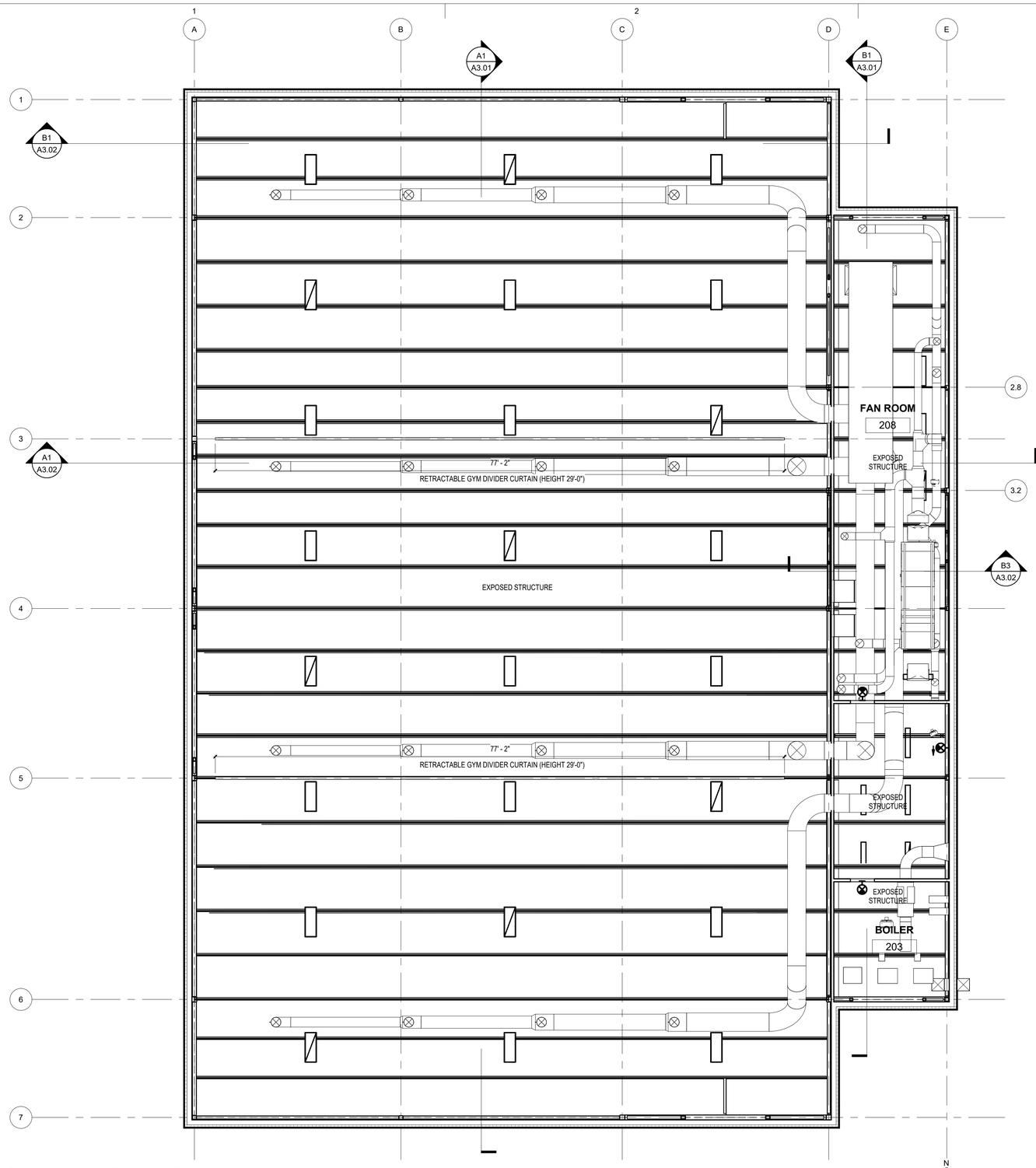
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| Checked DM | Job No. 24048.01 |

Sheet Contents
FLOOR PLANS

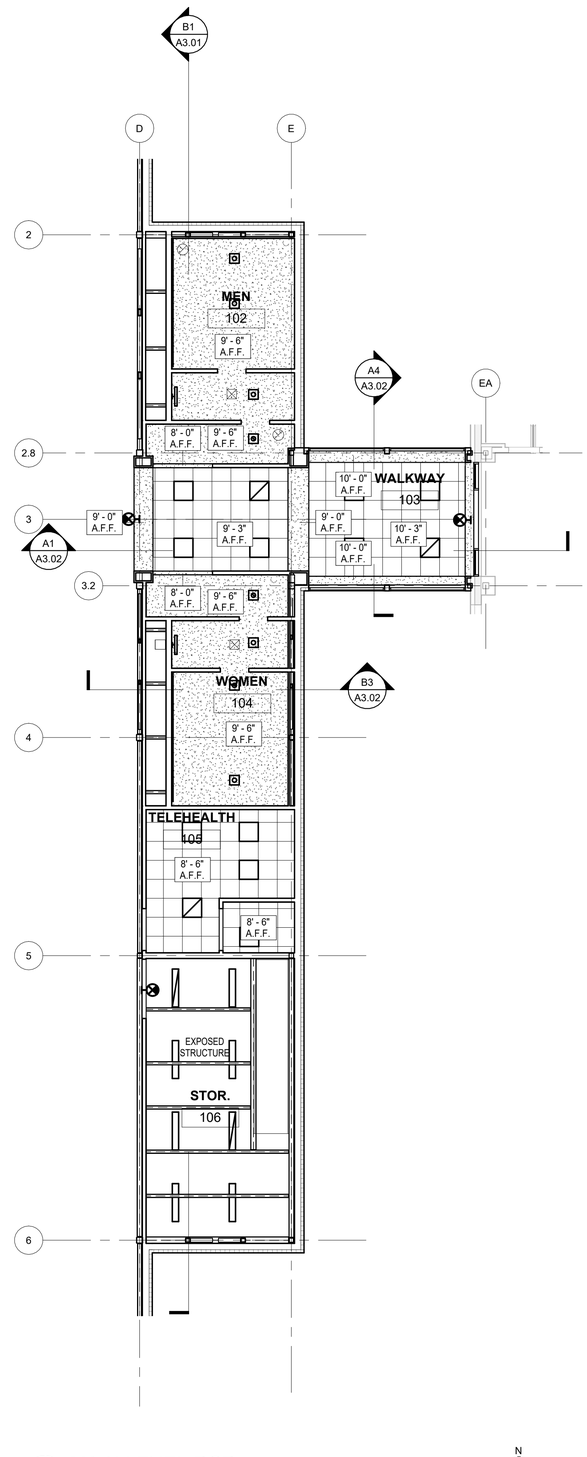
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**A1.01**

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A1 / A1.02 GYM/MEZZANINE RCP

1/8" = 1'-0"




A3 / A1.02 MAIN LEVEL RCP

1/8" = 1'-0"

## RCP LEGEND

- SUSPENDED ACOUSTICAL CEILING
- GYPSUM BOARD CEILING
- MECHANICAL DIFFUSERS, REFER TO MECHANICAL DRAWINGS
- LIGHTING, REFER TO ELECTRICAL DRAWINGS
- 10'-0" A.F.F. — CEILING HEIGHT AS INDICATED

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# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

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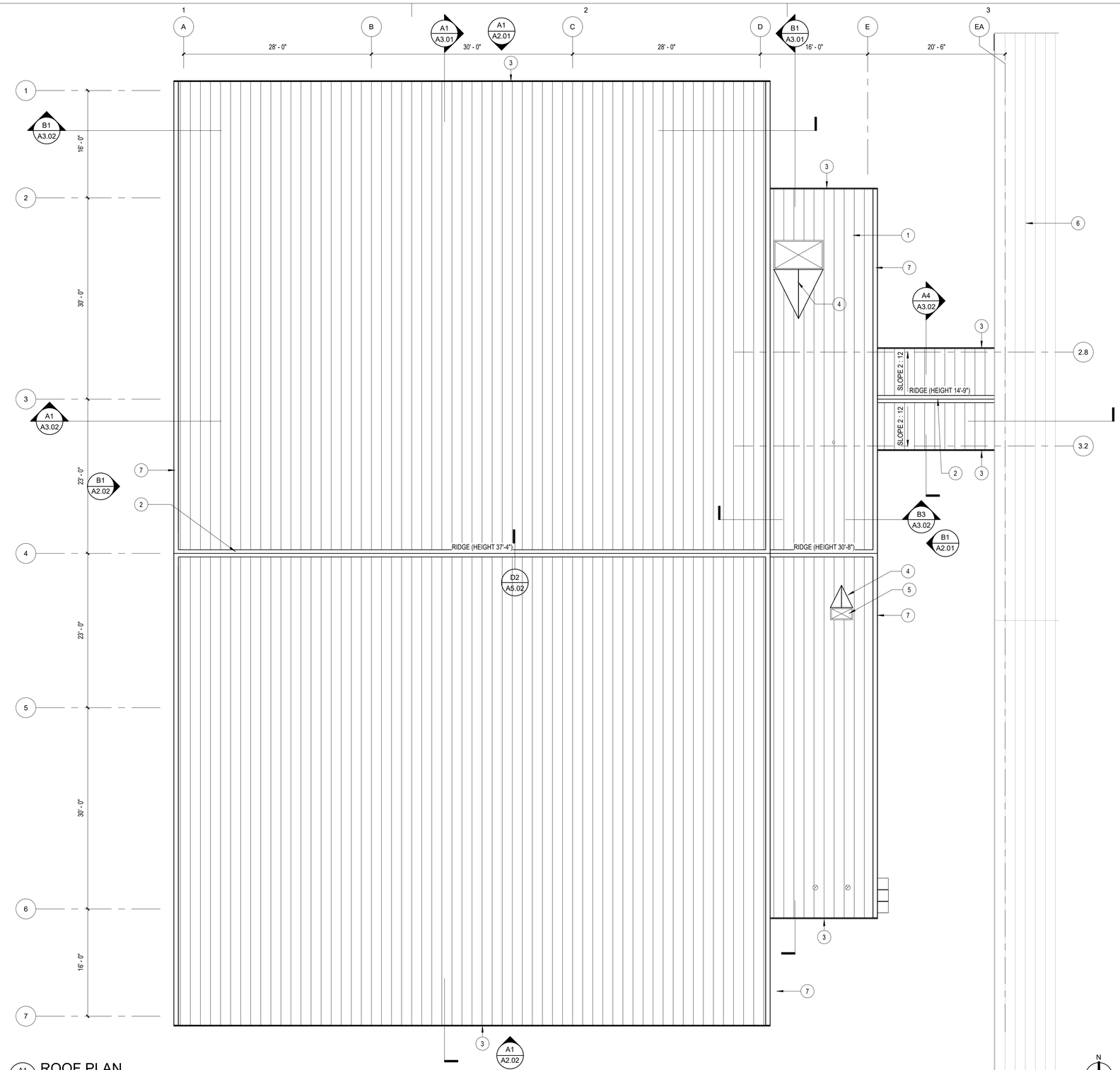
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Sheet Contents
REFLECTED CEILING PLANS

Sheet No.
**A1.02**

Plot Date Time: 1/22/2025 2:52:43 PM

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## SHEET KEYNOTES

1. INSULATED METAL ROOF PANELS, TYPICAL.
2. RIDGE FLASHING
3. EAVE FLASHING
4. ROOF CRICKET
5. ROOFTOP EQUIPMENT, SEE MECHANICAL.
6. EXISTING BUILDING
7. RAKE-EDGE FLASHING

A1 A1.03 ROOF PLAN

1/8" = 1'-0"

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Sheet Contents
ROOF PLAN

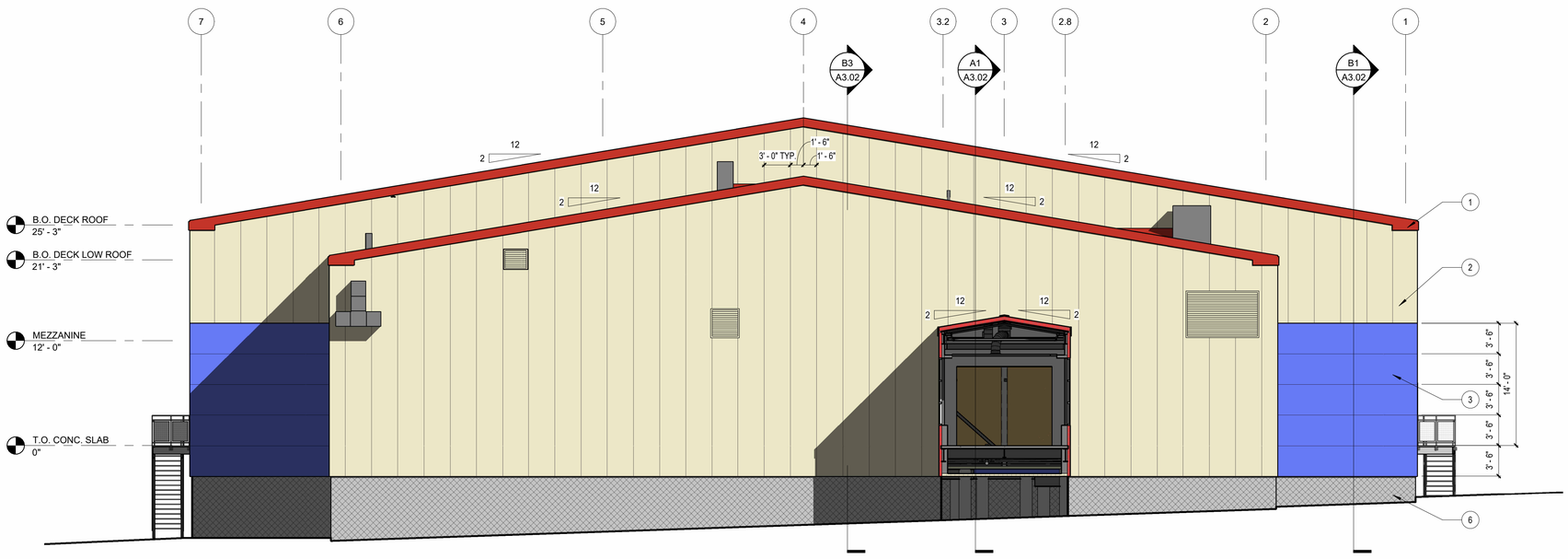
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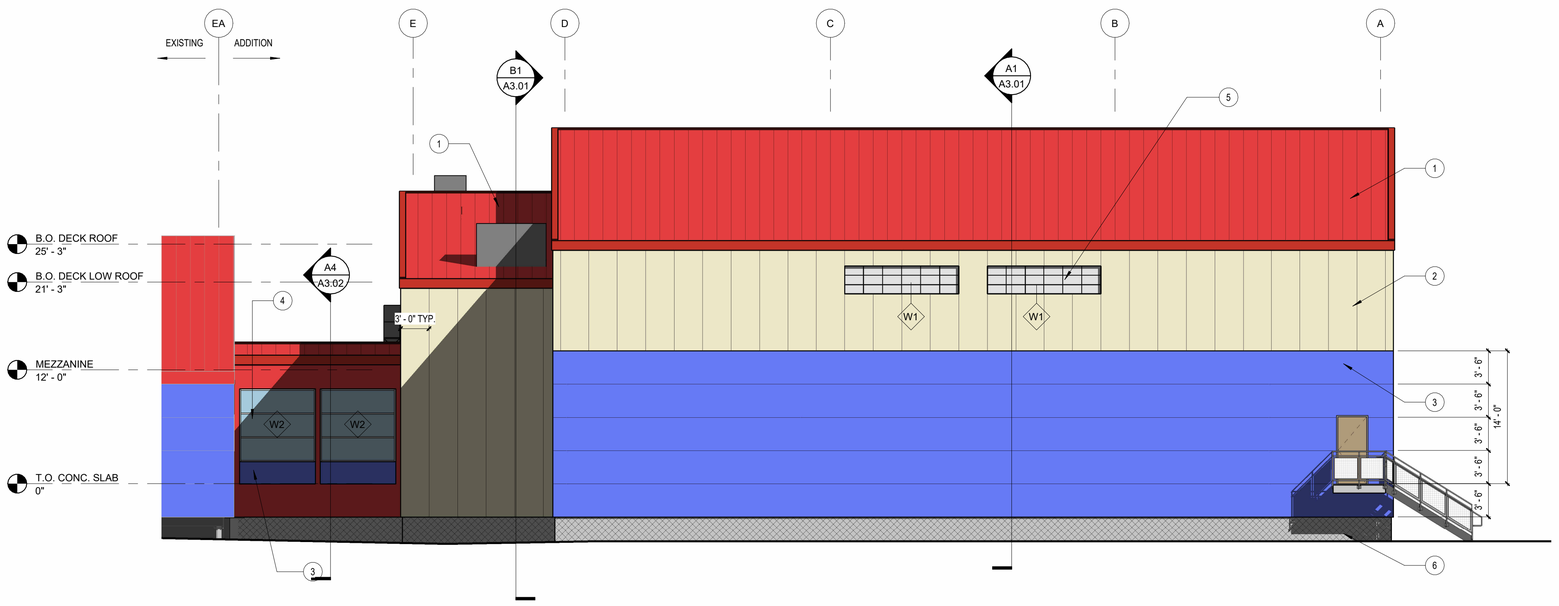
## SHEET KEYNOTES

1. INSULATED METAL ROOF PANELS, COLOR AND PROFILE TO MATCH EXISTING BUILDING
2. VERTICAL INSULATED METAL PANELS, COLOR AND PROFILE TO MATCH EXISTING BUILDING
3. HORIZONTAL INSULATED METAL PANELS, COLOR AND PROFILE TO MATCH EXISTING BUILDING
4. GLAZING TO MATCH EXISTING COVERED WALKWAY
5. TRANSLUCENT PANEL
6. CHAIN LINK FENCING




B1 A2.01 EAST ELEVATION

1/8" = 1'-0"




A1 A2.01 NORTH ELEVATION

1/8" = 1'-0"

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BETHEL, ALASKA

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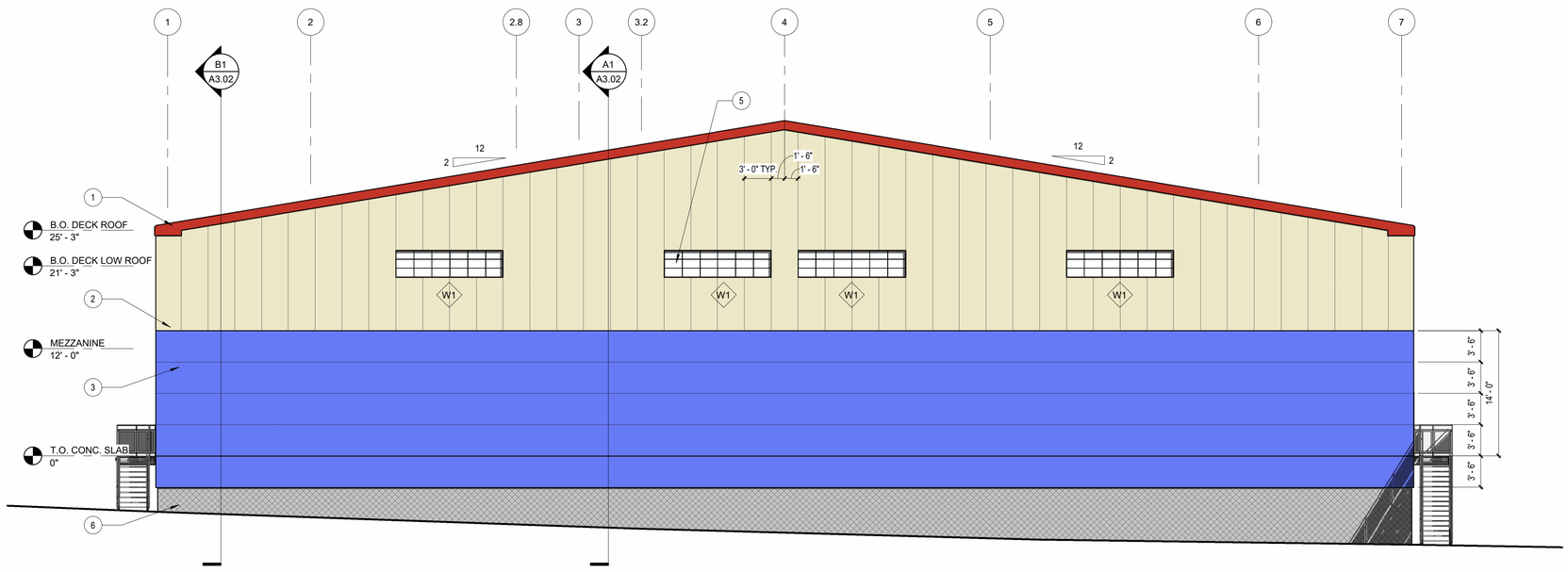
EXTERIOR ELEVATIONS

Sheet No.

**A2.01**

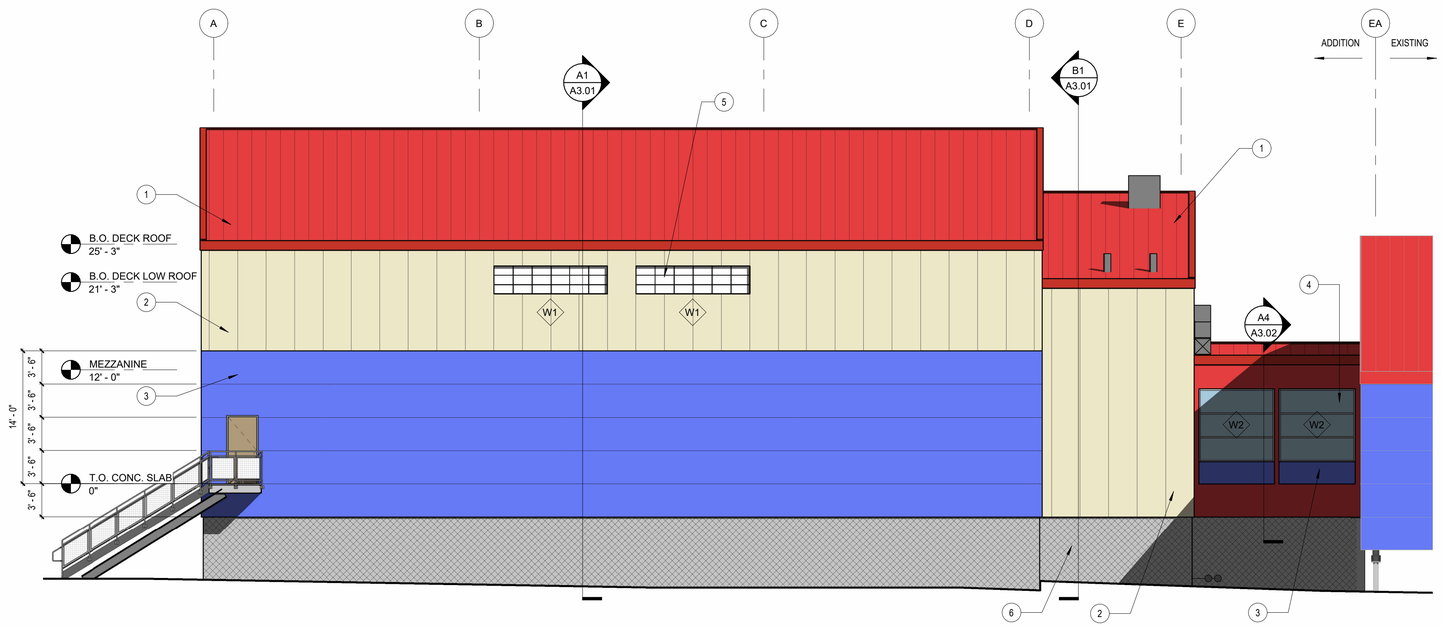
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B1 A2.02 WEST ELEVATION

1/8" = 1'-0"




A1 A2.02 SOUTH ELEVATION

1/8" = 1'-0"

## SHEET KEYNOTES

1. INSULATED METAL ROOF PANELS, COLOR AND PROFILE TO MATCH EXISTING BUILDING
2. VERTICAL INSULATED METAL PANELS, COLOR AND PROFILE TO MATCH EXISTING BUILDING
3. HORIZONTAL INSULATED METAL PANELS, COLOR AND PROFILE TO MATCH EXISTING BUILDING
4. GLAZING TO MATCH EXISTING COVERED WALKWAY
5. TRANSLUCENT PANEL
6. CHAIN LINK FENCING

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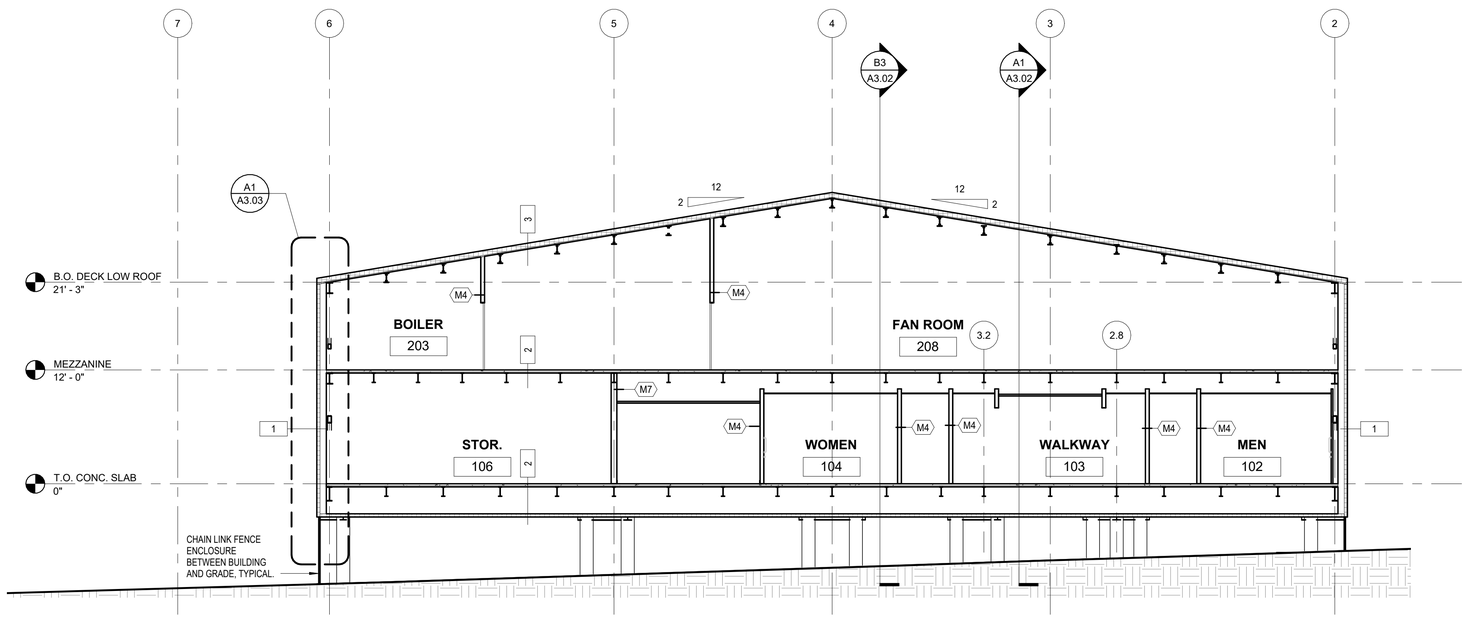
EXTERIOR ELAVATIONS

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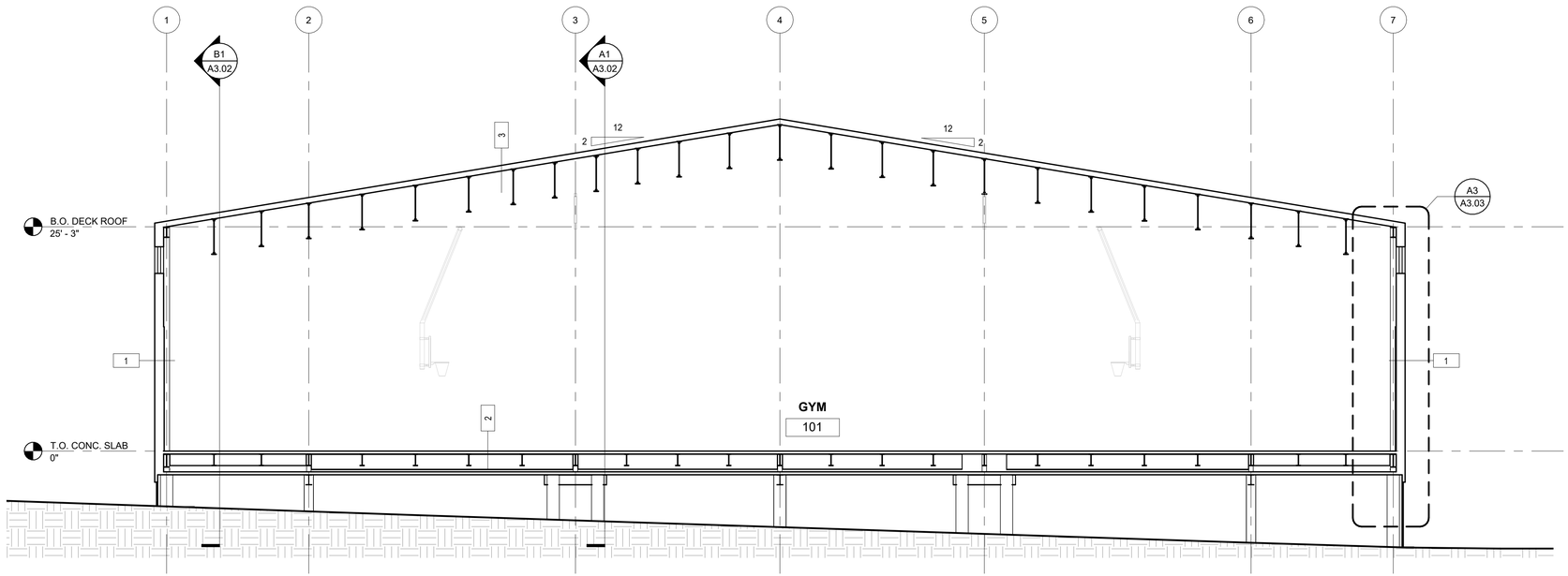
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Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt




## B1 A3.01 BUILDING SECTION

1/8" = 1'-0"




## A1 A3.01 BUILDING SECTION

1/8" = 1'-0"

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BETHEL, ALASKA

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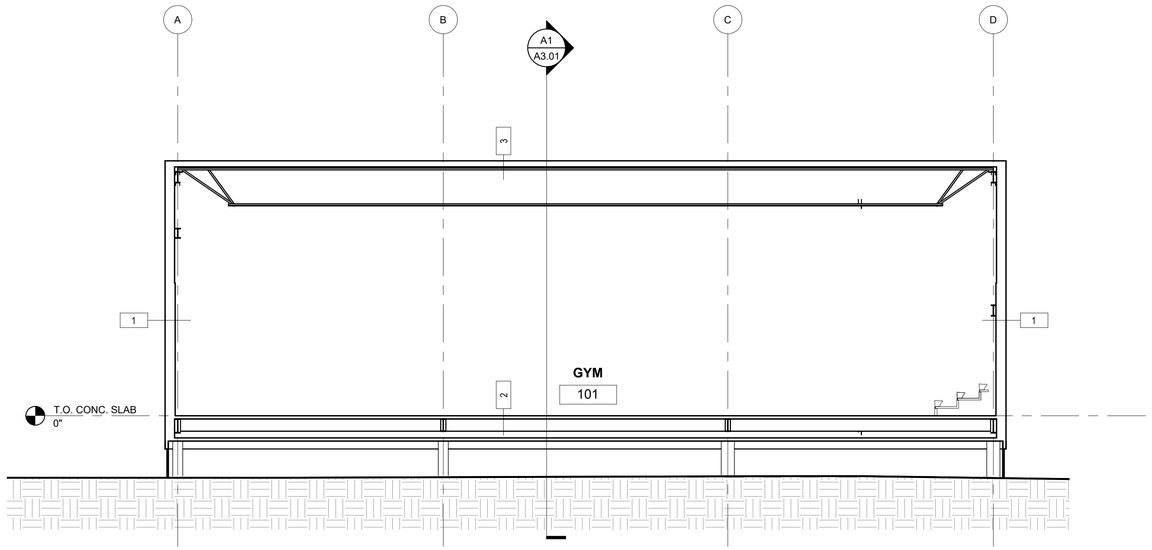
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Sheet Contents
BUILDING SECTIONS

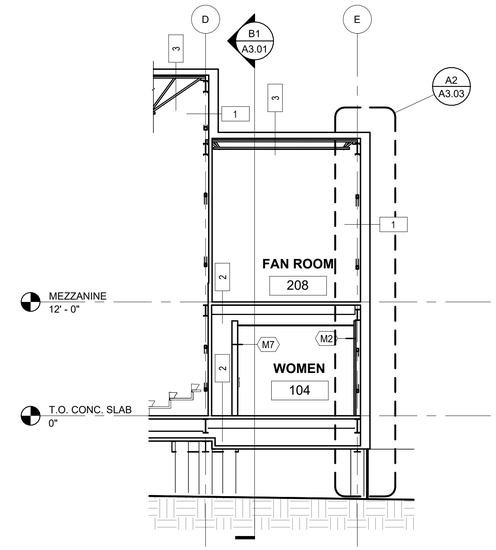
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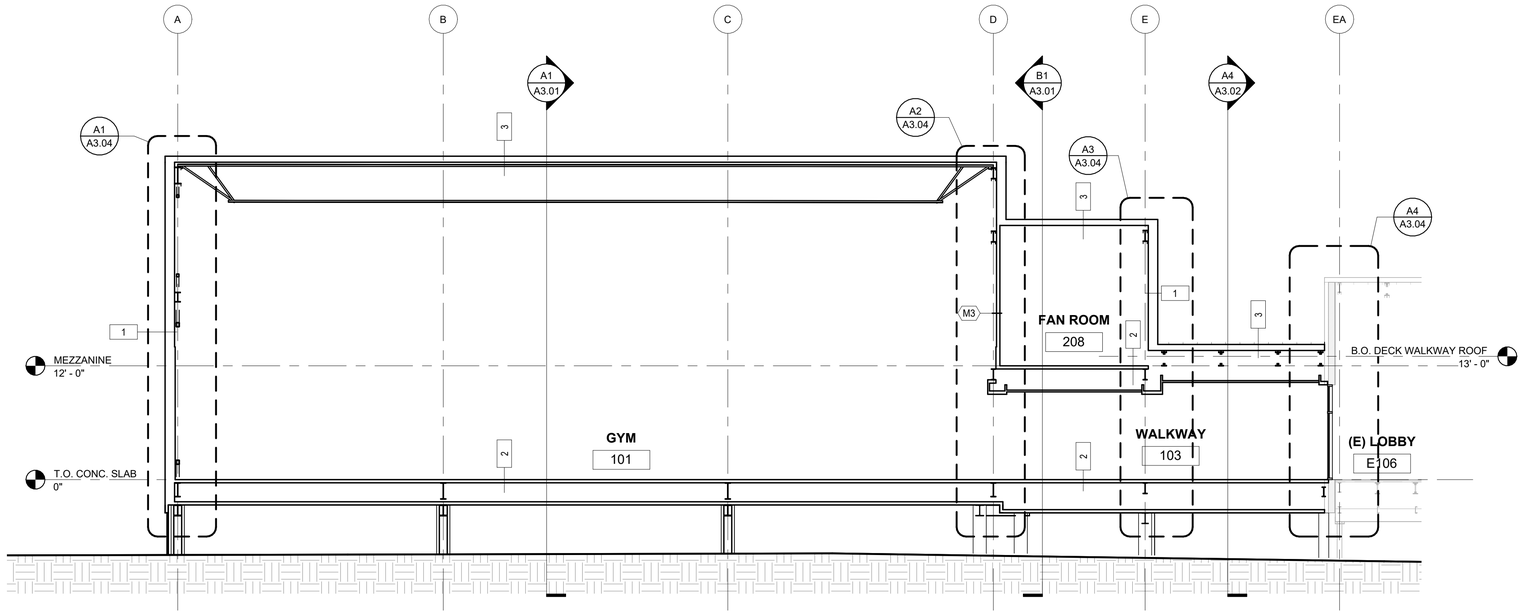
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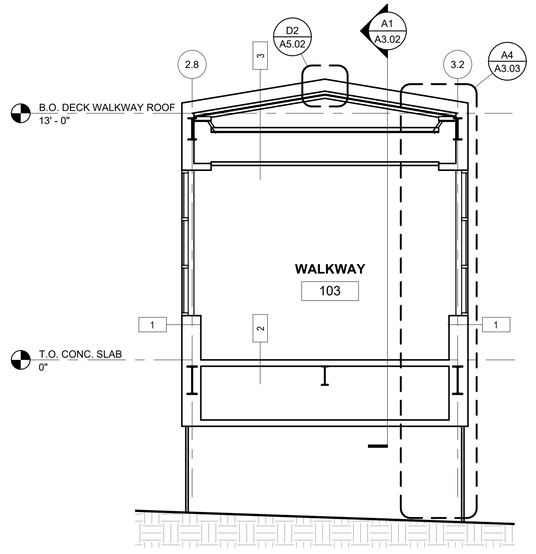

B1 A3.02 BUILDING SECTION
1/8" = 1'-0"




B3 A3.02 BUILDING SECTION
1/8" = 1'-0"




A1 A3.02 BUILDING SECTION
1/8" = 1'-0"




A4 A3.02 WALKWAY SECTION
1/4" = 1'-0"

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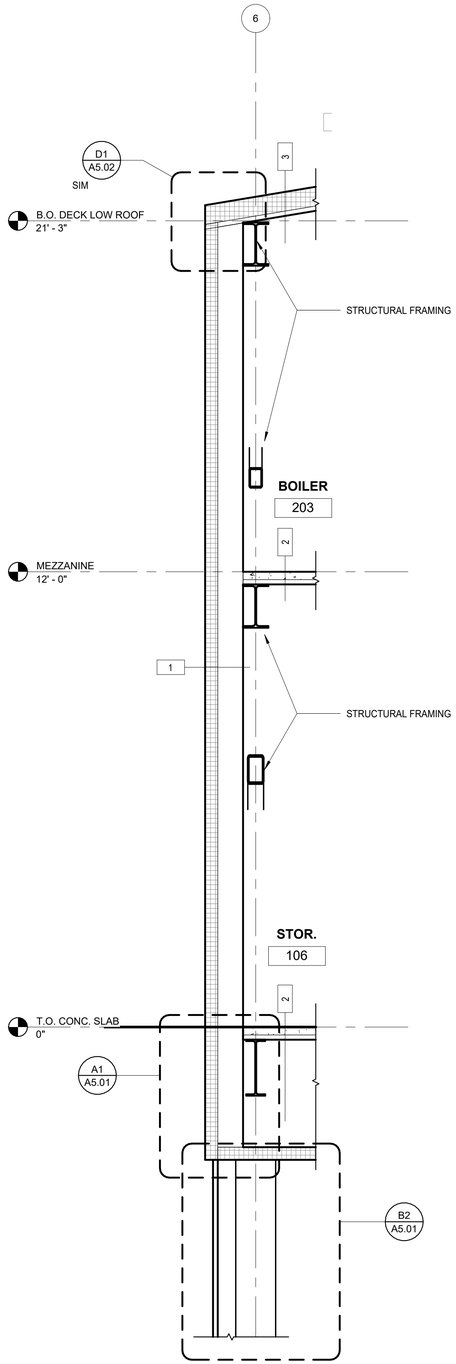
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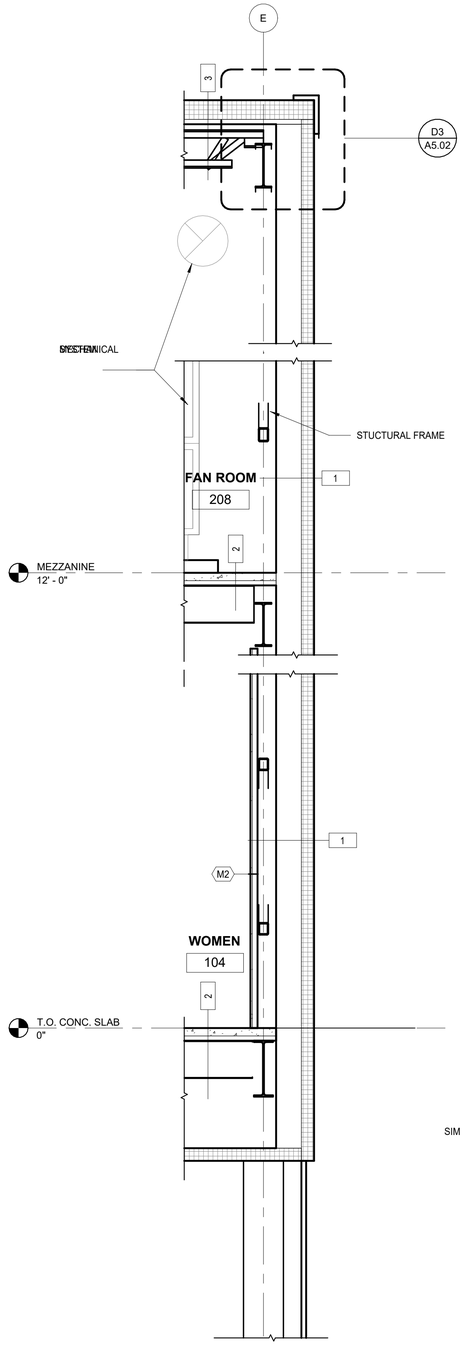
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BUILDING SECTIONS

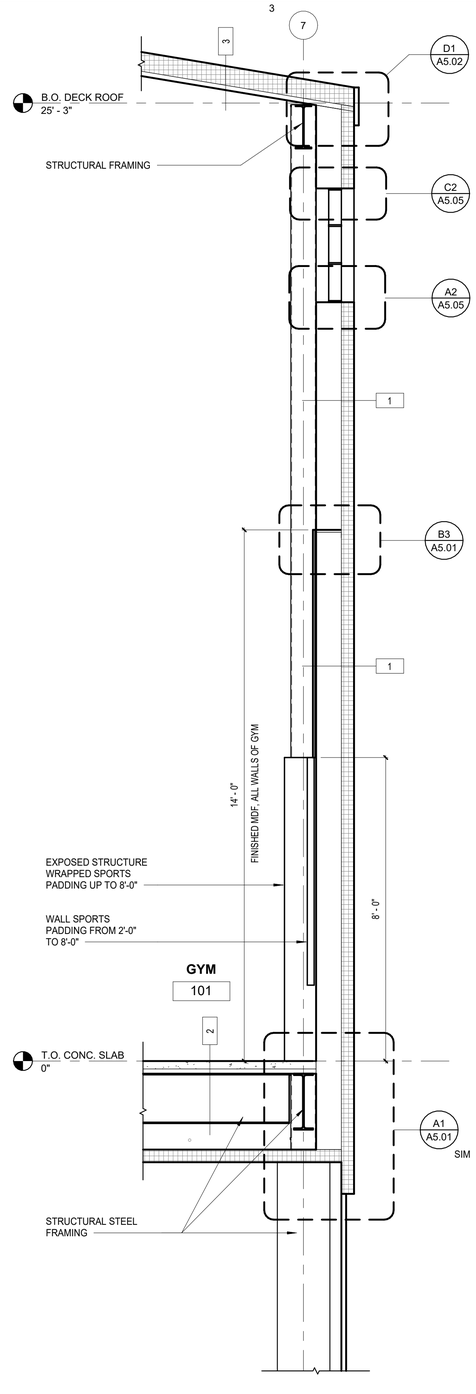
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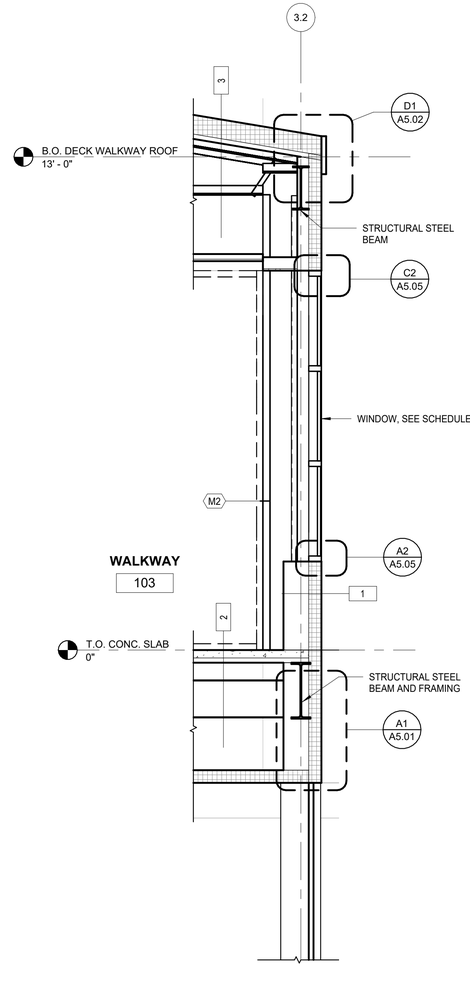
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Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt




A1 A3.03 WALL SECTION
1/2" = 1'-0"

A2 A3.03 WALL SECTION
1/2" = 1'-0"

A3 A3.03 WALL SECTION
1/2" = 1'-0"

A4 A3.03 WALKWAY WALL SECTION
1/2" = 1'-0"

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65% DESIGN DEVELOPMENT

CITY OF BETHEL
# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
|---|---|---|
| | | |

| | |
|---|---|
| Drawn by WVZ | Date 01-22-2025 |
| Checked DM | Job No. 24048.01 |

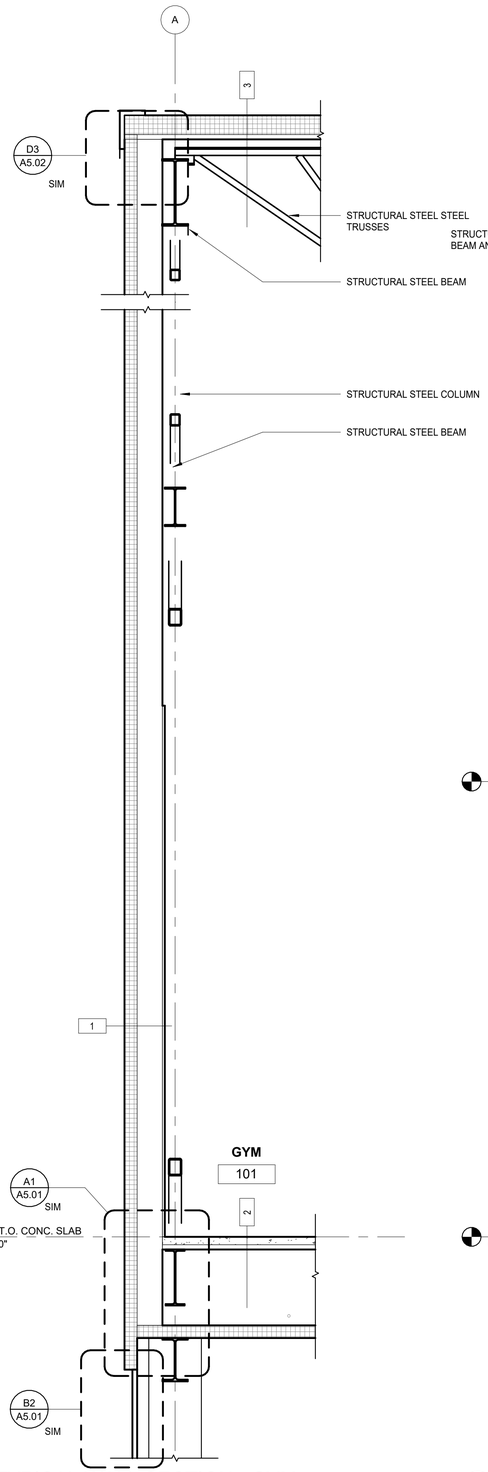
Sheet Contents
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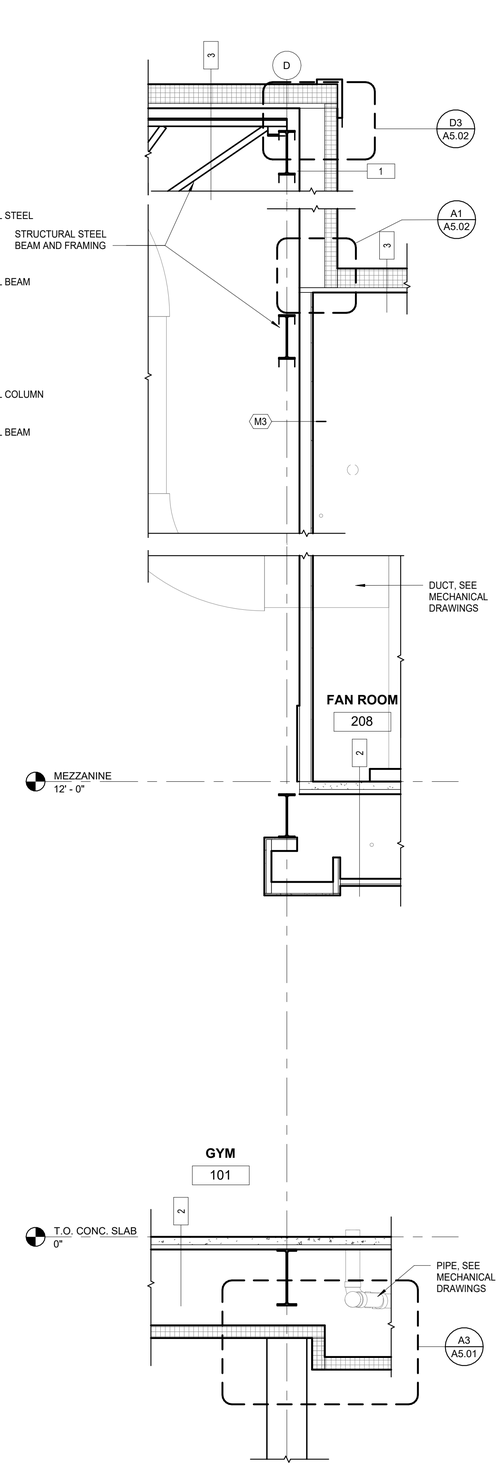
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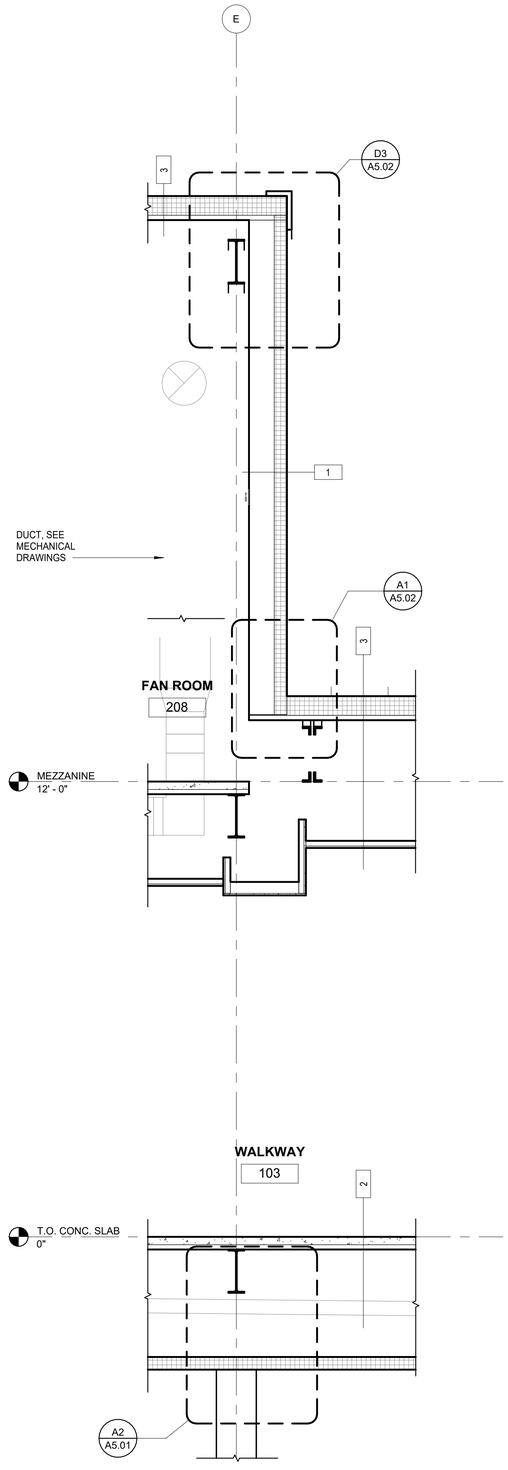
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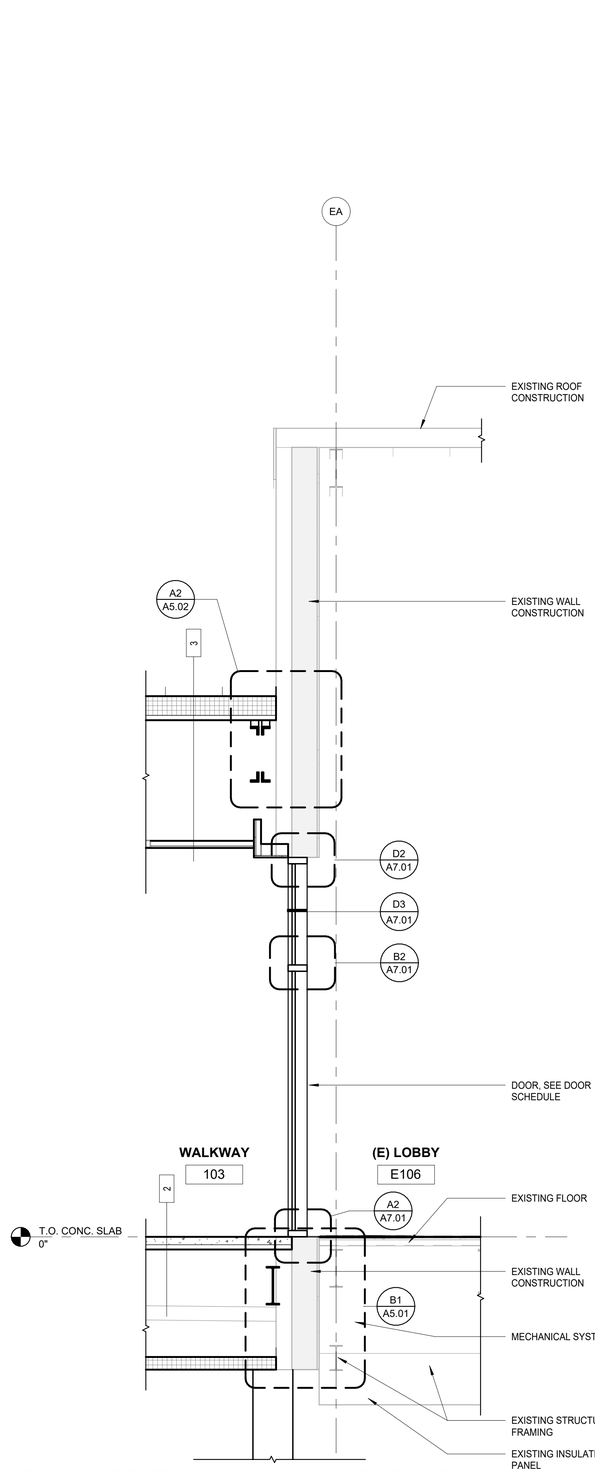

A1 / A3.04 TYPICAL WALL SECTION - GYM
1/2" = 1'-0"




A2 / A3.04 WALL SECTION - WALKWAY AT GRID E
1/2" = 1'-0"




A3 / A3.04 WALL SECTION - WALKWAY AT GRID D
1/2" = 1'-0"




A4 / A3.04 WALL SECTION - WALKWAY AT EXISTING WALL
1/2" = 1'-0"

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CITY OF BETHEL
# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

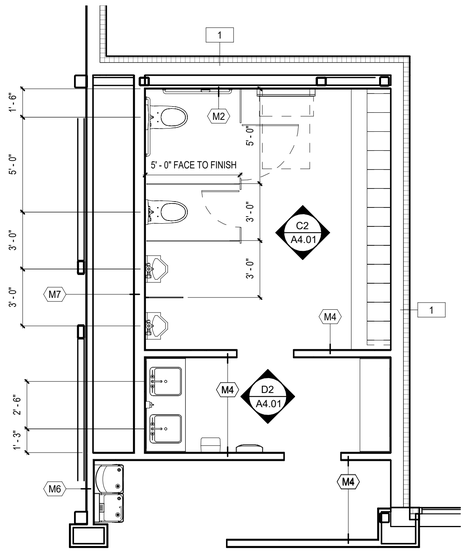
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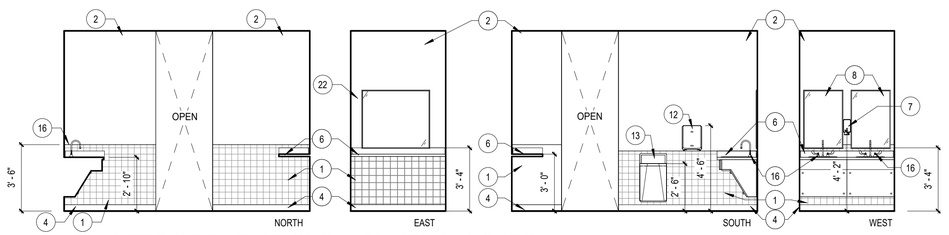
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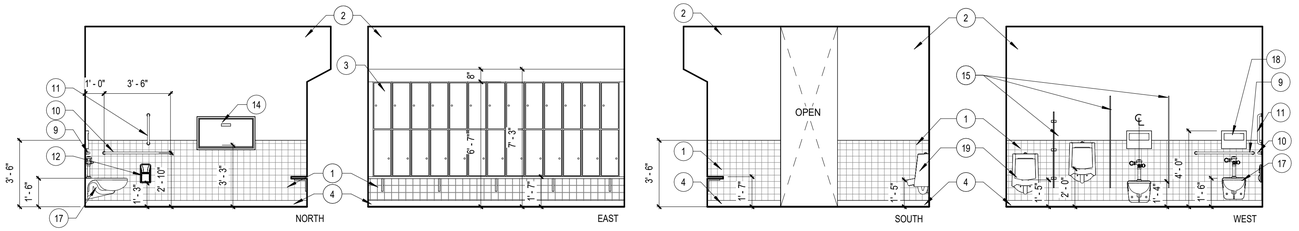
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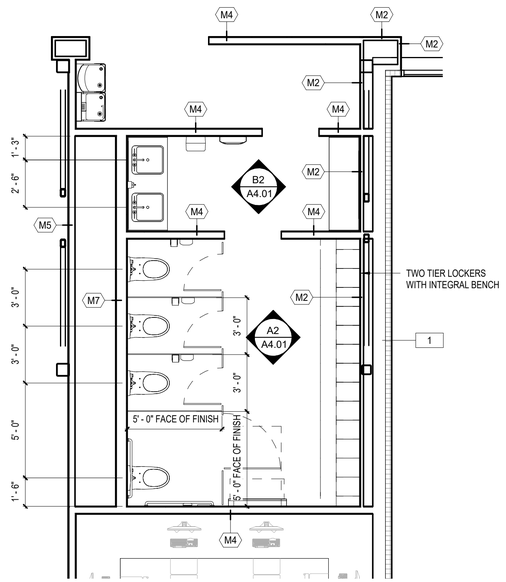

C1 A4.01 ENLARGED PLAN - 102 MENS LOCKER
1/4" = 1'-0"



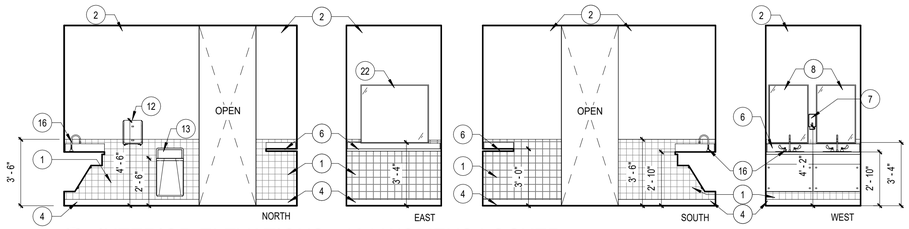

D2 A4.01 INTERIOR ELEVATIONS - 102 MENS LOCKER
1/4" = 1'-0"



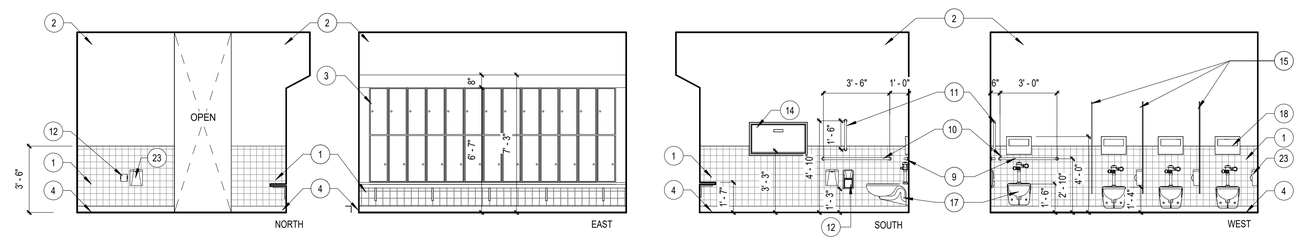

C2 A4.01 INTERIOR ELEVATIONS - 102 MENS LOCKER
1/4" = 1'-0"




A1 A4.01 ENLARGED PLAN -104 WOMENS LOCKER
1/4" = 1'-0"




B2 A4.01 INTERIOR ELEVATIONS - 104 WOMENS LOCKER
1/4" = 1'-0"




A2 A4.01 INTERIOR ELEVATIONS - 104 WOMENS LOCKER
1/4" = 1'-0"

## SHEET KEYNOTES

| | |
|---|---|
| 1 | WAINSCOTT, SEE FINISH SCHEDULE |
| 2 | GYPSUM WALL BOARD |
| 3 | 2 TIER LOCKERS, SLOPED TOP,W/ INTEGERAL BENCH |
| 4 | BASE, SEE FINISH SCHEDULE |
| 5 | DOOR, SEE SCHEDULE |
| 6 | SOLID SURFACE COUNTER TOP WITH 4" BACKSPLASH, LAMINATE PANELS BELOW |
| 7 | SOAP DISPENSER |
| 8 | 24" X 36" MIRROR, CENTER OVER SINK |
| 9 | 36" GRAB BAR |
| 10 | 42" GRAB BAR |
| 11 | 18" VERTICAL GRAB BAR |
| 12 | TOILET PAPER DISPENSER |
| 13 | WASTE RECEPTICAL |
| 14 | CHANGING STATION |
| 15 | TOILET PARTITION |
| 16 | SINK, SEE MECHANICAL DRAWINGS |
| 17 | TOILET, SEE MECHANICAL DRAWINGS |
| 18 | TOILET SEAT COVER DISPENSER |
| 19 | URINAL, SEE MECHANICAL DRAWINGS |
| 20 | PHENOLIC BENCH W/ 2X2X1/4 ALUM, SUPPORT BRACKETS |
| 21 | COUNTERTOP SUPPORT BRACKET |
| 22 | 30" X 42" MIRROR, CENTER OVER COUNTER TOP |
| 23 | SANITARY NAPKIN DISPOSAL |

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# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

Revisions

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|---|---|
| Drawn by SP / DWL | Date 01-22-2025 |
| Checked DM | Job No. 24048.01 |

Sheet Contents
ENLARGED PLANS AND INTERIOR ELEVATIONS

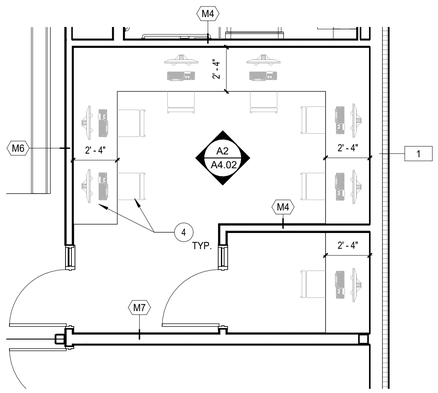
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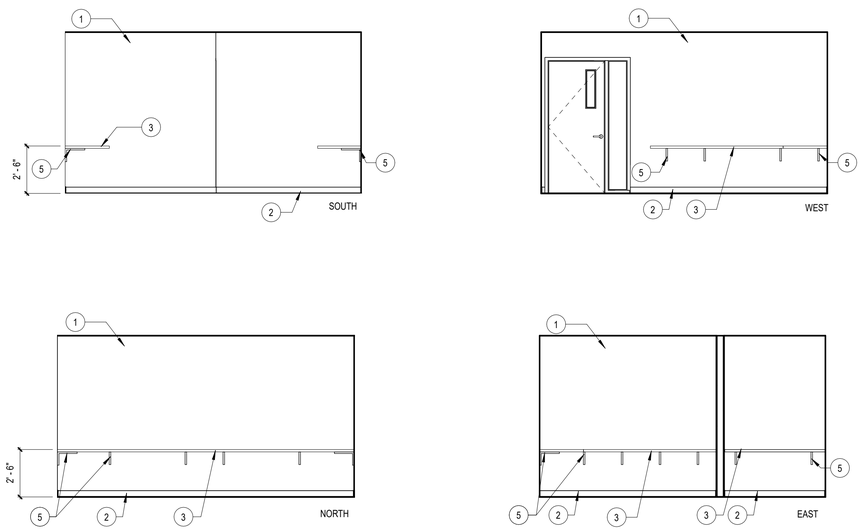
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## SHEET KEYNOTES

1. GYPSUM WALL BOARD
2. BASE, SEE FINISH SCHEDULE
3. LAMINATE COUNTER TOP
4. OWNER PURCHASED & INSTALLED COMPUTER & CHAIR
5. MTL BRACKETS AT INTERVALS AS RECOMMENDED BY MFR




A1 / A4.02 ENLARGED PLAN - 105 TELEHEALTH CONFERENCE ROOM
1/4" = 1'-0"




A2 / A4.02 INTERIOR ELEVATIONS - 105 TELEHEALTH CONFERENCE ROOM
1/4" = 1'-0"

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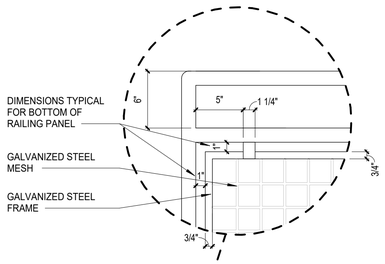
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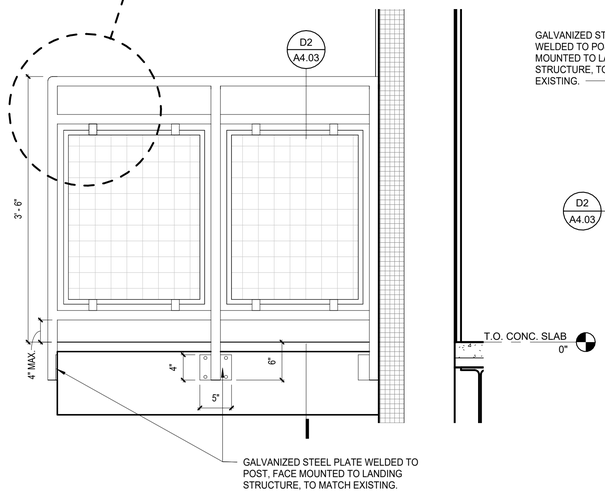
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ENLARGED PLANS AND INTERIOR ELEVATIONS

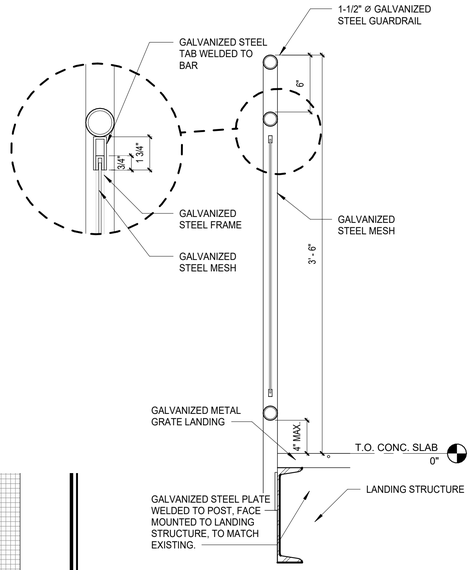
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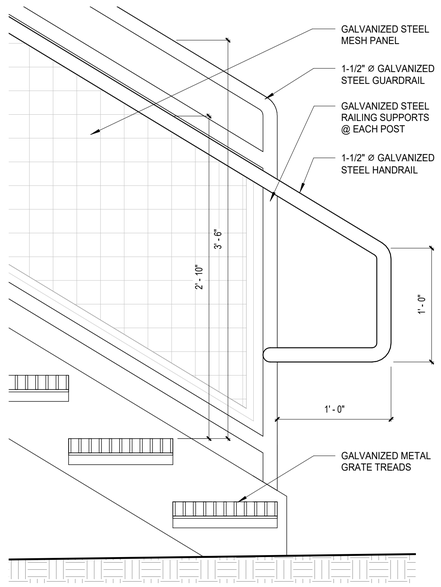


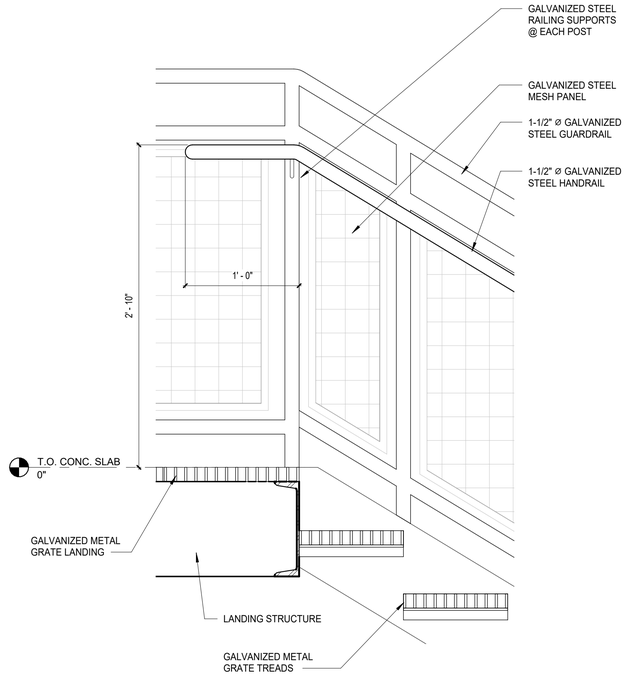

C3 A4.03 ELEVATION - GUARDRAIL TYPE 2
1" = 1'-0"



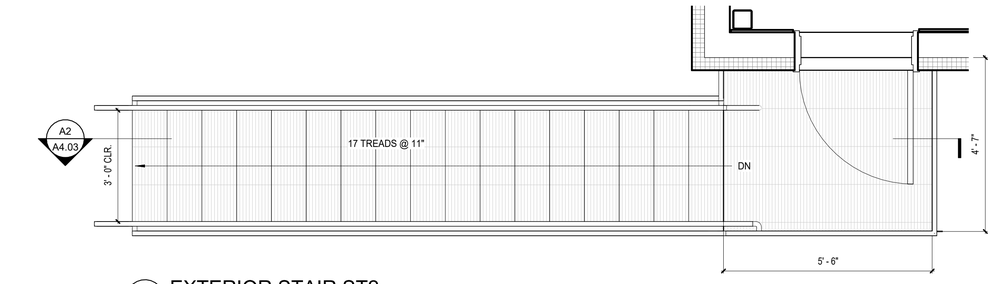

D2 A4.03 GUARD RAIL
1 1/2" = 1'-0"



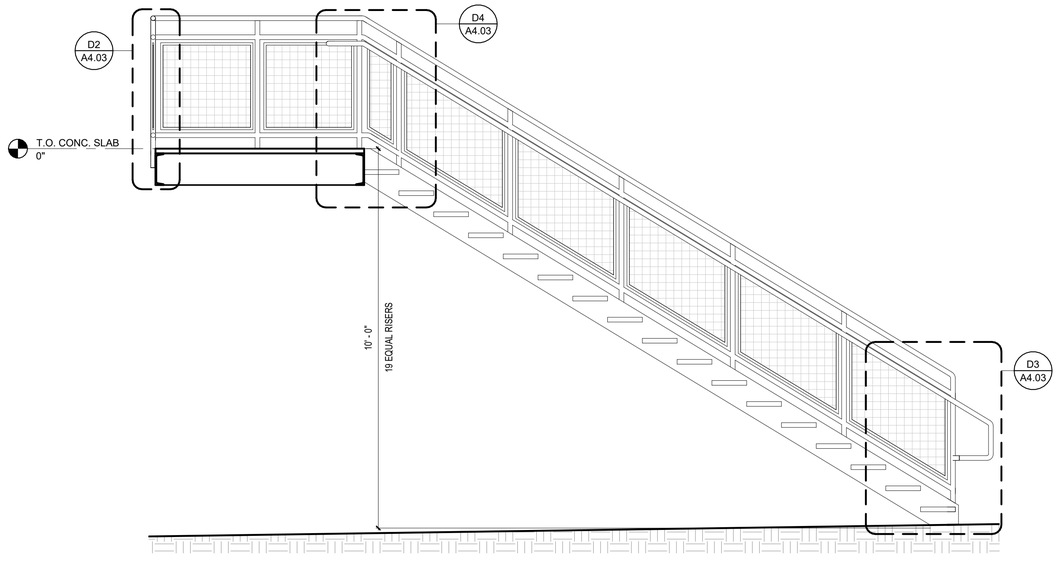

D3 A4.03 EXTERIOR STAIR BASE
1 1/2" = 1'-0"




D4 A4.03 EXTERIOR STAIR LANDING
1 1/2" = 1'-0"




A1 A4.03 EXTERIOR STAIR ST2
1/2" = 1'-0"




A2 A4.03 SECTION - EXTERIOR STAIR ST2
1/2" = 1'-0"

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|---|---|
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| DM | 24048.01 |

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EXTERIOR STAIR

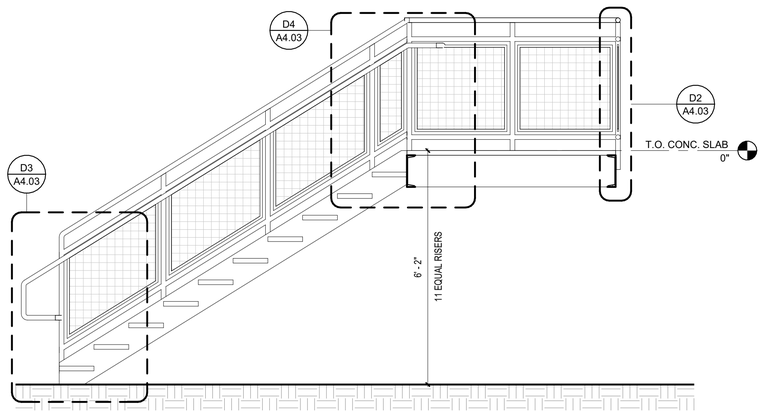
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Plot Date Time: 1/22/2025 2:53:14 PM

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt




A1 / A4.04 EXTERIOR STAIR ST3
1/2" = 1'-0"




A3 / A4.04 ST3 SECTION
1/2" = 1'-0"

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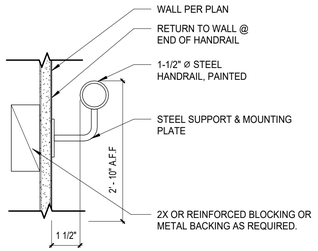
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Sheet Contents
EXTERIOR STAIR

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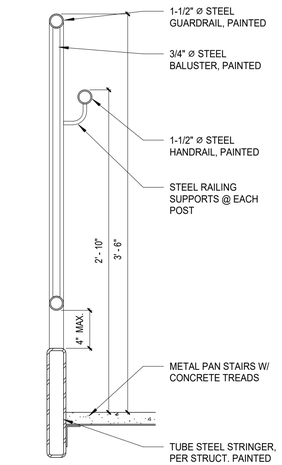
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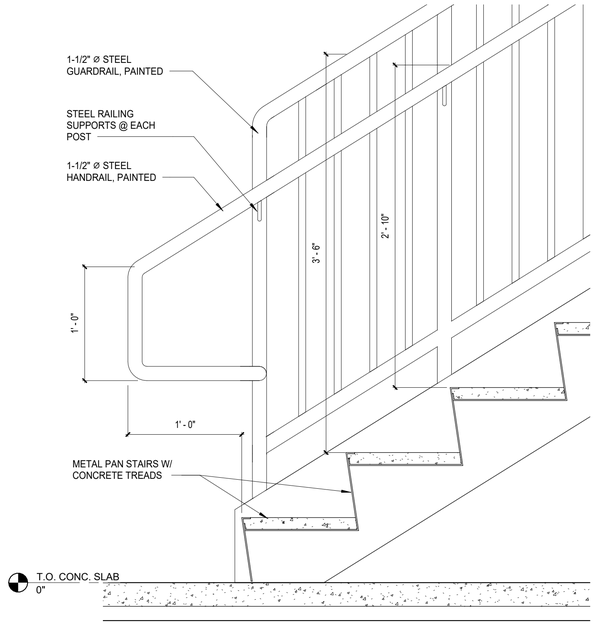



HANDRAILS SHALL BE DESIGNED TO RESIST A CONCENTRATED LOAD OF 200 LBS IN ANY DIRECTION. PROVIDE BLOCKING IN THE WALL AS REQUIRED.

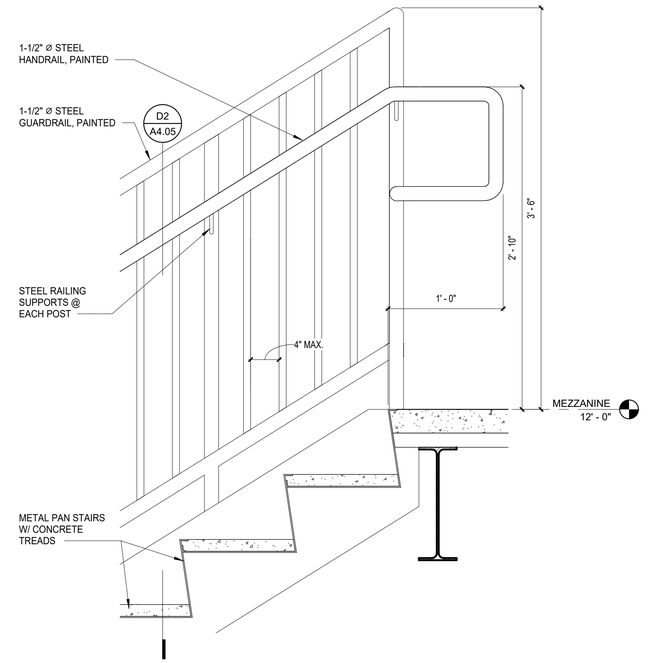
D1 / A4.05 HANDRAIL DETAIL
3" = 1'-0"



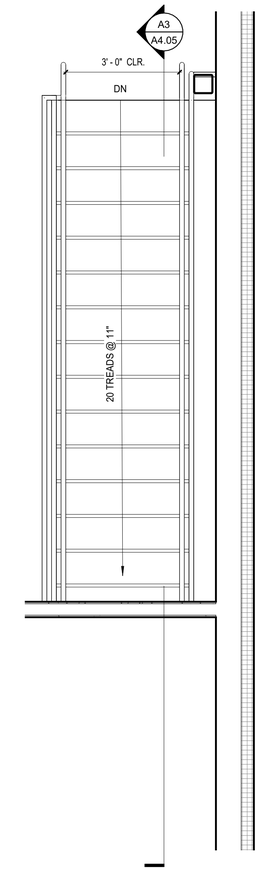

D2 / A4.05 RAIL DETAIL
1 1/2" = 1'-0"



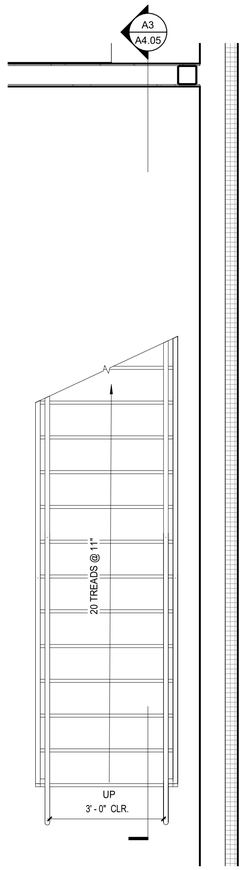

D3 / A4.05 STAIR RAIL DETAIL BOTTOM
1 1/2" = 1'-0"



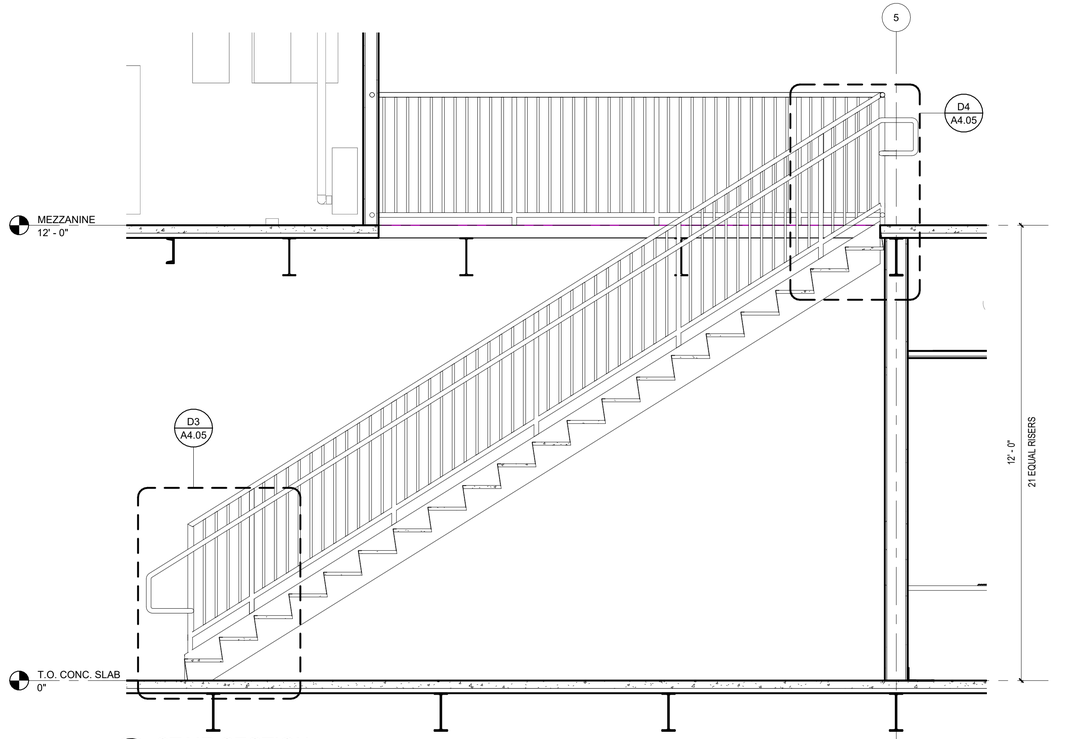

D4 / A4.05 STAIR RAIL DETAIL TOP
1 1/2" = 1'-0"




A1 / A4.05 STAIR ST1 - MEZZANINE
1/2" = 1'-0"




A2 / A4.05 STAIR ST1 - LEVEL 1
1/2" = 1'-0"




A3 / A4.05 STAIR SECTION
1/2" = 1'-0"

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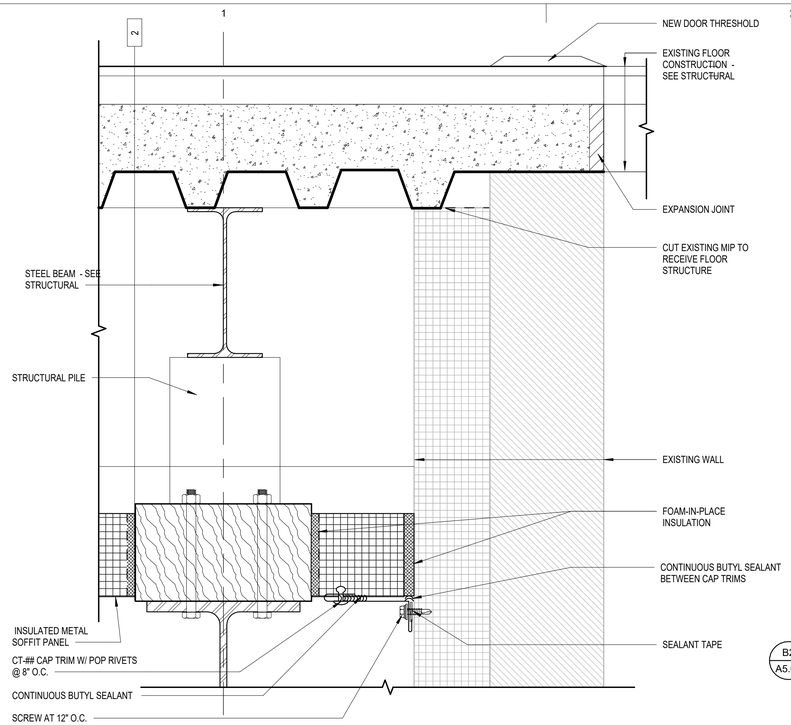
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Sheet Contents
INTERIOR STAIR

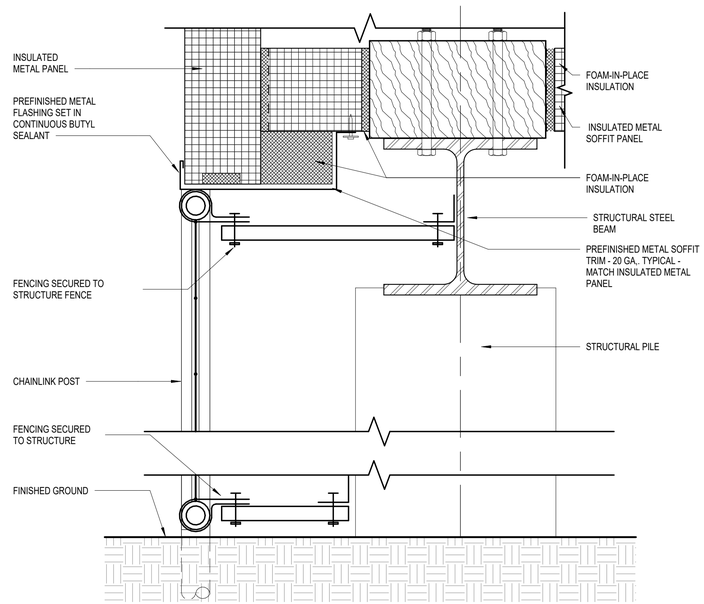
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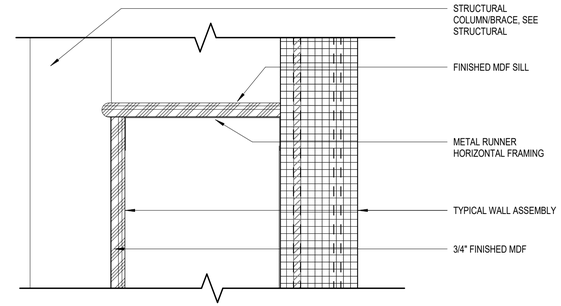
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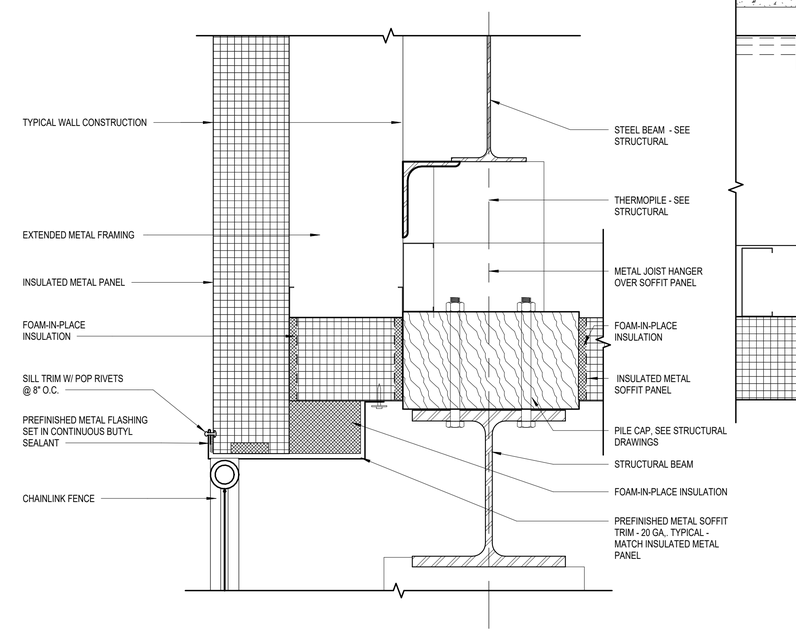

B1 A5.01 EXISITNG WALL AT FLOOR DETAIL
3" = 1'-0"



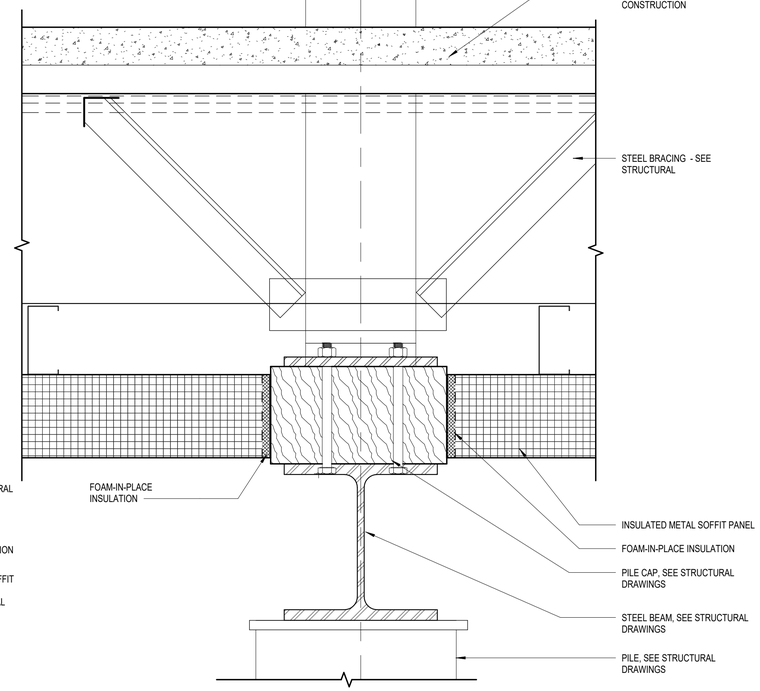

B2 A5.01 TYPICAL FENCE DETAIL
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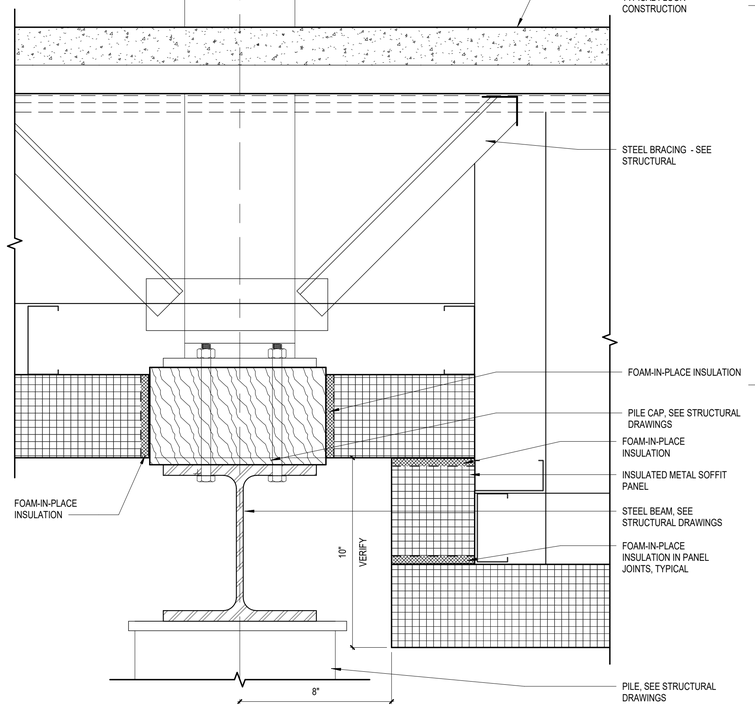

B3 A5.01 GYM INTERIOR FIINISH WALL CAP
3" = 1'-0"




A1 A5.01 TYPICAL WALL TO SOFFIT DETAIL
3" = 1'-0"




A2 A5.01 PILE CAP BRACE
3" = 1'-0"




A3 A5.01 PILE CAP BRACE - SOFFIT TRANSITION
3" = 1'-0"

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65% DESIGN DEVELOPMENT

CITY OF BETHEL
# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
|---|---|---|
| | | |

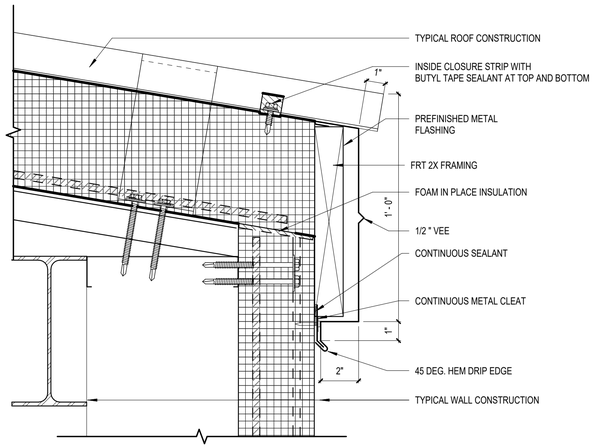
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| Checked DM | Job No. 24048.01 |

Sheet Contents
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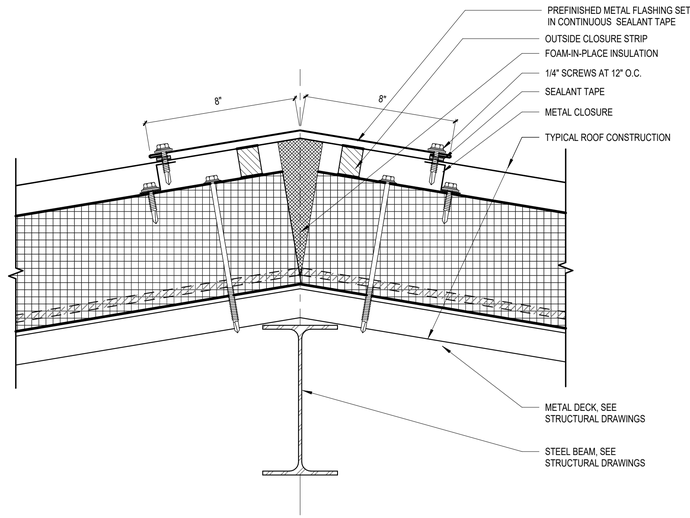
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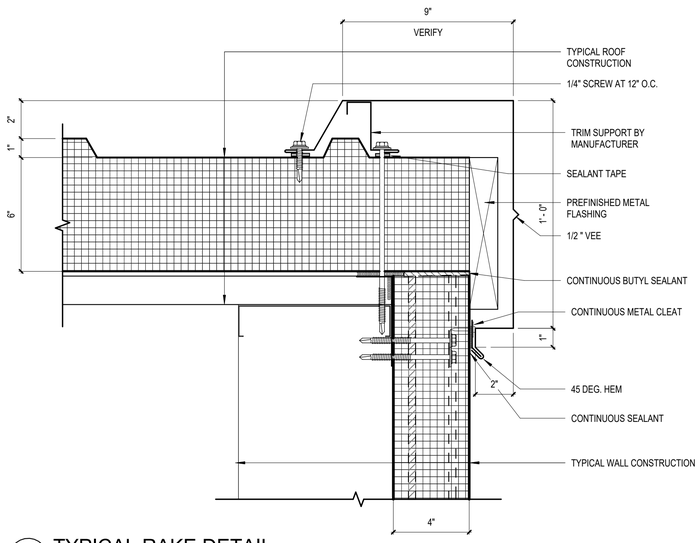
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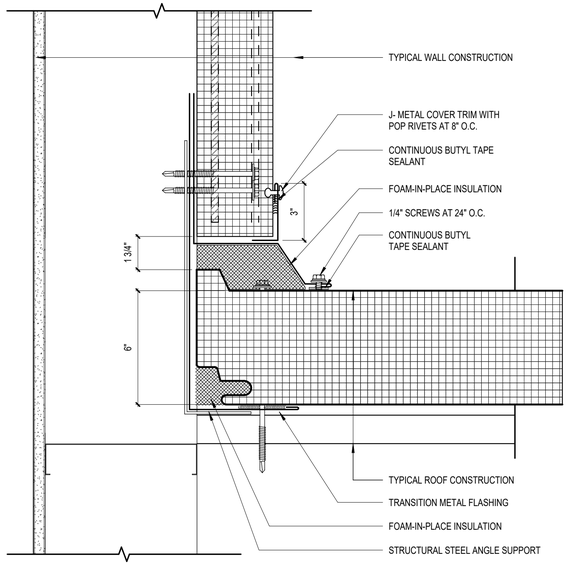

D1 A5.02 TYPICAL EAVE DETAIL
3" = 1'-0"



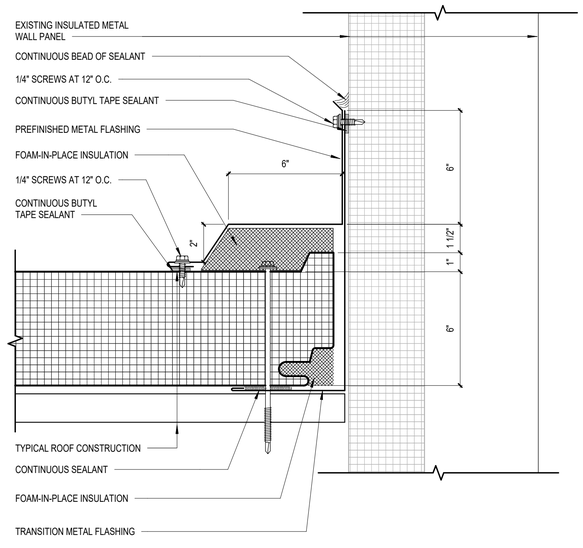

D2 A5.02 TYPICAL RIDGE DETAIL
3" = 1'-0"



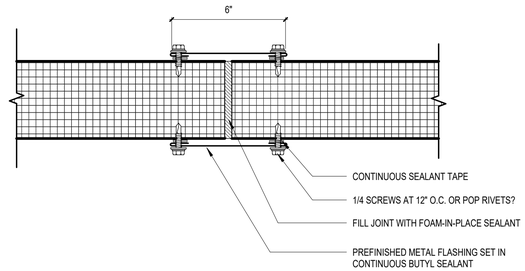

D3 A5.02 TYPICAL RAKE DETAIL
3" = 1'-0"




A1 A5.02 TYPICAL ROOF AT WALL DETAIL
3" = 1'-0"




A2 A5.02 TYPICAL ROOF AT EXISTING WALL
3" = 1'-0"




A3 A5.02 SOFFIT SPLICE
3" = 1'-0"

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BETHEL, ALASKA

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| | | |

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| WVZ | 01-22-2025 |
| Checked | Job No. |
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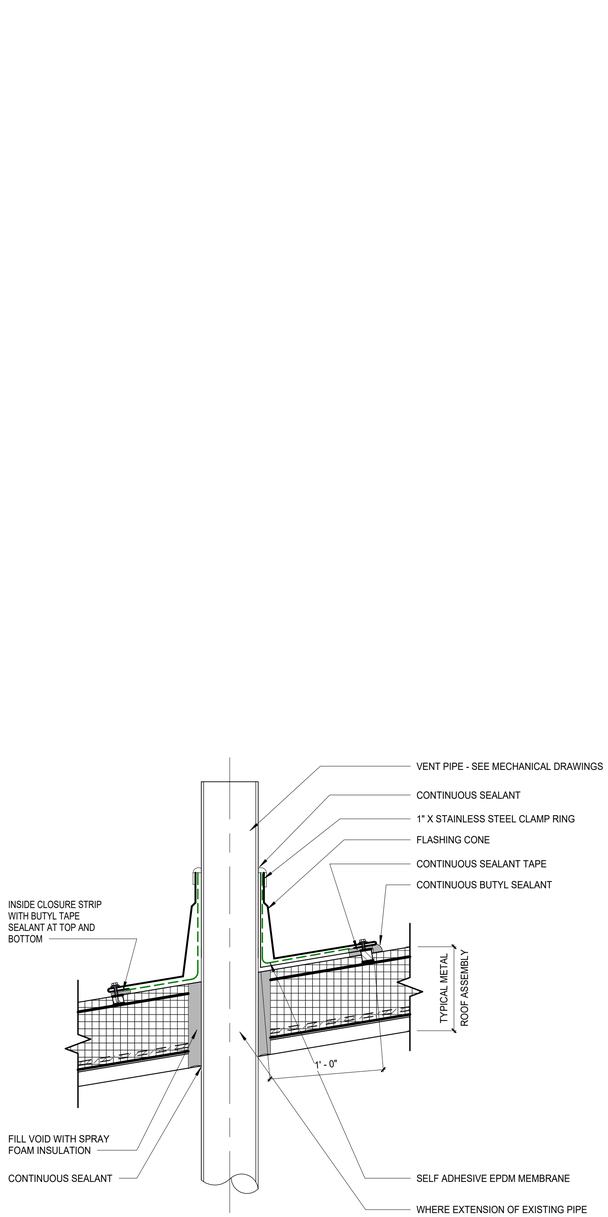
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EXTERIOR DETAILS

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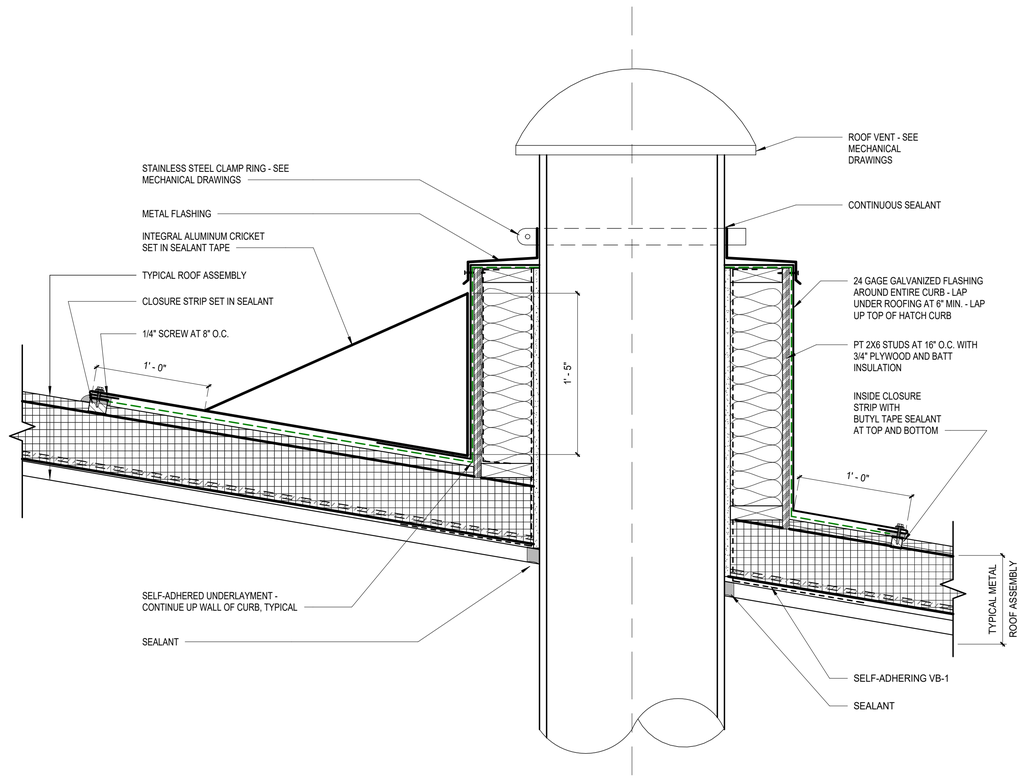
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Plot Date Time: 1/22/2025 2:53:18 PM




A1 / A5.03 ROOF PIPE PENETRATION
1 1/2" = 1'-0"




A2 / A5.03 SLOPE ROOF CURB
1 1/2" = 1'-0"

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CITY OF BETHEL
# Yukon Kuskokwim Community Center Expansion
BETHEL, ALASKA

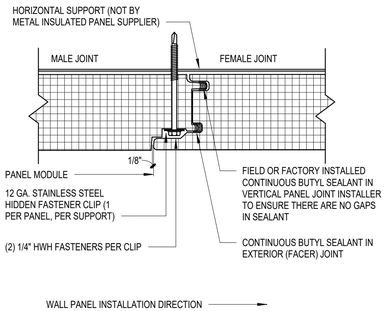
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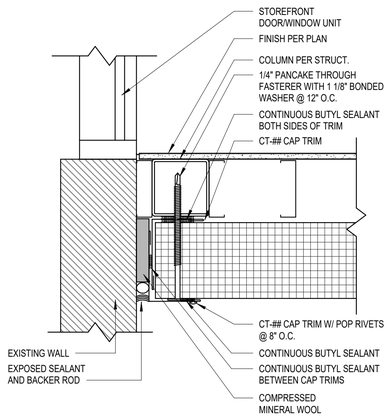
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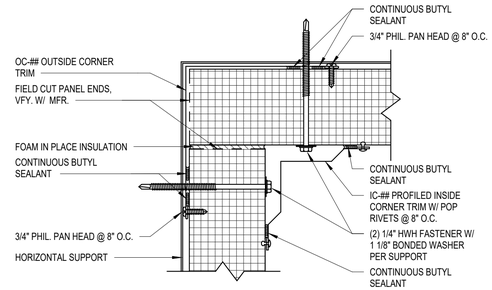
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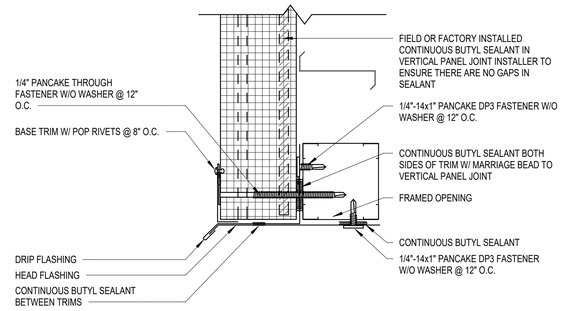

C1 / A5.04 MIP - ENGAGED PANEL JOINT
1 1/2" = 1'-0"



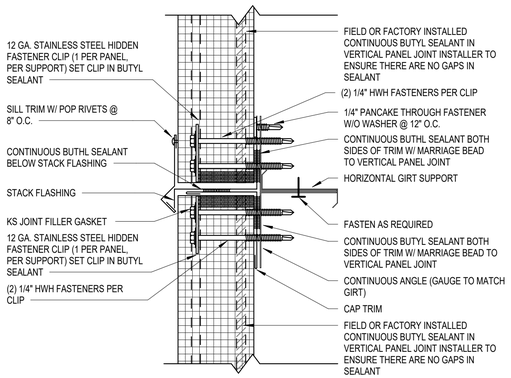

C2 / A5.04 MIP - ENDWALL TERMINATION
1 1/2" = 1'-0"



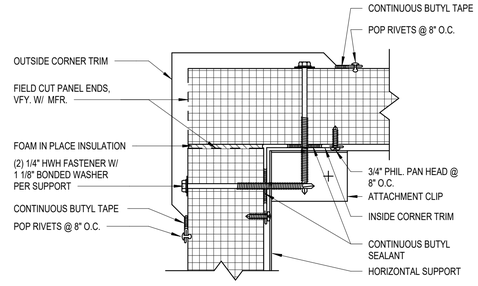

C3 / A5.04 MIP - INSIDE CORNER
1 1/2" = 1'-0"



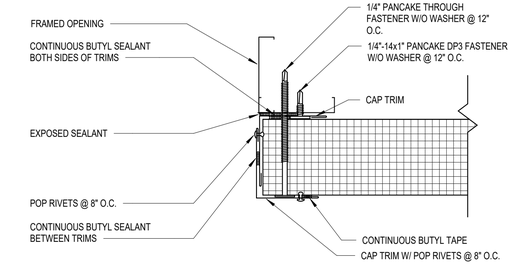

C4 / A5.04 MIP - HEAD OPENING
1 1/2" = 1'-0"



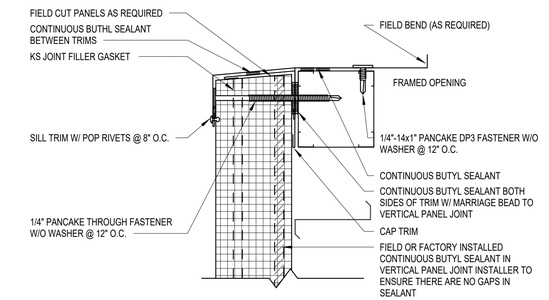

B1 / A5.04 MIP - STACK JOINT
1 1/2" = 1'-0"




B3 / A5.04 MIP - OUTSIDE CORNER
1 1/2" = 1'-0"




B4 / A5.04 MIP - JAMB OPENING
1 1/2" = 1'-0"




A4 / A5.04 MIP - SILL OPENING
1 1/2" = 1'-0"

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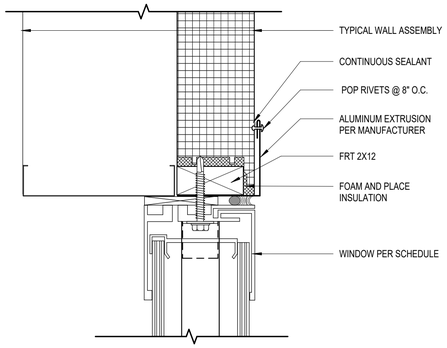
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MIP DETAILS

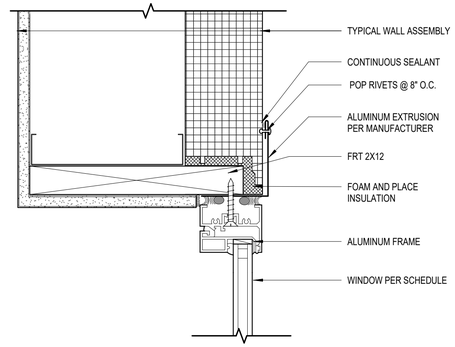
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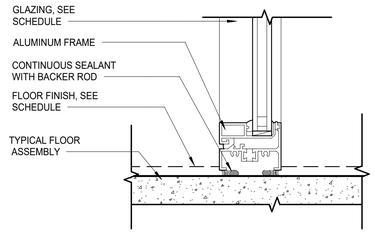
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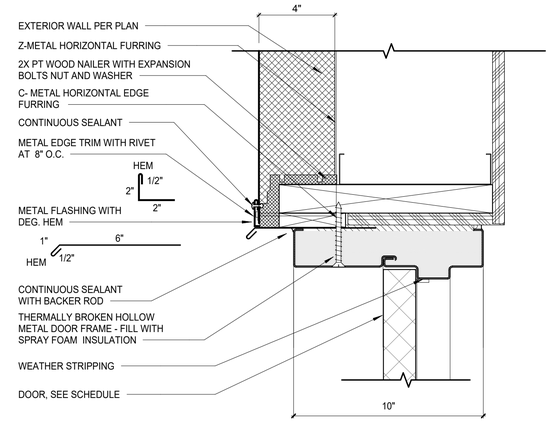

C1 A5.05 TRANSLUCENT PANEL HEAD AT NO INTERIOR FINISH
3" = 1'-0"



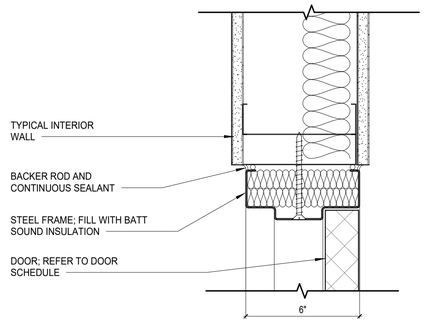

C2 A5.05 TYPICAL WINDOW HEAD
3" = 1'-0"



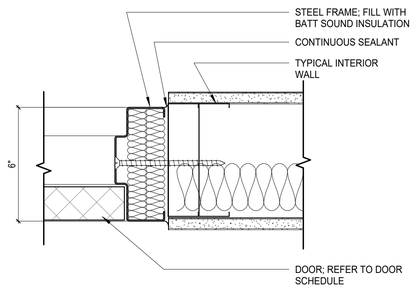

D2 A5.05 SIDELITE SILL
3" = 1'-0"



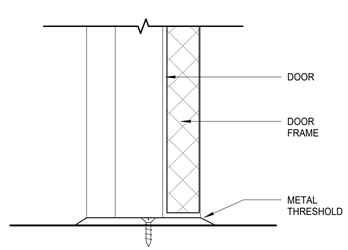

C4 A5.05 DOOR HEAD - EXTERIOR
3" = 1'-0"



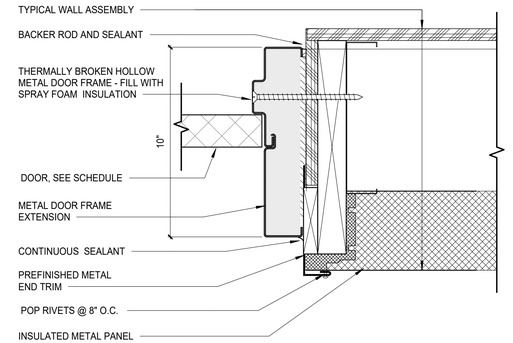

C3 A5.05 DOOR HEAD - INTERIOR
3" = 1'-0"



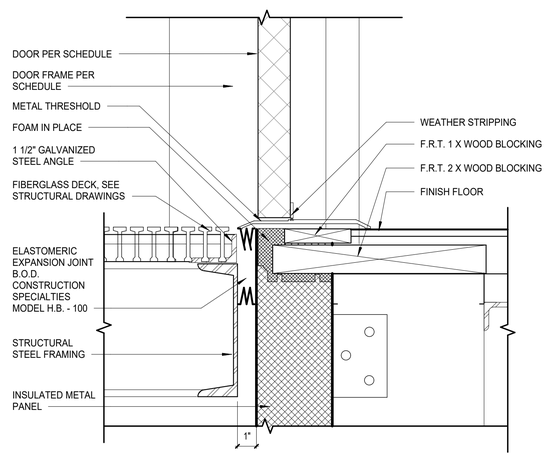

B3 A5.05 DOOR JAMB - INTERIOR
3" = 1'-0"



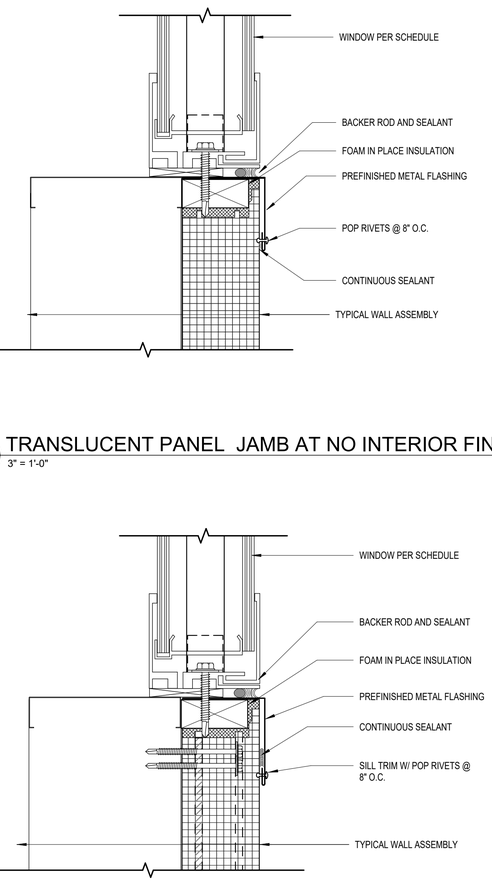

A3 A5.05 DOOR SILL - INTERIOR
3" = 1'-0"



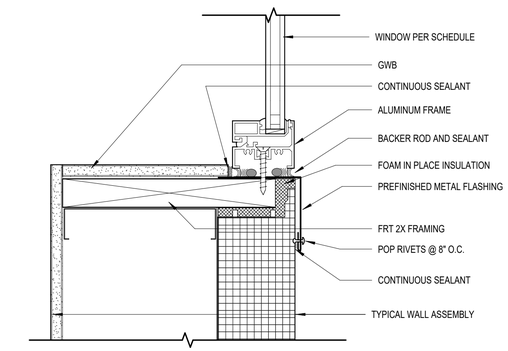

B4 A5.05 DOOR JAMB - EXTERIOR
3" = 1'-0"




A4 A5.05 DOOR SILL - EXTERIOR
3" = 1'-0"



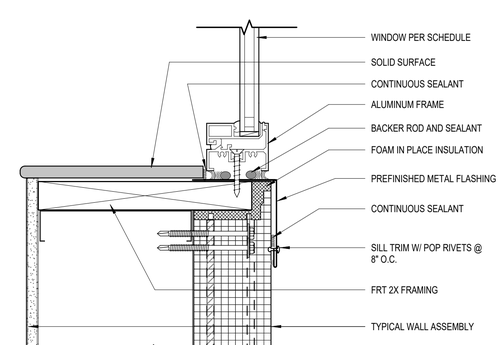

B1 A5.05 TRANSLUCENT PANEL JAMB AT NO INTERIOR FINISH
3" = 1'-0"




B2 A5.05 TYPICAL WINDOW JAMB
3" = 1'-0"




A1 A5.05 TRANSLUCENT PANEL SILL AT NO INTERIOR FINISH
3" = 1'-0"




A2 A5.05 TYPICAL WINDOW SILL
3" = 1'-0"

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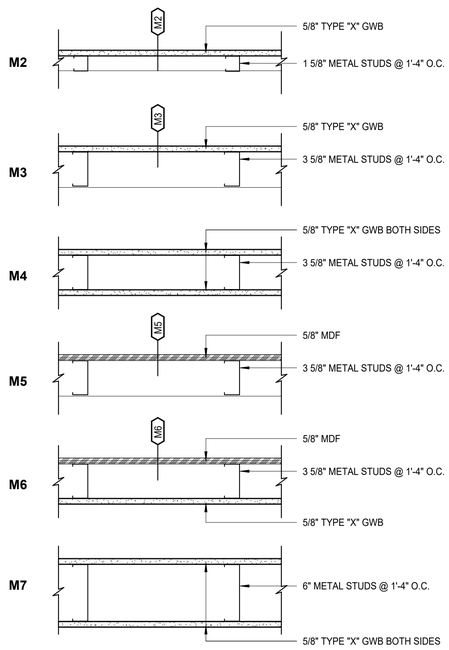
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Sheet Contents
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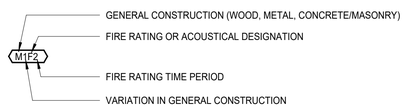
Sheet No.
**A5.05**

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt

# PARTITION TYPES




# PARTITION TYPES LEGEND AND NOTES




FULL HEIGHT STUD PARTITIONS ARE INDICATED WITH THE FOLLOWING DESIGNATIONS AFTER THE PARTITION TYPE DESIGNATION (EG.: M2A OR W6F2)

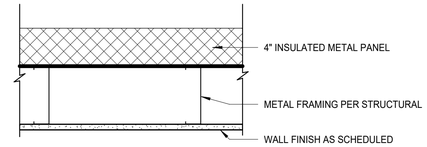
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(ONE HOUR PER IBC TABLE 720.1(2))

**F2** FIRE RATING
(TWO-HOUR PER IBC TABLE 720.1(2)

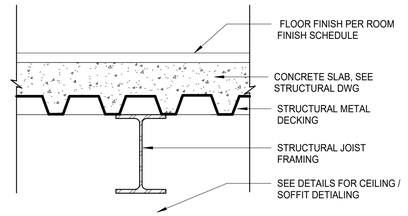
**A** ACOUSTICAL SEPARATION WALL
(ADD 3 1/2" ACOUSTICAL INSULATION)

1. FOR A SYMETRICAL PARTITIONS, THE LOCATION OF THE PARTITION TYPE SYMBOL ON THIS SHEET CORRESPONDS TO THE SAME ORIENTAION AS THE FLOOR PLAN
2. SEE FLOOR PLAN FOR PLUMBING WALL DIMENSIONS NOT SHOWN.
3. IF STRUCTURAL USE PANELS (S.U.P.) ARE INDICATED, REFER TO STRUCTURAL DRAWINGS FOR THICKNESS, GRADE, AND SPAN RATING.

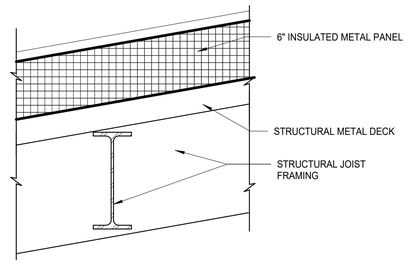
# HORIZONTAL AND VERTICAL ASSEMBLIES




1 TYPICAL EXTERIOR WALL ASSEMBLY




2 TYPICAL FLOOR ASSEMBLY




3 TYPICAL ROOF ASSEMBLY

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| Drawn by<br>WVZ | Date<br>01-22-2025 |
| Checked<br>DM | Job No.<br>24048.01 |

Sheet Contents
VERTICAL AND HORIZONTAL ASSEMBLIES

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**A6.01**

Plot Date Time: 1/22/2025 2:53:20 PM

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# ROOM FINISH SCHEDULE

| NO. | ROOM NAME | FLOOR | | | BASE | | | WALLS | | | | | | | | | | | | | | CEILING | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | NORTH | | | EAST | | | SOUTH | | | WEST | | | | | | | | |
| | | MATERIAL | FINISH | COLOR | MATERIAL | FINISH | COLOR | MATERIAL | FINISH | COLOR | MATERIAL | FINISH | COLOR | MATERIAL | FINISH | COLOR | MATERIAL | FINISH | COLOR | MATERIAL | FINISH | COLOR | |
| 101 | GYM | F6 | FF | | B1 | FF | | W3/W4 | PT | | W3/W4 | PT | | W3/W4 | PT | | W3/W4 | PT | | C3 | PT | | |
| 102 | MEN | F4 | FF | | B1 | FF | | W1/W5 | PT/FF | | W1 | PT | | W1/W5 | PT/FF | | W1/W5 | PT/FF | | C1 | PT | | |
| 103 | WALKWAY | F5 | FF | | B2 | FF | | W1 | PT | | W1 | PT | | W1 | PT | | W1 | PT | | C1/C2 | PT/FF | | |
| 104 | WOMEN | F4 | FF | | B1 | FF | | W1/W5 | PT/FF | | W1 | PT | | W1/W5 | PT/FF | | W1/W5 | PT/FF | | C1 | PT | | |
| 105 | TELEHEALTH | F5 | FF | | B1 | FF | | W1 | PT | | W1 | PT | | W1 | PT | | W1 | PT | | C1 | PT | | |
| 106 | STOR. | F4 | FF | | B1 | FF | | W2 | FF | | W2 | FF | | W2 | FF | | W2 | FF | | C1 | PT | | |
| 201 | STOR. | F1 | S | | B1 | FF | | W2 | FF | | W2 | FF | | W2 | FF | | W2 | FF | | C1 | PT | | |
| 203 | BOILER | F1 | S | | B1 | FF | | W1 | PT | | W1 | PT | | W1 | PT | | W1 | PT | | C1 | PT | | |
| 208 | FAN ROOM | F1 | S | | B1 | FF | | W1 | PT | | W1 | PT | | W1 | PT | | W1 | PT | | C3 | PT | | |

# ROOM FINISH LEGEND

FLOOR MATERIALS

| | |
|---|---|
| F1 | CONCRETE |
| F2 | WALK OFF MAT |
| F3 | CARPET |
| F4 | RESILIENT SHEET |
| F5 | RESILIENT TILE |
| F6 | HIGH IMPACT COMPOSITE |

BASE MATERIALS

| | |
|---|---|
| B1 | 4" RUBBER BASE |
| B2 | 6" SELF COVED BASE |

FLOOR FINISHES

| | |
|---|---|
| S | SEALER |
| FF | FACTORY FINISH |

BASE FINISH

| | |
|---|---|
| FF | FACTORY FINISH |

WALL MATERIALS

| | |
|---|---|
| W1 | GYPSUM WALL BOARD |
| W2 | FIBERGLASS REINFORCED PANEL |
| W3 | EXPOSED STRUCTURE |
| W4 | IMPACT PANELING + 12'-0" |

CEILING MATERIALS

| | |
|---|---|
| C1 | GYPSUM BOARD |
| C2 | SUSPENDED ACOUSITCAL PANELS |
| C3 | EXPOSED STRUCTURE |

WALL FINISHES

| | |
|---|---|
| PT | PAINT |
| FF | FACTORY FINISH |

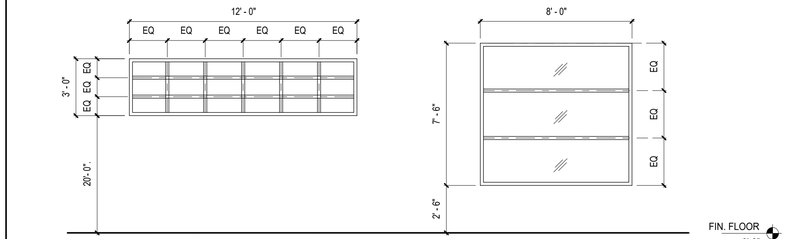
CEILING FINISHES

| | |
|---|---|
| PT | PAINT |
| FF | FACTORY FINISH |

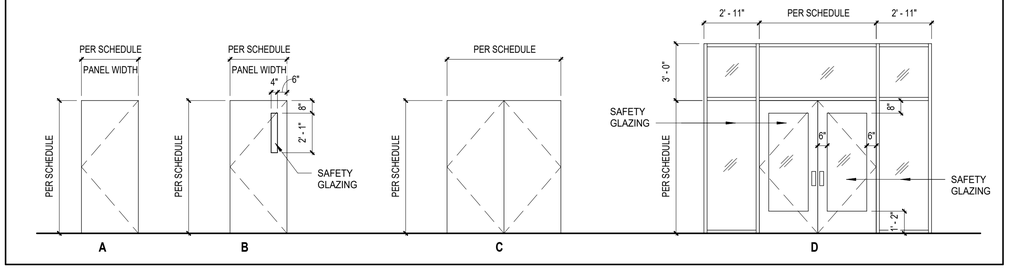
# DOOR SCHEDULE

| NO. | SIZE | | DOOR | | | | FRAME | | | LOW VOLTAGE | HARDWARE GROUP | RATING | DETAILS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WIDTH | HEIGHT | TYPE | MATERIAL | FINISH | GLASS | TYPE | MATERIAL | FINISH | | | | HEAD | JAMB | THRESHOLD |
| 101-1 | 3' - 0" | 7' - 0" | A | MTL | FF | | DF1 | MTL | PT | | | | | | |
| 101-2 | 3' - 0" | 7' - 0" | A | MTL | FF | | DF1 | MTL | PT | | | | | | |
| 103-1 | 6' - 2" | 7' - 0" | D | MTL | FF | G1 | DF4 | MTL | PT | | | | | | |
| 105-1 | 3' - 0" | 7' - 0" | B | MTL | FF | | DF2 | MTL | PT | | | | | | |
| 105-2 | 3' - 0" | 7' - 0" | A | MTL | FF | | DF1 | MTL | PT | | | | | | |
| 106-1 | 6' - 0" | 7' - 0" | C | MTL | FF | | DF3 | MTL | PT | | | | | | |
| 201-1 | 3' - 0" | 7' - 0" | A | MTL | FF | | DF1 | MTL | PT | | | | | | |
| 203-1 | 3' - 0" | 7' - 0" | A | MTL | FF | | DF1 | MTL | PT | | | 1 HR | | | |

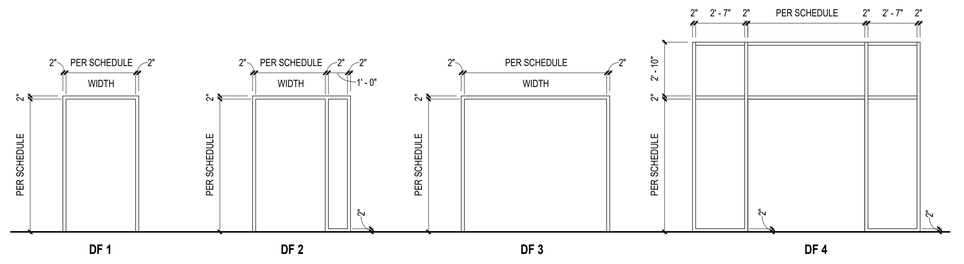
# WINDOW TYPES




# DOOR TYPES




# FRAME TYPES




# GLASS TYPES

| | |
|---|---|
| GL-1 | TRANSLUCENT GLAZING |
| GL-2 | TEMPERED/LAMINATED SAFETY GLAZING |
| GL-3 | INSULATED GLAZING |

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Revisions

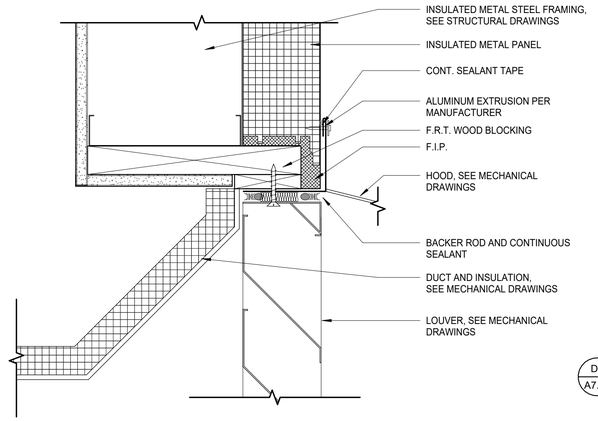
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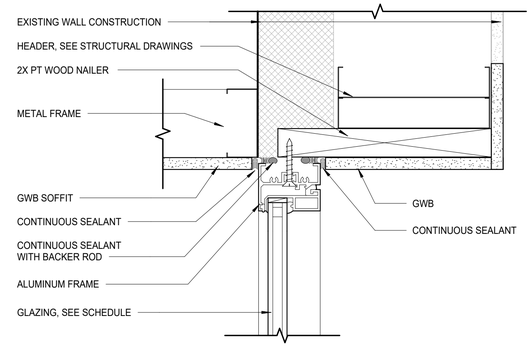
Sheet Contents
FINISH AND DOOR SCHEDULES

Sheet No.
**A6.02**

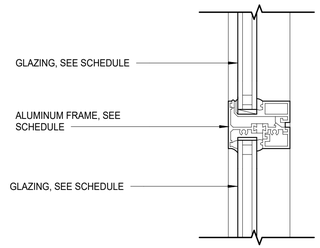
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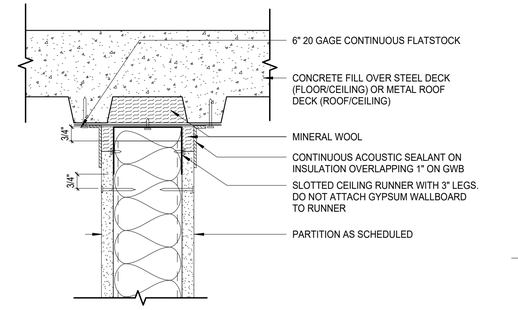

D1 / A7.01 MECHANICAL HOOD HEAD
3" = 1'-0"



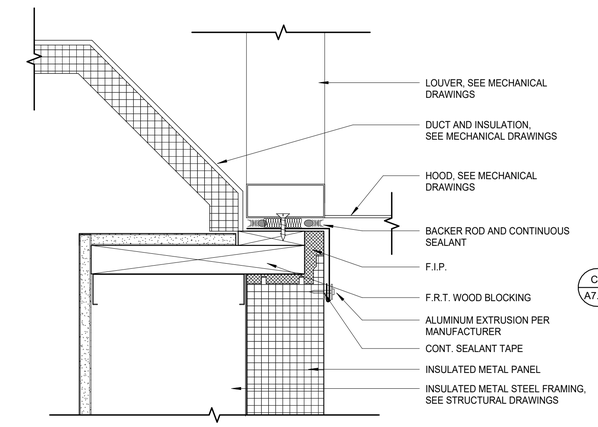

D2 / A7.01 SIDELITE - TRANSOM HEAD AT EXISTING WALL
3" = 1'-0"



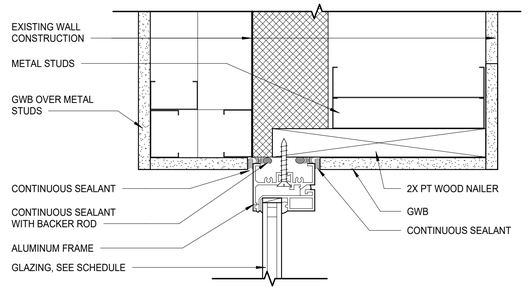

D3 / A7.01 SIDELITE HEAD TO TRANSOM
3" = 1'-0"



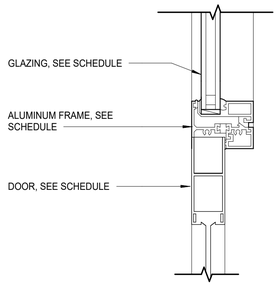

D4 / A7.01 TYPICAL NON-RATED HEAD OF WALL PARTITION
3" = 1'-0"



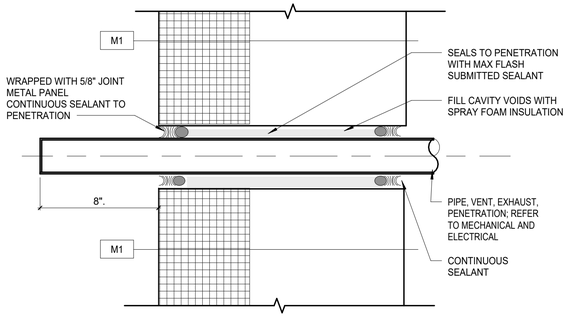

B1 / A7.01 MECHANICAL HOOD JAMB
3" = 1'-0"



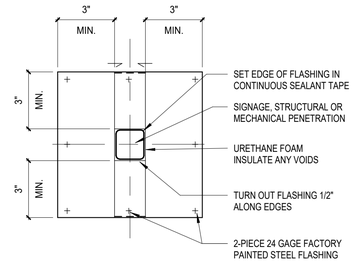

C1 / A7.01 SIDELITE - TRANSOM JAMB AT EXISTING WALL
3" = 1'-0"



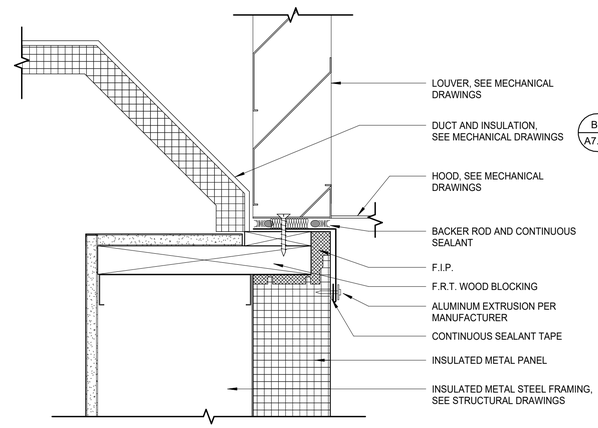

B2 / A7.01 DOOR TO TRANSOM HEAD (JAMB SIM)
3" = 1'-0"



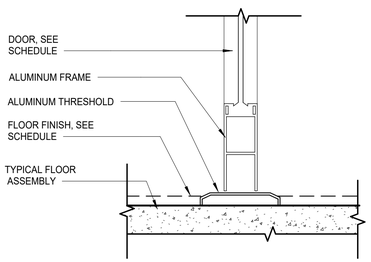

B3 / A7.01 TYPICAL WALL PENETRATION DETAIL
3" = 1'-0"



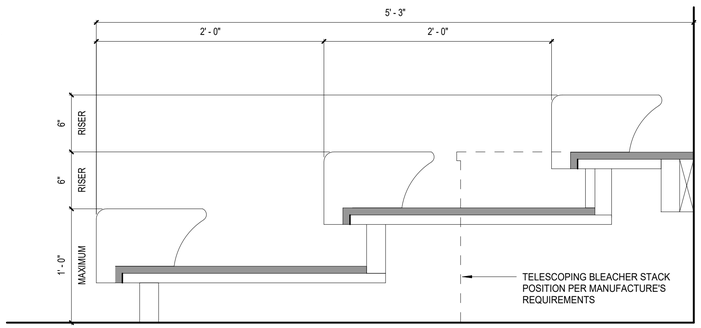

B4 / A7.01 TYPICAL PENETRATION DETAIL
3" = 1'-0"




A1 / A7.01 MECHANICAL HOOD SILL
3" = 1'-0"




A2 / A7.01 DOOR SILL AT EXISTING WALL
3" = 1'-0"




A3 / A7.01 BLEACHER SECTION
1 1/2" = 1'-0"

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Revisions

| No. | Description | Date |
|---|---|---|
| | | |

| Drawn by | Date |
|---|---|
| TB/WZ | 01-22-2025 |
| Checked | Job No. |
| DM | 24048.01 |

Sheet Contents
INTERIOR AND MISCELLANEOUS DETALS

Sheet No.
**A7.01**

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/Bethel YK Fitness Center Gym Expansion R23.rvt
Plot Date Time: 1/22/2025 2:53:22 PM

# GENERAL NOTES

THE FOLLOWING NOTES APPLY UNLESS INDICATED OTHERWISE:

**CODE:**

INTERNATIONAL BUILDING CODE, 2021 EDITION.

**PILE DESIGN:**

12" OD THERMAL PILES W/ POF 13' BELOW GRADE. CONSULT SOILS REPORT BY DOWL ENGINEERS, DATED 9.25.2024, FOR PILE DESIGN PARAMETERS.

**DESIGN LIVE LOADS:**

| | |
|---|---|
| ROOF | Pg = 40 PSF, Pf = 40 PSF<br>I = 1.0, Ce = 1.0, Ct = 1.1 |
| SNOW DRIFT | ASCE 7-16, CHAPTER 7 |
| FLOORS | |
| GYM | 100 PSF, WITH LIVE LOAD REDUCTION |
| CONCENTRATED | 2000 LB |
| CORRIDORS | 100 PSF |
| MECHANICAL FLOORS | 125 PSF |
| WIND | 146 MPH 3-SECOND GUST<br>EXPOSURE C<br>BUILDING CATEGORY II, I = 1.0<br>(GCpi) = 0.18, qh = 45 PSF |
| COMPONENTS AND CLADDING | |
| WALL - WITHIN 9 FT OF OUTSIDE CORNERS | 60 PSF |
| REMAINDER OF WALL | 55 PSF |
| ROOF - WITHIN 22 FT OF ROOF CORNERS | 115 PSF |
| WITHIN 18 FT OF ROOF EDGES | 90 PSF |
| REMAINDER OF ROOF | 55 PSF |
| SEISMIC | I = 1.0, SEISMIC USE GROUP II<br>Ss = 0.33, S1 = 0.124<br>SOIL SITE CLASS d<br>Sds = 0.34, Sd1 = 0.19,<br>SEISMIC DESIGN CATEGORY C<br>BASIC SEISMIC FORCE RESISTING SYSTEM: ORDINARY CONCENTRIC BRACED FRAMES<br>Cs = 0.104, R = 3.25, OMEGA = 2<br>V BASE = 161 K,<br>EQUIVALENT LATERAL FORCE ANALYSIS |

**FOUNDATION THERMAL PILING:**

STEEL ROUND HSS PILES - 12" DIA. WITH .25" MINIMUM WALL THICKNESS & 16" DIA. WITH .3125" MINIMUM WALL THICKNESS PER ASTM A500, GRADE C, SELF-REFRIGERATED TYPE AS MANUFACTURED BY ARCTIC FOUNDATIONS, INC. SPECIAL INSPECTION REQUIRED. PILES TO BE SET IN PRE-AUGERED HOLES A MINIMUM OF 6" LARGER THAN OUTSIDE DIAMETER OF PILE. BACKFILL ANNULAR SPACE WITH SAND SLURRY FILL. SEE SPECIFICATIONS FOR PILE AND SLURRY REQUIREMENTS. PILE CAPACITY = 12" - 31 TONS PER PILE, 16" – 42 TON PER PILE.

**REINFORCED CONCRETE:**

UNLESS OTHERWISE NOTED, REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60. PROVIDE CLASS B SPLICE. SUBMIT REINFORCING STEEL SHOP DRAWINGS WITH DETAILS PER ACI 315 MANUAL OF STANDARD PRACTICE.

ASTM A706, GRADE 60, REINFORCING STEEL SHALL BE USED FOR:
- WELDED OR FIELD-BENT BARS.
- SHEAR WALL BOUNDARY MEMBER REINFORCING.
- MAIN REINFORCING, SPIRALS, TIES AND STIRRUPS IN THE FRAME MEMBERS BEAMS AND COLUMNS) COMPRISING THE LATERAL FORCE RESISTING SYSTEM.

GROUT:

GROUT – 5,000 PSI MINIMUM 7-DAY CUBE STRENGTH PER ASTM C1107. GROUT TO BE PREMIXED, NONMETALLIC, SHRINKAGE-RESISTANT GROUT PER ASTM C1107. USE SPECIFIC GROUT MIX RECOMMENDED BY MANUFACTURER FOR EACH GROUT APPLICATION AND FOLLOW MANUFACTURER'S INSTRUCTIONS.

ANCHOR BOLTS:

ANCHOR BOLTS, ASTM A307 OR F1554, GRADE 36. EMBED HEADED END OR PROVIDE DOUBLE NUT OR SINGLE NUT WITH MARRED THREADS ABOVE AND BELOW NUT. WELDING, INCLUDING TACK WELDS, TO ANCHOR BOLTS IS NOT PERMITTED. SPECIAL INSPECTION REQUIRED. SET ALL ANCHOR BOLTS BY TEMPLATE.

DRILL-IN EXPANSION ANCHORS:

"POWER-STUD+ SD2" BY DEWALT OR APPROVED EQUAL. ICC-ES CERTIFICATION FOR SEISMIC RESISTANCE IN CRACKED CONCRETE REQUIRED. SPECIAL INSPECTION REQUIRED.

DRILL-IN ADHESIVE ANCHORS:

"PURE110+" ADHESIVE BY DEWALT OR APPROVED EQUAL. ICC-ES CERTIFICATION FOR SEISMIC RESISTANCE IN CRACKED CONCRETE REQUIRED. SPECIAL INSPECTION REQUIRED.

CONCRETE SCREW ANCHORS:

"SCREW-BOLT+" BY DEWALT OR APPROVED EQUAL. ICC-ES CERTIFICATION FOR SEISMIC LOAD RESISTANCE IN CRACKED CONCRETE REQUIRED. SPECIAL INSPECTION REQUIRED.

**STRUCTURAL STEEL:**

ALL STEEL ASTM A36, EXCEPT WIDE FLANGE SECTIONS TO BE ASTM A992, OR A572-50, TUBE SECTIONS TO BE ASTM A500 GRADE C, AND PIPE SECTIONS TO BE ASTM A53 TYPE E GRADE B. SPECIAL INSPECTION REQUIRED. FABRICATION AND ERECTION PER AISC SPECIFICATIONS.

FABRICATOR SHALL PARTICIPATE IN AISC QUALITY CERTIFICATION PROGRAM AND BE DESIGNATED AN AISC CERTIFIED PLANT, CATEGORY BU. IN LIEU OF AISC CERTIFICATION, FABRICATOR SHALL PROVIDE IN-SHOP SPECIAL INSPECTION. WHERE REQUIRED, IN-SHOP SPECIAL INSPECTION COSTS FOR NON-AISC-CERTIFIED FABRICATORS SHALL BE BORN BY THE CONTRACTOR.

SUBMIT SHOP DRAWINGS. WIDE FLANGE SECTIONS WITH FLANGE THICKNESS EQUAL TO OR GREATER THAN 1 1/2" SHALL HAVE CHARPY V-NOTCH TOUGHNESS OF 20 FT-LBS AT 70 DEGREES F TESTED IN THE ALTERNATE CORE LOCATION PER ASTM A6 SUPPLEMENARY REQUIREMENT S30.

WELDING PER AWS D1.1. MINIMUM SIZE WELDS 3/16" CONTINUOUS FILLET. WELDERS CERTIFIED PER AMERICAN WELDING SOCIETY FOR ROD AND POSITION. ELECTRODES SHALL BE E70XX MINIMUM, WITH MINIMUM CHARPY V-NOTCH TOUGHNESS OF 20 FT-LB AT -20 DEG F.

HIGH-STRENGTH BOLTS PER ASTM F3125 TYPE 1, GRADE A325 OR F1852, EXCEPT GRADE A490 WHERE NOTED. TYPICAL BOLTED CONNECTIONS –PRETENSIONED TYPE UNLESS OTHERWISE NOTED. FAYING SURFACES IN BOLTED CONNECTIONS RESISTING SEISMIC LOADS SHALL BE PREPARED AS REQUIRED FOR CLASS A JOINTS. TENSION HIGH-STRENGTH BOLTS BY DIRECT TENSION INDICATOR METHOD USING LOAD INDICATOR DEVICES INSTALLED PER MANUFACTURER'S INSTRUCTIONS.

APPLY ONE COAT OF SHOP PAINT TO ALL STEEL EXCEPT FOR CONTACT SURFACES IN BOLTED PARTS, SURFACES EMBEDDED IN CONCRETE, AREAS TO BE FIELD WELDED OR SURFACES WITH SPRAY-ON FIREPROOFING.

HEADED SHEAR STUDS - SHEAR STUDS PER ASTM A108, GRADES 1010 THRU 1020, HEADED TYPE, AWS D1.1, TYPE B, AUTOMATICALLY END WELDED. USE 3/4" DIA. x 3 1/2" STUDS, ON TOP OF ALL FLOOR BEAMS AND GIRDERS SUPPORTING A CONCRETE SLAB. MIN STUDS @12" OC OR STUD COUNT FOR EACH COMPOSITE BEAM AS INDICATED ON PLAN, WHICHEVER IS LARGER.

CAMBER BEAMS AS INDICATED ON PLAN AT MIDSPAN. FLOOR AND ROOF BEAMS IN BRACED BAYS ARE NOT CAMBERED.

**STEEL JOISTS:**

Fy = 50 KSI. STEEL JOISTS AND GIRDERS DESIGNED, MANUFACTURED AND INSTALLED PER STEEL JOIST INSTITUTE SPECIFICATIONS. ICC-ES CERTIFICATION REQUIRED.

CHORD SIZES INDICATED ON PLANS ARE MINIMUM ONLY. BASIC NET ROOF DESIGN WIND UPLIFT (0.6D – 0.6W) TO BE **(30 PSF)**, ASD. JOIST DESIGNER MAY USE REDUCED UPLIFT PER ASCE 7-16 WIND LOADING PROVISIONS IN LIEU OF BASIC UPLIFT PRESSURE GIVEN ABOVE. SUBMIT SHOP DRAWINGS STAMPED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF ALASKA AND DESIGN CALCULATIONS. PROVIDE BRIDGING AND ERECTION BRACING PER MANUFACTURER'S INSTRUCTIONS. PROVIDE STANDARD JOIST CAMBER.

IN ADDITION TO LOADS INDICATED, DESIGN JOISTS FOR THE FOLLOWING DOWNWARD LOAD OCCURRING AT ANY ONE PANEL POINT: 500 POUNDS AT EACH K JOIST AND 1,000 POUNDS AT EACH LH AND DLH JOIST.

**STEEL DECKING:**

STEEL DECKING DESIGNED, MANUFACTURED AND INSTALLED PER STEEL DECK INSTITUTE SPECIFICATIONS. ICC-ES CERTIFICATION REQUIRED. SUBMIT SHOP DRAWINGS. G60 GALVANIZED FINISH ON ALL DECKING.

FLOOR DECKING:
1 1/2" DP X 20 GA TYPE B COMPOSITE DECK, Imin = 0.219 IN4/FOOT, Smin = 0.230 IN3/FOOT.

FLOOR DECKING TO BE CONTINUOUS OVER 3 SPANS MINIMUM. DESIGN COMPOSITE FLOOR DECK AS A FORM PER AISI AND SDI SPECIFICATIONS AND PROVIDE EMBOSSMENTS AND INDENTATIONS IN THE DECK TO DEVELOP COMPOSITE ACTION WITH THE CONCRETE FILL. CONCRETE FILL OVER FLOOR DECK – 2 1/2" THICKNESS ABOVE DECK FLUTES (4" TOTAL THICKNESS), f'c = 3000 PSI, MAXIMUM W/C = .50. REINFORCE WITH #3 AT 18" ON CENTER EACH WAY WITH 3/4" CLEAR COVER MEASURED FROM TOP OF SLAB.

FASTEN FLOOR DECK UNITS TO STEEL AT TRANSVERSE AND END SUPPORTS WITH 7/8" VISUAL DIAMETER SPOT WELDS AT 12" ON CENTER. FASTEN UNITS TO STEEL AT SIDE SUPPORTS WITH 7/8" VISUAL DIAMETER SPOT WELDS AT 24" ON CENTER. FASTEN SIDE LAPS OF ADJACENT UNITS WITH BUTTON PUNCH AT 24" ON CENTER. SHEAR STUDS WELDED THROUGH DECKING FOR COMPOSITE FRAMING CAN BE USED TO TAKE THE PLACE OF WELDED ATTACHMENT ABOVE.

ROOF DECKING:
1 1/2" DP X 20 GA TYPE B DECK, Imin = 0.219 IN4/FOOT, Smin = 0.230 IN3/FOOT.

FASTEN ROOF DECK UNITS TO STEEL AT TRANSVERSE AND END SUPPORTS WITH 7/8" VISUAL DIAMETER SPOT WELDS AT 12" ON CENTER. FASTEN UNITS TO STEEL AT SIDE SUPPORTS WITH 7/8" VISUAL DIAMETER SPOT WELDS AT 24" ON CENTER. FASTEN SIDE LAPS OF ADJACENT UNITS WITH BUTTON PUNCH AT 24" ON CENTER.

ROOF DECKING TO BE CONTINUOUS OVER 3 SPANS MINIMUM. IN LIEU OF ATTACHMENT INDICATED ABOVE, CONTRACTOR MAY SUBMIT ALTERNATE ATTACHMENT VIA TEK SCREWS, LOW-VELOCITY FASTENERS, OR OTHER ATTACHMENT ICC-APPROVED FOR RESISTANCE OF DIAPHRAGM SHEAR AND UPLIFT PRESSURES. MINIMUM DIAPHRAGM SHEAR CAPACITY - **TBD** PLF. UPLIFT CAPACITY PER WIND LOAD SECTION ABOVE.

PROVIDE ADDITIONAL STEEL REINFORCEMENT AND CLOSURE PIECES AS REQUIRED FOR STRENGTH, CONTINUITY OF DECKING AND SUPPORT OF OTHER WORK.

**COLD-FORMED STEEL FRAMING:**

GALVANIZED STEEL SHALL BE ASTM A653 FOR NON-LOAD BEARING STUDS AND ASTM A1003 FOR LOAD BEARING STUDS, Fy = 50 KSI, EXCEPT 43 MIL AND LIGHTER SHALL BE Fy = 33 KSI. ALL STRUCTURAL MEMBERS SHALL BE DESIGNED IN ACCORDANCE WITH AISI SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS.

WALL STUDS - **6" x 42 MIL, Imin = 1. IN4 Smin = 0. IN3.**

**DEFERRED SUBMITTALS:**

THE DESIGN OF THE FOLLOWING ELEMENTS SHALL BE DEFERRED SUBMITTALS AND SHALL BE SUBMITTED TO THE ARCHITECT FOR REVIEW PRIOR TO SUBMITAL TO THE LOCAL BUILDING DEPARTMENT:

STEEL FABRICATOR'S AISC CERTIFICATION, CATEGORY BU
OPEN-WEB STEEL JOISTS
CURTAIN WALL DESIGN

EACH SUBMITTAL SHALL INCLUDE DRAWINGS STAMPED BY A DESIGN PROFESSIONAL LICENSED IN THE STATE OF ALASKA AND SUPPORTING CALCULATIONS. REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR OTHER DEFERRED SUBMITTALS.

**MISCELLANEOUS:**

CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS, MEMBER SIZES AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS ARE INTENDED AS GUIDELINES ONLY AND MUST BE VERIFIED. THE EXISTING CONDITIONS SHOWN ON THE DRAWINGS ARE BASED ON EITHER SITE OBSERVATION, ORIGINAL DRAWINGS OR WERE ASSUMED BASED ON EXPECTED CONDITIONS. IF THE EXISTING CONDITIONS DO NOT CLOSELY MATCH THE CONDITIONS SHOWN ON THE DRAWINGS, OR IF THE EXISTING MATERIALS ARE OF QUESTIONABLE OR SUBSTANDARD QUALITY, NOTIFY THE ARCHITECT PRIOR TO COMMENCING ANY WORK.

DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT AND STRUCTURAL ENGINEER.

REFER TO ARCHITECTURAL DRAWINGS FOR WALL OPENINGS, ARCHITECTURAL TREATMENT AND DIMENSIONS NOT SHOWN.

REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR SIZE AND LOCATION OF DUCT OPENINGS, PIPING, CONDUITS, ETC, NOT SHOWN.

SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED PRIOR TO FABRICATION.

PROVIDE TEMPORARY ERECTION BRACING AND SHORING AS REQUIRED FOR STABILITY OF THE STRUCTURE DURING ALL PHASES OF CONSTRUCTION.

REFER TO SPECIFICATIONS FOR INFORMATION NOT CONTAINED IN THESE GENERAL NOTES.

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Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
|---|---|---|
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|---|---|
| Drawn by<br>CMS | Date<br>1/14/2025 |
| Checked<br>GOL | Job No.<br>24048.01 |

Sheet Contents
GENERAL NOTES

Sheet No.
**S0.01**

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Plot Date Time: 1/21/2025 2:18:42 PM

# TYPICAL ABBREVIATIONS

| | |
|---|---|
| (A) | ABOVE |
| AB | ANCHOR BOLT |
| ACI | AMERICAN CONCRETE INSTITUTE |
| ADDL | ADDITIONAL |
| ADJ | ADJACENT |
| AESS | ARCHITECTURALLY EXPOSED STRUCTURAL STEEL |
| AISC | AMERICAN INSTITUTE OF STEEL CONSTRUCTION |
| AISI | AMERICAN IRON AND STEEL INSTITUTE |
| AITC | AMERICAN INSTITUTE OF TIMBER CONSTRUCTION |
| ALT | ALTERNATE |
| ALUM | ALUMINUM |
| ARCH | ARCHITECT, ARCHITECTURAL |
| @ | AT |
| APPROX | APPROXIMATELY |
| ASCE | AMERICAN SOCIETY OF CIVIL ENGINEERS |
| ASTM | AMERICAN SOCIETY FOR TESTING MATERIAL |
| AWS | AMERICAN WELDING SOCIETY |
| & | AND |
| | |
| (B) | BELOW |
| BD | BOARD |
| BG | BELOW GRADE |
| BLDG | BUILDING |
| BLK | BLOCK |
| BLKG | BLOCKING |
| BOD | BOTTOM OF DECK ELEVATION |
| BM | BEAM |
| BOT | BOTTOM |
| BRG | BEARING |
| BRK | BRICK |
| BSMT | BASEMENT |
| BTWN | BETWEEN |
| | |
| C | AMERICAN CHANNELS |
| CG | CENTER OF GRAVITY |
| CJ | CONSTRUCTION JOINT |
| CIP | CAST-IN-PLACE |
| CL | CENTER LINE |
| CJP | COMPLETE JOINT PENETRATION |
| CLR | CLEAR |
| CMP | CORRUGATED METAL PIPE |
| CMU | CONCRETE MASONRY UNIT |
| CO | CLEANOUT, CONCRETE OPENING |
| COL | COLUMN |
| CONC | CONCRETE |
| CONN | CONNECTION |
| CONSTR | CONSTRUCTION |
| CONT | CONTINUOUS |
| CONTR | CONTRACTOR |
| CSA | CONCRETE SCREW ANCHOR |
| CTJ | CONTROL JOINT, CONTRACTION JOINT |
| CTR | CENTER |
| CU | CUBIC |
| | |
| DBL | DOUBLE |
| DEPT | DEPARTMENT |
| DET | DETAIL |
| DIA, Ø | DIAMETER |
| DIAA | DRILLED-IN ADHESIVE ANCHOR |
| DIAB | DRILLED-IN ADHESIVE BOLT |
| DIAG | DIAGONAL |
| DIAPH | DIAPHRAGM |
| DIEB | DRILLED-IN EXPANSION BOLT |
| DIM | DIMENSION |
| DN | DOWN |
| do | DITTO |
| DP | DEEP |
| DWG | DRAWING |
| DWL | DOWEL |
| | |
| E | EAST |
| EA | EACH |
| EF | EACH FACE |
| EL | ELEVATION (HEIGHT) |
| ELEC | ELECTRICAL |
| ELEV | ELEVATOR |
| ENGR | ENGINEER |
| EOD | EDGE OF DECK |
| EQ | EQUAL |
| EQUIP | EQUIPMENT |
| ES | EACH SIDE |
| EW | EACH WAY |
| EXIST, (E) | EXISTING |
| EXP | EXPANSION |
| EXT | EXTERIOR |

| | |
|---|---|
| FD | FLOOR DRAIN |
| FDN | FOUNDATION |
| FIN | FINISH, FINISHED |
| FF | FINISHED FLOOR |
| FLG | FLANGE |
| FLR | FLOOR |
| FOS | FACE OF STUDS |
| FRP | FIRE RESISTANT TREATED PLYWOOD |
| FRT | FIRE RESISTANT TREATED (LUMBER) |
| FS | FINISH SLAB ELEVATION, FAR SIDE |
| FT OR ' | FOOT, FEET |
| FTG | FOOTING |
| FV | FIELD VERIFY |
| | |
| GA | GAUGE, GAGE |
| GALV | GALVANIZED |
| GEN | GENERAL |
| GL | GLUE LAMINATED |
| GWB | GYPSUM WALL BOARD |
| GYP | GYPSUM |
| | |
| HDG | HOT DIPPED GALVANIZED |
| HORIZ | HORIZONTAL |
| HP | HP STEEL SHAPE |
| HSB | HIGH STRENGTH BOLT |
| HSS | HOLLOW STRUCTRAL SECTION |
| HT | HEIGHT |
| | |
| IBC | INTERNATIONAL BUILDING CODE |
| ID | INSIDE DIAMETER |
| IF | INSIDE FACE |
| IMP | INSULATED METAL PANEL |
| IN OR " | INCH |
| INCL | INCLUDE |
| INSUL | INSULATION, INSULATED, INSULATE |
| INT | INTERIOR |
| | |
| JT | JOINT |
| JST | JOIST |
| | |
| K | KIP, KIPS |
| KSI | KIPS PER SQUARE INCH |
| | |
| LB OR # | POUND |
| LLBB | LONG LEG BACK TO BACK |
| LLH | LONG LEGS HORIZONTAL |
| LLV | LONG LEGS VERTICAL |
| LONGIT | LONGITUDINAL |
| LSL | LONG SLOTTED HOLES |
| LT | LIGHT |
| LT WT | LIGHT WEIGHT |
| L | ANGLE |
| LVF | LOW VELOCITY FASTENERS |
| LVL | LAMINATED VENEER LUMBER |
| | |
| M | MISCELLANEOUS SHAPE |
| MATL | MATERIAL |
| MAX | MAXIMUM |
| MC | MISCELLANEOUS CHANNEL SECTION |
| MECH | MECHANICAL |
| MFR | MANUFACTURER |
| MFRG | MANUFACTURING |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MT | STRUCTURAL TEE FROM M SERIES SECTION |
| MTL | METAL |
| | |
| N | NORTH |
| NDT | NON-DESTRUCTIVE TESTING |
| NF | NEAR FACE |
| NIC | NOT IN CONTRACT |
| No OR # | NUMBER |
| NOM | NOMINAL |
| NS | NEAR SIDE |
| NSG | NON-SHRINK GROUT |
| NTS | NOT TO SCALE |
| | |
| OC | ON CENTER |
| OD | OUTSIDE DIAMETER |
| OF | OUTSIDE FACE |
| OPNG | OPENING |
| OPP | OPPOSITE |
| OSB | ORIENTED STRAND BOARD |
| OVS | OVERSIZED |

| | |
|---|---|
| P/C | PRECAST |
| PCWT | PLATE-CONNECTED WOOD TRUSS |
| PEMB | PRE-ENGINEERED METAL BUILDING |
| PERP | PERPENDICULAR |
| PJ | PANEL JOINT |
| PL | PLATE (STEEL OR WOOD) |
| PLCS | PLACES |
| PLWD | PLYWOOD |
| PP | PARTIAL PENETRATION |
| PSF | POUNDS PER SQUARE FOOT |
| PSI | POUNDS PER SQUARE INCH |
| PSL | PARALLEL STRAND LUMBER |
| PT | PRESSURE TREATED |
| P/T | POST TENSION |
| PVC | POLYVINYL CHLORIDE |
| | |
| R | RADIUS |
| RD | ROOF DRAIN, ROUND |
| REF | REFERENCE |
| REINF | REINFORCING, REINFORCEMENT, REINFORCED |
| REQD | REQUIRED |
| RO | ROUGH OPENING |
| RS | RING SHANK |
| | |
| S | AMERICAN STANDARD STEEL SHAPE, SOUTH |
| SCHED | SCHEDULE |
| SEC | SECTION |
| SHT | SHEET |
| SHTG | SHEETING |
| SHTHG | SHEATHING |
| SIM | SIMILAR |
| SIP | STRUCTURAL INSULATED PANEL |
| SLBB | SHORT LEGS BACK TO BACK |
| SMS | SHEET METAL SCREWS |
| SOG | CONCRETE SLAB ON GRADE |
| SPA | SPACE, SPACING, SPACES |
| SPEC | SPECIFICATION |
| SQ | SQUARE |
| SS | STAINLESS STEEL |
| SSL | SHORT SLOTTED HOLES |
| ST | STRUCTURAL T FROM S SERIES SECTION |
| STD | STANDARD |
| STIFF | STIFFENER |
| STL | STEEL |
| STRUCT | STRUCTURAL |
| SUPT | SUPPORT |
| SUSP | SUSPENDED |
| SYMM | SYMMETRICAL |
| | |
| T | TOP |
| T&G | TONGUE AND GROOVE |
| TEMP | TEMPERATURE, TEMPORARY |
| THK | THICK |
| THRU | THROUGH |
| TOB | TOP OF BEAM ELEVATION |
| TOC | TOP OF CONCRETE ELEVATION, TOP OF CMU ELEVATION |
| TOF | TOP OF FOOTING ELEVATION |
| TOS | TOP OF STEEL ELEVATION |
| TOSH | TOP OF SHEATHING ELEVATION |
| TOW | TOP OF WALL ELEVATION |
| TP | TOP OF PAVEMENT |
| TRANS | TRANSVERSE |
| TS | STRUCTURAL TUBE |
| TYP | TYPICAL |
| | |
| UL | UNDERWRITERS LABORATORY |
| UON | UNLESS OTHERWISE NOTED |
| UT | ULTRASONIC TEST |
| | |
| VERT | VERTICAL |
| | |
| W | WEST, W SERIES SECTION |
| W/ | WITH |
| W/O | WITHOUT |
| WD | WOOD |
| WHS | WELDED HEADED STUD |
| WTS | WELDED THREADED STUD |
| WP | WORK POINT |
| WT | WEIGHT, STRUCTURAL TEE FROM W SERIES SECTION |
| WWF | WELDED WIRE FABRIC |
| | |
| YD | YARD |


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65% DESIGN DEVELOPMENT

CITY OF BETHEL
Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

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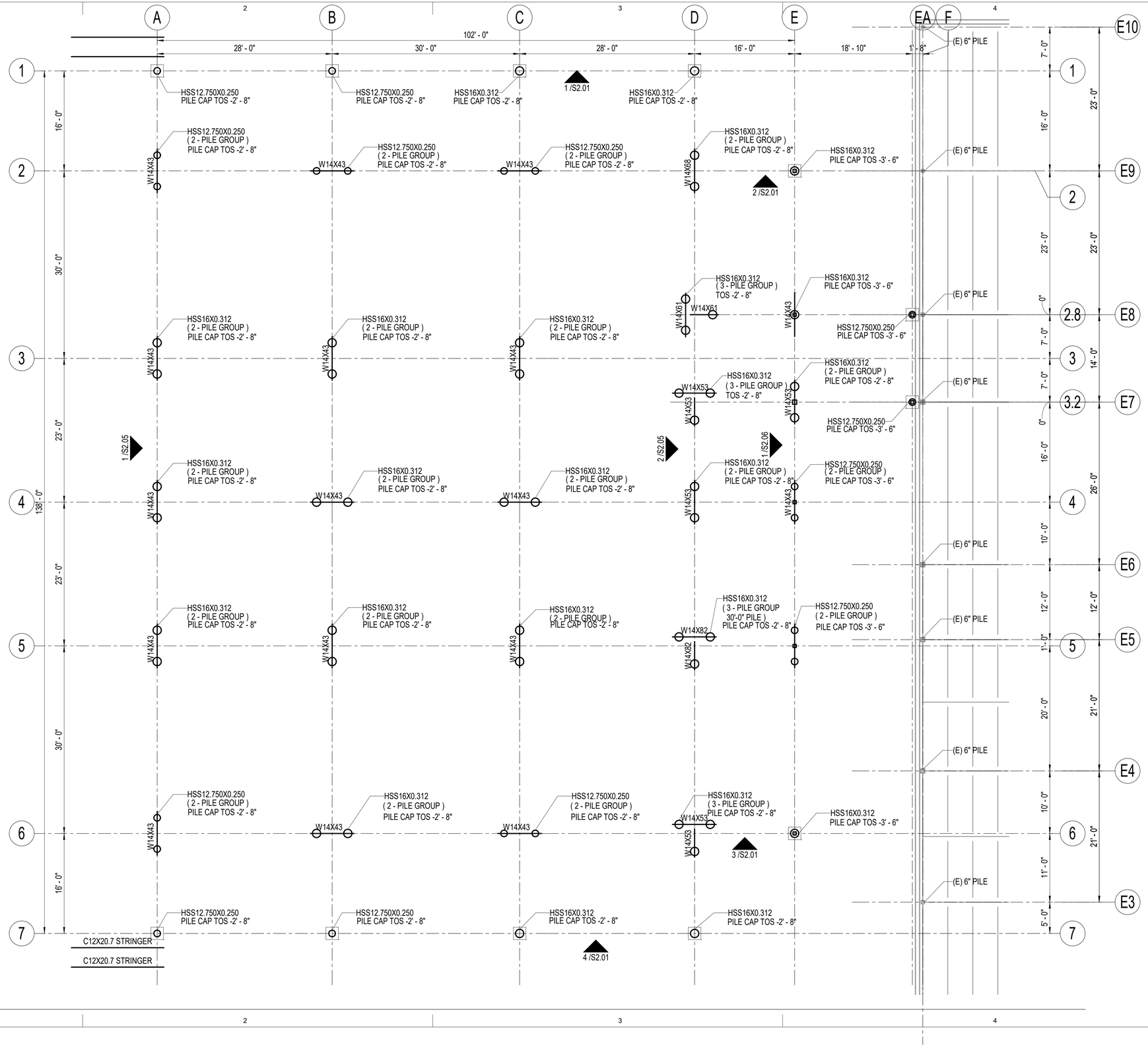
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| Checked Checker | Job No. 24048.01 |

Sheet Contents
ABBREVIATIONS

Sheet No.
**S0.02**


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Plot Date Time: 1/21/2025 2:18:42 PM

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/224076 STRUCT BETHEL YK FITNESS CENTER GYM EXPANSION R23.rvt




FOUNDATION NOTES:

1. CONTRACTOR FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO START OF WORK.
2. ELEVATIONS NOTED ARE WITH RESPECT TO FIRST FLOOR DATUM OF X'-X".
3. TOP OF SLAB IS NOTED THUS: TOC X'-Y".
4. PROVIDE 1/8" WX1 1/2" DEEP SAWN OR FORMED CONTROL JOINTS ON GRID.
5. PLACE CONSTRUCTION AND CONTROL JOINTS AT COLUMNS LINES AND AT INTERMEDIATE LOCATIONS NOT TO EXCEED 20'-0" EACH WAY.
6. PILE TIP ELEVATIONS (-40' BELOW GRADE).
7. PILE CUTOFF ELEVATIONS [6' - 0"].

## 1 PILE PLAN

1/8" = 1'-0"

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BETHEL, ALASKA

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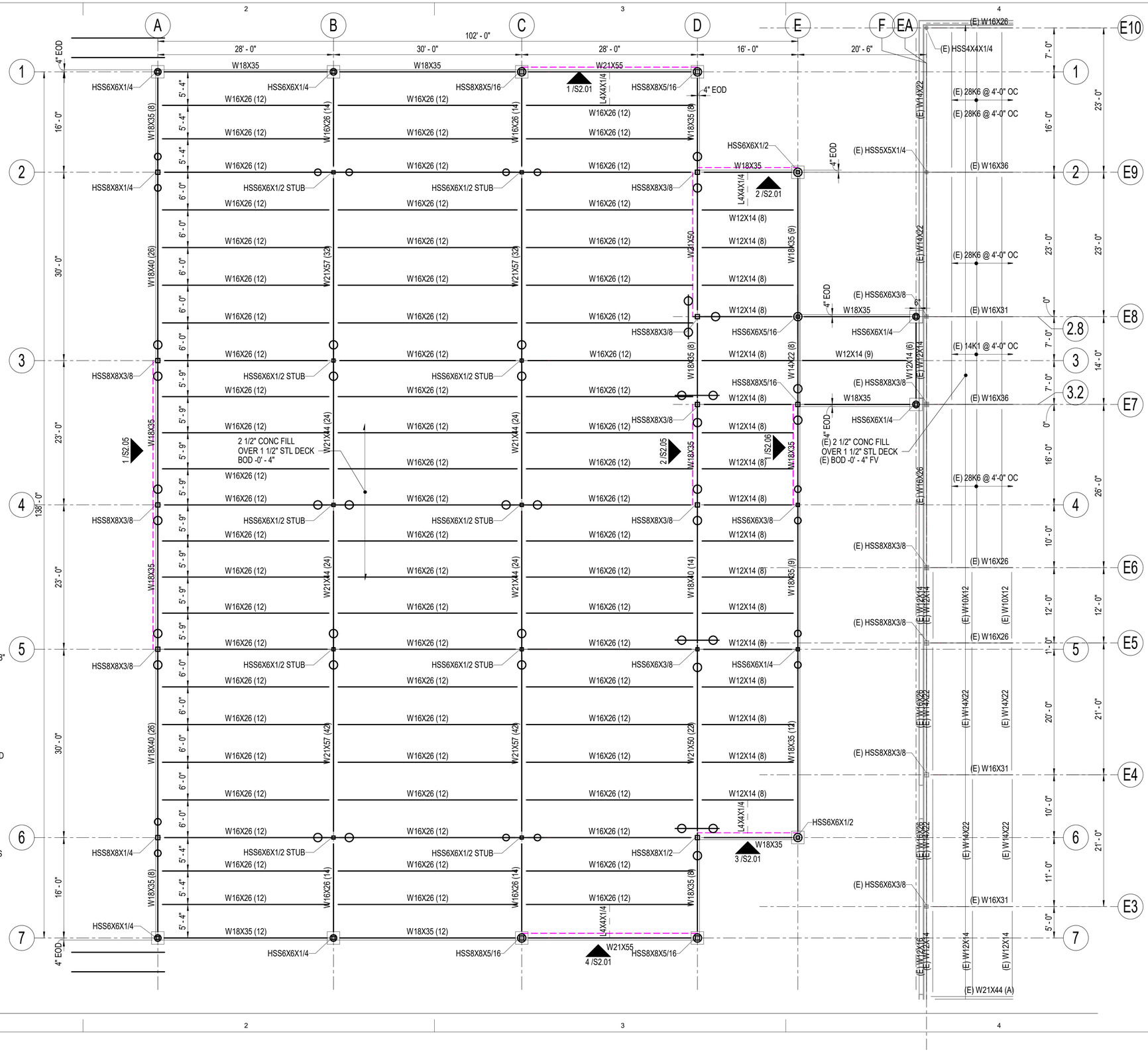
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Sheet Contents
PILE PLAN

Sheet No.
**S1.02**

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FRAMING NOTES:

1. CONTRACTOR FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO START OF WORK.
2. ELEVATIONS NOTED ARE WITH RESPECT TO FIRST FLOOR DATUM OF X'-X".
3. FOR BRACING ELEVATIONS SEE SHT S201-S206
4. BOTTOM OF DECK ELEVATION IS NOTED THUS: BOD X'-Y".
5. TOP OF STEEL ELEVATIONS NOTED THUS: TOS X'-Y".
6. 3.0K DENOTES JOIST OR JOIST GIRDER CONCENTRATED LOAD IN KIPS.
7. JOIST ADD LOADS SHALL BE DISTRIBUTED TO JOIST GIRDERS.
   * DENOTES 1000 POUND ADD LOAD TO JOIST OR 3000 POUND TO JOIST GIRDER. * ARE IN ADDITION TO NOTE 6.
   DESIGN SHALL BE FOR * LOCATED AT ANY PANEL POINT ALONG LENGTH OF JOIST OR JOIST GIRDER.
8. PROVIDE FRAMING AROUND ALL ROOF DECK OPENINGS GREATER THAN 0'-8" SQUARE PER DETAIL 10/S510. COORDINATE WITH MECHANICAL AND ARCHITECTURAL
   DRAWINGS FOR ADDITIONAL OPENINGS NOT SHOWN.
9. PROVIDE 3/4"ØX3" WELDED HEADED SHEAR STUDS @ 12" OC AT ALL BEAMS AND GIRDERS UNO.
10. * DENOTES 1"Ø A490 BOLTS IN LIEU OF 3/4"Ø BOLTS PER TABLE 1, SHEET S601.
11. BEAMS WITH AN ASTERISK (*) REQUIRE SHEAR TRANSFER ANGLES BETWEEN JOIST PER 10/S510.
12. UNDIMENSIONED MEMBERS ARE EQUALLY SPACED BETWEEN DIMENSIONED MEMBERS.
13. SEE ARCHITECTURAL DRAWINGS FOR SIZE AND LOCATION FOR SLAB DEPRESSIONS.
14. ALL DECK FRAMING TO BE PRESSURE TREATED (PT).
15. ▭ INDICATES CONCENTRATED LOAD.
16. ▨ INDICATES ROOF TOP MECH UNIT.
17. DESIGN NET WIND UPLIFT = 20 PSF.
18. DESIGN ALL JOISTS FOR ADD LOAD OF 0.5K
19. ALL K JOIST AND LH JOIST TO HAVE 5" DEEP SEATS.
20. DESIGN JOIST FOR SEISMIC STRUT FORCE NOTED IN BRACKETS [ ]. LOAD IS LRFD, INCLUDING OMEGA.

## 1 LEVEL 1 FRAMING PLAN

1/8" = 1'-0"

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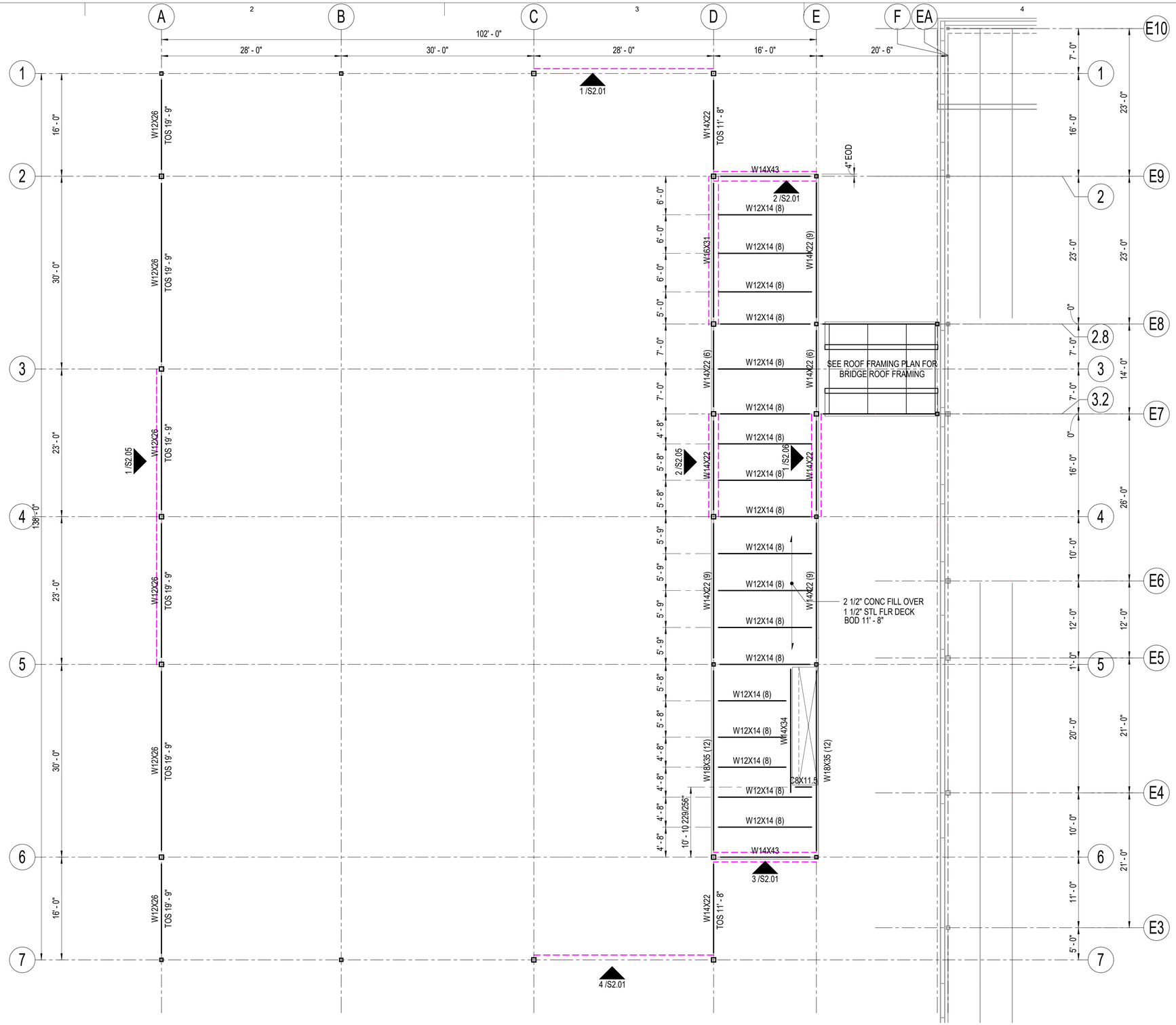
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Sheet Contents
LEVEL 1 FRAMING PLAN

Sheet No.
**S1.12**

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## 1 MEZZANINE FRAMING PLAN

1/8" = 1'-0"

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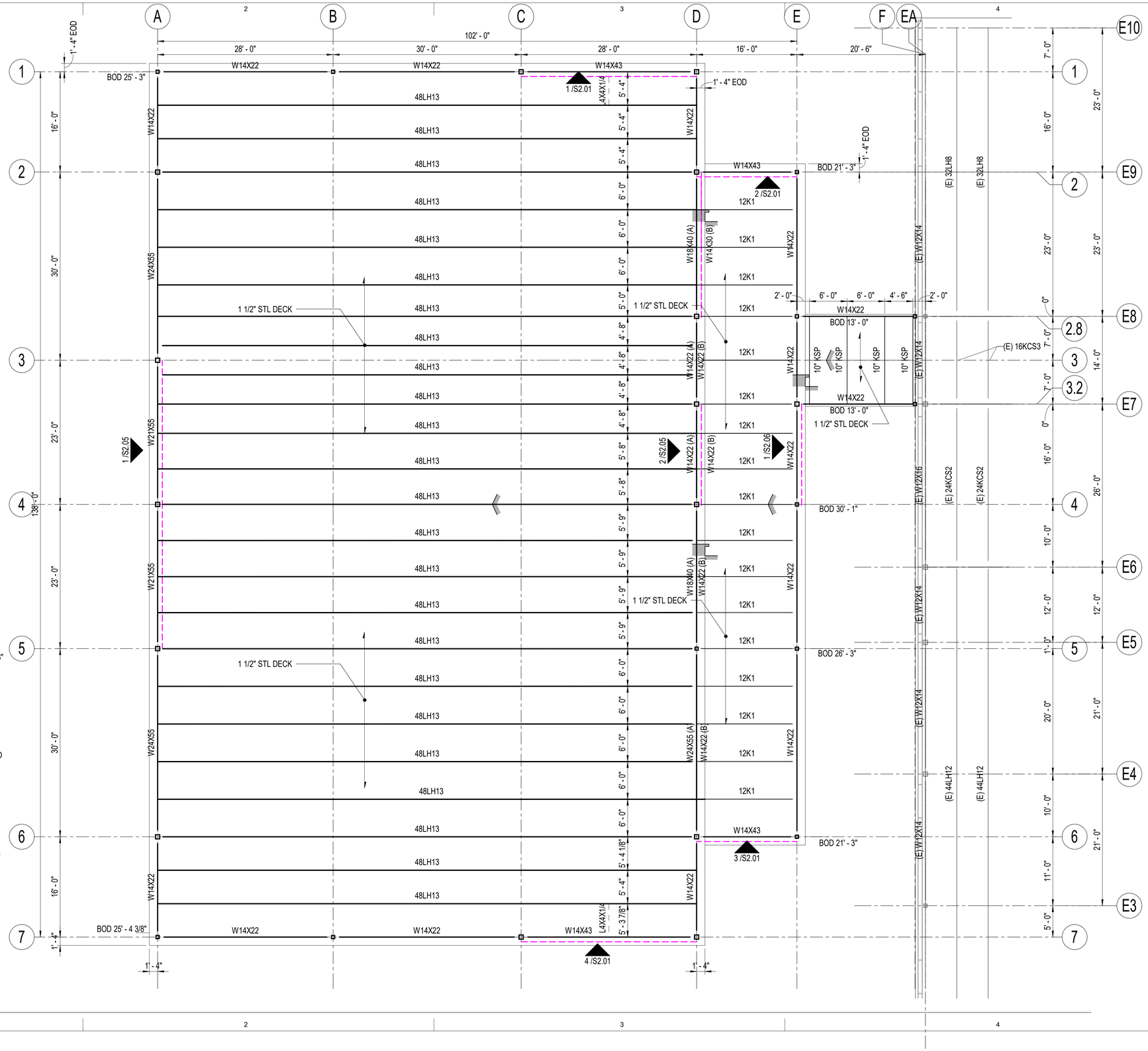
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Sheet Contents
MEZZANINE FRAMING PLAN

Sheet No.
**S1.22**

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## 1 ROOF FRAMING PLAN

1/8" = 1'-0"

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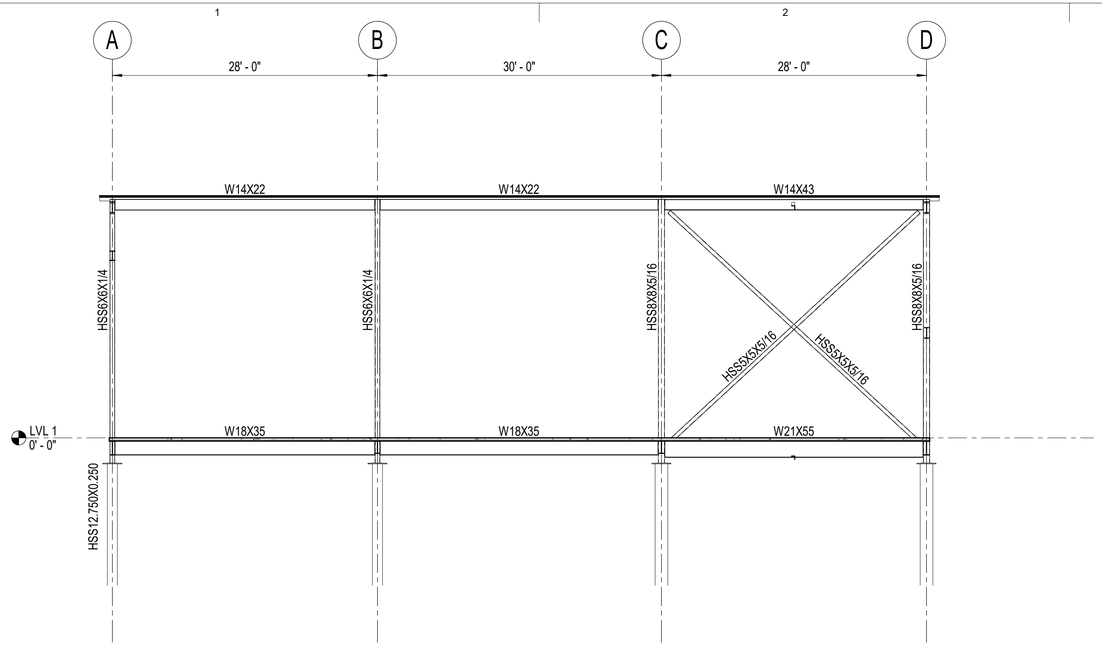
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ROOF FRAMING PLAN

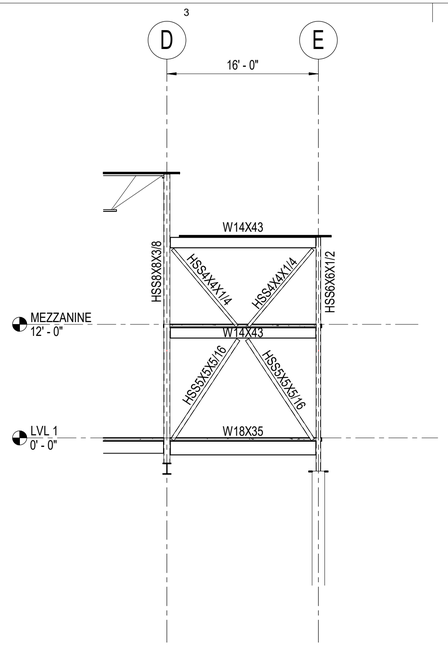
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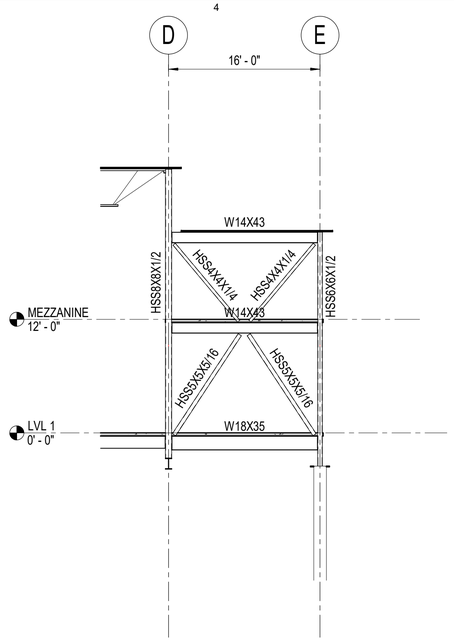
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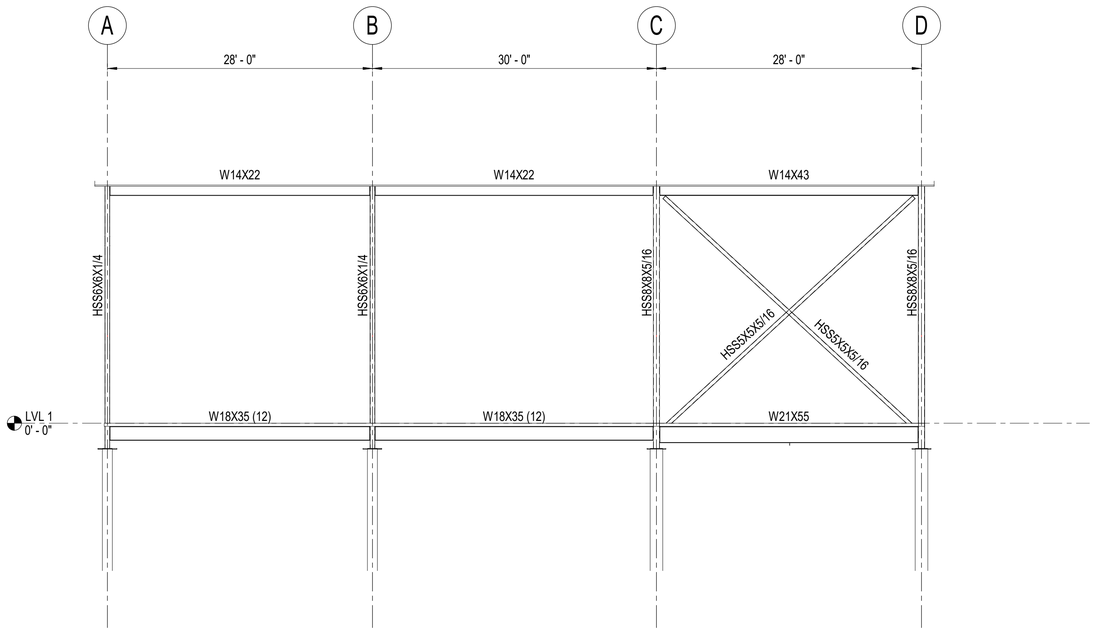

1 GRID 1 - BRACE ELEVATION
1/8" = 1'-0"




2 GRID 2 - BRACE ELEVATION
1/8" = 1'-0"




3 GRID 6 - BRACE ELEVATION
1/8" = 1'-0"




4 GRID 7 - BRACE ELEVATION
1/8" = 1'-0"

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65% DESIGN DEVELOPMENT

CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

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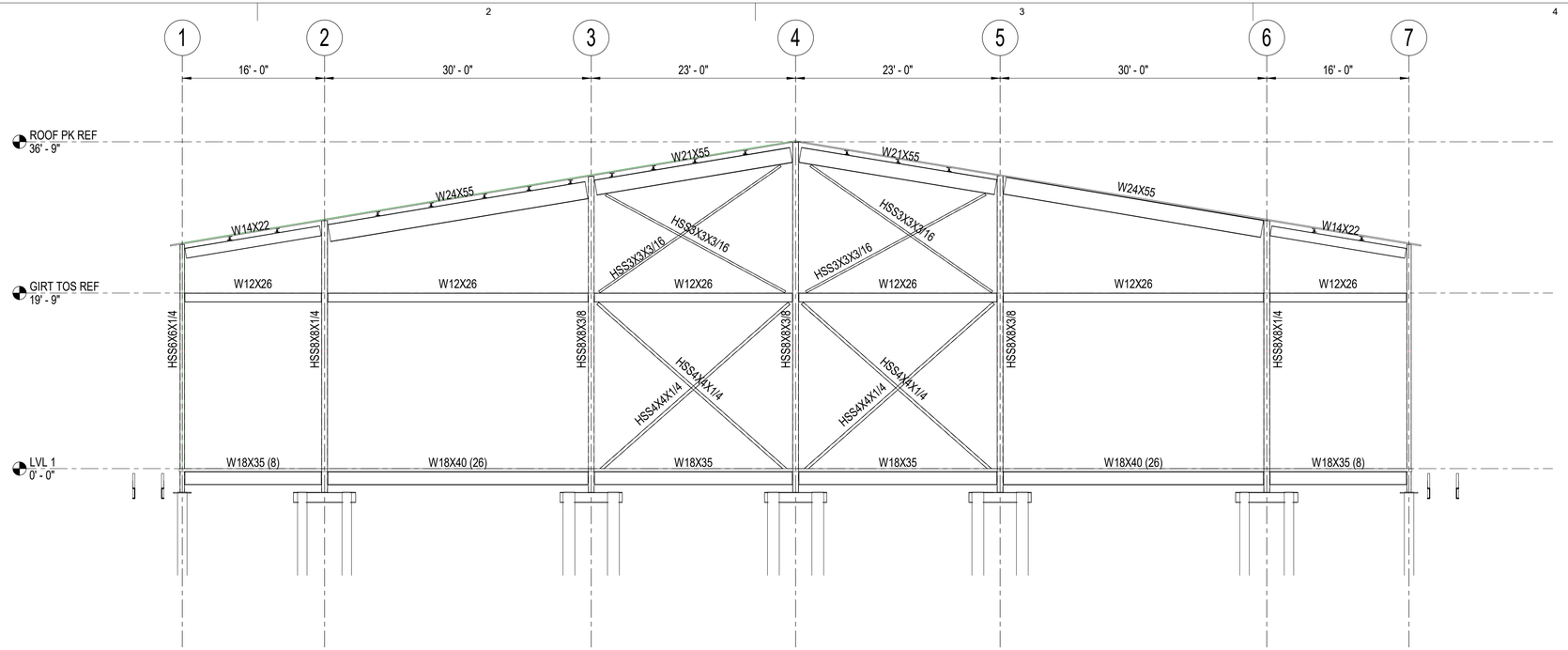
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| Checked GOL | Job No. 24048.01 |

Sheet Contents
BRACE FRAME ELEVATIONS

Sheet No.
**S2.01**

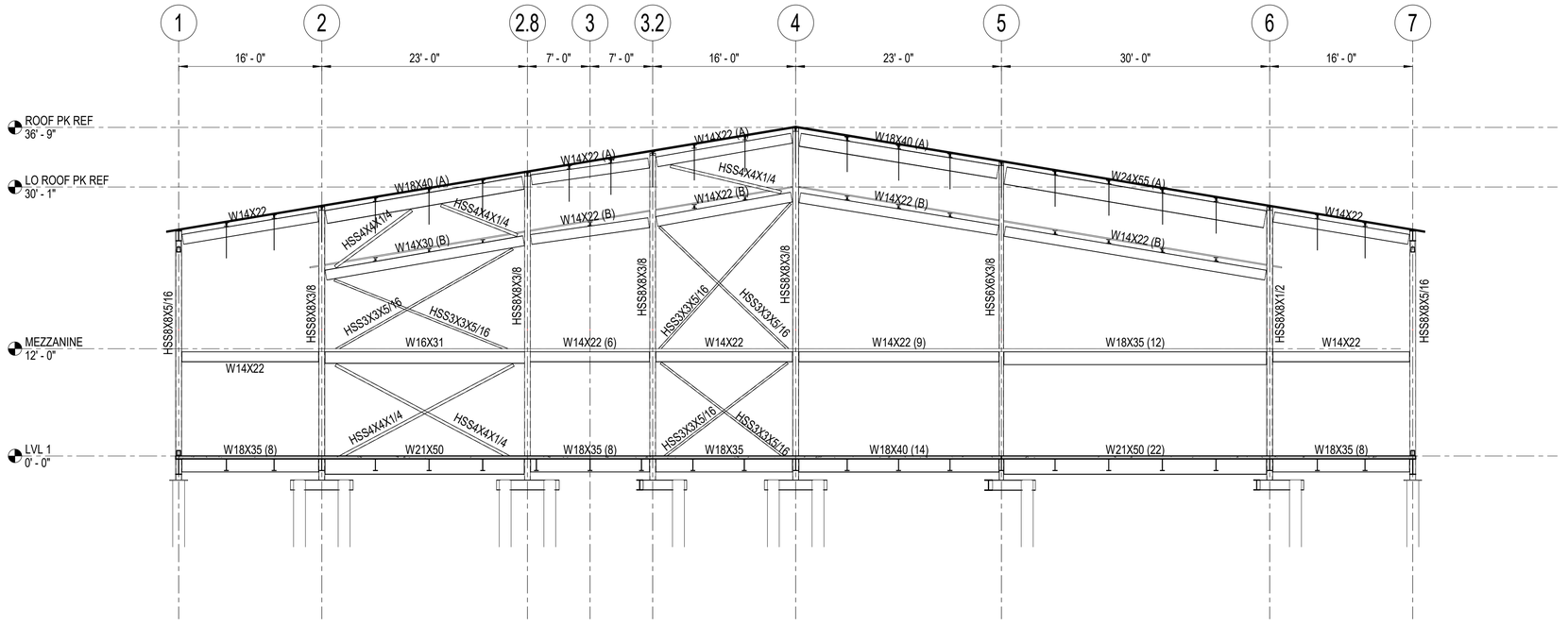
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Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/224076 STRUCT BETHEL YK FITNESS CENTER GYM EXPANSION R23.rvt




## 1 GRID A - BRACE ELEVATION

1/8" = 1'-0"




## 2 GRID D - BRACE ELEVATION

1/8" = 1'-0"

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BETHEL, ALASKA

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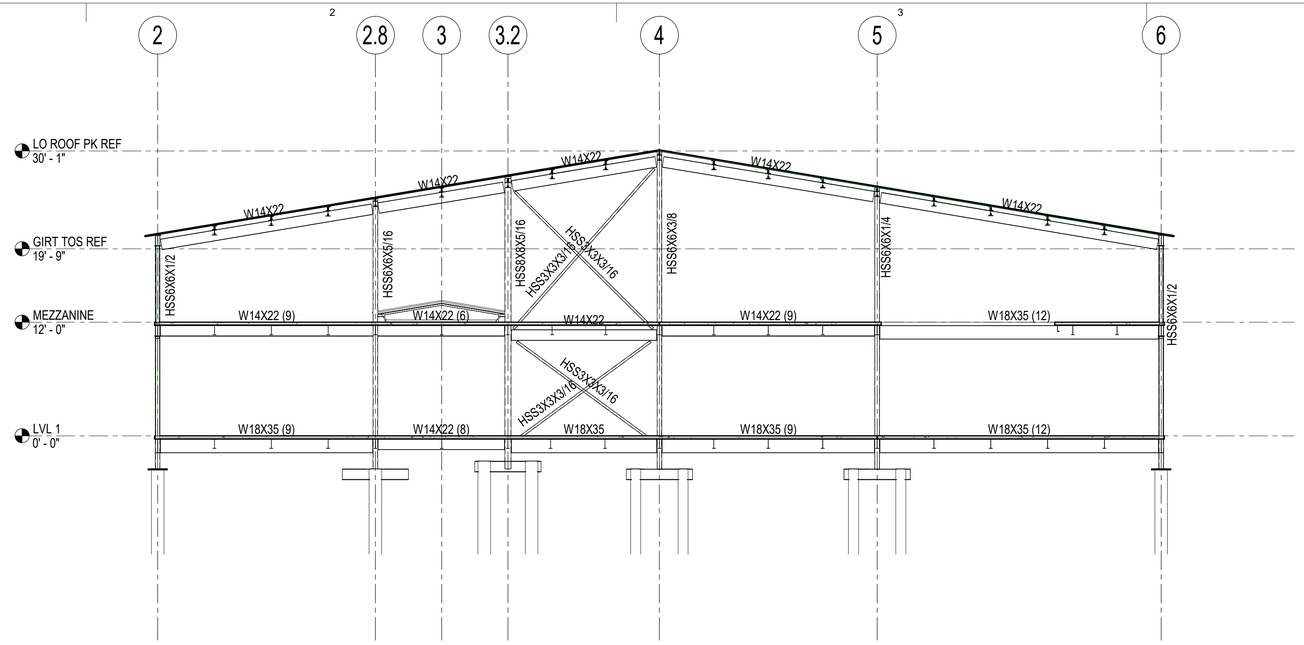
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Sheet Contents
BRACE FRAME ELEVATIONS

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**S2.05**

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1 GRID E - BRACE ELEVATION
1/8" = 1'-0"

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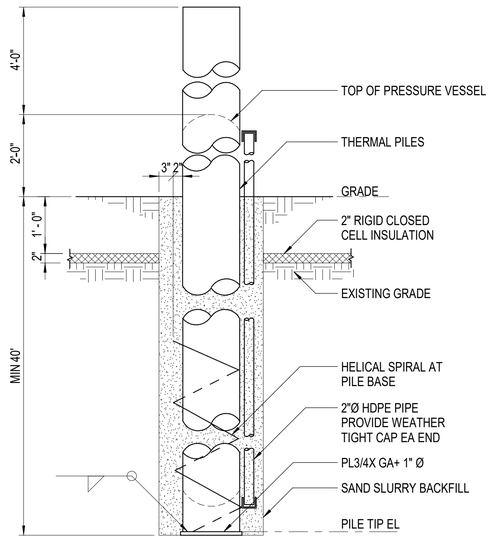
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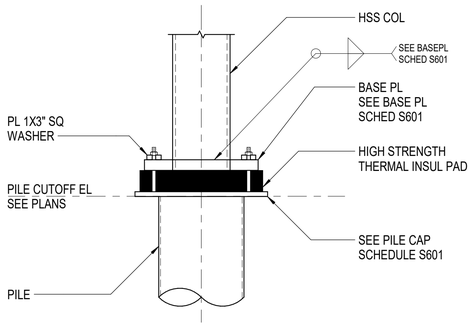
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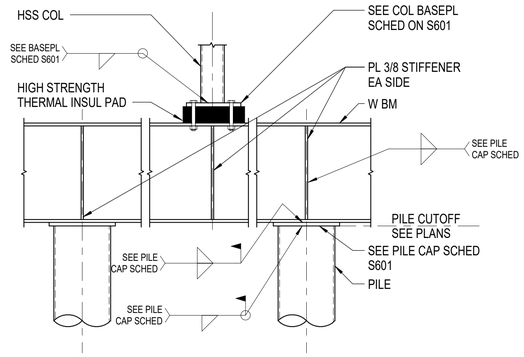



## 1 TYP 12" PILE EMBEDMENT
3/4" = 1'-0"

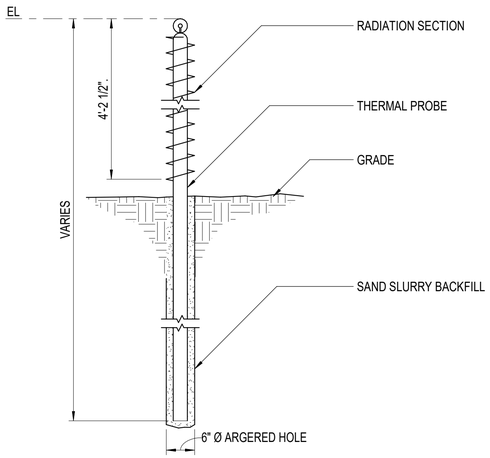



NOTES:
1. PROVIDE FULL SIZE PLATE SHIMS TO MATCH 2'-3"X2'-3" PLATE AS NEEDED.
2. WELD THREADED STUDS TO PL1 W/ 3/8" FILLET ALL AROUND.

## 2 HSS COL TO PILE
3/4" = 1'-0"




## 4 COL TO W BM AND PILES
3/4" = 1'-0"




## 9 THERMAL PROBE INSTALLATION
3/4" = 1'-0"

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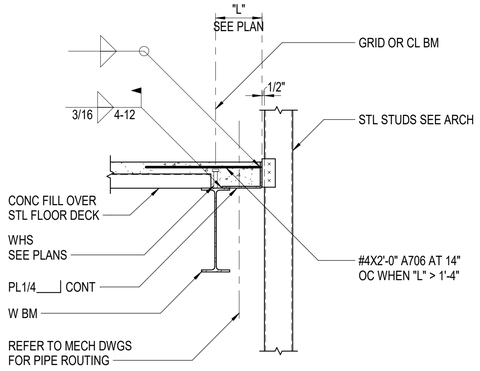
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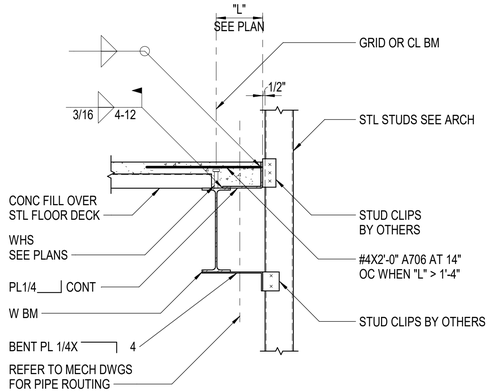
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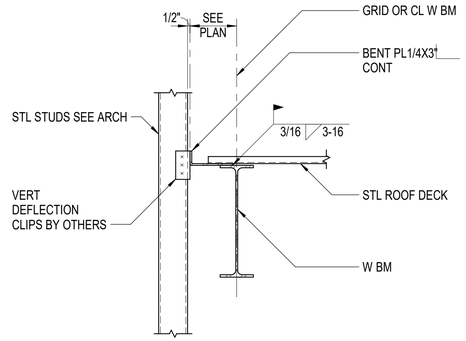
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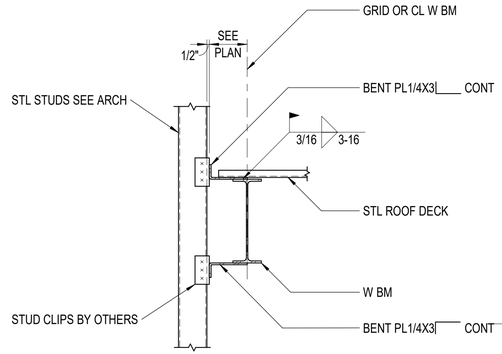

## 1 FLOOR DECK EDGE
3/4" = 1'-0"



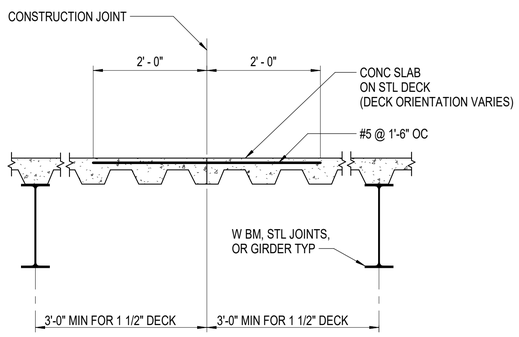

## 2 FLOOR DECK EDGE STUDS @ WIDE OPNG
3/4" = 1'-0"




## 3 ROOF DECK EDGE
3/4" = 1'-0"

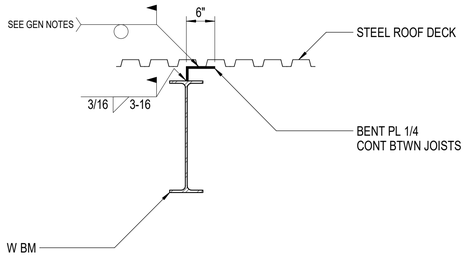



## 4 ROOF DECK EDGE STUDS AT WIDE OPENING
3/4" = 1'-0"

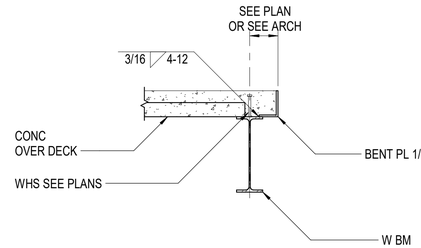



NOTE:
LOCATE CONSTRUCTION JOINT 20'-0" MIN FROM NEAREST BRACED GRID LINE.

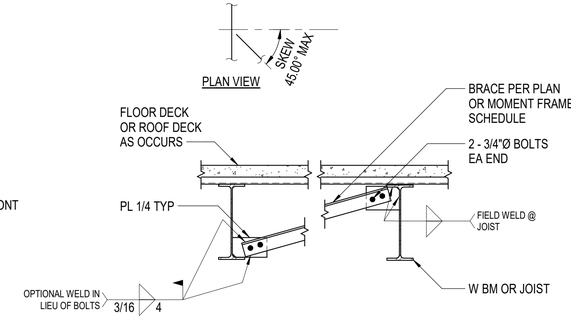
## 5 CONSTRUCTION JOINT IN SLAB ON DECK
3/4" = 1'-0"




## 6 L BTWN JOISTS
3/4" = 1'-0"

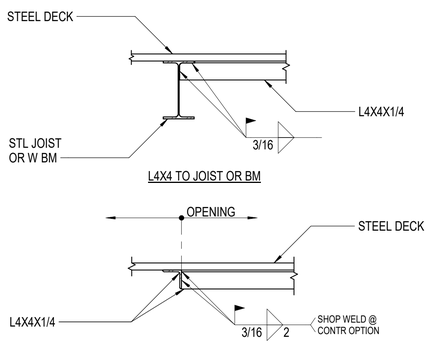



## 7 INTERIOR SLAB EDGE
3/4" = 1'-0"




NOTE:
1. AT JOISTS SKEW BRACE 45°MAX TO NEAREST TOP PANEL POINT.
2. LENGTH OF L3X3 BRACE SHALL NOT EXCEED 8'-0".
3. LENGTH OF L4X4 BRACE SHALL NOT EXCEED 12'-0".

## 8 BOTTOM FLANGE BRACE
3/4" = 1'-0"




L4X4 TO JOIST OR BM




L4X4 TO L4X4

NOTE:
APPLIES AT ALL DECK OPENINGS LARGER THAN 8".

## 9 DECK OPENING SUPPORT FRAME
3/4" = 1'-0"

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65% DESIGN DEVELOPMENT

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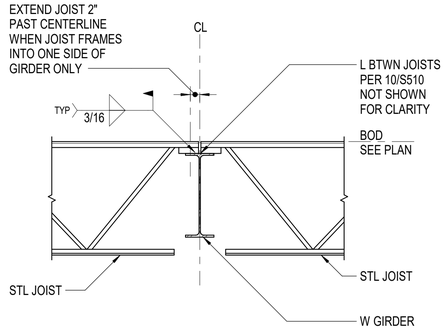
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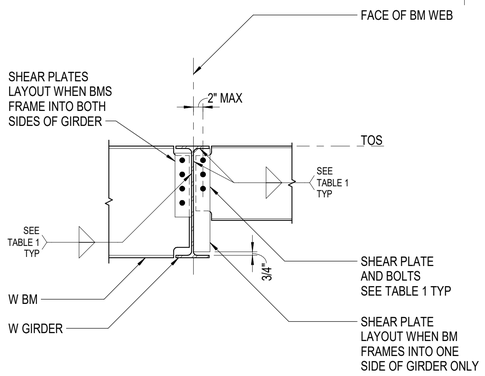
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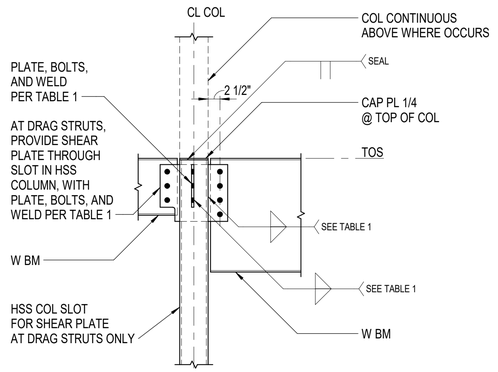



NOTES:
1. JOISTS WITH SPAN GREATER THAN 40' SHALL BE FIELD BOLTED WITH 2 BOLTS EACH END.
2. IF BEAM FLANGE IS LESS THAN 5 1/2" WIDE, JOIST MANUF TO DESIGN FOR REDUCED BEARING WIDTH.

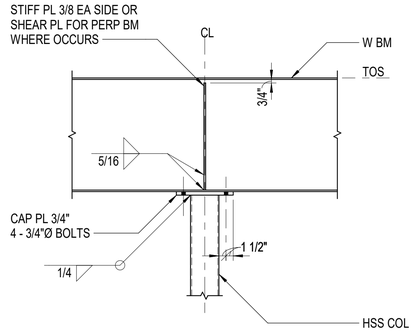
## 1 JOIST TO W GIRDER
3/4" = 1'-0"



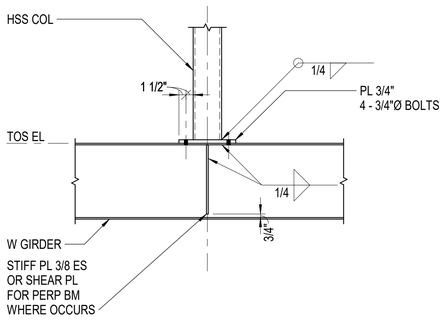

## 2 BEAM TO BEAM
3/4" = 1'-0"



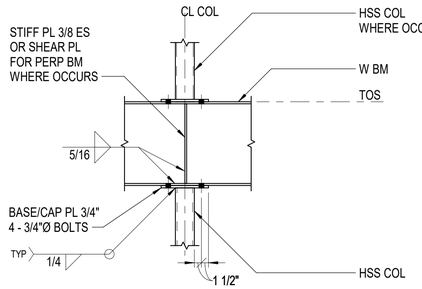

## 3 W BEAMS AT HSS COL
3/4" = 1'-0"



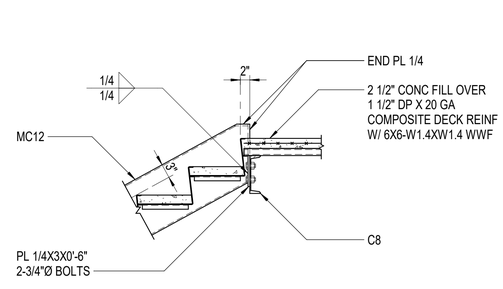

## 4 W BM OVER HSS COL
3/4" = 1'-0"



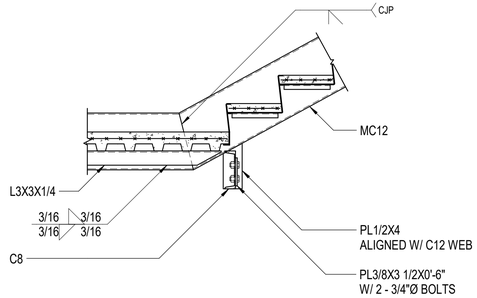

## 5 HSS COL TO W GIRDER
3/4" = 1'-0"



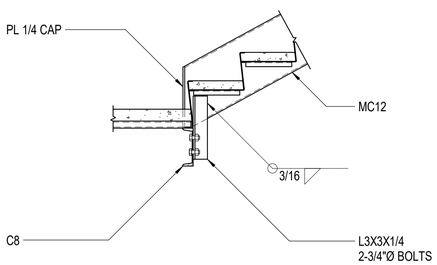

## 6 W BEAM OVER HSS
3/4" = 1'-0"



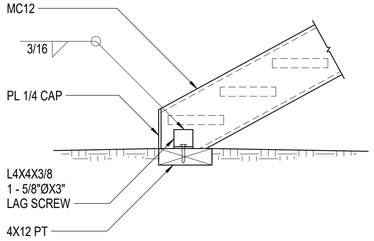

## 7 STRINGER TO C8
3/4" = 1'-0"



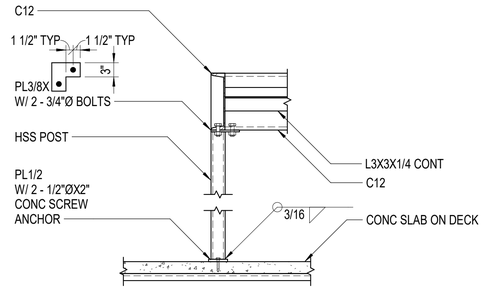

## 8 BENT STRINGER
3/4" = 1'-0"




## 9 STRINGER TO C8 LANDING
3/4" = 1'-0"




## 10 STAIR STRINGER TO GRADE
3/4" = 1'-0"




## 11 STAIR LANDING SUPPORT POST
3/4" = 1'-0"

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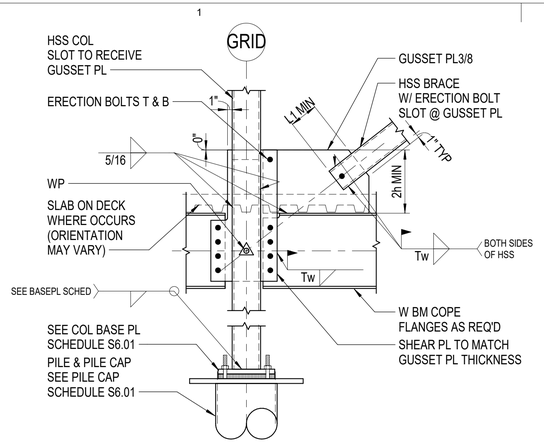
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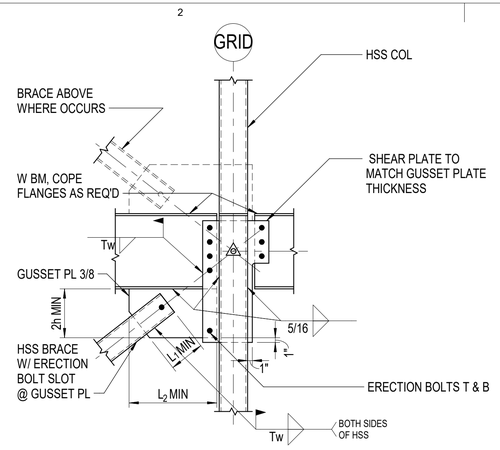
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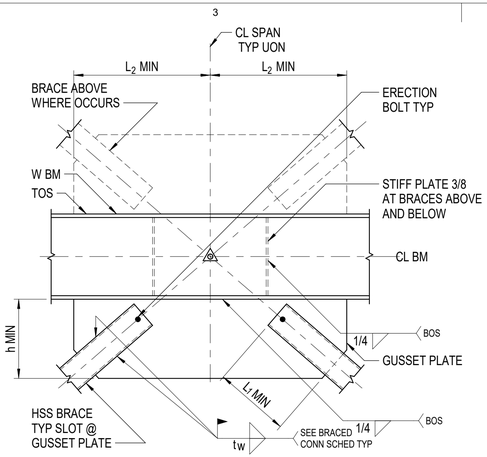
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1 HSS BRACE TO HSS COL
3/4" = 1'-0"




2 HSS BRACE TO W BM
3/4" = 1'-0"




3 HSS BRACE TO W BM
3/4" = 1'-0"

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**S5.12**

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## TABLE 1
SINGLE-PLATE SHEAR CONNECTIONS

| BEAM SIZES | HSB REQD | HSB SIZE & TYPE | SHEAR PLATE THICKNESS | WELD SIZE |
|---|---|---|---|---|
| W8 TO W10 | 2 | 3/4"Ø - A325N | 3/8" | 1/4" |
| W12 TO W14 | 3 | 3/4"Ø - A325N | 3/8" | 1/4" |
| W16 TO W18 | 4 | 3/4"Ø - A325N | 3/8" | 1/4" |
| W21 | 5 | 3/4"Ø - A325N | 3/8" | 1/4" |
| W24 TO W27 | 6 | 7/8"Ø - A325N | 3/8" | 1/4" |

NOTES:
1. ALL HSB TO BE FULLY TIGHTENED.
2. FABRICATE SHEAR PLATES WITH HORIZ SHORT-SLOTTED HOLES AND BEAMS WITH STANDARD HOLES.
3. HSB VERT SPACING = 3", MIN EDGE DIST = 1 1/2" .
4. AT COLLECTORS (DENOTED W/ * ON PLAN) DO NOT USE SLOTTED HOLES AND USE A A490 1"Ø BOLTS.

1 TABLE 1
NTS

## BRACE CONNECTION SCHEDULE

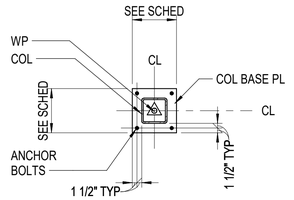
| BRACE SIZE | BRACE WELDS | | GUSSET PLATE | | GUSSET WELDS | BRACE CONN REINF | | SIDE PL EA SIDE AT X-CONN | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tw, in | Lw, in | T, in | W, in | T1, in | REINF PLATE ES | REINF WELD | PLAT E | END FILLET | LENGTH OF FLARE BEVEL WELD REINF W/ 3/16 FILLET |
| HSS3X3X3/16 | 3/16 | 9 | 1/2 | 4 1/2 | 5/16 | PL 1/4X3/4X1'-4" | 1/4 | 1/4X6 | 3/16" | 11" |
| HSS4X4X1/4 | 1/4 | 12 | 1/2 | 6 1/2 | 5/16 | PL 3/8X1X1'-8" | 1/4 | 3/8X7 | 3/16" | 15" |
| HSS5X5X5/16 | 5/16 | 14 | 5/8 | 7 1/2 | 5/16 | PL 1/2X1X1'-9" | 1/4 | 3/8X11 | 3/16" | 19" |

NOTE:
ALL GUSSET PLATES, SIDE PLATES, AND REINF PLATES TO BE ASTM A572 GRADE 50.

2 SQUARE HSS BRACE CONNECTION SCHEDULE
NTS

## COL BASE PL SCHEDULE

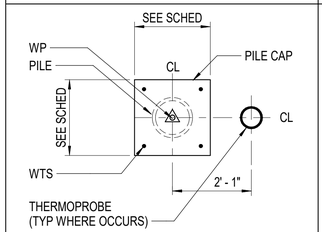
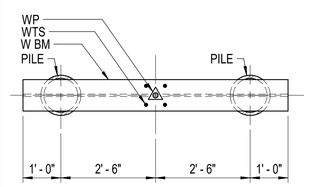
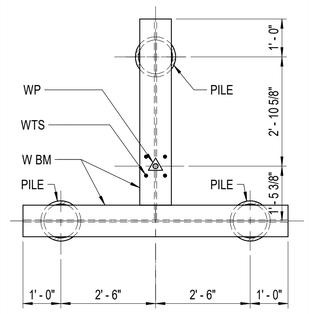
PLAN
NOT TO SCALE




| MARK | COL | BASE PL, ANCHOR BOLTS | REMARKS |
|---|---|---|---|
| BP1 | HSS6X6X1/4 | PL1" X 12" X 1'-0"<br>4 - 3/4"Ø AB | -- |
| BP2 | HSS6X6X5/16 | PL1" X 12" X 1'-0"<br>4 - 3/4"Ø AB | -- |
| BP3 | HSS6X6X3/8 | PL1" X 12" X 1'-0"<br>4 - 3/4"Ø AB | -- |
| BP4 | HSS6X6X1/2 | PL1" X 12" X 1'-0"<br>4 - 3/4"Ø AB | -- |
| BP5 | HSS8X8X1/4 | PL1" X 14" X 1'-2"<br>4 - 3/4"Ø AB | -- |
| BP6 | HSS8X8X3/8 | PL1" X 14" X 1'-2"<br>4 - 3/4"Ø AB | -- |
| BP7 | HSS8X8X1/2 | PL1" X 14" X 1'-2"<br>4 - 3/4"Ø AB | -- |

3 COL BASE PL SCHEDULE
NTS

## PILE CAP SCHEDULE

| PLAN NOT TO SCALE | MARK | TYPE | PILE CAP | REMARKS |
|---|---|---|---|---|
|  | PC1 | 1 - PILE | PL1" X 24" X 2'-0" | -- |
|  | PC2A | 2 - PILES | W14X43 | -- |
| | PC2A | 2 - PILES | W14X53 | -- |
| | PC2A | 2 - PILES | W14X68 | -- |
|  | PC3A | 3 - PILES | W14X53 | -- |
| | PC3B | 3 - PILES | W14X82 | -- |



9 PILE CAP SCHEDULE
NTS

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65% DESIGN DEVELOPMENT

CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

| | |
|---|---|
| Drawn by CMS | Date 1/14/2025 |
| Checked Checker | Job No. 24048.01 |

Sheet Contents
SCHEDULES

Sheet No.
**S6.01**

Plot Date Time: 1/21/2025 2:18:55 PM

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/24805 BETHGYM - MEP (AMC).rvt

# ABBREVIATIONS

| | | | |
|---|---|---|---|
| @ | AT | IN HG | INCHES MERCURY |
| & | AND | IN WC | INCHES WATER COLUMN |
| # | NUMBER | INSUL | INSULATION |
| % | PERCENT | IPS | INTERNATIONAL PIPE STANDARD |
| AD | ACCESS DOOR | K | THERMAL CONDUCTIVITY |
| AAP | AREA ALARM PANEL | KW | KILOWATT |
| ADA | AMERICANS WITH DISABILITIES ACT | KWH | KILOWATT HOUR |
| AFF | ABOVE FINISHED FLOOR | LAT | LEAVING AIR TEMPERATURE |
| AFG | ABOVE FINISHED GRADE | LB/HR | POUNDS PER HOUR |
| AHJ | AUTHORITY HAVING JURISDICTION | LBS | POUNDS |
| AHU | AIR-HANDLING UNIT | LF | LINEAR FEET |
| ALT | ALTERNATE | L | LENGTH |
| AMB | AMBIENT | LWT | LEAVING WATER TEMPERATURE |
| AMCA | AIR MOVEMENT AND CONTROL ASSOCIATION | LOC | LOCATION/LOCATED |
| ANSI | AMERICAN NATIONAL STANDARDS INSTITUTE | LP | LOW PRESSURE |
| APD | AIR PRESSURE DROP | LR | LONG RADIUS |
| APPROX | APPROXIMATE | MAN | MANUAL |
| AR | ACID RESISTANT | MAT | MIXED AIR TEMPERATURE |
| ARCH | ARCHITECTURAL | MAV | MANUAL AIR VENT |
| ASME | AMERICAN SOCIETY OF MECHANICAL ENGINEERS | MAX | MAXIMUM |
| ATM | ATMOSPHERE | MBH | THOUSAND BTU PER HOUR |
| AUTO | AUTOMATIC | MECH | MECHANICAL |
| AVG | AVERAGE | MFR | MANUFACTURER |
| AWG | AMERICAN WIRE GAUGE | MH | MANHOLE |
| BAS | BUILDING AUTOMATION SYSTEM | MIN | MINIMUM, MINUTE |
| BDD | BACKDRAFT DAMPER | MPH | MILES PER HOUR |
| BHP | BRAKE HORSEPOWER, BOILER HORSEPOWER | MTD | MOUNTED |
| BLDG | BUILDING | N/A | NOT APPLICABLE |
| BLW | BELOW | NC | NOISE CRITERIA, NORMALLY CLOSED |
| BOD | BOTTOM OF DUCT | NFPA | NATIONAL FIRE PROTECTION ASSOCIATION |
| BOP | BOTTOM OF PIPE | NIC | NOT IN CONTRACT |
| BTU | BRITISH THERMAL UNIT | NO | NORMALLY OPEN, NUMBER |
| BTUH | BTU PER HOUR | NTS | NOT TO SCALE |
| C | COMMON, CONDENSATE | OD | OUTSIDE DIAMETER |
| C-C | CENTER TO CENTER | OFOI | OWNER FURNISHED, OWNER INSTALLED |
| CAP | CAPACITY, END CAP | OSA | OUTSIDE AIR |
| CCW | COUNTER-CLOCKWISE | OZ | OUNCE |
| CF | COOLING FAN, CIRCULATING FAN, CUBIC FOOT | PD | PRESSURE DROP OR DIFFERENCE |
| CFM | CUBIC FEET PER MINUTE | PG | PROPYLENE GLYCOL |
| CI | CAST IRON | PL | PLATE |
| CL | CENTER LINE | PLBG | PLUMBING |
| CLG | CEILING | POC | POINT OF CONNECTION |
| CMPR | COMPRESSOR | PNL | PANEL |
| COEF | COEFFICIENT | PH | PHASE (ELECTRICAL) |
| CONC | CONCRETE | PPM | PARTS PER MILLION |
| COND | CONDENSER | PSI | POUNDS PER SQUARE INCH |
| CTR | CENTER | PSIA | POUNDS PER SQUARE INCH - ABSOLUTE |
| CU | COPPER, CONDENSING UNIT | PSID | POUNDS PER SQUARE INCH - DIFFERENTIAL |
| CU IN | CUBIC INCH | PSIG | POUNDS PER SQUARE INCH - GAUGE |
| CV | VALVE FLOW COEFFICIENT | PRESS | PRESSURE |
| CW | CLOCKWISE | PRI | PRIMARY |
| DB | DECIBEL | R-407C, | REFRIGERANT (407C,410A,ETC.) |
| DBT | DRY-BULB TEMPERATURE | R-410A | |
| DDC | DIRECT DIGITAL CONTROL | R/A | RETURN AIR |
| DEG OR ° | DEGREE | RAD | RADIANT OR RADIATION |
| DEG C | DEGREE CENTIGRADE | RCVR | RECEIVER |
| DEG F | DEGREE FAHRENHEIT | RECIRC | RECIRCULATE |
| DEMO | DEMOLITION | RED | REDUCER |
| DENS | DENSITY | REFRIG | REFRIGERATION |
| DGM | DIAGRAM | REV | REVOLUTIONS |
| DI | DUCTILE IRON | RF | RELIEF FAN OR RETURN FAN |
| DIA OR ⌀ | DIAMETER | RH | RELATIVE HUMIDITY |
| DIFF | DIFFERENCE OR DELTA | RM | ROOM |
| DIP | DUCTILE IRON PIPE | RPM | REVOLUTIONS PER MINUTE |
| DISS | DIAMETER-INDEX SAFETY SYSTEM | RPS | REVOLUTIONS PER SECOND |
| DN | DOWN | S/A | SUPPLY AIR |
| DO | DITTO | SAT | SATURATION |
| DTL | DETAIL | SCHD | SCHEDULE |
| DWDI | DOUBLE WIDTH DOUBLE INLET | SCFM | STANDARD CUBIC FEET PER MINUTE |
| DWG | DRAWING | SD | STORM DRAIN |
| (E) | EXISTING | SEC | SECONDARY |
| EA | EACH | SF | SQUARE FEET |
| E/A | EXHAUST AIR | SH | SENSIBLE HEAT |
| EAT | ENTERING AIR TEMPERATURE | SHG | SENSIBLE HEAT GAIN |
| EF | EXHAUST FAN | SHR | SENSIBLE HEAT RATIO |
| EFF | EFFICIENCY | SHT | SHEET |
| EG | ETHYLENE GLYCOL, EXHAUST GRILLE | SHWR | SHOWER |
| ELEC | ELECTRICAL | SP | STATIC PRESSURE |
| ELEV | ELEVATION | SPD | STATIC PRESSURE DROP |
| EMB | EMBEDMENT | SPEC | SPECIFICATION, SPECIFIED |
| ENT | ENTERING | SPKLR | SPRINKLER |
| EQIV FT | EQUIVALENT FEET | SR | SHORT RADIUS |
| ESP | EXTERNAL STATIC PRESSURE | SWSI | SINGLE WIDTH SINGLE INLET |
| EVAP | EVAPORATOR | SQ | SQUARE |
| EXP | EXPANSION | SS | STAINLESS STEEL, SANITARY SEWER |
| EWT | ENTERING WATER TEMPERATURE | STD | STANDARD |
| °F | FAHRENHEIT | SUCT | SUCTION |
| FA | FACE AREA | TA | TRANSFER AIR |
| F-F | FACE TO FACE | TEMP | TEMPERATURE, TEMPORARY |
| FD | FIRE DAMPER | THRU | THROUGH |
| FLEX | FLEXIBLE | TOD | TOP OF DUCT |
| FLR | FLOOR | TONS | TONS OF REFRIGERATION |
| FOB | FLAT ON BOTTOM | TOP | TOP OF PIPE |
| FOT | FLAT ON TOP | TYP | TYPICAL |
| FP | FREEZING POINT | UG | UNDERGROUND |
| FPM | FEET PER MINUTE | UON | UNLESS OTHERWISE NOTED |
| FPS | FEET PER SECOND | UPC | UNIFORM PLUMBING CODE |
| FSD | FIRE-SMOKE DAMPER | V | VOLTS OR VOLTAGE |
| FSDM | FIRE-SMOKE DAMPER, MODULATING | VAC | VACUUM |
| FT OR ' | FOOT OR FEET | VAC | VOLTS (ALTERNATING CURRENT) |
| FV | FACE VELOCITY | VAL | VALVE |
| GA | GAGE OR GAUGE | VAP PR | VAPOR PRESSURE |
| GAL | GALLONS | VAR | VARIABLE |
| GPD | GALLONS PER DAY | VAV | VARIABLE AIR VOLUME |
| GPH | GALLONS PER HOUR | VDC | VOLTS (DIRECT CURRENT) |
| GPM | GALLONS PER MINUTE | VEL | VELOCITY |
| GR | GRAINS | VERT | VERTICAL |
| GRD | GRILLES, REGISTERS, DIFFUSERS | VFD | VARIABLE FREQUENCY DRIVE |
| HD | HEAD | VOL | VOLUME |
| HDPE | HIGH DENSITY POLYETHYLENE | VP | VELOCITY PRESSURE |
| HG | HEAT GAIN | VSD | VARIABLE SPEED DRIVE |
| HT | HEIGHT | VTR | VENT THROUGH ROOF |
| HP | HORSEPOWER | W | WATT |
| HR | HOUR(S) | W/ | WITH |
| HVAC | HEATING, VENTILATING & AIR-CONDITIONING | W/O | WITHOUT |
| HZ | FREQUENCY | WB | WET BULB TEMPERATURE |
| IAW | IN ACCORDANCE WITH | WC | WATER COLUMN |
| ID | INSIDE DIAMETER | WH | WATT-HOUR |
| IE | INVERT ELEVATION | WP | WEATHER PROOF, WATER PROOF |
| IBC | INTERNATIONAL BUILDING CODE | WPD | WATER PRESSURE DROP |
| IFC | INTERNATIONAL FIRE CODE | WT | WEIGHT |
| IMC | INTERNATIONAL MECHANICAL CODE | YD | YARD |
| IN OR " | INCH OR INCHES | ZVB | ZONE VALVE BOX |

# GENERAL

SHEET NOTE CONVENTION:
REFERENCED SHEET NOTE
REFERENCED DEMOLITION NOTE
GENERAL SHEET NOTE
DETAIL REFERENCE
DETAIL DESIGNATION
SHEET WHERE DETAIL APPEARS
SECTION REFERENCE
SECTION DESIGNATION
SHEET WHERE SECTION APPEARS
POINT OF CONNECTION
PLUMBING FIXTURE NUMBER
EQUIPMENT TAG
EQUIPMENT DESIGNATION
EQUIPMENT NUMBER
AIR TERMINAL TAG
AIR TERMINAL DESIGNATION
CFM
BASEBOARD FINTUBE TAG
FINTUBE DESIGNATION
GPM
LINEAR FEET OF FINTUBE ELEMENT
AIR TERMINAL UNIT TAG
LINE CONVENTION
NEW OR REINSTALLED ITEM
ITEM TO BE DEMOLISHED
EXISTING ITEM TO REMAIN
EXISTING ITEM TO BE RELOCATED

# VENTILATION

DOUBLE LINE DUCTWORK
SINGLE LINE DUCTWORK
FLEX DUCTWORK
SLOT GRILLES/REGISTERS/DIFFUSERS
S/A GRILLES/REGISTERS/DIFFUSERS - SUPPLY AIR
R/A GRILLES/REGISTERS/DIFFUSERS - RETURN AIR
E/A GRILLES/REGISTERS/DIFFUSERS - EXHAUST AIR
AIR FLOW ARROW
AIR VOLUME DAMPER
FIRE DAMPER
SMOKE DAMPER
FIRE-SMOKE DAMPER
ACOUSTICAL DUCT LINING
DUCT INSULATION
DUCT: ROUND
DIAMETER AS SHOWN
DUCT: RECTANGULAR
FIRST FIGURE SIDE SHOWN
DUCT: FLAT OVAL
FIRST FIGURE SIDE SHOWN
MOTORIZED OPERATED DAMPER
OPPOSED BLADE DAMPER
PARALLEL BLADE DAMPER
BACK DRAFT DAMPER
DAMPER
DUCT TURNING UP OR TOWARD
DUCT TURNING DOWN OR AWAY

# MONITORING AND CONTROLS

THERMOSTAT, ZONE TEMPERATURE SENSOR
HUMIDISTAT, ZONE HUMIDITY SENSOR
CARBON DIOXIDE SENSOR
CARBON MONOXIDE SENSOR
CONTROL LEAD
CONTROL WIRING
CONTROL AIR/PNEUMATIC
PRESSURE GAUGE
CURRENT SENSOR
CURRENT TRANSMITTER
FLOW SWITCH
TEMPERATURE TRANSMITTER
DIFFERENTIAL PRESSURE SWITCH
DIFFERENTIAL PRESSURE INDICATOR
PRESSURE INDICATOR
TEMPERATURE INDICATOR
THERMOMETER

# GENERAL PIPING

BALL VALVE
GV GATE VALVE
GLOBE VALVE
BV BUTTERFLY VALVE
TDV TRIPLE DUTY VALVE
CV CHECK VALVE
BACKFLOW PREVENTER
PRESSURE REGULATING VALVE (PILOT OPERATED)
PRESSURE REGULATING VALVE (SELF REGULATING)
PLUG VALVE
SOV SOLENOID OPERATED VALVE
MOV 2 WAY MOTOR OPERATED VALVE
MOV 3 WAY MOTOR OPERATED VALVE
2 WAY PNEUMATIC OPERATED VALVE
3 WAY PNEUMATIC OPERATED VALVE
BALANCING VALVE
FCV AUTOMATIC FLOW CONTROL VALVE
SV SAFETY VALVE
VB VACUUM BREAK
AAV AIR VENT, AUTO WITH ISOLATION VALVE
MAV AIR VENT, MANUAL
PTTP PRESSURE & TEMP TEST PLUG
STRAINER W/ BLOWDOWN HOSE FITTING
EQUIPMENT DRAIN HOSE
EQUIPMENT DRAIN PLUG
REDUCER (CONCENTRIC)
REDUCER (ECCENTRIC)
FLOW ARROW
ANCHOR
PIPE GUIDE
PIPE SLEEVE
PIPE UNION
PIPE FLANGE
FLEXIBLE CONNECTION
METER
LINE BREAK
END CAP
PIPE UP / TEE UP
P-TRAP
PIPE DOWN (ELBOW)
PIPE DOWN (TEE)

# PLUMBING PIPING

CW COLD WATER
HW HOT WATER
HWC HOT WATER CIRCULATION
TW TEMPERED WATER
TWC TEMPERED WATER CIRCULATION
V PLUMBING VENT
TP TRAP PRIMER
W WASTE WATER
RL RAIN LEADER
ORL OVERFLOW RAIN LEADER
HB HOSE BIBB
WHA WATER HAMMER ARRESTER
PDI PLUMBING AND DRAINAGE INSTITUTE WATER HAMMER ARRESTER SIZE A, B, C, D, OR E
AUTOMATIC TRAP PRIMER VALVE
FCO, YCO FLOOR CLEANOUT, YARD CLEAN OUT
WCO WALL CLEANOUT
FD, FS FLOOR DRAIN, FLOOR SINK
RD, ORD ROOF DRAIN, OVERFLOW ROOF DRAIN

# HYDRONIC PIPING

HWS HEATING WATER SUPPLY
HWR HEATING WATER RETURN
GHS GLYCOL HEATING SUPPLY
GHR GLYCOL HEATING RETURN
FT BASEBOARD FINTUBE RADIATION
UH UNIT HEATER
CUH CABINET UNIT HEATER, HORIZONTAL OR VERTICAL

# MECHANICAL DRAWING INDEX


| | |
|---|---|
| M0.01 | LEGEND AND ABBREVIATIONS |
| M0.02 | MECHANICAL SCHEDULES |
| M0.03 | MECHANICAL SCHEDULES |
| M1.01 | OVERALL PLAN - MECHANICAL |
| M1.02 | EXISTING BUILDING - PARTIAL UNDERFLOOR PLAN - PLUMBING |
| M2.01 | ENLARGED PLANS - PLUMBING |
| M3.00 | UNDERFLOOR PLAN - PIPING |
| M3.01 | MAIN LEVEL FLOOR PLAN - PIPING |
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65% DESIGN DEVELOPMENT

(C) 24805

CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
|---|---|---|
| | | |

| | |
|---|---|
| Drawn by M. LANGBERG | Date 01-22-2025 |
| Checked M. LANGBERG | Job No. 24048.01 |

Sheet Contents
LEGEND AND ABBREVIATIONS

Sheet No.
**M0.01**

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Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/24805 BETHGYM - MEP (AMC).rvt

## MISCELLANEOUS EQUIPMENT SCHEDULE

| SYMBOL | LOCATION | MOTOR (HP,V,PH) | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|
| SECTION 22 1000 - DOMESTIC WATER PIPING AND SPECIALTIES | | | | |
| WH-3<br>WH-4 | MENS TOILET<br>WOMENS TOILET | 14KW,208,1<br>(67A) | 25 | POINT OF USE ELECTRIC TANKLESS WATER HEATER, 1.6 GPM AT<br>70 F TEMP RISE.<br>AO SMITH C2VA-140X. |
| SECTION 23 1113 - FUEL OIL PIPING AND SPECIALTIES | | | | |
| DT-2 | BOILER<br>ROOM | -, 120,1<br>(TRANSFER<br>PUMP) | 400 | FUEL OIL DAYTANK:<br>U.L. LISTED, 60 GALLON CAPACITY, SECONDARY CONTAINMENT, 2<br>GPM FUEL TRANSFER PUMP SET, PACKAGED TANK LEVEL CONTROL<br>SYSTEM, HAND TRANSFER PUMP, LEAK SENSOR, BAS ALARM<br>MONITORING CONTACT.<br>SIMPLEX STS-60. |
| SECTION 23 2113 - HYDRONIC PIPING AND SPECIALTIES | | | | |
| GM-3 | BOILER<br>ROOM | 50W,115,1 | 160 | GLYCOL HEATING MAKE-UP PACKAGE: COMPLETE WITH PUMP, LOW LEVEL<br>CUT-OFF AND ALARM ARRANGEMENT, PRIMING VALVE, SHUTOFF VALVE,<br>STRAINER, 17 GALLON STORAGE TANK WITH PRESSURE CONTROL, REDUCING<br>VALVE AND GAUGE, LOW LEVEL ALARM WITH DRY CONTACTS, 1.0 GPM<br>MAKE-UP CAPACITY AT FREE FLOW.<br>AXIOM MODEL DMF300. |
| AS-2 | BOILER<br>ROOM | - | 190 | HYDRONIC HEATING COMBINATION AIR AND DIRT SEPARATOR: 3 INCH<br>FLANGED CONNECTIONS, MAX WORKING PRESSURE OF 150 PSIG, MAX<br>WORKING TEMPERATURE OF 270 DEG F, COALESCING MEDIA.<br>SPIROTHERM VDT300FA. |

## PLUMBING FIXTURE CONNECTION SCHEDULE

| SYMBOL | FIXTURE | WASTE (INCH) | VENT (INCH) | HW (INCH) | CW (INCH) | POWER | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|
| WC-1 | WATER CLOSET | 4 | 2 | - | 1 | BATTERY | WALL MOUNTED, TOP SPUD, ELONGATED BOWL, SENSOR OPERATED FLUSH VALVE. |
| WC-1H | WATER CLOSET | 4 | 2 | - | 1 | BATTERY | WALL MOUNTED, TOP SPUD, ELONGATED BOWL, SENSOR OPERATED FLUSH VALVE, ADA COMPLIANT. |
| U-1H | URINAL | 2 | 1-1/2 | - | 3/4 | BATTERY | WALL MOUNTED, SENSOR OPERATED FLUSH VALVE, ADA COMPLIANT. |
| L-1H | LAVATORY | 1-1/2 | 1-1/2 | 1/2 | 1/2 | BATTERY | COUNTER MOUNTED, SENSOR OPERATED FAUCET, ADA COMPLIANT. |
| DF-1H | DRINKING FOUNTAIN / BOTTLE FILLER | 1-1/2 | 1-1/2 | - | 1/2 | - | WALL MOUNTED, DUAL HEIGHT, REFRIGERATED, ADA COMPLIANT. |
| HB-1 | HOSE BIBB | - | - | - | 3/4 | - | ROUGH CHROME, WITH VACUUM BREAKER, WHEEL HANDLE OPERATOR. |
| FD-1 | FLOOR DRAIN | 2 | 1-1/2 | - | - | - | CAST IRON BODY WITH ADJUSTABLE POLISHED NICKEL BRONZE TOP. |
| FD-2 | FLOOR DRAIN | 3 | 2 | - | - | - | MEDIUM DUTY, CAST IRON BODY WITH ADJUSTABLE POLISHED NICKEL BRONZE TOP. |
| TP-1 | TRAP PRIMER | - | - | - | 1/2 | - | FLOW ACTIVATED PRIMER VALVE WITH VACUUM BREAKER PORTS AND INTERNAL BACKFLOW PROTECTION. |
| TP-2 | ELECTRONIC TRAP PRIMER | - | - | - | 1/2 | 115V/1PH 6.3 W | ELECTRONIC TRAP PRIMER WITH RECESSED CABINET, SOLENOID VALVE WITH DISTRIBUTION UNIT. |

## TERMINAL HEATING UNIT SCHEDULE

| SYMBOL | LOCATION | OUTPUT (MBH) (1) | FLUID | FLOW (GPM) | MAX WPD (FEET) | FLUID TEMP IN/OUT (DEGREES F) | MOTOR (HP,V,PH) | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|---|
| UH-7<br>UH-8 | FAN ROOM<br>208 | 11.5 | WATER | 1.0 | 1.0 | 190/160 | 1/25, 115, 1 | 20 | HORIZONTAL UNIT HEATER:<br>370 CFM, AIR DEFLECTORS,<br>SAFETY GUARD.<br>MODINE HC-24. |
| UH-9 | STORAGE<br>201 | 11.0 | WATER | 1.0 | 1.0 | 190/160 | 1/25, 115, 1 | 20 | HORIZONTAL UNIT HEATER:<br>370 CFM, AIR DEFLECTORS,<br>SAFETY GUARD.<br>MODINE HC-24. |
| UH-10 | STORAGE<br>106 | 11.0 | WATER | 1.0 | 1.0 | 190/160 | 1/25, 115, 1 | 20 | HORIZONTAL UNIT HEATER:<br>370 CFM, AIR DEFLECTORS,<br>SAFETY GUARD.<br>MODINE HC-24. |
| UH-11 | BOILER ROOM<br>203 | 48.0 | WATER | 4.0 | 1.0 | 190/160 | 1/8, 115, 1 | 52 | HORIZONTAL UNIT HEATER:<br>1,340 CFM, AIR DEFLECTORS,<br>SAFETY GUARD.<br>MODINE HC-86. |
| UH-12<br>UH-13<br>UH-14<br>UH-15 | GYMNASIUM<br>101 | 70.0 | WATER | 7.0 | 0.5 | 190/160 | 1/4,115,1 | 118 | VERTICAL UNIT HEATER:<br>2340 CFM FAN MOTOR, FACTORY<br>PAINTED "SNOW WHITE" CABINET.<br>SIGMA 145V. |
| FT-1 | SEE PLANS | 820.0<br>BTU/LF | WATER | - | - | 190/160 | - | - | SINGLE TIER BARE FINNED TUBE:<br>3/4" COPPER TUBE, 3-1/4" SQUARE<br>ALUMINUM FINS, 50 FINS/FOOT.<br>STERLING BARE C3/4-35. |

NOTES:
(1) SCHEDULED MBH OUTPUT IS REQUIRED HEAT LOAD FOR ROOM CONDITIONING.

## BOILER SCHEDULE

| SYMBOL | LOCATION | MOTOR (HP,V,PH) | INPUT (MBH) | OUTPUT (MBH) | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|
| BLR-3<br>BLR-4 | BOILER ROOM<br>203 | -,120,1 | 4.2<br>(GPH OIL) | 483 | 2,000 | OIL FIRED CAST IRON SECTIONAL WATER<br>BOILER WITH POWER BURNER:<br>30 PSIG WORKING PRESSURE, 50 PSIG ASME<br>SAFETY RELIEF VALVE, GAUGES AND<br>PACKAGED CONTROLS, REAR FLUE.<br>BURNHAM V904AW WITH<br>POWERFLAME C1-OS BURNER. |

## EXPANSION TANK SCHEDULE

| SYMBOL | LOCATION | ACCEPTANCE VOL (GAL) | TANK VOL (GAL) | PRE-CHARGE (PSIG) | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|
| ET-5 | BOILER ROOM<br>203 | 34 | 68 | 12 | 800 | HYDRONIC HEATING SYSTEM EXPANSION:<br>ASME STAMPED, STEEL SHELL WITH HEAVY DUTY<br>BUTYL DIAPHRAGM, 125 PSIG MAX WORKING<br>PRESSURE, 240 F MAX OPERATING TEMP.<br>AMTROL EXTROL AX-120V. |
| ET-6 | BOILER ROOM<br>203 | 11.3 | 16.5 | 12 | 190 | SECONDARY GLYCOL SYSTEM EXPANSION:<br>ASME STAMPED, STEEL SHELL WITH HEAVY DUTY<br>BUTYL DIAPHRAGM, 125 PSIG MAX WORKING<br>PRESSURE, 240 F MAX OPERATING TEMP.<br>AMTROL EXTROL AX-20V-DD. |

## PUMP SCHEDULE

| SYMBOL | LOCATION | SERVICE | FLUID | TEMP. (DEG F) | GPM | HEAD (FEET) | MOTOR (HP,V,PH) | REMARKS<br>BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|
| SECTION 23 2123 - HYDRONIC PUMPS | | | | | | | | |
| PMP-15<br>PMP-16 | BLR-1<br>BLR-2 | BOILER<br>HEATING<br>CIRC | WATER | 190 | 35 | 14 | 1/4,115,1 | INLINE CENTRIFUGAL PUMP:<br>CAST IRON CONSTRUCTION,<br>1,800 RPM, 1" FLANGED CONNECTIONS.<br>ARMSTRONG 1050 SERIES SIZE 1B |
| PMP-17<br>PMP-18 | BOILER<br>ROOM | BUILDING<br>HEATING<br>CIRC | WATER | 190 | 125 | 50 | 3,460,3<br>(VSD) | INLINE CENTRIFUGAL PUMP:<br>CAST IRON CONSTRUCTION,<br>1,800 RPM, 2" FLANGED CONNECTIONS.<br>ARMSTRONG 4300 SERIES 2X2X8 |
| PMP-19<br>PMP-20 | BOILER<br>ROOM | GLYCOL<br>HEATING<br>CIRC | 50% PG | 180 | 69 | 50 | 2 460,3<br>(VSD) | INLINE CENTRIFUGAL PUMP:<br>CAST IRON CONSTRUCTION,<br>1,800 RPM, 2" FLANGED CONNECTIONS.<br>ARMSTRONG 4300 SERIES 2X2X8 |
| ZP-3<br>ZP-4 | BOILER<br>ROOM | RADIANT<br>SLAB<br>CIRC | WATER | 110 | 4.5 | 25 | 220W<br>115,1 | INLINE CARTRIDGE CIRCULATOR PUMP:<br>CAST IRON CONSTRUCTION, FLANGED<br>CONNECTIONS, 3 SPEEDS.<br>ARMSTRONG ASTRO 280CI |
| FTP-3 | FST-2 | FUEL OIL<br>TRANSFER<br>PUMP | FUEL OIL | -40<br>TO<br>70 | 2 | - | 1/3,115,1 | PACKAGED PUMP SET,<br>WEATHER PROOF HEATED<br>ENCLOSURE.<br>SIMPLEX MODEL SPS25. |

## HEAT EXCHANGER SCHEDULE

| SYMBOL | LOCATION | HOT SIDE FLUID | GPM | TEMP IN (DEG F) | TEMP OUT (DEG F) | MAX WPD (PSI) | COLD SIDE FLUID | GPM | TEMP IN (DEG F) | TEMP OUT (DEG F) | MAX WPD (PSI) | MIN OUTPUT (MBH) | WEIGHT (LBS) | REMARKS BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HX-6 | BOILER ROOM<br>203 | WATER | 70 | 190 | 160 | 5.00 | 50% PG | 69 | 150 | 180 | 5.00 | 933.2 | 140 | BRAZED PLATE:<br>80 PLATES.<br>TACO TB120TX80. |

## EXTERIOR FUEL OIL TANK SCHEDULE

| SYMBOL | LOCATION | NOMINAL SIZE (GALLONS) | DIA (INCH) | LENGTH (FEET) | FOS CONN | | FOR CONN | | NORMAL VENT INNER (INCH) | NORMAL VENT OUTER (INCH) | EMER VENT INNER (INCH) | EMER VENT OUTER (INCH) | FILL SIZE (INCH) | GAGE CONN (INCH) | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | QTY | SIZE (INCH) | QTY | SIZE (INCH) | | | | | | | | |
| FST-2 | EXTERIOR | 3,000 | 76 | 14 | 1 | 3/4 | 1 | 1 | 2 | - | 6 | 6 | 4 | 2 | 29,000 | ABOVE GROUND FUEL OIL STORAGE TANK:<br>UL 142 LABELED, TYPE 1 DOUBLE-WALL<br>STEEL CONSTRUCTION, SKID-MOUNT BASE<br>WITH TOW BAR, TOP CONNECTIONS FOR<br>FILL, GAUGES, VENT, EMERGENCY VENT,<br>ACCESS LADDER.<br>ANCHORAGE TANK & WELDING AT3MULAG. |

## RADIANT FLOOR HEATING ZONE SCHEDULE

| SYMBOL | AREA SERVED | SERVICE | AREA (SF) | MBH | NO. OF CIRCUITS | GPM | HEAD LOSS (FEET) | FLUID TEMP SUP / RTN (DEGREES F) | FLUID | TUBE DIA (INCH) | TUBE SPACING (INCH) | CIRCUIT LENGTH (FEET) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RHZ-5 | MENS TOILET 02 | RADIANT FLOOR HEATING | 317 | 8.0 | 2 | 1.0 | 1.0 | 110/90 | WATER | 5/8 | 9 | 250 |
| RHZ-6 | HALLWAY 03 | RADIANT FLOOR HEATING | 411 | 10.0 | 2 | 1.5 | 2.0 | 110/90 | WATER | 5/8 | 9 | 300 |
| RHZ-7 | WOMENS TOILET 04 | RADIANT FLOOR HEATING | 310 | 8.0 | 2 | 1.0 | 1.0 | 110/90 | WATER | 5/8 | 9 | 250 |
| RHZ-8 | TELEHEALTH 105 | RADIANT FLOOR HEATING | 250 | 6.3 | 2 | 1.0 | 1.0 | 110/90 | WATER | 5/8 | 9 | 200 |

NOTES:
1. CIRCUIT LENGTHS INCLUDE 10 FOOT LEADER LENGTHS.
2. INSTALL TUBES EMBEDDED IN CONCRETE. ROUTE TUBING BELOW CONCRETE AS RECOMMENDED BY THE MANUFACTURER AT EXPANSION JOINTS, CONTROL JOINTS, AND CONSTRUCTION JOINTS.
3. MBH VALUES SHOWN INDICATE HEAT NEEDED TO THE SPACE FOR ROOM CONDITIONING.

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65% DESIGN DEVELOPMENT

(C) 24805

CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
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| Drawn by<br>M. LANGBERG | Date<br>01-22-2025 |
| Checked<br>M. LANGBERG | Job No.<br>24048.01 |

Sheet Contents
MECHANICAL SCHEDULES

Sheet No.
**M0.02**

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## AIR HANDLING UNIT SCHEDULE

| SYMBOL | LOCATION | FAN SERVICE | SCFM | EXT / INT SP (IN WC) | FAN SIZE (INCH) | FAN TYPE | FAN RPM | FAN EFF & BHP | MOTOR (HP,V,PH) | COIL NO. | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AHU-3 | FAN ROOM (SERVES SUPPORT SPACES) | S/A | 2,500 | 0.50/2.56 | 17.7 | PLENUM | 1,900 | 61% | 5,208,3<br>13.9 FLA<br>17.4 MCA<br>30A MOP | PHC-3<br>HC-3 | 2100 | MODULAR HEAT RECOVERY AIR HANDLING UNIT:<br>CONSTANT VOLUME, 2" SUMMER MERV-8 PRE-FILTER, PRE-HEAT COIL, 2" WINTER MERV-8 PRE-FILTER, 4" MERV-13 FINAL FILTER, AIR-TO-AIR HEAT EXCHANGER, BYPASS DAMPERS, SUPPLY FAN, MERV-8 EXHAUST AIR FILTER, EXHAUST FAN, OUTSIDE AIR AND EXHAUST AIR CONTROL DAMPERS, DRAIN PANS, AND MOISTURE ELIMINATOR. SCCR = 6,000 AMPS.<br>CROSS FLOW HEAT EXCHANGER: 104.7 MBH HEAT RECOVERY, MAX 1" AIR PRESSURE DROP EACH SIDE, S/A = 20F TO 58.8 F, R/A SIDE IS 72F TO 36.3F.<br>VTS AVS030-R-EFHFPHVE/AVS030-L-EFVPDEE_cd. |
| | | E/A | 2,300 | 0.50/1.53 | 17.7 | PLENUM | 1,611 | 62% | 3,208,3<br>9.0 FLA<br>11.3 MCA<br>20A MOP | | | |
| AHU-4 | FAN ROOM (SERVES GYM) | S/A | 14,000 | 0.60/2.12 | 200-9 | AF | 2,049 | 60%<br>5.74 | 7.5,208,3<br>(2 FANS)<br>2 VSD'S | HC-4 | 7000 | CUSTOM AIR HANDLING UNIT: VARIABLE AIR VOLUME, DRAW THROUGH ARRANGEMENT, MIXING BOX WITH FACTORY INSTALLED RETURN DAMPER ON END AND OUTSIDE AIR DAMPER ON TOP OF MIXING BOX, MERV 8 2" PRE-FILTER, MERV 13 4" FINAL FILTER, HEATING COIL, WITH DRAIN PAN, ACCESS SECTIONS, DIRECT DRIVE SUPPLY FANS, DISCHARGE PLENUM.<br>YORK XTI-84X72. |

## INDOOR AIR QUALITY DOCUMENTATION

THE VENTILATION SYSTEMS FOR THIS FACILITY WERE DESIGNED IN ACCORDANCE WITH ASHRAE STANDARD 62.1-2019, BASED ON THE FOLLOWING ASSUMPTIONS:

| | |
|---|---|
| 50 | NORMAL BUILDING POPULATION |
| 2,700 | AHU-4 MINIMUM OUTSIDE AIR CFM FOR INDOOR AIR QUALITY AND BUILDING PRESSURIZATION |
| -26 | OUTSIDE WINTER DESIGN TEMPERATURE (DEGREES F) |

ASSUMPTION: OUTSIDE AIR MEETS NATIONAL PRIMARY AMBIENT AIR QUALITY STANDARDS SET BY THE U.S. EPA.
ASSUMPTION: SOURCES OF IAQ CONTAMINATION ARE LIMITED TO NORMAL BUILDING FURNISHINGS, MATERIALS AND SURFACE COATINGS, AND HUMAN BIO-EFFLUENTS ASSOCIATED WITH ORDINARY HUMAN ACTIVITIES.

## HEATING COIL SCHEDULE

| SYMBOL | LOCATION | MBH | SCFM | AIR TEMP (IN/OUT) | SIZE WIDTH X HT (INCHES) | MAX VEL (FPM) | MAX APD (INCH WC) | FLUID | GPM | FLUID TEMP IN/OUT (DEGREES F) | MAX WPD (FEET) | REMARKS BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PHC-3 | AHU-3 | 167.2 | 2,500 | -42/20 | 41.3 X 22.5 | 350 | 0.05 | 50% PG | 12.0 | 180/150 | 8.0 | PREHEAT COIL:<br>1 ROW COIL, 10 FINS/INCH.<br>BY AHU MANUFACTURER. |
| HC-3 | AHU-3 | 43.7 | 2,500 | 59/75 | 41.3 X 22.5 | 400 | 0.06 | 50% PG | 3.1 | 180/150 | 1.0 | HEATING COIL:<br>1 ROW COIL, 10 FINS/INCH.<br>BY AHU MANUFACTURER. |
| HC-4 | AHU-4 | 707.0 | 14,000 | 45/91.6 | 59 X 72.5 | 480 | 0.17 | 50% PG | 52.0 | 180/150 | 3.0 | HEATING COIL:<br>2 ROW COIL, 8 FINS/INCH.<br>BY AHU MANUFACTURER. |
| RHC-13 | WALKWAY 03 | 14.7 | 800 | 65/82 | 15 X 15 | 520 | 0.05 | WATER | 1.0 | 190/160 | 2.00 | DUCT HEATING COIL:<br>1 ROW COIL, 6 FINS/INCH.<br>PRECISION COILS HW12. |

## FAN SCHEDULE

| SYMBOL | LOCATION | USE | SCFM | SP (INCH WC) | FAN RPM | MOTOR (HP,V,PH) | WEIGHT (LBS) | REMARKS BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|
| RF-2 | FAN ROOM | RELIEF AIR | 5,000<br>(1,200 MIN.) | 0.5 | 1610 | 1-1/2,208,3 | 275 | BELT DRIVE MIXED FLOW FAN: SCREENED INLET, SUPPORT FROM FLOOR. GREENHECK QEI-16-I-15. |
| RF-3 | FAN ROOM | RELIEF AIR | 14,000<br>(2,000 MIN.) | 0.5 | 1175 | 5,208,3 | 600 | BELT DRIVE MIXED FLOW FAN: SCREENED INLET, SUPPORT FROM FLOOR. GREENHECK QEI-27-I-50. |
| CF-1 | BOILER ROOM | S/A | 1,000 | 0.75 | 1112 | 1/3,120,1 | 150 | BELT DRIVE CABINET FAN: TOP HORIZONTAL RECTANGULAR DISCHARGE. GREENHECK BCF-108-3. |

## LOUVER/HOOD SCHEDULE

| SYMBOL | UNIT AND USAGE | SCFM | SIZE WIDTH X HT (INCHES) | MIN FREE AREA (SF) | MAX FREE AREA VEL (FPM) | MAX APD (IN WC) | WEIGHT (LBS) | REMARKS, BASIS OF DESIGN |
|---|---|---|---|---|---|---|---|---|
| HD-6 | AHU-3 OUTSIDE AIR | 2,500 | 18 X 36 THROAT | 4.5 | 560 | 0.04 | 85 | GRAVITY INTAKE HOOD: LOW PROFILE, HEAVY GAUGE GALVANIZED STEEL, WITH BIRDSCREEN AND BASE. GREENHECK FABRAHOOD FGI. |
| HD-7 | AHU-4 OUTSIDE AIR | 14,000 | 48 X 84 THROAT | 28.0 | 500 | 0.04 | 420 | GRAVITY INTAKE HOOD: SAME AS HD-6 EXCEPT SIZE. GREENHECK FABRAHOOD FGI. |
| LV-1 | AHU-3 EXHAUST AIR | 2,300 | 36W X 36H | 4.55 | 510 | 0.05 | 40 | LOUVER: 6" THICK EXTRUDED ALUMINUM, 37.5 DEGREE DRAINABLE BLADES WITH BIRD SCREEN, AMCA RATED FOR WATER AND AIR, VERTICAL MULLIONS AT 36" CENTERS. BLANK OFF UNUSED PORTIONS OF LOUVERS. RUSKIN EVH-501. |
| LV-2 | GYM RELIEF AIR | 14,000 | 96W X 60H | 22.75 | 620 | 0.07 | 230 | LOUVER: SAME AS LV-1 EXCEPT SIZE. RUSKIN EVH-501. |
| LV-3 | CF-1 OUTSIDE AIR | 1,000 | 30W X 24H | 2.25 | 450 | 0.04 | 40 | LOUVER: SAME AS LV-1 EXCEPT SIZE. RUSKIN EVH-501. |

## AIR INLET/OUTLET SCHEDULE

| SYMBOL | SCFM RANGE | MAX NC | MAX APD (IN WC) | ACTIVE FACE SIZE (INCH) | DUCT SIZE (INCH) | BASIS OF DESIGN | REMARKS |
|---|---|---|---|---|---|---|---|
| SA | 100 | 10 | 0.02 | 24X24 MODULE | 6 DIA IN 6X6 NECK | TITUS MCD-AA | CEILING SUPPLY DIFFUSER: ALUMINUM, MODULAR CORE, ADJUSTABLE PATTERN, COORDINATE BORDER TYPE WITH CEILING SYSTEM. |
| SB | 400 | 14 | 0.04 | 24X24 MODULE | 12 DIA IN 12X12 NECK | TITUS MCD-AA | SAME AS SA, EXCEPT SIZE. |
| SC | 200 | - | 0.04 | 10X10 | 10X10 | TITUS 300RL | WALL SUPPLY GRILLE: STEEL, ADJUSTABLE DOUBLE DEFLECTION BLADES PARALLEL TO LONG DIMENSION, 3/4" BLADE SPACING, SURFACE MOUNT BORDER. |
| SD | 500 | 12 | 0.04 | 22X10 | 22X10 | TITUS 300RL | SAME AS SC, EXCEPT SIZE. |
| RA | 3,500 | 17 | 0.05 | 36X32 | 36X32 | TITUS 350ZRL | DUCT-MOUNTED RETURN GRILLE: STEEL, 0 DEGREE FIXED DEFLECTION, BLADES PARALLEL TO LONG DIMENSION, 3/4" BLADE SPACING, SURFACE MOUNT BORDER. |
| SE | 900 | 26 | .05 | 32 | 16 | TITUS TMRA-AA | ROUND ALUMINUM CEILING DIFFUSER: DUCT MOUNTED, 4 RING, VERTICAL TO HORIZONTAL DISCHARGE PATTERN VIA TYPE 3 ADJUSTMENT. PROVIDE WITH AG75 BALANCE DAMPER. |
| EA | 500 | - | 0.04 | 14X14 | 14 DIA IN 14X14 NECK | TITUS 50F | CEILING EXHAUST GRILLE: ALL ALUMINUM CONSTRUCTION, 1/2 INCH EGG CRATE GRID. COORDINATE BORDER TYPE WITH CEILING SYSTEM. |
| EB | 400 | 11 | 0.05 | 12X12 | 12X12 | TITUS 350RL | DUCT-MOUNTED RETURN GRILLE: STEEL, 35 DEGREE FIXED DEFLECTION, BLADES PARALLEL TO LONG DIMENSION, 3/4" BLADE SPACING, SURFACE MOUNT BORDER. |

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BETHEL, ALASKA

Revisions

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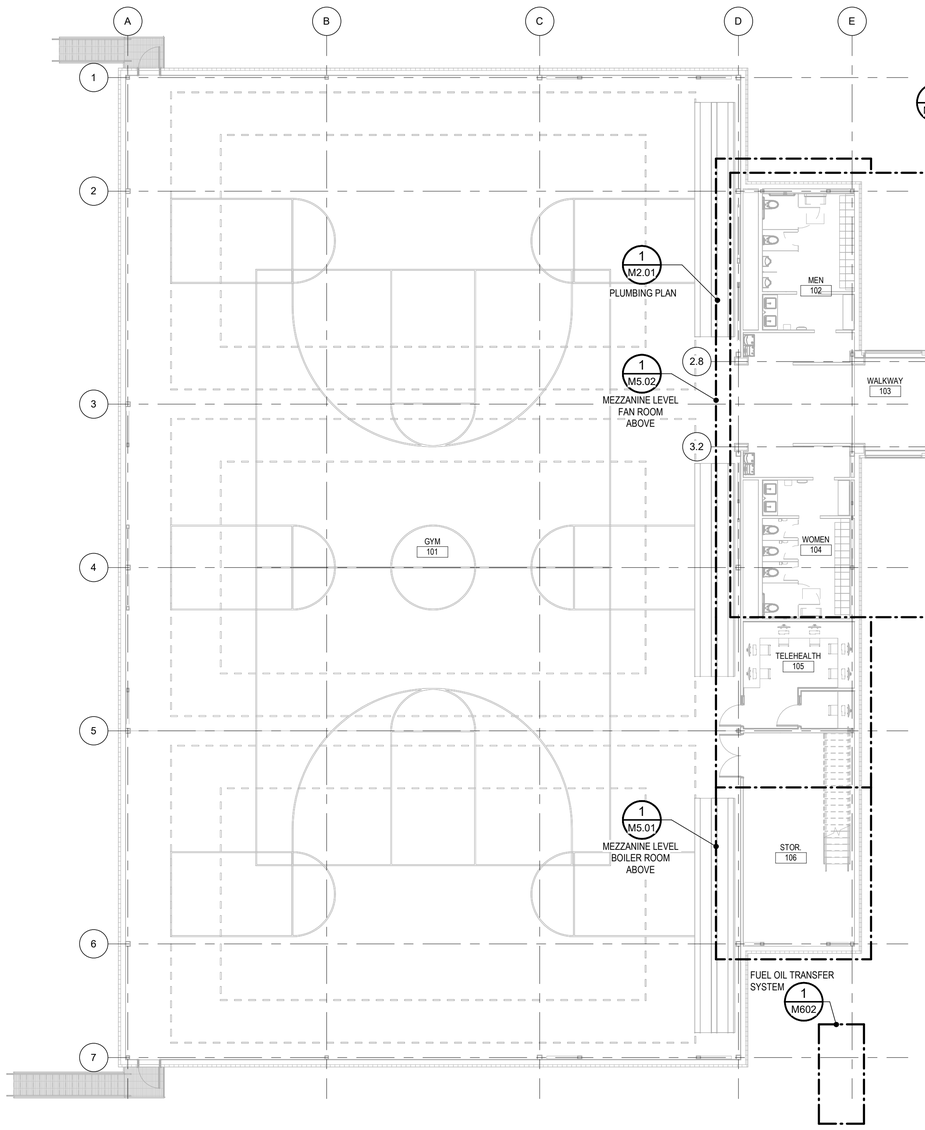
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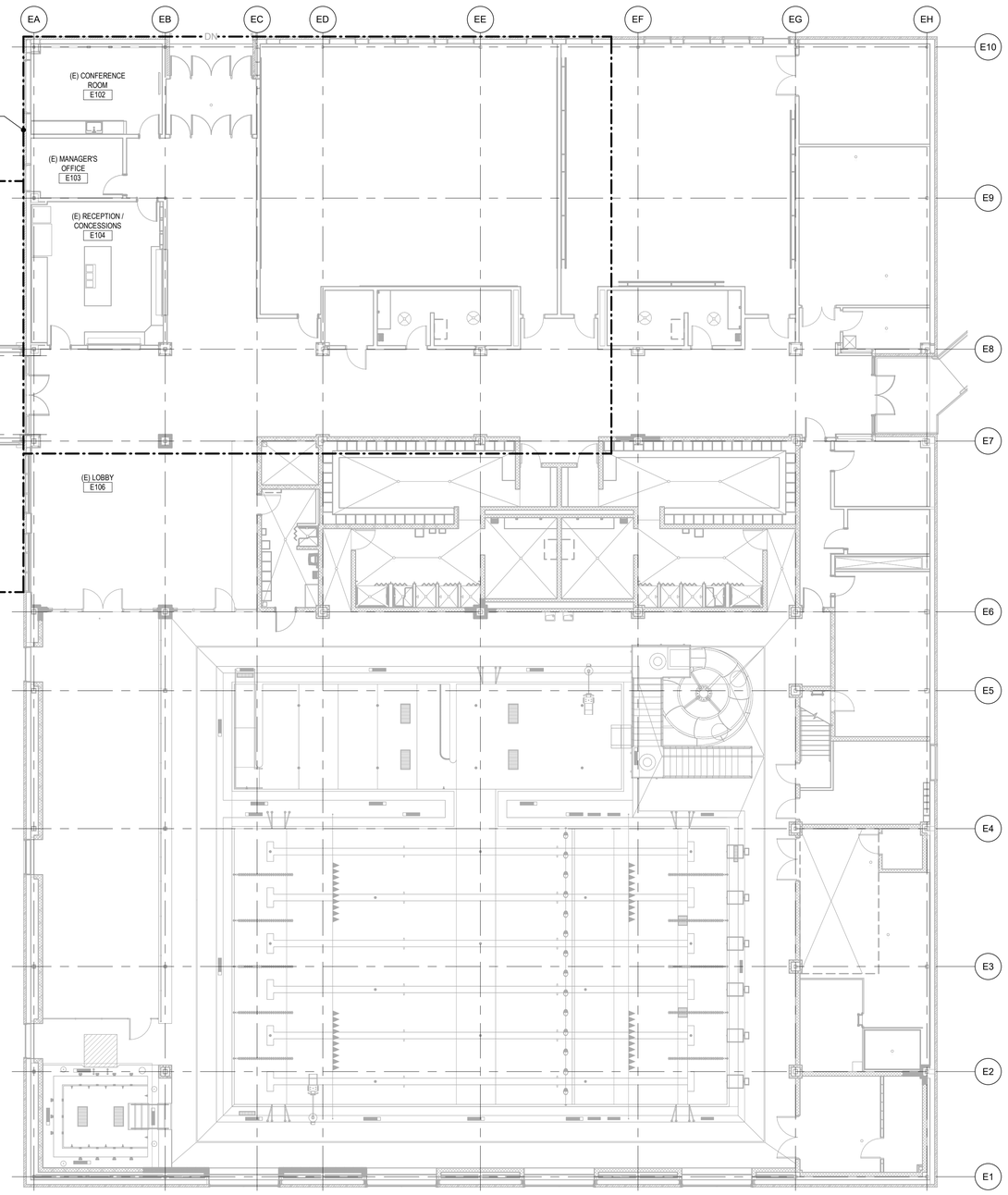
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MECHANICAL SCHEDULES

Sheet No.
**M0.03**

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**1 / M1.01 OVERALL MAIN LEVEL FLOOR PLAN - MECHANICAL**
SCALE: 3/32" = 1'-0"

0 4' 8' 16' 24'

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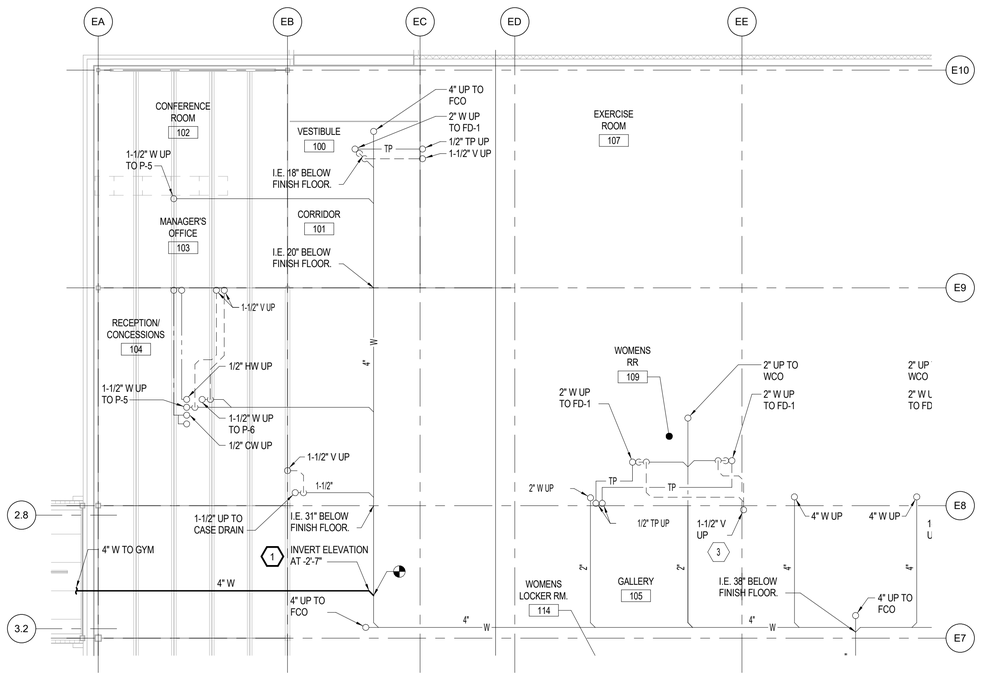
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| Checked<br>M. LANGBERG | Job No.<br>24048.01 |

Sheet Contents
OVERALL PLAN - MECHANICAL

Sheet No.
**M1.01**

Plot Date Time: 1/22/2025 8:39:02 AM

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## 1 EXISTING BUILDING UNDERFLOOR PLAN - PLUMBING
M1.02 SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

## GENERAL NOTES
1. SLOPE 4" WASTE PIPE AT 1/8" PER FOOT.

## SHEET NOTES
1. FIELD VERIFY EXISTING PIPE ROUTING AND ELEVATIONS.

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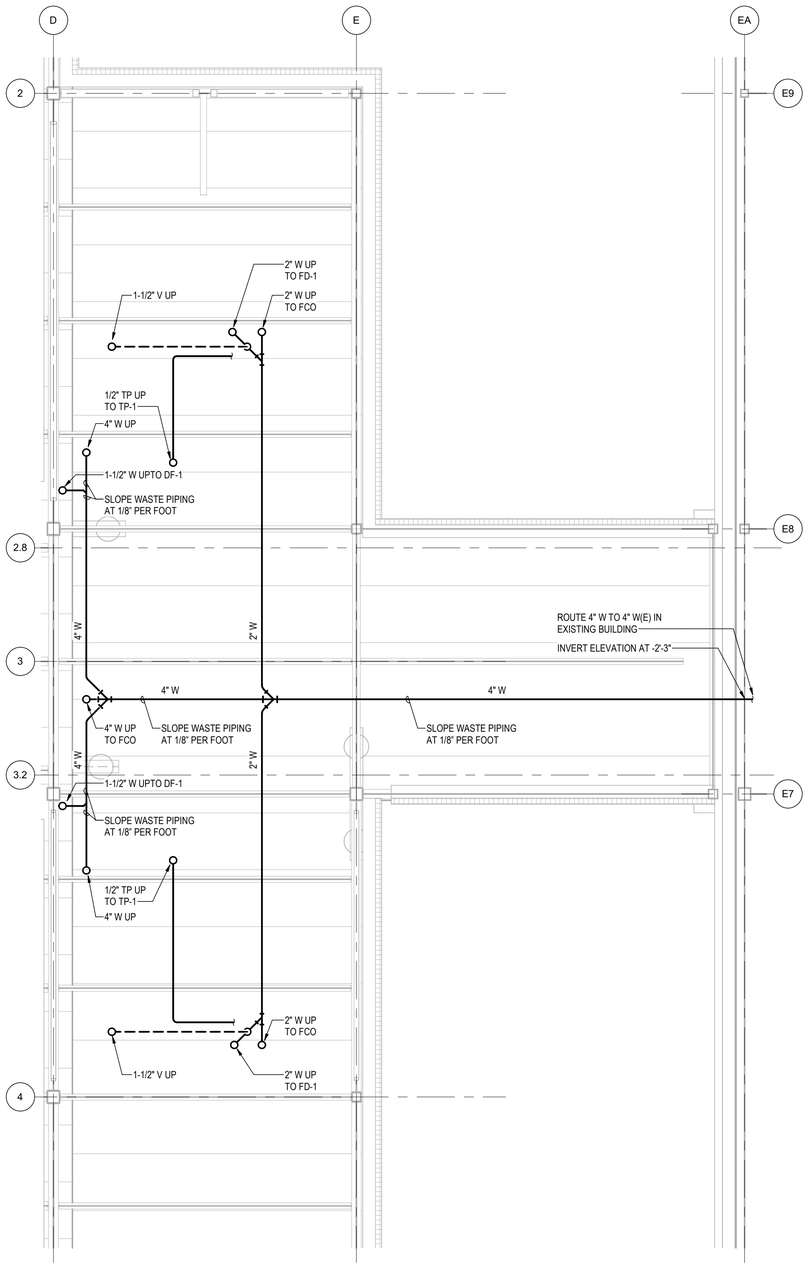
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| Checked M. LANGBERG | Job No. 24048.01 |

Sheet Contents
EXISTING BUILDING - PARTIAL UNDERFLOOR PLAN - PLUMBING

Sheet No.
**M1.02**

Plot Date Time: 1/22/2025 8:39:02 AM

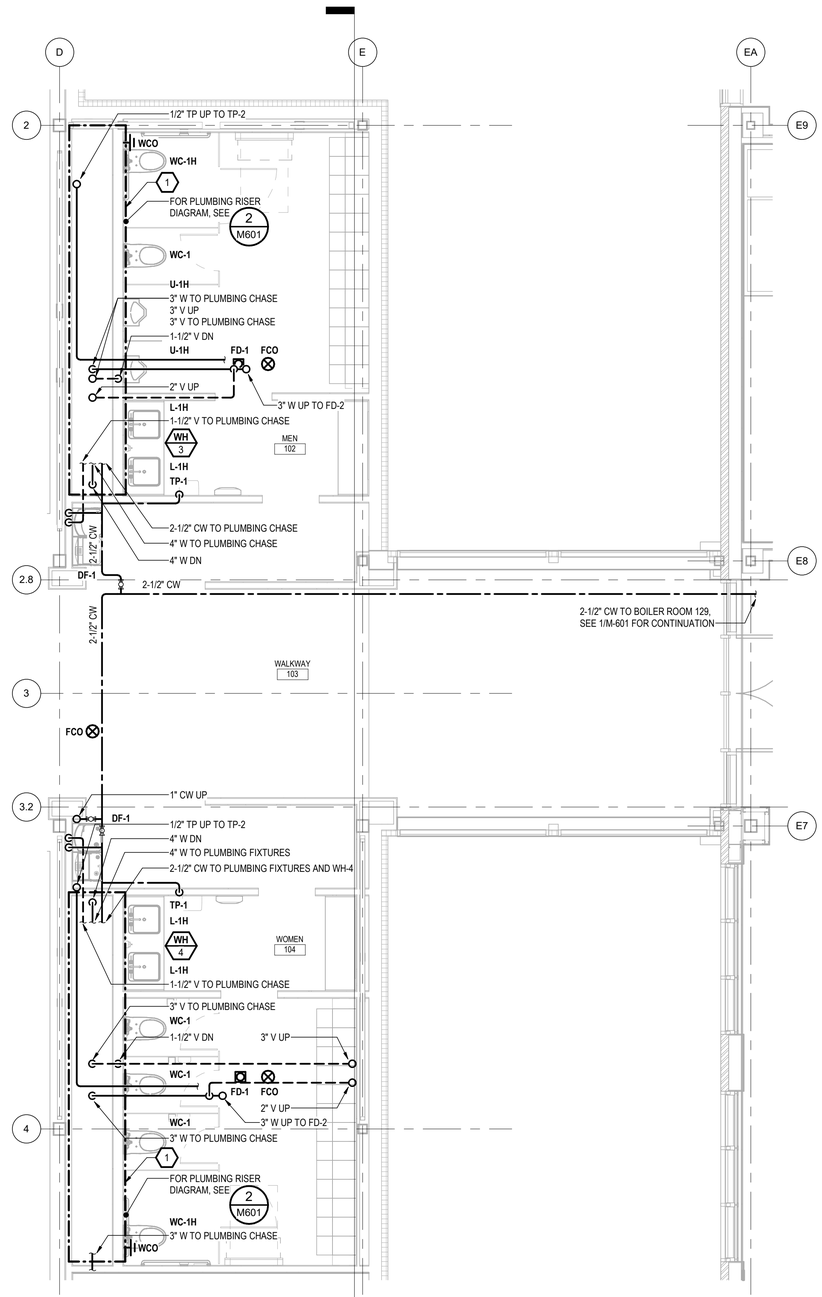
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## 1 ENLARGED UNDERFLOOR PLAN - PLUMBING

M2.01 SCALE: 1/4" = 1'-0"

0 4' 8' 16' 24'




## 2 ENLARGED PLAN - PLUMBING

M2.01 SCALE: 1/4" = 1'-0"

A M5.02

0 4' 8' 16' 24'

## GENERAL NOTES

1. SLOPE WASTE PIPING AT 1/4" PER FOOT UNLESS OTHERWISE NOTED.
2. INVERT ELEVATIONS SHOWN ARE BASED ON 0'-0" LEVEL 1 FINISHED FLOOR ELEVATION.
3. MINIMUM PLUMBING PIPE SIZE SERVING MULTIPLE FIXTURES IS 3/4". REFER TO PLUMBING FIXTURE CONNECTION SCHEDULE FOR INDIVIDUAL FIXTURE PIPE SIZES.
4. PROVIDE ACCESS DOORS WHERE EQUIPMENT, VALVES, AND ACCESSORIES ARE LOCATED ABOVE INACCESSIBLE CEILINGS OR WITHIN WALLS. ACCESS DOORS SHALL MATCH ASSEMBLY RATINGS.

## SHEET NOTES

1. PROVIDE 30X24 LOCKABLE ACCESS PANEL. COORDINATE LOCATION WITH GRAB BAR REQUIRMENTS.

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CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

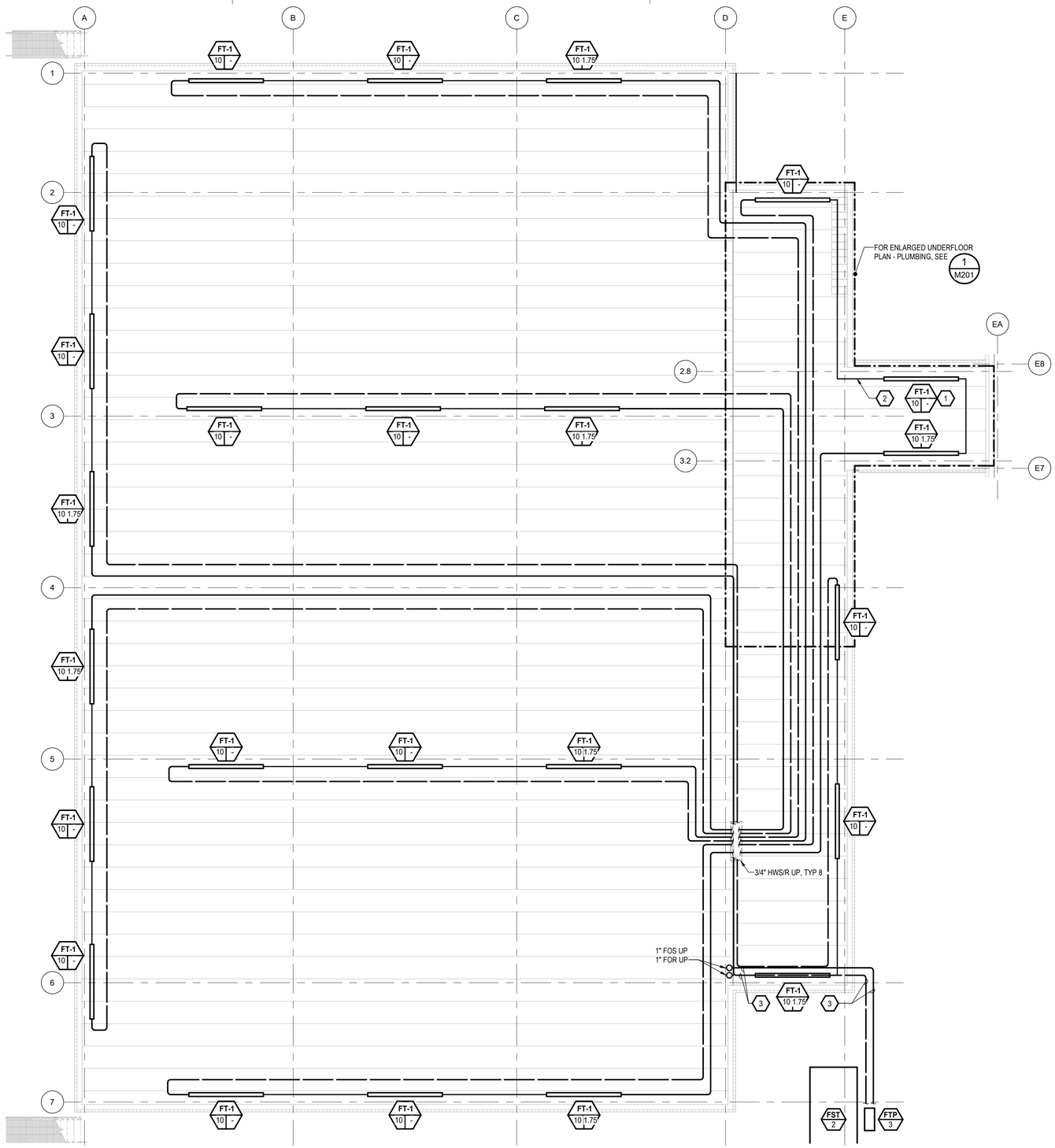
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| Drawn by M. LANGBERG | Date 01-22-2025 |
| Checked M. LANGBERG | Job No. 24048.01 |

Sheet Contents
ENLARGED PLANS - PLUMBING

Sheet No.
**M2.01**

Plot Date Time: 1/22/2025 8:39:05 AM




## 1 UNDERFLOOR PLAN - PIPING
M3.00 SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

## GENERAL NOTES

1. MINIMUM PIPE SIZE IS 3/4" UNLESS OTHERWISE NOTED.

## SHEET NOTES

1. MOUNT FINTUBE SECTIONS FROM FLOOR DECK ABOVE, TYPICAL.
2. SUSPEND PIPING FROM FLOOR DECK ABOVE, TYPICAL.
3. ROUTE FOS/FOR PIPING BELOW BUILDING AND UP THROUGH THE UNDERFLOOR SPACE AND MAIN FLOOR TO THE MEZZANINE.

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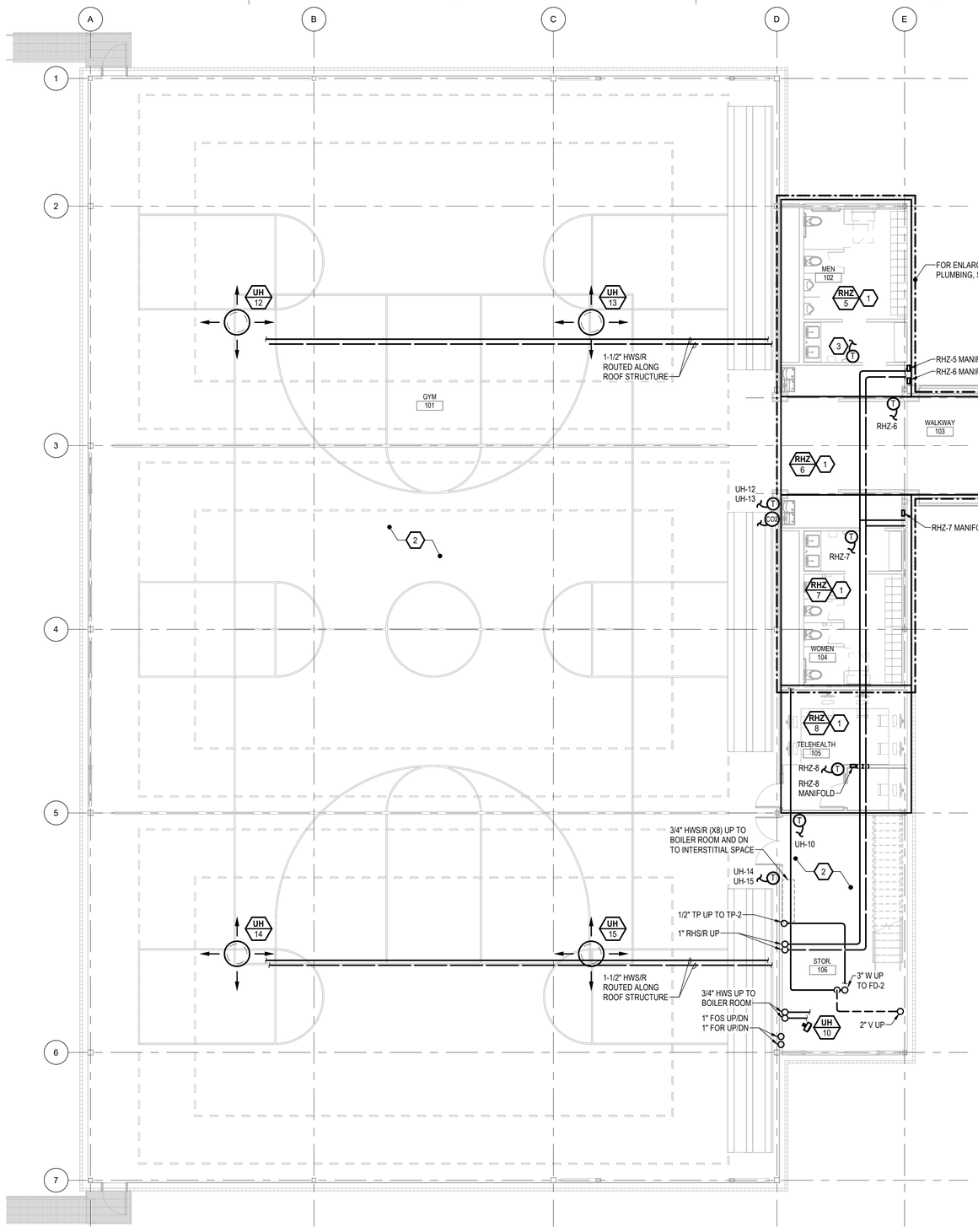
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| M. LANGBERG | 01-22-2025 |
| Checked | Job No. |
| M. LANGBERG | 24048.01 |

Sheet Contents
UNDERFLOOR PLAN - PIPING

Sheet No.
**M3.00**

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/24805 BETHGYM - MEP (AMC).rvt
Plot Date Time: 1/22/2025 8:39:06 AM

Autodesk Docs://24048.01 Dowl Bethel YK Fitness Center Gym Expansion/24805 BETHGYM - MEP (AMC).rvt




## GENERAL NOTES

1. MINIMUM PIPE SIZE IS 3/4" UNLESS OTHERWISE NOTED.
2. MOUNT ZONE TEMPERATURE SENSORS AT 44" AFF.
3. PROVIDE MANUAL HIGH POINT VENTS AND LOW POINT DRAINS WITH CAPPED HOSE CONNECTIONS; SLOPE PIPING TO ALLOW FOR DRAINAGE OF THE HYDRONIC SYSTEM.
4. PROVIDE ACCESS DOORS WHERE EQUIPMENT, VALVES, AND ACCESSORIES ARE LOCATED ABOVE NON-ACCESSIBLE CEILINGS OR WITHIN WALLS. ACCESS DOORS TO MATCH ASSEMBLY RATINGS.

## SHEET NOTES

1. RADIANT FLOOR HEATING SLAB SENSOR INSIDE 1/2 INCH CONDUIT EMBEDDED IN CONCRETE.
2. NO RADIANT FLOOR HEATING IN THIS ROOM.
3. SERVES RHZ-5 AND AHU-3 S/A TEMPERTATURE.

1 M3.01 **MAIN LEVEL FLOOR PLAN - PIPING**
SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

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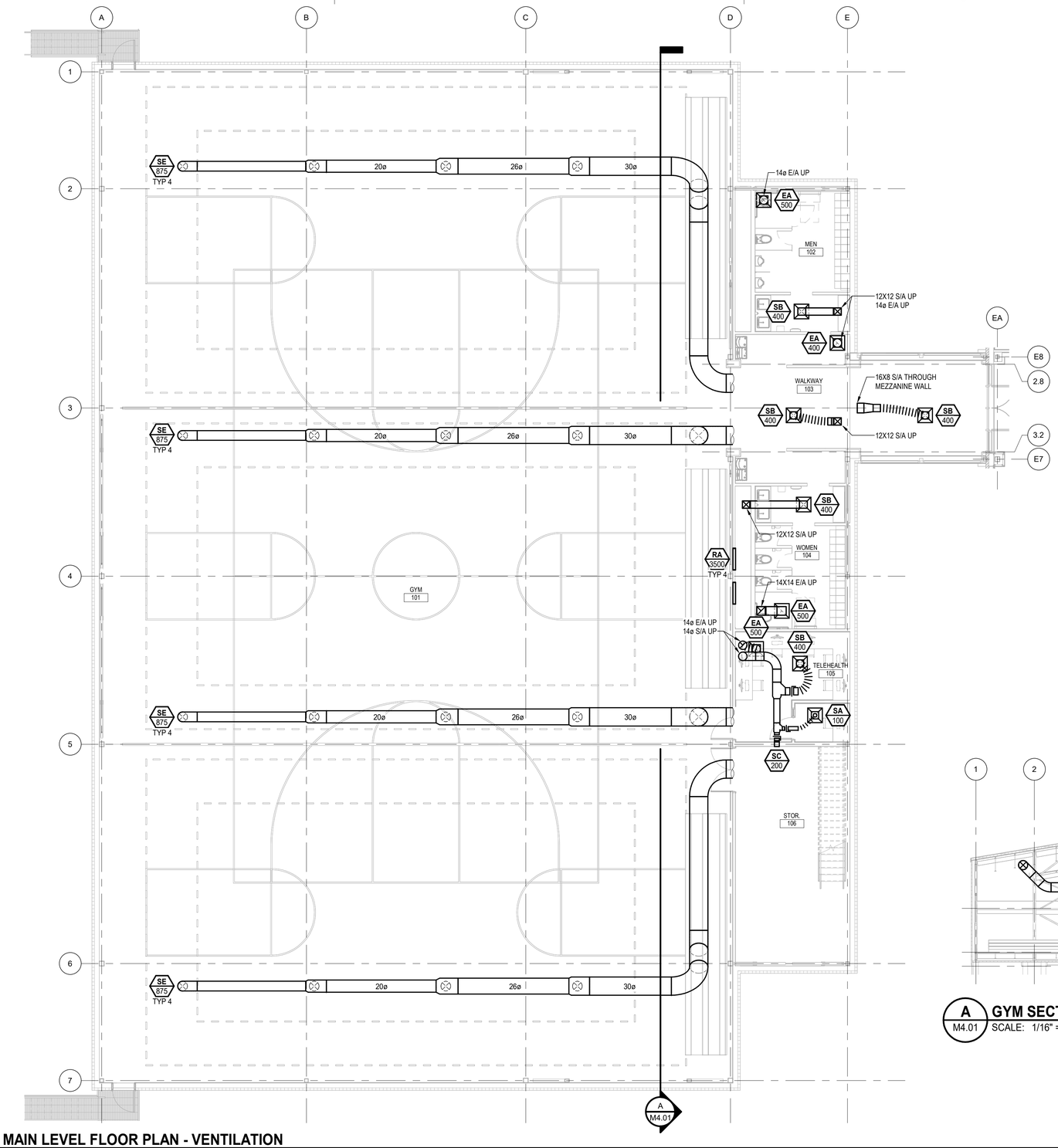
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Sheet Contents
MAIN LEVEL FLOOR PLAN - PIPING

Sheet No.
**M3.01**

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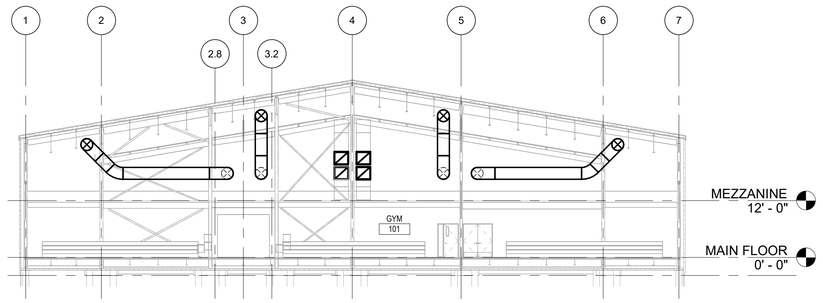
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## 1 M4.01 MAIN LEVEL FLOOR PLAN - VENTILATION

SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'




## A M4.01 GYM SECTION - VENTILATION

SCALE: 1/16" = 1'-0"

## GENERAL NOTES

1. FOR DUCT FITTINGS, SEE DETAIL X/MXXX.
2. FOR FLEX DUCT CONNECTION, SEE DETAIL X/MXXX.
3. FOR DUCT CONSTRICTION, SEE DETAIL X/MXXX.
4. FOR STANDARD LOW VELOCITY DUCT SCHEDULE, SEE DETAIL X/MXXX.
5. SUPPLY AIR DIFFUSER THROW IS 4-WAY UNLESS SHOWN OTHERWISE.
6. PROVIDE REMOTE OPERATOR VOLUME DAMPERS OR CEILING ACCESS PANELS FOR BALANCING DAMPERS ABOVE NON-ACCESSIBLE CEILINGS, COORDINATE WITH ARCHITECTURAL. FOR REMOTE OPERATOR VOLUME DAMPER, SEE DETAIL X/MXXX.

## SHEET NOTES

1. SHEET NOTE
2. SHEET NOTE
3. SHEET NOTE

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Sheet Contents
MAIN LEVEL FLOOR PLAN - VENTILATION

Sheet No.
**M4.01**

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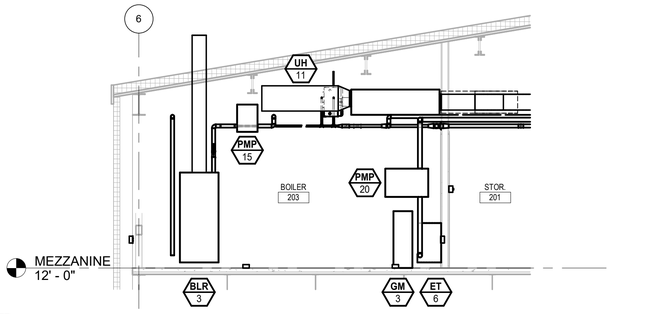
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## GENERAL NOTES

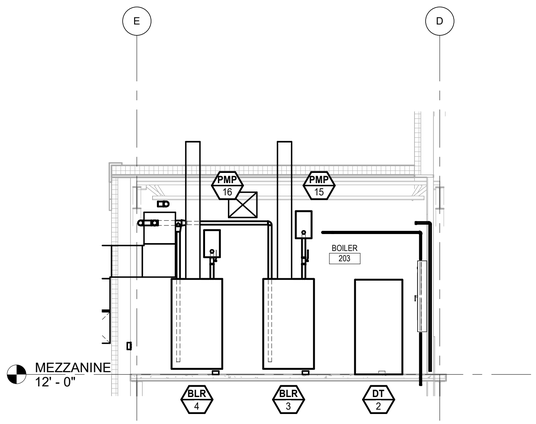
1. MINIMUM PIPE SIZE IS 3/4" UNLESS OTHERWISE NOTED.
2. MOUNT ZONE TEMPERATURE SENSORS AT 44" AFF.
3. PROVIDE MANUAL HIGH POINT VENTS AND LOW POINT DRAINS WITH CAPPED HOSE CONNECTIONS; SLOPE PIPING TO ALLOW FOR DRAINAGE OF THE HYDRONIC SYSTEM.

## SHEET NOTES ⬡

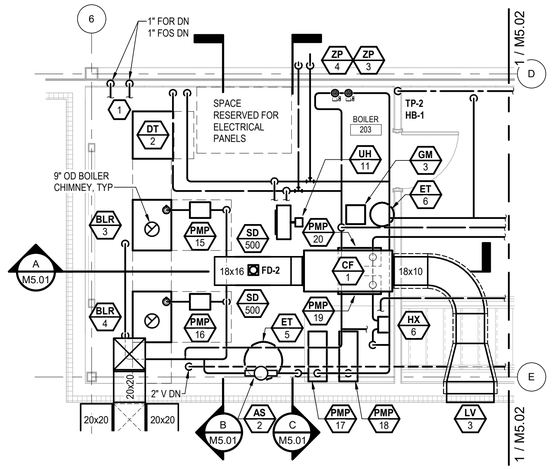
1. CONNECT FOS/FOR PIPING FROM FST-1 TO DT-1. ROUTE FUEL PIPING AT FLOOR LEVEL BEHIND BOILERS AND TO BURNERS.



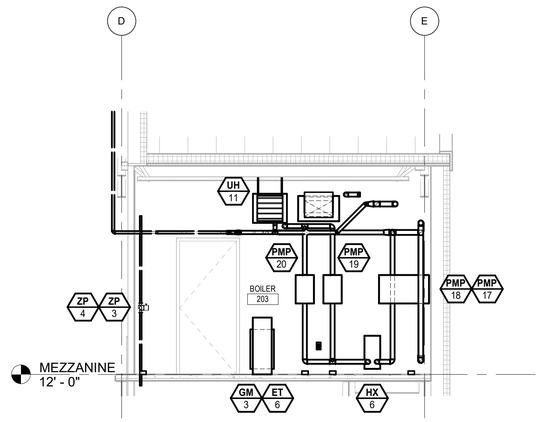

**A** M5.01 **SECTION A - BOILER ROOM**
SCALE: 1/4" = 1'-0"
0 2' 4' 8' 12'




**B** M5.01 **SECTION B - BOILER ROOM**
SCALE: 1/4" = 1'-0"
0 2' 4' 8' 12'




**1** M5.01 **ENLARGED MEZZ LEVEL PLAN - BOILER ROOM**
SCALE: 1/4" = 1'-0"
0 2' 4' 8' 12'




**C** M5.01 **SECTION C - BOILER ROOM**
SCALE: 1/4" = 1'-0"
0 2' 4' 8' 12'

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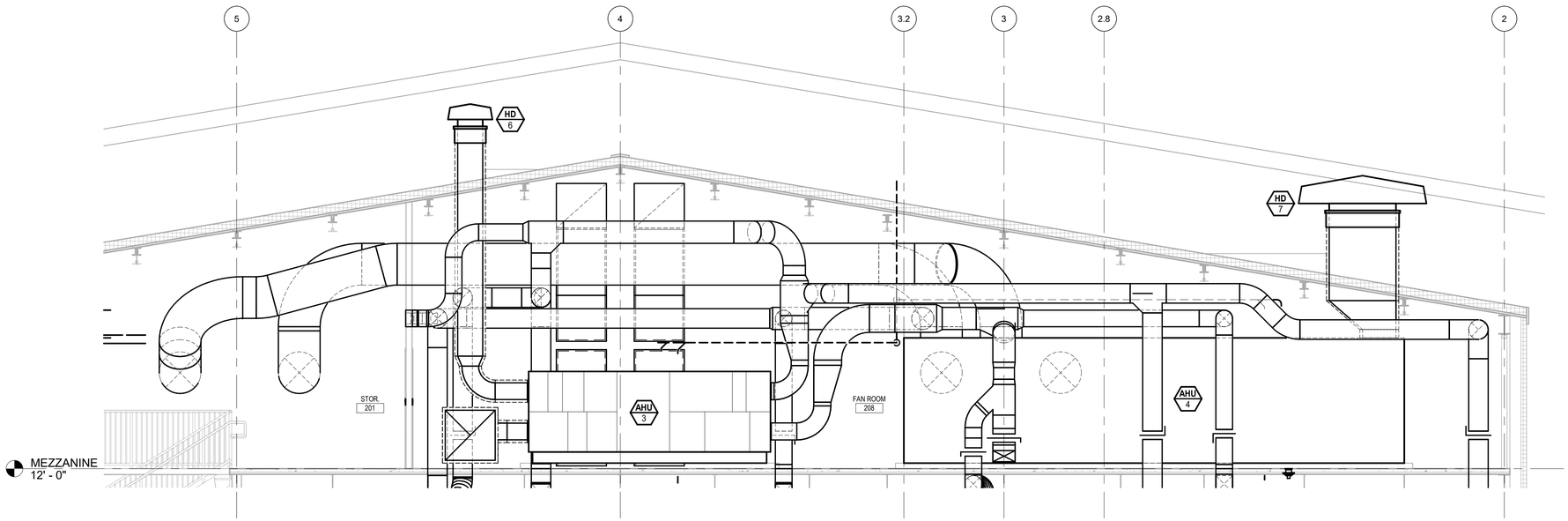
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Sheet Contents
ENLARGED PLANS AND SECTIONS - BOILER ROOM

Sheet No.
**M5.01**

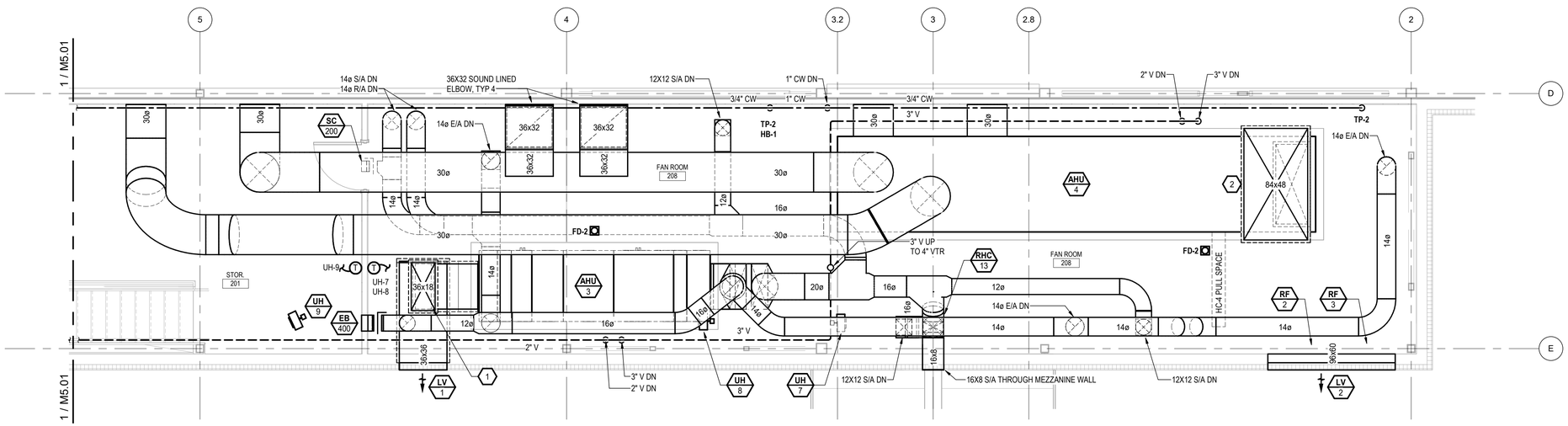
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MEZZANINE
12' - 0"

## A SECTION - MEZZANINE
M5.02 SCALE: 1/4" = 1'-0"




## 1 ENLARGED MEZZ LEVEL PLAN - FAN ROOM
M5.02 SCALE: 1/4" = 1'-0"

0 2' 4' 8' 12'

## GENERAL NOTES
1. FOR STANDARD LOW VELOCITY DUCT SCHEDULE, SEE DETAIL X/MXXX.

## SHEET NOTES
1. ROUTE DUCT UP THROUGH ROOF TO HOOD HD-6. SEE DETAIL X/MXXX.
2. ROUTE DUCT UP THROUGH ROOF TO HOOD HD-7. SEE DETAIL X/MXXX.

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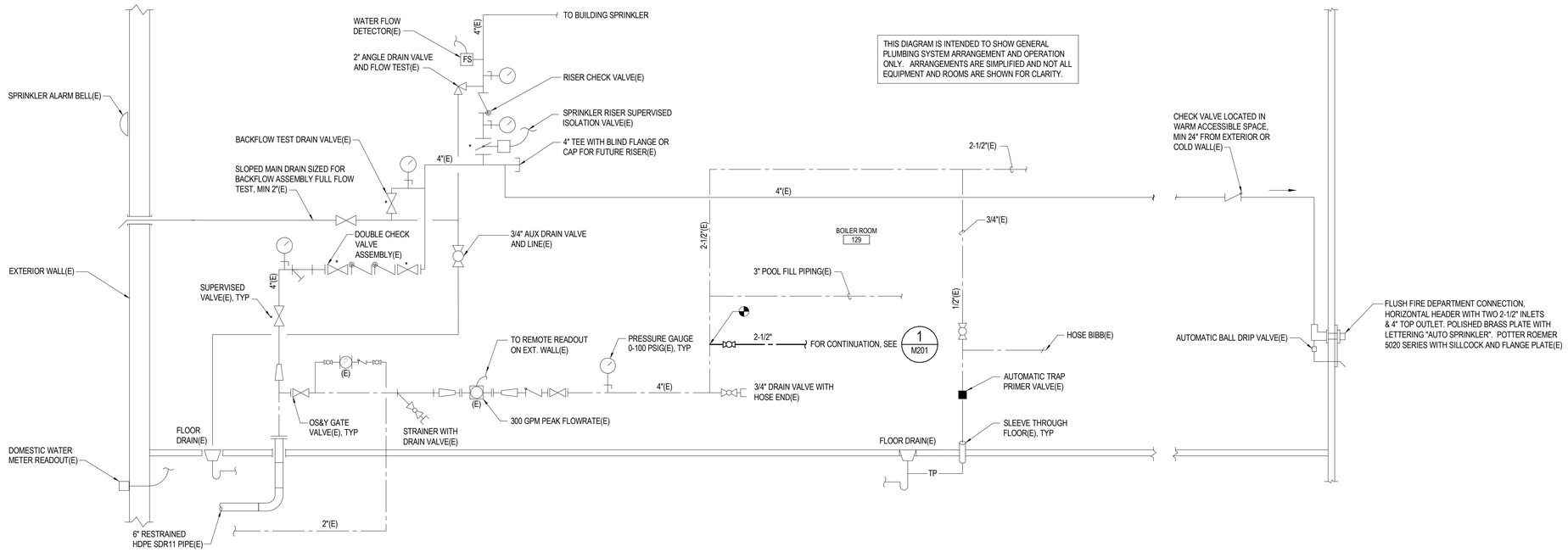
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Sheet Contents
ENLARGED PLANS AND SECTIONS - FAN ROOM

Sheet No.
**M5.02**

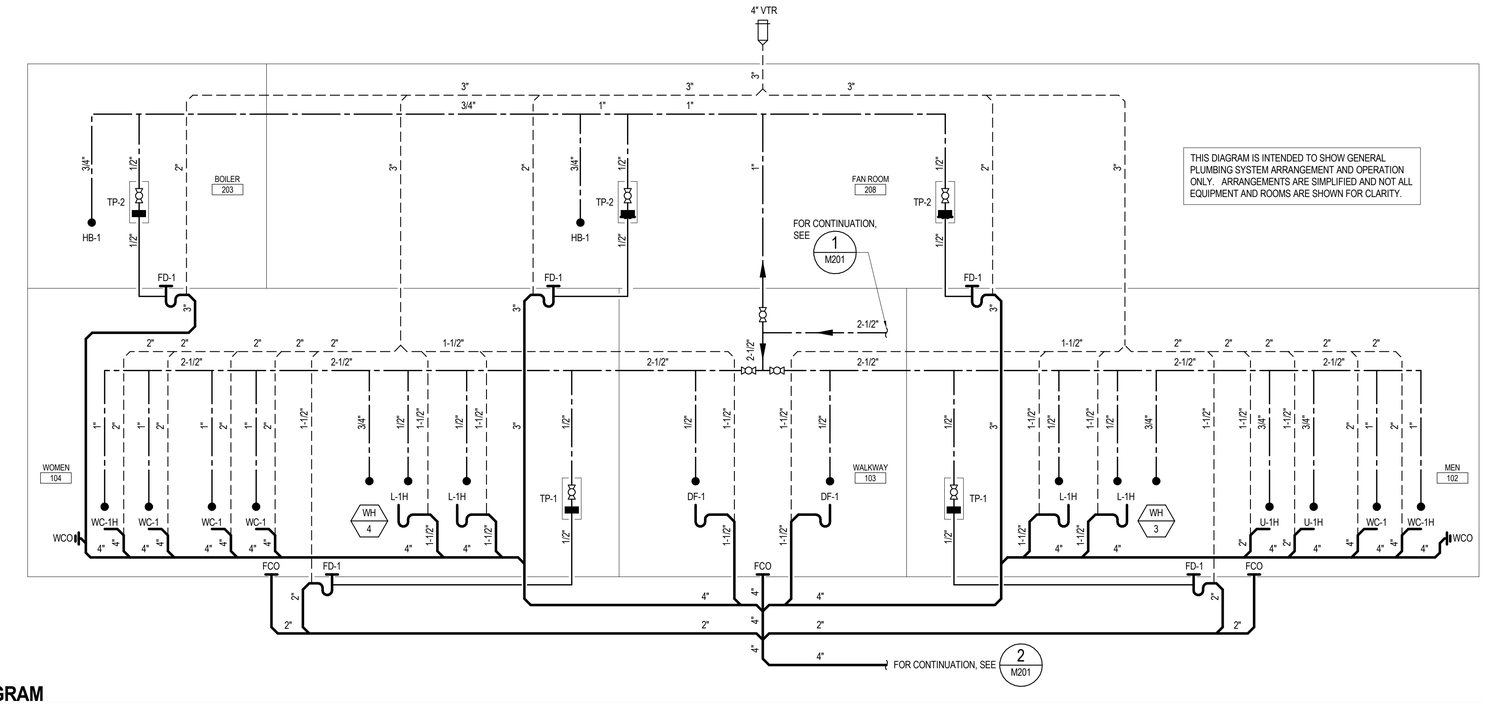
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## 1 M-601 DIAGRAM - WATER SERVICE ENTRANCE AND FIRE PROTECTION RISER (MODIFY EXISTING)

SCALE: NONE




## 2 M601 PLUMBING RISER DIAGRAM

SCALE: NONE

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Sheet Contents

DIAGRAMS AND DETAILS - PLUMBING

Sheet No.

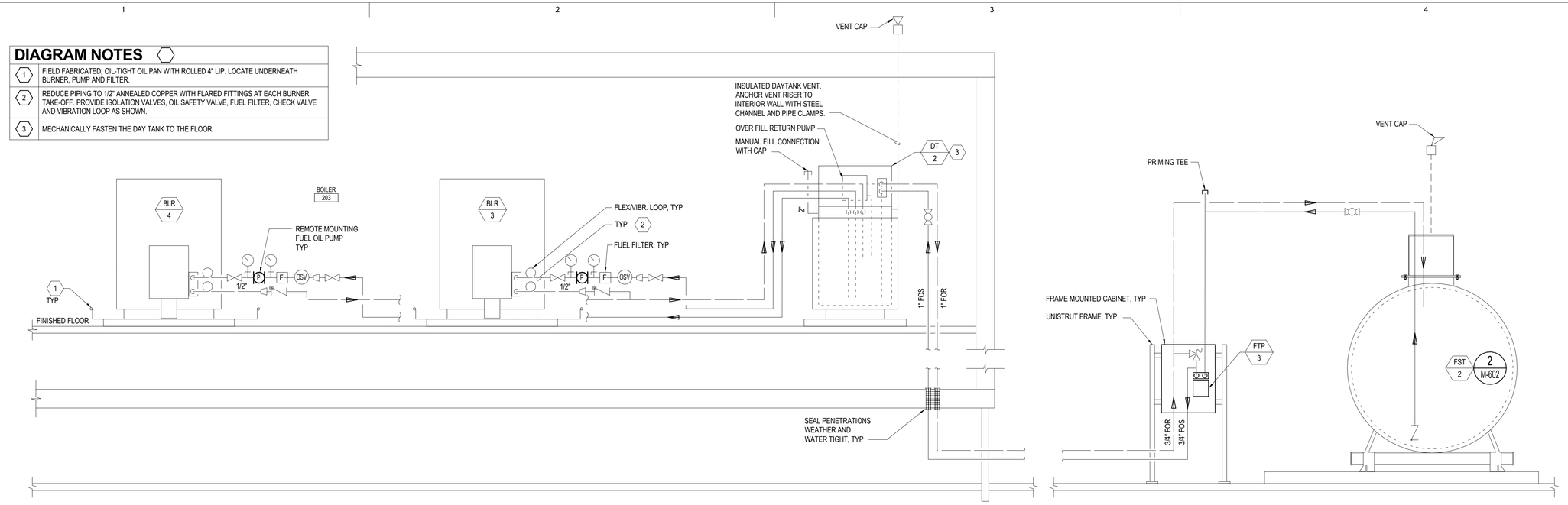
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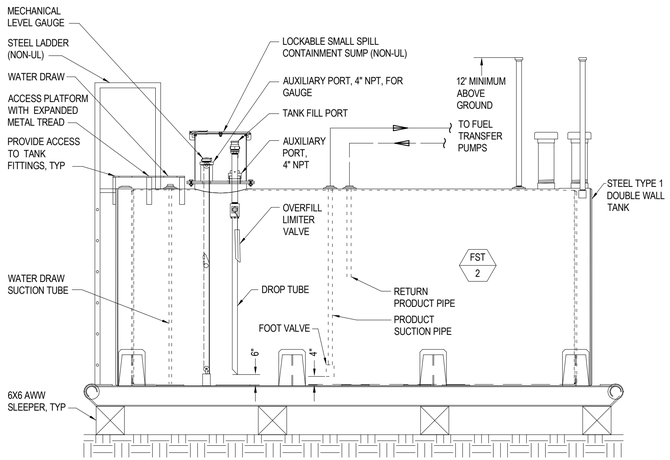
## DIAGRAM NOTES

| | |
|---|---|
| 1 | FIELD FABRICATED, OIL-TIGHT OIL PAN WITH ROLLED 4" LIP. LOCATE UNDERNEATH BURNER, PUMP AND FILTER. |
| 2 | REDUCE PIPING TO 1/2" ANNEALED COPPER WITH FLARED FITTINGS AT EACH BURNER TAKE-OFF. PROVIDE ISOLATION VALVES, OIL SAFETY VALVE, FUEL FILTER, CHECK VALVE AND VIBRATION LOOP AS SHOWN. |
| 3 | MECHANICALLY FASTEN THE DAY TANK TO THE FLOOR. |




## 1 M-602 DIAGRAM - FUEL OIL TRANSFER SYSTEM

SCALE: NONE




## 2 M-602 DETAIL - FUEL OIL STORAGE TANK (FST-2)

SCALE: NONE

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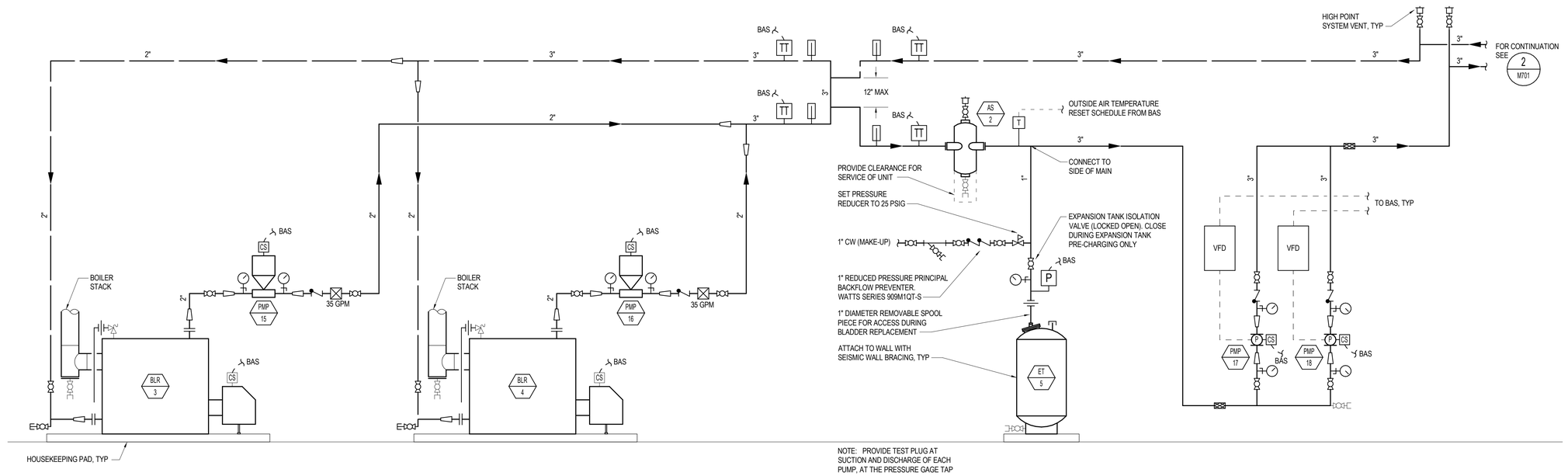
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Sheet Contents
DIAGRAMS AND DETAILS - PLUMBING

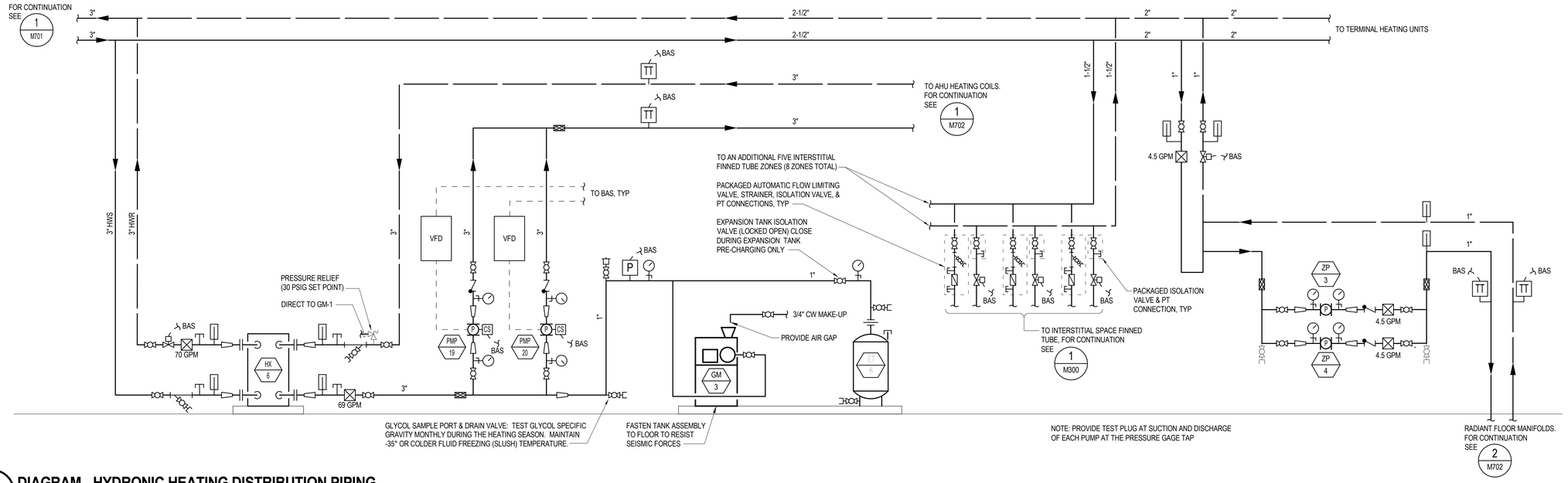
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**M6.02**

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## 1 DIAGRAM - CENTRAL HYDRONIC HEATING SYSTEM
1 / M701 SCALE: NONE




## 2 DIAGRAM - HYDRONIC HEATING DISTRIBUTION PIPING
2 / M701 SCALE: NONE

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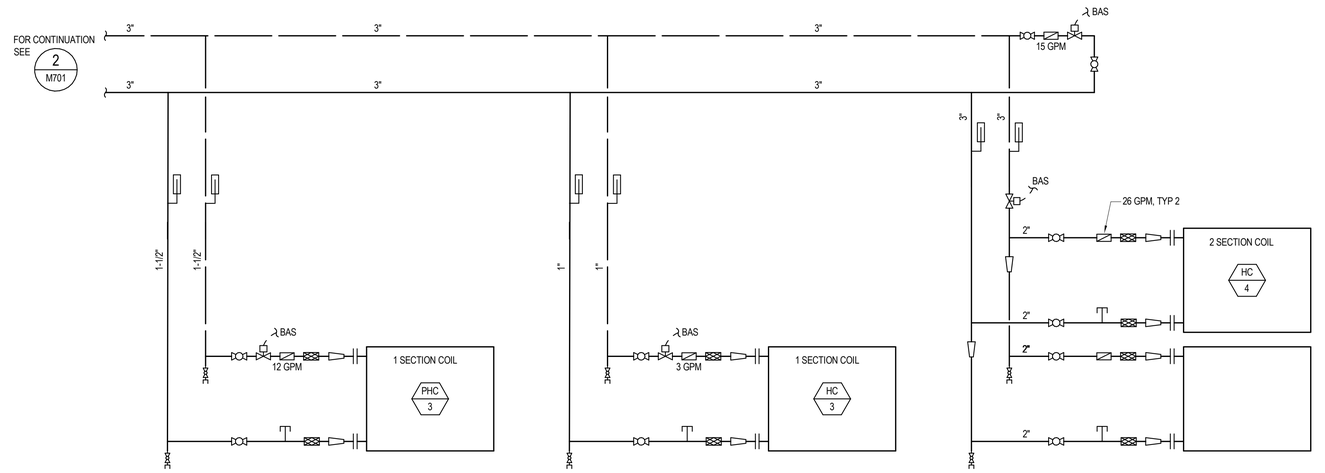
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Sheet Contents
DIAGRAMS AND DETAILS - HEATING

Sheet No.
**M7.01**

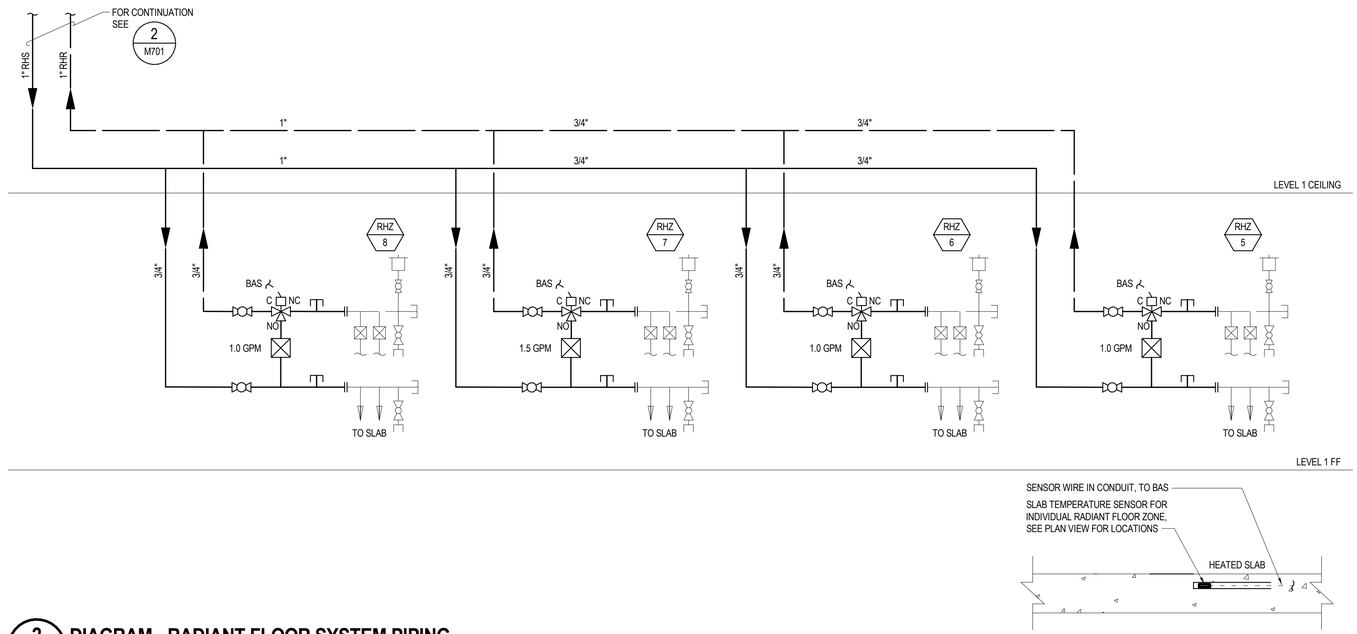
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## 1 M702 DIAGRAM - AHU HEATING COIL PIPING

SCALE: NONE




## 2 M702 DIAGRAM - RADIANT FLOOR SYSTEM PIPING

SCALE: NONE

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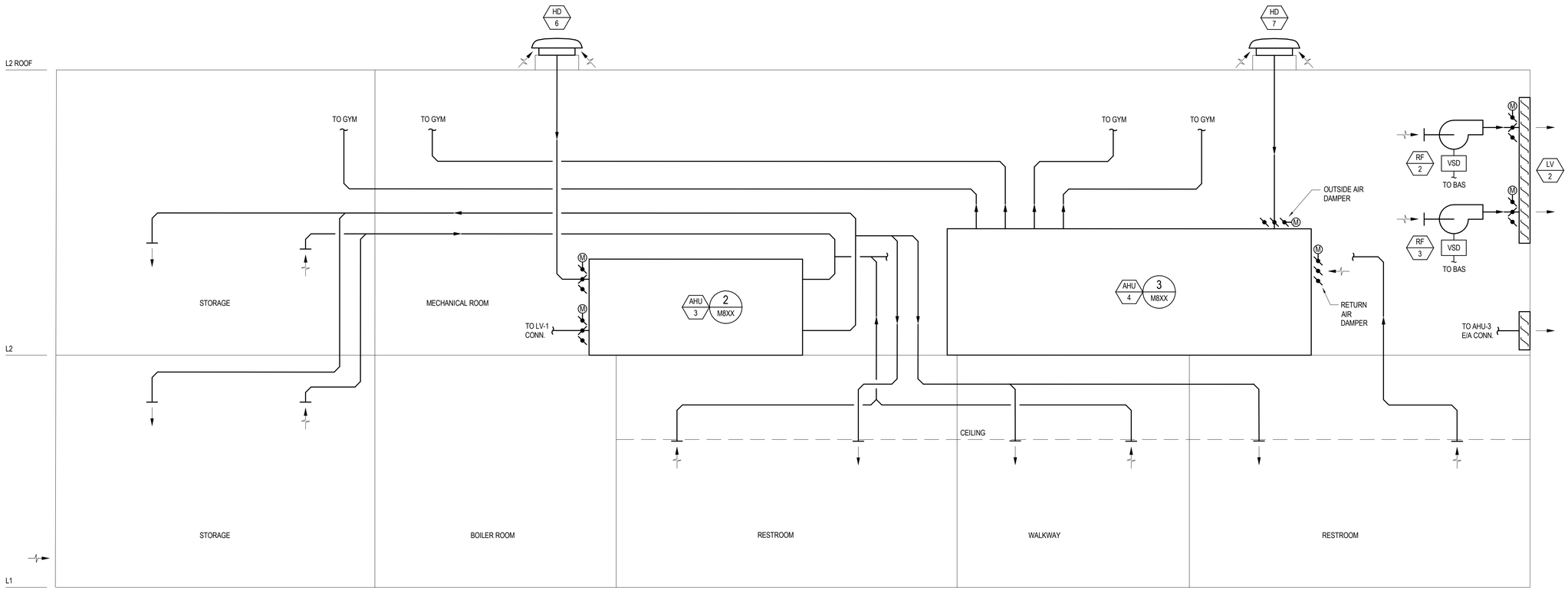
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Sheet Contents
DIAGRAMS AND DETAILS - HEATING

Sheet No.
**M7.02**

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## 1 M801 DIAGRAM - VENTILATION SYSTEMS

SCALE: NONE

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Sheet Contents
DIAGRAMS AND DETAILS - VENTILATION

Sheet No.
**M8.01**

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## GENERAL

SHEET NOTE CONVENTION:
1 — REFERENCED SHEET NOTE
2. — GENERAL SHEET NOTE

# — FEEDER IDENTIFICATION TAG
FEEDER NUMBER

1 / E0.01 — DETAIL REFERENCE
DETAIL NUMBER
SHEET WHERE DETAIL APPEARS

A / E0.01 — SECTION REFERENCE
SECTION LETTER
SHEET WHERE SECTION APPEARS

LINE WORK CONVENTION:
NEW OR REINSTALLED ITEM
ITEM TO BE DEMOLISHED
EXISTING ITEM TO REMAIN
FUTURE ITEM
EXISTING ITEM TO BE RELOCATED

CONDUIT/FEEDER LINE CONVENTION:
CONCEALED
UNDERGROUND OR CONCEALED IN FLOOR
EXPOSED
FLEXIBLE CONDUIT

P-1,3 — CIRCUITING CONVENTION
CIRCUIT NUMBER(S)
PANEL

BRANCH CIRCUIT HOMERUN TO PANELBOARD
NUMBER OF MARKS INDICATE NUMBER OF CONDUCTORS IN RACEWAY, NOT COUNTING GROUNDING CONDUCTORS. (ABSENCE OF MARKS INDICATE TWO CONDUCTORS, PLUS REQUIRED GROUNDS)
UNSWITCHED CONDUCTORS SHOWN ON HOMERUN SIDE OF NEUTRAL
NEUTRAL
SWITCHED CONDUCTORS SHOWN ON LOAD SIDE OF NEUTRAL

## ABBREVIATIONS

| | |
|---|---|
| ACS | ACCESS CONTROL SYSTEM |
| AFF | ABOVE FINISHED FLOOR |
| AFG | ABOVE FINISHED GRADE |
| AL | ALUMINUM |
| APPROX | APPROXIMATE |
| AHJ | AUTHORITY HAVING JURISDICTION |
| BAS | BUILDING AUTOMATION SYSTEM |
| CKT | CIRCUIT |
| CCTV | CLOSED CIRCUIT TELEVISION |
| CMH | COMMUNICATIONS MANHOLE |
| C. | CONDUIT |
| C.O. | CONDUIT ONLY |
| CU | COPPER |
| (D) | DEMOLISH |
| DB | DECIBEL |
| EL | EMERGENCY LIGHT |
| ELU | EMERGENCY LIGHTING UNIT |
| ENL | EMERGENCY NIGHT LIGHT |
| (E) | EXISTING |
| (F) | FUTURE |
| FAA | FIRE ALARM ANNUNCIATOR |
| FACP | FIRE ALARM CONTROL PANEL |
| FO | FIBER OPTIC |
| FOPP | FIBER OPTIC PATCH PANEL |
| FSD | FIRE/SMOKE DAMPER |
| HZ | FREQUENCY |
| HP | HORSEPOWER |
| IAW | IN ACCORDANCE WITH |
| K | KELVIN |
| KVA | KILO VOLT-AMPS |
| KW | KILOWATT |
| LCP | LIGHTING CONTROL PANEL |
| MCC | MOTOR CONTROL CENTER |
| MCP | MOTOR CONTROL PANEL |
| MDS | MAIN DISTRIBUTION SWITCHBOARD |
| MIN | MINIMUM |
| MM | MULTIMODE FIBER OPTIC CABLE |
| MTR | MAIN TELECOM ROOM |
| NEC | NATIONAL ELECTRICAL CODE |
| NFPA | NATIONAL FIRE PROTECTION ASSOCIATION |
| NL | NIGHT LIGHT |
| NC | NORMALLY CLOSED |
| NO | NORMALLY OPEN |
| N/A | NOT APPLICABLE |
| NIC | NOT IN CONTRACT |
| NTS | NOT TO SCALE |
| OFC | OPTICAL FIBER CABLE |
| OFCI | OWNER FURNISHED, CONTRACTOR INSTALLED |
| OFOI | OWNER FURNISHED, OWNER INSTALLED |
| PA | PUBLIC ADDRESS |
| PH | PHASE (ELECTRICAL) |
| PLC | PROGRAMMABLE LOGIC CONTROLLER |
| PMCS | POWER MONITORING CONTROL SYSTEM |
| SM | SINGLEMODE FIBER OPTIC CABLE |
| SMR | SURFACE MOUNTED RACEWAY |
| SPD | SURGE PROTECTIVE DEVICE |
| TELECOM | TELECOMMUNICATION |
| TR | TELECOMMUNICATION ROOM |
| TYP | TYPICAL |
| UON | UNLESS OTHERWISE NOTED |
| VR | VANDAL RESISTANT |
| VSD | VARIABLE SPEED DRIVE |
| VAC | VOLTS (ALTERNATING CURRENT) |
| VDC | VOLTS (DIRECT CURRENT) |
| V | VOLTS OR VOLTAGE |
| W | WATT |
| WP | WEATHERPROOF |
| WG | WIRE GUARD |

## LIGHTING

LIGHTING FIXTURE
LIGHTING FIXTURE - WALL MOUNTED
LIGHTING FIXTURE - SURFACE OR PENDANT MOUNTED
LIGHTING FIXTURE - RECESS MOUNTED
LIGHTING FIXTURE CONNECTED TO EMERGENCY POWER CIRCUIT, NIGHT LIGHT
LIGHTING FIXTURE CONNECTED TO EMERGENCY POWER CIRCUIT
EXIT FIXTURE - WALL MOUNTED SHADED AREA(S) DENOTE FACE(S) OF SIGN, ARROWS AS NOTED (FIXTURE TYPE EX)
EXIT FIXTURE - CEILING MOUNTED SHADED AREA(S) DENOTE FACE(S) OF SIGN, ARROWS AS NOTED (FIXTURE TYPE EX)
EMERGENCY LIGHTING UNIT - WALL MOUNTED (FIXTURE TYPE XA)
EMERGENCY LIGHTING UNIT - CEILING MOUNTED (FIXTURE TYPE XA)
SITE LIGHTING - POLE MOUNTED
$ — SINGLE POLE SWITCH
$3 — THREE-WAY SWITCH
$4 — FOUR-WAY SWITCH
$a — SWITCH FOR FIXTURES MARKED 'a',
$D — DIMMER SWITCH
$K — KEYED SWITCH
$M — MOMENTARY SWITCH
$O — OCCUPANCY SENSOR/SWITCH
$P — PILOT LIGHTED SWITCH
PC — PHOTOCELL
DS — DAYLIGHT SENSOR - WALL MOUNTED
DS — DAYLIGHT SENSOR - CEILING MOUNTED
OCCUPANCY SENSOR - WALL MOUNTED
OCCUPANCY SENSOR - CEILING MOUNTED

## POWER

RECEPTACLE MOUNTING:
RECEPTACLE - WALL MOUNTED (SEE "RECEPTACLE TYPES" BELOW)
RECEPTACLE - WALL MOUNTED, HORIZONTAL (SEE "RECEPTACLE TYPES" BELOW)
RECEPTACLE - FLOOR MOUNTED (SEE "RECEPTACLE TYPES" BELOW)
RECEPTACLE - CEILING MOUNTED (SEE "RECEPTACLE TYPES" BELOW)

RECEPTACLE TYPES:
NORMAL POWER / EMERGENCY POWER
DUPLEX RECEPTACLE
GROUND FAULT INTERRUPTER, DUPLEX RECEPTACLE
DOUBLE DUPLEX RECEPTACLE
GROUND FAULT INTERRUPTER, DOUBLE DUPLEX RECEPTACLE

ELECTRICAL DEVICES:
SPECIAL PURPOSE RECEPTACLE, 3 PHASE, NEMA TYPE AS NOTED
SPECIAL PURPOSE RECEPTACLE, 1 PHASE, NEMA TYPE AS NOTED
POWER POLE
MOTOR
$T — SWITCH - THERMAL TRIP WITH HEATER
SURFACE MOUNTED RACEWAY
FUSED DISCONNECT
NON-FUSED DISCONNECT
COMBINATION STARTER/FUSED DISCONNECT
STARTER OR CONTACTOR
J — JUNCTION BOX AND/OR CONNECTION TO EQUIPMENT
M — METERING DEVICE
VSD — VARIABLE SPEED DRIVE
PB — PUSHBUTTON - SPECIAL
PUSHBUTTON (1 BUTTON)
PUSHBUTTON (2 BUTTON)
PUSHBUTTON (3 BUTTON)
PANEL - SURFACE MOUNTED
PANEL - FLUSH MOUNTED
TRANSFORMER
R — RELAY
G — GROUND FAULT RELAY

## COMMUNICATIONS

X — TELECOMMUNICATION OUTLET - (X DENOTES NUMBER OF PORTS)
X — TELECOMMUNICATION OUTLET - FLOOR MOUNTED (X DENOTES NUMBER OF PORTS)
IC — INTERCOM CALL IN STATION
IC MS — INTERCOM MASTER STATION
DAS — DISTRIBUTED ANTENNA SYSTEM
WP — WIRELESS ACCESS POINT (CEILING MOUNT), 1 TELECOM OUTLET
AV — AUDIO/VIDEO OUTLET, +90" AFF, UON.
S PA — SPEAKER - WALL MOUNTED
S PA — SPEAKER - CEILING OR PENDANT MOUNTED
M — MICROPHONE CONNECTION
M — MICROPHONE CONNECTION - CEILING MOUNTED
ANALOG CLOCK
ANALOG CLOCK/SPEAKER UNIT
DIGITAL CLOCK
DIGITAL CLOCK/SPEAKER UNIT
OP — OVERHEAD PROJECTOR - CEILING MOUNTED

## SECURITY

GB — GLASS BREAK DETECTOR - WALL MOUNTED
GB — GLASS BREAK DETECTOR - CEILING MOUNTED
IR L — SECURITY INFRARED MOTION DETECTOR - LONG RANGE - WALL MOUNTED
IR 360 — SECURITY INFRARED MOTION DETECTOR - 360 DEGREE COVERAGE - CEILING MOUNTED
D — DOOR CONTACT
DO — AUTOMATIC DOOR OPENER
DC — DOOR HOLDER/CLOSER
MAGNETIC HOLDER/RELEASE
MS — MONITOR SWITCH
ML — MAGNETIC LOCK
EL — ELECTRONIC LOCK
ES — ELECTRONIC STRIKE
EPT — ELECTRIC POWER TRANSFER
REX — REQUEST TO EXIT SENSOR
DEL — DELAYED EGRESS
KP — KEYPAD
SECURITY CARD READER
CCTV CAMERA - 360
CCTV CAMERA - 270
CCTV CAMERA - 180
CCTV CAMERA

## FIRE ALARM

FIRE ALARM STROBE - WALL MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
FIRE ALARM STROBE - CEILING MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
H — FIRE ALARM HORN - WALL MOUNTED
H — FIRE ALARM HORN - CEILING MOUNTED
S — FIRE ALARM SPEAKER - WALL MOUNTED
S — FIRE ALARM SPEAKER - CEILING MOUNTED
BELL - WALL MOUNTED
FIRE ALARM HORN/STROBE - WALL MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
FIRE ALARM HORN/STROBE - CEILING MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
FIRE ALARM SPEAKER/STROBE - WALL MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
FIRE ALARM SPEAKER/STROBE - CEILING MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
FIRE ALARM CHIME/STROBE - WALL MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
FIRE ALARM CHIME/STROBE - CEILING MOUNTED (X DENOTES CANDELA RATING IF OTHER THAN 15cd)
F — FIRE ALARM MANUAL PULL STATION
MULTI-TECHNOLOGY SMOKE DETECTOR
H — HEAT DETECTOR
H 135 — FIXED TEMPERATURE HEAT DETECTOR (135 DEGREES FAHRENHEIT)
DD — DUCT DETECTOR
FS — FLOW SWITCH
TS — TAMPER SWITCH
PS — PRESSURE SWITCH
MAGNETIC DOOR HOLDER
FACP — FIRE ALARM CONTROL PANEL
FAA — FIRE ALARM ANNUNCIATOR

## ELECTRICAL DRAWING INDEX


| | |
|---|---|
| E0.01 | LEGEND AND ABBREVIATIONS |
| E0.02 | LIGHTING FIXTURE AND PANEL SCHEDULES |
| E1.01 | OVERALL MAIN LEVEL FLOOR PLAN - ELECTRICAL |
| E2.01 | MAIN FLOOR PLAN AND MEZZANINE LEVEL - LIGHTING |
| E3.01 | MAIN LEVEL FLOOR PLAN - POWER |
| E4.01 | MAIN LEVEL FLOOR PLAN - SPECIAL SYSTEMS |
| E5.01 | ENLARGED PLANS - BOILER ROOM AND MEZZANINE FAN ROOM |
| E8.01 | POWER ONE-LINE DIAGRAM |



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CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
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| Drawn by C. DENNIS | Date 01-22-2025 |
| Checked J. LACKEY | Job No. 24048.01 |

Sheet Contents
LEGEND AND ABBREVIATIONS

Sheet No.
**E0.01**

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# LIGHTING FIXTURE SCHEDULE

| TYPE | DESCRIPTION | COLOR TEMP | LUMENS | WATTAGE | MOUNTING | NOTES |
|---|---|---|---|---|---|---|
| A | LUX DYNAMICS<br>L-2-36LM-DA-840-4-U10-CP4-B-5/10-10Y18-GYM<br>4' LENGTH, GYMNASIUM HIGH BAY, CLEAR POLYCARBONATE DIFFUSE LENS,<br>Y-HANGER AC CABLE SUSPENDED MOUNT, DUAL CHANNEL | 4000K | 36794 | 232 | SUSPENDED CEILING | |
| C | LITHONIA LDN6 40/20 LO6AR LSS MVOLT EZ1<br>6" ROUND DOWNLIGHT, NON-IC LED HOUSING, WET LOCATION RATED<br>OPEN REFLECTOR WITH CLEAR SEMI-SPECULAR FINISH | 4000K | 2000 | 22.5 | RECESSED CEILING | |
| D | LITHONIA FMVCSLS 48IN MVOLT 30K35K40K 90CRI BN M4<br>48" CYLINDRICAL VANITY, ACRYLIC DIFFUSER, BRUSHED NICKEL FINISH | 4000K | 3200 | 36 | SURFACE WALL AT 6'-6" AFF | |
| E | MARK SPRLED LOP 14FT RLP FL 80CRI 40K 1000LMF MIN1 MVOLT ZT<br>14' RECESSED PERIMETER WALL WASH ARCHITECTURAL FIXTURE | 4000K | 1000 LM/FT | 10.5 | RECESSED PERIMETER | |
| G | LITHONIA 2BLT2 33L ADSM GZ10 LP840<br>2'X2' TROFFER, RECESSED CEILING MOUNT, SMOOTH REFLECTOR, CURVED SMOOTH DIFFUSER | 4000K | 3391 | 26.5 | RECESSED CEILING | |
| Z | LITHONIA ZL1N-L48-5000LM-FST-MVOLT-40K-80CRI-WH<br>4' LINEAR STRIP, FROSTED DIFFUSE LENS, DAMP LOCATION RATED, RATED<br>TO -40 F, MULTI-VOLT, E10LWCP EMERGENCY PACK WHERE REQUIRED | 4000K | 4585 | 34 | SURFACE CEILING | NOTE 3 |
| EX | LITHONIA LHQM LED G HO M6<br>EMERGENCY EXIT SIGN, EX-WG WIRE GUARD | N/A | N/A | 4.3 | SURFACE WALL | |
| SA | LITHONIA WDGE1 LED P1 40K 80CRI VF MVOLT DDBXD<br>WALL SCONCE, VISUAL COMFORT FORWARD THROW, WET LOCATION<br>RATED, RATED TO -40 F, DARK BRONZE FINISH | 4000K | 1194 | 10 | SURFACE WALL | |

## LIGHTING FIXTURE SCHEDULE NOTES

1. REFER TO SPECIFICATION SECTION 26 5000 FOR ADDITIONAL REQUIREMENTS REGARDING LIGHT FIXTURES, LED LAMPS AND DRIVERS.
2. PROVIDE AN EMERGENCY CIRCUIT CONNECTION (CIRCUIT AS NOTED ON DRAWINGS) TO ALL EXIT SIGNS AND EMERGENCY LIGHTING FIXTURES. WIRING FOR FIXTURES CONNECTED TO EMERGENCY CIRCUITS SHALL BE KEPT ENTIRELY INDEPENDENT OF ALL OTHER WIRING AND EQUIPMENT IN ACCORDANCE WITH NEC ARTICLE 700.
3. SURFACE CEILING MOUNT FIXTURES IN ROOMS/AREAS WITH CEILINGS. IN AREAS WITHOUT CEILINGS, PENDANT FIXTURES DOWN FROM BOTTOM OF STRUCTURE TO HEIGHT INDICATED. IN AREAS WITH MECHANICAL EQUIPMENT, DUCTWORK AND PIPING, PENDANT FIXTURES DOWN TO BOTTOM OF MECHANICAL DUCTWORK OR PIPING AS APPROPRIATE. FIXTURE PENDANTS SHALL BE RIGID (THREADED HANGAR RODS) AND SHALL BE SWAY BRACED WHERE PENDANTS EXCEED 24 INCHES IN LENGTH.

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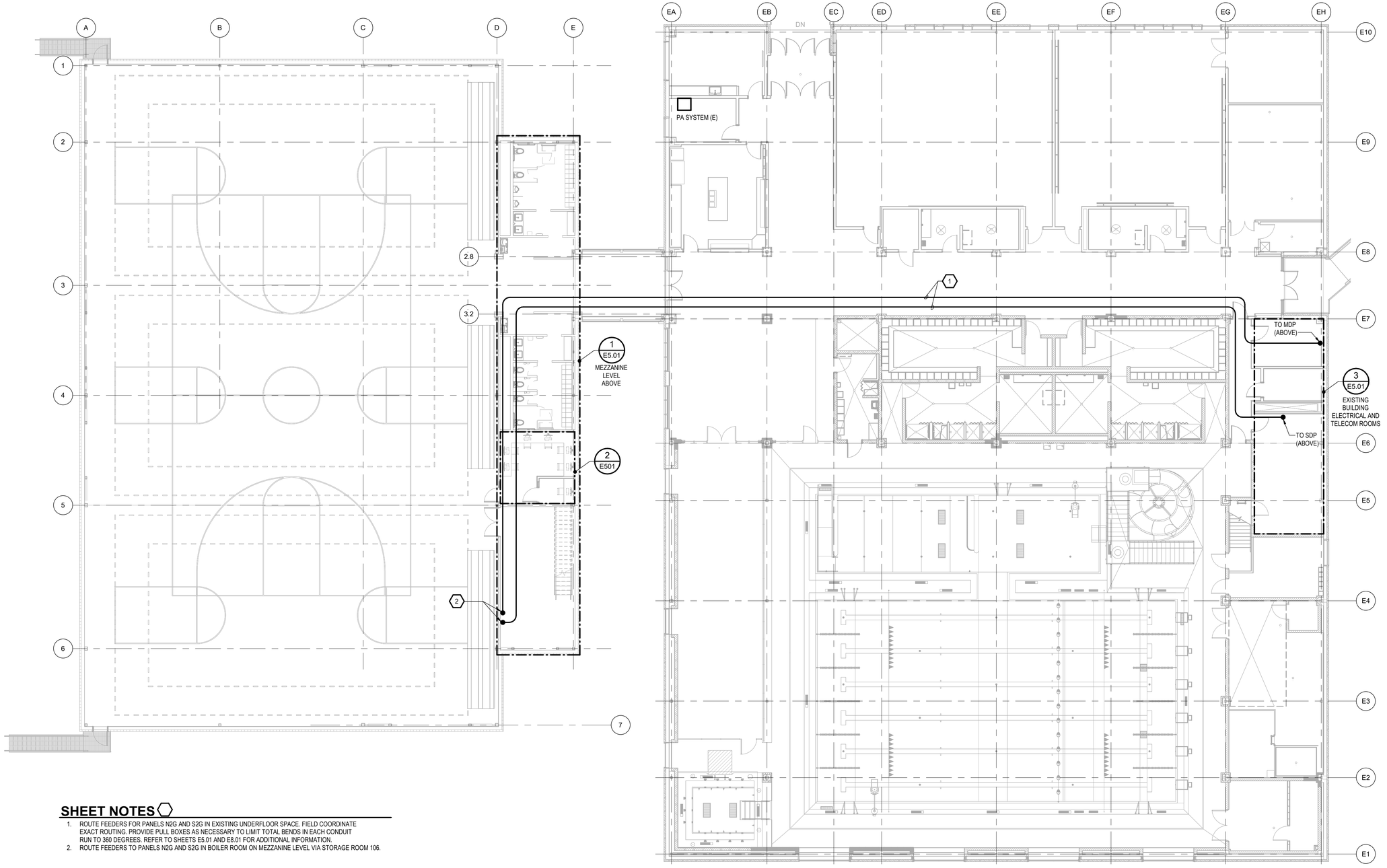
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| Drawn by<br>J. LACKEY | Date<br>01-22-2025 |
| Checked<br>J. LACKEY | Job No.<br>24048.01 |

Sheet Contents
LIGHTING FIXTURE AND PANEL SCHEDULES

Sheet No.
**E0.02**

Plot Date Time: 1/21/2025 5:31:59 PM

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## SHEET NOTES

1. ROUTE FEEDERS FOR PANELS N2G AND S2G IN EXISTING UNDERFLOOR SPACE. FIELD COORDINATE EXACT ROUTING. PROVIDE PULL BOXES AS NECESSARY TO LIMIT TOTAL BENDS IN EACH CONDUIT RUN TO 360 DEGREES. REFER TO SHEETS E5.01 AND E8.01 FOR ADDITIONAL INFORMATION.
2. ROUTE FEEDERS TO PANELS N2G AND S2G IN BOILER ROOM ON MEZZANINE LEVEL VIA STORAGE ROOM 106.

## 1 OVERALL MAIN LEVEL FLOOR PLAN - ELECTRICAL

1 / E1.01 SCALE: 3/32" = 1'-0"

0 4' 8' 16' 24'

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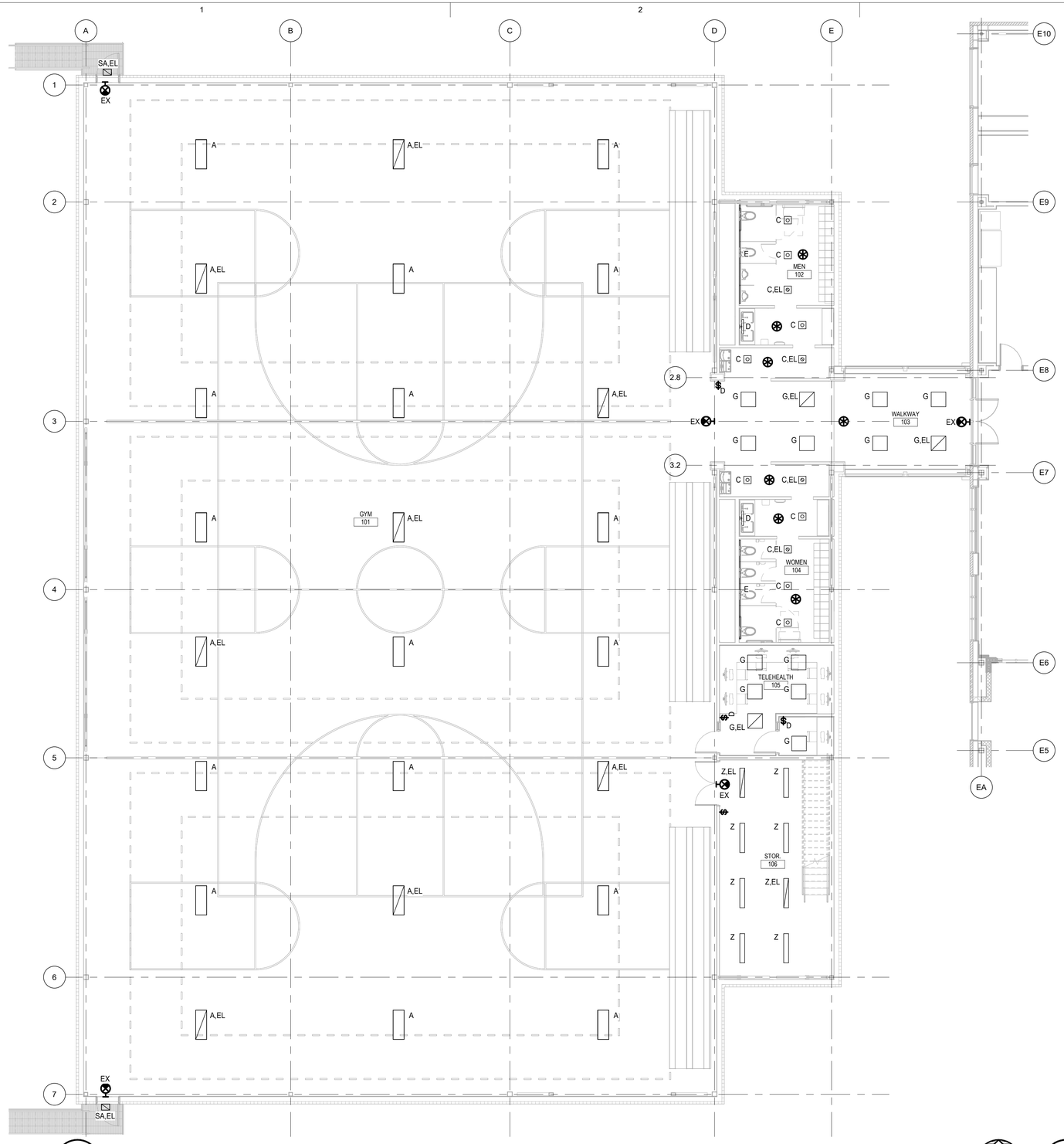
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| C. DENNIS | 01-22-2025 |
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| J. LACKEY | 24048.01 |

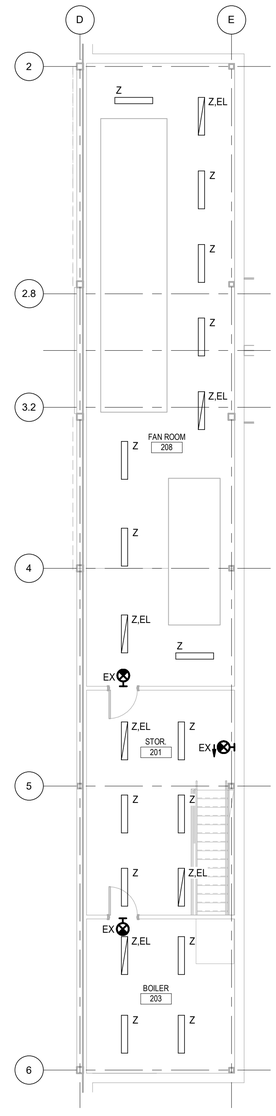
Sheet Contents
OVERALL MAIN LEVEL FLOOR PLAN - ELECTRICAL

Sheet No.
**E1.01**

Plot Date Time: 1/21/2025 5:32:02 PM

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## GENERAL NOTES

1. CONNECT LIGHTING TO PANEL S2G, UNLESS OTHERWISE NOTED.
2. CONNECT EMERGENCY LIGHTING AND EXIT SIGNS TO PANEL E2A LOCATED IN GENERATOR ROOM 126.

1 E2.01 **MAIN LEVEL FLOOR PLAN - LIGHTING**
SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

2 E2.01 **MEZZANINE LEVEL - LIGHTING**
SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

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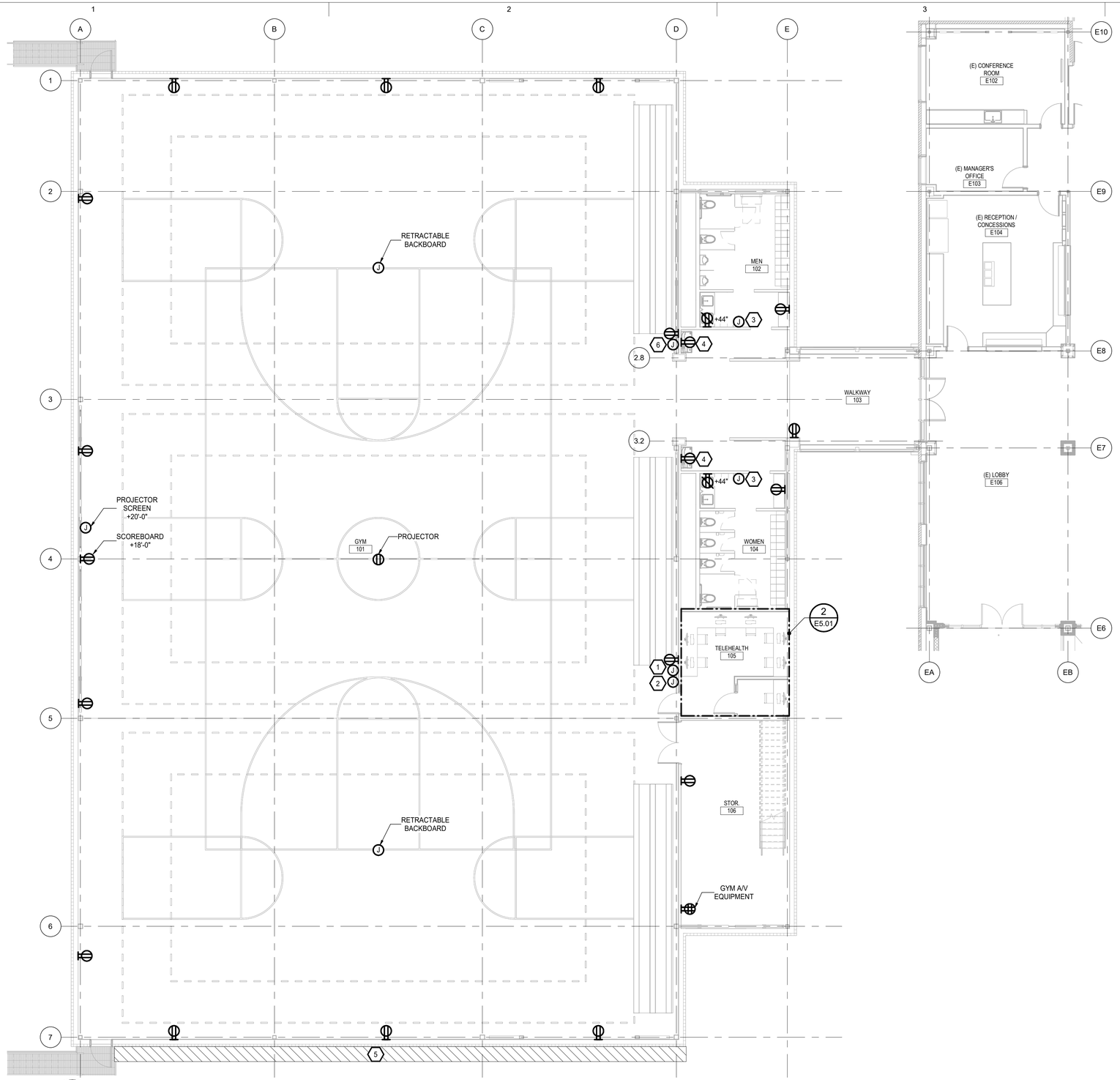
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| J. LACKEY | 01-22-2025 |
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| J. LACKEY | 24048.01 |

Sheet Contents
MAIN FLOOR PLAN AND MEZZAINE LEVEL - LIGHTING

Sheet No.
**E2.01**

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1 E3.01 **MAIN LEVEL FLOOR PLAN - POWER**
SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

## GENERAL NOTES

1. CONNECT DEVICES AND EQUIPMENT TO PANEL N2G, UNLESS OTHERWISE NOTED.

## SHEET NOTES

1. INSTALL SCOREBOARD CONTROLS FURNISHED UNDER DIVISION 11 AT THIS LOCATION. CONNECT BRANCH CIRCUIT POWER AND CONTROLS CABLING IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. PROVIDE PROJECTOR SCREEN CONTROLS AT THIS LOCATION. CONNECT BRANCH CIRCUIT POWER AND CONTROLS CABLING IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. PROVIDE 120V LINE VOLTAGE TO ELECTRIC HAND DRYER.
4. PROVIDE GFCI BREAKER IN SERVING PANEL FOR GFCI PROTECTION OF THIS RECEPTACLE.
5. AREA RESERVED FOR WALL MOUNTED SOLAR PANEL INSTALLATION. REFER TO POWER ONE-LINE ON SHEET E8.01 FOR ADDITIONAL INFORMATION.
6. INSTALL RETRACTABLE BACKBOARD CONTROLS FURNISHED UNDER DIVISION 11 AT THIS LOCATION.

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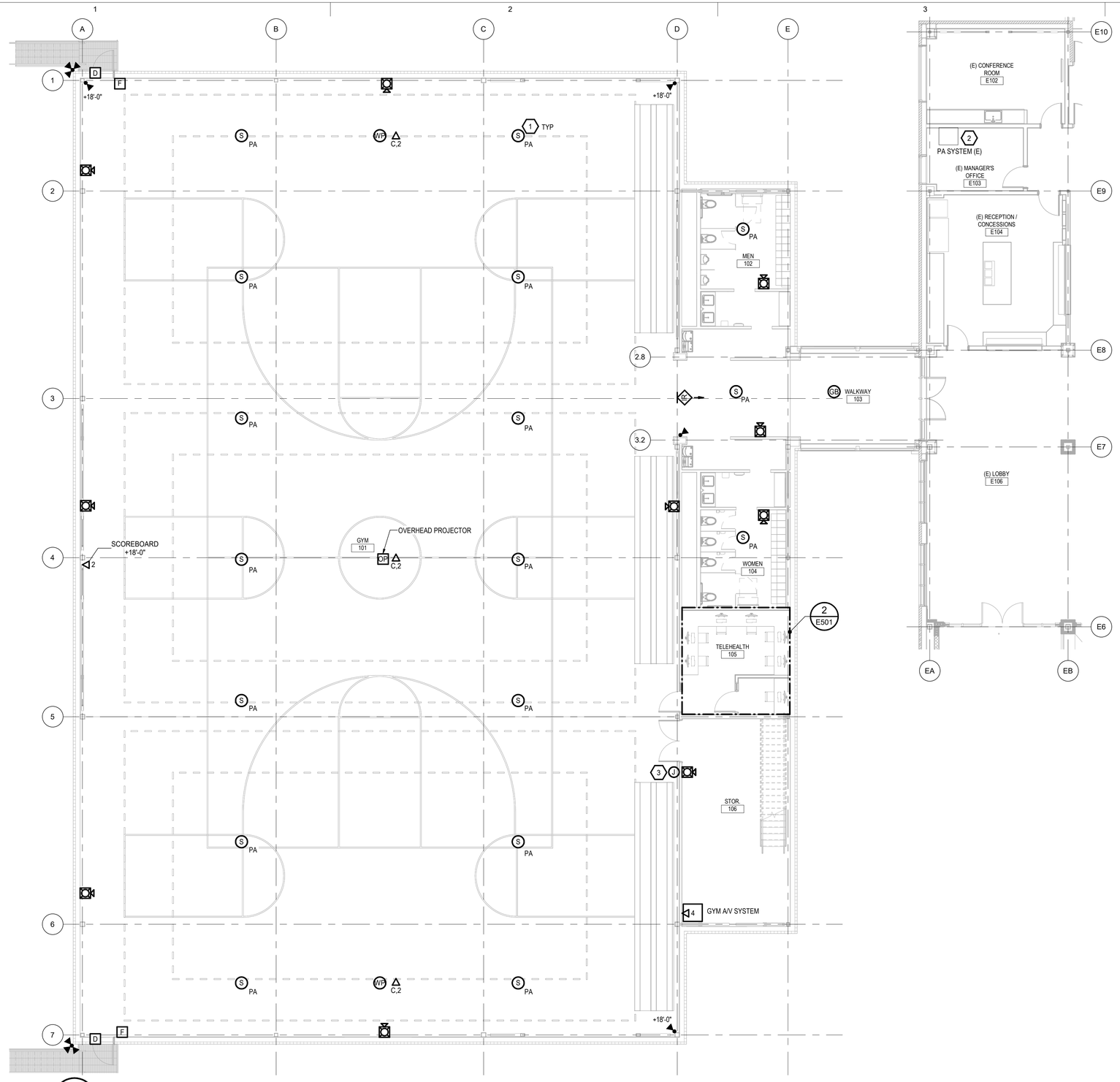
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| Drawn by J. LACKEY | Date 01-22-2025 |
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Sheet Contents
MAIN LEVEL FLOOR PLAN - POWER

Sheet No.
**E3.01**

Plot Date Time: 1/21/2025 5:32:08 PM

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## GENERAL NOTES

1. ROUTE CATEGORY 6A CABLING BACK TO TELECOM ROOM 122 IN EXISTING BUILDING. TERMINATE ON PATCH PANEL PROVIDED IN EXISTING RACK. REFER TO SHEET E501 FOR ADDITIONAL INFORMATION.
2. PROVIDE ONE CATEGORY 6A CABLE TO EACH VIDEO SURVELLIANCE CAMERA. ROUTE CABLING BACK TO TELECOM ROOM 122 IN EXISTING BUILDING. TERMINATE ON EXISTING VIDEO SURVELLIANCE PATCH PANEL.
3. CONNECT FIRE ALARM DEVICES TO EXISTING FIRE ALARM SYSTEM. EXTEND EXISTING CIRCUITS OR PROVIDE NEW CIRCUITS AS REQUIRED TO SUPPORT DEVICES IN THE GYMNASIUM EXPANSION.

## SHEET NOTES

1. PROVIDE PENDANT MOUNTED PA SPEAKERS IN GYM 101 AS SHOWN. SPEAKERS SHALL BE USED FOR BOTH PA AND A/V SYSTEMS AND WILL BE SET AS ONE ZONE. PA SYSTEM TO OVERRIDE A/V SYSTEM DURING PAGES.
2. PROVIDE ADDITIONAL AMPLIFIERS AND OTHER HEAD END EQUIPMENT AS REQUIRED TO SERVE PA SPEAKERS IN THE GYMNASIUM EXPANSION. ADD SPEAKERS IN MEN 102, WALKWAY 103 AND WOMEN 104 TO THE GENERAL AREA ZONE OF THE EXISTING SYSTEM. SPEAKERS IN GYMASIUM SHALL COMPRISE A SEPARATE ZONE.
3. PROVIDE GYM A/V CONTROLLER AND INPUT WALL PLATE AT THIS LOCATION. INPUT WALL PLATE SHALL HAVE ONE HDMI INPUT AND ONE 3.5mm MINI JACK INPUT. A/V SYSTEM SHALL OPERATE AS FOLLOWS:
   A. TURN SYSTEM ON/OFF VIA WALL CONTROLLER.
   B. SELECT SOURCE VIA WALL CONTROLLER (HDMI OR 3.5mm MINI JACK)
   C. ADJUST VOLUME VIA WALL CONTROLLER
   D. PAGING SYSTEM AUDIO SHALL OVERRIDE A/V SYSTEM AUDIO
   E. A/V SYSTEM SHALL OUTPUT SELECTED SOURCE ON GYMNASIUM PROJECTOR AND SPEAKERS.

1 E4.01 **MAIN LEVEL FLOOR PLAN - SPECIAL SYSTEMS**
SCALE: 1/8" = 1'-0"

0 4' 8' 16' 24'

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65% DESIGN DEVELOPMENT

(C) 24805

CITY OF BETHEL
# Bethel YK Fitness Center Gym Expansion
BETHEL, ALASKA

Revisions

| No. | Description | Date |
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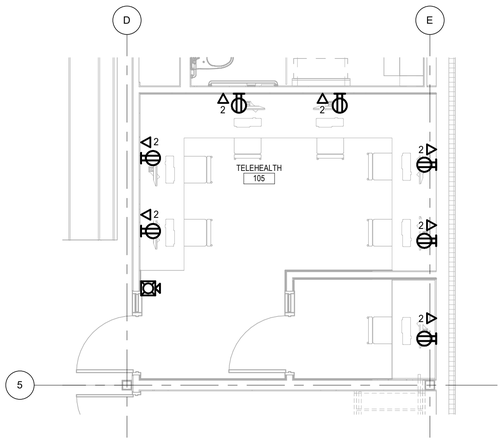
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| Drawn by J. LACKEY | Date 01-22-2025 |
| Checked J. LACKEY | Job No. 24048.01 |

Sheet Contents
MAIN LEVEL FLOOR PLAN - SPECIAL SYSTEMS

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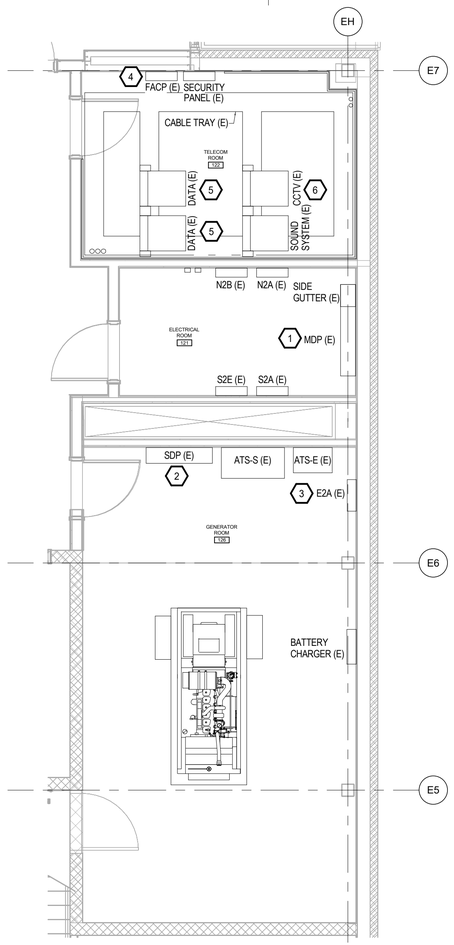
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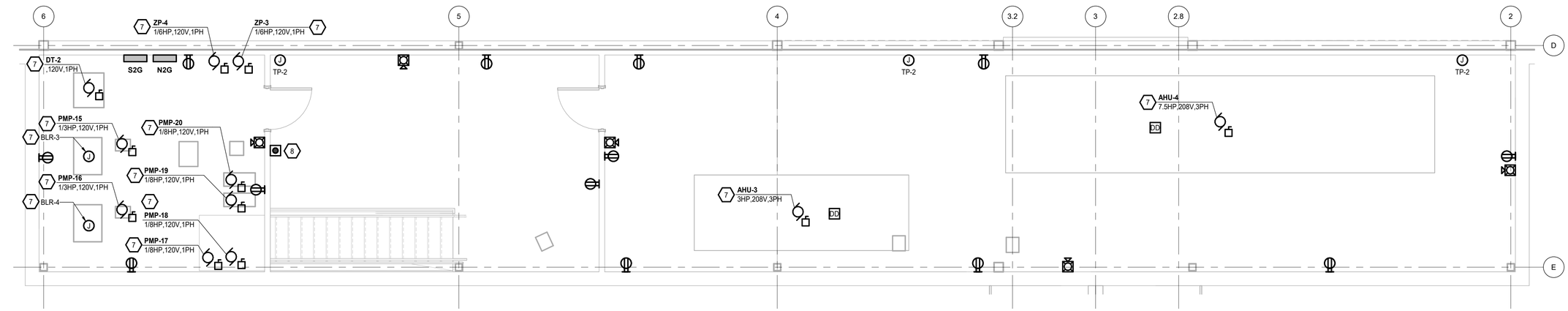

## 2 ENLARGED TELEHEALTH - ELECTRICAL
E5.01 SCALE: 1/4" = 1'-0"

0 2' 4' 8' 12'




## 3 EXISTING BUILDING - ELEC ROOM AND TELECOM ROOM
E5.01 SCALE: 1/4" = 1'-0"

0 2' 4' 8' 12'




## 1 ENLARGED MEZZ LEVEL PLAN - ELECTRICAL
E5.01 SCALE: 1/4" = 1'-0"

0 2' 4' 8' 12'

## GENERAL NOTES

1. REFER TO MECHANICAL 65% DESIGN DEVELOPMENT DOCUMENTS FOR ADDITIONAL INFORMATION ON MECHANICAL EQUIPMENT.
2. CONNECT DEVICES AND EQUIPMENT TO PANEL N2G, UNLESS OTHERWISE NOTED.

## SHEET NOTES

1. CONNECT N2G FEEDER TO PANEL MDP. REFER TO POWER ONE-LINE DIAGRAM ON SHEET E801 FOR ADDITIONAL INFORMATION.
2. CONNECT S2G FEEDER TO PANEL SDP. REFER TO POWER ONE-LINE DIAGRAM ON SHEET E801 FOR ADDITIONAL INFORMATION.
3. CONNECT GYMNASIUM EMERGENCY EGRESS LIGHTING AND EXIT SIGN CIRCUIT(S) TO PANEL E2A.
4. CONNECT FIRE ALARM DEVICES IN THE GYMNASIUM EXPANSION TO THE EXISTING FIRE ALARM SYSTEM. PROVIDE ADDITIONAL CARDS, BATTERIES, AND OTHER EQUIPMENT AS REQUIRED TO SUPPORT THE REVISED SYSTEM CONFIGURATION. REPROGRAM AND RECOMMISSION THE FIRE ALARM SYSTEM IN ACCORDANCE WITH NFPA 72 REQUIREMENTS.
5. PROVIDE A 48 PORT CATEGORY 6A PATCH PANEL IN ONE OF THE EXISTING DATA RACKS FOR GYMNASIUM EXPANSION TELECOM CABLING.
6. CONNECT VIDEO SURVELLIANCE CAMERA CABLING TO SPARE PORTS ON EXISTING CCTV RACK PATCH PANEL. ADD THE GYMNASIUM EXPANSION CAMERAS TO THE EXISTING VIDEO MANAGEMENT SOFTWARE AND NVRS. REPROGRAM AND RECOMMISSION THE SYSTEM PER MANUFACTURER'S RECOMMENDATIONS.
7. CONNECT TO PANEL S2G.
8. PROVIDE 2 POSITION PUSH-PULL, LED ILLUMINATED, RED KNOB WITH "PUSH EMERGENCY STOP" PRINTED ON KNOB, MUSHROOM TYPE BUTTON. SQUARE D MODEL #9001KR9P1LRR05H2 OR APPROVED EQUAL. FOR REMOTE SHUTDOWN OF AUTOMATICALLY FIRED BOILERS IN ACCORDANCE WITH ASME CSD-1-2009. PROVIDE FLIP UP POLYCARBONATE COVER SUCH THAT LIFTING UP ON THE COVER WILL GAIN ACCESS TO EMERGENCY SHUT DOWN BUTTON. PROVIDE ENGRAVED LABEL TO READ: "BOILER SHUTDOWN SWITCH". COORDINATE CONTROL SEQUENCE WITH DIVISION 23. FIELD COORDINATE EXACT LOCATION.

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BETHEL, ALASKA

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|---|---|
| Drawn by C. DENNIS | Date 01-22-2025 |
| Checked J. LACKEY | Job No. 24048.01 |

Sheet Contents
ENLARGED PLANS - BOILER ROOM AND MEZZANINE FAN ROOM

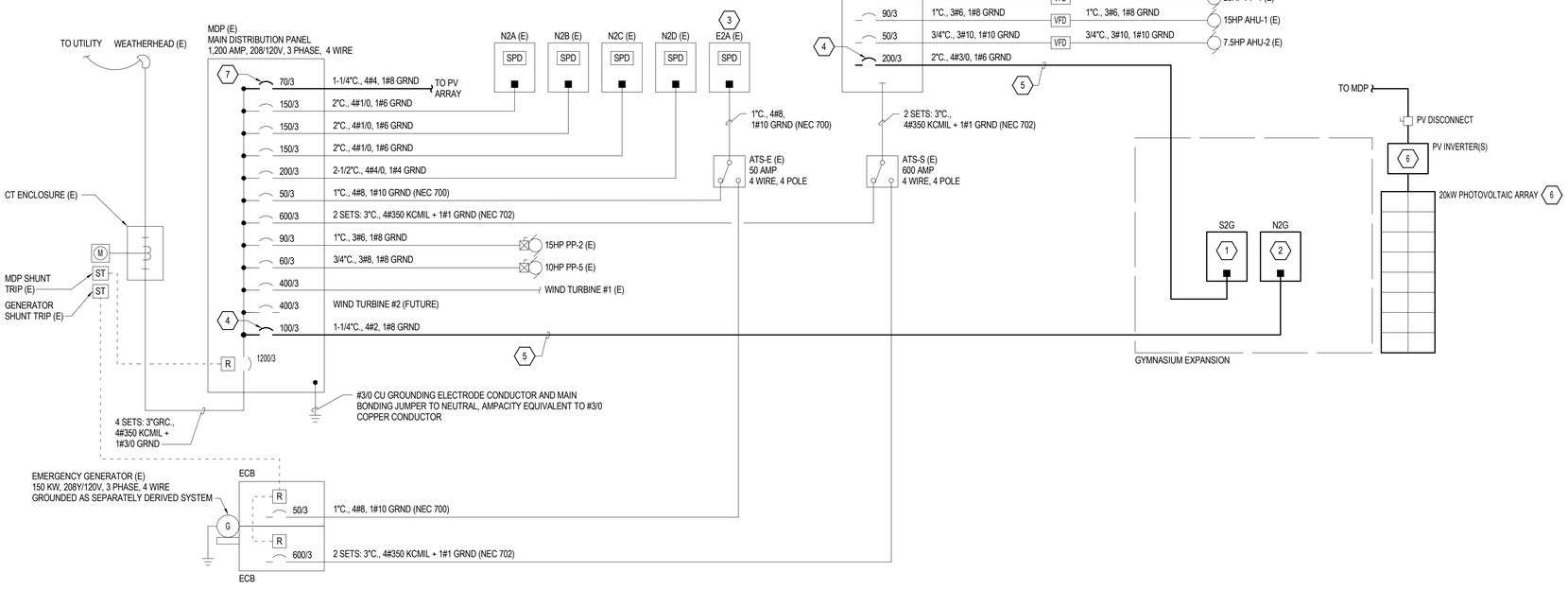
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## SHEET NOTES ⟨#⟩

1. PROVIDE A 225 AMP, 208Y/120V PANEL WITH INTEGRAL SURGE PROTECTIVE DEVICE TO SERVE MECHANICAL AND SELECT LIGHTING LOADS IN THE GYMNASIUM EXPANSION.
2. PROVIDE A 100 AMP, 208Y/120V PANEL WITH INTEGRAL SURGE PROTECTIVE DEVICE TO SERVE GENERAL RECEPTACLE AND LIGHTING LOADS IN THE GYMNASIUM EXPANSION.
3. CONNECT EMERGENCY EGRESS LIGHTING AND EXIT SIGNS IN THE GYMNASIUM EXPANSION TO PANEL E2A.
4. PROVIDE CIRCUIT BREAKER IN EXISTING PANEL. BREAKER SHALL BE LISTED FOR INSTALLATION IN EXISTING PANEL.
5. PROVIDE FEEDER AS SHOWN. ROUTE FEEDER IN UNDERFLOOR SPACE BETWEEN MAIN ELECTRICAL ROOM AND GYMNASIUM EXPANSION BOILER ROOM.
6. PROVIDE PHOTOVOLTAIC SYSTEM IN ACCORDANCE WITH SPECIFICATION SECTION 26 31 00. COORDINATE PHOTOVOLTAIC SYSTEM FEEDER, DISCONNECT, AND INPUT BREAKER SIZE WITH PHOTOVOLTAIC SYSTEM PROVIDER. REFER TO STRUCTURAL FOR MOUNTING LOCATION.
7. MOUNT PV SYSTEM INPUT BREAKER ON OPPOSITE SIDE OF MDP BUS FROM THE MAIN BREAKER PER NEC ARTICLE 705.




# 1 POWER ONE-LINE DIAGRAM

E801 SCALE: NONE

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| Checked J. LACKEY | Job No. 24048.01 |

Sheet Contents
POWER ONE-LINE DIAGRAM

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# BETHEL FITNESS CENTER GYM EXPANSION

65% DESIGN DEVELOPMENT - SPECIFICATIONS

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| **20 05 53** | **MECHANICAL IDENTIFICATION** |
| **20 07 00** | **MECHANICAL INSULATION** |

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| | |
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**23 37 00 AIR OUTLETS AND INLETS**
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**SECTION 01 91 00**
**COMMISSIONING**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Commissioning objectives and scope.
2. Definitions of commissioning team members.
3. Definitions of commissioning terminology.
4. Description of the commissioning process.
5. Sample Commissioning Master Equipment and Systems Log.
6. Sample PC/FT checklists.

B. Related Sections:

1. 20 00 00 - Mechanical General Requirements
2. 20 05 13 - Common Motor Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Mechanical Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 07 00 - Mechanical Insulation
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8. 22 11 00 - Domestic Water Piping and Specialties
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19. 23 51 00 - Breechings, Chimneys and Stacks
20. 23 52 23 - Cast Iron Boilers and Accessories
21. 23 73 23 - Central Air Handling Units
22. 23 82 00 - Terminal Heating and Cooling Units
23. 23 83 16 - Radiant Floor Heating Equipment
24. 25 30 00 - Building Automation System Field Devices
25. 25 40 00 - Variable Speed Drives
26. 25 50 00 - Building Automation System
27. 25 90 00 - Sequence of Operations

## 1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 1.03 REFERENCES

A. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):

1. Standard 202-2018 - Commissioning Process for Buildings and Systems.
2. Guideline 0-2013 - The Commissioning Process.
3. Guideline 1.1 - 2007 - The HVAC Commissioning Process.

B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) HVAC Systems Commissioning Manual.

## 1.04 SCOPE

A. Provide comprehensive (Level 2) commissioning, as defined by reference A, for the systems, subsystems, and equipment as identified in Division 11, Divisions 20, 21, 22, 23, 25, and Divisions 26, 27, and 28 using the commissioning process outlined by this section.

B. Complete the following commissioning objectives to the satisfaction of the Commissioning Authority.

1. Furnish, install, adjust, operate, and test systems, subsystems, and equipment to meet the design intent of the Contract Documents.
2. Document the installation, starting, and testing of the systems, subsystems, and equipment.
3. Provide complete and annotated installation, operation, and maintenance manuals, and red line drawings which accurately reflect the actual installed systems, subsystems, and equipment configurations.
4. Provide complete project record documents which accurately reflect the actual installation of systems, sub systems and equipment.
5. Formally train the Contracting Agency's maintenance staff such that they are made familiar with the operation and maintenance requirements of the systems, subsystems and equipment through effective training.
6. Document the maintenance staff training.
7. Coordinate the commissioning process with all parties involved in the project in order to maintain project schedule, documentation, and quality control.
8. Coordinate with contractors, sub-contractors, and equipment manufacturer's authorized representative, to provide the appropriate field and office support for commissioning activities, including but not limited to, the following anticipated support:
    a. Building Automation System sub-contractor shall provide support for obtaining trend BAS data and information as requested by the CA or Contracting Agency.
    b. Building Automation System sub-contractor shall provide field support for commissioning activities during the CA's verification site visit.
    c. Mechanical and electrical contractors and sub-contractors shall provide field support for commissioning activities during the CA's verification site visit.
    d. TAB contractor shall provide field support for commissioning activities, including spot-checking of TAB report values and verification of room pressure relationships during the CA's verification site visit.
    e. Equipment manufacturer's authorized representative for start-up and adjustment.

9. Complete commissioning activities including items identified by CA and Contracting Agency during FC prior to project closeout.

**1.05 DEFINITIONS**

A. Commissioning Authority (CA): The person(s) or company responsible, on the Contracting Agency's behalf, for verifying that the commissioning process is properly executed and completed in accordance with the Contract Documents. The CA reviews and approves the scope, planning, scheduling, execution, documentation, training and final completion of the overall commissioning process. The CA works directly for the Contracting Agency's Project Manager.

B. Contractor's Commissioning Representative (CCR): The Contractor's representative is responsible for planning, scheduling, managing, executing and documenting the required commissioning activities. The CCR must be experienced in basic design, operation, installation and testing of HVAC and electrical systems and must have strong administrative, planning, organizational and communication skills. The primary duty of the CCR is to oversee the commissioning process. The CA approves the selection of the CCR.

C. Contractors Commissioning Team: Members of the Contractor's team responsible for commissioning activities. These team members include, but are not limited to:

1. The CCR and designated support staff.
2. Mechanical and electrical coordinators.
3. Subcontractors.
4. Sub-subcontractors.
5. Product and System Vendors.
6. Manufacturer's Representatives.

D. Commissioning Master Equipment and System Log: A tabulated list of equipment and systems that are required to be commissioned as identified in Division 11, Divisions 20, 21, 22, 23, 25, and Divisions 26, 27 and 28 of the specifications. A sample log is provided in Part 3 of this section.

E. Pre-Functional Installation Checklist (PC): A list of equipment inspections and elementary component tests required for verification of proper installation of equipment. Pre-functional checklist items include static inspections and procedures to prepare the equipment or system for initial operation (e.g., supports, hangers, and seismic restraint installed, belt tension, fluid levels, labels and tags affixed, sensors and gages correctly located and calibrated, etc.) and simple testing of component or system function, (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). Pre-functional checklists augment and are combined with the manufacturer's start-up checklist. The CCR field verifies that the pre-functional checks are completed and processed. The Contracting Agency and CA may elect to witness the execution of selected parts of the PC.

F. Functional Performance Test (FT): Systematic testing of the dynamic function and operation of equipment and systems using direct observation and monitoring equipment methods. Functional testing includes dynamic testing of systems under full operation, including interaction with related systems (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through the control system's sequences of operation and components are verified to be responding as stated in the sequences. Functional Performance Tests are performed after PCs, equipment startups, and Testing, Adjusting and Balancing (TAB) are complete. The CCR field verifies that the functional performance tests are completed and processed.

G. Functional Performance Test Checklist (FC): A list of performance tests required to document the proper performance of the dynamic function and operation of equipment and systems using direct observation and monitoring equipment methods. The CCR and the Contracting Agency field verify that the FTs take place. The CA will witness the execution of selected parts of the FT. The Contracting Agency may elect to witness the execution of selected parts of the FT. The CCR field verifies that the functional performance test checklists are completed and processed

H. Deferred Functional Tests: FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed at an earlier date. Only those functional tests pre-approved by the Contracting Agency and the CA may be deferred.

I. Functional Completion: Completion of the commissioning activities required by the Contract Documents prior to Substantial Completion, as defined in Section 00 73 00 - Supplemental General Conditions of the Construction Contract.

J. Phased Commissioning: Commissioning that is completed in pre-approved phases (by floors or areas, for example) due to the size of the systems or other scheduling issues, in order minimize total construction time.

**1.06 COMMISSIONING PROCESS**

A. Commissioning Master Equipment and System Log:

1. Within 90 days after receipt of conformed documents, the CA will provide the Commissioning Master Equipment and System Log to the CCR.
2. The CA will advise the CCR regarding any reorganization and/or reformatting of the Commissioning Master Equipment and System Log to support construction.

B. Construction Schedule:

1. The CCR shall incorporate the items from the Commissioning Master Equipment and System Log into the Construction Schedule.
2. Use of Phased Commissioning shall be pre-approved by the CA and Contracting Agency.
3. See Section 01 23 13 - Work Schedules and Reports.

C. Schedule of Values:

1. The CCR shall incorporate the tasks from the Commissioning Master Equipment and System Log into the Schedule of Values.
2. See Section 01 29 73 - Schedule of Values.

D. Commissioning Meetings:

1. The CCR shall plan, schedule, coordinate, and attend the commissioning meetings. The CCR shall record, maintain, and distribute the minutes for each meeting. The CA will conduct each meeting.
2. Within 30 days after award of the Contract, hold an initial commissioning meeting at the job site. All members of the commissioning team shall be present at the meeting either in person or by teleconference / videoconference. The purpose of the meeting is to:
    a. Identify the commissioning team members and provide contact information.
    b. Provide an overview of the commissioning process.
    c. Discuss administrative requirements, responsibilities and scheduling.
    d. Discuss the status of the Commissioning Master Equipment and System Log.
3. Hold a regularly scheduled commissioning status videoconference meeting every month. The CA and the Contracting Agency will be present at each meeting. Additional

members of the commissioning team shall attend these meetings as directed by the CCR.

E. Installation, Operation and Maintenance Data:

1. Upon approval of submittals, the CCR shall oversee the timely preparation and submission of product installation, operation and maintenance data, pre-functional installation examination checklists and functional performance test checklists in accordance with the Construction Schedule and Section 01 33 00 – Submittals.
2. The Contracting Agency will approve the installation, operation and maintenance data and checklists for conformance to the design intent.
3. The CA will provide final approval for installation, operation and maintenance data and associated checklists for completeness and suitability to support commissioning activities.
4. See 01 78 23 - Operation and Maintenance Data.

F. Commissioning Binders:

1. The CCR shall maintain the master copy of the approved installation, operation and maintenance data and checklists. Neatly arrange and label the data by specification section in the commissioning binders. Include a copy of the Commissioning Master Equipment and System Log at the front of the binders. Annotate this log to accurately reflect the status of completeness.
2. The CA will periodically review the master commissioning binders.
3. The CA will maintain a second copy of the approved installation, operation and maintenance data and the checklists. This copy will serve as the formal O&M manual submittal to the Contracting Agency.

G. Equipment Installation:

1. The CCR provides written approval prior to the start of installation for each item listed on the Commissioning Master Equipment and System Log. Equipment shall not be installed unless approved installation, operation and maintenance data, and PC and FC forms are on file in the master commissioning binders.
2. The CCR updates the Construction Schedule to indicate actual installation start date.
3. The installer obtains a copy of the installation information and PC from the CCR. The equipment is installed using a copy of the approved installation instructions and the associated PC.
4. The installer signs off each step of the PC and submits the completed PC to the subcontractor responsible for the work.
5. The subcontractor reviews the PC, physically verifies that the equipment is properly installed and signs the subcontractor review block of the PC.
6. The CCR reviews the PC provided by the subcontractor, observes the work and signs the CCR review block.
7. The CCR files the completed PC in the commissioning binder and signs off the Commissioning Master Equipment and System Log to indicate the equipment is installed.
8. The CCR updates the Construction Schedule to indicate that the equipment installation is complete.
9. The CCR forwards a copy of the completed PC to the CA.
10. The CA files the PC in the CA copy of the commissioning binders.

H. Training Material:

1. Upon approval of installation, operation and maintenance data and checklists, the CCR shall oversee the formulation of training topics and associated syllabi and training material to support the items on the Commissioning Master Equipment and System Log.
2. The Contracting Agency will approve training topics for conformance to the design intent.
3. The CA will provide final approval of training topics for suitability to support commissioning.
4. The CCR shall maintain the master copy of the training syllabi and training material. Neatly arrange and label by specification section and/or system the information in the training binders. Provide a table of contents which lists the training topics and current status of training material approval. The CA will periodically review the master training binders.
5. The CCR shall update the Construction Schedule to indicate status of training material approval.
6. The CA will maintain a second copy of the approved training material. This copy will serve as the formal training documentation submittal to the Contracting Agency.

I. Functional Performance Testing:

1. The CCR provides written approval prior to the start of functional testing for each item listed on the Commissioning Master Equipment and System Log. Functional testing of equipment is not allowed unless the approved PC has been completed and is on file in the master commissioning binder.
2. The CCR updates the Construction Schedule to indicate the actual functional testing start date.
3. The equipment or system is functionally tested using a copy of the approved installation, operation and maintenance data and FC.
4. The operator obtains a copy of the approved installation, operation and maintenance data and FC from the CCR. The operator signs off each step of the FC and forwards the completed FC form to the applicable subcontractor responsible for the work.
5. The subcontractor reviews the FC, physically verifies proper equipment operation with the operator and signs the subcontractor review block of the FC and informs the CCR that the equipment FC is complete and the equipment is ready for final checkout.
6. The CCR informs the CA that the equipment is ready for final checkout and provides a date and time for a site visit observation of the operating equipment (48 hours minimum notification time is required).
7. The CA will notify the Contracting Agency and arrangements will be made to include maintenance staff personnel at final equipment checkouts as much as possible to support effective field training.
8. Upon satisfactory completion of the final checkout, the CCR and CA shall sign appropriate review blocks of the FC.
9. The CCR files the completed FC in the commissioning binder and signs off the Commissioning Master Equipment and System Log to indicate that equipment functional tests for that item are complete.
10. The CCR updates the Construction Schedule to indicate that the equipment functional testing is complete.

J. Training:

1. Upon approval of training topics and training material and the actual installation status of equipment, the CCR shall review and modify the construction schedule as necessary to

maintain an up-to-date training schedule. Training shall not be given on a piece of equipment until functional testing for the equipment is satisfactory completed and the completed FC is on record in the commissioning binder.

2. The CA will review and approve the training schedule.
3. The CCR shall issue a training notice 2 weeks prior to the scheduled training session. Disseminate the notice via e-mail, fax or other method as approved by the CA.
4. Include the following information in the notice:
   a. Training topic.
   b. Instructor name and contact telephone number and e-mail address.
   c. Date, time, location, duration.
5. The CCR shall monitor the training topics, verify that the training occurs and effectively covers all training topics indicated on the syllabi.
6. The CCR shall verify that a written training record is completed for each topic which includes the following:
   a. Training topic.
   b. Date and time of training.
   c. Instructor name, title and contact information.
   d. Attendance list.
   e. Signature of instructor indicating that each item identified in the syllabi was effectively covered during the training session.
   f. CCR signature indicating that the training was effective.
7. The CCR shall forward a copy of the completed training report to the CA for review and approval.
8. The CA will approve and file the completed training record in the CA copy of the training binders. The CA may elect to observe any or all training sessions to verify effectiveness.

K. Record Drawings:

1. The CCR shall oversee the maintenance of master “as-built” mark-ups of the Contract Documents as the work progresses. To accurately reflect actual installation conditions, document addendum items, field changes, and installation modifications on the “as-built” mark-ups. Update the master “as-built” mark-ups a minimum of once a week.
2. The Contracting Agency will review the “as-built” mark-ups during each site visit and provide a specific comment on each field report indicating the status of “as-built” drawings with regard to completeness and design intent.
3. Upon completion of construction, the “as-built” drawings shall be drafted using AutoCad to produce the project Record Drawings.
4. The CCR shall verify that the completed Record Drawings accurately reflect the constructed project and forward to the CA for final approval.
5. The CA will review the Record Drawings for final approval.
6. See 01 78 39 – Project Record Documents.

**1.07 SUBMITTALS VERIFY DESIRED SUBMITTALS FOR EACH PROJECT**

A. Commissioning Reports:

1. Submit a written Cx report which documents the findings of the preliminary walk-through. Include a punch list of discrepancies, corrective actions required and estimated complete date.

2. Submit a second written report which confirms that the preliminary walk-through discrepancies have been satisfactorily corrected.
3. Submit a written Cx report which documents the field Cx, training and project documentation effort oversight of the testing, adjusting and balancing effort, the review of installation, operation and maintenance manuals have been completed.

B. Commissioning Certificate:
1. Submit the complete the Cx certificate provided at the end of this specification section.
2. Persons signing the certificate must be in responsible charge for the portion of work completed and signing authority for the firm indicated.

**PART 2 PRODUCTS – NOT USED**

**PART 3 EXECUTION**

**3.01 COMMISSIONING MASTER EQUIPMENT AND SYSTEMS LOG (SAMPLE)**

A. The following sample Commissioning Master Equipment and Systems Log is provided to show general format only and does not include all the equipment, systems, and subsystems to be commissioned. Refer to Division 11, Division 13, Divisions 20, 21, 22, 23, 25, and Divisions 26, 27, and 28 for specific systems, subsystems, and equipment to be commissioned.

**3.02 COMMISSIONING MASTER EQUIPMENT AND SYSTEMS LIST**

| PRODUCTS | System/Equipment Tag | System/Equipment Description | Equipment Submittal Approved | I/O&M Approved | PC and FT Checklists Approved | Training Syllabus Approved | PC Completed | FT Completed | Training Completed |
|---|---|---|---|---|---|---|---|---|---|
| **Divisions 20, 21, 22, 23, 25 - Mechanical** | | | | | | | | | |
| 1 | BLR-1 thru BLR-6 | Central Heating Plant | | | | | | | |
| 2 | PMP-1 thru PMP-12<br>AS-1/ET-1/2 | Central Heating System | | | | | | | |
| 3 | HX-1<br>ET-3/GM-1<br>PMP-19/20 | Secondary Glycol Heating Loop Penthouse 3001 | | | | | | | |
| 4 | HX-2<br>ET-6/GM-3<br>PMP-28/29 | Secondary Glycol Heating Loop Penthouse 3101 | | | | | | | |
| 5 | CH-1 | Central Cooling Plant | | | | | | | |
| 6 | PMP-21 thru PMP-24<br>ET-4/GM-2<br>BT-1 | Central Cooling System | | | | | | | |

| PRODUCTS | System/Equipment Tag | System/Equipment Description | Equipment Submittal Approved | I/O&M Approved | PC and FT Checklists Approved | Training Syllabus Approved | PC Completed | FT Completed | Training Completed |
|---|---|---|---|---|---|---|---|---|---|
| 7 | CH-2 | Central Cooling Plant | | | | | | | |
| 8 | PMP-30 thru PMP-33<br>ET-7/GM-4<br>BT-2 | Central Cooling System | | | | | | | |
| 9 | PMP-38/39<br>PMP-40/ 41/42 | Radiant Floor Heating System | | | | | | | |
| 10 | AHU/RFU-1 | Central Ventilation System | | | | | | | |
| 11 | AHU/EFU-2 | Central Ventilation System | | | | | | | |
| 49 | WH-1/ET-11<br>PMP-13/44 | Water Heating System (Domestic) | | | | | | | |
| 53 | PMP-43A/B/C<br>ET-10 | Domestic Water Booster System | | | | | | | |
| 54 | FP-1/JP-1 | Fire Pump | | | | | | | |
| 55 | PMP-48 | Elevator Sump Pump | | | | | | | |
| 56 | VAV-101 thru VAV-135 | VAV Terminals AHU-1 | | | | | | | |
| 57 | VAV-201 thru VAV-209 | VAV Terminals AHU-2 | | | | | | | |
| 58 | VAV-301 thru VAV-343 | VAV Terminals AHU-3 | | | | | | | |
| 59 | VAV-401 thru VAV-420 | VAV Terminals AHU-4 | | | | | | | |
| 60 | VAV-501 thru VAV-527 | VAV Terminals AHU-5 | | | | | | | |
| 64 | UH-1 thru UH-20 | Unit Heaters | | | | | | | |
| 65 | CUH-1 thru CUH-6 | Cabinet Unit Heaters | | | | | | | |
| 67 | FT-1 thru FT-5 | Fin Tube | | | | | | | |

| PRODUCTS | System/Equipment Tag | System/Equipment Description | Equipment Submittal Approved | I/O&M Approved | PC and FT Checklists Approved | Training Syllabus Approved | PC Completed | FT Completed | Training Completed |
|---|---|---|---|---|---|---|---|---|---|
| 68 | ACU-1/2/3 - DC-1 PMP-25/26 ET-5 | Air-Conditioning System (Telecom) | | | | | | | |
| 70 | WS-1 | Water Softener | | | | | | | |

| **Divisions 26, 27 and 28 - Electrical** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 72 | WC | Wire and Cable (Megger Test Feeder Cables) | | | | | | | |
| 73 | ATSS | Auto Transfer Switch - Standby | | | | | | | |
| 74 | ATSE | Auto Transfer Switch - Emergency | | | | | | | |
| 75 | DS | Distribution Switchboards | | | | | | | |
| 76 | GS | Grounding Systems – Power/Telecom | | | | | | | |
| 77 | ST | Secondary Transformers | | | | | | | |
| 78 | SP | Switchboards and Panel boards | | | | | | | |
| 79 | TVSS | Transient Voltage Surge Suppression | | | | | | | |
| 80 | OPD | Over current Protective Devices | | | | | | | |
| 81 | MS | Motor Starters | | | | | | | |
| 82 | LF | Lighting Fixtures | | | | | | | |
| 83 | LC | Lighting Control Systems | | | | | | | |
| 84 | FA | Fire Alarm System | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 85 | CRWS | Computer Raceway and Wiring Systems | | | | | | | |
| 86 | SA | Security Alarm | | | | | | | |
| 87 | CCTV | CCTV | | | | | | | |
| 88 | PM | Power Monitoring | | | | | | | |
| 89 | AV | Audio/Video Systems | | | | | | | |
| 90 | PA | PA System | | | | | | | |

**3.03 COMMISSIONING PRE-FUCTIONAL INSTALLATION (PC) AND FUNCTIONAL PERFORMANCE TEST (FT) CHECKLISTS (SAMPLES)**

A. The following sample commissioning checklists are provide to show general format only and do not include all the equipment and systems to be commissioned. Refer to Division 11, Divisions 20, 21, 22, 23, 25, and Divisions 26, 27 and 28 for specific systems, subsystems and equipment to be commissioned.

## Pre-Functional Installation Checklist (PC)
## Air Handling Unit

| | | | |
|---|---|---|---|
| PROJECT: | ____AVCP Buildiong __ | UNIT NO: | _____ |
| LOCATION: | ____Bethel, AK_____ | SERVICE: | _____ |
| MANUFACTURER: | _____ | MODEL: | _____ |

| ITEM | OK | COMMENT |
|---|---|---|
| PRE-START-UP INSPECTION | | |
| Mountings Checked (Shipping Bolts Removed) | | |
| Vibration Isolators Installed | | |
| Seismic Restraints Installed | | |
| Equipment Guards Installed | | |
| Pulleys Aligned and Belt Tension Correct | | |
| Plenums Clear and Free of Loose Material | | |
| Fans Rotate Freely | | |
| Fans, Motors and Linkages Lubricated | | |
| Fire & Balance Dampers Positioned | | |
| Temporary Start-up Filters Installed | | |
| Electrical Connections Completed | | |
| Disconnect Switch Installed | | |
| Overload Heaters in Place (Sized Correctly) | | |
| Heating Coil Clean and Clear – Piping Complete | | |
| Cooling Coil Clean and Clear – Piping Complete | | |
| Condensate Drains Clear | | |
| Humidifier Section Installation Completed | | |
| Safety Controls Operational | | |
| Building & Fan Room Clean For Start-up | | |
| Duct Cleaning Completed | | |
| Control System Completed (End to End Checks) | | |

COMMENTS:_____
_____
_____

| | | | |
|---|---|---|---|
| Review (Foreman): | _____ | DATE: | _____ |
| Review (CCR): | _____ | DATE: | _____ |
| Approved (CA): | _____ | DATE: | _____ |

## Functional Performance Checklist (FT)
## Air Handling Unit

| | | | |
|---|---|---|---|
| PROJECT: | ____AVCP Building __ | UNIT NO: | _____ |
| LOCATION: | ____Bethel, AK_____ | SERVICE: | _____ |
| MANUFACTURER: | _____ | MODEL: | _____ |

| ITEM | OK | COMMENT |
|---|---|---|
| START-UP INSPECTION | | |
| Start-up By Manufacturer's Representative | | |
| Fan Rotation Correct | | |
| Electrical Interlocks Verified | | |
| Fan Status Indicators Verified (Local / Remote) | | |
| Freeze Protection Operational | | |
| Local Air Leakage Acceptable | | |
| Vibration & Noise Level Acceptable | | |
| Motor Amps – Rated _____Actual _____ | | |
| Motor Volts – Rated _____Actual _____ | | |
| Final Operating Filters Installed | | |

COMMENTS:
_____
_____
_____

| | | | |
|---|---|---|---|
| Functional Testing By: | _____ | DATE: | _____ |
| Review (Foreman): | _____ | DATE: | _____ |
| Approved (CCR): | _____ | DATE: | _____ |
| Approved (CA): | _____ | DATE: | _____ |

**END OF SECTION**

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## SECTION 02 03 42
## REMOVAL AND SALVAGE OF PERIOD CONSTRUCTION MATERIALS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

A. Work includes deconstruction and salvage of identified items and materials and removal of rubbish and debris.

#### 1.02 RELATED REQUIREMENTS

A. Section 02 41 00 - Demolition: Selective demolition of nonhistoric building elements for alteration purposes.

#### 1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

#### 1.04 FIELD CONDITIONS

A. Comply with applicable requirements of NFPA 241.

B. Dust Control: Control dust resulting from removal, salvage, and demolition operations from spreading to occupied portions of the project and creating a nuisance in surrounding area. Use of water to control dust is not permitted when it will result in or create:
   1. Damage to existing building materials.
   2. Hazardous or objectionable conditions such as ice, flooding, or pollution.

C. Protection of Existing Historic Property: Before beginning removal, salvage, or demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Take necessary precautions to avoid damage to existing items to remain in place, be reused, or remain Owner's property. Repair or restore to original condition items damaged by Contractor, using approved means, methods, and techniques. Replace items that cannot be successfully repaired or restored to original condition.

### PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION

#### 3.01 GENERAL PROCEDURES

A. Drawings indicating existing construction, building services, and site utilities are based on casual field observation and existing record documents only.
   1. Report discrepancies to Architect before disturbing existing historic elements.
   2. Beginning of work constitutes acceptance of existing conditions that are apparent upon examination at that time.

B. Separate spaces in which removals and salvage operations are conducted from occupied spaces.
   1. Provide, erect, and maintain temporary dustproof partitions; see Section 01 50 00.

#### 3.02 ENVIRONMENTAL CONTROLS

A. Comply with federal, state, and local regulations pertaining to water, air, solid waste, recycling, chemical waste, sanitary waste, sediment, and noise pollution.

#### 3.03 ITEMS TO BE SALVAGED

A. General: Salvage elements and components to the maximum extent possible. Maintain a chain of custody of salvaged materials, including the condition of such materials before and after salvage operations.

### 3.04 MATERIALS TO BE REMOVED

A. Remove existing nonhistoric elements as indicated and as required to allow direct access to period construction elements indicated to be restored or salvaged for reuse.
   1. Remove items indicated on drawings.

### 3.05 MATERIALS TO BE RECYCLED

A. Recycle removed nonhistoric materials to the maximum extent possible. Remove recyclable materials by hand wherever possible.

B. Recycle items indicated on drawings.

### 3.06 CLEANING

A. Upon completion of work, clean dust, dirt, and debris caused by salvage and demolition operations from portions of existing structure to remain and adjacent areas. Remove and transport debris and rubbish in a manner that prevents spillage on streets or adjacent areas. Obey local regulations regarding hauling and disposal.

**END OF SECTION 02 03 42**

# SECTION 03 30 00
# CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Concrete Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.

b. Construction joints, control joints, isolation joints, and joint-filler strips.

c. Semirigid joint fillers.

d. Vapor-retarder installation.

e. Anchor rod and anchorage device installation tolerances.

f. Cold and hot weather concreting procedures.

g. Concrete finishes and finishing.

h. Curing procedures.

i. Methods for achieving specified floor and slab flatness and levelness.

j. Floor and slab flatness and levelness measurements.

k. Concrete repair procedures.

l. Concrete protection.

m. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)

n. Protection of field cured field test cylinders.

1.04 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Aggregates.
3. Admixtures:
    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
4. Vapor retarders.
5. Floor and slab treatments.
6. Liquid floor treatments.
7. Curing materials.
    a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
8. Joint fillers.
9. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Maximum w/cm.
4. Slump limit.
5. Air content.
6. Nominal maximum aggregate size.
7. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
8. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
9. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Steel Reinforcing: Submit shop drawings showing size, location, and detailing of all required steel reinforcing.
2. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Joint-filler strips.
9. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Aggregates.
3. Admixtures:

a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Preconstruction Test Reports: For each mix design.

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.08 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

3. Do not use frozen materials or materials containing ice or snow.

4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.

5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

**PART 2 - PRODUCTS**

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
   c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
2. Maximum Coarse-Aggregate Size: 1 inch nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
7. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.
8. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of

forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

9. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).

    a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRD C48 at a hydraulic pressure of 200 psi for 14 days.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable or complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4

2.03 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

    a. Ambient Temperature Below 50 deg F: Black.

    b. Ambient Temperature between 50 deg F and 85 deg F: Any color.

    c. Ambient Temperature Above 85 deg F: White.

C. Curing Paper: 8-feet-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

D. Water: Potable or complying with ASTM C1602/C1602M.

2.05 RELATED MATERIALS

A. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

2.06 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.07 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and concrete with a w/cm below 0.50.
4. Use permeability-reducing admixture in concrete mixtures where indicated.

2.08 CONCRETE MIXTURES

A. Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 F0 S0 W0 C0.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: As indicated.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Slump Flow Limit: 22 inches, plus or minus 1.5 inches.
6. Air Content:
   a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.
   b. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

B. Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0 S0 W1 C0.

2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: As indicated.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Slump Flow Limit: 22 inches, plus or minus 1.5 inches.
6. Air Content:
    a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

2.09 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.03 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.04 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.

2. Face laps away from exposed direction of concrete pour.

3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.

4. Lap joints 6 inches and seal with manufacturer's recommended tape.

5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.

6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.

7. Protect vapor retarder during placement of reinforcement and concrete.

a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.05 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.

2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.

2. Deposit concrete to avoid segregation.

3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.

b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.

2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

3. Maintain reinforcement in position on chairs during concrete placement.

4. Screed slab surfaces with a straightedge and strike off to correct elevations.

5. Level concrete, cut high areas, and fill low areas.

6. Slope surfaces uniformly to drains where required.

7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.

8. Do not further disturb slab surfaces before starting finishing operations.

3.07 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
   a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
   b. Remove projections larger than 1 inch.
   c. Tie holes do not require patching.
   d. Surface Tolerance: ACI 117 Class D.
   e. Apply to concrete surfaces not exposed to public view.

3.08 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
   a. Slabs on Ground:
      1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

C. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces in accordance with manufacturer's written instructions and as follows:

1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.
2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating.
3. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
4. After final floating, apply a trowel finish.
5. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

## 3.09 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

## 3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.

b. Continuous Sprinkling: Maintain concrete surface continuously wet.

c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

1) Recoat areas subject to heavy rainfall within three hours after initial application.

2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.

2. Interior Concrete Floors:

a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.

b) Continuous water-fog spray.

4) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

b) Cure for not less than seven days.

5) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.

b) Continuous water-fog spray.

b. Floors to Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.

3) Maintain continuity of coating, and repair damage during curing period.

4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

c. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.

2) Recoat areas subjected to heavy rainfall within three hours after initial application.

3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).

2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.

2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.
    a. Limit cut depth to 3/4 inch.
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
    b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
    a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to remain exposed with repair topping.
    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.

b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.

d. Place, compact, and finish to blend with adjacent finished concrete.

e. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.

b. Dampen cleaned concrete surfaces and apply bonding agent.

c. Place patching mortar before bonding agent has dried.

d. Compact patching mortar and finish to match adjacent concrete.

e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.

2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.

3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.

2) Name of testing agency.

3) Names and certification numbers of field and laboratory technicians performing inspections and testing.

4) Name of concrete manufacturer.

5) Date and time of inspection, sampling, and field testing.

6) Date and time of concrete placement.

7) Location in Work of concrete represented by samples.

8) Date and time sample was obtained.

9) Truck and batch ticket numbers.

10) Design compressive strength at 28 days.

11) Concrete mixture designation, proportions, and materials.

12) Field test results.

13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
   c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests:
    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
       1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.15 PROTECTION

A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit use of pipe-cutting machinery over concrete surfaces.
4. Prohibit placement of steel items on concrete surfaces.
5. Prohibit use of acids or acidic detergents over concrete surfaces.
6. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

**SECTION 03 35 11**
**CONCRETE FLOOR FINISHES**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Surface treatments.

B. Liquid densifiers and hardeners.

C. Concrete floor topping with aggregate.

D. Low-gloss sealer.

E. Penetrating sealers.

F. Slip-resistant coatings.

## PART 2 PRODUCTS

### 2.01 APPLICATIONS

A. Unless otherwise indicated on drawings, finish concrete floors using troweling aid, densifier, and curing agent.

B. Penetrating Sealer:
   1. Use at the following locations: Storage Rooms, Mechanical Rooms.

C. Slip-Resistant Coating: Finely-ground aggregates added to coatings.
   1. Use at the following locations: Storage Rooms, Mechanical Rooms.

### 2.02 SURFACE TREATMENTS

A. Troweling Aid, Densifier and Curing Agent: Liquid reactive colloidal silica-based topical treatment, spray-applied to wet concrete and floated or troweled into the surface.
   1. Product:

### 2.03 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing.

### 2.04 COATINGS

A. Concrete Floor Topping with Aggregate: Pre-mixed blend of Portland cement, hardeners and emery/corundum.
   1. Products:

B. High-Gloss Clear Coating: Transparent, nonyellowing, acrylic-polymer-based coating.

C. Penetrating Sealer: Transparent, nonyellowing, water- or solvent-based coating.

D. Slip-Resistant Coating:

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

### 3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

### 3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents,

and other impediments to adhesion.

B. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

C. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

**3.04 PROTECTION**

A. Protect installed coatings from subsequent construction operations.

B. Do not permit traffic over unprotected floor surface.

**END OF SECTION 03 35 11**

# SECTION 05 12 00
# STRUCTURAL STEEL FRAMING

## PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 05 31 00 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 05 50 00 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.
3. Section 09 96 00 "High-Performance Coatings" for painting requirements.

1.02 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.05 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Shop primer.
6. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.

3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, fabricator, and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.

F. Source quality-control reports.

G. Field quality-control reports.

1.07 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

1. In lieu of AISC Certification, additional special inspections can be performed in the shop. The in-shop special inspection requirements for non-AISC-certified shops are the same as the steel field special inspections and are indicated in the drawings.

B. Installer Qualifications: A qualified Installer with experience erecting buildings of similar size in remote locations.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.

2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

**PART 2 - PRODUCTS**

2.01 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.

2. ANSI/AISC 341.

3. ANSI/AISC 360.

4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

2.02 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M ASTM A572/A572M, Grade 50 ASTM A529/A529M, Grade 50 ASTM A913/A913M, Grade 50.

B. Channels, Angles, M-Shapes: ASTM A36/A36M.

C. Channels, Angles, S-Shapes: ASTM A36/A36M.

D. Plate and Bar: ASTM A36/A36M.

E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C ASTM A1085/ASTMA1085M structural tubing.

F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

G. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS AND CONNECTORS

A. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.

2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.

2.04 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36 ASTM A36/A36M.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.
3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

C. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM A36/A36M carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

2.05 PRIMER

A. Steel Primer:

1. Comply with Section 09 96 00 "High-Performance Coatings."
2. SSPC-Paint 23, latex primer.
3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.06 SHRINKAGE-RESISTANT GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

2.07 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.08 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: As indicated.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.09 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

2. Surfaces to be field welded.

3. Surfaces of high-strength bolted, slip-critical connections.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.

C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E165/E165M.

b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

c. Ultrasonic Inspection: ASTM E164.

d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

3. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection[ unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M].

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: As indicated.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.05 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Cleaning and touchup painting are specified in Section 09 96 00 "High-Performance Coatings."

C. Touchup Priming: Cleaning and touchup priming are specified in Section 09 96 00 "High-Performance Coatings."

3.06 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.

3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.

2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

3) Ultrasonic Inspection: ASTM E164.

4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 05 12 00

# SECTION 052100 - STEEL JOIST FRAMING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. LH-series long-span steel joists.
3. Steel joist accessories.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

### 1.2 DEFINITIONS.

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

### 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Welding certificates.

C. Manufacturer certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Mill Certificates: For each type of bolt.

F. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

G. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications[**."**][**" and "Standard Specification for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice."**]

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications[**."**][**" and "Standard Specification for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice."**]

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.7 SEQUENCING

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated on Drawings.

1. Use LRFD; data are given at factored-load level.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:

a. Roof Joists: Vertical deflection of 1/240 of the span.

## 2.2 STEEL JOISTS

A. K-Series Steel Joist: Manufactured steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.
2. Provide holes in chord members for connecting and securing other construction to joists.
3. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated on Drawings, complying with SJI's "Specifications."
4. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated on Drawings, complying with SJI's "Specifications."
5. Do not camber joists.
6. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48)..

B. Long-Span Steel Joist: Manufactured steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements[ **as follows:**][ **as indicated on Drawings.**]

1. Joist Type: LH-series long-span steel joists.
2. End Arrangement: Square.
3. Top-Chord Arrangement: Parallel.
4. Provide holes in chord members for connecting and securing other construction to joists.
5. Camber long-span steel joists according to SJI's "Specifications."
6. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

## 2.3 PRIMERS

A. Primer:

1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
2. Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

## 2.4 STEEL JOIST ACCESSORIES

A. Bridging:

1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction.

1. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated on Drawings.
2. Finish: Plain, uncoated.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain.

D. Welding Electrodes: Comply with AWS standards.

E. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

## 2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP or power-tool cleaning, SSPC-SP 3.

B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications[**,"**][**" and "Standard Specification for Composite Steel Joists, CJ-Series" in "Standard Specifications for Composite Steel Joists, Weight Tables and Bridging Tables, Code of Standard Practice,"**] joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Field weld joists to supporting steel [**bearing plates**] [**and**] [**framework**]. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

## 3.3 REPAIRS

A. Touchup Painting:

1. Immediately after installation, clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories.

    a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
    b. Apply a compatible primer of same type as primer used on adjacent surfaces.

## 3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage Engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 052100

# SECTION 05 31 00
# STEEL DECKING

## PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Roof deck.

B. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
2. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.02 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.03 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   a. Power-actuated mechanical fasteners.
   b. Acoustical roof deck.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

D. Field Quality-Control Submittals:

1. Field quality-control reports.

E. Qualification Statements: For welding personnel.

1.04 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:

1. AWS D1.1/D1.1M.
2. AWS D1.3/D1.3M.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

**PART 2 - PRODUCTS**

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

2.02 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Vulcraft/Verco Group; a division of Nucor Corp.

B. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.03 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Galvanizing Repair Paint: [ASTM A780/A780M] [SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight].

G. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in accordance with deck manufacturer's written instructions. Submit supporting documentation indicating that mechanical fasteners achieve the required wind uplift and diaphragm shear strength indicated in the drawings.

3.03 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: As indicated.

2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 inches as indicated, using one of the following methods as indicated in drawings:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

2. Mechanically clinch or button punch.

3. Fasten with a minimum of 1-1/2-inch-long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds / mechanical fasteners not more than 12 inches apart with at least one weld / fastener at each corner.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

3.04 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

a. Field welds will be subject to inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 05 31 00

# SECTION 05 40 00
# COLD-FORMED METAL FRAMING

## PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.02 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.
3. Vertical deflection clips.
4. Post-installed anchors.
5. Power-actuated anchors.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated Design Submittal: For cold-formed steel framing.

1.03 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Miscellaneous structural clips and accessories.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association the Steel Stud Manufacturers Association or the Supreme Steel Framing System Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. CEMCO; California Expanded Metal Products Co.

2. MRI Steel Framing, LLC.

3. Mill Steel Framing; Mill Steel Company.

4. SCAFCO Steel Stud Company; Stone Group of Companies.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.

2. Deflection Limits: Design framing systems to withstand service-level (ASD) loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing: Horizontal deflection of L/180 of the wall height.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection

failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of L/240 (based on span of structural member).

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S240.

2.03 COLD-FORMED STEEL FRAMING MATERIALS

A. Framing Members, General: Comply with AISI S240 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.

2. Coating: G90 or equivalent.

C. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating: G90.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.

2. Flange Width: 1-3/8 inches minimum..

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch minimum, Matching steel studs.

2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips, Exterior: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

2.05 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.

2. Bracing, bridging, and solid blocking.

3. Web stiffeners.

4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Hole-reinforcing plates.
8. Backer plates.

2.06 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC193 ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.

C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.07 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M MIL-P-21035B or SSPC-Paint 20.

2.08 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.

2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.03 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Connect vertical deflection clips to bypassing studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.04 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.05 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.06 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

**SECTION 05 50 00**
**METAL FABRICATIONS**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

### 1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

B. Section 05 21 00 - Steel Joist Framing: Structural joist bearing plates, including anchorage.

C. Section 05 31 00 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.

D. Section 05 51 00 - Metal Stairs.

E. Section 05 52 13 - Pipe and Tube Railings.

F. Section 09 91 13 - Exterior Painting: Paint finish.

G. Section 09 91 23 - Interior Painting: Paint finish.

### 1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2020.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
      a. Include the following, as applicable:
         1) Design criteria.
         2) Member sizes and gauges.
         3) Details of connections.
         4) Bracing requirements.

## PART 2 PRODUCTS

### 2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### 2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Bolts, Nuts, and Washers: Stainless steel.

### 2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### 2.04 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

### 2.05 FINISHES - STEEL

A. Prime paint steel items.

B. Prime Painting: One coat.

### 2.06 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.

B. Interior Aluminum Surfaces: Class I natural anodized.

C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

### 2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

### 3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

### 3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

### 3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION 05 50 00**

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**SECTION 05 51 00**
**METAL STAIRS**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Stairs with concrete treads.

B. Stairs with grating treads.

C. Structural steel stair framing and supports.

D. Handrails and guards.

### 1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 05 50 00 - Metal Fabrications.

D. Section 05 52 13 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.

E. Section 09 91 13 - Exterior Painting: Paint finish.

F. Section 09 91 23 - Interior Painting: Paint finish.

### 1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

K. NAAMM AMP 510 - Metal Stairs Manual; 1992.

L. NAAMM MBG 531 - Metal Bar Grating Manual; 2024.

M. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2024.

N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

O. SSPC-SP 2 - Hand Tool Cleaning; 2024.

**1.04 SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer's seal and signature on each sheet of shop drawings.

**1.05 QUALITY ASSURANCE**

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Prefabricated Metal Stairs:
   1. Cutting Edge Steel; Cutting Edge Stair: www.cesteel.com/#sle.

**2.02 METAL STAIRS - GENERAL**

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
   2. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
   3. Dimensions: As indicated on drawings.
   4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
   5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
   6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:
   1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
      a. Welded Joints: Continuously welded and ground smooth and flush.
      b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
      c. Exposed Edges and Corners: Eased to small uniform radius.
      d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
   2. Industrial: All joints made neatly.
      a. Welded Joints: Welded on back side wherever possible.
      b. Welds Exposed to Touch: Ground smooth.
      c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

**2.03 METAL STAIRS WITH CONCRETE TREADS**

A. Jointing and Finish Quality Level: Architectural, as defined above.

B. Risers: Open.

C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch minimum.
   4. Concrete Reinforcement: Welded wire mesh.
   5. Concrete Finish: For resilient floor covering.

D. Stringers: Rolled steel channels.
   1. Stringer Depth: 10 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

E. Railings: Steel pipe railings.

F. Finish: Shop- or factory-prime painted.

G. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

**2.04 METAL STAIRS WITH GRATING TREADS**

A. Jointing and Finish Quality Level: Industrial, as defined above.

B. Risers: Open.

C. Treads: Steel bar grating.
   1. Grating Type: Welded.
   2. Bearing Bar Depth: 3/4 inch, minimum.
   3. Top Surface: Standard.
   4. Nosing: Checkered plate.
   5. Nosing Width: 1-1/4 inch, minimum.
   6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels.
   1. Stringer Depth: 10 inches.
   2. End Closure: Sheet steel, 14 gauge, 0.075 inch minimum; welded across ends.

E. Railings: Steel pipe railings.

F. Finish: Shop- or factory-prime painted.

**2.05 HANDRAILS AND GUARDS**

A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
   1. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.

B. Guards:
   1. Top Rails: Round pipe or tube rails unless otherwise indicated.
      a. Outside Diameter: 1-1/4 inch, minimum, to 1-1/2 inches, maximum.
   2. Infill at Pipe Railings: Pipe or tube rails sloped parallel to stair.
      a. Outside Diameter: 1 inch.
      b. Material: Steel pipe or tube, round.
      c. Vertical Spacing: Maximum 4 inches on center.
      d. Jointing: Welded and ground smooth and flush.
   3. End and Intermediate Posts: Same material and size as top rails.
      a. Horizontal Spacing: As indicated on drawings.
      b. Mounting: Welded to top surface of stringer.

**2.06 MATERIALS**

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

D. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).

E. Gratings: Bar gratings that comply with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

F. Concrete Reinforcement: Mesh type as detailed, galvanized.

**2.07 ACCESSORIES**

A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.

B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

**2.08 SHOP FINISHING**

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
   2. Number of Coats: One.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field conditions are acceptable and are ready to receive work.

**3.02 PREPARATION**

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

**3.03 INSTALLATION**

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

**3.04 TOLERANCES**

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

**END OF SECTION 05 51 00**

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# SECTION 05 52 13
# PIPE AND TUBE RAILINGS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

### 1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 05 51 00 - Metal Stairs: Attachment plates for handrails specified in this section.

C. Section 09 91 13 - Exterior Painting: Paint finish.

D. Section 09 91 23 - Interior Painting: Paint finish.

### 1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

### 1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Handrails and Railings:
   1. Alumi-Guard: www.alumi-guard.com/#sle.

### 2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

E. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

### 2.03 STEEL RAILING SYSTEM

A. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.

B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

C. Exposed Fasteners: No exposed bolts or screws.

**2.04 FABRICATION**

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

**2.05 ALUMINUM FINISHES**

A. Color: To be selected by Architect from manufacturer's standard line.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field conditions are acceptable and are ready to receive work.

**3.02 PREPARATION**

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

**3.03 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

**3.04 TOLERANCES**

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION 05 52 13**

# SECTION 06 10 53
# MISCELLANEOUS ROUGH CARPENTRY

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Preservative treated wood materials.

B. Communications and electrical room mounting boards.

C. Concealed wood blocking, nailers, and supports.

D. Miscellaneous wood nailers, furring, and grounds.

### 1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

### 1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

D. PS 1 - Structural Plywood; 2023.

E. PS 20 - American Softwood Lumber Standard; 2021.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

### 1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

### 2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No.2 or Standard Grade.
   2. Boards: Standard or No.3.

D. Window and Door Bucks: 1-1/2 inch thick laminated strand lumber.

**2.03 CONSTRUCTION PANELS**

A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

**2.04 ACCESSORIES**

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

**2.05 FACTORY WOOD TREATMENT**

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
   1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to ____ lb/cu ft retention.
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber in contact with roofing, flashing, or waterproofing.
   2. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
      a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

**PART 3 EXECUTION**

**3.01 INSTALLATION - GENERAL**

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

**3.02 BLOCKING, NAILERS, AND SUPPORTS**

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

**3.03 ROOF-RELATED CARPENTRY**

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

### 3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

### 3.05 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

**END OF SECTION 06 10 53**

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# SECTION 06 20 00
# FINISH CARPENTRY

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Window casings and moldings.

### 1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

## PART 2 PRODUCTS

### 2.01 FINISH CARPENTRY ITEMS

A. Interior Woodwork Items:
   1. Window Sills: TBD, either solid surface or painted

### 2.02 LUMBER MATERIALS

A. Softwood Lumber: TBD species, TBD sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
   1. Grading: In accordance with rules certified by ALSC; www.alsc.org.

### 2.03 SHEET MATERIALS

A. Particleboard: ANSI A208.1 Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

### 2.04 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming and Blocking: Softwood lumber of TBD species.

C. Cellular PVC Trim and Moldings: Extruded, expanded PVC; UV-resistant, heat-stabilized, and rigid material; for exterior use only.
   1. Density: 31 pounds per cubic foot, minimum.
   2. Flame Spread: ASTM E84, 75, maximum.
   3. Manufacturers:
      a. AZEK Building Products, Inc; PVC Trim: www.azek.com/#sle.

### 2.05 HARDWARE

A. Countertop Support Brackets: Fixed, L-shaped, face-of-stud mounting.
   1. Material: Steel; T-shape cross-section.
      a. Finish: Manufacturer's standard, factory-applied, textured powder coat.
      b. Color: Black.
      c. Height: 9 inches.
      d. Support Length: 9 inches.
      e. Width: 1 inch.

### 2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

### 3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

### 3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION 06 20 00**

# SECTION 06 42 00
# WOOD PANELING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Custom wood veneer paneling.

### 1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on fire-retardant treatment materials and application instructions.

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

## PART 2 PRODUCTS

### 2.01 PANELING

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Flat Paneling:
   1. Species: MDF.
   2. Thickness: 3/4 inch.
   3. Panels: Veneer of full widthm .
   4. Visible Edges and Reveals: Filled and painted.
   5. Outside Corners: Mitered and splined.

### 2.02 WOOD-BASED MATERIALS - GENERAL

A. Particleboard: Composed of wood chips, medium density, with waterproof resin binders; of grade to suit application; sanded faces; complying with ANSI A208.1.

### 2.03 ADHESIVES AND FASTENERS

A. Fasteners: As indicated on drawings.

### 2.04 FABRICATION

A. Prepare panels for delivery to site, permitting passage through building openings.

B. Finish exposed edges of panels as specified by grade requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

### 3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Do not begin installation until wood materials have been fully acclimated to interior conditions.

C. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

### 3.03 PREPARATION FOR FIELD FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

### 3.04 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

**END OF SECTION 06 42 00**

# SECTION 06 74 00
# COMPOSITE GRATINGS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Pultruded gratings.

B. Grating edge components.

C. Panel clips.

### 1.02 REFERENCE STANDARDS

A. ASCE/ACMA (PS) - ASCE/ACMA Pre-Standard for Load & Resistance Design (LRFD) of Pultruded (FRP) Structures; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data - Pultruded Gratings: Include resin, load/deflection tables, panel size, bearing bar sectional shape, and bearing bar depth.

C. Shop Drawings: For each grating system:
   1. Elevations, Plans, and Sections: Include dimensions; indicate panel sizes, panel layouts, and clearances between panels and adjacent construction.
   2. Details: Include connection, fastening, and anchorage details; indicate clearances between grating and adjacent construction.

D. Samples: Two samples of each type of composite grating, 12 inches by 12 inches in size; indicate specified surfacing and color.

E. Design Calculations for Systems Not Designed in Contract Documents:
   1. Sufficient to demonstrate compliance with ASCE/ACMA (PS) and applicable building code; signed and sealed by Engineer of Record for design of composite gratings.

F. Test Reports: Provide test reports of surfacing burning characteristics of tested grating panel; provide report in accordance with reporting criteria of ASTM E84.

G. Contractor's Design-Related Professional Services: Designer's qualification statement.

H. Manufacturer's Instructions: Manufacturer's published installation instructions.

I. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.

### 1.04 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of composite grating systems and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in fabricating products of this section, with not less than ten years of documented experience.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, unbroken packages or bundles bearing label of manufacturer.

B. Store materials in enclosed areas, under cover, and elevated above grade.

C. Store resins, catalysts, and hardeners in accordance with manufacturer's instructions.

D. Protect composite grating panels from damage, including abrasion, cracking, chipping, and twisting.

### 1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's standard three-year warranty against defective products.

## PART 2 PRODUCTS

### 2.01 COMPOSITE GRATINGS - GENERAL

A. Fiber-Reinforced Polymer (FRP) Composite Gratings:
   1. Composite grating plates manufactured by molded or pultrusion process; composed of reinforcements and resins; in qualities, quantities, and arrangements required to meet specified requirements.
   2. Fire-Retarding Resin Additives: Compatible with fiber and resin systems.
   3. Ultraviolet Protection Resin Additive: Compatible with fiber and resin systems.
   4. Surface Burning Characteristics: Flame spread rating of 25 or less when tested in accordance with ASTM E84.
   5. Ultraviolet Protection Coating: For additional protection, provide 1 mil, minimum, ultraviolet-resistant coating.
   6. Finished Surfaces: Smooth, resin-rich, free of voids; without dry spots, cracks, crazes, or unreinforced areas.

### 2.02 PULTRUDED GRATINGS

A. Manufacturers:
   1. McNICHOLS: Fiberglass Grating Pultruded, I-Bar, MS-I-4015 - DURAGRID®, ADA, Fiberglass, SPF Polyester Resin, Gray, 1.500" Height x 0.600" Top Flange Width I-Bar, Fine Grit Surface, 40% Open Area.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Fiber-reinforced polymer (FRP) composite grating panels assembled from pultruded bearing bars and cross rods that are mechanically and chemically bonded together.
   1. Maximum Spacing of Cross Rods: 12 inches.

C. Pultruded Gratings:
   1. Resin: Fiberglass-reinforced vinyl ester resin.
   2. Bearing Bar Depth: 1-1/2 inches.
   3. Surfacing: Bonded grit.
   4. Color: Light gray.

### 2.03 GRATING EDGE COMPONENTS

A. Manufacturer's standard composite edge components for composite grating, including edge banding and kickplates.

### 2.04 PANEL CLIPS

A. Manufacturer's standard metal clips for securing grating panels to structural supports; end panel clips for panel-to-panel unsupported connections.

### 2.05 ACCESSORIES

A. Anchorage Devices: Provide anchorage devices for securing structural composites to in-place construction as determined by Structural Engineer of Record for design of composite grating systems.

B. Stainless Steel Fasteners: As recommended by manufacturer.

### 2.06 FABRICATION

A. Assemble grating panels for tightly fitted and secured joints.

B. Fabricate grating panels free from warps, twists, or other defects that would negatively affect appearance and serviceability.

C. Seal cut edges, holes, and abrasions with resin compatible with grating resin to provide maximum corrosion resistance.

D. Fabricate grating panels to be readily-removable.

E. Fabricate grating panels to sizes that will accommodate clearances indicated below:
   1. Between Panels and Side of Trench: 1/4 inch.

**2.07 SOURCE QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Flame Spread Rating Testing: Provide full-scale testing of actual production grating panel of same material specified for project; test for compliance with specified flame spread rating of 25 or less in accordance with ASTM E84.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install grating panels and contiguous grating layouts with specified clips and fasteners in accordance with manufacturer's installation instructions and as required to meet specified performance requirements.

B. Install grating panels plumb and level with clearances indicated below:
   1. Between Panels and Side of Trench: 1/4 inch.
   2. Between Panels and Vertical Surfaces: 1/2 inch.
   3. Between Adjacent Panels: 1/4 inch.

C. Seal field cuts, drilled edges, holes, and abrasions with compatible resin recommended by manufacturer based on application and corrosive environment.

**3.02 CLEANING**

A. Clean composite gratings in accordance with manufacturer's instructions.

**3.03 PROTECTION**

A. Protect installed composite gratings from subsequent construction operations.

**END OF SECTION 06 74 00**

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## SECTION 06 83 16
## FIBERGLASS REINFORCED PANELING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

#### 1.02 RELATED REQUIREMENTS

A. Section 09 78 00 - Interior Wall Paneling: Decorative FRP wall paneling.

#### 1.03 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

#### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: Submit two samples 3 inch by 3 inch in size illustrating material and surface design of panels.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. Crane Composites, Inc: www.cranecomposites.com/#sle.

#### 2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet.
   2. Panel Thickness: 0.10 inch.
   3. Surface Design: Embossed.
   4. Color: As selected by Architect.
   5. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints.

#### 2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.

B. Trim: Vinyl; color coordinating with panel.

C. Fasteners: Nylon rivets.

D. Adhesive: Type recommended by panel manufacturer.

E. Sealant: Type recommended by panel manufacturer; white.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

### 3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Pre-drill fastener holes in panels, 1/8 inch greater in diameter than fastener, spaced as indicated by panel manufacturer.

D. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

E. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

F. Install panels with manufacturer's recommended gap for panel field and corner joints.

G. Drive fasteners to provide snug fit, and do not over-tighten.

H. Place trim on panel before fastening edges, as required.

I. Fill channels in trim with sealant before attaching to panel.

J. Install trim with adhesive and screws or nails, as required.

K. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

L. Remove excess sealant after paneling is installed and prior to curing.

**END OF SECTION 06 83 16**

# SECTION 07 21 00
# THERMAL INSULATION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Board insulation at over roof deck, exterior wall behind metal wall finish, and interior wall with facer providing exposed finish.

### 1.02 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.04 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

## PART 2 PRODUCTS

### 2.01 APPLICATIONS

A. Insulation Inside Prefabricated Wall Panels: Extruded polystyrene (XPS) board.

B. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

C. Insulation over Roof Deck: Extruded polystyrene (XPS) board.

### 2.02 FOAM BOARD INSULATION MATERIALS

A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

B. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Products:
      a. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### 3.02 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

**END OF SECTION 07 21 00**

# SECTION 07 21 19
# FOAMED-IN-PLACE INSULATION

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Foamed-in-place insulation.
   1. In exterior framed walls.
   2. In underside of roofs and ceilings.
   3. In underside of floor decks.

### 1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

F. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.

G. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers; 2022.

H. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

I. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction; Current Edition, Including All Revisions.

J. UL 1715 - Standard for Safety Fire Test of Interior Finish Material; Current Edition, Including All Revisions.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

### 1.04 FIELD CONDITIONS

A. Do not apply foam when temperature is within 5 degrees F of dew point.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Foamed-In-Place Insulation:
   1. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.

### 2.02 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open cell or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.

a. Fire Protection: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation either exposed or with covering that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.

2. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

**2.03 ACCESSORIES**

A. Primer: As required by insulation manufacturer.

**PART 3 EXECUTION**

**3.01 APPLICATION**

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply to a minimum cured thickness of 5 inch.

C. Apply protective coating monolithically, without voids, to fully cover foam insulation, to achieve fire rating required.

**END OF SECTION 07 21 19**

# SECTION 07 26 00
# VAPOR RETARDERS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Vapor retarders.

### 1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Vapor retarders on exterior wall sheathing.

B. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

### 1.03 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

B. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016 (Reapproved 2023).

C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

## PART 2 PRODUCTS

### 2.01 VAPOR RETARDERS

A. Vapor Retarder Sheet: Butyl, black color.
   1. Thickness: 45 mil, 0.045 inch.
   2. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M.
   3. Seam Lap and Perimeter Adhesive: Elastomeric, same composition as sheet or other compatible material.

B. Vapor Retarder Sheet: Polyethylene sheeting complying with ASTM D4397, clear colored.
   1. Thickness: 5 mil, 0.005 inch, nominal.
   2. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches wide; compatible with sheet material.

### 2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M; slip resistance requirement waived if not installed on roof.
   1. Width: 4 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

C. Vapor Retarder Tape: Coated polyester film with acrylic adhesive backing; pressure sensitive.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Self-Adhered Sheets:
   1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle fashion to shed water and seal laps airtight.
   3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
   5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.

**END OF SECTION 07 26 00**

# SECTION 07 41 13
# METAL ROOF PANELS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Insulated metal roof panel system of preformed steel panels.

### 1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Roof framing and purlins.

B. Section 06 10 00 - Rough Carpentry: Roof sheathing.

C. Section 07 21 00 - Thermal Insulation: Rigid roof insulation.

D. Section 07 42 13 - Metal Wall Panels: Preformed wall panels.

E. Section 07 92 00 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

### 1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

C. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2019.

D. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2017).

E. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2018).

F. ASTM E1680 - Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems; 2016 (Reapproved 2022).

G. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Storage and handling requirements and recommendations.
   2. Installation methods.
   3. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.

D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

E. Installer's qualification statement.

F. Test Reports: Indicate compliance of metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

### 1.07 FIELD CONDITIONS

A. Do not install metal roof panels when surface, ambient air, or wind chill temperatures are below 45 degrees F.

### 1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Metal Roof Insulated Panel Manufacturers:
   1. Kingspan Insulated Panels; KingRib Insulated Roof Panel: www.kingspan.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.02 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:
   1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
      a. Dead Loads: Weight of roofing system.
      b. Live Loads: As indicated on drawings.
   2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
   3. Wind Uplift: Class 90 wind uplift resistance of UL 580.
   4. Air Infiltration: Maximum 0.06 cfm/sq ft at air pressure differential of 6.24 lbf/sq ft, when tested according to ASTM E1680.
   5. Water Penetration: No water penetration when tested in accordance with procedures and recommended test pressures of ASTM E1646; perform test immediately following air infiltration test.
   6. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F.
   7. Thermal Resistance: Provide throughout system, R-value of 15 (2.6) at 2 inch (51 mm) thick, minimum, when tested in accordance with ASTM C1363.

### 2.03 STRUCTURAL METAL ROOF PANELS

A. General: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Insulated Metal Panels: Factory-formed panels with factory-applied finish.
   1. Type: Double-skin, factory assembled with foamed-in-place polyurethane insulation.
      a. Thickness: 6 inches, nominal.
      b. R-Value: 48
   2. Steel Panels:
      a. Aluminum-zinc alloy-coated SS (structural steel) sheet complying with ASTM A792/A792M; minimum AZ50 coating.
      b. Steel Thickness: Minimum 22 gauge, 0.03 inch.
   3. Profile: Standing seam, with minimum 1-1/2-inch seam height; concealed fastener system for field seaming with special tool.
   4. Texture: Smooth.
   5. Length: Full length of roof slope, without lapped horizontal joints.
   6. Width: Maximum panel coverage of 24 inches.

### 2.04 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

### 2.05 FINISHES

A. Fluoropolymer Coil Two-Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer’s standard line.

### 2.06 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, trim, closure strips, caps, and similar sheet metal items of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:
   1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
   2. Concealed Sealant: Non-curing butyl sealant or tape sealant.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.

C. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.

D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.

E. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

**3.03 INSTALLATION**

A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

B. Accessories: Install necessary components that are required for complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, caps, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.

**3.04 PROTECTION**

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

**END OF SECTION 07 41 13**

## SECTION 07 42 13
## INSULATED METAL WALL PANELS - KINGSPAN

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

A. Factory-assembled, insulated metal panels for walls and under-building soffits, with trim, and accessory components.

#### 1.02 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel Framing: Structural steel building frame.

B. Section 05 40 00 - Cold-Formed Metal Framing: Metal framing members supporting insulated metal wall panels.

C. Section 07 21 00 - Thermal Insulation.

D. Section 07 26 00 - Vapor Retarders: Vapor retarder materials.

E. Section 07 41 13 - Metal Roof Panels.

F. Section 07 62 00 - Sheet Metal Flashing and Trim.

#### 1.03 REFERENCE STANDARDS

A. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products; 2018.

B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2023.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

D. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2022.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).

G. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2020.

H. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates; 2023.

I. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films; 2023.

J. ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 2022.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

L. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

M. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.

N. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

#### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer documentation on tested structural, thermal, and fire resistance capabilities of assembled panel.

C. Shop Drawings: Indicate panel profiles, layout, exterior sheet gauge, interior sheet gauge, joints, dimensions, spans, sealant locations, construction details, methods of anchorage, and sequence of installation.

D. Selection Samples: For each finish product specified, submit at least three sample color chips representing manufacturer's standard range of available colors, sheen, and texture; 3 by 5 inch minimum.

E. Design Data: Provide calculations verifying panels will withstand design wind loads indicated without detrimental effects or exceeding deflection criteria.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.05 QUALITY ASSURANCE**

A. Installer Qualifications: Company specializing in performing work of type specified in this section and authorized by panel manufacturer.

**1.06 DELIVERY, STORAGE, AND HANDLING**

A. Store prefinished material above ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

**1.07 WARRANTY**

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Limited Warranty: Standard form in which manufacturer agrees to repair or replace items that fail in materials or workmanship within specified warranty period. Include structural performance, including bond integrity, deflection, and buckling.
   1. Warranty Period: Two years from Date of Substantial Completion, or two years and three months from date of shipment from manufacturer's plant, whichever occurs first.

C. Finish Warranty: Standard form in which manufacturer agrees to repair or replace metal panels that evidence deterioration of fluoropolymer finish. Deterioration includes flaking or peeling from approved primed metal substrate, chalk over 8 when tested in accordance with ASTM D4214, Method A, and color fading over 5 delta units on panels when tested in accordance with ASTM D2244.
   1. Warranty Period: Twenty years from Date of Substantial Completion, or twenty years and three months from date of shipment from manufacturer's plant, whichever occurs first.

D. Thermal Warranty: Standard form in which manufacturer agrees to repair or replace panels that exhibit greater than 10 percent reduction from published R-value (RSI-value) at time of manufacture, as measured in compliance with ASTM C518 within specified warranty period.
   1. Warranty Period: Thirty years from Date of Substantial Completion, or 30 years and three months from date of shipment from manufacturer's plant, whichever occurs first.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Kingspan Insulated Panels: KS Series QuadCore www.kingspan.com/#sle.

B. Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 PANEL SYSTEM**

A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.
   1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

2. Accommodate tolerances of building structural framing.
3. Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials; see Section 07 21 00.
4. Provide continuity of vapor retarder at building enclosure elements in conjunction with vapor retarder materials; see Section 07 26 00.

**2.03 PERFORMANCE REQUIREMENTS**

A. Thermal Performance: Provide thermal resistance through entire system; minimum R-value of minimum.
   1. ≈ 8 per inch per ASTM C518 @ 75˚F mean temperature
   2. ≈ 9 per inch per ASTM C518 @ 35˚F mean temperature

B. Structural Performance: Design and size to withstand dead loads and wind loads caused by positive and negative wind pressure acting normal to plane of panel.
   1. Verify structural performance in accordance with ASTM E72 and ASTM E330/E330M, using test pressure 1.5 times design wind pressure, with 10 seconds duration of maximum load.
   2. Design Wind Loads: Calculated complying with requirements of authorities having jurisdiction.

C. Fire Test Performance:
   1. Fire Propagation Performance Testing: Tested with and successfully passed acceptance criteria of NFPA 285.

D. Wind-Borne-Debris Resistance: Identical full-size assembly without auxiliary protection, having Miami-Dade County approval - Miami (APD) for Large and Small Missile impact and pressure cycling at design wind pressure.

E. Movement: Accommodate movement caused by following items without damage to system, components, or deterioration of seals:
   1. Normal movement between system components.
   2. Seasonal temperature cycling.

**2.04 PANELS AND TRIM**

A. Wall Panels: Factory-assembled, foamed-in-place, insulated metal panels with exterior and interior sheet metal skins; panels interlock at edges.
   1. Panel Width: As indicated on drawings.
   2. Panel Orientation: Horizontally applied at walls, and perpendicular to floor framing for soffits..
   3. Exterior Panel Face Profile: Shadowline.
   4. Interior Panel Face Profile: Shadowline.
   5. Panel Thickness: 4 inches.
   6. R Value: 32
   7. Exterior Sheet: Prefinished aluminum-zinc-alloy-coated steel, 22 gauge, 0.0299 inch minimum base metal thickness.
   8. Interior Sheet: Prefinished galvanized steel, 24 gauge, 0.0239 inch minimum base metal thickness.
   9. Horizontal Joints Between Panels: 1/8 inch wide joint reveal.
   10. Vertical Joints Between Panels: 1/8-inch reveals.
       a. Gasket Color: Standard black gasket.
   11. Sealant at Exposed Joints (Horizontal Panel Applications): Elastomeric polyurethane sealant complying with ASTM C920.
   12. Fabricate panels in longest practicable lengths.
   13. Exterior Face of Panel Paint Finish: Fluoropolymer Coil Two-Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80

percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch; color and gloss as selected by Architect from manufacturer's standard line.

a. Color: As selected from manufacturer's current insulated wall panel color chart.

B. Soffit Panels: Same as wall panels.

C. Trim, Closure Pieces, Expansion Joints, Caps, Flashings, Fascias, Infills, and External Corners: Same material, thickness, and finish as exterior face of insulated metal panel; brake formed to required profiles; fabricated in longest practicable lengths.

1. Thickness: 22 gauge, 0.0336 inch.
2. Exposed Fasteners: Not permitted.
3. Profiles: To suit system.

**2.05 PANEL MATERIALS**

A. Precoated Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A755/A755M steel coil material with AZ50 coated steel in accordance with ASTM A792/A792M.

1. Color of Exposed Exterior Surfaces: As selected by Architect from manufacturer's standard range.

B. Gaskets: Manufacturer's standard type suitable for use with panel system, permanently resilient; color as selected by Architect.

C. Panel Sealants: Manufacturer's standard type suitable for use with installation of panel system; nonstaining, skinning, nonshrinking, nonsagging, ultraviolet, and ozone resistant; color as selected by Architect.

**2.06 FOAMED-IN-PLACE INSULATION**

A. QuadCore hybrid polyisocyanurate foamed-in-place core, ASTM C591 Type IV, CFC and HCFC free, Halogenated Flame Retardant (HFR) free, compliant with Montreal Protocol and Clean Air Act, with the following minimum physical properties:

1. Thermal Resistance of Insulated Panel: Nominal R-value of 8.0 per inch thickness when tested in accordance with ASTM C518 at 75 degree F mean temperature; nominal R-value of 9.0 per inch thickness when tested at 35 degrees F.
2. Compressive Strength: 24 psi, when tested in accordance with ASTM D1621.
3. Density: 2.2 to 2.8 lb/cu ft, when tested in accordance with ASTM D1622.
4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 90 or less, when tested in accordance with ASTM E84.
5. Manufacturer: Kingspan Insulated Panels; QuadCore.
   a. Substitutions: Not permitted.

**2.07 ACCESSORIES**

A. Fasteners: Manufacturer's standard corrosion-resistant type to suit application; hot-dip galvanized steel with soft neoprene washers. Where exposed fasteners are required, provide cap color to match exterior panel.

B. Clips: Manufacturer's standard stainless steel clips.

C. Field Touch-up Paint: As recommended by panel manufacturer.

D. Concealed Sealants: Noncuring butyl sealant or tape sealant; type as recommended by panel manufacturer.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that structural framing is ready to receive panel system.

**3.02 INSTALLATION**

A. Install panel system on walls and soffits in accordance with manufacturer's instructions.

B. Install panels plumb, level, and true-to-line with dimensions and layout indicated on approved shop drawings.

C. Protect panel surfaces from contacting cementitious materials and dissimilar metals.

D. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

E. Locate panel joints over supports.

F. Use concealed fasteners unless otherwise indicated by Architect.

G. Seal and place gaskets to prevent weather penetration, and maintain neat appearance.

H. Field drill weep holes where appropriate in horizontal trim; minimum 1/8" diameter at 24 inches on center.

**3.03 REPAIR**

A. Touch-up, repair, or replace metal panels and trim that have been damaged.

**3.04 CLEANING**

A. Remove protective film from metal panels immediately after installation.

**END OF SECTION 07 42 13**

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**SECTION 07 62 00**
**SHEET METAL FLASHING AND TRIM**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, sheet metal roofing, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

### 1.02 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. CDA A4050 - Copper in Architecture - Handbook; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

### 1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. ALUCOBOND by 3A Composites USA; ALUCOBOND AXCENT: www.alucobondusa.com/#sle.

### 2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's standard colors.

### 2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

**2.04 FLASHING**

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

**2.05 ACCESSORIES**

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

**3.02 PREPARATION**

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

**3.03 INSTALLATION**

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

**END OF SECTION 07 62 00**

# SECTION 07 92 00
# JOINT SEALANTS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

### 1.02 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

F. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Backing material recommended by sealant manufacturer.
   4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   5. Substrates the product should not be used on.

C. Executed warranty.

### 1.04 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

## PART 2 PRODUCTS

### 2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints:
      a. Seal the following joints:
         1) Joints between doors, windows, and other frames or adjacent construction.
   2. Interior Joints:
      a. Do not seal interior joints indicated on drawings as not sealed.
      b. Seal the following joints:
         1) Joints between door frames and window frames and adjacent construction.
         2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.

B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
   2. Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
   2. Floor Joints in Wet Areas: Nonsag polyurethane non-traffic-grade sealant suitable for continuous liquid immersion.

D. Interior Wet Areas: Bathrooms and kennel areas; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

**2.02 JOINT SEALANTS - GENERAL**

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

**2.03 NONSAG JOINT SEALANTS**

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.
   5. Service Temperature Range: Minus 20 to 180 degrees F.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: Match adjacent finished surfaces.

C. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
   1. Color: White.

D. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.

E. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
   1. Movement Capability: Plus and minus 35 percent, minimum.

F. Type ___ - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.

G. Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.

**2.04 SELF-LEVELING JOINT SEALANTS**

A. Flexible Polyurethane Foam: Single component, gun grade, and low-expanding.
   1. Color: White.

**2.05 ACCESSORIES**

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

### 3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

### 3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

**END OF SECTION 07 92 00**

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# SECTION 08 11 13
# HOLLOW METAL DOORS AND FRAMES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

D. Accessories, including glazing and matching panels.

### 1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

D. Section 09 91 23 - Interior Painting: Field painting.

### 1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. NAAMM: National Association of Architectural Metal Manufacturers.

C. SDI: Steel Door Institute.

D. UL: Underwriters Laboratories.

### 1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2019.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2017.

### 1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

### 1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

B. Maintain at project site copies of reference standards relating to installation of products specified.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### 2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
   2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
   3. Door Thickness: 1-3/4 inches, nominal.
   4. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   5. Door Face Sheets: Flush.
   6. Weatherstripping: Refer to Section 08 71 00.
   7. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.

2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches, nominal.
4. Door Face Sheets: Flush.
5. Door Finish: Factory primed and field finished.

**2.04 HOLLOW METAL FRAMES**

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
3. Frame Finish: Factory finished.
4. Weatherstripping: Separate, see Section 08 71 00.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
2. Frame Finish: Factory finished.

D. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Finish: Factory finished.

**2.05 FINISHES**

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
1. Color: As indicated on drawings.

**2.06 ACCESSORIES**

A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
1. Size: As indicated on drawings.
2. Frame Material: 18 gauge, 0.0478 inch, galvanized steel.
3. Metal Finish: powder coating factory primed & finished, see color selection in drawings.

B. Glazing: As specified in Section 08 80 00, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

**3.02 INSTALLATION**

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 71 00.

D. Comply with glazing installation requirements of Section 08 80 00.

E. Touch up damaged factory finishes.

**3.03 TOLERANCES**

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

**3.04 ADJUSTING**

A. Adjust for smooth and balanced door movement.

**END OF SECTION 08 11 13**

# SECTION 08 31 00
# ACCESS DOORS AND PANELS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Wall-mounted access units.

### 1.02 REFERENCE STANDARDS

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

### 1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

## PART 2 PRODUCTS

### 2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units in Wet Areas:
   1. Location and size: As indicated on drawings.
   2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   3. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

### 3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

### 3.03 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

**END OF SECTION 08 31 00**

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**SECTION 08 45 23**
**INSULATED TRANSLUCENT PANELS**

## PART 1 GENERAL

### 1.01 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

D. ASTM E2707 - Standard Test Method for Determining Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure; 2015.

E. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

F. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

### 1.02 SUMMARY

A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work includes providing and installing:
   1. Flat insulated, translucent sandwich panels
   2. Aluminum clamptite installation system
   3. Aluminum sill flashing

### 1.03 SUBMITTALS

A. Submit manufacturer’s product data. Include construction details, material descriptions, profiles, and finishes of components.

B. Submit shop drawings. Include plans, elevations, and details.

C. Submit manufacturer’s color charts showing the full range of colors available for factory finished exposed aluminum.
   1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below.
      a. Sandwich panels: 24” x 12” units
      b. Factory finished aluminum: 3” long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
   1. Reports required (if applicable) are:
      a. Flame Spread and Smoke Developed (((UL 723))) – Submit UL Card
      b. Burn Extent (ASTM D 635)
      c. Color Difference (ASTM D 2244)
      d. Impact Strength (((UL 972)))
      e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
      f. Bond Shear Strength (ASTM D 1002)
      g. Beam Bending Strength (ASTM E 72)

h. Insulation U-Factor (((NFRC 100)))
i. NFRC System U-Factor Certification (((NFRC 700)))
j. NFRC Visible Light Transmittance (((NFRC 202)))
k. Solar Heat Gain Coefficient (NFRC or Calculations)
l. Condensation Resistance Factor (((AAMA 1503))) (Thermally Broken, insulated panels only)
m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (((ASTM E2707)))

**1.04 CLOSEOUT SUBMITTALS**

A. Provide field maintenance manual to include in project maintenance manuals.

**1.05 QUALITY ASSURANCE**

A. Manufacturer's Qualifications:
1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing Kalwall panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope, and type.

**1.06 PERFORMANCE REQUIREMENTS**

A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
1. When requested, include span analysis data.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads. Provide system capable of handling the following loads:
a. Positive Wind Load (PSF): ???Insert Number??? PSF Ultimate or ASD
b. Negative Wind Load (PSF): ???Insert Number??? PSF Ultimate or ASD

B. Deflection Limits:
1. Walls: Limited to L/60 of clear span for each assembly component.

C. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 110 degrees Fahrenheit, ambient; 150 degrees Fahrenheit, material surfaces.

### 1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

### 1.08 WARRANTY

A. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails in material or workmanship, within one year from the date of delivery. Failure of material or workmanship shall include deterioration of finish on metal in excess of normal weathering; and defects in accessories; insulated, translucent sandwich panels; and other components of the work.

## PART 2 PRODUCTS

### 2.01 MANUFACTURER

A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project subject to compliance with the performance requirements of this specification and submission of evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

B. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: info@kalwall.com

### 2.02 PANEL COMPONENTS

A. Face Sheets:
   1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
      a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
      b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
   2. Interior face sheets:
      a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 450 when tested in accordance with UL 723.
      b. Burn extent by ASTM D 635 shall be no greater than 1".
   3. Exterior face sheets:
      a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 3 years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
      b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 feet lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
      c. Erosion Protection: Integral, embedded-glass erosion barrier.
   4. Appearance:
      a. Exterior face sheet: Smooth, ???Insert Thickness??? thick and ???Insert Color??? in color.
      b. Interior face sheet: Smooth, ???Insert Thickness??? thick and ???Insert Color??? in color.
      c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core:
   1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width

of I-beam shall be no less than 7/16".

2. I-beam Thermal break: Minimum 2", thermoset fiberglass composite. Poured and de-bridged thermal break is not acceptable.

C. Laminate Adhesive:
1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI
   b. 182° F: 100 PSI
   c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
   d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

**2.03 PANEL CONSTRUCTION**

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
1. Thickness: 4 inches
2. Grid Core Insulation: Fill panel cores with air
3. Panel U-factor by NFRC certified laboratory: 4" thermally broken grid 0.55
4. Complete insulated panel system shall have NFRC certified U-factor of ???Insert NFRC U-factor ???
5. Visible Light Transmittance (VLT): Select VLT criteria below
   a. Visible LT (((NFRC 202))) by NFRC certified laboratory: Match existing.
6. Solar heat gain coefficient ???Insert Value???
7. Grid pattern as viewed: See drawings.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.

C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:
1. Absence of flame penetration through the wall assembly at any time.
2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-min observation period.
3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-min observation period.

D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

**2.04 ALUMINUM CLAMPTITE INSTALLATION SYSTEM**

A. Aluminum clamptite installation system:
1. Thermally Broken-Flat extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamptite installation system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum clamptite installation system, excluding final fasteners to the building.

D. Finish:

1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards.
2. Mill (optional)
3. Anodized

**PART 3 - EXECUTION**

**3.01 3.1 EXAMINATION**

A. A. Installer shall examine substrates, supporting structure, and installation conditions.

B. B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

A. A. Metal Protection:
   1. 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
   2. 2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

**3.3 INSTALLATION**

A. A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation instructions.
   1. 1. Anchor component parts securely in place by permanent mechanical attachment system.
   2. 2. Accommodate thermal and mechanical movements.
   3. 3. Seal aluminum clamptite installation system as shown on the manufacturer’s fabrication drawings and suggested installation instructions.

B. B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturers fabrication drawings and suggested installation instructions.

**3.4 FIELD QUALITY CONTROL DELETE THIS SECTION IF NOT APPLICABLE.**

A. A. Water Test: Installer to test a representative section of installed materials according to procedures in AAMA 501.2.

B. B. Repair or replace work that does not pass testing or that is damaged by testing and retest work.

**3.5 CLEANING**

A. A. Clean the panel system, interior and exterior, immediately after installation.

B. B. Refer to manufacturer's written recommendations.

**END OF SECTION 08 45 23**

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# SECTION 08 51 13
# ALUMINUM WINDOWS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

### 1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Rough opening framing.

B. Section 07 25 00 - Weather Barriers: Sealing frame to water-resistive barrier installed on adjacent construction.

C. Section 07 92 00 - Joint Sealants: Sealing joints between window frames and adjacent construction.

D. Section 08 80 00 - Glazing.

### 1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2022.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

C. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products; 2021.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors; 2002 (Reapproved 2018).

G. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations, and installation requirements.

C. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
   1. Evidence of AAMA Certification.
   2. Evidence of WDMA Certification.
   3. Evidence of CSA Certification.
   4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

D. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

E. Manufacturer's qualification statement.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

### 1.07 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

### 1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.

D. Manufacturer Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with manufacturer.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Aluminum Window Manufacturers:
   1. Arcadia, Inc: www.arcadiainc.com/#sle.

### 2.02 ALUMINUM WINDOWS

A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
   1. Frame Depth: 3-1/2 inch.
   2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
   3. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
   4. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

B. Fixed, Non-Operable Type:

### 2.03 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
   1. Performance Class (PC): Meet IECC thermal preformance requirements.

B. Design Pressure (DP): In accordance with applicable codes.

### 2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

### 2.05 FINISHES

A. Finish Color: As selected by Architect from manufacturer's standard range.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 25 00.

### 3.02 PRIME WINDOW INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Install glass and infill panels in accordance with requirements; see Section 08 80 00.

### 3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

### 3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed aluminum windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.
2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

### 3.05 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

### 3.06 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

**END OF SECTION 08 51 13**

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**SECTION 08 71 00**
**DOOR HARDWARE**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Hardware for hollow metal doors.

B. Hardware for fire-rated doors.

C. Thresholds.

D. Weatherstripping and gasketing.

### 1.02 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 10 14 00 - Signage: Additional signage requirements.

### 1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA A156.1 - Standard for Butts and Hinges; 2021.

C. BHMA A156.3 - Exit Devices; 2020.

D. BHMA A156.4 - Door Controls - Closers; 2019.

E. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

F. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.

G. BHMA A156.16 - Auxiliary Hardware; 2023.

H. BHMA A156.21 - Thresholds; 2019.

I. BHMA A156.22 - Standard for Gasketing; 2021.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

L. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

M. UL (DIR) - Online Certifications Directory; Current Edition.

N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.

D. Manufacturer's qualification statement.

### 1.05 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

### 1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.
   4. Other Hardware: Two years, minimum.

## PART 2 PRODUCTS

### 2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.
   3. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.

### 2.02 HINGES

A. Manufacturers:
   1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Hinges: Comply with BHMA A156.1, Grade 1.
   1. Provide hinges on every swinging door.
   2. Provide following quantity of butt hinges for each door:

### 2.03 FLUSH BOLTS

A. Manufacturers:

B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
   1. Flush Bolt Throw: 3/4 inch, minimum.

### 2.04 EXIT DEVICES

A. Manufacturers:
   1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
   1. Lever design to match lockset trim.
   2. Provide cylinder with cylinder dogging or locking trim.
   3. Provide exit devices properly sized for door width and height.
   4. Provide strike as recommended by manufacturer for application indicated.

5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

**2.05 EXIT ALARMS**

A. Manufacturers:
   1. Detex Corporation: www.detex.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

**2.06 LOCK CYLINDERS**

A. Manufacturers:
   1. Best, dormakaba Group: www.bestaccess.com/#sle.

B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
   1. Provide cylinders from same manufacturer as locking device.
   2. Provide cams and/or tailpieces as required for locking devices.

**2.07 DOOR PULLS AND PUSH PLATES**

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.
   3. Material: Aluminum, unless otherwise indicated.

**2.08 COORDINATORS**

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
   1. Type: Bar, unless otherwise indicated.
   2. Material: Aluminum, unless otherwise indicated.
   3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

**2.09 CLOSERS**

A. Manufacturers; Surface Mounted:
   1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. Provide door closer on each fire-rated and smoke-rated door.
   4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
   5. At corridor entry doors, mount closer on room side of door.
   6. At outswinging exterior doors, mount closer on interior side of door.

**2.10 OVERHEAD STOPS AND HOLDERS**

A. Manufacturers:
   1. Rixson or Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
   1. Provide stop for every swinging door, unless otherwise indicated.

### 2.11 PROTECTION PLATES

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.

B. Protection Plates: Comply with BHMA A156.6.

C. Metal Properties: Aluminum material.
   1. Metal, Standard Duty: Thickness 0.050 inch, minimum.

D. Edges: Beveled, on four sides unless otherwise indicated.

E. Fasteners: Countersunk screw fasteners.

### 2.12 KICK PLATES

A. Manufacturers:
   1. Hiawatha, Inc, an Activar Construction Products Group company: www.activarcpg.com/hiawatha/#sle.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

### 2.13 THRESHOLDS

A. Manufacturers:
   1. Dunbarton Corporation: www.dunbarton.com/#sle.

B. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at each exterior door, unless otherwise indicated.
   2. Type: Flat surface.
   3. Material: Aluminum.
   4. Threshold Surface: Fluted horizontal grooves across full width.
   5. Field cut threshold to profile of frame and width of door sill for tight fit.
   6. Provide non-corroding fasteners at exterior locations.

### 2.14 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. Dunbarton Corporation: www.dunbarton.com/#sle.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.

### 2.15 SIGNAGE

A. See Section 10 14 00 for additional signage requirements.

B. Signage (Room Name Plates and Numbers): Provide on doors for individuals to easily identify room names and/or numbers.
   1. Text Required: "RESTROOM" with symbols and braille text.
   2. Material: In plastic or metal with paint used to create necessary text, adhered to door.

### 2.16 FINISHES

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

### 3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

E. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

### 3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

### 3.04 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

### 3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

### 3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

**END OF SECTION 08 71 00**

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**SECTION 08 80 00**
**GLAZING**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic sheet glazing units.

D. Glass coatings.

E. Glazing compounds.

### 1.02 RELATED REQUIREMENTS

A. Section 07 26 00 - Vapor Retarders.

B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors.

D. Section 08 54 13 - Fiberglass Windows: Glazing provided by window manufacturer.

### 1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C1036 - Standard Specification for Flat Glass; 2021.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

J. GANA (SM) - GANA Sealant Manual; 2008.

K. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

L. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

M. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

### 1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

### 1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Glass Fabricators:
   1. GGI - General Glass International: www.generalglass.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:
   2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
   3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

### 2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

**2.04 INSULATING GLASS UNITS**

A. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.
   7. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
      a. Breather Tubes: Seal or crimp breather tubes upon installation in accordance with insulating glass fabricator's requirements.

B. Type GL-3 - Insulating Glass Units: Vision glass, triple glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with argon.
   3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Middle Lite: Annealed float glass, 1/4 inch thick, minimum.
   5. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   6. Total Thickness: 1 inch.
   7. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.13, nominal.
   8. Visible Light Transmittance (VLT): 57 percent, nominal.
   9. Solar Heat Gain Coefficient (SHGC): 0.25, nominal.

**2.05 GLAZING UNITS**

A. Type GL-2 - Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Glazed sidelights to doors, except in fire-rated walls and partitions.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

**2.06 PLASTIC SHEET GLAZING UNITS**

A. Type GL-1 - Fiberglass Sheet: Molded thermosetting polyester; Type 70, fiberglass fabric reinforcement; translucent.
   1. Application: Locations as indicated on drawings.
   2. Surface Burning Characteristics: Flame Spread Index (FSI)/Smoke Developed Index (SDI) of Class A, 25/450, maximum, when tested in accordance with ASTM E84.

3. Exterior surface coated with polyvinyl fluoride film for improved weather resistance.
4. Tint: Translucent.
5. Thickness: 0.090 inch.

**2.07 GLAZING COMPOUNDS**

A. Type GC-1 - Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.

**PART 3 EXECUTION**

**3.01 VERIFICATION OF CONDITIONS**

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

**3.02 INSTALLATION, GENERAL**

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

**END OF SECTION 08 80 00**

# SECTION 09 21 16
# GYPSUM BOARD ASSEMBLIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum sheathing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Structural steel stud framing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

### 1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

C. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

D. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

F. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.

G. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

I. ASTM E413 - Classification for Rating Sound Insulation; 2022.

J. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide data on gypsum board, accessories, and joint finishing system.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion.

## PART 2 PRODUCTS

### 2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

### 2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company: www.americangypsum.com/#sle.
   2. CertainTeed Corporation: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   4. USG Corporation: www.usg.com/#sle.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch.

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including waterfountain, lavatory and toilets.
   2. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
      a. Regular Type: Thickness ___ inch.

D. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 1/2 inch.
   3. Edges: Tapered.
   4. Products:
      a. CertainTeed Corporation; Interior Ceiling Drywall: www.certainteed.com/#sle.

### 2.03 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
   2. Joint Compound: Drying type, vinyl-based, ready-mixed.
   3. Joint Compound: Setting type, field-mixed.

D. Finishing Compound: Surface coat and primer, takes the place of skim coating.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

### 3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

### 3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

### 3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

### 3.05 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

### 3.06 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

### 3.07 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

**END OF SECTION 09 21 16**

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# SECTION 09 22 16
# NON-STRUCTURAL METAL FRAMING

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Requirements for structural, load-bearing, metal stud framing and exterior wall stud framing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking within stud framing.

C. Section 09 21 16 - Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

### 1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

D. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

## PART 2 PRODUCTS

### 2.01 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: C-shaped with flat faces.
   2. Runners: U-shaped, sized to match studs.

B. Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging on both sides.

C. Non-Loadbearing Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
      a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.
   3. Framing Connectors: ASTM A653/A653M steel clips; secures cold rolled channel to wall studs for lateral bracing.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

### 3.02 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure where indicated and to ceiling in other locations.

B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Align and secure top and bottom runners at 24 inches on center.

D. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

E. Align stud web openings horizontally.

F. Secure studs to tracks using crimping method. Do not weld.

G. Fabricate corners using a minimum of three studs.

H. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

I. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

**3.03 CEILING AND SOFFIT FRAMING**

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

B. Install furring independent of walls, columns, and above-ceiling work.

C. Securely anchor hangers to structural members or embed them in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

D. Space main carrying channels at maximum 72 inches on center, and not more than 6 inches from wall surfaces. Lap splice securely.

E. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

F. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

**3.04 TOLERANCES**

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

**END OF SECTION 09 22 16**

**SECTION 09 30 00**
**TILING**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Tile for wall applications.

B. Cementitious backer board as tile substrate.

C. Ceramic accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

### 1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2023.

B. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

C. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

E. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).

H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

J. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

K. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).

L. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

M. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

N. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.

O. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

P. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

Q. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

R. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

### 1.06 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

## PART 2 PRODUCTS

### 2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Dal-Tile Corporation: www.daltile.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Glazed Wall Tile, Type Color Wheel Classics: ANSI A137.1 standard grade.
   1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
   2. Size: 6 by 6 inch and 3x6 nominal.
   3. Edges: Cushioned.
   4. Surface Finish: High gloss.
   5. Color(s): To be selected by Architect from manufacturer's standard range.
   6. Color(s): As indicated on drawings. TBD
   7. Pattern: 3 colors in a standard pattern layout TBD.
   8. Trim Units: Matching bead, bullnose, cove, and base shapes in sizes coordinated with field tile.

### 2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

### 2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

### 2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Premixed Polymer Modified Grout: Single component, stain resistant grout.
   1. Applications: Where indicated.
   2. Use for joints 1/16 inch to 1/2 inch wide.
   3. Color(s): As selected by Architect from manufacturer's full line.

**2.05 MAINTENANCE MATERIALS**

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

**3.02 PREPARATION**

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

**3.03 INSTALLATION - GENERAL**

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

**3.04 INSTALLATION - WALL TILE**

A. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

**3.05 CLEANING**

A. Clean tile and grout surfaces.

**3.06 PROTECTION**

A. Do not permit traffic over finished floor surface for 4 days after installation.

**3.07 SCHEDULE**

**END OF SECTION 09 30 00**

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# SECTION 09 51 00
# ACOUSTICAL CEILINGS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

### 1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

### 1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. USG Corporation: www.usg.com/ceilings/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

### 2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

### 2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Tiles: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 0.86 percent, determined in accordance with ASTM E1264.
   5. Tile Edge: Square.

a. Joint: Kerfed and rabbeted.
6. Color: White.
7. Suspension System: Concealed.
8. Products:
a. Armstrong World Industries, Inc; Dune: www.armstrongceilings.com/#sle.
b. USG Corporation; Pebbled Acoustical Panels: www.usg.com/ceilings/#sle.
c. Substitutions: See Section 01 60 00 - Product Requirements.

**2.04 SUSPENSION SYSTEM(S)**

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
1. Application(s): Seismic.
2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 15/16 inch face width.
4. Color: White.
5. Products:
a. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

**2.05 ACCESSORIES**

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

**3.02 INSTALLATION - SUSPENSION SYSTEM**

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Locate system on room axis according to reflected plan.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

**3.03 INSTALLATION - ACOUSTICAL UNITS**

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

**3.04 TOLERANCES**

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**END OF SECTION 09 51 00**

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**SECTION 09 65 00**
**RESILIENT FLOORING**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Resilient stair accessories.

E. Installation accessories.

### 1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

### 1.03 REFERENCE STANDARDS

A. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2023.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

C. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2019.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

C. Verification Samples: Submit two samples, 12 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

D. Manufacturer's Qualification Statement.

### 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Do not double stack pallets.

### 1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

## PART 2 PRODUCTS

### 2.01 SHEET FLOORING

A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.
   1. Manufacturers:
      a. Armstrong Flooring; Medintone: www.armstrongflooring.com/#sle.
   2. Minimum Requirements: Comply with ASTM F1913.
   3. Thickness: 0.080 inch nominal.

### 2.02 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Manufacturers:
      a. Armstrong Flooring; Standard Excelon Imperial Texture: www.armstrongflooring.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Size: 12 by 12 inch.
   4. Thickness: 0.125 inch.
   5. Color: To be selected by Architect from manufacturer's full range.

### 2.03 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Flexco Corporation; Base Sculptures: www.flexcofloors.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Height: 4 inches.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.

### 2.04 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Vinyl Flooring:

D. Moldings, Transition and Edge Strips: Same material as flooring.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

### 3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

### 3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

### 3.04 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

**3.05 INSTALLATION - TILE FLOORING**

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

**3.06 INSTALLATION - RESILIENT BASE**

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

**3.07 CLEANING**

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

**3.08 PROTECTION**

A. Prohibit traffic on resilient flooring for 48 hours after installation.

**3.09 SCHEDULE**

**END OF SECTION 09 65 00**

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**SECTION 09 65 66**
**RESILIENT ATHLETIC FLOORING**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Rubber sheet flooring, adhesively installed.

B. Interlocking, loose-laid rubber tile.

C. Painted game lines.

### 1.02 REFERENCE STANDARDS

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Selection Samples: Manufacturer's color charts for flooring materials specified and game line paints, indicating full range of colors and textures available.

E. Verification Samples: Actual flooring material specified, not less than 12 inch square, mounted on solid backing.
   1. Include samples of game lines, illustrating colors selected.

### 1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

### 1.06 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F or to go above 100 degrees F.

## PART 2 PRODUCTS

### 2.01 PREFORMED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.
   1. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rubber Sheet Flooring: Three-layer vulcanized rubber.
   1. Thickness: Minimum 8 mm, nominal.
   2. Underlayment: Manufacturer's standard shock absorbing, synthetic rubber underlayment.
   3. Surface Texture: Smooth.
   4. Color: As selected from manufacturer's standard range.
   5. Products:
      a. Mondo America, Inc; Advance New Generation: www.mondoworldwide.com/#sle.

## 2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

## PART 3 EXECUTION

## 3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

## 3.02 PREPARATION

A. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

B. Broom clean areas to receive athletic flooring immediately before beginning installation.

## 3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:
   1. Unroll flooring and allow to relax before beginning installation.
   2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
   3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
   4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
   5. Weld seams using techniques and equipment recommended by manufacturer.
   6. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.
   7. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

D. Rubber Tile Flooring:
   1. Lay out center lines in spaces to receive tile flooring, based on location of principal walls. Start tile installation from center, and adjust as necessary to avoid tiles less than one-half width at perimeter.
   2. Lay tiles square with room axis, matching for color and pattern by selecting from cartons and mixing as recommended by manufacturer.

## 3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

## 3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

**END OF SECTION 09 65 66**

**SECTION 09 91 13**
**EXTERIOR PAINTING**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

### 1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting.

### 1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and

instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

**1.06 FIELD CONDITIONS**

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

**2.02 PAINTS AND FINISHES - GENERAL**

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated in Color Schedule.

**2.03 PAINT SYSTEMS - EXTERIOR**

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
   3. Top Coat Sheen:
      a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

**3.02 PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

**3.03 APPLICATION**

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**3.04 PROTECTION**

A. Protect finishes until completion of project.

**3.05 SCHEDULE - PAINT SYSTEMS**

A. Steel Fabrications: Finish surfaces exposed to view and concealed surfaces where required to conform to performance requirements and resist corrosion.

B. Aluminum: Finish surfaces exposed to view.

C. Galvanized Steel: Finish surfaces exposed to view.

D. Shop-Primed Metal Items: Finish surfaces exposed to view.
   1. Finish the following items:
      a. Exposed surfaces of steel stairs and railings.
      b. Mechanical equipment.
      c. Electrical equipment.

**END OF SECTION 09 91 13**

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**SECTION 09 91 23**
**INTERIOR PAINTING**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Prime surfaces to receive wall coverings.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

### 1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

### 1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

D. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished

surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

**1.05 DELIVERY, STORAGE, AND HANDLING**

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

**1.06 FIELD CONDITIONS**

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 fc measured mid-height at substrate surface.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

**2.02 PAINTS AND FINISHES - GENERAL**

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated on drawings.
   1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

**2.03 PAINT SYSTEMS - INTERIOR**

A. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
   2. Two top coats and one coat primer.
   3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
   4. Top Coat Sheen:

a. Satin: MPI gloss level 4; use this sheen at all locations.

B. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, uncoated steel, and shop primed steel.
1. Two top coats and one coat primer.
2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
1. Shop primer by others.
2. One top coat.
3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.

**2.04 PRIMERS**

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.

**2.05 ACCESSORY MATERIALS**

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Wallboard: 12 percent.

**3.02 PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Galvanized Surfaces:

G. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial

Blast Cleaning. Protect from corrosion until coated.

H. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

**3.03 APPLICATION**

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**END OF SECTION 09 91 23**

**SECTION 10 14 23**
**PANEL SIGNAGE**

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Panel signage.

### 1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.

D. Samples: Submit one sample of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Panel Signage:
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.

### 2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

### 2.03 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Room and door signs.
   2. Description: Flat signs with engraved panel media, tactile characters.
   3. Sign Size: 4 inches by 6 inches.
   4. Total Thickness: 1/8 inch.
   5. Color and Font, unless otherwise indicated:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper and lower case (title case).
      c. Background Color: As scheduled.
      d. Character Color: Contrasting color.
   6. Material: Laminated colored plastic engraved through face to expose core as background color.
   7. Profile: Flat panel without frame.
   8. Tactile Letters: Raised 1/32 inch minimum.
   9. Braille: Grade II, ADA-compliant.

### 2.04 SIGNAGE APPLICATIONS

A. Room and Door Signs:
   1. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.

2. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that substrate surfaces are ready to receive work.

B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

**3.02 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until date of substantial completion; repair or replace damaged items.

**END OF SECTION 10 14 23**

# SECTION 10 28 00
# TOILET, BATH, AND LAUNDRY ACCESSORIES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Diaper changing stations.

### 1.02 RELATED REQUIREMENTS

A. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

### 1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

C. ASTM C1036 - Standard Specification for Flat Glass; 2021.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

### 1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

### 1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products: www.ajw.com/#sle.
   2. American Specialties, Inc: www.americanspecialties.com/#sle.
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Diaper Changing Stations:
   1. Bradley Corporation; _____: www.bradleycorp.com/#sle.
   2. Koala Kare Products; _____: www.koalabear.com/#sle.

### 2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 3 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

**2.03 FINISHES**

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

**2.04 COMMERCIAL TOILET ACCESSORIES**

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel.
   1. Products:
      a. AJW Architectural Products: UX142-SF www.ajw.com/#sle.
      b. American Specialties, Inc: www.americanspecialties.com/#sle.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 400 multifold minimum.
   2. Products:
      a. AJW Architectural Products: U180 www.ajw.com/#sle.

C. Waste Receptacle: Stainless steel, freestanding style with swing top.
   1. Liner: Removable seamless stainless steel receptacle.
   2. Minimum capacity: 10 gallons.

D. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with ABS cover; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
   1. Minimum Capacity: 48 ounces.

E. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
   1. 24" x 36" and 42" x 36"
   2. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   3. Products:
      a. AJW Architectural Productshttps://www.ajw.com/products/series/U7048B-2436/
      b. American Specialties, Inc: www.americanspecialties.com/#sle.

F. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.

G. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Finish: Satin.
      d. Length and Configuration: As indicated on drawings.
      e. Products:
         1) AJW Architectural Products: www.ajw.com/#sle.
         2) American Specialties, Inc: www.americanspecialties.com/#sle.

H. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

**2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS**

A. Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
    a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
    b. Comply with ICC A117.1.
    c. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

### 3.02 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

### 3.03 INSTALLATION

A. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

### 3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

**END OF SECTION 10 28 00**

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# SECTION 10 51 29
# PHENOLIC LOCKERS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Phenolic lockers.

B. Locker benches.

### 1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete Concrete base construction.

### 1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate locker plan layout, numbering plan.

C. Samples: Submit two samples 3 by 6 inches in size, of each color scheduled.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Phenolic Lockers:
   1. ASI Storage Solutions; Phenolic Tradional Plus: www.asi-storage.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.02 LOCKER APPLICATIONS

A. Student Lockers: Phenolic lockers, wall mounted with matching closed base.
   1. Width: 12 inches.
   2. Depth: 15 inches.
   3. Height: 60 inches.
   4. Locker Configuration: Two tier.
   5. Fittings: Size and configuration as indicated on drawings.
      a. Hooks: One double prong.
   6. Ventilation: By open space between the back of the door and locker body.
   7. Locking: Padlock hasps, for padlocks provided by Owner.
   8. Provide sloped top.

B. Locker Benches: Stationary type; bench top of phenolic material; painted steel pedestals.
   1. Height: 18 inch.
   2. Length: 12 inch.
   3. Manufacturers:
      a. Summit Lockers, Inc: www.summitlockers.com/#sle.

C. Locker Bench Support Brackets: Welded structural aluminum single arm floor mount pedestal bench support brackets; pre-drilled for bench top material attachment and for wall anchorage.

### 2.03 PHENOLIC LOCKERS

A. Lockers: Factory assembled, made of phenolic core panels with mortise and tenon joints and stainless steel mechanical joint fasteners; fully finished inside and out; each locker capable of standing alone.
   1. Doors: Full overlay, covering full width and height of locker body; square edges.

2. Panel Core Exposed at Edges: Machine polished, without chips or tool marks; square edge unless otherwise indicated.
3. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.
4. Door Color: As selected by Architect; allow for 2 different colors.
5. Body Color: Manufacturer's standard white or light color.
6. Fasteners for Accessories and Locking Mechanisms: Tamperproof type.

B. Component Thicknesses:
1. Doors: 1/2 inch minimum thickness.
2. Locker Body: One of the following combinations:

C. Phenolic Core Panels: Nonporous phenolic resin and paper core formed under high pressure, with natural colored finished edges, integral melamine surface, matte finish, and uniform surface appearance; glued laminated panels not acceptable.
1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.

D. Coat Hooks: Stainless steel or reinforced nylon; attached with tamperproof screws.

E. Number Plates: Manufacturer's standard, minimum 4-digit, permanently attached with adhesive; may be field installed.

F. Built-In Lock Boxes: Same material as locker, manufacturer's standard size, with padlock hasps, for padlocks provided by Owner.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

### 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

### 3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

**END OF SECTION 10 51 29**

# SECTION 11 66 23
# GYMNASIUM EQUIPMENT

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor anchors for tensioned elements.

C. Wall mounted protection pads.

D. Gym divider curtains.

E. Indoor batting cages.

F. Volleyball nets and posts.

### 1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Secondary structural members supporting gymnasium equipment.

B. Section 26 05 83 - Wiring Connections.

### 1.03 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

### 1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gauge of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

C. Samples: Submit samples of wall pad coverings in manufacturer's available range of colors.

D. Operating and maintenance data for each operating equipment item.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### 1.05 QUALITY ASSURANCE

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

### 1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Gymnasium Equipment:

1. ADP Lemco, Inc; _____: www.adplemco.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 GENERAL REQUIREMENTS**

A. See drawings for sizes and locations, unless noted otherwise.

B. Where mounting dimensions or sizes are not indicated, comply with applicable requirements of the following:
   1. National Federation of State High School Associations (NFHS) sports rules.

C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of Contract Documents.

D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

**2.03 GYMNASIUM DIVIDER CURTAINS**

A. Gymnasium Divider Curtains:
   1. Curtain Material: Class A rated, self-extinguishing vinyl coated polyester complying with NFPA 101.
   2. Upper Section: 9 oz/sq yd vinyl mesh fabric.
   3. Lower Section: 18 oz/sq yd solid vinyl coated polyester.
   4. Operation: Vertical lift roll-up, curtain coils on bottom rail .
   5. Width: As indicated on drawings.
   6. Manufacturers:
      a. ADP Lemco, Inc; _____: www.adplemco.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

**2.04 INDOOR CONTAINMENT**

**2.05 BASKETBALL**

A. Basketball System: Backstop assembly, backboard, and goal.
   1. Weight: __ pounds, maximum.
   2. Manufacturers:
      a. ADP Lemco, Inc; _____: www.adplemco.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Wall-Mounted Backstop Assemblies: Wall-mounted steel frame assembly capable of mounting both rectangular and fan-shaped backboards.
   1. Framing: Up-folding retractable framing and stationary framing.
   2. Folding Control System: Electric hoist with 115 volt actuator, integral limit switches that provide automatic shut-off in both positions, and safety catch with automatic reset.
   3. Folding Control System: Manual winch with safety catch and automatic reset.
   4. Height Adjuster: Raises or lowers assembly by 2 feet to adjust goal height.
      a. Height Control System: Electric hoist that adjusts backstop with 115 volt actuator, and integral limit switches that provide automatic shut-off in both positions.
   5. Framing Color: Manufacturer's standard.
   6. Weight: __ pounds, maximum.
   7. Manufacturers:
      a. IPI by Bison, Inc; IP10WB Stationary Basketball Goals: www.ipibybison.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Ceiling-Suspended Backstop Assemblies: Capable of mounting both rectangular and fan-shaped backboards.

1. Framing: Center strut; forward folding framing.
2. Framing Color: Manufacturer's standard.

D. Backboards: Tempered glass, rectangular shaped.
1. Frame: Brushed aluminum edge, steel mounting.
2. Markings: Painted.
3. Color: Manufacturer's standard.

E. Goals: Steel rim, mounted to backboard, with attached nylon net; complete with mounting hardware.
1. Net Attachment Device: Tube-tie.
2. Finish: Powder coat orange.

**2.06 FLOOR-MOUNTED EQUIPMENT**

A. Volley Ball Nets and Posts: ___ three court system of adjustable posts, net, and tensioning winch meeting requirements for FIVB, USA Volleyball, NCAA and NFHS competition requirements.
1. Posts: 3-1/2 inch O.D. schedule 80 aluminum tube with 1 inch height adjustments between 42 and 96 inches.
2. Net: 4 inch square #36 nylon cord with vinyl coated polyester hem, double stitched around the perimeter.
3. Tensioning Winch: Manual crank heavy duty, self-locking worm gear mechanism.

**2.07 WALL PADDING**

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
1. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
a. Color: As selected from manufacturer's standard range.
b. Texture: Embossed leather-look.
c. Fabric Weight: 14 oz/sq yd, minimum.
2. Foam: Soft, urethane or polyurethane, with 3.5 pcf nominal density.
3. Foam Thickness: 1-1/2 inches.
4. Backing Board: Plywood.
5. Manufacturers:
a. ADP Lemco, Inc: www.adplemco.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Specially Shaped Padding: Same construction as standard padding; custom fabricate to fit irregularly shaped members, areas, and protrusions in gymnasium as indicated; provide padding for:
1. Metal Columns and Cross Bracing.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation, and notify Architect in writing of unsatisfactory or detrimental conditions.

C. Do not proceed with this work until conditions have been corrected; commencing installation constitutes acceptance of work site conditions.

D. Verify that electrical services are correctly located and have proper characteristics.

### 3.02 INSTALLATION

A. Install in accordance with Contract Documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

### 3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves, and use actual movable equipment to be anchored if available.

### 3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

### 3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

**END OF SECTION 11 66 23**

# SECTION 12 36 00
# COUNTERTOPS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

B. Wall-hung counters and vanity tops.

### 1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. PS 1 - Structural Plywood; 2023.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

F. Installer's qualification statement.

### 1.04 QUALITY ASSURANCE

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## PART 2 PRODUCTS

### 2.01 COUNTERTOPS

A. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet, Type ___: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Substitutions: See Section 01 60 00 - Product Requirements.
      b. Finish: Matte or suede, gloss rating of 5 to 20.
      c. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.
   2. Back and End Splashes: Same material, same construction.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness: 1/2 inch, minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
   b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
3. Other Components Thickness: 1/2 inch, minimum.
4. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

**2.02 MATERIALS**

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

E. Joint Sealant: Mildew-resistant silicone sealant, clear.

**2.03 ACCESSORIES**

A. Fixed Top-Mounted Countertop Support Brackets:
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
   3. Color: Black.
   4. Products:
      a. Centerline Brackets; Front Mounting Countertop Support: www.countertopbracket.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

**2.04 FABRICATION**

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

D. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

**3.02 PREPARATION**

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

**3.03 INSTALLATION**

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and vertical surfaces.

**3.04 TOLERANCES**

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

**3.05 CLEANING**

A. Clean countertops surfaces thoroughly.

**3.06 PROTECTION**

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION 12 36 00**

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# SECTION 12 66 13
# TELESCOPING BLEACHERS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Telescoping bleachers.

### 1.02 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

B. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).

C. NFPA 102 - Standard for Grandstands, Folding and Telescopic Seating, Tents, and Membrane Structures; 2021.

D. PS 1 - Structural Plywood; 2023.

### 1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage handling and requirements.
   3. Installation methods.

C. Shop Drawings: Complete layout with dimensions, seat heights, row spacing and rise, aisle widths and locations, points of connection to substrate, assembly dimensions, and material types and finishes.
   1. Provide drawings customized to this project.
   2. Include Professional Engineer certification.

D. Selection Samples: For each material for which color selection is required, submit samples, 2 by 2 inches in size, illustrating colors and finishes available.

E. Operation and Maintenance Data: Manufacturer's operation and maintenance instructions, including annual inspection and maintenance and bi-annual inspection by a Professional Engineer or manufacturer factory service personnel.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Telescoping Bleachers:
   1. Interkal LLC: www.interkal.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

### 2.02 TELESCOPING BLEACHERS

A. Telescoping Bleachers: Factory assembled tiered benches that retract horizontally into depth approximately the same as a single row depth, with fixed seats mounted on leading edge of platforms.
   1. Design to comply with applicable requirements of NFPA 102 and requirements of code authorities having jurisdiction; where conflicts between requirements occur, comply with whichever is more stringent.
   2. Design with solid fascia (riser) or seat fronts that conceal interior mechanisms when fully retracted, fitting tightly enough to prevent climbing up face; at front row provide key locked, hinged fascia (skirt) to cover gap between seat riser/fascia and floor.
   3. Operation: Manual.

B. Design Loads: Design to withstand the following loading conditions:
   1. Live Load on Structural Supports: 100 psf, minimum, of gross horizontal projection.
   2. Live Load on Seats and Walking Surfaces: 120 pounds per linear foot.

3. Lateral Sway Stress on Structural Supports: 24 pounds per linear foot of seat plank.
4. Perpendicular Sway Stress on Structural Supports: 10 pounds per linear foot of seat plank.

C. Dimensions:
1. See drawings for overall dimensions.
2. Rows: 3.
3. Rise Per Row: 12 inches.
4. Row Depth: 24 inches.
5. Seat Height Above Tread: 6 inches.

D. Structural Supports: Steel or aluminum; manufacturer's standard wheeled carriages supporting each tier separately, with moving parts permanently lubricated and metal parts cushioned to prevent metal-to-metal contact during operation.
1. Design so that each row carriage so that it will individually support the design loads and is self supporting when fully assembled without dependence on platform panels or boards, seats, or fascia.
2. Welding: In accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M.
3. Bolting: Use lock-washers or locknuts.
4. Wheels: Minimum 5 inch diameter by 1-1/8 inch wide, with non-marring rubber tires; ball, roller, or oil-impregnated metal bearings; minimum of 2 wheels at each floor support.
5. Finish: Manufacturer's standard enamel or powder coating.
6. Row Locking: Automatically mechanically lock each carriage to adjacent carriages when fully extended.
7. Unlocking: Provide single manual release mechanism to allow retraction of all carriages, concealed behind skirt board of first row.

## 2.03 SEAT AND PLATFORM COMPONENTS

A. Seat/Fascia Assembly: Continuous, molded UV-stabilized high-density polyethylene plastic, seat minimum 1 inch thick, textured finish, homogeneous color throughout, color as selected from manufacturer's standard selection; approximately 18 inch long sections independently removable with tongue-and-groove or rabbeted interlock at end joints.
1. Shape: Ergonomically contoured, with internal ribs spaced for natural flexibility; rear edge cantilevered to provide toe room of not less than 3 inches; no openings to trap debris.
2. Provide end caps of same material and finish on each exposed end.
3. Supports: Internal steel reinforcement of each seat segment bolted to platform nose member; minimum two bolts per segment.

B. Platform, Tread, and Step Structure: Plywood continuously supported on front and rear with side joints tongue-and-grooved.
1. Plywood: PS 1, 5-ply southern pine or polyethylene-overlaid douglas fir or southern pine, Grade A-C.
2. Plywood Thickness: 5/8 inch, minimum.
3. Front (Nose), Rear, and Intermediate Supports: Steel channel or tube, hot-dipped galvanized.
4. Provide end caps of same material and finish on each exposed end.

## 2.04 ACCESSORIES

A. Fillers and Closures:
1. Ends of Retracted Units: Plywood panels, finished to match platforms.
2. Top Row: Provide seat level rear filler panels to close openings between top row seat and wall; finish to match platforms.
3. Back of Units: Full width plywood panels, finished to match platforms, up to 8 feet above floor; vinyl curtains above to underside of top platform.
4. Sides of Extended Units: Vinyl curtains.

5. Vinyl Curtains: 18 ounce vinyl with grommets; color as selected from manufacturer's standard palette.

B. Fasteners: Provide hardware and fasteners in accordance with manufacturer's recommendations.

C. Anchorage: As indicated on drawings; provide hardware in accordance with manufacturer's recommendations.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that field measurements are consistent with those on the shop drawings.

B. Do not begin installation until substrates have been properly prepared and area has been cleared of obstructions.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Do not field cut or alter seats, fascia, or structural members without approval.

C. Provide manufacturer's field representative to inspect completed installation.

### 3.03 ADJUSTING

A. Lubricate, test, and adjust each moving assembly to ensure proper operation in compliance with manufacturer's recommendations.

### 3.04 CLEANING

A. Clean exposed and semi-exposed assembly surfaces.

B. Touch up finishes on damaged or soiled areas.

### 3.05 CLOSEOUT ACTIVITIES

A. Demonstration and Training: Provide manufacturer's field representative to demonstrate to and train Owner's operating personnel in proper operation of equipment.
   1. Location: On site using installed equipment.
   2. Time: As agreed between Owner and Contractor.

### 3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

**END OF SECTION 12 66 13**

**SECTION 20 00 00**

**MECHANICAL GENERAL REQUIREMENTS**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Project Description:

1. This project is a gymnasium addition to the existing aquatic center, with separate oil-fired heating system and separate ventilation systems. Plumbing waste piping will be connected to the existing underfloor waste piping. Domestic cold water will be supplied from the existing building. Fire sprinkler piping will be extended from the existing building to the addition.
2. Comply with the Contract Documents requirements, applicable codes, and standards, as well as the Authority Having Jurisdiction (AHJ) requirements. The contract documents have performance, materials, and installation requirements which may exceed code minimums.

B. Section Includes: Supplemental requirements in addition to Division 1 - General Requirements applicable to all Divisions 20, 21, 22, 23, 25 mechanical specification sections.

C. Related Sections

1. 01 91 00 - Commissioning
2. 20 05 13 - Common Motor Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Mechanical Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 07 00 - Mechanical Insulation
7. 21 10 00 - Water Based Fire Suppression Systems
8. 22 11 00 - Domestic Water Piping and Specialties
9. 22 13 00 - Sanitary Waste and Vent Piping and Specialties
10. 22 40 00 - Plumbing Fixtures
11. 23 05 93 - Testing, Adjusting and Balancing
12. 23 11 13 - Fuel Oil Piping and Specialties
13. 23 13 23 - Aboveground Fuel Oil Storage Tanks
14. 23 21 13 - Hydronic Piping and Specialties
15. 23 21 23 - Hydronic Pumps
16. 23 31 00 - Ducts and Accessories
17. 23 34 00 - HVAC Fans
18. 23 37 00 - Air Outlets and Inlets
19. 23 51 00 - Breechings, Chimneys and Stacks
20. 23 52 23 - Cast Iron Boilers and Accessories
21. 23 73 00 - Central Air Handling Units
22. 23 82 00 - Terminal Heating and Cooling Units
23. 23 83 16 - Radiant Floor Heating Equipment

24. 25 30 00 - Building Automation System Field Devices
25. 25 40 00 - Variable Speed Drives
26. 25 50 00 - Building Automation System
27. 25 90 00 - Sequences of Operation

**1.02 REFERENCES**

A. Codes and Standards:

1. Perform work in accordance with the legally enacted editions of applicable international, State, and local codes with locally accepted amendments to include:
    a. 2021 International Building Code (IBC).
    b. 2021 International Mechanical Code (IMC).
    c. 2021 Uniform Plumbing Code (UPC).
    d. 2021 International Fire Code (IFC).
    e. 2020 NFPA 70, National Electric Code (NEC).
    f. ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
    g. Standard for Accessible and Usable Buildings and Facilities (ANSI A117.1-2017).
2. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested, and approved, in conformance with the current publications and standards of the following organizations:
    a. American Gas Association - AGA.
    b. American National Standards Institute - ANSI.
    c. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE.
    d. American Society of Mechanical Engineers - ASME.
    e. American Society for Testing and Materials - ASTM.
    f. Facility Guidelines Institute - FGI.
    g. Manufacturers Standardization Society of the Valve and Fittings Industry - MSS.
    h. National Electrical Manufacturers' Association - NEMA.
    i. National Fire Protection Association - NFPA.
    j. Occupational Safety and Health Administration - OSHA.
    k. Sheet Metal and Air Conditioning Contractors National Association, Inc. - SMACNA.

B. Definitions:

1. “Accessible” means arranged so that an appropriately dressed man 6'-2" tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended; and may then position himself to properly perform the task to be accomplished, without disassembly or damage to the surrounding installation.
2. “Authority Having Jurisdiction” is the individual official, board, department, or agency established and authorized by the political subdivision created by law to administer and enforce the provisions of the Code as adopted or amended.
3. “As Specified” denotes a product, system, or installation that:
    a. Includes salient characteristics identified in the Drawings and Specifications.

b. Meets the requirements of the “Basis of Design.”

c. Is produced by a manufacturer listed as acceptable on the Drawings or in the Specifications.

4. “Basis of Design” refers to products around which the design has been prepared. Some or all salient characteristics of Basis of Design products may be critical to the fit or performance of the completed installation. Such characteristics are often subtle. Where substitutions are made to products that are the Basis of Design, the Contractor is alerted that nominally acceptable substitutions may produce undesirable side effects such as products that no longer fit the space due to increased product dimensions. The Contractor is responsible for resolving impacts of substitutions. Approval of a substitution request does not relieve the Contractor of complying with the design intent and applicable Codes. Reference to a specific manufacturer’s product (even as “Basis of Design”) does not necessarily establish acceptability of that product without regard to compliance with other provisions of these specifications.
5. “Contracting Agency” is the Owner as defined in the General Conditions of the Contract.
6. “Demolish” means to permanently remove and properly dispose of a component, piece of equipment, or system and its appurtenances with no intent for reuse.
7. “Furnish” means to purchase material as shown and specified and deliver the material to an approved location at the site or elsewhere, as noted or agreed, to be installed by supporting crafts.
8. “Install” means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
9. “Product” is a generic term that includes materials, equipment, fixtures, and any physical item used on the project.
10. “Provide” means furnish products, labor, subcontracts, and appurtenances required and install to a complete and properly operating, finished condition.
11. “Remove” means to remove a component, equipment, or system and its appurtenances and either store it for re-installation/reuse or turn it over to the Contracting Agency.
12. “Rough-in and Connect” means provide an appropriate system connection such as water services with stops, continuous wastes with traps, shutoff valves, and piping connections, testing, etc., for proper operation, ready for furnished products to be installed. Equipment furnished is received, uncrated, assembled and set in place by supporting crafts unless prior arrangements are made to hire the rough-in installer for this work.
13. “Serviceable” means arranged such that the component or product in question may be properly and safely removed and replaced without disassembly, destruction, or damage to the surrounding installation. "Serviceable" components shall be "accessible.”
14. “Shop Drawings” are dimensioned working construction drawings drawn to scale to show an entire area of work in sufficient detail to demonstrate service and maintenance clearances and coordination of all trades.
15. “Substitution” is a product, system or installation that is not by a listed manufacturer or does not conform to all salient characteristics identified in the Project Manual, but that the Contractor warrants meets specific requirements listed in the Project Manual.
16. “System Drawing” is a diagrammatic engineered drawing that shows the interconnection and relationship between products to demonstrate how the products interact to accomplish the function intended. Examples of system drawings include plumbing diagrams, control, and instrumentation diagrams, and wiring diagrams. Some drawings,

such as dimensioned and complete Fire Suppression Drawings may be both System Drawings and Shop Drawings.

**1.03 SYSTEM DESCRIPTION**

A. Performance Requirements:

1. Provide labor, products and services required for the complete installation, checkout, and startup of mechanical systems shown and specified. Coordinate related work, including the work of other crafts, to provide each system complete and in proper operating order.
2. Cooperate with others involved in the project; with due regard to their work, to promote rapid completion of the entire project.
3. Become thoroughly familiar with the local conditions under which the work is to be performed. Schedule work regarding seasons, weather, climatic conditions, and other local conditions that may affect the progress and quality of the work.
4. Coordinate and perform demolition in support of the project as specified and/or as shown on the Drawings. Restore systems that are to remain but that are affected by demolition work. Conduct a site visit prior to bid to determine Scope.
5. In general, the mechanical, electrical, and building automation systems are interrelated. Coordinate the interface and operation of systems so that interrelated systems operate in proper synchronization and balance.
6. Provide labor, materials, and equipment to facilitate the commissioning process of systems and equipment within this scope of work. Perform tests and verification procedures required for the commissioning process as requested by the Contracting Agency.
7. Work and materials shall be in accordance with requirements of the applicable State and local Codes, regulations and ordinances, and the rules and regulations of Authorities Having Jurisdiction. Nothing in drawings and specifications shall be construed to permit work not in conformance with applicable codes, standards, rules, and regulations.
8. Where drawings or specifications call for a material or construction of a better quality or larger sizes than required by the above-mentioned Codes, rules and regulations, the provision of the specifications shall take precedence.
9. Furnish without any extra charge any additional material and labor when required for compliance with the listed codes, rules, standards, and regulations, even though the work may not be mentioned in the specifications or shown on the drawings. It is the responsibility of the successful bidder to bid in accordance with the minimum requirements of the applicable codes, rules, standards, and regulations.

**1.04 PRE-INSTALLATION MEETINGS**

A. Meet with and coordinate Divisions 20, 21, 22, 23, 25 work with the interrelated work of other trades including Architectural, Civil, Structural, Mechanical and Electrical to identify and resolve potential conflicts.

B. Prior to installation of any Division 20, 21, 22, 23, and 25 component, coordinate installation with trades responsible for portions of other related sections of the Project Manual.

**1.05 CONSTRUCTION MANAGEMENT SOFTWARE**

A. Electronic construction management software system, preapproved by the Contracting Agency, may be used to administer the construction administration process.

B. Examples: Procore Construction Manager, Oracle Primavera Submittal Exchange, Autodesk Construction Cloud, and e-Builder.

## 1.06 SUBMITTALS

A. Refer to Division 1 for general submittal requirements.

B. In addition to Division 1 general submittal requirements, prepare Divisions 20, 21, 22, 23, 25 submittals in accordance with the following, and supplemental requirements listed within the specific specification section.

C. The Contracting Agency's obligation to review submittals and to return them in a timely manner is conditioned upon the prior review and approval of the submittals by the Contractor as required by the Construction Contract.

D. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Project Manual.

1. Submittals will not be checked for quantity, dimension, fit, or for proper technical design of manufactured equipment.
2. Provision of a complete and satisfactory working installation is the responsibility of the Contractor.

E. Furnish suppliers with the applicable sections of the Project Manual and review and verify that the suppliers' submittals clearly represent products which comply with the Project Manual.

F. Master Submittal Log:

1. Create and maintain a project specific master submittal log for items to be submitted in accordance with Division 20, 21, 22, 23, and 25 submittal requirements to include but not limited to products, test results, inspections, certifications, record drawings, Installation, Operation and Maintenance (IO&M) manuals, etc.
2. Submit master submittal log, as the initial submittal, independent of other submittals, for review and approval by the Contracting Agency.
3. Promptly update the master submittal log with each submittal action.
4. Provide Contracting Agency access to the current master submittal log.

G. Coordination:

1. Prior to submittal submission to the Contracting Agency for approval, coordinate with applicable subcontractors for conflicts, clearances, physical space allocation and routing, discrepancies, dimensional errors, omissions, contradictions, departures from the Contract requirements, correct electrical/mechanical services and connections, and provisions for commissioning.
2. Review, revise, correct, and appropriately annotate submittals prior to submission for approval.

H. Product Submittals:

1. Provide electronic submittals in PDF format.
2. Reduce PDF file size by removing data and file creation elements not needed for final file presentation. Coordinate maximum file size with the Contracting Agency if necessary.
3. Create PDF documents without security, to be searchable, and to allow for copy and paste functions.
4. For scanned documents, run the optical character recognition (OCR) function to ensure the document is searchable and can be copied and pasted.

I. Product Data:

1. General:

a. Prepare mechanical product submittals in accordance with Division 1, the general requirements of this section and the additional specific requirements of each individual specification section.

b. Submittals not provided as specified shall be rejected without review. This procedure is designed to accelerate and improve the accuracy of the technical review process, as well as simplify the future preparation of the IO&Ms.

c. Product data for each specification section shall be submitted as a complete package, except as noted in this section.

2. Submittal Organization:

a. Organize product submittal information in the same order as the products are specified within each specification section.

b. Provide a separate electronic file folder under each section number and name (e.g., 20 05 29 – Mechanical Hangers and Supports).

c. Within each section file, organize product cutsheet information in the same order as the products are specified in Part 2 of each applicable specification section.

d. Provide electronic bookmarks within each section for the first page of each separate product submittal. Provide product paragraph number/title for each bookmark.

e. Use PDF editing tools to clearly indicate the salient characteristics of each product and neatly cross out non-applicable information.

f. If a particular specified product is being omitted from the product submittal or will not be used for the project, provide a single page file identifying the product and annotated with a brief reason why the product is not being submitted (e.g., “NOT USED,” “NO SUBMITTAL REQUIRED,” “TO BE SUBMITTED BY (PROVIDE DATE),” etc.) This will inform the submittal reviewer that the product was not unintentionally omitted.

g. Product submittals from individual subcontractors may be provided which cover a particular sub-contractor’s scope of work. In this case, arrange partial submittals by system classification such as: PLUMBING, HEATING, FIRE SUPPRESSION, VENTILATION, BUILDING AUTOMATION SYSTEM, etc. Within each system classification, arrange product submittals by specification section, as described, such that each specification section can easily be reorganized into a master set of Division 20, 21, 22, 23, and 25 product submittals organized by specification section. This will simplify the preparation of IO&M manuals.

3. Product Information:

a. Indicate manufacturer's name and address, and local supplier's name, address, phone number.

b. Indicate each product as “Basis of Design,” “Specified Equal” or “Proposed Substitution.”

c. Identify catalog designation and/or model number.

d. Provide manufacturer’s product literature. Neatly annotate to indicate specified salient features, appurtenances and performance criteria for each product specified to demonstrate compliance with the Project Manual to include scheduled information, drawing information and specified information.

e. Indicate product deviations from the Project Manual and mark out non-applicable items on generic “cut sheets.”

f. Include manufacturer provided dimensioned equipment drawings with rough-in mechanical and electrical connections.

g. Include operation characteristics, performance curves and rated capacities.

h. Include motor characteristics and applicable wiring diagram(s).

i. Include weight of equipment. Including accessories.

j. Provide basic manufacturer’s installation instructions.

4. Product Substitutions:

a. Clearly indicate both in the section table of contents and on the individual product submittal information each proposed substitution, deviation or change from the product as described in the Project Manual.

b. Submittal approval does not include substitutions, deviations, or changes from the requirements of the Project Manual unless they are specifically itemized and approved. The term “No Exceptions Taken” will not apply to substitutions, deviations or changes not clearly identified.

c. Provision of a satisfactory working installation of equal quality to the system as described in the Project Manual shall be the responsibility of the Contractor.

d. Correct unapproved deviations from the Project Manual discovered in the field as directed by and at no additional cost to the Contracting Agency.

e. Cost of any design modifications because of proposed product substitutions shall be borne by the Contractor.

J. System Drawings:

1. Submit System Drawings for dynamic elements/systems of the project which are performance specified to include but not limited to: Fire Suppression Systems, Building Automation Systems, and stand-alone packaged equipment.

2. Prepare system drawings on full sized sheets of the same size as the original construction drawings.

3. Include with each system a sequence of operation narrative which describes each mode of system operation in sufficient detail to demonstrate compliance with the Project Manual to the satisfaction of the Contracting Agency.

K. Shop Drawings:

1. General:

a. The Project Manual documents are not intended for nor are they suitable for use as shop drawings. Project Manual documents shall not be utilized for the actual fabrication or installation of products or equipment.

b. The Drawings are partly diagrammatic and do not show all offsets in piping or ducts and may not show in minute detail all features of the installation; however, provide systems complete and in proper operating order.

c. Locations of products are approximate unless dimensioned.

d. Divisions 20, 21, 22, 23, 25 products and systems shall not be installed without shop drawings approved by the Contracting Agency.

e. Rework, changes or additional engineering support required because of the installation of products and systems prior to the approval of applicable shop drawings by the Contracting Agency shall be provided at the Contractor's expense.

f. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations or identified on the drawings or specifications.

2. Preparation:

a. Review each Divisions 20, 21, 22, 23, 25 specification section and identify specific shop drawing requirements.

b. Combine the shop drawing requirements first by system (i.e., ventilation system, heating system, plumbing system, etc.) and then by area (i.e., fan room, boiler room, etc.).

c. Prepare shop drawings on full sized sheets of the same size as the original construction drawings.

d. Arrange shop drawings to scale, showing dimensions where accuracy of location is necessary for coordination or communication purposes.

e. Incorporate the actual dimensions and configurations of the products and systems approved through the product submittal process into the shop drawings.

f. Provide dimensioned maintenance clearance areas around each product as recommended by the manufacturer.

g. Coordinate Divisions 20, 21, 22, 23, 25 work with the interrelated work of other trades including Architectural, Civil, Structural, and Electrical.

h. Identify and provide recommendations to resolve major conflicts which may impact the design of the systems as shown. Such conflicts will be resolved during the shop drawing review process.

i. Identify locations where field coordination between various trades is necessary to avoid conflicts.

j. Indicate elevation of piping, ductwork and equipment above or below finished floor at various locations and in sufficient detail to demonstrate clearance from structural elements and the work of other trades.

k. Coordinate placement of openings and holes through structure, walls, floors, ceilings, and roof with Structural and Architectural.

3. Submittal:

a. Submit dimensioned shop drawings as specified to demonstrate proper planning and sequencing of the applicable trades for the installation and arrangement of Divisions 20, 21, 22, 23, 25 with respect to other interrelated work.

b. Partial shop drawings submittals (i.e., heating system only) will be rejected without review, as the interrelationship with other related work and overall system fit cannot be evaluated.

1). Underslab shop drawings may be submitted separately for review to accommodate the construction schedule.

c. It is assumed that shop drawings submitted for review have been thoroughly prepared and coordinated and that the products and systems can and shall be installed as shown. Conflicts which are not clearly identified and annotated on the submitted shop drawings are assumed not to exist.

d. Installation conflicts arising from the failure to properly coordinate the work of related trades shall be provided at the Contractor's expense.

L. Certificates:

1. Review the submittal requirements for Certificates for each Divisions 20, 21, 22, 23, 25 specification section.
2. Submit copies of certificates as specified. This information may be included within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

M. Test and Evaluation Reports:

1. Review the submittal requirements for Test and Evaluation Reports for each Divisions 20, 21, 22, 23, 25 specification section.
2. Submit copies of reports as specified. Also include these reports within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

N. Installation, Operations and Maintenance (IO&M) Manuals:

1. Review the submittal requirements for IO&M manuals for each Divisions 20, 21, 22, 23, 25 specification section.
2. Begin the preparation of the mechanical IO&M manuals with a complete and fully approved set of mechanical product data submittals organized, annotated and with the product information as indicated within the "Product Data" submittals article above and in each Divisions 20, 21, 22, 23, 25 section.
3. Next, augment each individual product submittal with the written installation, operations, and maintenance information for each approved product. This type of information is not applicable (or available) for bulk commodity or simplistic products such as copper pipe, basic pipe hangers or equipment tags, etc.
4. Annotate the installation, operations, and maintenance information to indicate applicable information for the specific equipment model(s) installed.
5. Maintenance information shall include:
   a. Preventive maintenance requirements for each product, including the recommended frequency of performing each preventive maintenance task.
   b. Instructions for troubleshooting, minor repair and adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and that require no extensive special training or skills.
   c. Information of a maintenance nature covering warranty items, etc., that have not been discussed in the manufacturers' literature.
   d. Information on the spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.
   e. Recommended spare parts list.
6. Organize the IO&M manual information files by specification section (not by sub-contractor) with bookmarks for each section. Provide bookmarks for each section (and subsection as appliable) within the IO&M. Label bookmarks in a similar format as used for product submittals.
7. Provide a cover page for the IO&M manual volume, to include:
   a. The Contracting Agency Name.
   b. Project Name.

c. “Mechanical Installation, Operations and Maintenance Manual.”

8. Provide a table of contents which lists the Divisions 20, 21, 22, 23, 25 specification sections and the Part 2 products in the same order as the applicable specification section.
9. Organize the IO&M manual information by specification section (not by sub-contractor) with a tabbed divider separating each section. Provide the typed section number on each tab.
10. Within each section, organize the product information in the same order as the products are specified in Part 2 of each applicable section. Provide sub-tabs within each section for each product. Provide the typed product article number on each tab.
11. Bind the information in identical 3 inch wide; hard-backed, loose-leaf, 3 ring binders with clear front and spine insert pockets. Divide information into multiple volumes so that the pages in each binder rest naturally on one side of rings.
12. Provide a master table of contents at the front of each volume which lists the Divisions 20, 21, 22, 23, 25 specification sections and indicates which sections are located within each volume.
13. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.
14. Provide identical cover and spine inserts for each IO&M manual volume, to include the following typed information:
    a. The Contracting Agency Name.
    b. Project Name.
    c. “Mechanical Installation, Operations and Maintenance Manual.”
    d. “Volume 1 of X, Volume 2 of X,” etc.
15. Submit copies of Operation and Maintenance Manuals in electronic PDF format.

**1.07 CLOSEOUT SUBMITTALS**

A. Warranty Documentation:
1. Review the manufacturer’s warranty requirements for each Divisions 20, 21, 22, 23, 25 specification section. Unless stated otherwise, provide 1-year Contractor’s warranty.
2. Submit required warranty documentation to the applicable Manufacturer’s Representative to validate standard manufacturer’s warranty for each required product. Obtain written confirmation of receipt from each applicable Manufacturer’s Representative.
3. Provide Contracting Agency one copy of submitted warranty documentation and written confirmation of receipt for each applicable Manufacturer’s Representative. This information may be included within the Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.
4. Provide statement of Contractor’s warranty of workmanship, labor, and materials, as described under WARRANTY.

B. Record Documentation:
1. General: As the Work progresses, neatly annotate a designated and otherwise unused set of Division 20, 21, 22, 23 and 25 Contract Drawings to show the actual locations and routing of Division 20, 21, 22, 23 and 25 Work and the terminal connection points to related Work. As a minimum, include the following:
    a. Annotate record drawings to incorporate each applicable addendum.

b. Annotate record drawings as directed by each applicable Request for Information (RFI) and accepted Change Order Proposal.

c. Modify record drawings to show actual equipment sizes and locations and pipe and duct routing. Revise pipe and duct sizes as appropriate.

d. Provide dimensioned locations for permanently concealed piping and ductwork (i.e., piping cast in concrete or buried underground/underslab).

e. Show the actual locations of system isolation valves, especially valves which are concealed above ceilings and behind access panels.

2. Preparation:

a. Neatly annotate record drawings to provide clear interpretation to support electronic drafting by a third party.

b. Tape electronic sketches from addendums and/or RFIs directly to the record drawings as overlays.

c. Annotate the record drawings in colored pencil using the same symbols and abbreviations as indicated in the Division 20, 21, 22, 23 and 25 legends and schedules of the Contract Drawings.
   1). Red to add information.
   2). Green to delete information.
   3). Blue to provide additional clarifying information which is not to be drafted.

d. After submittal to the Contracting Agency, provide additional clarification, information, or rework as necessary to support the accurate interpretation and electronic drafting of the record drawings.

3. Submittals:

a. Provide dimensioned underslab record drawings to the Contracting Agency prior to pouring/placing the slab. For slabs placed in multiple sections, provide record drawings for the applicable slab sections to the Contracting Agency prior to each pour.

b. Provide complete record drawings for concealed areas (i.e., above lay-in and hard ceilings and inside walls) to the Contracting Agency prior to concealment.

c. Provide the remaining portion of the record drawings for exposed areas to the Contracting Agency prior to the final completion of the project.

**1.08 MAINTENANCE MATERIAL SUBMITTALS**

A. Spare Parts:

1. Furnish spare parts for systems and equipment as listed in applicable sections of Division 20, 21, 22, 23 and 25.

2. Clearly label each part with name, manufacturer’s part number, system and/or equipment where used and location.

3. Deliver parts to location and person designated by the Contracting Agency, in durable storage boxes.

4. Group cartons containing smaller items by system or application and deliver in an appropriate number of storage boxes.

B. Extra Stock Materials:

1. Furnish extra stock as listed in applicable sections of Division 20, 21, 22, 23 and 25.

2. Clearly label with name, manufacturer’s part number, system and/or equipment where used and location.

3. Deliver to location and person designated by the Contracting Agency, in durable storage boxes.

C. Tools: Provide three sets of special tools and testing and monitoring equipment as listed in applicable sections of Division 20, 21, 22, 23 and 25.

**1.09 QUALITY ASSURANCE**

A. Qualifications:

1. Manufacturers: Companies specializing in manufacturing the Products specified in the Division 20, 21, 22, 23 and 25 sections with minimum 3 years documented experience.
2. Fabricators: Companies specializing in fabricating the Products specified in the Divisions 20, 21, 22, 23 and 25 sections with minimum 3 years documented experience.
3. Installers: Perform the Work using qualified workers that are experienced and usually employed in the trade.
4. Testing Agencies: Products requiring electrical connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and as indicated.

B. Product Testing and Certification:

1. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors shall be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.
2. Where the words Listed, UL Listed, UL Labeled, Underwriters Laboratories, Inc., UL, or variations of this terminology, appear under this Division of the Specifications or the associated drawings, it is understood that a comparable testing agency as defined by NRTL above is acceptable.
3. Such testing and certification is applicable to products within the following categories:
    a. Life safety and fire suppression.
    b. Fuel burning appliances, except certain classes of power or industrial equipment for which other recognized certification applies as well.
    c. Factory fabricated, wired electrical control panels, and packaged equipment with factory installed electrical controls or panels.
    d. Components for life safety systems, fuel systems and medical gas systems.
4. The listing examples are provided for illustration of requirements and are not exclusive. Provide products that have been tested and listed for the intended application when such products are available unless the Contracting Agency has provided written exemption on an itemized basis.
5. Provide electrical products listed and labeled by UL, FM, ETL or other approved NRTL. If listing and labeling is not available, stamp the submittal for these products by an Alaska Registered Professional Engineer approved by the Authority Having Jurisdiction, at no additional cost.
6. Where interpretation is required, the Contracting Agency will provide direction and will be the sole judge in cases of compliance with this subsection.

C. Job Site Documents:

1. Maintain current approved submittal hard copies of shop drawings, materials, products, and calculations at the job site.
2. Maintain current RFIs and ASIs hard copies with annotations references on current hard copy shop drawing red lines at the job site.

**1.10 DELIVERY, STORAGE AND HANDLING**

A. Delivery and Acceptance Requirements:

1. Verify products are new and delivered in original factory packaging/crating and are free from damage and corrosion.
2. Replace products delivered to job site that does not comply with above requirements at no expense to Owner.
3. Remove damaged, or otherwise unacceptable, products from the project site when directed by the Contracting Agency.

B. Storage and Handling Requirements:

1. Store products in covered storage area protected from the elements, outside the general construction area until installed. Maintain ambient conditions required by product manufacturer.
2. Store products in original factory packaging until actual installation or as required by manufacturer.
3. Handle items carefully to avoid breaking, chipping, denting, scratching, or other damage.
4. Replace damaged items with same item in new condition.
5. Pipes, conduits, and ductwork to be covered, protected, when subject to external or internal damage or contamination.

**1.11 WARRANTY**

A. See Division 1 for general warranty requirements.

B. Warranty workmanship, labor, and materials for a period of one year from the date of final acceptance, without limitation, except where longer warranty periods are specified in a specific Section under this Division, or in the General Conditions of the Contract. Promptly coordinate and perform Warranty work at the Contractor’s sole expense.

C. Submit necessary documentation to each appropriate Manufacturer’s Representative to validate manufacturer’s warranty.

D. Provide one copy of warranty documentation and confirmation receipt from the Manufacturer’s Representative.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Protection of In-Place Conditions:

1. Cover and protect open ends and individual components of the ventilation and piping systems during construction when dust, dirt, debris, overspray, or other potential construction contaminates could enter the air distribution system or elements (ducts, fans, VAV boxes, silencers, etc.).
2. Provide temporary construction filters over return airshaft openings and at air handling unit return air dampers.

B. Demolition/Removal:

1. Examination:
    a. Drawings involving existing conditions are based on building record drawings and limited field observation.
    b. Conduct a site inspection prior to submission of Bid to become thoroughly familiar with the Scope of Work.
    c. Report discrepancies to the Contracting Agency before disturbing existing installation.
    d. Verify field measurements, locations, sizes, and routing arrangements and site conditions.
    e. Commencement of demolition implies Contractor accepts existing conditions.
2. Preparation:
    a. In buildings that will remain occupied during construction, coordinate with the Contracting Agency in advance before scheduling disruption of services.
    b. Accommodate the Contracting Agency’s normal business schedule to the maximum extent possible.
    c. Provide temporary mechanical systems to maintain existing systems in service during construction. Submit plan for providing temporary services for approval.
    d. Cover and protect open ends and individual components of the ventilation and piping systems during construction when dust, dirt, debris, overspray, or other potential construction contaminates could enter the air distribution system or elements (ducts, fans, VAV boxes, silencers, etc.).
    e. Provide temporary construction filters over return air openings and at air handling unit return air dampers.
    f. When work must be performed on operating equipment or systems, use personnel experienced in the operation of the specific equipment affected.
    g. Notify the Contracting Agency and the Fire Department Agencies at least 24 hours before partially or completely disabling Fire Suppression, Alarm, or Notification Systems.
3. Execution:
    a. Remove, relocate, and extend existing installations to accommodate new construction as shown and as required for phasing or final systems operations.
    b. Disconnect and remove abandoned fixtures, terminal units, and other products. Remove abandoned controls and associated wiring to source of signal and supply.
    c. Remove abandoned piping and ductwork back to source of supply or other point as shown, and cap tight to accept normal system test pressures.
    d. Remove exposed abandoned or indicated for demolition controls, equipment, pipes, and ducts, including abandoned items above ceiling finishes. Cut concealed pipes and ducts flush with walls and floors. Remove brackets, stems, hangers, and other accessories. Fill and repair surfaces to match surrounding finish work.
    e. Repair damaged surfaces, insulation, ceiling tiles, and fireproofing. Plug, patch, repair holes, and surfaces. Repair assemblies to match existing fire, temperature, and/or smoke ratings. Refinish surface to match surrounding finish work.
    f. Seal room penetrations to maintain pressure relationships to adjacent spaces.

g. Maintain access to existing mechanical and electrical installations that remain active. Modify installation or provide access panels as appropriate, coordinate with the Contracting Agency.

h. Turn salvaged items over to the Contracting Agency as noted on the Drawings. Dispose of items that the Contracting Agency does not desire to retain at a legal disposal site.

i. Recover refrigerant charge from existing units to be demolished in accordance with EPA section 608 of the Clean Air Act of 1990. Remove recovered refrigerant from the premises.

**3.02 INSTALLATION**

A. Special Techniques: Provide temporary heating to maintain the building interior at 65 degrees F.

B. Interface with Other Work:

1. Electrical Work:

a. Coordinate with Division 26.

b. See also specification Section 20 05 13 - Common Motor Requirements.

c. Suggested Coordination Schedule: The Contractor is responsible to provide heating, ventilating, and plumbing equipment motors, and controls, including fire suppression controls. Unless otherwise indicated on the Drawings, it is recommended that motors and controls be furnished, set in place, and wired in accordance with the following schedule. “CC” applies to either a Control subcontractor working as a sub to the General Contractor or to the Divisions 20, 21, 22, 23, 25 Mechanical subcontractor. Coordinate work between subcontractors.

| MC - Divisions 20, 21, 22, 23, 25-Mechanical<br>CC - Divisions 20, 21, 22, 23, 25-Controls<br>EC - Divisions 26, 27 and 28-Electrical | Furnished By | Set in Place By | Power By | Control By |
|---|---|---|---|---|
| Equipment Motors | MC | MC | EC | CC |
| *Magnetic motor starters: | | | | |
| Automatic controlled, w/ or w/o HOA switches | EC | EC | EC | CC |
| Automatic controlled, w/ or w/o HOA switches, and that are furnished as part of factory wired equipment | MC | MC | EC | MC |
| *Manual Motor Starters: | | | | |
| Manually controlled | EC | EC | EC | EC |
| Manually controlled, and that are furnished as part of factory wired equipment | MC | MC | EC | MC |
| Combination disconnect and motor starter | EC | EC | EC | CC |
| Motor Control Centers | EC | EC | EC | CC |
| Variable Speed Drives | MC | EC | EC | CC |
| Push-button stations, pilot lights, contactors, multi-speed switches | EC | EC | EC | EC |
| Disconnect switches, thermal overload switches, manual operating switches | EC | EC | EC | -- |

| MC - Divisions 20, 21, 22, 23, 25-Mechanical<br>CC - Divisions 20, 21, 22, 23, 25-Controls<br>EC - Divisions 26, 27 and 28-Electrical | Furnished By | Set in Place By | Power By | Control By |
|---|---|---|---|---|
| Multi-speed switches furnished as part of factory wired equipment | MC | MC | EC | MC |
| Temperature control relays, transformers, electric thermostats, time clocks, etc., that are not part of factory furnished equipment | CC | CC | CC | CC |
| Remote bulb thermostats, motor valves, controls, which are an integral part of factory furnished mechanical equipment. | MC | MC | EC | MC |
| Fire sprinkler suppression controls | MC | MC | EC | MC |
| Duct smoke detectors, including relays for fan shutdown | MC | MC | EC | EC |
| Fire/Smoke Dampers | MC | MC | EC | EC |
| Control Systems | CC | CC | CC | CC |
| Damper & Valve Actuators (120 v) | CC | CC | EC | CC |
| Damper & Valve Actuators (24 v) | CC | CC | CC | CC |
| Master Building Power quality monitors (loss/reversal) | EC | EC | EC | CC |
| Boiler and water heater controls, boiler burner control panels, internally wired | MC | MC | EC | MC |
| Electric Generator(s) | | | | |
| Genset(s) | EC | EC | EC | EC |
| Fuel Lines | MC | MC | -- | -- |
| Day Tank (if separately furnished) | MC | MC | EC | MC |
| Silencer | EC | MC | | |

* Provide starters in accordance with the Electrical Specifications. Note that thermal overload relays are required for each starter (packaged equipment included).

2. Coordination with Room Numbering:
   a. Certain systems provided under this Division rely on identification systems that are based on room names or numbers.
   b. The numbering scheme indicated in this Project Manual is based on room numbers assigned during the design process.
   c. The Contracting Agency reserves the right to change the numbers prior to Substantial Completion, and the final names and numbers will not necessarily match those found in the Project Manual.
   d. Obtain from The Contracting Agency the final room numbers prior to commencing the numbering of Divisions 20, 21, 22, 23, 25 systems.
   e. Tag and label system equipment and devices in accordance with the final numbering scheme at no additional cost.

### 3.03 REPAIR/RESTORATION

A. Touch-up, repair or replace product components broken during installation or startup with new replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

C. Clean and repair existing identification tags/labels, hangers, supports, insulation, materials, instrumentation, and equipment that remain or are to be reused or are affected by this work. Materials and equipment which require major repair may be replaced at the Contractor's option.

D. Plug, patch and repair surfaces, adjacent construction, and finishes damaged during demolition and new work. Restore to original condition or better including fire, smoke or temperature ratings or listings. Retexture surfaces to match surrounding surfaces. Repaint affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish. Replace cracked or damaged ceiling tiles. Repair fireproofing, assembly fire ratings, and construction resistant to the passage of smoke.

### 3.04 SITE QUALITY CONTROL

A. Site Tests and Inspections:

1. The Contracting Agency may inspect and approve sample installation of systems and equipment prior to general installation of units.
2. Schedule, obtain, and pay for fees and/or services required by the local Authorities Having Jurisdiction and by these specifications, to test the mechanical systems.
3. Notify the Contracting Agency a minimum of 24 hours in advance of tests. Certify in writing that specified tests have been made in accordance with the specifications.
4. Immediately correct deficiencies that are discovered during the tests and repeat tests until system is approved. Do not cover or conceal piping, equipment, or other portions of the mechanical installations until satisfactory tests are made and approved.
5. Under the direction of the Contractor and in the presence of the Contracting Agency, place the entire mechanical installation and/or any portion thereof in operation to demonstrate satisfactory operation.
6. Arrange for the Contracting Agency to witness tests. The Contracting Agency may waive witnessing any specific test at its discretion.

B. Non-Conforming Work:

1. Expediently remove and provide new for work not conforming to the Project Manual upon discovery, including warranty and discovery periods.
2. Warranty period shall start over for replaced equipment and installation from the date of accepted by the Contracting Agency.

C. Manufacturer Services:

1. Authorized manufacturer's representative shall be on-site for testing, start-up, functional check-out, and commissioning of equipment and systems.
2. Procurement, installation, start-up, and warranty services to be provided by manufacturer's authorized representative and service company.
3. Equipment, devices, hardware, and software to be approved for application, and of current production. Original manufacturer's parts, hardware, software, and support to be available for ten years after installation.

**3.05 CLEANING**

A. Upon completion of installation and prior to initial operation, remove debris, and clean and wipe down equipment, piping, ductwork, and floor to eliminate dust and dirt.

**3.06 CLOSEOUT ACTIVITIES**

A. Demonstration: Provide demonstration, conducted by authorized factory start-up personnel, to the Contracting Agencies authorized personnel as listed in each individual specification section.

B. Training: In addition to training specified in each individual specification section, provide 8 additional hours of operational instruction conducted by qualified personnel, covering any of the mechanical systems and installation requested by the Contracting Agency to its authorized maintenance personnel.

**3.07 PROTECTION**

A. Provide finished products with protective covers during balance of construction.

B. Provide open duct ends, grilles, and diffusers with protective covers during balance of construction.

C. Provide open pipe ends with protective caps during balance of construction.

**END OF SECTION**

# SECTION 20 05 13
# COMMON MOTOR REQUIREMENTS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes general requirements, products and methods of execution relating to electric motors in general and shall apply to motors furnished as integral parts of equipment specified in this and other Divisions.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 23 21 23 - Hydronic Pumps
4. 23 34 00 - HVAC Fans
5. 23 52 23 - Cast Iron Boilers and Accessories
6. 23 73 00 - Central Air Handling Units
7. 23 82 00 - Terminal Heating and Cooling Units
8. 23 83 16 - Radiant Floor Heating Equipment
9. 25 40 00 - Variable Speed Drives

### 1.02 REFERENCES

A. Codes and Standards:

1. See section 20 00 00 - Mechanical General Requirements.
2. National Electrical Manufacturers Association, NEMA, Standards Publication Motors and Generators, MG-1.

### 1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide product performance characteristics as specified or scheduled on drawings.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Provide a tabular listing of motors including the following information: Tag (from drawings), location, function, actual nameplate FLA, fuse size used, overload relay used, and overload setting.
2. Make copy of list available during Substantial Completion observation by the Contracting Agency. Include list in Operations and Maintenance Manuals.

### 1.06 CLOSEOUT SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.07 QUALITY ASSURANCE

A. See Section 20 00 00 - Mechanical General Requirements.

B. Certifications: Motors shall conform to governing NEMA Standards and ASA Form C-50 for rotating machinery.

**1.08 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 MOTORS IN ELECTRICAL CLASSIFIED LOCATIONS**

A. Motors used in environments indicated to be NEC Class I, Division I shall be built and labeled as explosion-proof for the Group and autoignition temperature, NEC T-code.

B. Motors used in environments indicated to be NEC Class I, Division II:

1. Listed for Class I Division I environments.
2. Listed for Class I Division II environments.
3. Does not have arc-producing brushes or switching mechanisms which could act as ignition sources.
4. Motors that include a space heater, its surface temperature may not exceed 80% of the autoignition temperature of the hazard.

**2.02 SUPPLY VOLTAGE**

A. Supply voltage shall be determined from the electrical plans where nominal utility voltage will be indicated.

B. Motor voltage shall be stamped on the nameplate and relate to the nominal voltage as follows:

| THREE PHASE MOTORS | |
|---|---|
| Nominal Volts | Motor Ratings |
| 208 volts | 200V, 208V, or 208/220V |
| 240 volts | 220V or 208/220V |
| 480 volts | 460V |
| | |
| SINGLE PHASE MOTORS | |
| Nominal Volts | Motor Ratings |
| 120 volts | 115V or 115/230V |
| 240 volts | 230V or 115/230V |
| 208 volts | 200V or 208V |

Note: Provide nameplate indicating that voltage for a motor operating at 208 VAC is suitable.

C. Voltage variation: Motors shall be designed to operate within the parameters of these requirements at rated load and with a voltage variation from the name plate voltage of plus or minus ten percent.

D. Motors shall operate successfully at rated load and at rated voltage with a maximum frequency variation of five percent above or below rated frequency.

E. Motors shall operate successfully at rated load with a combined maximum variation in the voltage and frequency of five percent above or below rated voltage and rated frequency.

F. Motors that operate with Variable Speed Drive (VSD) controllers shall be suitable for the application.

1. Motors operated using PWM type VSDs: Conform to NEMA MG 1 Part 31 requirements.
2. Motors operated using six-step type VSDs: Conform to NEMA MG 1 Part 30 or Part 31 requirements.

**2.03 MOTOR INSULATION**

A. Unless otherwise specified, motor insulation shall be NEMA Class “B” (or better). Based on 40 degrees C. maximum ambient, and 90 degrees C. maximum rise, total maximum operating temperature shall not exceed 130 degrees C.

**2.04 MOTOR LOADING**

A. No motors shall be subjected to loads exceeding the motor nameplate rating, under any normal operating condition.

**2.05 MOTOR RATING**

A. Motors are sized in conformity with the manufacturer’s published information and shall not be interpreted as the final requirement. Check each motor for adequacy in relation to the specific application.

B. Motors indicated as being connected to variable speed drives (VSD) shall be rated for VSD service.

**2.06 HIGH EFFICIENCY AC MOTORS**

A. Furnished high efficiency electric motors for equipment that:

1. Require a three horsepower or larger drive motor.
2. Have duty cycles classified as continuous.

B. Efficiency of the motors shall be determined by NEMA Standard MG 1 - 12.536 and shall have efficiencies equal to or better than:

| Motor Size | Nominal Efficiency |
|---|---|
| Through 3 HP | 89 percent |
| Over 3 HP through 10 HP | 91 percent |
| Over 10 HP through 30 HP | 93 percent |
| Over 30 HP through 60 HP | 94 percent |
| Over 60 HP through 100 HP | 95 percent |
| Over 100 HP | 95 percent |

**2.07 MOTOR HOUSING FEATURES**

A. Open drip-proof, totally enclosed fan cooled (TEFC), or explosion-proof, as appropriate for the use intended and the environment where installed, or as noted. Provide totally enclosed fan cooled motors for equipment below grade, located outdoors, or operating in damp or dust-laden locations. Provide a continuous moisture drain that is screened against insect entry for totally enclosed motors.

B. Oversized external conduit boxes at least one size larger than NEMA standard.

## 2.08 SHAFT GROUNDING RINGS

A. Motors operated on variable frequency drives shall be equipped with a maintenance-free, conductive microfiber shaft grounding ring (SGR) to meet NEMA MG-1, 3.4.4.4.3 requirements, with a minimum of two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground. SGR's Service Life: Designed to last for service life of motor. Provide AEGIS SGR Conductive MicroFiber Shaft Grounding Ring, or approved equal.

B. Application Note: Motors up to 100 HP shall be provided with one shaft grounding ring installed on either the drive end or non-drive end. Motors over 100 HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor with the exception of line contact bearings in the drive end of the machine. In this case the line contact bearing shall be electrically insulated and the AEGIS Bearing Protection Ring installed on the opposite drive end of the motor. Grounding rings shall be provided and installed by the motor manufacturer or contractor and shall be installed in accordance with the shaft grounding ring manufacturer's recommendations.

## 2.09 HIGH FREQUENCY BONDING

A. Motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection. Provide AEGIS HF Ground Straps, or equal.

B. Application Note: High frequency grounding straps shall be used to ensure the proper grounding of inverter driven induction motor frames.

# PART 3 EXECUTION

## 3.01 PREPARATION

A. Protection of In-Place Conditions: Cover motors to protect them from construction dirt and debris.

## 3.02 INSTALLATION

A. Special Techniques:

1. Installation of motors shall be as required by the driven equipment. Make sure motor design and characteristics are suitable for the application.
2. Electrical connections for motors shall conform to NEC Articles 430 and 440 as applicable, and to any state and local code having jurisdiction.
3. Unless furnished as part of a complete package including disconnects and control, and/or motor fuse protection, protect motors by Bussmann Fusetron Dual-Element Time Delay fuses, or approved equal.
4. Megger motor windings prior to starting. Include log of megger readings in the Operations and Maintenance manuals.
5. Verify correct rotation of motors.
6. Comply with Article 460 of the National Electrical Code for installation of power factor correction capacitors.
7. Motor sizes shown on the Drawings are estimates based upon the mechanical design. Where motors actually furnished are of a different size than those shown, motor circuit components (starters, disconnects, overcurrent devices, and conductors) shall be revised to suit the motors actually furnished, without increase in the Contract amount. Similarly, motor overcurrent device sizes shown on the Drawings or specified are based upon estimated motor code letters, overcurrent device manufacturers' recommendations, and

full-load currents from the NEC Tables. Where the motors actually furnished require different sizing, the sizes of the overcurrent devices shall be adjusted to conform to the NEC, without increase in the Contract amount.

**3.03 SHAFT GROUNDING RINGS (MOTORS WITH VARIABLE FREQUENCY DRIVES)**

A. Shaft grounding rings (SGR) shall be factory installed inside the motors by the manufacturer wherever possible. SGRs may be field installed by installing contractor subject to Engineer's approval. Provide AEGIS SGR Colloidal Silver Shaft Coating, or approved equal, on shafts prior to rings installation, per SGR manufacturer's recommendations, after first cleaning shafts.

B. Install and test SGRs in accordance with manufacturer's recommendations. Install the SGR so that the aluminum frame maintains an even clearance around the shaft. Conductive microfibers shall be in full circumferential contact with conductive metal surface of the shaft. Do not use thread lock to secure the mounting screws as it may compromise the conductive path to ground. If thread lock is required, use a small amount of EP2400 AEGIS Conductive Epoxy, or approved equal, to secure the screws in place.

C. Shafts shall be clean and free of any coatings, paint, or other nonconductive material (clean to bare metal). Depending upon the condition of the shaft, it may require using emery cloth or Scotch-Brite. If the shaft is visibly clean, a non-petroleum based solvent may be used to remove any residue. Check the conductivity of the shaft using an ohm meter. Ohms test: Place the positive and negative meter leads on the shaft at a place where the microfibers will contact the shaft. Each motor will have a different reading but in general one should have a maximum reading of less than 2 ohms. If the reading is higher, clean the shaft again and retest.

D. After motors with SGRs are fully installed in the field (in equipment, assemblies, or individually), for both factory installed SGRs and field installed SGRs, test for a conductive path to ground using an Ohm meter. Place one probe on metal frame of SGR and one probe on motor frame. Motor must be grounded to common earth ground with variable frequency drive according to applicable standards. Verify that SGR installations and test readings comply with SGR manufacturer's requirements.

**3.04 HIGH FREQUENCY BONDING (MOTORS WITH VARIABLE FREQUENCY DRIVES)**

A. Motors operated on variable frequency drives shall be bonded from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection. Provide AEGIS HF Ground Straps, or approved equal. After motors with SGRs are fully installed in the field (in equipment, assemblies, or individually), for both factory installed SGRs and field installed SGRs, test for a conductive path to ground using an Ohm meter.

**3.05 REPAIR/RESTORATION**

A. Repair any components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**END OF SECTION**

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## SECTION 20 05 29
## MECHANICAL HANGERS AND SUPPORTS

### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Hanger, support and anchoring requirements for plumbing and mechanical appliances, equipment, and related distribution systems.
2. Building wall, floor, and roof penetration methods for the routing of plumbing and mechanical distributions systems (e.g., sleeving and sealants).

B. Related Sections:

1. 20 00 00 - Mechanical General Requirements
2. 20 05 48 - Vibration and Seismic Control
3. 20 05 53 - Mechanical Identification
4. 22 11 00 - Domestic Water Piping and Specialties
5. 22 13 00 - Sanitary Waste and Vent Piping and Specialties
6. 22 40 00 - Plumbing Fixtures
7. 23 11 13 - Fuel Oil Piping and Specialties
8. 23 21 13 - Hydronic Piping and Specialties
9. 23 21 23 - Hydronic Pumps
10. 23 31 00 - Ducts and Accessories
11. 23 34 00 - HVAC Fans
12. 23 51 00 - Breechings, Chimneys and Stacks
13. 23 52 23 - Cast Iron Boilers and Accessories
14. 23 73 23 - Central Air Handling Units
15. 23 82 00 - Terminal Heating and Cooling Units
16. 23 83 16 - Radiant Floor Heating Equipment
17. 25 40 00 - Variable Speed Drives

#### 1.02 RELATED WORK

A. The building structure shall be designed to support the weight of plumbing and mechanical appliances, equipment, and distribution systems (non-structural components), as well as related seismic and wind forces in accordance with ASCE/SEI 7.

B. See Structural drawings for appliance and equipment housekeeping pad material, construction, and attachment. Actual housekeeping pad locations, dimensions and through penetrations shall be coordinated with approved appliance and equipment base dimensions, weights, and anchoring requirements using the product submittal and shop drawing process.

#### 1.03 REFERENCES

A. Codes and Standards:

1. Refer to Section 20 00 00 - Mechanical General Requirements for general Code and Standard references.
2. MSS SP-58-2018 - Pipe Hangers and Supports - Materials Design and Manufacture, Selection, Application, and Installation.

3. MSS SP-127-2014a – Bracing for Piping Systems: Seismic – Wind – Dynamic Design, Selection, and Application.
4. ASCE/SEI 7-16 Minimum Design Loads for Buildings and Other Structures.

B. Abbreviations, Acronyms and Definitions:
1. See Section 20 00 00 - Mechanical General Requirements for general abbreviations, acronyms, and definitions.
2. See Mechanical Drawings (Legend and Abbreviations).

**1.04 DESCRIPTION**

A. This section applies to Divisions 20, 21, 22, 23, 25 equipment and systems:
1. Support fire suppression system piping and equipment in accordance with Section 21 10 00 - Water Based Fire Suppression Systems.
2. Support plumbing piping, appliances, and equipment in accordance with this section and Uniform Plumbing Code (UPC) requirements as applicable, whichever is more restrictive. In case of conflicts, follow UPC criteria.
3. Support mechanical system piping, appliances, and equipment in accordance with this section and International Mechanical Code (IMC) requirements as applicable, whichever is more restrictive. In case of conflicts, follow IMC criteria.
4. Support ductwork in accordance with Section 23 31 00 - Ducts and Accessories.
5. Provide additional seismic restraint as required for mechanical and plumbing appliances, equipment, and related distribution systems in accordance with 20 05 48 - Vibration and Seismic Control.

B. Design Requirements:
1. Appliance, equipment, and related distribution system support:
a. Select and apply pipe hangers and supports using stock or production parts whenever possible.
b. Design support spacing such that free span of piping does not exceed code or MSS SP69 criteria, whichever is most restrictive.
c. Calculate required supporting force at each hanger location to confirm hanger type and hanger rod diameter selection.
d. Provide hangers such that equipment connection points do not carry connected piping load.
e. When possible, adjust hanger spacing, hanger rod length/diameter to meet the seismic design exclusion criteria of ASCE/SEI 7 to minimize the need for additional seismic restraint.
2. Vibration and seismic restraint systems: If the exclusion criteria of ASCE/SEI 7 cannot be met, provide additional seismic support as required for mechanical and plumbing appliances, equipment, and related distribution systems in accordance with 20 05 48 - Vibration and Seismic Control.
3. Building Design Criteria:
This project is not designated as an essential facility.
Wind design data: See Structural Design Criteria Schedule.
Seismic design data: See Structural Design Criteria Schedule.
Component Importance Factors, Ip:
Fire suppression systems: Ip = 1.5
Fuel gas system: Ip =1.5

Piping Importance Factor: Ip =1.0
All other components: Ip = 1.0

C. General Performance Requirements:
   1. Plumbing and mechanical distribution systems as shown are semi-diagrammatic.
   2. Provide additional hangers, expansion loops, pipe anchors and pipe guide assemblies as required based on actual (as-built) distribution system layout/routing.
   3. Coordinate hanger and support anchor locations and methods with structural.
   4. Provide hangers and supports that allow for the free expansion and contraction of system piping without transferring tensile and compressive stresses to adjacent supports or connected equipment.

D. Special Performance Requirements for Open Ceiling Spaces:
   1. Coordinate the routing and support of ductwork, piping, electrical conduit, lighting and other equipment in open ceiling spaces (using the shop drawing review process) to provide a uniform and symmetrical appearance.
   2. In general, use trapeze hanger style support systems with hangers equally spaced based on the limiting component supported. Provide hanger rods vertical and straight. Trim hanger rod ends to provide a “finished” uniform appearance.

E. Equipment and Systems Subject to Wind Loading: Provide equipment anchorage and additional support in accordance with the manufactures recommended installation requirements, as well as ASCE/SEI 7 anchorage and wind load requirements (e.g., roof mounted equipment).

## 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
   1. Provide manufacturer’s catalog data, including load capacity and anchor embedment requirements.
   2. Manufacturer’s Installation Instructions: Indicate special tools, procedures, and assembly of components.

C. Shop Drawings:
   1. Submit dimensioned shop drawings for housekeeping pads and roof curbs (with dimensioned penetration locations).
   2. Submit shop drawings for field fabricated support systems.
   3. For plumbing and mechanical distributions system shop drawings:
      a. Overlay locations and types of hangers and supports to be provided.
      b. Include details for each hanger and support type with anchorage requirements.
      c. Dimension expansion loops and alignment guide locations and offsets.
      d. Coordinate additional seismic and vibration isolation requirements with Section 20 05 48 - Vibration and Seismic Control.

## 1.06 CLOSEOUT SUBMITTALS

A. Record Documentation:
   1. Indicate installed hanger locations, supports and expansion control assemblies on applicable contractor as-built drawings.

2. Provide Operating and Maintenance Data (installation and adjustment instructions) for non-commodity products.

**1.07 QUALITY ASSURANCE**

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years documented experience.
2. Installers: Minimum 3 years' experience.
3. Provide piping and support systems designed and manufactured per MSS SP69.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. See Section 20 00 00 - Mechanical General Requirements.

**PART 2 PRODUCTS**

**2.01 PIPE HANGERS AND SUPPORTS**

A. General:

1. Piping and support systems materials: Malleable iron, steel, or copper.
2. Hot dipped galvanized ferrous hangers and supports installed outdoors or in unheated spaces.
3. Select and apply pipe hangers and supports per MSS SP69. Use stock or production parts when possible.
4. Fabricate and install pipe hangers and supports per MSS SP69 recommended practices.
5. Hangers shall securely lock using a mechanical fastener. Hangers and supports using gravity type locking are not acceptable. For example, adjustable swivel ring Type 6 is not allowed.
6. Pre-engineered support systems (e.g., Unistrut, Super-Strut, B-Line) may be used in accordance with manufacturer's load limits.
7. Manufacturers: Grinnell, M-CO Michigan Hanger Company, Kin Line or equal.

B. Plumbing Piping:

1. Conform to the Uniform Plumbing Code requirements.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
3. Hangers for DWV and Cold Pipe Sizes two inch and over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers under six inches: Steel channels with welded spacers and hanger rods.
5. Wall Supports: Welded steel bracket and wrought steel clamp.
6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
7. Floor Support for Hot Pipe Sizes up to four inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
8. Vertical Support: Steel riser clamp.
9. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Hydronic Piping:
   1. Conform to ASME B31.9 and the International Mechanical Code.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
   3. Hangers for Hot Pipe sizes two to four inch: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support: Welded steel bracket and wrought steel clamp.
   6. Vertical Support: Steel riser clamp.
   7. Floor Support for Hot Pipe Sizes up to four inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
   8. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

**2.02 DUCTWORK, FLUES, STACKS, AND BREECHINGS HANGERS AND SUPPORTS**

A. Provide hangers and supports for ductwork in accordance with Section 23 31 00 - Ducts and Accessories.

B. Provide hangers, supports, and/or guy wires as applicable for flues, stacks, and breechings in accordance with Section 23 51 00 - Breechings, Chimneys and Stacks.

**2.03 ACCESSORIES**

A. Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded.

B. Escutcheons: Nickel or chrome plate with screws or springs for holding plate in position.

C. Pipe Protection Saddles: Shop fabricate or purchase specially manufactured saddles specifically designed for the intended use. Provide saddles where roller type support is used, or where the pipe hanger is installed outside the insulation for protection of insulating jacket.

D. Outdoor applications: Metal components shall be galvanized or stainless steel.

**2.04 INSERTS**

A. Provide inserts to match the load bearing capacity of hangers.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four (4) inch diameter.

C. Concrete deck inserts: Galvanized rod, steel plate, similar to Kin-Line Figure 293.

D. Screw insert for concrete: Malleable iron similar to Grinnell Figure 152.

**2.05 PRE-ENGINEERED SUPPORT SYSTEMS**

A. Manufacturers:
   1. Unistrut.
   2. Super-Strut.
   3. B-Line.
   4. K-Line.
   5. Erico.
   6. Approved equal.

B. Materials and Finish:
   1. Heated Indoor Applications:
      a. Carbon steel with pre-galvanized zinc (PG) finish.

b. Carbon steel with plain (PL), paintable galvanized, or phosphatized and primed when welding or painting will be required.

2. Outdoor Applications:

a. Carbon steel with hot dipped galvanized zinc (HG) finish. Coat field cuts with zinc rich paint provide by the support system manufacturer.

b. Stainless steel (Type 304) where specifically specified for use in damp, corrosive, or marine environments.

C. Special Finishes: High performance epoxy coating (e.g., Unistrut Perma-Green III) for surface metal raceways.

D. Channel:

1. Standard Size: 1-5/8 inch x 1-5/8 inch. Gauge thickness as required for attached load.

2. Standard Hole Pattern: Slotted. Provide solid channel in exposed public areas.

E. Fittings: Match channel material and finish.

F. Nuts and Hardware:

1. Channel nuts: Hardened steel (ASTM-A675 and ASTM A36).

2. Bolts, screws, and nuts: Hardened steel (ASTM-A307, ASTM A563 and SAE J429).

3. Material and Finish:

a. Heated indoor applications: Electro-galvanized (EG).

b. Outdoor applications:
1). Hot-dipped galvanized (HG).
2). Stainless steel (Type 304) where specifically specified for use in damp, corrosive, or marine environments.

G. Mechanical Accessories: Provide accessories from the support system manufacturer designed for the specific equipment to be supported, to include but not limited to:

1. Pre-insulated pipe hanger inserts to permit continuous insulation at the pipe clamps: Unistrut model PUX, Armaflex model EcoLight.

2. Splice and gusset plates.

3. Corner angles.

4. Specialized support brackets.

5. Beam clamps with restraints.

6. Column supports.

7. Strut pipe clamps.

8. Straps.

9. Brackets.

## 2.06 SEISMIC RESTRAINT SYSTEMS

A. See Section 20 05 48 - Vibration and Seismic Control.

## 2.07 SLEEVES, ACOUSTICAL SEALS AND FIRE-STOPPING

A. Fabricate sleeves in non-load bearing walls from 20-gauge galvanized sheet steel conforming to ASTM A924 / A924M.

B. Fabricate sleeves in load-bearing walls from standard-weight galvanized steel pipe conforming to ASTM A53 / A53M.

C. Provide UL listed prefabricated fire rated sleeves and seals for pipes through fire rated and fire resistive floors and walls.

**2.08 FRAMED OPENINGS**

A. Provide structural steel members for framed openings conforming to ASTM A36 / A36M.

B. Closure Collars:

1. For round and rectangular ducts with a minimum dimension less than 16 inches, fabricate collars from 20 gauge galvanized steel.

2. For round and rectangular ducts with a minimum dimension of 16 inches or greater, fabricate collars from 18 gauge galvanized steel.

**2.09 WALL PENETRATION WATER SEALS**

A. Mechanical seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.

B. EPDM seals.

C. Type 316 stainless steel bolts and nuts.

D. Hot-dipped galvanized or coated sleeve with full water stop flange with continuous weld on both sides.

E. Manufacturer: Metraflex, Thunderline, Crouse-Hinds, or approved equal.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Visually inspect appliances, equipment and distribution systems requiring anchorage/attachment to structure for installation location tolerance, interference and other conditions affecting installation.

B. Verify actual locations of cast-in-place anchors, structure reinforcements and other required attachments prior to installation.

C. Document and correct deficiencies or submit proposed design modifications for approval prior to the installation.

D. Note this project contains cast in place radiant floor heating tubing. Coordinate slab penetration locations so as to not damage tubing.

**3.02 PREPARATION**

A. Prior to installation, prepare detailed shop drawings of the planned installation of hanger and support products specified by this section. Coordinate the location, type and size of hangers and supports, housekeeping pads (thickness/perimeter overhang dimensions) and roof curbs with Architectural and Structural elements using the shop drawing review process.

B. If exclusion criteria of ASCE/SEI 7 cannot be met, coordinate and provide additional seismic support as required for mechanical and plumbing appliances, equipment, and related distribution systems in accordance with 20 05 48 - Vibration and Seismic Control.

C. Submit shop drawings required by this section coordinated with the additional seismic design as required.

D. Do not install hangers and supports without approved shop drawings.

**3.03 INSTALLATION**

A. Attachment:

1. Hollow masonry: Toggle bolts.

2. Solid masonry and concrete: Preset inserts or expansion bolts.

3. Structural steel: Beam clamps which engage both sides of structural member or have retaining clips or other approved means for positive engagement.
4. Metal surfaces: Machine screws, bolts, or welding.
5. Wood construction: Wood or sheet metal screws.
6. Do not use powder-actuated fasteners for anchorage in tension applications. Obtain written permission from the Owner prior to using any type of powder -actuated studs.
7. Plastic screw inserts and caulked lead inserts are prohibited, except for mounting instructions and control diagrams.

B. Pipe Hangers and Supports:

1. Install hangers and supports in accordance with manufacturer's instructions, applicable code requirements and approved shop drawings.
2. Pipe Support: Provide pipe support spacing as indicated in the table below, except where spacing is more restrictive by Code.

| PIPE SIZE (Inches) | HANGER SPACING MAX (Feet) | | | |
|---|---|---|---|---|
| | Steel | | Copper | PE, CPVC (1) |
| | Water Filled | Gas Filled | | |
| 1/2 | 7 | 9 | 5 | |
| 3/4 | 7 | 9 | 5 | |
| 1 | 7 | 9 | 6 | |
| 1-1/4 | 7 | 9 | 7 | |
| 1-1/2 | 9 | 12 | 8 | |
| 2 | 10 | 13 | 8 | |
| 2-1/2 | 11 | 14 | 9 | |
| 3 | 12 | 15 | 10 | |
| 4 | 14 | 17 | 12 | |
| 6 | 17 | 21 | 14 | |
| 8 | 19 | 24 | 16 | |

(Based on Table 4, MSS SP-69, except for plastic piping)

(1) (Based on manufacturer's data)

3. Independently support piping at equipment, such that the equipment supports no weight.
4. Insulated piping: Coordinate with Section 20 07 00 - Mechanical Insulation. Provide insulation saddles or 18 gauge steel insulation shields combined with sections of calcium silicate or cellular glass or provide pre-insulated pipe hanger inserts to permit continuous insulation at the pipe hangers or clamps.
5. Support cold piping outside the insulation and vapor barrier where continuous vapor barrier is specified.
6. Subject to approval, hot piping may be insulated around the supports.
7. Provide trapeze hangers when more than three pipes run parallel and at same elevation.

8. Provide roller supports for hot pipes. Provide saddles where roller type support is used, or where the pipe hanger is installed outside insulation for protection of insulating jacket.
9. Design rods and cross members to support three times the weight of pipes and contents plus 250 pounds.
10. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
11. Place hangers within 12 inches of each horizontal elbow.
12. Use hangers with 1-1/2 inch minimum vertical adjustment.
13. Support horizontal cast iron pipe adjacent to each hub, with five feet maximum spacing between hangers.
14. Support riser piping independent of connected horizontal piping.

C. Piping Requiring Vibration Isolation:
1. Support main risers less than 20 feet in height only at mid-level, with riser guides at other levels.
2. Do not support vibration isolated piping along with non-isolated piping on a common trapeze.
3. Rigidly mount steel spring hanger boxes to the supporting structure. Do not locate in the middle of the hanger rod.
4. Rigid pipe anchors are not permitted in vibration isolated piping circuits.

D. Equipment Bases and Supports:
1. For cast-in-place concrete requirements see Section 03 30 00 - Cast-in-Place Concrete.
2. Unless noted otherwise, provide 3-1/2 inch high (2x4 form) reinforced concrete housekeeping pads with 8 inches minimum extended, chamfered edge beyond base frame in all directions for floor mounted appliances and equipment. Where exterior isolators are used, this distance is measured from the outermost holes in the isolator base plate to the edge of the housekeeping pad.
3. Provide 5-1/2 inch high (2x6 form) reinforced concrete housekeeping pads for central air handling units to provide adequate condensate drain trap water column height. Pads shall extend 8 inches minimum beyond equipment as noted above.
4. The 8-inch extended edge beyond base frame dimension may be reduced to 6 inches minimum with approved anchorage calculations.
5. Construct field fabricated equipment bases and supports from steel members and/or pre-engineered support systems. Prime and paint bases and supports gray or black.
6. Pre-engineered support systems, which are factory coated, are not required to be painted.

E. Equipment and Systems Subject to Wind Loads:
1. Provide equipment anchorage and additional support in accordance with the manufactures recommended installation requirements, as well as ASCE/SEI 7 anchorage and wind load requirements.
2. As applicable, provide wind restraint systems (e.g., guy wires, etc.) in compliance with the manufacturer’s written instructions, and certified and approved application engineering installation details.
3. Install wind restraints so as not to stress or misalign equipment, piping, and ductwork.

F. Penetrations:

1. Coordinate mechanical penetrations with Architectural and Structural construction details prior to installation. Set sleeves in position in concrete formwork. Provide reinforcement around sleeves as required.
2. Provide compatible materials, fasteners, adhesives, sealants, and other products required for proper installation.
3. Provide penetrations through roof, exterior walls, and floors (See floor penetration seals) to be weather tight and watertight.
4. Provide UL rated fire-stopping assemblies for rated roof, wall, and floor penetrations in accordance with Division 07.
5. Sleeves:
   a. Provide sleeves for pipe and round ducts less than 16 inches diameter passing through floors, walls, ceilings, or roofs.
   b. Provide 1 inch clearance between the pipe/duct and sleeve opening. Oversize sleeves for cold piping to allow continuous insulation with vapor barrier through the sleeve. Coordinate with UL listed firestop through penetration details.
6. Framed Openings:
   a. Provide framed openings for round ducts 16-inch diameter and greater and rectangular ductwork passing through floors, walls, ceilings, or roofs.
   b. Provide 1-inch clearance between the duct and framed opening.
   c. Provide closure collars not less than 4 inches wide on each side of penetration.
   d. Escutcheons: Provide escutcheons for ductwork, piping and conduit passing through walls, floors, and ceilings in finished areas, below counters and inside closets and casework subject to view when doors are open. Size escutcheons to cover sleeves. Secure escutcheons in position.
7. Wall Penetration Seals:
   a. Provide pre-engineered wall penetration water seal systems for exterior wall penetrations.
   b. Select appropriate wall penetration sealing systems based on pipe/conduit material and nominal pipe/conduit size in accordance with the manufacturer's selection charts.
8. Floor Penetration Seals:
   a. Provide water-tight sleeves at floor penetrations and extend sleeve height two (2) inches above finished floor or as detailed.
   b. Sleeves may terminate flush with top of concrete housekeeping pads unless detailed otherwise.
   c. Grout and seal sleeves to floor and seal annulus between pipe and sleeve to create a watertight penetration assembly.
   d. Floor penetrations to include but not limited to plumbing and mechanical distribution system piping and ductwork.
   e. Coordinate with UL listed firestop through penetration details.
   f. Roof Flashing: Provide roof penetration flashing in accordance with Division 07 as an integral part of the roofing system.

### 3.04 INTERFACE WITH OTHER WORK

A. Coordinate and sequence installation of hangers and supports with trades responsible for portions of this and other related sections of the Project Manual.

### 3.05 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

### 3.06 SITE QUALITY CONTROL

A. Non-Conforming Work: Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

### 3.07 CLEANING

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces.

**END OF SECTION**

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**SECTION 20 05 48**

**VIBRATION AND SEISMIC CONTROL**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: Performance requirements for the design, product selection and installation of seismic and vibration control anchors, bracing and supports for nonstructural mechanical, electrical, and plumbing (MEP) system components.

B. Related Sections:

1. 03 30 00 - Cast-in-Place Concrete
2. 20 00 00 - Mechanical General Requirements
3. 20 05 29 - Hangers and Supports
4. 20 07 00 - Mechanical Insulation
5. 22 11 00 - Domestic Water Piping and Specialties
6. 22 13 00 - Sanitary Waste and Vent Piping and Specialties
7. 22 40 00 - Plumbing Fixtures
8. 23 11 13 - Fuel Oil Piping and Specialties
9. 23 21 13 - Hydronic Piping and Specialties
10. 23 21 23 - Hydronic Pumps
11. 23 31 00 - Ducts and Accessories
12. 23 34 00 - HVAC Fans
13. 23 51 00 - Breechings, Chimneys and Stacks
14. 23 52 23 - Cast Iron Boilers and Accessories
15. 23 73 23 - Central Air Handling Units
16. 23 82 00 - Terminal Heating and Cooling Units
17. 25 40 00 - Variable Speed Drives
18. Division 26 - Electrical

### 1.02 RELATED WORK

A. The building structure shall be designed to support the weight of the projects non-structural components, as well as related seismic and wind forces in accordance with ASCE/SEI 7.

### 1.03 REFERENCES

A. Codes and Standards:

1. Refer to Section 20 00 00 - Mechanical General Requirements for general Code and Standard references.
2. ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. Abbreviations, Acronyms and Definitions:

1. See Section 20 00 00 - Mechanical General Requirements and Section 26 00 00 - Electrical General Requirements for general abbreviations, acronyms, and definitions.
2. See Mechanical and Electrical Drawings (Legend and Abbreviations).

3. Seismic Design Firm (SDF): A firm specializing in the design, manufacturing, testing and certification of vibration and seismic restraint systems (and their individual components) for attachment and support of building mechanical and electrical equipment and associated distribution systems. The SDF provides certification that it's manufactured vibration and seismic restraint systems are seismically qualified for service by analysis, testing and/or experience data in accordance with ASCE/SEI 7, Chapter 13.
4. Seismic Design Firm Representative: Structural engineer regularly employed by the SDF. Proficient in the design and proper application of seismically qualified (certified) vibration and seismic control attachments and support systems for building mechanical and electrical equipment and distribution systems.
5. Seismic Design Engineer (SDE): Alaska licensed professional structural engineer with advanced formal education and training in structural engineering relating to seismic design. Responsible for the design, field certification and as-built drawing documentation of the project's vibration and seismic control design.
6. Project Structural Engineer: The project's structural design engineer of record.

**1.04 SYSTEM DESCRIPTION AND CRITERIA**

A. Design Requirements:
1. Provide vibration isolation and seismic control anchoring and support system products and application design and installation supervision services from a single pre-approved product manufacturer/Seismic Design Firm (SDF) and/or an Alaska licensed Structural Design Engineer serving as the SDE.
2. Note that the project's structural design engineer of record may serve as the SDE.
3. Provide the design to anchor, brace, and support the facility's non-structural components and associated distribution systems, including pre-engineered equipment, to the building's structure in accordance with ASCE/SEI 7 Chapter 13 (Seismic).

B. Building Design Data: See Section 20 05 29 – Mechanical Hangers and Supports.

C. Performance Requirements:
1. Responsibilities of the SDF/SDE include:
a. Review the contract documents to determine the scope of the vibration and seismic control design for the project.
b. Work with the Contractor and provide recommendations regarding the physical routing of mechanical and electrical distribution systems to limit the need for additional seismic support. See ASCE/SEI 7, Section 13.6 Exceptions.
c. Define the mechanical and electrical components and distribution systems which will require vibration and seismic support to comply with ASCE/SEI 7.
d. Provide professional engineering seismic design force calculations, associated design drawings, details and selected products to be used to provide the necessary vibration isolation and/or seismic restraint at each required location.
e. Coordinate vibration and seismic design force conditions with Project Structural Engineer and incorporate adjustments necessary to avoid overstressing the building structure.
f. Submit vibration and seismic design for review by the Owner's Representative for approval.
g. Supply and deliver packaged vibration isolation and seismic restraint products with detailed installation instructions to the project site.

h. Provide onsite training to the Contractor to ensure the proper installation and performance of the project's vibration and seismic control systems.

i. Review MEP product submittals for products which include factory provided vibration isolation and/or seismic restraint component(s) for compliance with the seismic design. Provide written review comments.

j. Provide field certification that the project's vibration isolation and seismic attachments and supports installation is complete and conforms to the approved vibration and seismic control design.

**1.05 SUBMITTALS**

A. See Section 20 00 00 - General Mechanical Requirements and Section 26 00 00 - General Electrical Requirements for general submittal requirements.

B. Submit Quality Assurance qualifications for:

1. Seismic Design Firm (SDF).
2. Seismic Design Engineer (SDE).
3. Vibration isolation and seismic restraint product manufacturer.
4. Mechanical, electrical, and plumbing trade installers.
5. Contractor's Statement of Responsibility.

C. Submit stamped engineering design for the project's vibration isolation and seismic design by a qualified, Alaska licensed professional structural engineer to include:

1. Support and attachment (or anchoring) detail drawings for each application.
2. Product selection, size, and installation configuration for each application.
3. Seismic design force data, assumptions, and calculations for each application.
4. Coordination requirements for topping slabs for embedded mechanical or electrical systems (e.g., radiant tubing, conduit, sensors).
5. Include evidence of coordination with Project Structural Engineer.

D. Submit vibration and seismic control design as a single submittal package. For larger projects, the vibration and seismic control submittal may be broken down into multiple smaller submittal packages, with each package covering a specific area of the building (e.g., Area A – First Floor, Penthouse Mechanical Room, etc.).

E. Product Data:

1. Annotated product catalog cutsheets and/or data sheets for the selected vibration isolation and seismic restraint products to be provided.
2. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and restraints by referencing numbered descriptive drawings.

F. For Seismic Design Categories C thru F:

1. Life Safety Components: Submit approved agencies' Analytical or Shaker Test "Certificate of Compliance" certificates.
2. Components Needed for the Continued Operation of the Facility: Submit approved agencies' Analytical or Shaker Test "Certificate of Compliance" certifications.
3. Components Containing Hazardous or Flammable Materials: Submit approved agencies' Analytical or Shaker Test "Certificate of Compliance" certificates. Testing shall prove that no internal component will rupture to ensure against loss of hazardous or flammable (explosive) material which could support combustion, ignition or cause contamination.

4. Use of historical data is permitted if evidence confirms historical based component having the same construction and weight with accompanying center of gravity as the submitted unit and basis of historical claim conforms to loads derived in testing with accompanying accelerations based on ICC-ES AC-156, “Acceptance Criteria for Seismic Certification by Shake-table Testing of Nonstructural Components.”
5. Components not listed and requiring only anchorage and load transfer compliance: The SDE shall submit stamped engineering calculations, drawings, and details to support the project specific equipment will accept anchorage through the component’s load path to structure at its center of gravity, at the designated anchorage locations.

G. Substitutions:
1. The proposed substitution equipment manufacturer shall provide a letter certifying that the equipment’s packaged or recommended vibration isolation and seismic restraint methods comply with the requirements of this specification. Letters from field offices or representatives are not acceptable.
2. The cost associated with converting to the specified vibration isolation and/or seismic restraints method shall be borne by the Contractor in the event of non-compliance.

H. Shop Drawings:
1. Submit floor plan shop drawings which include and identify the locations of:
   a. Approved major mechanical and electrical system components.
   b. Vibration isolated components and systems.
   c. Mechanical and electrical distribution systems to include (as applicable):
      1). Piping and tubing systems.
      2). Ductwork systems and in-line components.
      3). Electrical conduit and cable trays.
      4). Bus Ducts.
      5). Plumbing.
      6). Pneumatic tube transport systems.
   d. Identify building seismic joint locations and calculated displacement at each floor level.
   e. Identify exempt components and distribution systems in accordance with ASCE/SEI 7 Chapter 13.
   f. Identify vibration isolation and seismic control attachment and support locations with reference to applicable detail drawing(s).

I. Quality Assurance/Control Submittals:
1. Contractor’s Quality Assurance and Quality Control procedures for the administration and tracking of special inspections and testing.
2. Design Data and Test Reports.
3. Certificates and Manufacturer’s Instructions.
4. SDF qualifications and E&O insurance certificate.
5. SDE professional license and seismic engineering qualifications.
6. Authority Having Jurisdiction submittal review comments and final approval notification.
7. Manufacturer’s Field Reports.
8. SDF and/or SDE certification of the correctness of completed installation.

J. Installation, Operation and Maintenance (IO&M) Manual:

1. Provide a copy of the manufacturer's written installation, operation, and maintenance manual to include the following information:

a. Manufacturer's descriptive literature neatly annotated to clearly indicate information applicable to the equipment installed.

b. Certified seismic design calculations and installation details.

K. Close-out Submittals:

1. Project record drawings: Annotate a clean copy of the project Contract Drawings to clearly indicate the actual installation location of each vibration and seismic restraint device type and keyed to the appropriate installation detail.

2. Provide a certificate from the Manufacturer's Representative indicating that the vibration and seismic restraint systems of the facility are installed and operational as designed.

**1.06 QUALITY ASSURANCE**

A. Manufacturer qualifications: Company specializing in manufacturing and testing of vibration and seismic control systems and components with a minimum of five (5) years documented experience.

B. Installer qualifications: Minimum five (5) years' experience in the installation of specialized vibration and seismic control systems.

C. SDF qualifications: Minimum five (5) years' experience in the design, selection, and inspection of specialized seismic control systems for facilities with similar occupancies and seismic criteria and acceptable to the Authority Having Jurisdiction.

D. SDE qualifications: Minimum five (5) years documented seismic engineering experience and acceptable to the Authority Having Jurisdiction.

E. Errors and Omissions Insurance Certificate:

1. Submit copy of the SDF/SDE E&O Insurance Certificate.

2. Product liability insurance certificates are not acceptable.

F. Pre-Installation Meetings:

1. Conduct a coordination meeting prior to the installation of vibration isolation and seismic restraint equipment.

2. Discuss the equipment and systems affected by this Section and the method to be used to coordinate the installation and inspection of vibration isolation and seismic restraint equipment.

3. Conduct additional meetings as required to coordinate the work.

4. The meeting will be attended by:

a. The Contractor.

b. Contractor's Commissioning Representative (if appliable).

c. Trade foremen for the systems affected by the work.

d. The SDF representative.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 WARRANTY**

A. See Section 20 00 00 - Mechanical General Requirements.

## PART 2 PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

A. Seismic Design Firms (SDF):
   1. ISAT/Kinetics Noise Control.
   2. Mason Industries.
   3. VMC Group.
   4. Pre-approved equal.

B. Vibration Isolation and Seismic Restraint Products:
   1. ISAT (Seismic Restraint).
   2. Kinetics Noise Control (Vibration Isolation).
   3. Mason Industries.
   4. VMC Group.
   5. Hilti.
   6. Unistrut, Tyco International.
   7. Pre-approved equal.

### 2.02 FINISHES

A. Product finishes for corrosion protection:
   1. Exposed steel to be stainless steel, galvanized, or finished with dry powder coating.
   2. Hardware: Zinc electroplated, galvanized, or stainless steel.
   3. Hardware in contact with concrete and surfaces subject to liquids shall be stainless steel.
   4. Springs and housings shall be powder coated.

B. In public areas, exposed support systems and elements shall be painted, excluding dynamic assemblies which shall have manufacturer's coating:
   1. Clean and prepare pipe, fittings, hangers, restraints, supports, and miscellaneous items for areas to be painted.
   2. Refer to the requirements specified in Division 09.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Visually inspect appliances, equipment and distribution systems requiring vibration isolation and/or seismic restraint for installation location tolerance, interference and other conditions affecting installation.

B. Verify actual locations of cast-in-place anchors, structure reinforcements and other required attachments prior to installation.

C. Document and correct deficiencies or submit proposed design modifications for approval prior to the installation.

D. Note if Project contains cast in place radiant floor heating tubing. Coordinate slab penetration locations so as to not damage tubing.

### 3.02 INSTALLATION

A. When possible, and without compromising distribution system performance or maintenance/replacement accessibility, route distribution systems such as to limit the extent of

seismic support required in accordance with ASCE/SEI 7 Chapter 13, Section 13.6 Exemptions.

B. When the exemption requirements of ASCE/SEI 7 cannot be met, provide vibration isolation and seismic restraint in accordance with the appliable sections of Section 13.6. and the following:

1. Install seismic control systems in compliance with the approved seismic design drawings and details and approved product manufacturer's written instruction instructions.
2. Install seismic control so as not to stress or misalign equipment, piping, or ductwork.
3. Provide flexible connections for piping, ductwork, and conduit connections to vibration isolated equipment.
4. Do not install rigid connections directly between vibration isolated equipment and the building structure.
5. Seismic restraint systems shall not interfere with installation or maintenance access to other building systems.
6. Install seismic cable assemblies taut on non-vibration isolated systems.
7. Install seismic cable assemblies with a slight amount of slack for vibration isolated systems to avoid sound shorts.
8. Seismic single arm braces may be used in place of cables on rigidly attached systems and in place of cables on isolated systems when resilient bushings are used.
9. Conduct Special and Periodic Inspections in accordance with FIELD QUALITY CONTROL article requirements.

**3.03 SEISMIC JOINTS**

A. When possible, limit the crossing of building seismic joints with distribution systems.

B. When crossing a seismic joint cannot be avoided, install flexible connections in distribution systems at the seismic joint which exceed the maximum design seismic joint deflection. See Structural drawings for calculated seismic joint deflections.

C. Use Ip = 1.5 without exception to accommodate displacements across seismic joints for ductwork.

**3.04 INSTALLATION OF EQUIPMENT**

A. Install indoor floor mounted equipment on raised reinforced concrete housekeeping pads. Extend pads beyond equipment base rails/floor mounting plates equally in all directions to meet seismic anchor embedment requirements. See Section 15 05 29 - Mechanical Hangers and Supports for detailed housekeeping pad requirements.

B. Install exterior equipment on crowned reinforced concrete equipment pads. Extend pads beyond equipment base rails/floor mounting plates equally in all directions to meet seismic anchor embedment requirements.

C. Install pump and other equipment bases into position, at normal vibration isolator operating height, using temporarily support blocks or shims prior to the installation of the equipment, isolators, and seismic restraints.

1. After the installation, and under full load (e.g., equipment filled with operating fluid), adjust isolators to transfer load from the temporary blocks to the isolators.
2. Next, remove temporary blocks, shims, and debris from beneath the equipment and verify no vibrational "short circuits" exist.
3. Confirm equipment is free to move in all directions, within the limits of the seismic snubbers (maximum 0.25 inches).

4. Minimum operating clearance between top of housekeeping pad and underside of isolator mounted equipment is 2 inches.

D. Protect air handling equipment and centrifugal fans from excessive displacement resulting from air thrust in relation to equipment weight. Provide horizontal thrust restraints if horizontal motion exceeds 3/8 inch.

E. Provide earthquake ceiling clips or other approved means of positive attachment of ceiling mounted diffusers and lighting fixtures (less than 75 pounds) to the ceilings T-bar support grid. Where ceilings are not braced, provide lay-in lighting fixtures with 4 independent corner diagonal wire ties to structure.

**3.05 CONSTRUCTION**

A. Interface with other Work:

1. Coordinate and sequence installation of vibration and seismic control supports and bracing with trades responsible for portions of this and other related portions of the Work.
2. Rework required because of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.
3. Coordinate and schedule special inspections related to systems under this specification section.

**3.06 REPAIR/RESTORATION**

A. Repair product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**3.07 FIELD QUALITY CONTROL**

A. Special Inspections:

1. Perform Independent Special and Periodic Inspections with written reports of findings of the seismic restraint systems serving nonstructural MEP system components at the expense of the Owner.
2. Special Periodic Inspections: See IBC Section 1705.13.6 for minimum inspection requirements.
3. Submit special inspection written reports a maximum of 2 working days following site inspection.

B. Manufacturer's Field Services:

1. Upon completion of installation of vibration isolation and seismic restraint devices and systems, the SDF's representative shall inspect the completed project and certify in writing to the Contractor that systems are installed properly or provide detailed corrective action as required.
2. If corrections are required, additional inspections shall be completed by the SDF's representative until all the work is certified to be installed properly.
3. The Contractor shall submit a report to the Owner which includes the SDF's representative letter certifying correctness of the installation.

**3.08 CLEANING**

A. Upon completion of installation, remove construction debris from around seismically restrained components to allow free motion in all directions within the limits of the seismic restraining devices.

### 3.09 EQUIPMENT STARTUP

A. Prior to equipment startup, remove shipping restraints from vibration isolators and adjust in accordance with the appliable manufacturers written operating instructions.

B. During start-up, with attached piping systems filled (as applicable), verify proper vibration isolator active spring heights and snubber offsets.

C. Adjust vibration isolators and seismic restraints during equipment operation to allow normal movement and minimize the transmission of equipment sound and vibration through the building structure and attached distribution systems.

**END OF SECTION**

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# SECTION 20 05 53
# MECHANICAL IDENTIFICATION

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes:
   1. Equipment Nameplates.
   2. Valve Tags.
   3. Valve and Equipment Directories.
   4. Pipe Identification.
   5. Ceiling Markers.

B. Related Sections:
   1. 20 00 00 - Mechanical General Requirements
   2. 22 11 00 - Domestic Water Piping and Specialties
   3. 22 13 00 - Sanitary Waste and Vent Piping and Specialties
   4. 23 11 13 - Fuel Oil Piping and Specialties
   5. 23 13 23 - Aboveground Fuel Oil Storage Tanks
   6. 23 21 13 - Hydronic Piping and Specialties
   7. 23 21 23 - Hydronic Pumps
   8. 23 31 00 - Ducts and Accessories
   9. 23 34 00 - HVAC Fans
   10. 23 52 23 - Cast Iron Boilers and Accessories
   11. 23 73 23 - Central Air Handling Units
   12. 23 82 00 - Terminal Heating and Cooling Units
   13. 23 83 16 - Radiant Floor Heating Equipment
   14. 25 40 00 - Variable Speed Drives

### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. ANSI/ASME A13.1-2015 (American Society of Mechanical Engineers) - Scheme for the Identification of Piping Systems.
   3. ANSI Z535.1-2017 - Safety Colors.

B. Abbreviations, Acronyms and Definitions:
   1. Refer to Section 20 00 00 - Mechanical General Requirements.
   2. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Provide equipment nameplates, valve tags and labels for the mechanical systems provided under this contract.

2. Provide labels for piping. Paint exposed piping and pipe insulation in utility and mechanical rooms.

**1.04 SUBMITTALS**

A. Refer to Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Master Schedule of Equipment:

a. Submit master schedule of equipment, components, and systems that will be tagged and labeled for the project.

b. Include the proposed method of labeling to be implemented (nameplate, tag, label/marker, etc.), legend ("Domestic Cold Water," "PMP-1," etc.) and letter/background colors.

c. Match legend to Contract Document legend, abbreviations, and schedule symbols. Use standard mechanical identification products when available.

2. Equipment Directories: Submit separate proposed "Equipment Directories" (subset of the master schedule) for each mechanical room that includes the equipment located within the applicable space. Include system name, fluid or medium type, and normal operating properties and ranges.

3. Valve Directories: Submit separate proposed "Valve Directories" (subset of the master schedule) for each mechanical room that includes the valves located within the applicable space. Include valve designations, a brief description and normal position (open (NO), closed (NC), balanced to X GPM). For Example:

| Valve Designator | Description | Normal Position |
|---|---|---|
| H-101 | BLR-1 Supply Isolation | NO |
| H-102 | BLR-1 Return Isolation | NO |
| H-103 | BLR-1 Flow Balance | 150 GPM |
| P-100 | Domestic Water Service Isolation | NO |
| P-201 | Supply Strainer Flush Valve | NC |
| ETC. | | |

C. Installation, Operation and Maintenance (IO&M) Manuals:

1. Provide completed, typed "Master Schedule of Equipment."

2. Provide completed, typed "Equipment Directories."

3. Provide completed, typed "Valve Directories" with balance valve settings obtained from the final balance report.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Marking Services Incorporated (MSI).

B. Seton Identification Products.

C. Craftmark.

D. Approved equal.

## 2.02 EQUIPMENT NAMEPLATES

A. Plastic Engraved Equipment Nameplates:

1. Minimum letter height: 3/4 inch.
2. Tag size: Minimum 2 inches high, length to fit equipment tag lettering requirements. Provide uniform size for similar types of equipment.
3. Plastic thickness: 1/16 inch minimum.
4. Fastening method:
    a. Mounting holes.
    b. Adhesive backing may be provided for labeling equipment where drilling holes is not feasible, with the pre-approval of the Contracting Agency.
5. Color coding: As designated by the Contracting Agency. If specific direction is not provided, select white letters on black background.
6. Legend: As designated by the Contracting Agency. If specific direction not provided, match scheduled equipment symbols.

## 2.03 VALVE TAGS

A. General:

1. Small equipment, such as in-line pumps may be identified with tags in lieu of nameplates if inadequate room is available.
2. Provide service indicator on top line of tag, using system abbreviations provided in Part 3 Pipe Identification Table.
3. Provide valve number on bottom line of tag. Start valve numbering with “001” for each legend series/service indicator. Assign valve numbers in a logical sequence from the source (i.e. service water entry point, gas meter service isolation) or heat source (boiler or water heater supply) and continue numbering outward to the most remote terminal connection point.

B. Plastic Engraved Tags:

1. Round, 1-1/2 inches diameter, engraved plastic.
2. Text stamped and filled black:
    a. 1/4 inch service indicator on top.
    b. 1/2 inch valve number below.
3. Beaded chain tag fasteners.
4. Provide tag color coding to match pipe marker coding or as designated by the Contracting Agency.

C. Brass Stamped Tags:

1. Round, 1-1/2 inches diameter, brass with smooth edges.
2. Text stamped and filled black:
    a. 1/4 inch service indicator on top.
    b. 1/2 inch valve number below.
3. Beaded chain tag fasteners.

**2.04 VALVE AND EQUIPMENT DIRECTORIES**

A. Equipment and Valve Directory Frame:
   1. 8-1/2” x 11” aluminum frame with plastic lens.
   2. Provide multiple frames as required.

**2.05 PIPE IDENTIFICATION, MARKING**

A. Identify both service and flow direction.

B. Colors and Lettering: Conform to ANSI/ASME A13.1; see tables under Article 3.2E below.

C. Plastic Pipe Labels:
   1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.
   2. Larger sizes may have maximum sheet size with plastic nylon ties or straps.

D. Plastic Tape Pipe Labels: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

**2.06 CEILING MARKERS**

A. Description:
   1. 7/8-inch diameter, color-coded.
   2. Metal push tacks or 0.030” rigid vinyl, pressure sensitive stickers.

B. Color code as follows:
   1. HVAC equipment: Yellow.
   2. Plumbing valves: Green.
   3. Non potable water and wastewater valves: Orange.
   4. Heating/cooling valves: Blue.
   5. Fire suppression valves and drains: Red.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Degrease and clean surfaces to be painted or directly receive adhesive labels.

B. Install identifying devices after completion of coverings and painting.

**3.02 INSTALLATION**

A. Do not install identifying devices over factory installed equipment labels.

B. Locate identifying devices in clear view for simple identification.

C. Tag automatic controls, instruments, and relays. Key these to control system schematic drawings.

D. Frame and install approved equipment and valve directories in each mechanical room, at a location designated by the Contracting Agency.

E. Pipe Identification:
   1. Identify piping, concealed or exposed, using ANSI A13.1 compliant pipe labels. Identify both service and flow direction in accordance with the following table.

| Abbreviation | Legend | Color (Letters/Background) |
|---|---|---|
| CW | Domestic Cold Water | White/Green |
| HW | Domestic Hot Water | White/Green |
| GHS | Glycol Heating Supply | White/Green |
| GHR | Glycol Heating Return | White/Green |
| RHS | Radiant Heating Supply | White/Green |
| RHR | Radiant Heating Return | White/Green |
| FOS | Fuel Oil Supply | White/Brown |
| FOR | Fuel Oil Return | White/Brown |
| W | Sanitary Drain | White/Green |
| V | Sanitary Vent | White/Green |
| FW | Fire Suppression Water | White/Red |

2. Pipe label letters shall be a minimum of 1/2" high and increase with pipe diameter as follows:

| 3. Pipe Outside Diameter | 4. Letter Height |
|---|---|
| 5. 0.75" to 1.25" | 6. 0.5" |
| 7. 1.5" to 2" | 8. 0.75" |
| 9. 2.5" to 6" | 10. 1.25" |
| 11. 8" to 10" | 12. 2.5" |
| 13. over 10" | 14. 3.5" |

15. Install labels in unobstructed view and aligned with horizontal or vertical axis of piping as appropriate. For piping located above the normal line of vision, place labels below the horizontal centerline of the pipe for clear unobstructed view from below.
16. Install labels not to exceed 20 foot intervals along straight piping runs (including risers and drops), close to valves, adjacent to changes in direction and branches, on each side of pipe penetrations through walls or floors, and at each access panel.

**END OF SECTION**

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# SECTION 20 07 00
# MECHANICAL INSULATION

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: Specific requirements, products and methods of execution which relate to the insulation of ducts, fittings, equipment, pipes and other surfaces of the mechanical installation.

B. Related Sections:

1. 20 00 00 - Mechanical General Requirements
2. 22 11 00 - Domestic Water Piping and Specialties
3. 22 13 00 - Sanitary Waste and Vent Piping and Specialties
4. 22 40 00 - Plumbing Fixtures
5. 23 21 13 - Hydronic Piping and Specialties
6. 23 31 00 - Ducts and Accessories
7. 23 83 16 - Radiant Floor Heating Equipment

### 1.02 REFERENCES

A. See Section 20 00 00 - Mechanical General Requirements.

B. ASHRAE 90.1 - 2010 Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. NFPA 90A - 2002 Standard for the Installation of Air Conditioning and Ventilating Systems.

D. NFPA 90B - 2006 Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

E. MSS Standard Practice SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

### 1.03 DESCRIPTION

A. Provide thermal insulation for ventilation system ductwork and building service piping.

B. Provide insulation for exposed ADA plumbing fixture piping.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Qualifications: Submit manufacturer and Applicator qualifications.

### 1.06 QUALITY ASSURANCE

A. See Section 20 00 00 - Mechanical General Requirements.

B. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training. Preference will be given to those who have successfully completed a manufacturer's installation training program, such as the 'Armacell Qualified Installer Program' (AQIP) or similar.

### 1.07 DELIVERY, STORAGE AND HANDLING

A. See Section 20 00 00 - Mechanical General Requirements.

B. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

### 1.08 WARRANTY

A. See Section 20 00 00 - Mechanical General Requirements.

## PART 2 PRODUCTS

### 2.01 FIRE RATING OF MATERIALS

A. Provide insulation products used aboveground in building with burning characteristics in compliance with NFPA Standards 90A and 90B: Flame Spread 25, Fuel Contributed 50, Smoke Developed 50. Tested according to UL 723, ASTM E84, or NFPA 255. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

B. Insulation specified for use underground and aboveground away from the building might have other burning characteristics. Use such products only where specifically required.

### 2.02 FIBERGLASS INSULATION

A. Piping: Provide insulation products as follows:

1. Thermal conductivity K equals 0.24 at 100 degrees F mean temperature, ASTM C335.
2. Factory applied vapor-barrier, flame retardant all service jacket and tape, with permeability rating equal to 0.02 perms, ASTM E 96.
3. Temperature limits for fiberglass pipe insulation: 350 degrees F, unless otherwise indicated.
4. Manufacturers: Johns Manville, Owens Corning, Knauf Fiber Glass, or approved equal.

B. Ductwork: Provide insulation products as follows:

1. Flexible insulation: Average thermal conductivity K equals 0.24 at 75 degrees F mean temperature at 1.5 pounds per cubic feet (PCF) density, ASTM C335.
2. Rigid insulation: Average thermal conductivity K equals 0.24 at 75 degrees F mean temperature at 3.0 PCF density, ASTM C518.
3. Factory-applied vapor barrier flame-retardant Foil-Scrim-Kraft (FSK) or all-service jacket and tape, with permeability rating equal to 0.02 perms, ASTM E 96.
4. Temperature limits for fiberglass duct insulation: 250 degrees F unless otherwise indicated.
5. Manufacturers: Johns Manville, Owens Corning, Certainteed, Knauf Fiber Glass, or approved equal.

### 2.03 FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Thermal Conductivity: 0.27.

B. Water Vapor Transmission: 0.08.

C. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Grade 1, Type I for tubular materials.

1. AP ArmaFlex or AP ArmaFlex Black LapSeal (basis of design).
2. Aeroflex USA, Inc.
3. K-Flex USA.

4. Approved equal.

**2.04 ADA LAVATORY/SINK INSULATION KIT**

A. Protective, molded, fire-resistant, antimicrobial, foam insulation with white vinyl outer jacket. Specifically designed for 1-1/4” and 1-1/2” for plumbing lavatory and sink fixture hot and cold water supply and sanitary draining piping.

B. Manufacturer: Sloan, Truebro, Handy Shield or approved equal.

**2.05 CANVAS JACKETING**

A. Insulating Lagging Canvas: Eight ounces per square yard minimum, fire-retardant material complying with fire ratings specified above. Manufacturer: Chas Harmon "Osnaberg", Claremont Company Inc., “Claretex”, or approved equal.

B. Lagging Adhesive: Plastic synthetic resin emulsion adhesive; watertight, mildew resistant, fire retardant. Manufacturer: Childers Chil-Perm CP, Foster® Sealfas® coating 30-36, or approved equal.

**2.06 METAL JACKETING**

A. 27 gauge (U.S. Standard) heavy corrugated aluminum.

B. Preformed fitting covers.

**2.07 COATINGS**

A. Coatings: UL labeled.

B. On cold or dual service lines, use vapor barrier type coatings.

**2.08 PREFORMED FITTING COVERS**

A. One piece pre-molded PVC jacketing and fitting covers specifically designed for the service intended.

B. Install per manufacturer's instructions and secure with manufacturer's color matching PVC tape.

C. Manufacturer: J-M “Zeston”, TeeCee, Proto, Certainteed.

**PART 3 EXECUTION**

**3.01 GENERAL**

A. Do not apply insulation materials until surfaces to be covered are clean and dry and foreign material such as rust, dirt, etc. is removed. Keep insulation clean and dry during installation and during the application of any finish.

B. Do not install the insulation on pipe fittings and pipe joints until the piping has been tested and approved.

C. Do not install the insulation on ducts or fittings until the ductwork has been tested and approved.

D. Do not apply under conditions of excessive humidity or at temperatures below 50 degrees F or above 100 degrees F.

E. Provide insulation support blocks, shields, and transitions for hangers, supports, anchors, and guides. Coordinate insulation requirements through rated assemblies and Listing penetration’s requirements.

F. Adjust hangers, guides, anchors, and supports after insulation installation has been approved.

## 3.02 PIPE INSULATION

A. Cold Piping:

1. Includes domestic cold water, plumbing vents through roof, and other cold piping to zero degrees F.
    a. Insulate plumbing vents from three feet below the under deck of the roof to the termination above the roofline.
2. Insulate with sectional fiberglass insulation and provide a completely sealed vapor barrier. Provide insulation thickness per Insulation Thickness Table.
3. Insulate fittings, tanks, vessels, heat exchangers, and similar components, except where indicated otherwise.

B. Hot Piping:

1. Includes domestic hot water supply and recirculation and hydronic heating.
2. Insulate with sectional fiberglass. Provide insulation thickness per Insulation Thickness Table.
3. Insulate fittings, tanks, vessels, air separators, heat exchangers, and similar components, except where indicated otherwise.

C. In addition to specified jackets, provide heavy corrugated aluminum jacket on piping insulation anywhere piping is exposed below eight feet zero inches above floor in public areas.

D. Insulation Thickness Table (units are in inches):

| Fluid Design Operating Temperature Range | Less than 1 | 1 to <1-1/2 | 1-1/2 to <4 | 4 to <8 | 8 and up |
|---|---|---|---|---|---|
| Heating Systems (Water and Glycol Solutions): | | | | | |
| 141 °F to 200 °F | 1.5 | 1.5 | 2 | 2 | 2 |
| 105 °F to 140 °F | 1.5 | 1.5 | 2 | 2 | 2 |
| Domestic Cold Water: | | | | | |
| All | 1 | 1 | 1.5 | 1.5 | 1.5 |
| Plumbing vents through roof: | | | | | |
| All | 1 | 1 | 1.5 | 1.5 | 1.5 |

## 3.03 TECHNIQUE FOR APPLICATION TO PIPES

A. Close longitudinal joints of pipe insulation firmly and butt insulation sections firmly together. Neatly and smoothly adhere laps and butt strips.

B. Clean the contact area on jacket for adhesive lap strips and butt strips so it is free from fingerprints, oil, construction dust and other contaminants. Clean surfaces with tack rags, methanol, or other suitable agent before attempting to adhere the strip. Apply pressure to adhesive strip with suitable tool immediately after adhering. Remove insulation with inadequately sealed joints and install new sections. Outwardly clinching staples may be used to reinforce joints.

C. Continuously seal vapor barriers. If staples are used at laps, seal the entire length of stapled lap with adhesive jacket tape applied as specified above for laps and butts. Sectionalize vapor barrier by sealing ends of insulation sections at not more than 25 feet intervals, to prevent moisture migrating lengthwise. Apply butt strips over joint as above.

D. Provide double insulation thickness on piping in outside walls and within five feet of vehicle doors or other large openings.

E. Except as indicated, locate pipe hangers and rollers outside insulation. Provide insulation saddles or sheet metal shields around insulation. On pipes two inches and larger, within the area of each insulation shield, use calcium silicate or cellular glass on the lower half of the insulation, equal in thickness to adjacent insulation.

F. Where piping is installed outdoors, provide two-layer glass cloth and four-layer weatherproof vapor barrier adhesive coating, in addition to jacket specified.

**3.04 TECHNIQUE FOR APPLICATION TO PIPE FITTINGS, EQUIPMENT, AND VALVES**

A. Insulate fittings, valves, and flanges to the same thickness as the pipe insulation.

B. Any of the following methods of insulation are acceptable:

1. Blanket Wrap: Wrap the fitting with compressed glass fiber blanket. Wire the blanket securely in place and cover with a smooth layer of insulating/finishing cement. Cover with glass mesh tape, adhering it with an adhesive coating.

2. Fabricated Segments: Cut mitered segments from pipe insulation that has the same wall thickness as adjacent pipe insulation to form a cover which will fit snugly around the fitting. Wire the segments firmly in place and seal the joints with insulating/finishing cement. Apply adhesive coating and wrap with glass mesh tape, then apply another layer of the same coating over the whole assembly.

3. Cement: Apply insulating or insulating/finishing cement, molding it to the contour of the fitting. When area is large, apply an under layer of cement, wrap this with glass mesh tape, then apply an outer layer of cement. If the insulation is not concealed the exposed surface of insulating/finishing cement shall have a final glass mesh tape wrap embedded in adhesive.

C. In each of the listed methods, to protect the insulation against contact damage, apply an adhesive coating when the cement is completely dry and hard, then wrap with glass mesh tape. Apply another coating of adhesive over the whole assembly.

D. In each of the listed methods, pre-formed fitting covers may be substituted for the tape and adhesive covering specified. Cement and tape fitting covers on cold piping to provide a positive vapor barrier.

E. Removable insulation blankets of comparable insulation value for valves and where equipment require frequent adjustments or maintenance shall be provided; identify and coordinate during submittal process.

F. After insulation has been installed adjust hangers for proper fit, maintain pipe grade and support.

**3.05 DUCT THERMAL INSULATION REQUIREMENTS**

A. Insulate ductwork as follows:

1. Insulate outside air intake ducts from air intake louver connection to equipment connections (including insulated isolation damper frame) with 3-inch rigid or semi-rigid board insulation.

2. Insulate exhaust and relief ducts from point of discharge to and including back draft damper support frame with 3-inchrigid or semi-rigid board insulation.

3. Return air ductwork: Insulate return air ductwork passing through unheated spaces, within in mechanical rooms and as indicated with 1-1/2” inch fiberglass insulation.

4. Lined ductwork: Provide external duct insulation only when indicated in addition to duct lining.

B. Insulation Type and Finish:

1. Rigid or semi-rigid board where canvas or metal jacket is specified. May also be used in place of blanket insulation where practical.
2. Blanket insulation where rigid board is not specified or indicated. Proper installation is critical. Loose joints and sagging insulation shall require re-insulation of entire branch or main duct before acceptance and during warranty period.
3. Fiberglass or canvas jacket over board insulation in mechanical and boiler rooms less than 10 feet above finish floor, where exposed in finished rooms and where indicated. Seal jacket with vapor barrier lagging adhesive.
4. Ductwork insulation to have a completely sealed vapor barrier, except segmental insulation on medium/high velocity trunk ducts and warm air ducts in concealed spaces, where approved.

**3.06 DUCT SOUND INSULATION REQUIREMENTS**

A. Refer to Section 23 31 00 - Ducts and Accessories.

B. Install where shown.

C. Install in accordance with manufacturers installation instructions. Completed installation shall be fastened tightly to ductwork and free of sags.

**3.07 TECHNIQUE FOR APPLICATION TO DUCTWORK**

A. Rigid and Semi-rigid Insulation:

1. Impaling Over Pins: Install insulation with edges tightly butted using adhesive and metal pins. Impale insulation on pins welded to the duct and secure with speed clips. Trim off pins close to speed clip. Space pins as required to hold insulation firmly against duct surface but not less than one pin per square foot.
2. Other Method of Securement: If the welded pin method is not feasible, secure the insulation to the duct with adhesive. Cover the entire surface of the metal with adhesive when applying to the underside of horizontal ducts. Application to top and sides may be in strips with a minimum of 50 percent coverage. Additionally, secure insulation with No. 16 galvanized wire on not more than 12 inches on center. Provide metal angle at corners to protect edges of insulation.
3. Vapor Barrier: Seal joints and speed clips with adhesive tape of similar construction to insulation jacket. Thoroughly clean contact surfaces for adhesive as specified under pipe insulation technique. Glass cloth tape set in adhesive may be used. Provide metal or plastic corner angles within eight feet of floor, walkway, or stairs.
4. Provide fiberglass or canvas jacket where specified. Completely cover with minimum 1/8" lagging adhesive. Cover canvas with two heavy coats of same adhesive and completely fill the weave. Inspect when dry for complete vapor barrier throughout and refinish as required.

B. Blanket Insulation:

1. Position insulation so that longitudinal seam will be underneath and not supporting weight of sheet. Remove a uniform strip of insulation from backing to provide a lap strip. Butt insulation and secure lap strip with outwardly clinching staples.
2. Use pins to secure blanket on large flat areas as specified for rigid insulation. Reinforce jacket at pin penetration where required.
3. Seal laps, staples and butt joints with adhesive tape of similar construction to insulation jack. Seal speed clips if used. Thoroughly clean contact surfaces for adhesive as specified under pipe insulation technique.

4. When system is under pressure, inspect insulation for inflation caused by improperly sealed ducts. Repair duct seal and reinsulate as necessary.
5. The Contracting Agency may inspect completed insulation and test taped joints for adhesion. Seal laps and butt tapes that can be removed with reasonable force shall require that entire branch or trunk duct be reinsulated.

**3.08 FIXTURE INSULATION ASSEMBLY**

A. Insulate cold and hot water supply and waste piping exposed beneath sink and lavatory fixtures designated on drawings or specified in Section 22 40 00 - Plumbing Fixtures, as intended for use by disabled persons. Install in accordance with ANSI A117.1 - 2009.

**END OF SECTION**

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**SECTION 21 10 00**

**WATER BASED FIRE SUPPRESSION SYSTEMS**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes performance requirements, products, and methods of execution relating to fire suppression for the project. The contract documents have performance, materials, and installation requirements which exceed code and standard minimums. This Section is substantially a “performance” specification.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements

### 1.02 REFERENCES

A. Perform work in accordance with the legally enacted editions of applicable international, State, standards, and local codes with locally accepted amendments to include:

1. International Fire Code – 2021, IFC.
2. International Mechanical Code – 2021, IMC.
3. International Building Code – 2021, IBC.
4. Uniform Plumbing Code – 2021, UPC.
5. NFPA 13 - 2019, Standard for the Installation of Sprinkler Systems.
6. ASCE 7 – 16, Minimum Design Loads and Associated Criteria for Building and Other Structures.
7. Underwriters Laboratories, UL, Fire Protection Equipment Directory.

B. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:

1. American National Standards Institute - ANSI.
2. American Society of Mechanical Engineers - ASME.
3. American Society for Testing and Materials - ASTM.
4. National Fire Protection Association - NFPA.

### 1.03 SYSTEM DESCRIPTION

A. Provide a complete fire suppression system fully operational in accordance with the contract documents and the applicable codes and standards, as well as the Authority Having Jurisdiction requirements to protect the building. The contract documents have performance, materials, and installation requirements which exceed code minimums. Work includes connection to existing sprinkler system for new work and modifications of existing sprinkler riser system and other items required for a complete and fully operational building fire suppression system.

B. Within the area of above ceiling work, replace 2-1/2” and smaller pipe that is schedule 10 with schedule 40 pipe.

C. Coordinate work with phasing requirements to allow areas to be fully occupied and operational with minimal impact during phased construction including acceptance and testing activities.

D. Provide seismic anchoring, bracing, supports, and clearance for equipment, pipes, and sprinkler heads per NFPA 13, International Building Code, and ASCE 7; most conservative

criteria shall govern. Include calculations and details with submittals. Provide for differential movement at building seismic joints, see architectural and structural requirements.

E. Provide labor, materials, and equipment to test sprinkler system as required per NFPA 25. Test shall be coordinate with Owner for specific systems and areas.

F. Provide listed sprinkler flex hose for sprinkler heads in suspended ceiling assemblies. Other methods to maintain required clearances are not allowed.

G. Provide provisions including isolation valves and fittings for inspection, testing, and maintenance of water-based fire protection systems identified in NFPA 13 and NFPA 25.

H. New and existing systems in or serving area of work shall be included. Limits and criteria for testing existing systems impacted by work under this contract to be coordinated with Owner and AHJ.

I. Work includes complete installation of pipes and sprinklers in many types of spaces and finished ceilings, architectural features, and building lines. Route pipes above ceilings where possible. Exposed pipes shall follow architectural elements/building lines for visual and symmetric appearance. Design and installation of sprinkler systems shall incorporate aesthetic review comments including routing and concealment of lines, exposed pipe, sprinkler head finish and locations, and exterior penetrations.

J. Sprinkler systems shall follow these general requirements:

K. Provide sprinkler zone by building floors and areas where indicated. Coordinate with and obtain approval from Owner where alternative layout is beneficial to building configuration and usage.

**1.04 SUBMITTALS**

A. Submittals shall be complete for review. Drawings, calculations, and product cutsheets shall be complete and submitted together in one package. See Section 20 00 00 - General Mechanical Requirements for additional requirements not covered below.

1. Keep a current hard copy of approved material, product, and shop drawing submittals, and the submittal log at the job site.

B. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents.

1. Submittals will not be checked for quantity, dimension, fit, or for proper technical design of manufactured equipment.
2. Providing a complete and satisfactory working installation is the responsibility of the Contractor.
3. Product data, shop drawings, and calculations shall be submitted together for review. Partial submittals will not be reviewed.

C. Electronic Submittals:

1. Provide electronic submittal in PDF format in addition to hard copy submittal.
2. Electronic submittals shall follow the organization and formatting required for paper submittals.
3. Provide electronic bookmarks within the PDF document in place of tabs and sub-tabs.
4. If individual PDF files are provided for each product or shop drawing sheet, organize files into folders and name files and folders to correspond with applicable specification sections or drawing titles.

5. PFD documents to be without security and be searchable,and copied and pasted. For scanned documents, run the optical character recognition (OCR) function to ensure the document is searchable and can be copied and pasted.
6. Reduce PDF file size by removing data and file creation elements not needed for final file presentation.

D. Product Data:

1. Submit product data for items specified in Part 2 and those products required by the performance standards of this Section. Identify catalog designation and/or model number and neatly annotate each salient characteristic and design option of the product. Identify operation characteristics, performance curves and rated capacities of products and devices to show compliance with shop drawings and calculations.
2. Provide exterior and interior signage with placement locations indicated on shop drawings.
3. Provide data on firestopped penetrations, including product being submitted, the rating of the assembly it will be used for, and the applicable Through Penetration Firestop System drawing(s) from the UL Fire Resistance Directory.

E. Shop Drawings:

1. Submit Authority Having Jurisdiction approved sets of shop drawings and calculations. Drawings and calculations shall include the NICET certification and State of Alaska Permit IIC or IIC-DO number and signature, or signed seal of a licensed professional engineer, and the fire suppression Contractor’s Alaska specialty license number.
2. Shop drawings shall be submitted with information in compliance with NFPA 13 and other performance standards of this Section. Shop drawings shall include but not limited to the following that are applicable to the project:
    a. Name of Contracting Agency, Occupant and Building Permit number.
    b. Location, including street address and legal description.
    c. Point of compass.
    d. Fire Department connections.
    e. Necessary controlling equipment.
    f. Location of water source, type, routing, depth of bury, and size of supply pipes. Identify location and size of city main and whether it is dead-end or circulating loop and distance to the flow data test hydrant.
    g. Distribution system pipes and outlets. Include pipe and fitting types.
    h. Sprinkler connection, drop, details including supports required for flex pipe.
    i. Supports, brackets, restraints, and seismic attachments details and schedules.
    j. Reflected ceiling plan showing ceiling heights, construction type, proposed location and type of sprinkler heads, and other ceiling devices such as HVAC diffusers, loud speakers, type and location of light fixtures, etc.
    k. Interference control between sprinkler system and other trades.
    l. Full height cross section, indicating basic building construction system, sprinkler piping arrangement, and elevation of the highest sprinkler head.
    m. Location of partitions. Identification of full height walls and draft stops.
    n. Location and size of unprotected concealed spaces.

o. Location of unheated areas and areas that cannot be reliably maintained above 40 degrees F.

p. Water flow test results: Include testing agency, time, date, and location of test.

q. Make, model, type, orifice, finish, color, and temperature rating of sprinklers and their respective locations.

r. Sprinklers with sprinkler guards.

s. Extended coverage sprinklers.

t. Corrosion resistant sprinklers.

u. Ceiling slopes greater than 2 to 12.

v. Each hydraulic remote area and associated calculations with hazard type and density.

w. Hydraulic node points.

x. The square footage area protected by each system.

y. The type and location of pipe hangers, equipment supports, seismic movement, and seismic restraints.

z. Make, model, size, and locations of pipe couplings, fittings, and flanges.

aa. Name, address, and telephone number of the fire protection specialty Contractor. If design is by a separate firm, include the name address, telephone and fax numbers, and email of the design firm.

bb. Legend of abbreviations and symbols indicated.

cc. Schedule of room occupancies.

dd. Note the size, location, and extent of “exposed” pipes.

ee. Location of fire rated assemblies.

F. Design Data:

1. Submit Authority Having Jurisdiction approved sets of calculations. Drawings and calculations shall include the NICET certification and State of Alaska Permit IIC or IIC-DO number and signature or stamp of a licensed professional engineer and the fire suppression Contractor’s Alaska specialty license number. Submit complete hydraulic calculations which were used to prepare the final design drawings. One set will be retained by the Engineer.

2. Product data, shop drawings, and calculations shall be submitted together for review; partial submittals not allowed.

3. Systems shall be limited to a maximum of 175 PSIG, unless otherwise approved. Systems requiring pressures 175 pig PSIG and higher shall have pressure reducing valves, controls, and related equipment incorporated.

4. Submit water flow information used for hydraulic calculations:

a. If the Contractor conducts the flow test, a representative of the AHJ and Contracting Agency shall witness the test. Submit a written procedure and certification for the test, which shall be in compliance with NFPA 13 and NFPA 291 for flow testing water supplies and approved by the AHJ. Provide a minimum of 72 hours advance notice of test to the Contracting Agency.

b. Hydraulic calculations shall be accomplished in compliance with the procedures established in NFPA 13. In addition to minimum NFPA 13 standard, a minimum 10

percent pressure is required to be designed into the system. Where local authorities require additional buffer, comply with the more demanding requirement.

c. Hydraulic calculations accomplished by computer program for submittal shall be accompanied by a complete legend of the abbreviations, nodes, and symbols utilized on the computer printout.

d. Hydraulic calculations shall follow NFPA 13 requirements and shall clearly identify the following:
   1). Sprinkler type and “K” factor.
   2). Pipe and fittings type, size, and inside diameter.
   3). Fitting equivalent length chart that complies with the “C” factor and pipe type.
   4). NFPA hazard designation, design density, and size of the design remote area.
   5). The elevation of the “highest” sprinkler.
   6). Extended coverage sprinklers shall include design pressure and coverage identified on the drawings and manufacturer's product information to confirm usage. Hydraulic calculations shall identify extended coverage sprinklers and operating pressure.
   7). The available water supply and system demand at the point of connection to the water supply, indicated on a logarithmic graph and required safety factors. Include hose demands.

e. Equipment, pipe, fittings, and sprinklers used in calculations shall match installed system. Variances shall require redesign and installation by contractor.

G. Quality Assurance/Control Submittals:

1. Design Data: Provide hydrant flow test reports or other information used for design.

2. Certificates Initial Submittal:

   a. Submit Contractor's qualifications, proof of three years’ experience under this Contractor’s firm name, and references for at least five projects in Alaska of similar type, size, or complexity.

   b. Submit a copy of designer's NICET certification and resume', Alaska Permit number and level or Alaska P.E. license number.

   c. Submit a copy of Contractor's State of Alaska Fire Protection Permit and Administrator's License for the appropriate type of systems provided.

   d. Welding materials, procedures, welder qualifications, quality control and quality assurance, and records shall meet NFPA 13 as minimum requirements.

3. Certificates Post Construction:

   a. Submit a letter of certification for backflow assembly installation and testing, signed by the installer/tester.

   b. Provide copy completed of the Contractor's Material and Test Certificate for above ground piping.

   c. Submit test results to Factory Mutual Global for acceptance.

   d. Provide a letter of certification stating that testing and flushing has been performed in accordance with the applicable codes and standards. Itemize codes and standards complied with.

4. Provide Manufacturer's Installation Instructions, and Manufacturer's field reports.

5. Fire suppression system shall be installed, tested, as-builts completed and installation approved by the Authority Having Jurisdiction, AHJ, before substantial completion request or notification is made.

6. Structural tests and special inspections required by IBC or ASCE-07 shall be identified on the shop drawings, products submitted and coordinated during installation. Reports shall be submitted. Secure required services and pay for tests and inspections.
7. Significant changes in piping due to on-site coordination with other trades and existing conditions shall require hydraulic recalculation to confirm adequate pipe sizing and be resubmitted to AHJ and Contracting Agency's Insurance agency.

H. Review, Approvals, and Permits Required:
1. Obtain written review and/or approval of the entire fire suppression system design and arrangement from the following authorities:
a. Contracting Agency - (Approval).
b. Authority Having Jurisdiction, AHJ - (Approval).
c. Architect - (Review).
d. Mechanical Engineer - (Review).
e. Contracting Agency's Insurance Agency – (Review)
2. Comply with the above review comments, revising the system design as required, and resubmitting in a timely manner, so as not to hinder the construction schedule.
3. Obtain and pay for required permits, inspections, tests, and approvals as required by Authority Having Jurisdiction.

I. Operation and Maintenance Manual Submittal:
1. Include manufacturers' descriptive literature, operating instructions, installation instructions, testing certificates, maintenance and repair data, parts listings, and spare parts list.
2. Electronic copy of the Authority Having Jurisdiction approved hydraulic calculations, drawings, and their review letter.
3. Table showing NFPA 25 maintenance requirements.
4. Provide an electronic copy of operations and maintenance manual in PDF format with bookmarks matching table of contents, including as-built shop drawings with each required paper copy.

J. Closeout Submittals:
1. Refer to Division 1 for general procedures for submittals.
2. Project Record Documents: Record actual locations of components and locations of access doors required for access or valving.
3. Warranty: Submit manufacturer warranty and ensure forms have been completed in Contracting Agency's name and registered with the manufacturer.
4. Submit a written affidavit at the completion of the system, stating that the fire suppression system as installed complies with referenced Codes and Standards, Authority Having Jurisdiction requirements.
5. Provide written warranty as specified in Division 1.

K. Record Drawings:
1. Maintain current and up-to-date As-Built shop drawing prints of the fire suppression system at the job site.
2. Approved full size As-Built drawings and electronic copy of as-built shop drawing files in PDF and DWG formats shall be submitted with IO&M manuals.

3. Final as-built record drawings will be used for development of future facility sprinkler system project construction documents. Drawings shall confirm with Contracting Agency's AutoCAD drawing standards.

**1.05 QUALITY ASSURANCE**

A. Furnish the services of a qualified and approved fire suppression subcontractor to provide the work of this specification section. Unless otherwise noted, this is substantially a "performance" specification.

B. Minimum qualifications of the Contractor/subcontractor shall include the following:

1. Specialist Firm: Company specializing in automatic fire suppression/sprinkler systems, possessing a minimum of three years of experience with systems similar in nature to the type specified herein. Demonstrate satisfactory completion of five projects of similar size and scope in the State of Alaska; provide references.

2. Design Certification: Drawings and calculations shall be prepared by a Level III or IV Fire Sprinkler Designer, certified by the National Institute for Certification in Engineering Technologies (NICET), in Fire Protection Engineering Technology Automatic Fire Sprinkler System Layout who also have their State of Alaska Permit IIC or IIC-DO license, or an Alaskan Licensed Professional Engineer.

3. Maintain a complete stock of replacement parts.

4. Remain on 24 hour call for emergency service.

5. Maintain an office and telephone, with authorized representatives of the fire suppression contractor's firm, including the Designated Project Administrator, with a physical presence and address in Alaska.

6. Bids by wholesalers, contractors, or any firm whose principal business is not that of manufacturing and/or installing fire suppression systems are not acceptable.

C. Material:

1. Equipment and components: Bear the "UL" label or the "FM" approval marking.

2. Grooved joint couplings, fittings, valves, and specialties shall be from the same manufacturer, including grooving tools.

**1.06 DELIVERY, STORAGE, AND HANDLING**

A. Deliver, store, protect, and handle products to the site under provisions of Division 1.

B. Deliver and store valves in manufacturer's packaging with labeling in place.

C. Prior to installation, pipes shall be wrapped with protective wrapping.

**1.07 PROJECT/SITE CONDITIONS**

A. Temporary or conditional occupancy permits, or partial occupancy require alarm and life safety systems to be fully operational. Expedite installation and complete life safety requirements for temporary and phased occupancy. Existing portions of the building will be occupied and fully functional.

B. Work shall be scheduled to minimize disruption of automatic fire suppression service, coordinate with Contracting Agency for shut down and fire watch requirements when the existing system is inoperable.

C. Check dimensions indicated on the Architectural and Structural Drawings, and verify dimensions at the site before fabricating any portion of the system. Discrepancies in piping and head locations shall be corrected expeditiously to provide proper coordination of trades.

D. Coordinate work with that of other trades to make sure that adequate space is provided, including requirements for accessibility and serviceability. Locate sprinkler heads a minimum

6 inches distance from ceiling T-Bar, structural elements, devices, and other installed equipment. Adjust final location of piping and heads in field to accomplish these requirements for coordination.

E. Identify structural penetrations for pipes, and submit details of those penetrations to the Structural Engineer for approval. Replace structural members that are damaged, cut, or penetrated without approval at no additional expense.

F. In addition to 20 00 00 Mechanical General Requirements Part 3 demolition requirements, review the contract documents and any Contracting Agency furnished equipment and determine if any portion of the existing fire suppression system will be affected by the temporary or permanent implementation of any portion of this work. Provide Contracting Agency a list of the specific fire suppression and detection systems affected before proceeding with design or demolition.

G. Design automatic fire suppression piping in this facility with full consideration given to the building occupants, minimizing inherent health risks caused by self-inflicted injury from the fire suppression system and/or damage to the system. This includes but is not limited to exposed pipes, security of system controls and service points, and sprinklers.

**1.08 FIRE WATCH**

A. Provide a fire watch when the sprinkler system is inoperable for 10 hours cumulative during a 24-hour period when impairment coordinator is on-site per NFPA 25 requirements.

B. Provide a fire watch when the fire alarm system is inoperable for more than 4 hours cumulative during a 24-hour period.

**PART 2 PRODUCTS**

**2.01 GENERAL**

A. Provide only products that are a standard product of a manufacturer regularly engaged in the manufacture of fire suppression equipment.

B. Products and materials shall have a minimum working pressure of 175 PSIG and capable of withstanding a hydrostatic test pressure of 200 PSIG at 2 hours test pressure without damage, unless noted otherwise for higher pressure ratings or basis of design includes higher pressure ratings.

1. Exception for approved ancillary devices that are normally isolated from the fire water and sprinkler lines shall have a minimum rated 150 PSIG working pressure.

C. Submittals are required for all equipment, materials, and products.

D. Glycol systems for fire suppression shall not be used.

**2.02 LABELS, TAGS, AND APPROVALS FOR PRODUCTS**

A. Products UL or FM listed, labeled, and specifically approved for the fire suppression application where they are used.

B. Label pipes, riser assemblies, pre-action systems, and alarm valves, including zone designation; enamel on metal for valves.

C. Tag equipment for maintenance and operations. Include in shop drawings and O&M manual.

**2.03 MANUFACTURERS**

A. Sprinkler System and Components:

1. AGF.
2. Central.
3. Croker.

4. Gem Sprinkler.
5. Grinnell.
6. Kennedy.
7. Metraflex.
8. Milwaukee.
9. Notifier Company.
10. Potter-Roemer.
11. Potter Electric.
12. Reliable.
13. System-Sensor.
14. Tyco.
15. Tolco.
16. Victaulic.
17. Viking.

**2.04 PIPE**

A. Plastic pipe is not allowed.

B. Pipe shall be marked with the name of the manufacturer, model designation or schedule, and ASTM designation.

C. Schedule 40 pipe to be used for threaded and cut groove fittings and pipe smaller than 3 inches.

D. The use of pipe nipples less than 1-inch in diameter and less than schedule 40 wall thickness is not allowed. Specialty listed steel pipe and non-metallic pipe recognized by NFPA-13 is not allowed.

E. Wet Pipe Sprinkler Systems:

1. Metallic pipes shall be listed for the intended service by UL or FM.
2. Whenever pipes other than steel schedule 40 is utilized, submit a statement that the pipe complies with NFPA 13 standards, the pipe strength is adequate for the application, and the pipe corrosion resistance ratio (CRR) shall be equal or greater than 1.0, equivalent to schedule 40 pipe for the installed system. Include this CRR data in product submittal.
3. Copper tube, Type L hard temper with brazed connections for MRI and similar areas requiring nonferrous pipe. Mechanically formed drilled or extruded tree-branch, press fit or mechanical connections are not allowed.

**2.05 FLEXIBLE SPRINKLER HOSE WITH THREADED END FITTINGS**

A. Flexible one-inch 304 stainless steel flexible sprinkler hose products shall be FM Global or UL tested and approved and submitted for the specific application. The drop system shall include required mounting brackets and appurtenances.

B. Equivalent length of 1" schedule 40 steel pipe and pressure drop information shall be included in product submittal and hydraulic calculations.

## 2.06 FITTINGS

A. Grooved Fittings, Couplings, and Mechanical Tees:

1. Grooved Fittings: ductile iron fittings with flow equal to standard pattern. Fabricated or segmented fittings are not acceptable. Couplings and mechanical tees shall be standard painted, unless indicated otherwise.
2. Grooved joint couplings shall consist of two ductile iron housing segments with pressure responsive gaskets and zinc plated, hot dipped galvanized or stainless steel hardware as required for application.
    a. Rigid type: Couplings shall provide joint rigidity, support and hanging in accordance with NFPA 13.
    b. Flexible type: For use in locations where vibration attenuation and stress relief or flexible connectors are required.
3. Mechanical Tee Clamp-on are not allowed for new work. Ductile iron with pressure responsive gaskets and zinc plated, hot dipped galvanized or stainless steel hardware as required for application. Threaded or grooved outlets. Crosses shall not be allowed.

B. Threaded fittings shall be compatible with piping system and include cast iron Class 125 and 250 and malleable iron Class 150 and 300 steel

C. Pipe Flanges shall be compatible with piping system and include cast iron Class 125 and 250 and malleable iron Class 150 and 300 steel.

D. Welded Pipe Fittings for Wet Pipe Sprinkler Only: Limited to Weld-o-lets, Thread-o-lets, Gruv-o-lets, Tees, and Welded Flanges. Welding limited to shop fabrication work with approved quality control process, welding procedures, and welders for specific application.

E. Welded pipe joints and fittings shall not be used on galvanized pipe or on pipes with wall thickness less than schedule 30.

F. Wrought copper brazed fittings ASTM B16.50 or cut ASTM B16.22 solder fittings for brazing. Soldered connections are not allowed.

G. Clamp-on, saddle type, or mechanical tee are not allowed for new work.

H. Other means of joining pipe are not permitted.

## 2.07 SPRINKLER HEADS

A. Provide sprinklers as required by NFPA 13 standards and the IBC Chapter 9. New sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body. Work on existing sprinkler systems shall match existing sprinklers unless all sprinkler systems in coverage area are replaced. Sprinkler finish and style as follows

1. In areas with surface mounted light fixtures attached to finished suspended ceilings, provide standard spray pendant sprinklers, and escutcheons to position the sprinkler deflector below the light fixture. Sprinklers and escutcheons to be chrome finish.
2. In areas with recessed lighting flush to the suspended ceiling finish, provide recessed standard spray pendant sprinklers. Sprinklers and escutcheons to be chrome finish.
3. In public areas and cleanable ceiling areas with flush or recessed light fixtures provide concealed type pendant sprinklers with white cover plates unless indicated otherwise. Provide sealing gasket for rooms requiring differential air pressure control where approved by listing agency.
4. Sprinklers above ceilings and exposed ceiling areas shall be bronze finish, standard spray, upright or pendant type.

5. Sidewall sprinklers shall be bronze finish in service areas, and chrome throughout public areas.
6. Sprinklers with orifices less than K-4.2 not allowed.
7. Guards are required on exposed piping sprinklers where subject to mechanical damage and sprinklers less than eight feet zero inches above finish floor. Provide the same brand sprinkler guard or escutcheon with the same finish as the sprinkler on which it is to be installed. Red guards are acceptable for bronze sprinklers only. Chrome finish guards are required for chrome sprinkler heads. Physically wire guards closed.
8. Sprinkler temperature rating shall be installed according to NFPA 13.
9. Provide additional sprinklers, as requested by Authority Having Jurisdiction, at no additional cost to the Owner.

**2.08 PIPE AND EQUIPMENT ANCHORS, BRACING, HANGERS, AND SUPPORTS**

A. Provide seismic anchoring, bracing, supports, and clearance for equipment, piping, and sprinkler heads per NFPA 13, International Building Code, and ASCE 7. Most conservative criteria shall govern.

B. Provide flexible couplings, bracing, and other components required and compatible with the piping materials and fittings.

C. Hangers, bracing, and seismic details and locations shall be included on the shop drawings.

**PART 3 EXECUTION**

**3.01 GENERAL**

A. The contract documents have performance, materials, and installation requirements which exceed code minimums.

**3.02 COORDINATION**

A. The fire suppression contractor shall coordinate their work with the work of other trades to assure timely installation and efficient use of areas including, but not limited to, boiler rooms, fan rooms, and ceiling spaces.

B. Promptly remove any work installed without proper coordination and reinstall in a manor to allow for a good practical arrangement of items which need to be installed by other trades involved.

C. Costs associated with coordination, arranging or rearranging of the fire suppression system shall be borne by the affected contractor, without causing any additional expense or delay to the Contracting Agency.

D. Installation, testing, O&M manuals, record drawings, and AHJ approvals shall be completed, submitted, and approved by the Contracting Agency before beneficial occupancy.

E. Review the Contract Documents and any Contracting Agency furnished equipment and determine if any portion of the existing fire suppression system will be affected by the temporary or permanent implementation of any portion of this work. Provide Contracting Agency list of specific fire suppression and detection systems affected before proceeding with design or demolition including sectional or isolation valves to allow system protection to meet phasing or operational requirements. Coordinate with Contracting Agency for shut down and maintain a fire watch when system is inoperable and required by AHJ.

F. Work shall be scheduled to minimize disruption of existing fire service. Coordinate with Contracting Agency for shut down and maintain a fire watch when system is inoperable.

G. Coordinate with architectural requirements for prepping and painting of pipes, hangers, brackets, restraints, and appurtenances in public exposed areas, unless indicated otherwise.

### 3.03 PIPING INSTALLATION

A. Install pipes, fittings, and appurtenances in accordance with codes and recommended practices. Pipe weld seams to be in 9 o'clock position. Follow manufacturers' installation instructions.

B. Installed system to have a corrosion resistance ratio (CRR) equal or greater than 1.0.

C. Pipes and equipment not directly serving exit enclosures or exit passageways shall not be routed through them. Only pipes and equipment directly serving exit enclosures or exit passageways shall be allowed in these spaces. There shall be no penetrations whether protected or not between adjacent exit enclosures or exit passageways.

D. Sprinkler system pipe and fittings shall be installed to flush and drain system. Drains shall be accessible.

E. Seismic protection for the piping system shall be in accordance with NFPA 13 standards and ASCE 7. Include seismic restraint details with installation shop drawings.

F. Provide clearance around pipes extending through walls, floors, and ceilings. Holes shall be sized 2" larger than the pipe, excluding frangible construction that is not required to have a fire resistance rating.

G. Install pipes to conserve building space and route pipes around roof hatches, electrical panels, access panels, and maintenance accesses.

H. Minimum 3 inches clearance from structure not used to support pipes.

I. Provide service access around equipment per manufacturer's requirements, minimum of 18 inches.

J. Provide flexible couplings per NFPA 13 and at the following locations:

1. Penetrated fire and smoke rated assemblies.
2. Within 24 inches of building's expansion joints.
3. Within 12 inches above and within 24 inches below for the floor in multistory buildings.

K. Sprinkler pipes shall be substantially supported from the building structure, which shall support the water loaded pipe plus a minimum 250 pounds temporary point load applied at the point of hanging. Pipe hangers shall include 250 pounds and weight of 5 times the pipe filled with water.

L. Pipes shall be concealed, except at ceilings exposed to structure, or as noted. Conceal pipes in areas with finished ceilings except where otherwise specified or indicated. Coordinate with the other trades to take timely advantage of available space above ceilings, below raised floor, in pipe and duct spaces and elsewhere.

M. Pipes shall not be concealed in walls.

N. Piping to sprinklers below ceilings with minimum 1-inch outlets.

O. Pipes in exposed ceiling areas shall be limited to branches serving heads in the area. Pipe routing shall be coordinated to minimize visual impact and approved prior to installation.

P. Connection to existing systems shall be configured and installed for flushing and draining of all pipes including, but not limited to, system supplies and risers, risers, cross and feed mains, and branches.

Q. Provide penetrations where pipes pass through walls, floors, or ceilings. Penetrations shall be in accordance with UL Fire Resistance Directory for "Through Penetration Firestop Systems (XHEZ)".

R. Fasten trapeze members to truss chords or structural members.

S. Install “beam clamp” type fasteners with retainer straps and locking nuts. Retainer strap shall be tight to beam.

T. Pipe hangers: “rod and ring” type hangers throughout for dry pipe system. Minimum 1/2" of adjustment on each side of the hanger ring nut, to allow for piping grade adjustment in the future.

U. Pipe size reductions by one-piece reducing fittings; bushing shall not be used.

V. Welded pipe shall be shop fabricated by certified welders and procedures. Field welding is not allowed. Welding of galvanized pipe is not allowed.

**3.04 GROOVED AND ROLLED FITTINGS**

A. Follow the manufacturer's suggested methods to prepare gaskets, pipes, and fittings to prevent leakage, system breakdown, and designed pipe and fitting movement.

B. Installers to have been trained by the coupling manufacturer in the use of grooving tools and installation of product. The manufacturer’s representative shall periodically visit the job site to ensure best practices are being followed.

**3.05 SPRINKLER HEAD INSTALLATION**

A. Sprinkler heads to be centered per approved shop drawings. Changes due to field conditions shall be pre-approved.

B. Sprinkler heads to be centered on acoustical lay-in panels and symmetrically 4-way on architectural drawings laid out in each separate room or space with GWB type ceiling regardless of finishes and Code minimum requirements.

C. Sprinkler heads shall be connected to system via minimum 1-inch diameter flexible stainless steel sprinkler hose in suspended ceiling areas, areas subject to tenant renovations, where indicated, and where required for seismic criteria. Ceiling systems with listed flex hose connections shall be identified on shop drawings.

D. Escutcheons and cover plates shall be metallic and listed for the assembly.

E. Provide guards where sprinklers may be subject to mechanical damage and in accordance with contract documents.

F. Do not install sprinklers that have been dropped, damaged, show a visible loss of fluid, or a cracked bulb.

G. The sprinkler bulb protector shall be removable by hand, without tools or devices that may damage the bulb.

H. Sprinkler head temperature ratings shall be selected based upon installed distance from heat source.

I. Provide clearance for removal of sprinkler heads and minimum 1-inch clearance from structure. Exclude concealed, recessed, and flush types, which have clearances above the ceiling

J. Identify sprinklers with less than 8 feet between them and include listing and NFPA 13 criteria.

**3.06 IDENTIFICATION**

A. Sprinkler system hydraulic design and relevant general information. Information shall meet NFPA 13 and NFPA 25 requirements for inspection, testing, and maintenance.

**3.07 FLUSHING**

A. Piping systems in or serving area of work shall be arranged for flushing. Cross main ends shall be provided with readily removable fittings and shall terminate with 1-1/4" or larger pipe.

B. Flush pipes before pressure tests.

**3.08 FIELD QUALITY CONTROL**

A. Arrange for proper witnessing of tests, as required by Authority Having Jurisdiction and as specified elsewhere. Contracting Agency's representative may witness tests. Notify Contracting Agency a minimum of 3 days in advance of test.

B. Arrange new and existing systems in or serving the area of work for testing. Limits and criteria for testing existing systems impacted by work under this contract to be coordinated with Contracting Agency and AHJ.

C. Spot check installed sprinkler's identification to match approved shop drawings, including hydraulically remote areas.

D. Conduct tests in accordance with applicable codes for new and existing systems in or serving area. Test pipes at minimum 200 PSIG hydrostatic for two hours.

E. Pipe shall not be concealed until satisfactorily pressure tested.

F. Log of test shall be kept at the job site and shall identify:

1. Who performed the test,
2. Time and date of test,
3. Section of system tested,
4. Results of test,
5. Completed Contractor's Material and Test Certification forms.

G. Provide a letter of certification stating that testing and flushing has been performed in accordance with the applicable codes and standards. Itemize codes and standards complied with.

**END OF SECTION**

SPRINKLER EXAMPLES for definitions see W:\NFPA General\NFPA 13 Installation of sprinkler systems\NFPA 13-2010\NFPA 13-2010 3 Definitions, Handbook.pdf

## Sprinkler Identification Card | NFPA 13 Handbook | 2016 Edition

### Early Suppression Fast Response (ESFR) Sprinkler (3.6.4.3)



*Viking® K-16.8 (left) and K-22.4 (right) from Reliable Automatic Sprinkler Co., Inc.*

Typically used in high challenge fire occupancies such as warehouses.

Often allows protection without additional in-rack sprinklers.

### Quick Response (QR) Standard Spray Sprinkler (3.6.4.8)



*Victaulic Quick-Response Standard Spray Sprinkler. (Courtesy of Victaulic®)*

Used to protect various light, ordinary, and extra hazard occupancies.

Response is determined by the fusible glass element thickness – 3mm or less for a QR sprinkler.

### Concealed Sprinkler (3.6.2.1)



*Standard Model G Concealed Ceiling Sprinkler. (Courtesy of Reliable Automatic Sprinkler Company, Inc.)*

Typically used for protection in office occupancies.

Sprinkler is hidden for aesthetics.

Cover plates cannot be painted except by the manufacturer as part of assembly listing.

### Pendent Sprinkler (3.6.2.3)



*Standard Spray Pendent Sprinkler. (Courtesy of Reliable Automatic Sprinkler Company, Inc.)*

Used to protect various light, ordinary, and extra hazard occupancies.

Response is determined by the fusible glass element thickness – 5mm or less for a standard response sprinkler.

### Recessed Sprinkler (3.6.2.4)



*Recessed Sprinkler. (Courtesy of Reliable Automatic Sprinkler Company, Inc.)*

Used to protect various light, ordinary, and extra hazard occupancies.

Sprinkler is partially hidden for architectural aesthetics.

### Sidewall Sprinkler (3.6.2.5)



*Horizontal Sidewall Sprinkler. (Courtesy of Reliable Automatic Sprinkler Company, Inc.)*

Typically used to protect areas where ceiling sprinklers are not practical.

Should not mistake residential sidewall sprinklers with commercial ones as they can look almost identical but can have very different K-factors.

### Upright Sprinkler (3.6.2.6)



*Upright Sprinkler. (Courtesy of Reliable Automatic Sprinkler Company, Inc.)*

Typically used to protect areas where ceiling sprinklers are not practical.

Care should be taken not to mistake residential sidewall sprinklers with commercial ones as they can look almost identical but can have very different K-factors.

### Dry Sprinkler (3.6.3.2)



*Viking Model E Dry Pendent Sprinkler. (Courtesy of Viking®)*

Typically used to protect specific rooms or small areas where freeze protection is required but, due to a limited number of sprinklers required for coverage, a dry pipe system is not warranted.

The water filled pipe is run outside of the chilled area and these are used to then drop into the protected area.

### Institutional Sprinkler (3.6.3.3)



*Institutional Sprinkler.*

Typically a flush type of sprinklers specifically designed to be tamper resistant.

For use in occupancies, such as institutional mental health occupancies, correctional facilities, or anywhere a likelihood of tampering with fire sprinklers by the occupants exists.

### Extended Coverage (EC) Sprinkler (3.6.4.4)



*EC Sprinkler. (Courtesy of Viking®)*

Used to protect various light, ordinary, and extra hazard occupancies.

These have specific ceiling and obstruction requirements but can allow designer to increase coverage from each sprinkler reducing required piping.

## Sidewall-Type EC Sprinkler (3.6.4.4)



*Sidewall-Type EC Sprinkler. (Courtesy of Viking®)*

Used to protect various light and ordinary hazard occupancies.

Can allow the designer to increase coverage from each sprinkler reducing required piping.

## Quick-Response EC Sidewall Sprinkler (3.6.4.8.2)



*Quick-Response EC Sidewall Sprinkler. (Courtesy of Reliable Automatic Sprinkler Company, Inc.)*

Used to protect various light and ordinary hazard occupancies.

Can allow the designer to increase coverage from each sprinkler reducing required piping.

The 3 mm element indicates a quick response sensitivity.

## Residential Sprinkler (3.6.4.9)



*Viking Listed Residential Sprinkler. (Courtesy of Viking®)*

Used to protect various residential and some light hazard occupancies.

Residential sprinklers are tested to different listing criteria than commercial sprinklers and should not be interchanged in designs.

Residential sprinklers are tested primarily as life safety devices with different criteria (and fire control capabilities) than commercial sprinklers.

## Corrosion-Resistant Sprinkler (6.2.6.1)



*Corrosion-Resistant Sprinkler. (Courtesy of American Fire Sprinkler Association)*

Used for special applications where corrosion of the sprinkler is a concern.

All corrosion coatings must be factor applied and tested as part of the listing.

## Intermediate Level Sprinkler (8.5.5.3.4)



*Intermediate Level Sprinkler. (Courtesy of Tyco Fire Protection Products LP)*

Used in specific cases per NFPA 13 to protect the sprinkler from premature "cooling" from the discharge of sprinklers above such as those at the ceiling level.

Some sprinklers are listed as intermediate sprinklers without the requirement of a large water shield above the deflector.

## Intermediate Level Sprinkler with a Shield (6.2.8)



*Intermediate Level Sprinkler with a Shield. (Courtesy of Viking®)*

Used in specific cases per NFPA 13 to protect the sprinkler from premature "cooling" from the discharge of sprinklers above such as those at ceiling level.

Some sprinklers are listed as intermediate sprinklers without the requirement of a large water shield above the deflector.

## Sprinkler Identification Factors

### Sprinkler Identification Number (SIN) (6.2.2)



All sprinklers are permanently marked with the SIN.

Identifies sprinkler operating characteristics in lieu of traditional laboratory approval marking.

Helps identify sprinklers installed in the field and minimize confusion resulting from the growing number and varieties of available sprinklers.

*Viking Sprinkler Showing SIN on Deflector (Courtesy of Viking®)*

### Variations in K-Factors: Thread Size (6.2.3.1)



*Sprinklers with K-factors of 2.8, 5.6, and 25.2. (Courtesy of Tyco Fire Products LP)*

K-factors compared for three sprinklers.

Two appear to both have ½ in. threads thus the only way to determine the K-factor is by internal inspection or careful review of the product information sheet.

### Variations in K-Factors: Orifice Size (6.2.3.1)



*Orifices of sprinklers with K-factors of 2.8, 5.6, and 25.2. (Courtesy of Tyco Fire Products LP)*

K-factors compared for three sprinklers.

Comparison of orifices of sprinklers with K-factors of 2.8, 5.6, and 25.2.

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# SECTION 22 11 00
# DOMESTIC WATER PIPING AND SPECIALTIES

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Pipe, fittings, and connections for domestic potable water system.
2. Mechanical coupling systems.
3. Piping accessories.
4. Valves.
5. Water hammer arresters.
6. Trap primer valves.
7. Access doors.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 07 00 - Mechanical Insulation
7. 21 10 00 - Water Based Fire Suppression Systems
8. 22 13 00 - Sanitary Waste and Vent Piping and Specialties
9. 22 40 00 - Plumbing Fixtures

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. Foundation for Cross-Connection Control and Hydraulic Research, 9th edition, University of Southern California.
3. NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances.
4. IAPMO Uniform Plumbing Code, UPC
5. NSF/ANSI 61 - Drinking Water System Components - Health Effects.

B. Abbreviations, Acronyms and Definitions:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. This section describes specific requirements, products, and methods of execution for interrelated systems necessary for the various plumbing systems and equipment. Wetted

surfaces of pipes, fittings, valves, and equipment in potable water systems shall be lead free as defined by NSF 61.

B. Performance Requirements:

1. Potable water systems shall perform quietly, with no objectionable vibration transmitted to the surrounding construction.
2. Replace piping and equipment that does not perform as intended with properly operating equipment.

**1.04 PRE-INSTALLATION MEETINGS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.05 SUBMITTALS**

A. Refer to Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed:

B. Product Data:

1. Submit product literature for items specified in Part 2 and those products required by the performance standards of this section. Literature clearly annotated to indicate specified salient features and performance criteria.
2. Indicate valve data and ratings.
3. Provide plumbing specialty component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings:

1. This Section shop drawings to be submitted under Section 20 00 00 - Mechanical General Requirements.
2. Show placement of fixtures and plumbing equipment.

D. Certificates: Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation of cross contamination protection devices.

E. Manufacturer's Installation, Operation, and Maintenance (IO&M) Manuals.

F. Test and Evaluation Reports:

1. Submit hydrostatic pressure test report.
2. Submit sterilization of system report.

**1.06 CLOSEOUT SUBMITTALS:**

A. Refer to Section 20 00 00 - Mechanical General Requirements for general closeout submittal requirements for the items listed below, supplemented with the additional requirements listed:

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements for general mechanical warranty requirements.

## PART 2 PRODUCTS

### 2.01 WATER SERVICE PIPING (ABOVE GRADE INSIDE BUILDING)

A. Copper (Hard drawn):
   1. Tubing: Type L (ASTM B88).
   2. Fittings:
      a. Cast copper alloy (ASME B16.18).
      b. Wrought copper and bronze (ASME B16.22).
   3. Joints: Solder, Grade 95TA (ASTM B32).

B. Copper Press Fitting System:
   1. Limited to tubing sizes 4 inch and smaller.
   2. Cast or wrought copper fittings, ASME B16.51. Pre-formed grooves with pre-lubricated EPDM O-rings designed to seal fitting to copper tubing water tight with the use of manufacturer's crimping tool. Fittings shall be rated for 250 degrees F and 200 PSI.
   3. IAPMO UPC listing.
   4. Manufacturer: Viega ProPress, NIBCO Press System, no substitutions.

C. CPVC Plastic Piping System (cold water piping (all sizes) and hot water piping over 2 inches):
   1. Tubing and Fittings: Extruded/molded CPVC CTS (ASTM D1784, D2846). Corrosion-resistant, plenum rated. Rated for 180 degrees F and 100 PSI. Schedule 40 on piping up to 2 inches; schedule 80 on piping 2-1/2 inches and larger.
   2. Fittings: CTS CPVC by brass threaded transition fittings.
   3. Joints: Socket type, joined with solvent cement (ASTM F493).
   4. Solvent Cement:
      a. Listed by NSF International for use with potable water.
      b. Manufacturer: Fry Technology, IPS Corporation, Schwartz Chemical of Canada Ltd., Oatey.
   5. Manufacturers of FlowGuard Gold pipe:
      a. Bow Plastics.
      b. Charlotte Pipe and Foundry Co.
      c. Cresline Plastic Pipe Co., Inc.
      d. Genova Products.
      e. Harvel Plastics.
      f. KBI Company.
      g. NIBCO.
      h. No substitutions.

### 2.02 UNIONS (STANDARD)

A. Copper Piping (Sweat and Threaded): Cast bronze, ground joint, copper to copper, or copper to threaded joint. Nibco 733-LF series.

### 2.03 DIELECTRIC ISOLATORS (ELECTRICALLY INSULATING)

A. Provide dielectric unions for 2 inch pipe and smaller.

B. Provide dielectric flanges for 2-1/2 inch pipe and larger.

C. Insulating gaskets, all types, shall be suitable for fluid type, temperature and pressure.

D. Galvanized pipe to copper: Brass threaded end and sweat copper end.

E. Black steel to copper: Zinc plated steel threaded end and sweat copper end.

F. Manufacturers: Capitol, Epco, Control Plastics, Watts, or approved equal.

**2.04 VALVES**

A. General:

1. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 PSIG saturated steam or 200 PSIG WOG. Packing material or seals shall not contain asbestos.

B. Ball Valves:

1. Two (2) inch and smaller: Two piece type, full port, bronze body and silicone bronze ball or chrome plated brass ball, TFE seats, blowout proof stem, 150 PSIG pressure/temperature rating (steam).
2. Two and one half (2-1/2) inches through four (4) inch: Two piece type, full port, bronze body and silicone bronze ball or chrome plated brass ball, TFE seats, 150 PSIG pressure/temperature rating (steam). May be substituted for gate valves except where otherwise indicated.

C. Globe Valves:

1. Two (2) inch and smaller: Bronze body, renewable disc suitable for service.
2. Two and one half (2-1/2) inch and larger: Iron body, bronze trim, flanged, bronze disc. Bronze valves optional for 2-1/2 inch and three-inch.

D. Swing Check Valves:

1. Two (2) inch and smaller: Bronze body, horizontal swing, Y-pattern, Buna-N-disc for water, oil and gas. TFE disc for steam.
2. Two and one half (2-1/2) inch and larger: Iron body, horizontal swing, bolted bonnet, renewable bronze seat and disc, flanged.
    a. Bronze valves optional for 2-1/2 inch and 3 inch.

E. Drain Valves:

1. Full port ball valve with threaded hose adapter with bronze end cap.
2. Do not use sillcocks or butterfly valves as drain valves.

**2.05 WATER HAMMER ARRESTERS**

A. Manufacturers:

1. Sioux Chief.
2. Precision Plumbing Products.
3. Mifab.
4. Zurn.
5. Any other manufacturer meeting the requirements of the contract documents. Substitution request not required.

B. Pressurized Piston Type:

1. Description: ASSE 1010 certified water hammer arrester.
2. Performance:

a. Maximum working temperature of 250 degrees F.
b. Maximum working pressure of 350 PSIG.

3. Materials:
a. Seamless copper body.
b. EPDM o-rings lubricated with FDA approved compound.

C. Expansion Bellows Type:
1. Description:
2. Performance:
a. Maximum working temperature of 250 degrees F.
b. Maximum working pressure of 350 PSIG.
3. Materials:
a. Stainless steel body and bellows.

**2.06 TRAP PRIMER VALVES**

A. Manufacturers:
1. Precision Plumbing Products.
2. MIFAB.
3. ProFlo.

B. Non-Electronic Type:
1. Description: Valve designed to deliver a metered amount of water to floor drain traps upon pressure drop of 10 PSI in the cold water line.
2. Performance: Factory set for proper operation with water pressure of 20 to 80 PSI.
3. Materials:
a. Lead-free brass body.
b. EPDM O-rings.
c. Stainless steel mesh screen.
4. Manufacturer: Precision Plumbing Products P1-500.

C. Non-Electronic Type:
1. Description: Valve designed to be installed in line with cold water pipe to sink.
2. Performance:
a. Factory set for proper operation with water pressure of 20 to 80 PSI.
b. Minimum discharge rate of 0.845 ounces at 20 PSI.
c. Minimum discharge rate of 1.65 ounces at 80 PSI.
3. Materials:
a. Lead-free brass body.
b. Neoperl check valve.
c. Nitrile o-rings.
d. Stainless steel screen.
4. Manufacturer: Precision Plumbing Products PrimePro.

D. Electronic Type:

1. Description: ETL listed, trap primer assembly designed to discharge a metered amount of water to floor drain traps on a timed schedule, subminiature solenoid valve, air gap, 6-feet long electrical cord.
2. Performance:
3. Materials: Copper, lead-free brass.
4. Manufacturer: Precision Plumbing Products Solo-Prime SP-500-24V.

E. Electronic Type:

1. Description: UL listed, trap primer assembly designed to discharge a metered amount of water to floor drain traps on a timed schedule. Assembly includes electronic solenoid valve, timer box with test button, circuit breaker, 1-inch air gap, and NEMA 1 surface mounted wall box with cover.
2. Performance:
   a. Pre-set timer opens once for 10 seconds every 24 hours.
   b. 20-150 PSI pressure range. Minimum 2 ounces of water at 20 PSI per drain served.
   c. 32-125 degrees F temperature range.
   d. 120-volt, single phase electrical connection with 0.11 amps hold current and 0.23 amps inrush current.
3. Materials:
   a. Copper with lead-free solder.
   b. 16 gauge steel wall box and cover.
   c. Stainless steel mesh screen.
4. Manufacturer: Precision Plumbing Products Mini-Prime.

F. Electronic Type:

1. Description: UL listed, trap primer assembly designed to discharge a metered amount of water to floor drain traps on a timed schedule. Assembly includes electronic solenoid valve, timer box with test button, circuit breaker, vacuum breaker, and NEMA 1 surface mounted wall box with cover.
2. Performance:
   a. Pre-set timer opens once for 10 seconds every 24 hours.
   b. 20-150 PSI pressure range. Minimum 2 ounces of water at 20 PSI per drain served.
   c. 32-125 degrees F temperature range.
   d. 120-volt, single phase electrical connection with 0.11 amps hold current and 0.23 amps inrush current.
3. Materials:
   a. Copper with lead-free solder.
   b. 16 gauge steel wall box and cover.
   c. Stainless steel mesh screen.
4. Manufacturer: Precision Plumbing Products Prime Time series.

G. Accessories: Distribution unit to serve multiple floor drains from a single trap primer.

**2.07 PRESSURE GAUGES**

A. Provide where shown on drawings, specified in Part 3, or as required.

B. Bourdon tube type with minimum 4-1/2-inch dial, accuracy plus or minus 1 percent (ANSI/ASME Grade 1A). Normal operating pressure near midpoint of range. Industrial quality.

C. Type 304 stainless steel case and ring, acrylic lens.

D. NSF-61 certified lead free brass.

E. Gauge cock on gauges and pulsation damper (snubber).

F. Manufacturers: Winters PCT-LF, or approved equal.

**2.08 ACCESS DOORS**

A. Provide access doors for mechanical systems in accordance with Division 08.

B. Provide UL labeled access doors and panels when required for fire resistance of surrounding construction.

C. Provide key locks on access doors located in public areas below eight feet above finished floor.

D. Prime coat steel.

E. Coordinate location and size of access doors in walls, partitions, floors, and ceilings to correspond with valves, trap primers, cleanouts, and other devices requiring service or adjustment. Maintain any fire rating of the surrounding construction.

F. Manufacturers: Elmdor, KARP, Milcor, MIFAB.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Protection of In-Place Conditions: Cover equipment and plug piping connections to protect components from construction dirt and debris.

B. Surface Preparation:

1. Verify that excavations are to required grade, dry, and not over-excavated.
2. Refer to Section 20 05 56 - Interior Trench Excavation and Backfill.

**3.02 INSTALLATION**

A. Interface with Other Work:

1. Review architectural drawings. Coordinate locations of access panels prior to piping installation.
2. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
3. Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related work shall be completed at no additional expense to the Owner.
4. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 9 for instructions on painting and coordination.

B. Water Service Piping:

1. Install piping and plumbing products in accordance with UPC and manufacturer's instructions. Provide seismic anchoring, bracing, supports, and clearance for equipment, piping and sprinkler heads per UPC, IBC, and ASCE-07; most conservative criteria shall govern.
2. Install piping to maintain headroom, conserve space, and not interfere with use of space.

3. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
4. At fixtures, install and connect hot water on left and cold water on right, as viewed when facing the fixture.
5. Use of bullhead tee with opposed flow, double inlet configuration not allowed.
6. Mechanically formed tee fittings not allowed.

C. Valves:

1. Provide accessible ball type isolation valves at major piping branches, and on main lines as shown, and at terminal devices.
2. Install balancing valves for hot water recirculation system to be accessible and adjustable.

D. Provide finished products with protective covers during balance of construction.

E. Access Doors: Provide appropriate size and install such that plumbing features are readily accessible and maintainable.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

**3.03 REPAIR/RESTORATION**

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**3.04 FLUSHING**

A. Flush pipes before pressure tests.

B. Flush underground service pipes and distribution pipes before connecting underground pipes to water system.

C. Remove and clean strainers and screens after flushing.

**3.05 PRESSURE TESTS**

A. Site Tests:

1. Test water piping hydrostatically at 100 PSIG or 150 percent of working pressure, whichever is greater, for a period of four hours. Observe piping during this period, repair leaks, and retest.
2. Air Test:

a. In general, air testing is not acceptable. In the event of low temperature conditions that would subject system piping to freezing, an equivalent air pressure test may be conducted in accordance with the Uniform Plumbing Code with prior Contracting Agency approval.

b. Test with clean air at 150 percent of system working pressure but not less than 75 PSIG or more than 150 PSIG. System shall hold pressure for not less than four hours. Inspect joints using leak detecting fluid or soapy water. Repair leaks and retest.

c. Observe necessary safety procedures when testing with air including, but not limited to, use of protective goggles or face shields. Only persons directly involved in testing procedure shall be within 20 feet of a pipe under pressure.

3. Test results shall be certified in writing as required by General Conditions. Include dates and sections tested, test pressure, test duration, printed names and signatures of person performing the test and Contracting Agency witnessing the test.

**3.06 SITE QUALITY CONTROL**

A. Inspection: Arrange for inspections and provide notice to the Contracting Agency when the entire work or logical portions thereof, is ready for inspection.

**3.07 STERILIZATION**

A. Sterilization of Domestic Water Systems:

1. Sterilize each unit of completed supply line and distribution system with chlorine before acceptance for domestic operation.
2. Sterilization as described below or by the system prescribed by the American Water Works Association Standard C-651. Apply the amount of chlorine to provide a dosage of not less than 50 PPM (parts per million). Provide chlorine manufactured in conformance to the following standards:
   a. Liquid Chlorine: Federal Specification BB-C-120.
   b. Hypochlorite: General Specification O-C-114a, type 11, Grade B or Federal Specification O-X-602.
3. Introduce the chlorinating material to the water lines and distribution system after piping system has been thoroughly flushed. Maintain a contact period of not less than 24 hours. Flush the system with clean water until the residual chlorine content is not greater than 1.0 part per million.
4. Open and close valves in the lines being sterilized several times during above chlorination.
5. Certify in writing that sterilization has been completed in accordance with these requirements.

**3.08 SYSTEM STARTUP**

A. Start-up and operate plumbing systems and equipment in accordance with the manufacturer's written installation and operation manual checklist.

**3.09 CLEANING**

A. After construction is completed, clean and wipe down exposed surfaces of fixtures, pumps, piping, and appurtenances.

**END OF SECTION**

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# SECTION 22 13 00
# SANITARY WASTE AND VENT PIPING AND SPECIALTIES

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Sanitary waste and vent pipe and fittings.
   2. Cleanouts.

B. Related Sections:
   1. 01 91 00 - Commissioning
   2. 20 00 00 - Mechanical General Requirements
   3. 20 05 29 - Mechanical Hangers and Supports
   4. 20 05 48 - Mechanical Vibration and Seismic Control
   5. 20 05 53 - Mechanical Identification
   6. 20 07 00 - Mechanical Insulation
   7. 22 11 00 - Domestic Water Piping and Specialties
   8. 22 40 00 - Plumbing Fixtures

### 1.02 REFERENCES

A. Codes and Standards: See Section 20 00 00 - Mechanical General Requirements.

B. Abbreviations, Acronyms and Definitions:
   1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
   2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
   3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.
   4. ASA - American Supply Association.
   5. ASTM - American Society for Testing and Materials
   6. CISPI - Cast Iron Soil Pipe Institute.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements: This section describes specific requirements, products and methods of execution for sanitary waste systems and equipment.

B. Performance Requirements:
   1. Sanitary waste systems shall perform quietly, with no objectionable vibration transmitted to the surrounding construction.
   2. Replace piping that does not perform as intended with properly operating equipment.
   3. Provide products with performance, output or salient features indicated or scheduled on the drawings.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed:

B. Product Data:
   1. Submit product literature for items specified in Part 2 and those products required by the performance standards of this section. Clearly annotate literature to indicate specified salient features and performance criteria.
   2. Provide plumbing specialty component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings:
   1. This Section shop drawings to be submitted under Section 20 00 00 - Mechanical General Requirements.
   2. Indicate pipe grade and direction of slope. Indicate elevation of piping at the beginning and end of each main, and at branch connections.
   3. Coordinate exact locations of drains, floor penetrations and structural penetrations with applicable trades.

D. Manufacturer's Installation, Operation and Maintenance Manuals.

E. Test and Evaluation Reports:
   1. Submit pressure test report.
   2. Submit system flushing report.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements for general closeout submittal requirements for the items listed below, supplemented with the additional requirements listed:

B. Warranty Documentation.

C. Record Documentation:
   1. Record actual dimensioned locations for buried or inaccessible piping.
   2. Show actual cleanout locations and types.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 DRAINAGE PIPING, ABOVE GRADE**

A. Hub-less Cast Iron Pipe and Fittings:
   1. Manufacturers:
      a. Charlotte Pipe and Foundry.
      b. Tyler Pipe and Coupling.
      c. AB&I Foundry.
      d. Equal.
   2. Pipe: CISPI 301, ASA group 022.
   3. Fittings: Cast iron.

4. Couplings:
    a. Manufacturers:
        1). Husky Series 2000
        2). MG Coupling
        3). Any other manufacturer meeting the requirements of the contract documents. Substitution request not required.
    b. Description: No-hub cast iron pipe couplings conforming to standard CISPI 310.
    c. Materials:
        1). Gaskets conforming to ASTM C564.
        2). Stainless steel clamp-and-shield assemblies.

B. Epoxy Coated Hub-less Cast Iron Pipe and Fittings:
1. Manufacturers:
    a. New Age Casting.
    b. Equal.
2. Pipe: CISPI 301, ASA group 022.
    a. Performance:
    b. 1). Corrosion resistant from 2 pH to 12 pH.
    c. 2). 200 degrees Fahrenheit temperature resistance.
    d. 3). Two-part epoxy sprayed on coating, 5 mils interior thickness and 2.5 mils exterior thickness.
3. Fittings: Epoxy Coated Cast iron.
    a. Performance:
    b. 1). Corrosion resistant from 2 pH to 12 pH.
    c. 2). 200 degrees Fahrenheit temperature resistance.
    d. 3). Two-part epoxy sprayed on coating, 5 mils thickness on interior and exterior.
4. Couplings: ASTM C1540.
    a. Manufacturers:
        1). Husky Series 4000.
        2). Approved equal.
    b. Materials:
        1). Heavy-duty 304-type stainless steel couplings and screws.
        2). Minimum shield thickness: 0.015 inch.
        3). Gaskets conforming to ASTM C564.

C. Copper Pipe, DWV: ASTM B75, ASTM B251, ASTM B302, ASTM B306.
1. Fittings: ASME B16.23 cast bronze, or ASME B16.29 wrought copper.
2. Joints: ASTM B32, lead-free solder, Grade 50B.

D. Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe: ASTM F628. Minimum cell classifications of 42222 or 32222, as defined in ASTM D3965. Install in accordance with ASTM D2321, ASTM F 1668 and manufacturer's guidelines.
1. Fittings: ABS, ASTM D2661.
2. Joints: Solvent weld.
3. Manufacturer: JM Eagle Solvent Weld SDR35 Sewer Pipe.

## 2.02 CLEANOUTS

A. Manufacturers:
   1. Zurn.
   2. Mifab.
   3. J.R. Smith.
   4. Any other manufacturer meeting the requirements of the contract documents. Substitution request not required.

B. Floor Cleanouts:
   1. Cast iron body, bronze plug with neoprene gasket.
   2. Adjustable head to match finished floor elevation.
   3. Round, scoriated bronze top.
   4. Where indicated, provide cleanout tops with tile-terrazzo insert or carpet insert to match surrounding floor finish.

C. Wall Cleanouts:
   1. Cast iron body, recessed bronze plug.
   2. Wall access panel or access cover with center screw.

D. Yard Cleanouts:
   1. Cast iron body, bronze plug with neoprene gasket.
   2. Heavy-duty access frame with anchor flanges and secured cover, fully surrounding and independent of cleanout.

# PART 3 EXECUTION

## 3.01 PREPARATION

A. Interface with Other Work:
   1. Review architectural and millwork shop drawings. Confirm location of cleanouts and access panels prior to installation.
   2. Coordinate and sequence installation of roof drains and piping with trades responsible for portions of this and other related sections of the Project Manual.

B. Protection: Cover equipment and plug piping connections to protect components from construction dirt and debris.

C. Surface Preparation:
   1. Verify that excavations are to required grade, dry, and not over-excavated.
   2. See Section 20 05 56 - Interior Trench Excavation and Backfill.

## 3.02 INSTALLATION

A. Install plumbing systems in accordance with manufacturer's instructions and listing.

B. Provide finished products with protective covers during balance of construction.

C. Access Doors: Provide appropriate size and install such that plumbing features are readily accessible and maintainable.

D. Piping:
   1. Grading: Minimum 1/4 inch per foot unless indicated otherwise on drawings and approved by AHJ for shallower slopes.
   2. Install piping to maintain headroom, conserve space, and not interfere with use of space.

3. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
4. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
5. Where pipe support members are welded to structural building framing; scrape, brush clean, and apply one coat of zinc rich primer to welding.
6. Connections:
    a. Thread Joints: Assemble with TFE tape or approved non-hardening joint compound.
    b. Solder Joints: Assemble with lead free solder.
    c. Grooved and other joints: Assemble in accordance with manufacturer instructions.

E. Vents:
1. Install vents as indicated and as required by plumbing code. Add vents when field conditions increase the length of a trap arm or cause other changes in venting requirements.
2. Unless otherwise indicated, the portion of the vent extending through roof shall be increased in size from one foot below roof assembly to termination as defined below. Increase as follows:
    a. Vent size two-inch and under; vent thru roof three-inch.
    b. Vent size three-inch; vent thru roof four-inch.
    c. Vent size four-inch; vent thru roof six-inch.
    d. Vent size six inch & larger; vent thru roof same size.
3. Termination of Vent: As required by the Uniform Plumbing Code.

F. Cleanouts:
1. Provide as indicated on drawings.
2. If field conditions create additional offsets or increase length of piping shown, provide additional cleanouts as required by the Uniform Plumbing Code and AHJ.
3. Where practical or as indicated provide cleanouts on vertical rainwater piping immediately above grade.

**3.03 REPAIR/RESTORATION**

A. Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

B. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

C. Substitute replacement parts from other manufacturers are not acceptable.

**3.04 FIELD QUALITY CONTROL**

A. Inspections: Arrange for inspections and provide notice to the Contracting Agency when the entire Work, or logical portions thereof, is ready for inspection.

B. Maintain current as-built drawings on-site recording including invert elevations, connections to fixtures, cleanouts, slopes, pipe sizes, and routing of pipes. Annotate sections of lines with dates when pressure tests have been approved by AHJ.

C. Pressure Tests:

1. Water Test: Test waste and vent system with water in accordance with the Uniform Plumbing Code.
2. Air Test:
   a. In general, air testing is not acceptable. In the event of low temperature conditions that would subject system piping to freezing, an equivalent air pressure test may be conducted in accordance with the Uniform Plumbing Code with prior Contracting Agency approval.
   b. Observe necessary safety procedures when testing with air including, but not limited to, use of protective goggles or face shields. Only persons directly involved in testing procedure shall be with 20 feet of a pipe under pressure.
3. Test results shall be certified in writing as required by General Conditions. Include dates and sections tested, test pressure, test duration, printed names and signatures of person performing the test and Contracting Agency witnessing the test.

**3.05 ADJUSTING**

A. Adjust functional components for proper operation in accordance with manufacturer's recommendations, or as otherwise directed.

**3.06 CLEANING**

A. Clean and flush drain piping to remove dirt and foreign debris from systems.

B. Clean exposed pipes, fittings, and materials.

C. Provide written certification which documents that the complete sanitary sewer system has been flushed of foreign debris. Include date and printed names and signatures of person(s) performing the flush and Contracting Agency witnessing the flush.

**3.07 CLOSEOUT ACTIVITIES**

A. Start-up and operate plumbing systems and equipment in accordance with the manufacturer’s written installation and operation manual checklist.

B. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

**END OF SECTION**

# SECTION 22 40 00
# PLUMBING FIXTURES

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Water closets.
   2. Urinals.
   3. Lavatories.
   4. Drinking fountains.
   5. Hose bibbs and hydrants.
   6. Floor drains and sinks.
   7. ADA plumbing fixture piping insulation.

B. Related Sections:
   1. 20 00 00 - Mechanical General Requirements
   2. 20 05 48 - Vibration and Seismic Control
   3. 20 05 53 - Mechanical Identification
   4. 20 07 00 - Mechanical Insulation
   5. 22 11 00 - Domestic Water Piping and Specialties
   6. 22 13 00 - Sanitary Waste and Vent Piping and Specialties

### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. American Society of Safety Engineers (ASSE).

B. Abbreviations, Acronyms and Definitions:
   1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
   2. See Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
   3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.
   4. GPF - Gallons Per Flush.
   5. PSI - Pounds per Square Inch.
   6. PSIG - Pounds per Square Inch Gauge.
   7. “Handicap”, “handicapped”, or “ADA compliant”: Refers to fixtures that comply with the requirements of ANSI A117.1.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. This section describes specific requirements, products and methods of execution for plumbing fixtures.
   2. Plumbing fixtures in potable water systems shall be lead free as defined by the 2011 Reduction of Lead in Drinking Water Act.

B. Performance Requirements:

1. Potable water systems shall perform quietly, with no objectionable vibration transmitted to the surrounding construction.
2. Replace piping and fixtures that do not perform as intended with properly operating piping and fixtures.

**1.04 PRE-INSTALLATION MEETINGS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.05 SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Provide plumbing specialty component sizes, rough-in requirements, service sizes, and finishes.
2. Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Shop Drawings:

1. This Section shop drawings to be submitted under Section 20 00 00 - Mechanical General Requirements.
2. Indicate dimensions and weights of fixtures and equipment, and placement of openings and holes.

D. Manufacturer's Installation, Operation, and Maintenance (IO&M) Manual.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 FIXTURES**

A. Traps, Stops and Supplies:

1. Provide traps, stops and supplies for fixtures.
2. Sink/lavatory P-Traps: 17 gauge chrome-plated tubular brass or cast brass.
3. Supplies: Flexible, stainless steel.
4. Stops: Quarter-turn, removable key type. Commercial quality metal components only; no plastic parts.

B. Escutcheons: Provide chrome plated wall escutcheons for pipe penetrations into walls.

C. Flush Valve Manufacturers: Sloan, Zurn, no substitutions.

D. Lavatory Faucet Manufacturers: Delta, Chicago Faucets, no substitutions.

E. Carriers:
   1. Manufacturer: J.R. Smith, Josam, Zurn, MIFAB.
   2. Provide carriers for wall mounted fixtures.

F. Fixtures specified elsewhere, or otherwise furnished:
   1. Provide appropriate strainer, tailpiece, trap, waste and supplies.
   2. Rough in and connect only.

G. Handicapped Fixtures:
   1. Provide fixtures in compliance with the appropriate standard listed in Part 1.
   2. Provide fixtures operable with one hand without grasping, pinching or twisting of the wrist, and requiring not more than five pounds of operating force.
   3. Handicap accessible lavatories and sinks: Where piping is exposed, provide fixture insulation assembly. Refer to Section 20 07 00 - Mechanical Insulation.

H. Sensors operated fixtures: In addition to features described in the Fixture list, provide the following features:
   1. General:
      a. Provide with Infra-red sensors, solid state circuitry, 24 VDC operation.
      b. Provide low voltage transformers. Battery operated fixtures not allowed.
      c. Adjustable sensor range, variable time-out adjustment.
      d. Filtered solenoid valves.
   2. Flush valves:
      a. Wall mounted sensors.
      b. Over-ride button.
   3. Hand faucet:
      a. ADA compliant.
      b. Splash proof electronic circuitry.
      c. Aerator/spray head with pressure compensating flow control.
      d. Trim plate for 4-inch center-set sink.
      e. Under-counter control module.
   4. Manufacturer: Sloan, Zurn, Symmons.

**2.02 WATER CLOSETS**

A. WC-1 - Water Closet:
   1. Fixture: Wall hung, siphon jet, elongated bowl, low consumption (1.6 gpf), 1-1/2 inch top spud. American Standard Model Afwall EL 1.6.
   2. Flush valve: Sloan Optima Royal model 111 ES-S, with automatic sensor actuation, over-ride button and 24V control transformer.
   3. Seat: Open front, commercial weight, heavy duty, solid plastic, stainless steel check hinge, without cover, white.
   4. Carrier: Floor mounted. No residential.

B. WC-1H - Water Closet:

1. Fixture: Wall hung, siphon jet, elongated bowl, low consumption (1.6 gpf), 1-1/2 inch top spud. American Standard Model Afwall EL 1.6.
2. Flush valve: Sloan Optima Royal model 111 ES-S, with automatic sensor actuation, over-ride button and 24V control transformer.
3. Seat: Open front, commercial weight, heavy duty, solid plastic, stainless steel check hinge, without cover, white.
4. Carrier: Floor mounted. No residential.
5. ADA: ADA compliant. Handicapped mounting height.

**2.03 URINALS**

A. U-1H - Urinal:

1. Fixture: Siphon jet, vitreous china, low consumption (1.0 gpf). Integral flush rim, wall hangers, 3/4 inch top spud. American Standard model Trimbrook 1.0.
2. Flush valve: Sloan Optima Royal model 186-1.0 ES-S, with automatic sensor actuation, over-ride button and 24V control transformer.
3. Carrier: Floor mounted. No residential.
4. ADA: ADA compliant. Handicapped mounting height.

**2.04 LAVATORIES**

A. L-1H - Counter Lavatory:

1. Fixture: Counter mounted, vitreous china, self-rimming, 20 inch by 17 inch oval, front overflow, faucet holes on four inch centers. American Standard model Affinity.
2. Faucet: Single lever, deck mounted. Delta model 523LF.
3. Faucet: Sensor actuated, battery powered, deck mounted, thermostatic mixing valve, ASSE 1070 listed. Sloan model EBF-650-BDT.
4. Drain: Metal grid strainer.
5. ADA: ADA compliant. Pipe drain for handicapped access.

**2.05 DRINKING FOUNTAINS**

A. DF-1H - Drinking Fountain/Bottle Filler:

1. Fixture: Wall mounted, dual height, polished stainless steel, hooded stream projector with push-button controls, perforated strainer, antimicrobial finish. Bottle filler with hands-free activation. Elkay model EZSTL8WSLK, Oasis model PGEBFSL, or approved equal.
2. Carrier: Wall mounted bracket. No residential.
3. ADA: ADA compliant.

**2.06 HOSE BIBBS AND HYDRANTS**

A. HB-1 - Hose valve:

1. Bent nose hose valve with vacuum breaker and wheel handle.
2. Rough chrome finish.
3. 3/4 inch hose connection.
4. Acorn model 8121-CR.

B. Manufacturers:

1. MIFAB.

2. Woodford.
3. Acorn.

**2.07 FLOOR DRAINS**

A. FD-1 - Floor Drain:
1. Fixture: Cast iron body with adjustable, polished nickel bronze top. Dome bottom strainer. No-hub outlet,
2. Grate: 6-inch round top except where 6-inch square top indicated (-B). Free area (minimum) 6-inch round = 9 square inches, 6-inch square = 12.5 square inches. Secured by vandal-proof screws.
3. Trap primer connection.
4. J.R. Smith No. 2010-A (-B) PBU, (caulk or thread); No. 2005-A (-B) PBU, (No-Hub).

B. FD-2 - Floor Drain:
1. Fixture: Medium duty, cast iron body with adjustable flat bottom cast iron grate. Dome bottom strainer. No-hub outlet.
2. Grate: 8-inch round top tractor grate.
3. Trap primer connection.
4. Funnel top when indicated (3580/81 Funnel).
5. J.R. Smith No. 2320Y.

C. Manufacturers: J.R. Smith, Zurn, Josam, MIFAB.

**2.08 ADA PLUMBING FIXTURE PIPING INSULATION ASSEMBLY**

A. Manufacturer: Skal+Gard, Model SG-100B, TCI Products, or approved equal.

B. Description: Protective, molded, fire-resistant foam, single piece insulation manufactured specifically for plumbing fixture supplies and drains.

C. Performance/Design Criteria: Insulation R factor 2.

D. Materials:
1. Foam: 4.5 pounds per cubic foot.
2. Skin: White fire retardant polyurethane.
3. Twist fasteners.

**PART 3 EXECUTION**

**3.01 INSTALLERS**

A. Installer: Perform work by experienced personnel previously engaged in plumbing system construction and fixture installation, and under the supervision of a qualified installation supervisor.

**3.02 PREPARATION**

A. Confirm location and size of fixtures and openings before piping rough-in and installation.

B. Verify that rough-ins have been provided, are correctly sized and are located within dimensional tolerances for fixtures to be installed prior to installation of fixtures.

C. Interface with other Work: Review Architectural drawings and millwork shop drawings to verify correct fixture locations.

## 3.03 INSTALLATION

A. Install piping and plumbing products in accordance with UPC and manufacturer's instructions. Provide seismic anchoring, bracing, supports, and clearance for equipment and piping per UPC, IBC, and ASCE-07; most conservative criteria shall govern.

B. Coordinate plumbing system flushing, pressure tests, and sterilization with fixtures. Remove and clean strainers and screens before start-up.

C. Provide permanent metal and wire positioners, supports, and carriers to secure fixtures and piping rigidly in proper alignment without movement or sway.

D. Anchor fixtures securely to withstand applied vertical load of not less than 250 pounds on the front of the fixture, without noticeable movement.

E. Install fixtures plumb, level and to the finished architectural surface, so that the maximum gap between the fixture and the surface does not exceed 3/16 inch. Caulk the edge of the joint between fixture and surface with silicone or butyl type waterproof caulking compound.

F. Install and connect hot water on left and cold water on right, as viewed when facing the fixture.

G. Locate flush valve handles on handicapped accessible water closets on the wide side of the stall. Mount Accessible fixtures shown in the ADA guidelines to the heights indicated.

H. ADA Plumbing Fixture Insulation Assembly:

1. Insulate hot water supply and waste piping exposed beneath sink and lavatory fixtures designated on drawings or specified in this section, as intended for use by the handicapped.

2. Install in accordance with ANSI A117.1.

## 3.04 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

## 3.05 SITE QUALITY CONTROL

A. Non-Conforming Work: Rework required because of failure to follow the manufacturer’s written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

## 3.06 ADJUSTING

A. Adjust functional components for proper operation in accordance with manufacturers’ recommendations, or as otherwise directed.

## 3.07 CLEANING

A. Clean fixtures, trim, and appurtenances to a clean condition. Obtain a written certification from the Owner that this has been accomplished and accepted.

## 3.08 CLOSEOUT ACTIVITIES

A. Demonstration: Provide 1 hour of demonstration conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

B. Training: Provide 1 hour of operational instruction conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

**END OF SECTION**

**SECTION 23 05 93**

**TESTING, ADJUSTING AND BALANCING**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: General requirements and methods of execution relating to the testing and balancing of the mechanical systems provided on this project.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 20 05 13 - Common Motor Requirements
4. 23 21 13 - Hydronic Piping and Specialties
5. 23 21 23 - Hydronic Pumps
6. 23 31 00 - Ducts and Accessories
7. 23 34 00 - HVAC Fans
8. 23 37 00 - Air Outlets and Inlets
9. 23 52 23 - Cast Iron Boilers and Accessories
10. 23 73 23 - Central Air Handling Units
11. 23 82 00 - Terminal Heating and Cooling Units
12. 23 83 16 - Radiant Floor Heating Equipment
13. 25 40 00 - Variable Speed Drives
14. 25 90 00 - Sequence of Operations

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. National Environmental Balancing Bureau - Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
3. National Environmental Balancing Bureau - Testing, Adjusting, Balancing Manual for Technicians.
4. SMACNA - HVAC SYSTEMS Testing, Adjusting, and Balancing.

B. Abbreviations and Acronyms:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.
3. TAB: Testing, Adjusting, and Balancing.
4. NEBB: National Environmental Balancing Bureau

C. Definitions:

1. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
2. Accuracy: Capability of an instrument to indicate the true value of a measured quantity.

3. Adjusting: Varying of system flows by partially closing balancing devices, such as dampers, and valves, and varying fan speeds to achieve optimum system operating conditions within design and installation limitations.
4. Balancing: Methodical proportioning of air and hydronic flows through the system main, branches, and terminal devices using acceptable procedures to achieve the specified air or hydronic flow with testing and design limitations.
5. Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.
6. NEBB Certified TAB Firm: A Firm that has met and maintains all the requirements of the NEBB for Firm certification in TAB and is currently certified by NEBB. A NEBB Certified Firm shall employ at least one NEBB Qualified TAB Supervisor in the full time management position.
7. NEBB Certified TAB Report: Data presented in a NEBB Certified TAB Report accurately represents system measurements obtained in accordance with the current edition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems. Variances from design quantities that exceed NEBB or contract document tolerances are to be noted in the TAB report project summary.
8. NEBB Qualified TAB Supervisor: Full time employee of the TAB Firm in a management position who has successfully passed the supervisor level written and practical qualification examinations and maintains the Supervisor re-qualification requirements of NEBB.
9. NEBB Qualified Technician: Full time employee of the TAB Firm who has met the technician level experience requirements of NEBB and has successfully passed the technician level written and practical qualification examinations. A NEBB Qualified TAB Technician shall be supervised by a NEBB Qualified TAB Supervisor. Supervision does not infer constant oversight; a NEBB Qualified Technician is capable of performing assigned tasks with periodic supervision.
10. Precision: Ability of an instrument to produce repeatable readings of the same quantity, or a tightly grouped set of values, under the same conditions.
11. Range: Upper and lower limits on an instrument’s ability to measure the value of a quantity for which the instrument is calibrated.
12. Resolution: Smallest change in a measured variable that an instrument can detect.
13. Testing: Use of specialized and calibrated instruments to measure temperatures, pressures, rotational speeds, electrical characteristics, velocities, and air and hydronic quantities for an evaluation of flow conditions.
14. Testing and Balancing: As used in these specifications, testing and balancing refers to testing, adjusting, and balancing (TAB) as described in the above references.
15. TAB: A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as “Testing, Adjusting, and Balancing” and are described in this document.

**1.03 SYSTEM DESCRIPTION**

A. Design Requirements: This section describes specific requirements, products and methods of execution for the testing, adjusting and balancing of the project.

B. Performance Requirements: Furnish the services of a qualified and approved TAB Firm to perform the work of this specification section.

C. The work of this section includes but is not necessarily limited to:
   1. Test and balance fans and supply, exhaust and relief ventilating systems.
   2. Test and balance hydronic heating, chilled water, and well water cooling systems.
   3. Test and balance domestic hot water recirculation flow rate.
   4. Test and balance fume hood exhaust and room negative pressurization system.
   5. Test and adjust fan filter differential pressure switches wherever provided.
   6. Work directly with the control subcontractor to obtain proper system adjustments.
   7. Provide a final report.

D. The work of this section does not include:
   1. Adjusting burners for proper combustion operation.
   2. Liquid waste transfer system adjustment.

**1.04 SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data: Sample report forms and outlines indicating adjusting, balancing, and equipment data required prior to commencing work.

C. Certificates:
   1. Submit the name and qualifications of TAB Firm for approval with general product submittals. Submit copy of TAB Firm's NEBB certification.
   2. Submit the names and certifications of the Firm's NEBB Qualified TAB Supervisor and NEBB Certified Technician.

D. Balancing Report:
   1. Submit a complete report of the testing and balancing of all devices in a format equivalent to that shown in the SMACNA HVAC Systems Testing, Adjusting and Balancing manual. Compile the test data and submit eight copies of the complete test data for acceptance and/or analysis and recommendations.
   2. Provide report in soft cover, letter size, comb bound binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include drawings within report.
   3. Report Cover Sheet. Include the following data:
      a. Project Name.
      b. Project Address.
      c. Names of Architect and Engineer.
      d. Names of General Contractor and HVAC Contractor.
      e. Report date.
      f. Names of TAB technicians responsible for the measurements and report.
   4. System Review Sheet:
      a. List air and hydronic systems balanced, with systems highlighted that were found to be performing outside design tolerances.
      b. Include a summary of problems encountered, deviations from design, deficiencies in performance, remaining problems, recommendations, and comments.

5. Instrument Calibration Report:
    a. Include a complete list of test equipment used, including apparatus manufacturer's name, model number, serial number, and date last calibrated.
    b. List the instruments used on the project during the balancing work, on an NEBB “Instrument Calibration Report” form, or equivalent form. This includes flow measuring hoods and other related devices.
6. Air Systems Report: Prepare a report for each air system balanced. Tabulate data separately for each system. Describe balancing method used for each system. At minimum, include the following:
    a. System Diagram: Include locations of air terminal units and pitot tube traverses. Include appropriate notes, static pressure reading locations, etc., taken during testing and balancing.
    b. Air Apparatus or Fan Test Report: Include pertinent data on the test report forms. If test data could not be measured, or is not applicable, indicate such on report forms. List how each actual cfm measurement was obtained (duct traverse, total of outlet airflows, or a combination).
    c. Duct Pitot Tube Traverse Reports: Include actual temperature and pressure readings recorded at the time of testing and balancing.
    d. Air Outlet Test Reports: Include applicable $A_k$ factors and terminal device sizes. If flow measuring hoods are used, indicate their use in the remarks column.
    e. Include complete identification of elements. Identify by box number, room name and number, air outlet symbol, orientation in room, etc., as necessary to clearly and positively identify the location of each element.
7. Hydronic Heating System Report. Prepare a report for each hydronic system balanced. Tabulate data separately for each system. Describe balancing method used for each system. At minimum, include the following:
    a. Schematic Diagram: Include heat exchange equipment and locations of flow measuring devices.
    b. Pump Test Report: Confirm test data was recorded and properly entered on form. Attach manufacturer’s pump capacity curves, with the actual pump operating point plotted, to the test report form. List how the actual pump flow rate was determined (flow meter, pump curve, etc.).
    c. Primary Heat Exchange Equipment: Confirm that appropriate test data has been recorded for the boilers, heat exchangers, chillers, and other primary heat exchange equipment. List how the actual flow rate(s) of each item was determined.
    d. Terminal Heat Exchange Equipment: Confirm that heating coil and terminal unit temperatures and pressures were recorded and properly entered on form. List how each terminal unit flow rate was determined.
    e. Include complete identification of elements. Identify by equipment tag number, room name and number, baseboard symbol, orientation in room, etc., as necessary to clearly and positively identify the location of each element.
8. Reduced Size Drawings: Provide with air outlets and equipment identified to correspond with data sheets. Record actual locations of thermostats, flow measuring stations, and balancing valves with settings.

## 1.05 QUALITY ASSURANCE

A. Qualifications:

1. The work described in this section shall be performed by a Firm certified by the National Environmental Balancing Bureau for air and hydronic balancing.
2. The Firm shall have a record of operation within Alaska for at least three years prior to bid date of this project and shall have demonstrated satisfactory completion of five projects of similar size and scope in the State of Alaska. Provide references if requested.
3. The Firm's Technician and Supervisor for this project shall be NEBB certified for their respective positions.
4. Bids by suppliers, contractors or any Firm whose principal business is not that of testing, adjusting, and balancing HVAC systems are not acceptable.

B. Balancing Standards:

1. Perform total system balance in accordance with NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
2. Maintain one copy of balancing procedural document on site.
3. Use standard NEBB forms.

C. Timing of Work:

1. Sequence work to commence after completion of systems. Do not begin balancing and testing until the systems are complete and in full working order.
2. Schedule the testing and balancing work in cooperation with other trades.
3. Schedule completion of testing and balancing before Substantial Completion of Project.

D. Construction team responsibility to TAB Agency: Refer to 20 00 00 - Mechanical General Conditions.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify systems are complete and operable before commencing work.

B. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

C. Report defects and deficiencies that may preclude proper TAB of systems and equipment.

### 3.02 PREPARATION

A. Schedule work under the provisions of Section 20 00 00 - Mechanical General Conditions.

B. Provide calibrated instruments required for testing, adjusting, and balancing operations.

C. Prior to starting work, review drawings and actual field conditions for additional balancing devices or components required for correct balance. Coordinate provision of additional balancing devices as required elsewhere in these specifications. Refer to Related Sections above.

D. Preliminarily adjust grille, register, and diffuser blades or pattern controllers per drawings. If airflow blow patterns are not shown on drawings, adjust for uniform diffusion pattern(s) or diffusion into long dimension of room.

### 3.03 SPECIAL TECHNIQUES:

A. Use instrumentation in accordance with NEBB requirements, calibrated to the accuracy standards specified by this organization.

B. Flow measuring hoods are acceptable for measurement of ceiling diffuser performance if used in a manner as recommended by the manufacturer and calibration and accuracy data is provided with the balancing report.

C. Upon request, make available to the Contracting Agency copies of current calibration certificates.

**3.04 ACCEPTABLE CRITERIA**

A. Systems will be considered balanced in accordance with NEBB *Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems* when the following conditions are satisfied:

1. Air Handling Systems:

a. Measured airflow quantities are within plus or minus 10 percent of design quantities. Deficiencies shall be noted in the TAB report.

b. There is at least one direct path with fully open dampers from the fan or terminal unit device to an air inlet or outlet. Additionally, if a system contains branch dampers, there will be at least one wide open path downstream of every adjusted branch damper.

2. Air Outlets and Inlets:

a. Measured airflow quantities total to within plus or minus 10 percent of design to space and individual outlets and inlets in space to within plus or minus 10 percent of design.

b. Grilles, registers, and diffusers blades or pattern controllers are adjusted for uniform diffusion in the space. Re-adjust airflow patterns that result in airflow velocities greater than 50 FPM (feet per minute) at 5 feet above finish floor (AFF).

3. Hydronic Systems:

a. Manually balanced systems:
1). Measured fluid flow quantities are within plus or minus 10 percent of design.
2). There is at least one direct path with fully open balancing valves from the pump discharge balancing valve (if present) to a terminal device. Additionally, if a system contains branch balancing valves, there will be at least one wide open path downstream of every adjusted branch balancing valve.

b. Automatically balanced systems: Pressure drops across a sample of system's automatic balance valves are within the manufacturer's recommended operating range for the device.

B. If systems or components cannot be adjusted to within specified tolerances:

1. Coordinate the replacement of sheaves, belts, or other components or devices needed for correct balance as required elsewhere in these specifications.

2. Note deficiencies in the TAB report.

**3.05 GENERAL PROCEDURES FOR TESTING AND BALANCING**

A. Perform testing and balancing procedures on equipment sheaves, belts, dampers, valves, air outlets and inlets and each system according to the procedures contained in the current edition of the NEBB *Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems* and this section.

B. Adjustments shall be made with air handler filters blanked off to create a filter pressure drop of 60 percent of the manufacturer's recommended filter final pressure. Where multiple filters are encountered each set shall be individually blanked off, for a cumulated pressure drop of 60 percent of each filters final pressure.

C. Ensure recorded data represents actual measured or observed conditions.

D. Permanently mark final settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Contracting Agency.

H. Schedule and provide assistance in final adjustment and test of fire alarm system with Authority Having Jurisdiction.

**3.06 SITE QUALITY CONTROL**

A. Make calibrated test instruments available to Contracting Agency to facilitate spot checks during testing and commissioning as appropriate.

B. Re-balance components or systems found to be out of tolerance at no additional expense to the Owner.

**END OF SECTION**

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## SECTION 23 11 13
## FUEL OIL PIPING AND SPECIALTIES

### PART 1 GENERAL

#### 1.01 SUMMARY

A. Section Includes:
   1. Fuel Piping, Fittings and Accessories.
   2. Remote Fuel Oil Pump Package.
   3. Packaged Day Tank.

B. Related Sections: 20 00 00 - Mechanical General Requirements.

#### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. Underwriters Laboratories (UL) Standards:
      a. UL 107: Glass Fiber Reinforced Plastic Pipe and Fittings for Flammable Liquids.
      b. UL 567: Pipe Connectors for Flammable and Combustible and LP Gas.
      c. UL 971: UL-Listed Non-Metal Pipe.

#### 1.03 SYSTEM DESCRIPTION

A. The work includes provision of the fuel oil distribution system from the main fuel storage tank connections to the day tank, and from the day tank to the oil burning apparatus connections. In general, oil burning equipment is specified elsewhere.

#### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

#### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data: Provide manufacturers' product literature, clearly annotated to indicate specified salient features and performance criteria for each product specified.

C. Shop Drawings:
   1. Provide scaled shop drawings.
   2. Incorporate the following installation information:
      a. Storage tank, day tank and fuel burning equipment locations and pipe connection points.
      b. Fuel pipe routing, elevations and slope to drain indication.
      c. Fuel piping isolation valve locations and accessories.

D. Quality Assurance/Control Submittals:
   1. Design Data, Test Reports: Field test reports.
   2. Certificates, Manufacturer's Instructions, and Manufacturer's Field Reports:
      a. Provide a complete manufacturer's written installation, operation and maintenance manual for each type of installed equipment. Clearly annotate the manual to indicate applicable information for the specific equipment model(s) installed.

b. Included with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
   1). Printed names and signatures of the installers.
   2). Documentation from Manufacturer's representative and Contracting Agency that the equipment has been properly installed and is fully operational, thus validating the equipment warranty.

c. Include with the checklist a list of applicable programmable control setpoints with their current programmed settings.

E. Operation and Maintenance (IO&M) Manuals:

1. Provide copies of approved submittal information for inclusion within the project IO&M Manual.

2. Refer to Section 20 00 00 - Mechanical General Requirements, for IO&M Manual formatting requirements and number of copies required.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Regulatory Requirements: Products Requiring Electrical Connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 FUEL PIPING AND FITTINGS**

A. Above grade:

1. Carbon Steel Product Line Pipe and Fittings:

   a. Schedule 40 black steel.

   b. 3000 lb forged steel socket weld couplings or schedule 40 butt weld fittings.

B. Flexible Connectors:

1. UL approved and labeled for underground use.

2. Teflon inner core.

3. Stainless steel braid outer core and ends.

4. Compatible with all fuels, including alcohol blends.

5. Manufacturer: Teleflex TL 6010 or equal.

6. Secondary Containment Boots: Teleflex TL601 31498124 or equal with stainless steel clamps and caps.

**2.02 THREAD SEALANT**

A. Threaded connections are to be sealed with a UPC listed, lead-free, paste thread sealant compatible with the product and piping materials specified.

B. Threaded connections which must be disassembled for periodic maintenance shall be sealed with a UPC listed, lead-free, non-seizing type, paste thread sealant compatible with the product and piping materials specified.

C. Manufacturer: Real-Tuff™, Grrip™, or approved equal.

**2.03 VALVES**

A. Isolation Valves (Interior Use):
   1. Size: 1/2 inch to 2 inch pipe size.
   2. Ball type, carbon steel, full port, WOG rated.
   3. Chrome plated ball and stem.
   4. Blow-out proof, grounded stem.
   5. PTFE resilient seats and seals.
   6. Threaded connections.
   7. Zinc plated handle with rubber handle cover.
   8. 3,000 PSIG CWP and 150 PSIG SWP.
   9. Manufacturer: Apollo 72-100 series, or approved equal.

B. Isolation Valves (Exterior Use):
   1. Size: 1/2 inch to 2 inch pipe size.
   2. Ball type, stainless steel, full port, WOG rated.
   3. Stainless steel ball and stem.
   4. Blow-out proof stem.
   5. PTFE resilient seats and seals.
   6. Threaded connections.
   7. Stainless steel handle with rubber handle cover.
   8. 1,000 PSIG CWP and 150 PSIG SWP.
   9. Manufacturer: Apollo 76F-100-A series, or approved equal.

C. Check Valves:
   1. Size: 1/2 inch to 2 inch pipe size.
   2. Screwed cap, Y pattern, swing type, malleable iron body.
   3. Threaded connections.
   4. 1,000 PSIG CWP and 300 PSIG SWP.
   5. Vertical or horizontal installation.
   6. Manufacturer: Crane, or approved equal.

D. Fusible Valves:
   1. UL listed.
   2. Bronze body.
   3. Automatic shutting at 165 degrees F.
   4. Self-adjusting stuffing box.
   5. Backseat feature.
   6. Threaded, flared or combination fittings.

7. Manufacturer: Firomatic, Fusomatic, Morrison Brothers, or approved equal.

E. Oil Safety Valves:
1. UL listed.
2. Provide positive shut-off of fuel supply in the event of downstream pipe failure.
3. Manufacturer: Webster Model OSVA, or approved equal.

F. Anti-Siphon Valves:
1. Body constructed of stainless steel, aluminum, or ductile iron with corrosion resistant coating.
2. Stainless steel or aluminum trim.
3. Seals and seats compatible with fuel oil.
4. Internal relief valve for thermal expansion protection.
5. Threaded connections.
6. Coordinate valve selection with field conditions for proper head pressure range.
7. Provide priming tees as required for system priming.
8. Manufacturer: OPW 199ASV, Morrison Brothers 910 series or 912 series, Franklin Fueling Systems, or approved equal.

**2.04 FILTERS**

A. Suitable for pressure type burners, UL listed.
B. 12 PSIG working pressure.
C. 60 GPH firing rate.
D. Filter capacity: 25 microns.
E. Manufacturers: General Filter, Firomatic, or approved equal.

**2.05 GAUGES**

A. 2-1/2 inch diameter gauge, suitable for oil service.
B. Accuracy at two percent of range.
C. Select pressure range for normal; indicate in the middle third of range.
D. Manufacturer: Trerice or approved equal.

**2.06 REMOTE FUEL OIL PUMP PACKAGE**

A. Provide remote fuel oil pump package with controls compatible with the interior day tank.
B. NEMA-4X (stainless steel) tank mounted cabinet.
C. Hydraulic gear fuel oil supply pump with the performance and electrical characteristics as scheduled.
D. Pump motor starter with overload relay.
E. Pump motor disconnect with door handle interlock.
F. Pump inlet and outlet ball type shut-off valves.
G. Priming tee and check valve assembly.
H. Pressure relief valve.
I. Fuel strainer.
J. Manufacturer: Simplex or approved equal.

## 2.07 PACKAGED DAY TANK

A. Provide packaged day tank system of the size, capacity, and with tappings as scheduled. Construct day tank to UL standards and provide UL label.

B. The packaged day tank shall include the following standard equipment:

1. Seam welded steel tank with removable top plate, steel channel feet with mounting holes. Epoxy coated tank interior. Enamel coated tank exterior.
2. Welded flange pipe and vent tappings as scheduled.
3. Overflow basin with screened top, float switch sensor and quick drain.
4. 2 GPM hydraulic gear pump (1/3 HP, 120 VAC).
5. 1 GPM hand pump.
6. 2 inch manual locking fuel fill cap.
7. One inch emergency “quick” drain.
8. Fuel strainer.
9. Priming tee and check valve assembly.
10. Pump intake solenoid valve.
11. Pressure relief valve.

C. The packaged day tank shall include the following control devices and alarms:

1. Power transformer.
2. Power available pilot light.
3. Pump “Run-Off-Automatic” mode selector switch.
4. Pump running light.
5. Remote high and low fuel level alarm dry signal contacts with auxiliary relay.
6. Local/remote low and high fuel level alarms.
7. High fuel level automatic pump stop.
8. Electric level gauge.

D. Manufacturer: Simplex SST series, or approved equal.

# PART 3 EXECUTION

## 3.01 INSTALLATION

A. Product Transfer Piping:

1. Install piping as per drawings, coordinate with field conditions.
2. Grade piping runs at a minimum slope of 1/8 inch per foot to drain back to main fuel storage tanks.

B. Tank Connections: Terminate fuel oil supply and return lines at threaded tank bosses as shown.

C. Above ground and interior fuel oil piping:

1. Provide socket welded steel fuel piping routed as shown.
2. Support piping (including trench mounted piping) with Unistrut or equal, pre-engineered mechanic support system. Provide rubber inserts provided by the manufacturer at each pipe clamp.

3. Insulate interior fuel oil supply and return piping with 1/2 inch thick (minimum) fiberglass pipe insulation with full vapor barrier.

D. Label fuel oil piping with self-adhesive pre-manufactured labels. Labels shall read “FUEL OIL SUPPLY” and “FUEL OIL RETURN” as appropriate in black letters on a yellow background with flow direction arrows. Manufacturer: Marking Services Incorporated (MSI) or equal.

E. Equipment Connections:

1. Provide the final operating connection to fuel oil burning equipment in accordance with the specific equipment manufacturer's installation instructions.

2. Provide leak tight, sheetmetal drip pans with 4 inch raised and rolled rims under each fuel oil burner, filter assembly, day tank and at any additional location susceptible to fuel oil leakage.

**3.02 FIELD QUALITY CONTROL**

A. Air Tightness Testing:

1. Fuel Pipe Testing: Upon completion of the transfer piping installation, subject fuel piping (except risers) to a 20 PSIG air tightness test, soaping joints and inspecting for bubbles. If lines have held product, or after backfilling, test lines hydrostatically to 110 percent of operating pressure, but not less than 20 PSIG.

B. Tank testing:

1. Tanks are to be shop pressure tested prior to delivery in accordance with UL 142. The listing mark of the Underwriters Laboratories, Inc. on a tank shall be evidence of compliance with this test.

2. Where the vertical length of fill and vent pipes is such that when filled with liquid, the static head imposed on the bottom of the tank exceeds 10 PSIG (23 feet WC), hydrostatically pressure test the tank and related piping to the pressure equal to the static head imposed.

C. Documentation. Document field testing to include the following:

1. Test Date and time.

2. Company and Person(s) conducting the test.

3. Test pressure and duration.

4. Contracting Agency witnessing the test.

5. Legible signatures of all parties involved in the test certify that the test was satisfactorily completed as specified and in accordance with the manufacturer’s written test procedures as applicable.

6. Submit test documentation in accordance with submittal requirements.

**3.03 ADJUSTING**

A. Adjust systems in accordance with the manufacturer’s written operation instructions.

B. Adjust oil return line safety valve setpoint from the nominal setpoint indicated on the Drawings to achieve an operating pressure of 2 PSIG at the boiler header piping.

**3.04 CLEANING**

A. Verify day tank interior is clean and free of debris prior to initial fill tank.

B. Clean inside transfer pump enclosures, secondary containment voids and any other accessible, covered spaces prior to initial fuel fill and again prior to substantial completion.

C. Clean exterior piping and equipment surfaces prior to substantial completion.

## 3.05 DEMONSTRATION AND STARTUP

A. Startup fuel transfer system as part of boiler startup in accordance with the manufacturer's written start-up procedures.

B. Demonstrate proper operation of the systems to the satisfaction of the Contracting Agency.

C. Provide written documentation that demonstration and start-up of the systems and equipment has been satisfactorily completed.

**END OF SECTION**

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# SECTION 23 13 23
# ABOVEGROUND FUEL OIL STORAGE TANKS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Aboveground tanks for the storage of petroleum products.
2. Tank appurtenances.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 23 11 13 - Fuel Oil Piping and Specialties

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. NFPA 30 - 2018: Flammable and Combustible Liquids Code.
3. Underwriters Laboratories (UL) Standard UL 142 - Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids.

### 1.03 SYSTEM DESCRIPTION

A. Provide aboveground fuel oil storage tank (AST) systems in accordance with the drawings, the referenced publications, and the manufacturer's written installation instructions, checklists, and warranty requirements for each system component. AST systems include the products, equipment, and systems identified in this section.

B. Drawings are diagrammatic and show the general design, arrangement and extent of the systems. Do not scale or attempt to use drawings for roughing-in measurements or as shop drawings.

C. Investigate capacity and space requirements of the proposed equipment before submitting shop drawings.

D. Obtain field measurements and prepare detailed shop drawings for submittal, demonstrating coordination with equipment and systems being provided by trades.

E. Where conditions necessitate rearrangement or equipment and/or systems, prepare and submit to the Contracting Agency for review, drawings of the proposed rearrangement. Due to the scale of the drawings, it is not possible to show all offsets, fittings, and accessories which may be required.

F. Installation of tanks shall be in accordance with the tank manufacturer's written installation instructions.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
   1. Provide submittal data in accordance with the general requirements of Section 20 00 00 - Mechanical General Requirements.
   2. Include the additional submittal information specific to the equipment specified by this section as followings:
      a. Provide manufacturer’s literature that fully demonstrates compliance with the manufacturing methods, appurtenances and salient features specified.
      b. Mark manufacturer’s literature to indicate exactly those items that are to be provided and cross out unrelated or non-applicable items. In addition, submit manufacturer's detailed installation instructions on equipment and materials submitted.

C. Substitutions: Additional costs associated with design modifications as a result of proposed product substitutions shall be borne by the Contractor.

D. Shop Drawings:
   1. Submit shop drawings for the above ground storage tank which show principal dimensions, materials, fitting locations, sizes and thread type and anchoring method.
   2. Coordinate shop drawings with work of other trades.

E. Operation and Maintenance (IO&M) Manual:
   1. Provide a complete copy of the manufacturer’s written installation, operation and maintenance manual to include the following information:
      a. Manufacturer’s descriptive literature.
      b. Installation instructions.
      c. Operating instructions.
      d. Troubleshooting guide.
      e. Preventative maintenance requirements.
      f. Complete parts list.
      g. Recommended spare parts list.
   2. Neatly annotate the IO&M manual to clearly indicate information applicable to the equipment installed.

F. Closeout submittals:
   1. Test Report: Provide a certified test report showing the tank has been tested in accordance with listed requirements and is in compliance.
   2. Project record drawings: Annotate a clean copy of the project Contract Drawings to clearly indicate the actual installation of the equipment.
   3. Provide a certificate from the Manufacturer's Representative indicating that the equipment and systems provided have been installed and are operational in accordance with the manufacturer’s written installation, operation and maintenance manual and the adjustment requirements required by the Part 3.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Regulatory Requirements: Products Requiring Electrical Connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.08 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 GENERAL**

A. Underwriters Laboratories under UL142 Standard shall list the entire tank system, including the skid and secondary containment, for safety as a complete and indivisible unit. The skid mounted tank assembly shall bear the UL listing marking.

**2.02 DOUBLE WALLED ABOVEGROUND TANKS FOR THE STORAGE OF PETROLEUM PRODUCTS**

A. Tank:

1. Above ground fuel oil storage tanks shall be of double wall (Type I), welded steel construction and guaranteed compatible with the contents indicated in the Drawings.
2. Construction of the outer tank shall be separate but in intimate contact with the inner tank and shall encompass 300 degrees of the circumference. The inner and outer tank shells and the tank heads shall be as required by the UL 142 listing. Head bracing shall be as required by the standard.
3. Flat unflanged heads shall not be permitted on either inner or outer tanks.

B. Skid:

1. The skid rails shall be constructed of structural steel beam and shall be listed as an integral part of the tank.
2. Skid supports shall be constructed of plate steel, equal in thickness to the inner tank with a 90 degree bent edge, 1 inch wide, at each side of the structural support. Supports shall be placed directly under the inner tank heads and thereafter, evenly spaced along the tank. Spacing between supports shall not exceed 69 inches. The skid supports shall be attached to a 12-inch wide saddle pad attached to the outer tank shell that is of sufficient length to encompass the bottom 120 degrees of the tank.
3. A capped length of schedule 80 pipe shall be attached to each end of the skid to function as a tow bar when the tank is empty. The skid rail beam member shall encircle the full 360 degrees of the tow bar.

C. Weld joints:

1. Joints on the inner and outer shell and tank heads shall be as required by the UL 142 listing. In addition, non-structural external seams shall be seal welded before painting.
2. Weld spatter shall be removed and sharp edges shall be rounded and smoothed by grinding.

D. Tank attachments and penetrations:

1. Piping penetrations shall be made through the top of the tank only with sizes and locations as shown on the Drawings.

2. Secondary containment shall allow for the full recovery of a release from the inner tank into the annular space between the inner and outer tanks.
3. An additional fitting shall be incorporated into the tank (typically located on the top of the opposite end of the tank from the monitoring port) to allow flushing of any product which may accumulate as a result of release or an accidental fill of the annular space.
4. Each tank shall be equipped with lifting lugs adequate for the safe handling of the tank during installation. Each lifting lug must be designed to support the total weight of the empty dual wall tank system. A minimum of two lifting lugs shall be provided on tanks having a rated capacity of more than 1,100 gallons of product.

E. Inspection and testing:
1. Prior to painting, each tank shall be tested per UL 142 by the tank manufacturer to determine that the tank does not leak.
2. Rewelding shall repair leaks and the tank retested until no leaks are present.

F. Finishes:
1. Exterior surfaces shall be cleaned and prepared by sandblasting in accordance with Steel Structures Painting SSPC-3 requirements and thereafter painted in accordance with the manufacturer's recommendations, with Contracting Agency's approval.
2. It shall not be necessary to blast and paint the interstice.

G. Warning signs and placards: Provide tank with appropriate, permanently attached, warning labels and/or placards in accordance with International Fire Code requirements, based on nominal tank capacity and the contents being stored.

H. Miscellaneous:
1. Thread protectors or plugs shall be installed in each tank opening during storage and shipment to the site.
2. Protectors and plugs shall include vent holes to allow pressure venting of the tanks while in storage.
3. Installation and field-testing shall be per Steel Tank Institute F921 Standard.

**2.03 TANK APPURTENANCES**

A. General: Tank appurtenances shall be as shown on drawings and specified below. Appurtenances shall be Underwriters Laboratories (UL) listed for storage of petroleum products. Appurtenances shall, where practical, be shop installed, tested and painted/coated with the same coating provided for the tank before shipment to the site.

B. Containment Manhole Fill Box:
1. Welded steel construction.
2. Lockable, hinged. weather-tight gasketed lid.
3. Three, 4 inch tank bosses.
4. Drain valve to tank.
5. Manufacturer: Anchorage Tank and Welding Inc., Greer, Ace Tank.

C. Suction Foot Valve:
1. 3/4 inch, double poppet.
2. Bronze body and poppet.
3. 8 mesh screen.
4. 3/4 inch FPT connection.

5. Manufacturer: OPW 92-0033, or approved equal.

D. Fill Limiter Assembly:
   1. Assembly shall be compatible with 4-inch tank opening.
   2. 2-inch diameter dry-break coupler with dust cap.
   3. Aluminum fill tube with adjustable collar, 4 inch FPT connection.
   4. Float valve with positive shut-off.
   5. Aluminum drop tube.
   6. Size fill pipe and drop tube for 90 percent product level shutoff based on tank diameter as per manufacturer instructions. Drop tube shall extend to within 6 inches of tank bottom.
   7. Manufacturer: Clay and Bailey F-30, Morrison 9095A, or approved equal.

E. Emergency Vent:
   1. Cast iron body.
   2. Lid design that minimizes weather effects.
   3. Brass fire/spark arresting screen.
   4. Manufacturer: Clay and Bailey No. 368, or approved equal.

F. Normal Vent:
   1. Aluminum body and cap for upward venting.
   2. Removable brass 40 mesh screen.
   3. 2-inch size with threaded NPT or setscrew connection.
   4. Manufacturer: OPW 23-0033, Clay and Bailey No. 395, Emco Wheaton MR 354, or approved equal.

G. Mechanical Level Gauge:
   1. For horizontal or vertical tanks up to 12 feet high.
   2. Measures in feet/inches.
   3. Continuous level indicating float gauge.
   4. 1/4 inch accuracy.
   5. 2 inch MPT connection.
   6. Manufacturer: Morrison, Model 818 “clock gauge”, or approved equal.

H. Bushings:
   1. Double tapped, cast iron, sized as shown on drawings.
   2. Duplex bushings shall be 2 x 1/2 x 1/2 inches.
   3. Manufacturer: Morrison No. 184, 184-D, or approved equal.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install AST system in accordance with the drawings, the referenced publications, and the manufacturer's written instructions, checklists, and warranty requirements for each system component.

### 3.02 TANK TESTING

A. Tanks are to be shop tested before being placed in service in accordance with UL 142. The listing mark of the Underwriters Laboratories, Inc. on a tank shall be evidence of compliance with this test.

B. Where the vertical length of fill and vent pipes is such that when filled with liquid, the static head imposed on the bottom of the tank exceeds 10 PSIG (23 feet WC), the tank and related piping shall be tested hydrostatically to the pressure equal to the static head imposed.

C. To prevent storage tank over-pressurization during associated product pipe pressure testing.

1. Disconnect product lines to be pressure tested at their storage tank connections and plug exposed tank openings with threaded plugs prior to connection of the pressure source.

2. Upon completion of the pressure test, de-pressurize product lines to ambient pressure, disconnect the pressure source and reassemble product pipes to their appropriate tank connections.

### 3.03 ADJUSTING

A. Adjust fuel limiter assembly to provide fuel fill shut-off at 90 percent tank capacity in accordance with the fuel limiter assembly installation and operation instructions. Document fuel limiter valve elevation (in inches) with respect to the inside base of the tank.

B. Adjust fuel tank level gauge assembly to provide accurate fuel level measurement in accordance with the fuel gauge assembly installation and operation instructions. Verify that fuel level gauge accuracy is within the manufacturer's listed tolerance during initial fill. Document that fuel level gauge accuracy has been verified.

**END OF SECTION**

**SECTION 23 21 13**
**HYDRONIC PIPING AND SPECIALTIES**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Pipe and fittings for:
      a. Hydronic heating piping.
      b. Equipment drains and overflows.
   2. Piping accessories.
   3. Flexible pipe connectors.
   4. Expansion joints and compensators.
   5. Pipe loops, offsets, alignment guides and swivel joints.
   6. Hydronic Specialties:
      a. Expansion tanks.
      b. Air vents.
      c. Air and dirt separators.
      d. Strainers.
      e. Flow indicators, controls, meters.
      f. Brazed plate heat exchangers.
      g. Flushing agents.
      h. Water treatment chemicals.
      i. Glycol specialties.

B. Related Sections:
   1. 01 91 00 - Commissioning
   2. 20 00 00 - Mechanical General Requirements
   3. 20 05 29 - Mechanical Hangers and Supports
   4. 20 05 48 - Vibration and Seismic Control
   5. 20 05 53 - Mechanical Identification
   6. 20 07 00 - Mechanical Insulation
   7. 23 05 93 - Testing, Adjusting and Balancing
   8. 23 21 23 - Hydronic Pumps
   9. 23 52 23 - Cast Iron Boilers and Accessories
   10. 23 73 00 - Central Air Handling Units
   11. 23 82 00 - Terminal Heating and Cooling Units
   12. 23 83 16 - Radiant Floor Heating Equipment
   13. 25 30 00 - Building Automation System Field Devices
   14. 25 50 00 - Building Automation System
   15. 25 90 00 - Sequence of Operations

## 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. ANSI/ASHRAE/IENA Standard 90.1-2001 Energy Standard for Buildings Except Low-Rise Residential Buildings.
3. ASME Boilers and Pressure Vessel Code (1998), Sections IV & VI.

B. Abbreviations, Acronyms and Definitions:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

## 1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. This section describes specific requirements, products, and methods of execution for the system of liquid heat transfer throughout the project. The system of heat generation is specified elsewhere.
2. Design expansion compensation system to adequately protect piping and structure from thermal expansion and contraction forces.

B. Performance Requirements:

1. Provide performance and output shown or scheduled on drawings.
2. Provide loops, pipe offsets, and swing joints, or expansion joints where required or indicated.
3. Pipes shall be capable of thermal expansion movement without disengagement of supports or forces on equipment connections.
4. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.
5. Expansion Calculations:
   a. Installation Temperature: 40 degrees F.
   b. Hot Water Heating: 210 degrees F.
   c. Domestic Hot Water: 140 degrees F.
   d. Safety Factor: 30 percent.

## 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Submit product literature for items specified in Part 2 and those products required by the performance standards of this section. Literature clearly annotated to indicate specified salient features and performance criteria.

2. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
3. Submit selection calculations for expansion joints and compensators.
4. Design Data: Submit calculations for performance specified products and systems.

C. Shop Drawings:
1. Submit shop drawings for performance-specified products and systems.
2. Submit shop drawings for piping systems to demonstrate proper layout and coordination.
3. Provide shop drawings to show system layout with location and detail of flexible pipe connectors and expansion joints.
4. Drawings of boiler room, fan rooms, and other areas with high-density piping, shall be shown at 1/4-inch scale or larger.
5. Indicate elevation of piping above finish floor.
6. Indicate dimensions and weights of equipment, and placement of openings and holes.
7. Include reference to ductwork and other equipment where space coordination is necessary to avoid conflicts.
8. Indicate mechanical and electrical service locations and requirements.

D. Manufacturer Reports:
1. Certificates, Manufacturer's Instructions, and Manufacturer's Field Reports:
a. Provide a complete manufacturer's written installation, operation and maintenance manual for each type of installed equipment. Annotate the manual to indicate applicable information for the specific equipment model(s) installed.
b. Included with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
1). Printed names and signatures of the installers.
2). Documentation from Manufacturer's representative and Contracting Agency that the equipment has been properly installed and is fully operational, thus validating the equipment warranty.
2. Test reports:
a. Provide certificate that cleaning of hydronic systems has been accomplished.
b. Provide certificate listing satisfactory results for the hydrostatic pressure tests.
c. Provide certificate listing satisfactory results for the operational tests.
3. Submit a letter to document that the training was conducted. Include in the letter the date, start/stop times for the training, list of attendees and signature/title of the person(s) providing the training.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Operation and Maintenance (IO&M) Manuals:
1. Refer to Section 20 00 00 - Mechanical General Requirements, for IO&M Manual formatting requirements and number of copies required.
2. Include the following:
a. Copies of approved submittal information.

b. Manufacturer's installation, operating and maintenance/repair instructions, parts listings, and spare parts list for each product. Annotate the manual to indicate applicable information for the specific equipment model(s) installed.

c. Computer software manuals and applicable licenses.

d. Completed start-up and operational test report as required to validate equipment warranty.

e. Start-up and operational test reports for each piece of equipment. Report shall include printed names and signatures of the installers and documentation that the equipment has been properly installed and is fully operational, thus validating the equipment warranty.

C. Record Documentation: Record actual locations of equipment, valves, strainers, air vents, flexible pipe connectors, expansion joints, other components, and locations of access doors required for maintenance access in accordance with Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 PIPE AND FITTINGS**

A. Water Systems:

1. Copper pipe three inches and smaller:

a. Type L copper, wrought copper fittings.

b. Fit joints using 430 silver solder, 95-5 tin-antimony or other approved lead-free solder. Solder type must be compatible with pipe and fittings. Solder containing lead shall not be allowed on the job site.

c. Soldering flux: Water flushable, low corrosivity type meeting the requirements of ASTM B813. Flux shall have label indicating it meets these requirements.

d. Extracted branch joints (T-Drill) may be approved when Contractor can demonstrate satisfactory experience with this method. Joints shall be brazed in accordance with the Copper Development Association Copper Tube Handbook using B-Cup series filler metal.

2. Galvanized piping is not permitted.

B. Glycol Systems (Copper or Steel Option):

1. Copper pipe three inches and smaller:

a. Type L copper, wrought copper fittings.

b. Fit joints using 430 silver solder, 95-5 tin-antimony or other approved lead-free solder. Solder type must be compatible with pipe and fittings. Solder containing lead shall not be allowed on the job site.

c. Soldering flux: Water flushable, low corrosivity type meeting the requirements of ASTM B813. Flux shall have label indicating it meets these requirements.

d. Extracted branch joints (T-Drill) may be approved when Contractor can demonstrate satisfactory experience with this method. All joints shall be brazed in accordance with the Copper Development Association Copper Tube Handbook using B-Cup series filler metal.

2. Viega ProPress copper press-fit joint-type pipe systems are not permitted.

3. Victaulic mechanical joint-type pipe systems are not permitted.

4. Galvanized piping is not permitted.

C. Copper Press Fitting System:

1. Limited to tubing sizes 4 inch and smaller.

2. Cast or wrought copper fittings, ASME B16.51. Pre-formed grooves with pre-lubricated EPDM O-rings designed to seal fitting to copper tubing water tight with the use of manufacturer's crimping tool. Fittings shall be rated for 250 degrees F., and 200 psi.

3. IAPMO UPC listing.

4. Manufacturer: Viega ProPress, NIBCO Press System, no substitutions.

D. Equipment drains and overflows: Type L copper pipe, wrought copper fittings.

**2.02 VALVES**

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 PSIG saturated steam or 200 PSIG WOG. Packing material or seals shall not contain asbestos.

B. Manufacturers: Crane, Nibco, Hammond, Jenkins, Grinnell, Milwaukee, Stockham.

C. Ball Valves 2 inch and smaller: Two piece type, full port, bronze body and silicone bronze ball or chrome plated brass ball, TFE seats, blowout proof stem, 150 PSIG pressure/temperature rating (steam).

D. Ball Valves 2-1/2 inches through 4 inch: Two piece type, full port, bronze body and silicone bronze ball or chrome plated brass ball, TFE seats, 150 PSIG pressure/temperature rating (steam). May be substituted for gate valves except where otherwise indicated.

E. Gate Valves, two inch and smaller: Bronze body and trim, rising stem, solid wedge. Use only where shown on drawings.

F. Globe Valve two inch and smaller: Bronze body, renewable disc suitable for service.

G. Globe or Angle Valve 2-1/2 inch and larger: Iron body, bronze trim, flanged, bronze disc. Bronze valves optional for 2-1/2 inch and three-inch.

H. Swing Check Valves two inch and smaller: Bronze body, horizontal swing, Y-pattern, Buna-N-disc for water, oil and gas. TFE disc for steam.

I. Swing Check Valves 2-1/2 inch and larger: Iron body, horizontal swing, bolted bonnet, renewable bronze seat and disc, flanged or grooved. Bronze valves optional for 2-1/2 inch and three-inch.

J. Spring Assisted In-line Silent Lift Check Valves two inch and smaller (for pump discharge applications): Bronze body, stainless steel stem, spring, and disc holder, Buna-N-disc for water or oil, TFE disc for steam, ½ psid cracking pressure.

K. Spring Assisted In-line Silent Lift Check Valves 2-1/2 inch and larger (for pump discharge applications): Iron body, bronze seat and disc, stainless steel spring, ½ psid cracking pressure.

L. Drain Valves: Full port ball valve with threaded hose adapter with bronze end cap. Do not use sillcocks or butterfly valves as drain valves.

M. Valves Specified Elsewhere: Provide special valves such as motor-operated valves, relief valves, temperature regulating valves, etc., as specified under the individual system or as indicated on the drawings.

**2.03 UNIONS (STANDARD)**

A. Steel Piping (Threaded):

1. Class 150 (150 PSIG steam, 300 PSIG WOG) malleable iron, ground joint, ASME B1.20.1, ASME B16.39. McMaster-Carr.
2. Where indicated: Class 250 malleable iron ground joint, copper or copper alloy seat. McMaster-Carr.

B. Copper Piping (Sweat): Cast bronze, ASTM B584 Alloy C84400, copper to copper. Nibco No. 733.

**2.04 DIELECTRIC ISOLATORS (ELECTRICALLY INSULATING)**

A. Provide dielectric unions for two inch pipe and smaller.

B. Provide dielectric flanges for 2-1/2 inch pipe and larger.

C. Insulating gaskets shall be suitable for fluid type, temperature and pressure.

D. Galvanized pipe to copper: Brass threaded end and sweat copper end.

E. Black steel to copper: Zinc plated steel threaded end and sweat copper end.

F. Manufacturers: Capitol, Epco, Control Plastics, Watts, or approved equal.

**2.05 PRESSURE GAUGES**

A. Provide where shown on drawings, specified in Part 3, and as required.

B. Bourdon tube type with 4-1/2-inch dial (minimum) accuracy plus or minus one-percent span, recalibratable. Normal operating pressure near midpoint of range. Industrial quality.

C. Gauge cock on gauges and pulsation damper (snubber). Steam gauges shall have siphon to isolate gauge from steam, except where remotely mounted and connected by looped tubing.

D. Differential pressure gauges shall be piston or diaphragm type with range suitable for application and static pressure capability suitable for system pressure. Orange Research.

**2.06 THERMOMETERS**

A. Provide where shown on drawings, specified in Part 3, and as required.

B. Liquid in glass type: Industrial quality blue-reading with nine-inch scale length (minimum). Straight angle or adjustable as necessary for visibility. Trerice, Marsh, Weksler, or approved equal.

C. Digital, self-powered type: Weiss DVU or equal.

D. Normal operating temperature at scale midpoint and sufficient range to cover operating conditions.

E. Provide separable wells of suitable material for piping and mounting hardware for ducts. Set probe in heat transfer paste recommended by thermometer manufacturer.

**2.07 PRESSURE AND TEMPERATURE TEST PLUGS**

A. Provide where shown on drawings, specified in Part 3, and as required.

B. Standard type for 1/8-inch diameter pressure or temperature probes. Self seal when probe removed and complete with threaded cap. Minimum continuous rating 125 PSIG and 220 degrees F coincident. Sealing element suitable for fluid in pipe.

C. Provide one thermometer and one pressure gauge for each range required by system parameters.

D. Manufacturers: Sisco, Peterson Equipment, or approved equal.

## 2.08 FLEXIBLE PIPE CONNECTORS

A. General:
   1. System Application: Hot water heating or 50 percent propylene glycol solution (heating) or 30 percent propylene glycol solution (cooling).
   2. System Maximum Operating Temperature: 210 degrees F.
   3. Pressure: Internal.
   4. Installation: Straight or Offset as shown.
   5. Movement: Constant or Intermittent.
   6. Maximum offset: Not to exceed 25 percent of the centerline bend radius.
   7. Determine appropriate minimum “live hose length” (flexible portion of assembly) based on the centerline bend radius for each application in accordance with manufacturer’s sizing tables.

B. Copper Pipe Flexible Connectors - Small Diameter (Sweat):
   1. Size: 3/4 inch through 2-1/2 inch nominal pipe size (NPS).
   2. Pipe Ends: Copper tube sweat.
   3. Corrugated Hose: Bronze.
   4. Outer Braid: Single braided bronze.
   5. Minimum Working Pressure Rating: 120 PSIG at 250 degrees F.
   6. Maximum Temperature Rating: 250 degrees F.

C. Copper Pipe Flexible Connectors - Small Diameter (Removable):
   1. Size: 3/4 inch through 2-1/2 inch nominal pipe size (NPS).
   2. Pipe Ends: Female pipe coupling, Female union, Male Hex Nipple, Male Pipe with Hex Nut.
   3. Corrugated Hose: Bronze.
   4. Outer Braid: Single braided bronze.
   5. Minimum Working Pressure Rating: 120 PSIG at 250 degrees F.
   6. Maximum Temperature Rating: 250 degrees F.

D. Steel Pipe Flexible Connectors - Large Diameter:
   1. Size: 3 inch through 10 inch nominal pipe size (NPS).
   2. Pipe Ends: 150 LB plate steel flat faced flange.
   3. Corrugated Hose: Type 304 stainless steel.
   4. Outer Braid: Single braided Type 304 stainless steel.
   5. Minimum Working Pressure Rating: 150 PSIG at 250 degrees F.
   6. Maximum Temperature Rating: 250 degrees F.

E. Manufacturers: Metraflex, Keflex, or equal.

## 2.09 FLEXIBLE EXPANSION LOOP

A. Provide flexible expansion loops of size and type noted on drawings.

B. Flexible loops shall consist of two flexible sections of hose and braid, two 90 degree elbows, and a 180 degree return assembled in such a way that the piping does not change direction

but maintains its course along a single axis. Loops shall have a factory supplied, center support nut located at the bottom of the 180 degree return, and a drain/air release plug. They shall impart no thrust loads to system support anchors or building structure.

C. Materials of construction and end fitting type shall be consistent with pipe material and equipment/ pipe connection fittings.

D. Manufacturer: Metraflex Metraloop or equal.

**2.10 PIPING ANCHORS AND ALIGNMENT GUIDES**

A. Manufacturers:

1. Hyspan.
2. Advanced Thermal Systems.
3. Adsco.
4. Metraflex.
5. No substitutions.

B. Design: Expansion joint anchor forces shown on drawings are determined from basis of design manufacturer (Hyspan, Series 1501 at 100 PSIG test pressure) literature and do not include an applicable safety factor. Apply anchor force safety factor(s) to anchor force design as deemed appropriate by Structural Engineer.

C. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum one inch thick insulation, minimum three inches travel.

D. Pipe Support Anchors: Two piece welded steel frame construction with four mounting holes. Enamel coating. For anchor bolt size, see Structural.

**2.11 ACCESSORIES**

A. Pipe Alignment Guides:

1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum one inch thick insulation, minimum three inches travel.
2. Manufacturers:

**2.12 EXPANSION TANKS**

A. General:

1. Performance as scheduled.
2. Full acceptance flexible heavy duty butyl removable bladder or flexible heavy duty butyl diaphragm sealed into tank, as scheduled.

B. Construction:

1. Designed, tested and stamped in accordance with ASME SEC 8-D standards; supplied with National Board Form U-1.
2. Welded steel shell and base.
3. Forged steel system connections.
4. Steel support stand.

C. Ratings:

1. Working pressure: 125 PSIG.
2. Working Temperature: 240 degrees F.

3. Precharge: As Scheduled.

D. Accessories:
1. Pressure gage.
2. Air charging fitting.
3. Tank drain isolation valve.
4. System connection isolation valve.

E. Model and size: As scheduled.

F. Manufacturers: Amtrol, Armstrong, Bell & Gossett, Taco, or equal.

**2.13 AIR VENTS**

A. Coin operated vent: Manual low profile vent for use in baseboard and other enclosures where automatic vent will not fit. 150 PSIG working pressure, 212 degrees F. operating temperature. Bell & Gossett No. 4V or approved equal.

B. Float Type:
1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
2. Iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.
3. Operating pressure 150 PSIG, 250 degrees F maximum temperature, intended for use in hot or cold lines. Provide ball type isolation valves for air vents that do not have integral shut off valves.
4. Manufacturers: Spirotherm Spirotop, Honeywell EA791004, or equal.

C. Disc Type:
1. Designed to be replaced without removal from line, with built-in check valve.
2. Limited to baseboard, unit ventilators, cabinet unit heaters, convectors, and elsewhere where air vent must be installed in a cabinet or enclosure, unless other type detailed on drawings.
3. Maximum working pressure: 50 PSIG.
4. Manufacturer: Hoffman No. 500, or equal.

**2.14 AIR AND DIRT SEPARATORS**

A. Construction:
1. Designed, tested, and stamped in accordance with ASME standards.
2. Welded steel shell with flanged connections.
3. Entering velocity not to exceed 4 feet per second.
4. Internal copper wound coalescing eliminator.
5. Top venting chamber with integral full port float actuated brass venting mechanism.
6. Side tap with valve to flush dirt or liquids and quick air bleed.

B. Ratings:
1. Working pressure: 150 PSIG (minimum) at 270 degrees F.
2. Working Temperature: 200 degrees F (minimum).

3. Capable of removing 100 percent of free air, 100 percent of entrained air, and 99.6 percent of dissolved air in the system fluid.
4. Dirt separation of at least 80 percent of all particles larger than 30 micron and larger within 100 passes.

C. Size: As scheduled.

D. Manufacturer: Spirotherm Spirovent VDT (Basis of Design), or approved equal.

**2.15 STRAINERS**

A. Size two inch and under:
1. Screwed brass or iron body for 175 PSIG working pressure.
2. Y pattern with 1/32-inch stainless steel perforated screen.

B. Size 2-1/2 inches to four inches:
1. Flanged or grooved iron body for 175 PSIG working pressure.
2. Y pattern with 3/64-inch stainless steel perforated screen.

C. Size five inches and larger:
1. Flanged or grooved iron body for 175 PSIG working pressure.
2. Basket pattern with 1/8-inch stainless steel perforated screen.

D. Manufacturers: Metraflex, Armstrong, Crane, Hayward, Watts Regulator, Hoffman, Sarco.

**2.16 AUTOMATIC FLOW LIMITING AND ISOLATION VALVES**

A. Supply pipe side: Brass alloy body with stainless steel flow cartridge assembly, integral ball valve, 20 mesh strainer element, two pressure/temperature test valves and drain valve with hose bibb adapter and end cap. Body design allows removal of flow cartridge without disturbing piping connections. Threaded sweat adapter inlet. Union with sweat adapter outlet.

B. Return pipe side: Forged brass body with integral ball valve, pressure/temperature test valve and manual air vent. Union with sweat adapter inlet. Threaded sweat adapter outlet.

C. Calibration: Control flow within five percent of selected rating, over operating pressure range of at least 10 times minimum pressure required for control. Provide three operating pressure ranges with a minimum range requiring less than 3.5 PSID to actuate flow control cartridge.

D. Flow Control Cartridge: Stainless steel one piece cartridge with segmented port design and full travel linear coil spring.

E. Provide supply and return components packaged as a system and labeled in accordance with the equipment schedule tag to match terminal heating unit served.

F. Manufacturer: Griswold Controls, Bell & Gossett, or approved equal.

**2.17 BALANCING VALVES**

A. Provide calibrated plug or ball valve type balancing valves with self-sealing quick connect pressure taps, scale and locking device. Include schedule with submittal.

B. Manufacturers: Bell & Gossett, Taco, or equal.

**2.18 BRAZED PLATE HEAT EXCHANGERS**

A. Provide brazed plate type heat exchanger(s) with the heat transfer and hydraulic performance characteristics as scheduled.

B. Heat exchangers to include the following:
1. Cover plates: Stainless steel ASTM 316L.
2. Channel Plates: Corrugated stainless steel ASTM 316L, vacuum brazed together.

3. Brazing material: Copper.
4. Connections: Stainless steel ASTM 316L.
5. Design pressure: 435 PSIG.
6. Design temperature: -310 degrees F (minimum) and 450 degrees F (maximum).

C. Manufacturers: Bell & Gossett, Trantor, or equal.

**2.19 FLUSHING AGENT**

A. Synthetic organic dispersant manufacturer: CH2O, Product 6149 or approved equal.

**2.20 WATER TREATMENT**

A. Hydronic loop treatment manufacturer: CH2O, Product 6439 or approved equal.

**2.21 GLYCOL SYSTEMS**

A. Provide equipment and products specifically designed and approved for continuous operation with the glycol solution specified.

B. Glycol Solution:

1. Inhibited propylene glycol solution premixed to 50 percent by volume for use with hydronic heating systems.
2. Fluid analysis test kit.
3. Manufacturer: Dow Chemical Company Dowfrost. No substitutes.

C. Automatic Glycol Make-up System:

1. Provide packaged glycol make-up system as scheduled with single point electrical connection.
2. Fill glycol make-up tank one half full with clean solution after testing and final system check out has been completed.

**PART 3 EXECUTION**

**3.01 INSTALLERS**

A. Installer: Perform work by experienced personnel previously engaged in hydronic system construction and under the supervision of a qualified installation supervisor.

**3.02 PREPARATION**

A. Protection of In-Place Conditions: Cover equipment and plug piping connections to protect components from construction dirt and debris.

B. Surface Preparation:

1. Prior to installation of equipment, verify concrete housekeeping pads are complete and properly sized for equipment mounting.
2. Prior to installation of piping and equipment, verify that shop drawings are approved, and locations and routing have been coordinated with the work of other trades.

**3.03 INSTALLATION**

A. Special Techniques:

1. Install equipment in accordance with manufacturer’s instructions and requirements of the codes specified herein.
2. Provide finished products with protective covers during balance of construction.
3. Provide accessible ball type isolation valves at major piping branches, and on main lines as shown, and at terminal devices. Provide drains and manual vents at main line and

branch line valves to facilitate draining and filling piping sections. Provide caps on drain outlets.

4. Access Doors: Provide appropriate size and install such that hydronic system features are readily accessible and maintainable.
5. Install balancing valves and automatic flow limiting valves to be accessible and adjustable.
6. Install piping to maintain headroom, conserve space, and not interfere with use of space.
7. Use of bullhead tee with opposed flow, double inlet configuration not allowed.
8. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
9. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
10. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Division 9 - Finishes.
11. Thermal Expansion:
    a. Install piping to allow for normal thermal expansion and contraction without stressing pipe, joints, or connected equipment.
    b. Provide anchors where necessary and as shown.
    c. Provide support and expansion loops and alignment guides to suit conditions and as shown on drawings.
    d. Piping shall be guided and restrained as recommended by the manufacturer.
12. Provide test plugs on both inlet and outlet sides of heat transfer elements to allow measurement of both fluid pressure drop and differential temperature.
13. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
14. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor the other end. Install in horizontal plane unless indicated otherwise.
15. Provide pipe anchors, offsets, and loops as required to control the expansion of pipelines.
16. Flushing:
    a. Where hydronic piping installed under this project is connected to an existing hydronic system, provide branch isolation valves and provision for cleaning and flushing consisting of tees with valve, hose fittings and caps immediately adjacent to the branch isolation valves.
    b. Clean internal surfaces of the completed heating system as follows:
        1). Flush hydronic piping to remove black magnetic iron oxide and mill scale from the system.
        2). Flush system piping with synthetic organic dispersant to remove grease. Circulate solution through system at 150 degrees F or greater for 12 to 24 hours.
        3). Repeat process until the system is clean to the satisfaction of the Contracting Agency.
        4). Flush system with fresh water as necessary to remove residual cleaning agent.
        5). Exercise proper care during flushing and cleaning of systems to make sure no damage is done to equipment, valves, fittings, or Work of other trades. Restore

damaged system components or Work of other trades to new or original condition at no additional cost to Owner.

17. Provide conductive compound paste in the temperature sensor wells.

B. Interface with Other Work: Coordinate and sequence installation of hydronic products with trades responsible for portions of this and other related sections of the Project Manual.

**3.04 REPAIR/RESTORATION**

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

C. Touch-up finished surfaces with touch-up paint provided by the equipment manufacturer.

**3.05 SITE QUALITY CONTROL**

A. Non-Conforming Work: Rework required because of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

B. Manufacturer Services:

1. Verify units are installed and operational in accordance with the manufacturer's written installation instructions.
2. Both the Contractor and Manufacturer's Representative(s) shall sign start-up and operational checklist to confirm proper unit installation and operation.
3. Provide samples of the inhibited propylene glycol solution to the manufacturer for testing using the fluid analysis test kit provided.
4. The manufacturer of the inhibited propylene glycol solution shall provide free testing of the solution 24 hours after system startup and again 90 days later to verify proper fluid performance for both tests.
5. Provide one copy of manufacturer's test reports to the Owner. Adjust fluid concentration and/or correct deficiencies as addressed in the report.

C. Hydronic System Cleaning and Treatment Coordination Meeting:

1. Conduct a meeting prior to flush cleaning and treatment of the hydronic heating system to discuss cleaning agents, treatment chemicals and procedures to be used. Discuss system fill procedures with inhibited propylene glycol solution.
2. Participants shall include the Contractor and Subcontractor directly performing the work and the Owner's Maintenance Staff personnel.
3. Provide one week notice prior to the meeting.
4. Cleaning, filling and treatment of any hydronic system is not permitted until this coordination meeting has been conducted and the Contracting Agency's concerns have been adequately addressed.

D. System fill:

1. After flush cleaning the hydronic heating system, fill the primary system with water and add treatment chemicals to the concentration recommended by the manufacturer. Fill the secondary loop system with inhibited propylene glycol solution as specified.
2. Thoroughly vent the systems to include piping high points and equipment vents (pump casings, air separators, etc.).

E. Site Tests:
   1. Hydrostatic Pressure Test:
      a. Make sure hydronic heating system is filled with clean operating fluid. Hydrostatically test system to 100 PSIG. System must hold test pressure for a two hour period with no pressure drop to pass test.
      b. Inspect system during test and repair leaks.
      c. Provide written report indicating that the pressure test has been satisfactorily completed.
   2. Operational Test:
      a. Inspect system for proper fluid circulation, sufficient clearance for expansion and contraction of piping and proper system pressure control.
      b. Note and correct discrepancies and deficiencies.
      c. Provide written report indicating that the operational test has been satisfactorily completed.
   3. Test results shall be certified in writing as required by General Conditions. Include dates and sections tested, test pressure, test duration, printed names and signatures of person performing the test and Contracting Agency witnessing the test.

F. Inspection: Arrange for inspections and provide written notice to the Contracting Agency when the entire work or logical portions thereof, is ready for inspection.

G. Verify penetrations are installed to maintain assembly integrity.

**3.06 SYSTEM STARTUP**

A. Start-up and operate hydronic heating systems and equipment in accordance with the manufacturer’s written installation and operation manual checklist.

B. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

**3.07 ADJUSTING**

A. Adjust functional components for proper operation in accordance with manufacturer's recommendations, or as otherwise directed.

B. Coordinate and work directly with the Balancing and Testing Agency and the requirements of Section 23 05 93 - Testing, Adjusting and Balancing, to provide systems in proper operating order.

C. Make corrections and adjustments as required by the Testing, Adjusting and Balancing (TAB) Agency in a timely manner.

**3.08 CLEANING**

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces of pumps, piping and appurtenances.

**3.09 CLOSEOUT ACTIVITIES**

A. Demonstration: Provide 2 hours of demonstration conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

B. Training: Provide 4 hours of operational instruction conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

**END OF SECTION**

# SECTION 23 21 23
# HYDRONIC PUMPS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. System lubricated circulators.
   2. In-line circulators.

B. Related Sections:
   1. 01 91 00 - Commissioning
   2. 20 00 00 - Mechanical General Requirements
   3. 20 05 13 - Common Motor Requirements
   4. 20 05 29 - Mechanical Hangers and Supports
   5. 20 05 48 - Vibration and Seismic Control
   6. 20 05 53 - Mechanical Identification
   7. 23 05 93 - Testing, Adjusting and Balancing
   8. 23 21 13 - Hydronic Piping and Specialties
   9. 23 52 23 - Cast Iron Boilers and Accessories
   10. 23 83 16 - Radiant Floor Heating Equipment
   11. 25 30 00 - Building Automation System Field Devices
   12. 25 40 00 - Variable Speed Drives
   13. 25 50 00 - Building Automation System
   14. 25 90 00 - Sequence of Operations

### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. UL 778 - Motor Operated Water Pumps.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. This section describes specific requirements, products and methods of execution for interrelated systems necessary for the pumping of heating fluid, which will be distributed to the locations shown.
   2. The method of generation of, and distribution of, this heat is specified elsewhere.

B. Performance Requirements:
   1. Select pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
   2. Provide performance and output shown or scheduled on drawings.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Provide manufacturers' product literature, clearly annotated to indicate specified salient features and performance criteria.
2. Include the following:
   a. Catalog data sheets for each pump scheduled. Indicate which model is being submitted.
   b. Certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   c. Dimensional data.
   d. Features and appurtenances being provided.
   e. Electrical characteristics and connection requirements.

C. Shop Drawings:

1. Submit fully dimensioned shop drawings of boiler room showing major equipment and housekeeping pads, with clear callouts indicating deviations from layout shown.
2. Indicate mechanical and electrical service locations and requirements.

D. Quality Assurance/Control Submittals:

1. Design Data and Test Reports: Provide design data and test reports for each pump.
2. Certificates, Manufacturer's Instructions, and Manufacturer's Field Reports:
   a. Provide a complete manufacturer's written installation, operation and maintenance manual for each installed pump. Clearly annotate the manual to indicate applicable information for the specific equipment model(s) installed.
   b. Test pump operation and sequencing in accordance with the manufacturer's written installation and testing instructions and Section 25 90 00 - Sequence of Operations.
   c. Submit a letter of certification indicating that the pump installation and start-up has been completed, that the pumps are properly adjusted and operating within the tolerances as specified by the manufacturer, and that the sequence of operation is fulfilled.
   d. Included with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
      1). Printed names and signatures of the installers.
      2). Documentation from Manufacturer's representative and Contracting Agency that the pumps have been properly installed and each is fully operational, thus validating the equipment warranty.

## 1.06 CLOSEOUT SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements.

B. Closeout Submittals:

C. Project Record Documents: Record actual locations of pumps and associated valves, and areas required for maintenance access.

D. Operation and Maintenance (IO&M) Manuals:

1. Provide copies of approved submittal information for inclusion within the project IO&M Manual.
2. Include manufacturer's descriptive literature, operating instructions, installation instructions, assembly views, lubrication instructions, maintenance and repair data, parts listings, and spare parts list.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Regulatory Requirements: Products Requiring Electrical Connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.08 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 SYSTEM LUBRICATED CIRCULATORS**

A. Type: Horizontal shaft, single-stage, direct connected, with resiliently mounted motor for in-line mounting.

B. Materials:

1. Pump: Cast iron, with flanged pump connections.
2. Impeller: Replaceable stainless steel cartridge.
3. Mechanical Seal Assembly: None.

C. Performance:

1. As scheduled.
2. Maximum working temperature: 230 degrees F.
3. Maximum working pressure: 140 PSIG.

D. Electrical Characteristics:

1. As scheduled.
2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

E. Manufacturers: Armstrong (Basis of Design), Grundfos, Bell and Gossett, Taco.

**2.02 IN-LINE CIRCULATORS**

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting.

B. Materials:

1. Pump Volute: Cast iron, with 125 pound ANSI flanged pump connections.
2. Impeller: Stainless Steel.
3. Shaft: Alloy steel copper sleeve.
4. Mechanical Seal Assembly: Carbon brass trim, ceramic seat.

C. Performance:
   1. As scheduled.
   2. Maximum working temperature: 230 degrees F.
   3. Maximum working pressure: 145 PSIG.

D. Electrical Characteristics:
   1. As scheduled.
   2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

E. Manufacturers: Armstrong (Basis of Design), Grundfos, Bell and Gossett, Taco.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Protection: Cover pumps and plug piping connections to protect pumps from construction dirt and debris.

B. Preparation: Prior to installation of pumps, verify that electrical power is available and of the same voltage and phase characteristics as the pump being installed.

### 3.02 INSTALLATION

A. Install pumps, pump supports, suction guides, mechanical seal piping, pressure gauges and other pump appurtenances in accordance with the manufacturer's written installation instructions.

B. Provide access space around pumps for service. Provide no less than the minimum as recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings.

D. Provide line sized shut-off valve on pump suction and discharge, and line sized in-line spring assisted center guided silent lift check valve. Provide 5-10 pipe diameters of straight pipe between pump discharge and check valve or balance valve; flow straighteners may be used to reduce straight pipe length where necessary.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Provide gauges with connections to suction and discharge.

H. Provide flexible connectors for vibration isolation as indicated on plans.

I. Lubricate pumps before start-up.

### 3.03 CONSTRUCTION

A. Interface with Other Work:
   1. Coordinate and sequence installation of pumps and appurtenances with trades responsible for portions of this and other related sections of the Project Manual.
   2. Rework required as a result of failure to follow the manufacturer’s written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

### 3.04 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**3.05 FIELD QUALITY CONTROL**

A. Manufacturer's Field Services:

1. After completion of the installation, a qualified representative of the pump manufacturer shall conduct pump start-up and written certification.
2. Start-up and adjust the system to within the tolerances as specified by the equipment manufacturer. Verify pump impellers rotate in the correct direction.
3. Provide two hours operating instruction to authorized Owner's Representative.
4. Test pump operation and sequencing in accordance with submittal requirements.
5. Submit a letter of certification indicating that the pump installation and start-up has been completed.

**3.06 ADJUSTING**

A. Coordinate and work directly with the Testing, Adjusting and Balancing Agency to provide systems in proper operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

**3.07 CLEANING**

A. After construction is completed, clean and wipe down exposed surfaces of pumps, piping and appurtenances.

B. Touch up marred or scratched factory finished surfaces using finish materials furnished by manufacturer.

**3.08 DEMONSTRATION & START-UP**

A. Start-up and operate hydronic pumps in accordance with the manufacturer's written installation and operation manual checklist.

B. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

**END OF SECTION**

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# SECTION 23 31 00
# DUCTS AND ACCESSORIES

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Metal Ductwork and Fittings.
2. Flexible Ductwork.
3. Acoustical Linings.
4. Casings and Plenums.
5. Volume Dampers.
6. Control Dampers.
7. Gravity Backdraft Dampers.
8. Flexible Duct Connectors.
9. Access Panels and Doors.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Mechanical Vibration and Seismic Control
5. 20 07 00 - Mechanical Insulation
6. 23 05 93 - Testing, Adjusting and Balancing
7. 23 34 00 - HVAC Fans
8. 23 37 00 - Air Outlets and Inlets
9. Division - Electrical

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings.
3. SMACNA HVAC Duct Construction Standards - Metal and Flexible, Third Edition 2005.
4. SMACNA HVAC Air Duct Leakage Test Manual, Second Edition 2012.
5. SMACNA Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, Fifth Edition 2002.
6. NFPA 90A - Installation of Air-Conditioning and Ventilating Systems.
7. ACR the National Air Duct Cleaners Association (NADCA) Standard for Assessment, Cleaning and Restoration of HVAC Systems, 2013.

### 1.03 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.04 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data: Include manufacturer's detailed fire, smoke, and combination fire/smoke damper installation instructions for each specific wall, ceiling, and floor construction type(s) for the project.

C. Shop Drawings:

1. Include the following information in the scaled ventilation system shop drawings:
    a. Label duct sizes using the same labeling method as the Contract Documents.
    b. Show terminal equipment ductwork connections.
    c. Volume, control, backdraft, fire, smoke, and combination fire/smoke damper locations as applicable.
    d. Flexible connection locations.
    e. Access panels and doors with sizes and swing directions shown.
2. Casings and plenums: Submit detailed shop drawings showing the proposed plenum and casing materials to be used and the construction method.

D. Test and Evaluation Reports:

1. Provide written certification to the Contracting Agency that smoke and combination fire/smoke dampers have been operationally tested and function in accordance with Section 28 46 00 - Fire Detection and Alarm sequences of operation.
2. Submit recorded kitchen exhaust system test information; see Part 3 - Site Tests and Inspections.

E. Installation, Operation and Maintenance (IO&M) Manuals.

## 1.05 CLOSEOUT SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements.

B. Record Documentation: Record actual locations of ductwork and areas required for maintenance access in accordance with Section 20 00 00 - Mechanical General Requirements.

## 1.06 QUALITY ASSURANCE

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.08 WARRANTY

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

# PART 2 PRODUCTS

## 2.01 METAL DUCTWORK AND FITTINGS

A. General: Provide metal ductwork and fittings fabricated in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, G90 zinc coated unless otherwise noted.

B. Low Pressure/Velocity Ductwork:

1. Duct Pressure Class: 2 inches WC.
2. Seal Class: A.

3. Maximum Velocity: 1,500 FPM.

## 2.02 FLEXIBLE DUCTWORK

A. Manufacturers:
   1. Thermaflex, Model M-KE.
   2. Hart & Cooley.
   3. JPL.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Description: UL listed, Class 1 flexible ductwork in compliance with NFPA 90A and 90B.

C. Performance/Design Criteria:

   1. Positive Pressure Rating:

| | |
|---|---|
| Ten inches WC | (4”-12” ID). |
| Six inches WC | (14”-16” ID). |
| Four inches WC | (18”-20” ID). |

   2. Negative Pressure Rating:

| | |
|---|---|
| One inch WC | (4”-12” ID). |
| One half inch WC | (14”-20” ID). |

   3. Maximum Velocity: 5000 FPM.
   4. Operating Temperature Range:
      a. 0 degrees F to 140 degrees F (continuous).
      b. Minus 20 degrees F to 250 degrees F (intermittent).
   5. Insulating Value: R-4.2.

D. Materials:
   1. Acoustically rated black polyester core permanently bonded to coated spring steel wire helix.
   2. Fiberglass insulation.
   3. Tear resistant, reinforced metalized vapor barrier.

## 2.03 ACOUSTICAL LININGS

A. Manufacturers:
   1. Knauf.
   2. Johns Manville.
   3. Owens-Corning.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Description:
   1. UL listed.
   2. NFPA 90A and 90B compliant.

3. One inch thick, 1.5 PCF, flexible, edge-coated, mat-faced glass fiber insulation bonded with thermosetting resin.
4. Does not promote growth of fungi or bacteria.

C. Performance/Design Criteria:

1. Maximum Velocity: 6000 FPM.
2. Operating Temperature Range: Up to 250 degrees F.
3. Maximum Water Vapor Sorption: Three percent by weight.

**2.04 CASINGS AND PLENUMS**

A. General:

1. Consider ductwork with any dimension exceeding 72 inches to be a plenum.
2. Provide packaged air handling unit casings and plenums fabricated by the air handling unit manufacturer.
3. Provide factory pre-fabricated or field fabricated plenums and casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Specific Double-Walled Casing and Plenum Requirements:

1. Outer duct: Galvanized steel (minimum 20 gauge).
2. Liner: Perforated, galvanized steel (minimum 22 gauge).
3. Insulation:
   a. Standard 2-inch fiberglass insulation with Mylar or similar cover material to prevent dust accumulation and to prevent insulation from entering the air stream.
   b. Provide 4-inch insulation where indicated.
4. Access Doors: Provide access doors in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
5. Acoustical Performance Sound Transmission Losses (dB):

| BAND, HZ | 125 | 250 | 500 | 1000 | 2000 | 4000 |
|---|---|---|---|---|---|---|
| 2” Wall Thickness | 18 | 21 | 29 | 38 | 49 | 55 |
| 4” Wall Thickness | 16 | 24 | 35 | 45 | 53 | 58 |

**2.05 VOLUME / BALANCING DAMPERS**

A. Manufacturers:

1. Ruskin.
2. Greenheck.
3. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Materials:

1. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for fabricated volume damper construction requirements.
2. Round ducts to 12 inches diameter and rectangular to 18 inches width:
   a. Flat sheet, galvanized steel, single blade damper.

b. Damper blade two gauges thicker than the duct gauge at the location installed (24 gauge minimum for round, 22 gauge minimum for rectangular).

c. Manual hand quadrant.

3. Round ducts over 12 inches diameter:

a. Flat sheet, galvanized steel, single blade damper.

b. Damper blade two gauges thicker than the duct gauge at the location installed (22 gauge minimum).

c. Manual hand quadrant with continuous steel rod.

4. Rectangular ducts over 18 inches width:

a. Flat sheet, galvanized steel, single blade damper.

b. Damper blade 18 gauge minimum.

c. Manual hand quadrant with continuous steel rod.

5. Accessible and lockable damper operators.

C. Extractors: Not Permitted.

D. Splitter Dampers: Not Permitted.

## 2.06 REMOTE VOLUME DAMPER OPERATORS

A. Manufacturers:

1. Duro-dyne.

2. Young Regulator.

3. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Provide flush mounted chrome plated remote operators with tamperproof cover, extension rod, and not more than one 90 degree angle gear drive.

C. Regulator: Duro-dyne Series SRC-380 or Young Regulator 301.

D. Angle Drive: Duro-dyne Model AD-38 or Young Regulator 927.

## 2.07 CONTROL DAMPERS

A. Manufacturers:

1. Ruskin, Model CD50 (rectangular) or CDR25 (round).

2. Greenheck, Model VCD-43 (rectangular).

3. Air Balance.

4. Pottorff.

5. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Rectangular:

1. Performance/Design Criteria:

a. Temperature Limits: -72 degrees F to 275 degrees F.

b. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions.

1). Closed Position: Maximum pressure of 13 inches WC at a 12-inch blade length.

2). Open Position: Maximum air velocity of 6,000 feet per minute.

c. Leakage: Maximum 3.0 cubic feet per minute per square foot at 1.0 inch WC for sizes 24 inches wide and above.

d. Pressure Drop: Maximum 0.05 inches WC at 1,500 feet per minute across 24 inch by 24 inch damper.

2. Material:

a. Frame: Five inches by one inch by minimum 0.125 inch 6063T5 extruded aluminum hat channel, mounting flanges on both sides of frame, reinforced at corners.

b. Blades: Airfoil-shaped, single-piece blades made of heavy-duty 6063T5 extruded aluminum. Maximum 6 inches blade depth.

c. Bearings: Non-corrosive, molded synthetic sleeve, turning in hole in frame.

d. Seals:
1). Blade: Extruded vinyl type for ultra-low leakage. Mechanically attached to blade edge.
2). Jamb: Flexible metal compressible.

e. Linkage: Concealed in frame.

f. Axles: Minimum 1/2-inch diameter plated steel hex, mechanically attached to blade.

3. Finishes: Mill aluminum.

C. Round:

1. Performance/Design Criteria:

a. Temperature Rating: Maximum 250 degrees F.

b. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions.

c. Closed Position: Maximum pressure of 10 inches WC.

d. Maximum system velocity: 4,000 feet per minute.

e. Maximum Leakage: Maximum 6 cubic feet per minute per square foot at 1 inch WC.

f. Pressure Drop: Maximum 0.05 inch WC at air volume of 7,000 cubic feet per minute through 24 inch diameter damper.

2. Material:

a. Frame:
1). Under 6 inches Diameter: Two inches by minimum 12 gauge galvanized steel tube.
2). 6 through 12 inches Diameter: Two inches by 1/2-inch by minimum 14 gauge galvanized steel channel.
3). Above 12 through 24 inches Diameter: Two inches by 1/2-inch by minimum 1/8-inch galvanized steel channel.

b. Blade: Provide single-piece construction made of the following material:
1). 18 inches diameter and less: Minimum 12 gage galvanized steel.
2). Over 18 inches diameter: Minimum 10 gage galvanized steel, stiffeners as required.

c. Blade Seals: Closed cell polyethylene foam rubber or neoprene, fully encompassing and mechanically attached to blade edge.

d. Bearings: Self-lubricating stainless steel sleeve.

e. Axles: Minimum 1/2-inch diameter plated steel, full length of and extending 6 inches beyond damper frame, mechanically attached to blade.

3. Finishes: Mill galvanized.

## 2.08 GRAVITY BACKDRAFT DAMPERS

A. Manufacturers:
   1. Ruskin model BD2A1 (CBS-4 or CBS-8 as applicable).
   2. Greenheck.
   3. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Performance/Design Criteria: Blades fully open at maximum static pressure drop of 0.10-inch WC.

C. Materials:
   1. Frame: 6063T5 extruded aluminum, 0.090 inches wall thickness.
   2. Blades: Formed aluminum, 0.025 inches wall thickness. Extruded vinyl edge seals, mechanically locked into blade edge.
   3. Bearings: Corrosion resistant synthetic.
   4. Linkage: Concealed in frame.

## 2.09 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:
   1. Duro-dyne Corporation.
   2. Vent Fabrics.
   3. Ductmate.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Performance/Design Criteria: Provide fan connectors with static pressure ratings suitable for each specific application. Minimum pressure ratings must be greater than, or equal to, the fan's shut-off static pressure, as indicated by the submitted fan curve, with a 50 percent safety factor.

C. Materials:
   1. Metal edging: 24 gauge galvanized steel.
   2. Fabric: UL Listed, polyester blend with vinyl coating. Double folded seams. Four inches width.

## 2.10 ACCESS PANELS AND DOORS FOR DUCTS AND PLENUMS

A. Manufacturers:
   1. Air Balance Inc. model FSA-100 (Basis of Design).
   2. Ruskin.
   3. Ductmate.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Material:
   1. Frame and Door: Minimum 24 gauge galvanized steel.
   2. Reinforced doors with cross-bracing and/or otherwise stiffened to prevent rattling and vibration.

3. Seals: Rubber gaskets, secured to door or frame.
4. Where ductwork is insulated or lined, provide double-walled access door panels with one inch of internal insulation to match duct or plenum insulating and/or sound attenuating characteristics.
5. Walk Through Doors:
    a. Construct in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
    b. Provide insulation and inner liner to match plenum or casing.

C. Hinges and Latches:
1. Low velocity system access panels:
    a. Sizes 12 inches by 12 inches through 24 inches by 24 inches.
    b. Continuous steel hinge mechanically fastened to frame and quarter turn cam latches.
2. Walk through doors (any dimension over 24 inches):
    a. Provide three hinges.
    b. Provide two latches with inside and outside handles.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify location, size and type (i.e. fire resistive construction) of wall, floor and ceiling/roof penetrations.

### 3.02 PREPARATION

A. Protection on In-Place Conditions: During construction, install temporary closures of sheet metal, cardboard or polyethylene taped over ductwork openings to prevent construction dust and debris from entering duct systems.

### 3.03 INSTALLATION

A. Metal Ductwork and Fittings:
1. Install, seal and support ductwork and fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible for the duct pressure class and seal class specified. The use of “duct tape” as a duct seal method is prohibited.
2. Provide low pressure/velocity ductwork at the following locations:
    a. Outside air intake ductwork.
    b. Exhaust and relief air ductwork.
    c. Constant volume ventilating systems.
3. Proprietary or other joint systems may be substituted for SMACNA details when submitted and approved in writing before starting work.
4. Where ducts penetrate through walls exposed in occupied spaces, provide sheet metal escutcheons at each penetration to provide a clean, finished appearance.
5. Duct penetrations: See Section 20 05 29 - Mechanical Hangers and Supports.
6. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoffs, use 90-degree conical tee or low-loss tee connections.

7. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream of equipment.
8. Provide orifice plates or balance dampers at branch connections as required for proper ventilation system balancing. Select balancing device and installation method to limit noise from mechanical vibration or air bypass.
9. Do not use turning vanes in medium velocity duct systems.
10. Support duct mounted equipment equal to or greater than 40 pounds, such as heating coils, independently from ductwork.
11. Support duct mounted equipment less than 40 pounds using standard duct supports and sway bracing located within 12 inches of equipment.
12. Where offsetting ductwork is not possible, ducts may be reduced a maximum of 20 percent to clear obstacles with Contracting Agency's permission.
13. Where steel ductwork is visible through air outlets or inlets, paint visible interior ductwork flat black.

B. Flexible Ductwork:

1. Install, connect and support flexible ductwork in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Connection to air outlets in suspended grid ceiling systems: Provide a flexible duct length of 6 to 8 feet with one 90-degree bend or large radius 180-degree curve in addition to outlet connection. Support flexible duct at connections to air outlets to maintain minimum recommended bend radius.
3. Seal flexible duct connections to rigid ductwork with draw bands to the pressure class of the rigid duct system.
4. Flexible duct connections between medium pressure ductwork and air terminal units are prohibited.
5. Flexible ductwork is prohibited in inaccessible locations, such as above "hard" ceilings.
6. Flexible ductwork is prohibited at penetrations through walls.

C. Acoustical Lined Ductwork:

1. Provide standard one inch thick acoustically lined ductwork as indicated using the acoustical liner material specified. Attach the lining material to the ductwork in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Provide thicker acoustical lining where specifically noted.
2. Duct dimensions indicated are net free-area duct dimensions. Add twice the liner thickness to obtain outside duct dimensions.
3. Sleeve acoustical duct penetrations through full height walls perpendicular to wall surface. Provide 1/2-inch minimum gap between sleeve and duct. Fill gap with mineral wool backer and seal each side of penetration with acoustical sealant.

D. Casings and Plenums:

1. Install casings and plenums in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Set plenum doors 6 to 12 inches above floor. Arrange door swing so fan static pressure holds door in closed position.
3. Casings: Unless indicated otherwise, install floor mounted casings on 4 inch high concrete curbs.

4. At floor, rivet panels on 8 inch centers to steel angles. Where floors are acoustically insulated, furnish 18 gauge galvanized expanded metal mesh liner supported at 12-inch centers, turned up 12 inches at sides with sheet metal shields.

E. Volume Dampers:
   1. Provide air volume dampers at each low-pressure duct main and branch take-off for proper air balancing.
   2. Locate dampers a minimum of 10 feet from diffusers except where shown otherwise.
   3. Volume dampers are not to be installed in medium pressure, variable air volume systems.

F. Control Dampers:
   1. Provide opposed blade type dampers for the following applications:
      a. Exhaust fan discharge dampers.
      b. Outside air intake dampers.
      c. Isolation dampers.
   2. Provide parallel dampers for the following application: Air handling unit mixing box.

G. Gravity Backdraft Dampers:
   1. Provide backdraft dampers where shown on drawings and at each building exhaust or relief location where a motor operated control damper is not indicated.
      a. When provided for roof curb mounted exhaust fans, locate backdraft damper in the curb opening.
      b. When provided for fans located within building, locate backdraft damper in the discharge duct immediately upstream of the louver or hood.
   2. Double leaf butterfly dampers in roof outlets are permissible only for paint booths and similar applications.

H. Flexible Duct Connectors:
   1. Install duct connectors in accordance with the manufacturers written installation instructions.
   2. Provide a flexible airtight joint between fans and other vibrating equipment and the air distribution ductwork systems.
   3. Externally isolated air handling units and fans: Provide flexible connections where ducts attach to unit inlet and outlet(s) of unit.

I. Penetrations:
   1. Access Panels and Doors:
      a. Locate access doors to enable in-duct equipment to be easily inspected, cleaned, maintained and tested and/or reset.
      b. Provide access doors at the following locations:
         1). Fire, smoke and combination fire/smoke dampers.
         2). Motor operated dampers.
         3). Each side of duct mounted coils.
         4). Each side of duct mounted humidification dispersion panels.
         5). As necessary for duct cleaning in accordance with NADCA Industry Standard for Mechanical Cleaning of Non-Porous Air Conveyance System Components.
         6). As necessary for maintenance access to serviceable instrumentation and control equipment.

c. Coordinate location and size of access doors in walls, partitions and ceilings to correspond with duct access doors, dampers and automatic control devices and instruments.

d. Coordinate with supplier of component air handlers, package units and similar equipment to ensure that access doors and panels will not be obstructed when the equipment is installed.

J. Interface with Other Work:

1. Assist electrical and controls trades in mounting instrumentation devices and safety controls in ductwork and air handling units.

2. Make penetrations through exterior building walls watertight. Detail ductwork connections to prevent condensation or leakage from entering into surrounding building construction. Provide sleeves, special connections and sealant as required to accomplish this performance requirement.

**3.04 SITE QUALITY CONTROL**

A. Verify accessibility to ventilation system components for maintenance, adjustment and cleaning.

**3.05 ADJUSTING**

A. Adjust and balance dampers in accordance with Section 23 05 93 - Testing. Adjusting and Balancing.

**3.06 CLEANING**

A. Prior to building occupancy and after ventilating systems are complete and functional, verify cleanliness of ventilating system ductwork. Verification shall comply with the inspection method(s) outlined in the National Air Duct Cleaners Association (NADCA) Standard for Assessment, Cleaning, and Restoration of HVAC Systems 2013. Conduct inspection in the presence of a Contracting Agency representative.

B. If the ductwork does not comply with the standard for cleanliness, clean the affected ductwork as follows:

1. Small systems: Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient airflow, clean one half of system completely before proceeding to other half. Protect equipment with potential to be harmed by excessive dirt with temporary filters, or bypass during cleaning.

2. Large systems: Clean duct systems with high power vacuum machines. Protect equipment with potential to be harmed by excessive dirt with filters, or bypass during cleaning.

**END OF SECTION**

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**SECTION 23 34 00**
**HVAC FANS**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes:
   1. Mixed flow fans.

B. Related Sections:
   1. 01 91 00 - Commissioning
   2. 20 00 00 - Mechanical General Requirements
   3. 20 05 13 - Common Motor Requirements
   4. 20 05 29 - Mechanical Hangers and Supports
   5. 20 05 48 - Vibration and Seismic Control
   6. 20 05 53 - Mechanical Identification
   7. 23 05 93 - Testing, Adjusting and Balancing
   8. 23 31 00 - Ducts and Accessories
   9. 23 37 00 - Air Outlets and Inlets
   10. 25 30 00 - Building Automation System Field Devices
   11. 25 40 00 - Variable Speed Drives
   12. 25 50 00 - Building Automation System
   13. 25 90 00 - Sequence of Operations
   14. Divisions 26, 27 and 28 - Electrical

### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. Air Movement and Control Association (AMCA) 99 - Standards Handbook.
   3. ANSI/AMCA 210 (ANSI/ASHRAE Standard 51) - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
   4. AMCA Publication 261 Directory of Products Licensed to Bear the AMCA Certified Rating Seal.
   5. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
   6. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

### 1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide product performance characteristics and output as specified or scheduled on drawings.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
   1. Provide fan curves with scheduled operating point clearly plotted.
   2. Provide sound power levels (in decibels) for each octave band for inlet, discharge, and radiated sound power for the assembled fan unit. Obtain sound level data by one of the following methods:
      a. Actual measurements from tests performed in accordance with AMCA Standards in an AMCA registered test chamber.
      b. Documented calculations that start with AMCA tested fan sound data and are modified in accordance with ASHRAE procedures identified in Chapter 48 of the 2011 ASHRAE HVAC Applications Handbook to accurately predict the sound power levels for the configuration shown.
   3. Provide electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C. Shop Drawings. Include the following information in the scaled ventilation system shop drawings:
   1. Location, orientation, and size of fans.
   2. Maintenance access and clearance requirements.
   3. Fan support methods (i.e., housekeeping pads, roof curbs, etc.).
   4. Ductwork connections and sizes.

D. Operation and Maintenance (IO&M) Manuals.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Record Documentation: Record actual locations of fans and components and areas required for maintenance access.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 GENERAL**

A. Manufacturers:
   1. Greenheck.
   2. Cook.
   3. Substitution request required.

B. Description:
   1. Regulatory Requirements:
      a. AMCA Certified Ratings seal for sound and air performance.

b. Products Requiring Electrical Connection - Listed and classified by Underwriters Laboratories Inc., or by a testing firm acceptable to the Authority Having Jurisdiction as suitable for the purpose specified and indicated.

C. Performance/Design Criteria: As scheduled.

D. Manufacturer's Nameplate: Permanently affixed, embossed metal containing model number and individual serial number for future identification, located on a permanent part of the fan.

**2.02 MIXED FLOW FANS**

A. Housing: Welded or bolted heavy gauge steel construction with inlet and outlet collars for slip fit duct connections. The housing, bearing, and motor supports constructed of structural steel members to prevent vibration and provide rigid support.

B. Fan wheel: Mixed flow type, with wheel cone, spherical backplate and single thickness cambered blades. Statically and dynamically balance to ANSI S2.19 balance grade G6.3. Match wheel cone and fan inlet cone to achieve precise running tolerances.

C. Motor:

1. Inverter duty.
2. Motor service factor of 1.15 or greater.
3. Class B motor Insulation or greater.

D. Drive: Belt.

E. AMCA Certified Ratings. Seals for both sound and air performance.

F. Options and Accessories:

1. Mounting support - ceiling hung.
2. Access door - bolted, flush.
3. Hanging isolation, Spring Hanging w/ 1-inch deflection, base field mounted.
4. Permatector coating on steel components.
5. Inlet silencer.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Surface Preparation:

1. Coordinate penetration locations with structure.

**3.02 INSTALLATION**

A. General:

1. Install fans in compliance with manufacturer's written installation instructions.
2. Provide flexible connections at fan duct connections as shown or specified. See Section 23 31 00 - Ducts and Accessories for flexible duct connectors.
3. Support fans independently from ductwork. Provide fan support in accordance with 20 05 29 - Mechanical Hangers and Supports.
4. Provide vibration isolation and seismic restraint for fans in accordance with 20 05 48 - Mechanical Vibration and Seismic Control.
5. Ensure that fan access doors and panels are not obstructed when the equipment is installed.
6. Extend lubrication points so each is easily reached for maintenance.

B. Interface with Other Work:

1. Coordinate and sequence installation of fans with trades responsible for portions of this and other related sections of the Project Manual.
2. Rework required because of failure to follow the manufacturer's written installation instructions or to properly coordinate the installation with related work shall be completed at no additional expense to the Owner.

**3.03 REPAIR/RESTORATION**

A. Refer to Section 20 00 00 - Mechanical General Requirements for general repair/restoration requirements.

**3.04 SITE QUALITY CONTROL**

A. Manufacturer Services: Verify fans are installed and operational in accordance with the manufacturer's written installation instructions.

**3.05 SYSTEM STARTUP**

A. Start-up and operate fans in accordance with the manufacturer's written installation and operation manual check list.

**3.06 ADJUSTING**

A. Adjust and balance fans in accordance with Section 23 05 93 - Testing, Adjusting and Balancing.

**3.07 CLEANING**

A. Upon completion of installation and prior to initial start-up, vacuum clean and wipe down external system components and internal shrouded areas.

**3.08 CLOSEOUT ACTIVITIES**

A. Demonstration: Demonstrate proper system operation in accordance with Section 25 90 00 - Sequence of Operations, utilizing the building automation system.

**END OF SECTION**

# SECTION 23 37 00
# AIR OUTLETS AND INLETS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Air Diffusers and Registers.
   2. Return/Exhaust Grilles.
   3. Stationary Louvers.
   4. Roof Hoods.

B. Related Sections:
   1. 20 00 00 - Mechanical General Requirements
   2. 20 05 29 - Mechanical Hangers and Supports
   3. 23 05 93 - Testing, Adjusting and Balancing
   4. 23 31 00 - Ducts and Accessories

### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. SMACNA HVAC Duct Construction Standards - Metal and Flexible Fourth Edition 2021.
   3. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
   4. ARI Standard 890-2001 - Air Diffusers and Air Diffuser Assemblies.

### 1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide product performance characteristics as specified or scheduled on drawings.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
   1. Air outlets and inlets performance data at operating conditions.
   2. Submit color selections for louvers from manufacturer’s color selection chart.

C. Shop Drawings:
   1. This Section shop drawings to be submitted under Section 20 00 00 - Mechanical General Requirements.
   2. Include the following information on scaled ventilation system shop drawings:
      a. Air diffuser, register and grille locations, duct connection sizes and throw directions.
      b. Louver locations with plenum dimensions.
      c. Louver penetration detail which clearly shows wall type, louver frame type, duct connection method, sealant and or gasket locations and drainage path.

D. Test and Evaluation Reports:
   1. Louver plenum water tightness test: Submit written certification that louver plenums have been satisfactorily tested and have been verified water-tight prior to insulating plenums.
   2. Refer to louver test under Part 3 below.

E. Installation, Operation and Maintenance (IO&M) Manuals.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 AIR DIFFUSERS AND REGISTERS**

A. Manufacturers:
   1. Titus.
   2. Price.
   3. Nailor Industries Inc.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Performance/Design Criteria: As scheduled.

C. Finishes: Standard white, baked enamel or powder coated finish suitable for field application of custom finish color as required.

D. Accessories:
   1. Equalizing grids.
   2. Earthquake tabs.

E. Correlate diffuser style, dimension, and fit with ceiling. Provide diffusers with modules of the proper size to match the suspended ceiling layout or with appropriate factory provided frame for surface mounting.

**2.02 RETURN/EXHAUST GRILLES**

A. Manufacturers:
   1. Titus.
   2. Price.
   3. Nailor Industries Inc.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Performance/Design Criteria: As scheduled.

C. Finishes: Standard white, baked enamel or powder coated finish suitable for field application of custom finish color as required.

D. Accessories: Earthquake tabs.

E. Correlate grille style, dimension, and fit with ceiling. Provide grilles with modules of the proper size to match the suspended ceiling layout or with appropriate factory provided frame for surface mounting.

**2.03 WALL LOUVERS**

A. Manufacturers:
   1. Ruskin.
   2. Greenheck.
   3. Pottorff.
   4. Substitution request required.

B. Description:
   1. General:
      a. 6 inches deep, stationary wall louvers.
      b. Horizontal drainable blades (37.5 degree blade angle) with integral downspouts incorporated into frame jamb and mullion design.
      c. Frame style designed for installation into wall penetration construction type indicated. See Architectural penetration details to coordinate style types.
      d. Louver frame with surfaces designed to accept exterior caulking.
   2. Regulatory Requirements:
      a. Louvers shall bear the AMCA Certified Ratings label for Water and Air Performance.
      b. Manufacturer's ratings based on testing in accordance with AMCA Publication 511.

C. Performance/Design Criteria:
   1. Size and performance as scheduled.
   2. Water penetration: 0.01 ounces of water per square foot of free area at 1000 FPM free area velocity.

D. Materials: Heavy gauge extruded aluminum.

E. Finishes: .
   1. Prime Coat.
   2. Standard Finish: Baked enamel (fluoropolymer). Color selected by Architect.
   3. Premium Finish: Epoxy. Color selected by Architect.
   4. Premium Finish: Kynar®. Color selected by Architect.
   5. Anodized Finish: Clear or color. Color selected by Architect.

F. Accessories:
   1. Bird Screens: Flattened, expanded aluminum with 1/2-inch mesh pattern. Located on internal side of louver assembly.
   2. Blank-off Panels:
      a. Provide factory installed, insulated blank-off panels as scheduled and/or as shown.
      b. Paint exterior side of blank-off panel flat black.
      c. Field installed blank-off panels are not acceptable.
   3. Extended Sills: Extruded aluminum.

## 2.04 GRAVITY INTAKE/RELIEF ROOF HOODS

A. Manufacturers:
   1. Greenheck.
   2. Cook.
   3. Metal Form.
   4. Any other manufacturer meeting the requirements of the Contract Documents. Substitution request not required.

B. Description:
   1. Low profile hoods constructed of roll-formed arched panels with interlocking seams.
   2. 12-inch high base with curb cap. Coordinate curb cap size with roof hood.
   3. Tie down points.

C. Performance/Design Criteria:
   1. Size and performance as scheduled.
   2. Manufacturer's ratings based on testing in accordance with AMCA Publication 511.

D. Materials:
   1. Bolted and welded construction utilizing corrosion resistant fasteners.
   2. Minimum 18 gauge aluminum construction.
   3. Minimum 8 gauge aluminum support members.

E. Finishes: Galvanized.

F. Accessories:
   1. Bird Screens: Aluminum with 1/2-inch mesh pattern.
   2. Dampers: Refer to Section 23 31 00 - Ducts and Accessories.
   3. Roof Curbs:
      a. Pre-fabricated by same manufacturer as hood manufacturer.
      b. Type and slope to match roof installation location.
      c. Minimum 18 gauge aluminum construction.
      d. 1-1/2 inch, three pound density insulation.
      e. 12-inch curb height.
      f. Wood nailer.

# PART 3 EXECUTION

## 3.01 PREPARATION

A. Removal: Remove existing air diffusers, registers and grilles designated for relocation and reuse after repair and cleaning.

## 3.02 INSTALLATION

A. General:
   1. Install products in compliance with the manufacturer's written installation instructions.
   2. Connect air outlets, registers, grilles and louvers to ventilation duct systems in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Air Diffusers, Registers and Grilles:

1. Install air diffusers, registers and return/exhaust grilles at the locations shown.
2. Orient and adjust diffusers to provide the throw directions indicated.
3. Provide appropriate borders for the ceiling, wall or floor construction type.

C. Wall Louvers:

1. Install wall louvers at the locations shown and in accordance with manufacturer's written installation instructions and details for the specific wall type.
2. Coordinate louver locations, borders and mullion spacing with architectural panels.
3. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
4. Seal louver penetrations watertight. Install, seal and insulate louver ductwork (intake or exhaust/relief plenums) to interior louver frame to prevent condensation or entrained water that enters ductwork from leaking into building. Provide sleeves, special connections and sealant as required to accomplish this requirement.
5. Slope plenum ductwork such that any entrained water drains out through base frame of wall louver. If drain holes are not provided by the manufacturer, drill 1/2-inch (minimum diameter) weep holes at 12-inch intervals on center through base of louver as required for drain water to escape. Touch-up holes with factory supplied touch-up paint.

## 3.03 REPAIR/RESTORATION

A. Refer to Section 20 00 00 - Mechanical General Requirements for general repair/restoration requirements.

## 3.04 SITE QUALITY CONTROL

A. Site Tests and Inspections: Prior to insulating louver intake and exhaust/relief plenums, with applicable fans shutdown, lightly spray water into louver from building exterior such that water enters plenums. Verify that the water readily drains out of louver drain holes without pooling and that no visible leakage is present. Repair and retest as necessary until performance requirements are met.

## 3.05 CLEANING

A. Clean exposed surfaces of air outlets and inlets to remove fingerprints and dirt, with water and mild soap or detergent not harmful to finish.

**END OF SECTION**

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# SECTION 23 51 00
# BREECHINGS, CHIMNEYS AND STACKS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes: Boiler venting system.

B. Related sections:

1. 20 00 00 - Mechanical General Requirements
2. 20 05 29 - Mechanical Hangars and Supports
3. 20 05 48 - Vibration and Seismic Control
4. 23 52 23 - Cast Iron Boilers and Accessories

### 1.02 REFERENCES

A. Codes and Standards: See Section 20 00 00 - Mechanical General Requirements.

B. Abbreviations, Acronyms and Definitions:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements: This section describes specific requirements, products and methods of execution for boiler venting systems.

B. Performance Requirements:

1. Provide product performance characteristics as specified or scheduled on drawings.
2. Boiler venting products shall be represented by the same entity that represents the boilers. Provide a single source of responsibility for the boilers and the venting as a complete system.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Provide manufacturers' product literature.
2. Annotate to indicate specified salient features and performance criteria for each product specified.

C. Calculations:

1. Provide calculations from the stack manufacturer based on the submitted stack shop drawings and submitted and approved boiler draft requirements to demonstrate adequate draft available under the following operating conditions:
   a. Boiler high and low firing rates for winter conditions of -30 degrees F.
   b. Boiler high and low firing rates for summer conditions of 73 degrees F.

2. For multiple boilers with a common boiler stack, identify number of operating boilers and the boiler flue connection position in the manifold.

D. Shop Drawings:

1. Submit fully dimensioned shop drawings of boiler room(s) showing the following:

a. Major equipment and housekeeping pads, with clear callouts indicating deviations from layout shown:

1). Submitted boiler shall be dimensionally equal to scheduled product within 6 inches in each dimension. Maintain clearances shown on drawings. Submit fully dimensioned shop drawings of boiler room(s) at drawing scale of 1/4-inch equals 1 foot 0 inches or larger, showing entire boiler room, equipment and deviations. Provide boiler room modifications required due to dimensional and technical deviation at no additional cost to the Owner. Submit shop drawings of proposed equipment layout and base or pad for each piece of equipment.

2). If equipment to be provided exceeds the weight of the specified equipment by more than 20 percent, or if the location is to be altered, submit shop drawings and calculations of proposed revised structural design, noting location of pertinent loads, stamped by a registered professional engineer.

b. Service area boundaries as required by manufacturer's installation.

c. Boiler piping and vent stack locations with dimensions. Coordinate stack roof penetrations with roof structure.

d. Indicate mechanical and electrical service locations and requirements.

**1.06 CLOSEOUT SUBMITTALS:**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 BOILER VENTING (CHIMNEY) SYSTEM**

A. Manufacturers:

1. Schebler.
2. Selkirk Metalbestos, Model IPSC1.
3. AMPCO (American Metal Products Company).
4. Cleaver Brooks.
5. ICC (Industrial Chimney Company).
6. Van Packer.

B. Description:

1. Provide complete, engineered venting system for oil fired equipment, including connections and adapters to smoke outlets.
2. Provide prefabricated chimney system of the size and configuration shown.

3. Provide supports and seismic restraints in accordance with the manufacturer's UL listing, Section 20 05 29 - Mechanical Hangers and Supports, and Section 20 05 48 - Vibration and Seismic Control.
4. Regulatory Requirements:
    a. US listed for application.
    b. Listed for pressurized systems.

C. Materials:
1. Stainless steel liner.
2. Stainless steel outer jacket where exposed to outdoors.
3. Galvalum steel outer jacket where located indoors.

D. Assembly/Fabrication:
1. 1 inch fiber insulation between inner and outer stack walls.
2. Clean-out tee with ball isolation valve, threaded hose connection and end cap
3. Roof thimble (Coordinate required thimble rough-in dimensions with roof penetration requirements and structural bracing).
4. Stack cap.
5. Stainless steel flashing and counter flashing.
6. Pre-manufactured support brackets.

## PART 3 EXECUTION

### 3.01 INSTALLERS

A. Installer: Perform work by experienced personnel under the supervision of a qualified installation supervisor.

### 3.02 PREPARATION

A. Surface Preparation: Prior to installation of stacks, verify that shop drawings are approved and stack locations and routing have been coordinated with other trades.

### 3.03 INSTALLATION

A. Special Techniques:
1. Install equipment in accordance with manufacturer's instructions and requirements of the codes specified herein.
2. Install with clearances from building elements in accordance with chimney listing and IMC.
3. Install components that were furnished loose with equipment for field installation.
4. Touch up marred or scratched factory finished surfaces using finish materials furnished by manufacturer.

B. Interface with Other Work: Coordinate and sequence installation of boiler and water heater and stacks with trades responsible for portions of this and other related sections of the Project Manual.

### 3.04 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**3.05 SITE QUALITY CONTROL**

A. Non-Conforming Work: Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

**3.06 CLEANING**

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces of boiler stacks.

**END OF SECTION**

# SECTION 23 52 23
# CAST IRON BOILERS AND ACCESSORIES

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes:
   1. Packaged hydronic boilers and appurtenances.
   2. Fuel oil burners.
   3. Packaged boiler control system.

B. Related sections:
   1. 01 91 00 - Commissioning
   2. 20 00 00 - Mechanical General Requirements
   3. 20 05 13 - Common Motor Requirements
   4. 20 05 29 - Mechanical Hangars and Supports
   5. 20 05 48 - Vibration and Seismic Control
   6. 20 05 53 - Mechanical Identification
   7. 23 05 93 - Testing, Adjusting and Balancing
   8. 23 11 13 - Fuel Oil Piping and Specialties
   9. 23 21 13 - Hydronic Piping and Specialties
   10. 23 21 23 - Hydronic Pumps
   11. 23 51 00 - Breechings, Chimneys and Stacks
   12. 25 50 00 - Building Automation System
   13. 25 90 00 - Sequence of Operations
   14. Divisions 26, 27 and 28 - Electrical

### 1.02 REFERENCES

A. Codes and Standards:
   1. See Section 20 00 00 - Mechanical General Requirements.
   2. NFPA 31 - Installation of Oil-Burning Equipment.
   3. ASME Boilers and Pressure Vessel Code (1998), Sections IV & VI.
   4. ASME CSD-1 - Controls and Safety Devices for Automatically Fired Boilers.

B. Abbreviations, Acronyms and Definitions:
   1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
   2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
   3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. This section describes specific requirements, products and methods of execution for the generation of heat, which will be distributed to the locations shown.
   2. The method of distribution of this heat is specified elsewhere.

B. Performance Requirements:

1. Provide product performance characteristics as specified or scheduled on drawings.
2. Operate central heating system in accordance with Section 25 90 00 - Sequence of Operations.
3. Boilers shall be represented by the same entity that represents the boiler venting products. Provide a single source of responsibility for the boilers and the venting as a complete system.

**1.04 PRE-INSTALLATION MEETINGS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.05 SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Provide manufacturers' product literature, clearly annotated to indicate specified salient features and performance criteria to include:
   a. Product model and selected optional equipment, appurtenances and special features.
   b. Boiler physical and performance characteristics as scheduled.
   c. Include weight of equipment filled with water. Boilers weighing more than 20 percent heavier that the schedule equipment will be disapproved unless it is determined by the Owner's representative that structure is able to bear the additional weight. Contractor may elect to increase structural support, in which case proposed changes to the structure and calculations stamped by a registered engineer shall be submitted.
   d. Dimensional data.
   e. Anchoring method.
2. Regulatory Requirements: Provide automatic boiler controls listed in the Mechanical Code and ASME CSD-1, latest edition, together with most current addenda and interpretations.

C. Shop Drawings:

1. Submit fully dimensioned shop drawings of boiler room(s) showing the following:
   a. Major equipment and housekeeping pads, with clear callouts indicating deviations from layout shown:
      1). Submitted boiler shall be dimensionally equal to scheduled product within 6 inches in each dimension. Maintain clearances shown on drawings. Submit fully dimensioned shop drawings of boiler room(s) at drawing scale of 1/4-inch equals 1 foot 0 inches or larger, showing entire boiler room, equipment and deviations. Provide boiler room modifications required due to dimensional and technical deviation at no additional cost to the Owner. Submit shop drawings of proposed equipment layout and base or pad for each piece of equipment.
      2). If equipment to be provided exceeds the weight of the specified equipment by more than 20 percent, or if the location is to be altered, submit shop drawings and calculations of proposed revised structural design, noting location of pertinent loads, stamped by a registered professional engineer.
   b. Service area boundaries as required by manufacturer's installation.

c. Boiler piping and vent stack locations with dimensions. Coordinate stack roof penetrations with roof structure.

d. Indicate mechanical and electrical service locations and requirements.

e. Boiler management system location.

D. Manufacturer Reports:

1. Provide start-up and operational test reports for each boiler. Refer to Article on Site Quality Control.

2. Provide start-up report for boiler control system with selected presets annotated.

3. Submit a letter to document that the training was conducted. Include in the letter the date, start/stop times for the training, list of attendees and signature/title of the person(s) providing the training.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 HOT WATER BOILER - CAST IRON**

A. Manufacturers:

1. Weil-McLain.

2. Burnham.

B. Description:

1. Factory assembled, sectional, wet base, cast iron boilers suitable for forced draft firing.

2. Regulatory Requirements:

C. Performance/Design Criteria: The thermal output of each boiler shall not be less than and no more than 10 percent greater than the values scheduled. Required thermal capacity shall be the gross I=B=R water rating.

D. Assembly/Fabrication:

1. Insulated metal jacket.

2. Burner mounting plate.

3. Gas tight seal between sections.

4. Flue damper assembly with valved test connection.

5. ASME safety relief valve (30 PSIG).

6. Low point system drain valve with end cap.

7. Flange mounted burner.

8. Instrument panel for each boiler complete with the following:
    a. Fire box draft gauge.
    b. Stack draft gauge.
    c. Stack temperature gauge.
    d. Boiler supply temperature gauge.
    e. Boiler return temperature gauge.
    f. Burner running time totalizer.
9. Provision for anchoring boiler to its housekeeping pad adequate to meet seismic requirements. Refer to Section 20 05 48 - Vibration and Seismic Control.
10. Additional components as necessary to provide a complete operational system.

**2.02 FUEL OIL BURNER**

A. Manufacturer:
    1. Beckett.
    2. Power Flame.
    3. Webster.
    4. Carlin.

B. Description:
    1. Forced draft fuel oil burner sized to match boiler rating and furnished by boiler manufacturer as part of the required complete boiler package.
    2. Regulatory Requirements: Burner control system shall be UL/FM listed as a unit.

C. Assembly:
    1. Combustion and firing controls including Honeywell Model RM-7800 series Flame Safeguard System with self-diagnostic capabilities. Provide one digital display readout module to be shared by the boilers and a set of dry contacts for monitoring only by the BAS.
    2. Firing control shall be Low-High-Low-Off.
    3. Peripheral controls including reset operating temperature controller, a high limit manually reset control, auxiliary Honeywell L4006E high limit control and a low water safety shut-off control.
    4. Provide wiring between burner cabinet, controls, and safety devices in accordance with applicable provisions of Divisions 26, 27 and 28.
    5. Indicators and alarms shall include power on, run, lock out, and other indicating lights as applicable. Lock out indicator shall have provision for connection to a remote alarm or monitoring device and burner firing control shall have provision for controlling boiler shut-off valve through the BAS control system.
    6. Coordinate the boiler controls specified in this section with the BAS control system specifications.

**2.03 LOW WATER CUTOFF**

A. Manufacturers:
    1. McDonnell Miller.
    2. Approved equal.

B. Description: Model #63M low water cut-off device for each boiler.

C. Performance/Design Criteria:
   1. 50 PSIG working pressure.
   2. UL/FM approved.
D. Operations: Wired in series with burner control.
E. Accessories: McDonnell Miller TC-4 test and check assembly.

**2.04 AUXILIARY HIGH LIMIT**

A. Manufacturers:
   1. Honeywell.
   2. Approved equal.
B. Description: Model L4006E auxiliary high limit sensor for each boiler.
C. Operations: Monitor boiler auxiliary high limit from BAS. See Section 25 90 00 - Sequence of Operations.

**2.05 EMERGENCY BOILER SHUTOFF**

A. Provide an emergency boiler shutoff switch. See Division 26.

**PART 3 EXECUTION**

**3.01 INSTALLERS**

A. Installer: Perform work by experienced personnel previously engaged in boiler plant construction and under the supervision of a qualified installation supervisor.

**3.02 PREPARATION**

A. Protection of In-Place Conditions: Cover boilers and burners and plug piping connections to protect equipment from construction dirt and debris.
B. Surface Preparation:
   1. Prior to installation of boilers, verify concrete housekeeping pads are complete and properly sized for boiler mounting.
   2. Prior to installation of stacks, verify that shop drawings are approved and stack locations and routing have been coordinated with required roof penetrations and the work of other trades.

**3.03 INSTALLATION**

A. Special Techniques:
   1. Install equipment in accordance with manufacturer’s instructions and requirements of the codes specified herein.
   2. Install boiler control system in accordance with manufacture’s installation instructions. Connect each of the boilers to the control system. Program control system to maintain boiler water temperature control as described in Sequence of Operation.
   3. Connect to the building automation system.
   4. Provide conductive compound paste in the temperature sensor wells.
   5. Setting of equipment:
      a. Set equipment on concrete housekeeping pads compatible with the building structural system.
      b. Level equipment to within recommended tolerances.

6. Anchoring:
    a. Anchor boilers to housekeeping pads as recommended by the manufacturer and to allow for normal expansion and contraction.
    b. Coordinate with Section 20 05 48 - Vibration and Seismic Control.
7. Thermal expansion:
    a. Install hydronic piping to allow for normal thermal expansion and contraction.
    b. Provide anchors where necessary and as indicated.
    c. Provide expansion loops, anchors and alignment guides to suit conditions and as indicated.
8. In systems containing glycol, provide only products specifically designed and approved for continuous operation with the glycol solution specified.
9. Install components that were removed from equipment for shipping purposes.
10. Install components that were furnished loose with equipment for field installation.
11. Provide interconnecting electrical control and power wiring.
12. Provide oil vent and service piping.
13. Provide piping for boiler pipe connections.
14. Program, adjust and operationally test boiler operation and sequencing in accordance with the manufacturer's written installation and testing instructions and Section 25 90 00 - Sequence of Operations.
15. Touch up marred or scratched factory finished surfaces using finish materials furnished by manufacturer.
16. Install emergency boiler shutoff switch outside the boiler room at each exit at 48 inches above finished floor.

B. Interface with Other Work: Coordinate and sequence installation of boilers and stacks with trades responsible for portions of this and other related sections of the Project Manual.

C. Systems Integration: Coordinate location and operation of boiler emergency shutoff switch with Division 26.

**3.04 REPAIR/RESTORATION**

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**3.05 SITE QUALITY CONTROL**

A. Non-Conforming Work: Rework required because of failure to follow the manufacturer’s written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

B. Manufacturer Services:

1. Provide manufacturer's representative start-up and instruction of each complete boiler system including all components assembled and furnished by the manufacturer whether or not of his own manufacture.
2. Start-up shall be conducted by experienced and factory authorized technician in the regular employment of the authorized service organization.
3. Start-up and adjust the system to within the tolerances as specified by the equipment manufacturer.

4. Operationally test safety devices and record settings. Test and record oxygen, carbon dioxide, stack temperature, and calculate excess air and steady state efficiency. Make final lead/lag set point adjustments. List set points in report. Submit final data for review.
5. Test boiler operation and sequencing in accordance with the manufacturer's written installation and testing instructions and Section 25 90 00 - Sequence of Operations.
6. Provide a start-up report that includes final control settings, and a performance chart of the control system furnished.
7. Submit a letter of certification with copy of start-up report, indicating that the boiler start-up has been completed, that the boilers are properly adjusted and operating within the tolerances as specified by the manufacturer, and that the sequence of operation is fulfilled.

**3.06 ADJUSTING**

A. Coordinate and work directly with the requirements of Section 23 05 93 - Testing, Adjusting and Balancing, to provide systems in proper operating order.

B. Make corrections and adjustments as required by the Testing, Adjusting and Balancing (TAB) Agency in a timely manner.

**3.07 CLEANING**

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces of boilers and burners.

**3.08 CLOSEOUT ACTIVITIES**

A. Demonstration: Provide 2 hours of demonstration conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

B. Training: Provide 4 hours of operational instruction conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

**END OF SECTION**

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**SECTION 23 73 00**

**CENTRAL AIR HANDLING UNITS**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Central air handling units.
2. Air filter media and support frames.
3. Heat recovery ventilator units.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 20 05 13 - Common Motor Requirements
4. 20 05 48 - Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 07 00 - Mechanical Insulation
7. 23 05 93 - Testing, Adjusting and Balancing
8. 23 21 13 - Hydronic Piping and Specialties
9. 23 31 00 - Ducts and Accessories
10. 25 30 00 - Building Automation System Field Devices
11. 25 40 00 - Variable Speed Drives
12. 25 50 00 - Building Automation System
13. 25 90 00 - Sequence of Operations
14. Divisions 26, 27 and 28 - Electrical

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. AMCA 99 (Air Movement and Control Association) - Standards Handbook.
3. ASHRAE Standard 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
4. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
5. ASHRAE Standard 52.2-2012 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

B. Abbreviations, Acronyms and Definitions:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

## 1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. This section describes specific requirements, products and methods of execution for the central air handling equipment, which will be distributed to the locations shown.
2. The method of air distribution is specified elsewhere.

B. Performance Requirements:

1. Provide product performance characteristics as specified or scheduled on drawings.
2. Operate ventilation systems in accordance with Section 25 90 00 - Sequence of Operations.

## 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Sound Power Levels: Provide custom sound power level data (decibels) for each octave band at inlet, discharge and radiated for the assembled air handling unit as shown.
    a. Octave band sound power levels shall not exceed those scheduled.
    b. Determine sound level data using one of the following methods:
        1). Actual measurements from tests performed in accordance with AMCA Standards in an AMCA registered test chamber.
        2). Documented calculations that start with AMCA tested fan sound data and are modified in accordance with ASHRAE Handbook 2011 HVAC Applications, Chapter 48 - Noise and Vibration Control to accurately predict the sound power levels for the configuration shown.
2. Wiring Diagrams: Provide electrical power connection and control logic wiring diagrams. Diagrams must differentiate between factory installed and field-installed wiring.

C. Shop Drawings:

1. This Section shop drawings to be submitted under Section 20 00 00 - Mechanical General Requirements.
2. Provide dimensional and orientation information (plan and elevation) for the approved central air handling unit(s), including housekeeping pad perimeter, incorporated into the ventilation system shop drawings.
    a. Label overall air handling unit(s) as scheduled. Label each cabinet section as specified.
    b. Show duct connections, with duct sizes indicated. Locate bottom of supply duct connections off discharge plenum as high as possible to maximize fan room floor space.
    c. Show damper arrangement and sizes.
    d. Show access door locations and access clearances for filter, coil and fan replacement.
    e. Show electrical connection points.

3. Coordinate supply fan discharge plenum floor penetrations and return fan/exhaust fan roof penetrations with structural. Exhaust fan vertical stack/relief hood alignment is critical as is coil/filter pull space alignment with the buildings support columns.

D. Installation, Operation and Maintenance (IO&M) Manuals.

E. Manufacturer Reports:

1. Provide a certificate from the Manufacturer's Representative indicating that the central air handling unit(s) is/are installed and operational in accordance with the manufacturer's written installation, operation and maintenance manual.

2. Provide start-up and operational checks using manufacturer checklists, signed by both the installing Contractor and Manufacturer's Representatives.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 MAINTENANCE MATERIAL SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Extra Stock Materials: Spare Filters. Furnish one complete set of replacement filters for each air handling unit upon final completion of project. Filters are to remain sealed in their original boxes and labeled by equipment tag as scheduled. Locate filters in storage area designated by the Contracting Agency.

**1.08 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Manufacturer qualifications: Company specializing in manufacturing the products specified in this section with a minimum of 10 years' documented experience.

C. Certifications: Air filters certified and tested in accordance with ASHRAE Test Standard 52.2.

D. Regulatory requirements: Products requiring electrical connection shall be listed and classified by Underwriters Laboratories Incorporated, or by a testing firm acceptable to the Authority Having Jurisdiction.

**1.09 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Storage and Handling Requirements: Maintain access doors shut, dampers and supply duct connections covered, and drain connections capped to protect components from construction dirt and debris.

**1.10 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 CENTRAL AIR HANDLING UNIT (AHU-4)**

A. Manufacturers:

1. York / Johnson Controls.

2. Daikin.

3. Trane.

4. Approved equal.

B. Description:

1. Dimensions: Air handler dimensions and base rail heights scheduled are for basis of design manufacturer as indicated. The dimensions for “as equal” manufacturers may differ. Prior to submitting equipment provided by an “as equal” manufacturer, verify that the unit will adequately fit in the space provided with proper access for operation and maintenance to include the removal/replacement of components.
2. Regulatory Requirements: Products requiring electrical connection - Listed and classified by Underwriters Laboratories Incorporated, or by a testing firm acceptable to the Authority Having Jurisdiction.
3. Unit will be complete with fans, motors, coils, dampers, controls, access doors and other components/options, as shown on product drawings, wiring diagrams, and as described in performance specifications.
4. Fans and drives will be balanced to limit vibration at operating speeds.
5. Unit will ship in one (1) piece whenever possible. Shipping splits will be provided when necessary. Lifting lugs will be provided where required for proper lifting.
6. Unit casing will be factory insulated.
7. Units will be ETL labeled.

C. Unit casing construction:

1. 6-inch galvanized structural steel base rail under the full perimeter of the unit.
2. Formed steel base rails suitable for rigging and lifting will be provided, as shown on product drawings.
3. Lifting lugs will be provided where required for proper lifting.
4. Unit is specifically designed for indoor applications.
5. Unit casing will consist of a structural frame and insulated roof, wall, and floor panels.
6. Removal of wall panels will not affect structural integrity of units.
7. Unit casing will be insulated with spray injected foam to achieve a minimum thermal resistance of R13 hr-ft2-°F/BTU. Insulation application will meet the requirements of NFPA 90A.
8. Insulation system will be resistant to mold growth in accordance with a standardized test method such as UL 181 or ASTM C 1338.
9. Unit will conform to ASHRAE Standard 111 Class 6 for casing leakage no more than 1% of design airflow at 1.25 times design static pressure up to a maximum of +8 inches WC in positive pressure sections and -8 inches WC in negative pressure sections.
10. Wall panels and access doors will deflect no more than L/240 when subjected to 1.5 times design static pressure up to a maximum of +8 inches WC in positive pressure sections and -8 inches WC in negative pressure sections. ‘L’ is the panel-span length and ‘L/240’ is the deflection at panel midpoint.
11. Unit will have double wall, 2” insulated panels for walls, roof, and floor. Exterior skin will be galvanized sheet steel. Individual segments will have galvanized sheet steel, stainless sheet steel, or perforated galvanized interior liner, as described in performance specifications.
12. Floor panels will be double wall construction, designed to provide at most L/240 deflection when subjected to a 300 lb. load at mid-span.

13. Double wall access doors will be provided on sections as shown on product drawings:
    a. Stainless steel hinges permit a 180-degree door swing.
    b. Access door will be of the same material type as exterior/interior casing.
    c. Access door latches will use a roller cam latching mechanism.
14. Provide shipping splits as needed.

D. Finishes:
1. External unit surfaces will be factory cleaned prior to finishing or shipping.
2. Unpainted air-handling units constructed of galvanized steel will pass the ASTM B-117 test for 220-hour salt spray solution (5 percent) without any sign of red rust.

E. Drain Pans:
1. Primary and auxiliary drain pans will be double wall with an insulation R-value of 6.25 hr-ft2-°F/(BTU-inch).
2. Drain pans comply with the guidelines of ASHRAE 62:
    a. Drain pans will be double sloped at least 1/8” per foot, and have no horizontal surfaces.
    b. Drain connection material will be the same as drain pan.
    c. Drain pans drain to one point.
    d. Drain connections will be welded to drain pans
    e. Drain pans will have at least 1” clearance between pan and coil supports.

F. Fans:
1. Fans will provide CFM and static pressure, as shown in performance specifications.
2. Fans will be Class II as required to meet selected RPM and horsepower shown in performance specifications.
3. Fans will be SWSI (plenum), as shown on product drawings.
4. Fans will have airfoil blades, as shown in performance specifications.
5. Airfoil fans will bear the AMCA Seal. Airfoil fan performance will be based on tests in accordance with AMCA standard 210 and will comply with the requirements of AMCA certified ratings programs for air and sound. Airfoil wheels will comply with AMCA standards 99-2408-69 and 99-2401-82.
6. Fans shafts will be polished steel and sized such that the first critical speed will be at least 125 percent of the maximum operating speed for the fan pressure class. Shaft will be coated with an anti-corrosion coating.
7. Fan and motor assembly will be internally mounted on a common base. Fan and motor base will be mounted on rubber pad isolators.
8. Fan discharge will be connected to cabinet via a flexible connection.
9. Access doors will be provided as shown on product drawing.
10. Fan sections with multiple fans will include counterbalanced aluminum back draft dampers
11. Each fan will include an ABB AYK-550 variable frequency drive sized to match the specified fan motors:
    a. Drives will be provided with a NEMA 1 enclosure, and a fused disconnect.
    b. Drives do not include a bypass.

G. Motors:
   1. Fan motors will be built in accordance with the latest NEMA and IEEE standards.
   2. Fan motors comply with ASHRAE Standard 90.1.
   3. Fan motors will be furnished in sizes, electrical power and starting characteristics as scheduled:
      a. Fan motors will be rated for continuous, full load duty at 104 degrees F ambient temperature and 1.15 service factor.
      b. Fan motors will be NEMA design ball bearing type.
      c. Fan motors will be totally enclosed fan cooled (TEFC).
      d. Premium Efficiency Inverter ready per NEMA STD MG1 PART 31.4.4.2.
      e. Motors will be suitable for use with variable frequency drives, and include shaft grounding rings.

H. Heating Coil Section:
   1. Coils described in this specification do not include:
      a. Electric Heat coils.
      b. Integral face and bypass coils.
      c. Heat pipe coils.
   2. Water and direct expansion (DX) coil capacity and pressure drop performance will be certified in accordance with AHRI Standard 410, when selected within fluid velocity, inlet fluid temperature, and entering air temperature ranges specified by AHRI 410.
   3. Coils will be removable from the side of unit, via removable AHU panels. No more than one panel shall be removed to remove a coil.
   4. Coils will have frames constructed of galvanized steel. Casing channels will be free-draining and do not block fin area.
   5. Coil segment door clearances will allow for at least 2-inches of field installed piping insulation.
   6. Coil bulkheads and blank-offs will prevent air from bypassing coils.
   7. A 1/4-inch FPT plugged vent/drain tap will be provided on each connection. Vent, drain, and coil connections will be extended to outside of AHU casing.
   8. Spool shaped coil grommets will be provided to insulate and seal coil penetrations.
   9. Water and glycol coils will be designed to operate at 250 PSIG and up to 300 degrees F and will be factory tested with 325 PSIG compressed air under water.
   10. Water, glycol and DX coils tubes will be mandrel expanded to form fin bond and burnished, work-hardened interior surface.
   11. Coil fins will be die-formed, continuous aluminum and have fully drawn collars to accurately space fins, and form a protective sheath for tubes.

I. Filters:
   1. Filter segments will be provided, as shown on product drawings. Filter tracks/frames will be an integral part of the unit.
   2. Filter types, nominal sizes, efficiencies, and performance characteristics will be as shown in performance specifications.
   3. Filter access will be provided via access doors on filter segments or adjacent segments as required by filter loading scheme.

4. Flush mounted, factory installed differential pressure gauge on the drive side of unit to measure pressure drop across filters will be provided.

J. Dampers:

1. Dampers will be factory installed.
2. Dampers will have parallel airfoil blades.
3. Dampers will have a maximum leakage rate of 4 CFM/square foot at 1" WC and comply with ASHRAE 90.1.
4. Outside air damper will be a Ruskin model TED 50.
5. Return air damper will be a Ruskin model CD 60.
6. Maximum damper torque requirement will be 7 inch-lbs / ft2.

K. Testing and Inspection:

1. Fan skid will be run-balanced at specified speed to insure smooth operation.
    a. Variable volume fan assemblies will be balanced from 10 to 100 percent of design RPM.

**2.02 HEAT RECOVERY VENTILATOR (AHU-3)**

A. Manufacturers:

1. VTS.
2. York / Johnson Controls.
3. Daikin.
4. Trane.
5. Approved equal.

B. Description:

1. Furnish and install where shown on the plans air handling units with construction features as specified below. The units shall be provided and installed in accordance with the specifications. Units shall be complete with all components and accessories as specified. Any exceptions shall be clearly defined.
2. Dimensions:
    a. Overall component air handler dimensions scheduled are for the basis of design air handler manufacturer as indicated. The dimensions for “as equal” manufacturers may differ.
    b. Prior to submitting equipment provided by an “as equal” manufacturer, verify that the unit will adequately fit in the space provided with proper access for operation and maintenance to include the removal/replacement of components.

C. Unit Casing Construction:

1. General: Provide factory-fabricated air handling units with capacity as indicated on the schedule. Units shall have overall dimensions as indicated and fit into the space available with adequate clearance for service. Units shall be completely assembled or multiple sectioned, shall be shipped as a single package (except where shipping limitations prevent) de-mounted into modular sections in the field. Units shall be furnished with sufficient gasket and bolts for reassembly in the field. Unit manufacturer shall provide certified ratings conforming to the latest edition of AMCA 210, 310, 500 and AHRI 410. Electrical components and assemblies shall comply with NEMA standards. Unit internal insulation shall have a flame spread rating not over 25 and smoke developed rating no higher than 50 complying with NFPA 90A, “Standard for the

Installation of Air Conditioning and Ventilating Systems." Units shall comply with NFPA 70, "National Electrical Code," as applicable for installation and electrical connections of ancillary electrical components of air handling units. Tags and decals to aid in service or indicate caution areas shall be provided. Units shall be UL or ETL listed.

2. Casing: The construction of the air handling unit shall consist of a non-skeleton structure made by a "C" or "L" sandwich 2.0 inch thick polyurethane foam with an external side 22 gauge coated steel and 22 gauge galvanized steel on the inside, making it a double wall construction. The coating on the exterior surface provides a minimum of 2,000 hours Salt Spray rated corrosion resistance (per ASTM B-117). Connect all elements with sealed joints.
3. Insulation: Unit shall be insulated with a full 2" thick (R13) closed cell foam insulation. Insulation edges shall be encapsulated within the panel. Field penetrations shall be completely sealed by installing contractor.
4. Access Doors: The unit shall be equipped with a solid double wall insulated (same as the unit casing), hinged or latched, access doors as shown on the plans. The doorframe shall be extruded aluminum, with a built-in thermal break barrier and full perimeter gasket. The door hinge assembly shall be made of composite material.
5. Unit shall be mounted on an 8 inch high x 2.5 inch wide x 13 gauge 'C' channel galvanized steel base rail.

D. Component Description:

1. Fans:
   a. Fans shall meet the air flow performance specified and shall not exceed the break horsepower or sound power levels specified on the mechanical equipment schedule. Fan performance shall be based on testing and be in accordance with AMCA Standards 210 and 300.
   b. The fan shall include direct driven, arrangement up to 5 plenum fans constructed per AMCA requirements for the duty specified. Fans shall be classified as class II or class III as required; class I fans are not acceptable. Fan wheels shall be made of aluminum construction and rated in accordance with and certified by AMCA for performance. Fans shall be selected to deliver the specified airflow quantity at the specified operating total static pressure and specified fan/motor speed. The fan shall be selected to operate at a system Total Static Pressure that does not exceed 90 percent of the specified fan's peak static pressure producing capability at the specified fan/motor speed. Each fan/motor assembly shall include a G90 galvanized steel motor support plate and fan base with internal RIS isolation.
   c. Motors shall be standard foot mounted type TEFC selected at the specified operating voltage, RPM, and efficiency as specified or as scheduled elsewhere. Motors shall meet the requirements of NEMA MG-1 Part 30 and 31, section 4.4.2. Motors shall be manufactured by Baldor, Siemens, Toshiba or WEG that operate at varying synchronous speeds as driven by an approved VFD. Motor HP shall not exceed the scheduled HP as indicated in the AHU equipment schedule(s). Steel cased motors and/or ODP motors are not acceptable. Motors shall include permanently sealed L10-400,000 hour bearings with shaft grounding to protect the motor bearings from electrical discharge machining due to stray shaft currents. Each fan wheel shall be dynamically balanced to BV-3 or better.
   d. Each fan motor shall be individually wired to a control panel containing one VFD per fan, circuit breakers, and a through the door rotary style disconnect switch. Each VFD shall be sized for the HP of the accompanying fan motor. Wire, breaker, and

disconnect sizing shall be determined, and installed, in accordance with applicable NEC standards and local code requirements.

2. Water Heating Coil:
   a. Performance is to be certified under AHRI Standard 410. Coils exceeding the range of AHRI standard rating conditions shall be noted.
   b. Single stacked cooling coils shall be mounted on rack to permit coils to slide out individually from the unit. Provide intermediate drain pans on double stacked cooling coils. The intermediate pan shall drain to the main drain pan. Water coils shall be constructed of seamless copper tubing mechanically expanded into fin collars. Fins shall be continuous within the coil casing to eliminate carryover inherent with a split fin design.
   c. Headers are to be seamless copper with die formed tube holes.
   d. Connections shall be male pipe thread (MPT) with vent and drain. Coil connections shall be extended to the exterior of the unit casing by the manufacturer. Coils shall be suitable for 261 PSIG working pressure. Maximum leak tested pressure shall be 522 PSIG and maximum burst pressure shall be 1189 PSIG.
   e. Water coils shall have the following construction:
      1). 1/2-inch O.D. x .020” wall copper tube with .020” return bends.
      2). 0.006” aluminum fins.
      3). Stainless steel casing for 4, 6, and 8 row coils and Galvanized casing for 1, 2, and 3 row coils.
3. Condensate Drain Pans:
   a. Pans fabricated from stainless steel. Pans shall be pitched for complete drainage with no standing water in the unit. Provide stainless steel drain connection extended to the exterior of the casing.
   b. Drain connections shall be piped and trapped separately for proper drainage.
4. Filters:
   a. Provide filters of the type indicated on the schedule. Factory fabricated filter sections shall be of the same construction and finish as the unit. Side service filter racks shall be fabricated from galvanized steel and include hinged access doors. Internal blank-offs shall be provided by the air unit manufacturer as required to prevent air bypass around the filters. Each filter rack shall include a factory mounted pressure gauge.
      1). Medium Efficiency MERV 8 Pleated filters: Provide 2-inch deep filters. Filters shall comply with ANSI/UL 900 – Test Performance of Air Filters. Provide 2 total sets of media.
      2). High Efficiency MERV 13 Pleated filters: Provide 4-inch deep filters. The filters shall be listed as Class II under UL Standard 900. Filters shall comply with ANSI/UL 900 – Test Performance of Air Filters. Provide 2 total sets of media.
5. Dampers:
   a. Ultra-low leakage Class 1A dampers (less than 3 cfm/sq ft. @ 1” WC). Ultra-low leakage dampers shall have insulated, extruded aluminum airfoil blades. Flat or formed metal blades are not acceptable.
   b. The damper blade shall incorporate rubber edge seals and aluminum, zinc plated or stainless steel square steel shaft for a non-slip operation.
   c. Shaft bearings shall be spherical, non-corrosive nylon to eliminate friction and any metal to metal contact.

6. Plate Heat Exchanger:
    a. Unit will be fabricated with an aluminum plate heat exchanger. The exchanger package consists of aluminum plates with pressed-in spacers, with condensate drainage possible in every direction. The plates are connected by a fold, which gives a severalfold material thickness at air entry and exit. The corners of the exchanger package are sealed into rigid aluminum extrusions in the casing with a sealing compound. The side walls of galvanized steel are bolted tightly to these extrusions. All performance data is AHRI-certified.
        1). Include factory mounted face and bypass dampers.
        2). Include drain pans on both sides of the heat exchanger, factory piped to the exterior of the unit. Drains shall be the same size and construction as the condensate/drain pans on the remainder of the unit.

E. Electrical Power and Controls:
1. Electrical and automatic control devices not previously called out or otherwise listed shall be furnished and installed in the field by others.
2. Wiring shall be (75°C) insulated copper wires.
3. The unit shall feature a mounted permanent nameplate displaying, at a minimum, the manufacturer, serial number, model number and current and amps voltage. The unit must have an ETL or UL Listing and bear the appropriate mark.
4. Conduit shall consist of a combination of EMT or flexible metal conduit as required. Liquidtite flexible metal conduit may be used outside the air tunnel for wet locations.

F. Factory Testing and Inspection:
1. The fans shall be factory run tested to ensure structural integrity and proper RPM.
2. Electrical circuits shall be tested to ensure correct operation before shipment of unit.
3. Units shall pass quality control and be thoroughly cleaned prior to shipment.

## PART 3 EXECUTION

### 3.01 INSTALLERS

A. Installer: Perform work by experienced personnel previously engaged in ventilation system construction and air handling unit installation, and under the supervision of a qualified installation supervisor.

### 3.02 PREPARATION

A. Protection of In-Place Conditions:
1. Provide a complete set of pre-filters for use during construction. Final filter bank media is to remain sealed in original boxes until final building housekeeping has been completed.
2. Protect return air inlet with 30 percent filters during construction.

B. Surface Preparation: Provide clean and level housekeeping pad to support equipment.

### 3.03 INSTALLATION

A. General:
1. Install air handling units and components in compliance with the manufacturer's written installation instructions. Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with Other Work shall be completed at no additional expense to the Contracting Agency.
2. Locate hydronic piping connections and drip pan drains on same side of unit(s) as floor drain.

3. Provide field installed condensate traps per manufacturer's recommendations on cooling coil drains. Pipe to indirect drain to floor drain.
4. Support central air handling unit base frames on concrete housekeeping pads. Center units on housekeeping pads to provide an equal housekeeping pad lip all around unit.

B. Interface with Other Work:

1. Seismically anchor air handling unit(s) using method approved by the seismic design engineer and in accordance with Section 20 05 48 - Vibration and Seismic Control.
2. Install BAS actuators, sensors, controls and control wiring in accordance with Section 25 50 00 - Building Automation System.
3. Install electrical power and wiring in accordance with Divisions 26, 27 and 28.

**3.04 REPAIR/RESTORATION**

A. Refer to Section 20 00 00 - Mechanical General Requirements for general repair/restoration requirements.

**3.05 SITE QUALITY CONTROL**

A. Site Tests and Inspections. With ventilation system operating at maximum air volume flow rate and with clean filter media installed:

1. Verify each filter bank is properly sealed and filter bank leakage is within manufacturer’s performance tolerances.
2. Verify that filter bank differential pressure gauges are operating properly in accordance with manufacturer’s written installation, operation and maintenance instructions.
3. Verify that clean filter differential pressures are as indicated in manufacturer’s submittal data (within 5 percent) for actual filter bank flow velocity.

B. Manufacturer Services: Verify air handling unit(s) is/are installed and operational in accordance with the manufacturer’s written installation instructions.

**3.06 CLEANING**

A. Upon completion of installation and prior to initial start-up, vacuum and wipe down internal and external surfaces.

B. Upon completion of final housekeeping and with written approval of the Contracting Agency, replace construction pre-filters with a complete set of new pre-filters and install remaining filter banks for use during testing and balancing.

**3.07 SYSTEM START-UP**

A. Start-up and operate air handling units in accordance with the manufacturer’s written installation, operation and maintenance (IO&M) manual.

B. Verify proper operation of sequences in accordance with Section 25 90 00 - Sequence of Operations.

C. Document start-up and operational checks using manufacturer checklists and submit in accordance with submittal requirements.

**3.08 ADJUSTING**

A. Test, adjust and balance air handling equipment in accordance with Section 23 05 93 - Testing, Adjusting and Balancing, the manufacturer's recommendations, and as otherwise directed by the Contracting Agency.

**END OF SECTION**

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# SECTION 23 82 00
# TERMINAL HEATING AND COOLING UNITS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Unit heaters.

B. Related Sections:
   1. 01 91 00 - Commissioning
   2. 20 00 00 - Mechanical General Requirements
   3. 20 05 13 - Common Motor Requirements
   4. 20 05 29 - Mechanical Hangers and Supports
   5. 20 05 48 - Mechanical Vibration and Seismic Control
   6. 20 05 53 - Mechanical Identification
   7. 20 07 00 - Mechanical Insulation
   8. 23 05 93 - Testing, Adjusting and Balancing
   9. 23 21 13 - Hydronic Piping and Specialties
   10. 23 31 00 - Ducts and Accessories
   11. 23 36 00 - Air Terminal Units
   12. 23 37 00 - Air Outlets and Inlets
   13. 25 30 00 - Building Automation System Field Devices
   14. 25 50 00 - Building Automation System
   15. 25 90 00 - Sequence of Operations

### 1.02 REFERENCES

A. Codes and Standards: See Section 20 00 00 - Mechanical General Requirements.

B. Abbreviations, Acronyms and Definitions:
   1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
   2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
   3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide terminal heating and cooling units, piping, appurtenances, and controls to automatically maintain interior temperature setpoint for each area of the building.

B. Performance Requirements: Provide performance and output shown or scheduled on drawings.

### 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

### 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
   1. Submit product literature for items specified in Part 2 and those products required by the performance standards of this section. Literature clearly annotated to indicate specified salient features and performance criteria.
   2. Include the following:
      a. Performance characteristics as scheduled.
      b. Enclosure style, material and grille arrangement.
      c. Dimensional data.

C. Shop Drawings:
   1. Submit schedules and locations of equipment, and comparison of specified heat required to actual heat output provided.
   2. Indicate mechanical and electrical service locations and requirements.

D. Provide certificates, manufacturer's instructions, and manufacturer's field reports for Quality Assurance/Control Submittals:
   1. Provide a complete manufacturer's written installation, operation and maintenance manual for each type of installed equipment.
   2. Clearly annotate the manual to indicate applicable information for the specific equipment model(s) installed.
   3. Included with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
      a. Printed names and signatures of the installers.
      b. Documentation from Manufacturer's representative and Contracting Agency that the equipment has been properly installed and is fully operational, thus validating the equipment warranty.

E. Closeout Submittals:
   1. Project Record Documents: Record actual locations of components and locations of access doors in terminal unit cabinets required for access or valves.
   2. Operation and Maintenance (IO&M) Manuals:
      a. Refer to Section 20 00 00 - Mechanical General Requirements, for IO&M Manual formatting requirements and number of copies required.
      b. Provide copies of approved submittal information for inclusion within the project IO&M Manual. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, parts listings, and spare parts list.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 MAINTENANCE MATERIAL SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Extra Stock Materials: Provide one set replacement filters for cabinet unit heaters and fan coil units.

**1.08 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Regulatory requirements: Products requiring electrical connection shall be listed and classified by Underwriters Laboratories Incorporated, or by a testing firm acceptable to the Authority Having Jurisdiction.

**1.09 DELIVERY, STORAGE, AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.10 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

B. Provide 5-year manufacturer's warranty for unit heaters and cabinet unit heaters.

**PART 2 PRODUCTS**

**2.01 UNIT HEATERS**

A. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

B. Casing: 0.0478-inch steel with threaded pipe connections for hanger rods.

C. Finish: Factory applied baked enamel finish.

D. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

E. Air Outlet: Adjustable pattern diffuser on projection models and two way louvers on horizontal throw models.

F. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. Refer to Section 20 05 13 - Common Motor Requirements.

G. Control: Local disconnect switch.

H. Capacity: As scheduled.

I. Electrical Characteristics:

1. Horsepower, voltage, and phase as scheduled on the Drawings, 60 Hz.
2. Refer to Divisions 26, 27 and 28.

J. Manufacturers: Sterling, Modine, Rittling, Trane, Vulcan, JAGA.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Protection: Cover equipment and plug piping connections to protect components from construction dirt and debris.

B. Preparation: Prior to installation of terminal units, make sure wall construction is complete enough to correctly locate and mount units.

**3.02 INSTALLATION**

A. Install terminal equipment in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

D. Hydronic Units:

1. Provide accessible ball type isolation valves on supply and return lines to each terminal unit to allow for unit drain down and repair.

2. Provide low-point drain valve that allows for complete gravity draining of terminal unit.
3. Provide balancing valve as specified elsewhere.
4. Provide high-point automatic air vent as specified elsewhere.

E. Install balancing valves and serviceable products for heating terminal units to be operable and adjustable without removal of the finish cover.

F. Provide pressure and temperature test plugs on both sides of heat transfer elements to measure the drop across runs of heat transfer elements.

G. In systems containing glycol, provide only products specifically designed and approved for continuous operation with the glycol solution specified.

**3.03 CONSTRUCTION**

A. Interface with Other Work:

1. Coordinate and sequence installation of terminal heating and cooling units with trades responsible for portions of this and other related sections of the Project Manual.
2. Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

**3.04 REPAIR/RESTORATION**

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

**3.05 FIELD QUALITY CONTROL**

A. Manufacturer's Field Services:

1. Verify units are installed and operational in accordance with the manufacturer's written installation instructions.
2. Both the Contractor and Manufacturer's Representatives shall sign start-up and operational checklist to confirm proper unit installation and operation.

**3.06 ADJUSTING**

A. Adjust functional components for proper operation in accordance with manufacturer's recommendations, or as otherwise directed.

B. Coordinate and work directly with the Testing, Adjusting and Balancing Agency to provide systems in proper operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

**3.07 CLEANING**

A. After construction is completed (including painting), and prior to initial start-up, clean and wipe down exposed surfaces of units. Vacuum clean coils and inside of cabinets and enclosures.

B. Touch up marred or scratched surfaces of factory finished cabinets and enclosures, using finish materials furnished by manufacturer.

C. Clean permanent filters or install new disposable filters.

**3.08 DEMONSTRATION AND START-UP**

A. Start-up and operate terminal heating and cooling units in accordance with the manufacturer's written installation and operation manual check list.

B. Demonstrate proper system operation using the building automation system.

C. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

**END OF SECTION**

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**SECTION 23 83 16**

**RADIANT FLOOR HEATING EQUIPMENT**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: Radiant floor heating systems.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 07 00 - Mechanical Insulation
7. 23 05 93 - Testing, Adjusting and Balancing
8. 23 21 13 - Hydronic Piping and Specialties
9. 23 21 23 - Hydronic Pumps
10. 25 30 00 - Building Automation System Field Devices
11. 25 50 00 - Building Automation System
12. 25 90 00 - Sequence of Operations

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. REHAU Radiant Floor Heating Systems - Technical Manual (Latest edition).
3. WIRSBO Complete Design Assistance Manual (Latest Edition).
4. DIN 4726 - Standard for Plastic Piping used in Warm Water Floor Heating Systems.
5. ASTM F876 - Standard Specification for Cross-linked Polyethylene (PEX) Tubing.

B. Abbreviations, Acronyms and Definitions:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

### 1.03 SYSTEM DESCRIPTION

A. Design Requirements:

1. This section describes specific requirements, products and methods of execution for radiant floor hydronic heating systems.
2. Provide a complete, pre-engineered radiant slab heating system which automatically maintains a constant interior temperature setpoint for each radiant floor heating zone as shown.
3. Not all hardware, components, and features are detailed on the drawings. Provide tubing, manifolds, fittings and hardware, isolation valves, strainers, drain valves, gauges,

supports, and other appurtenances required for a complete and properly operating system.

B. Performance Requirements:

1. Provide performance and output as shown or scheduled on drawings.
2. System contains a water / glycol solution as specified in Section 23 21 13 - Hydronic Piping and Specialties.

**1.04 PRE-INSTALLATION MEETINGS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.05 SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:

1. Provide manufacturers' product literature for each system product.
2. Provide a complete copy of the technical design guide and installation instructions to be used. Clearly annotate this information to indicate installation method to be used. Include the following:
   a. Performance characteristics as scheduled.
   b. Catalog data sheets for radiant floor tubing material, supports, tubing guides, spacers and associated items necessary for installation of tubing.
   c. Catalog data sheets for each pump scheduled.
   d. Dimensional data.
   e. Features and appurtenances being provided.
   f. Electrical characteristics and connection requirements.

C. Shop Drawings:

1. Provide engineering design calculations that confirm heat output performance, pumping flow (GPM) requirements, pumping head requirements and supply water temperature requirements. Submit calculation using copies of forms provided with the approved design manual. Include circuit balancing data necessary for system start up.
2. Provide radiant floor heating system shop drawings which indicate:
   a. Each radiant zone location and BTUH/SF heating performance.
   b. Zone tubing patterns, tube spacing, tubing diameters, number of circuits and circuit lengths.
   c. Location of in-floor electrical raceways and ductwork, slab control joints and construction joints, and typical tube routing detail where piping must cross raceways or joints. Indicate these items in sufficient detail, including dimensioned locations of system components, to demonstrate complete coordination between trades.
   d. Location of floor drains and other floor penetrations.
   e. Manifold, circulator pump and hydronic supply and return piping locations.
   f. System piping diagram showing piping arrangement, circulation and injection pumps, control valves, isolation valves, balance and drain valves, test fittings and vents, temperature sensors and other appurtenances.
3. Indicate mechanical and electrical service locations and requirements.

D. Quality Assurance/Control Submittals:
   1. Design Data and Test Reports:
      a. Provide design data for system components.
      b. Provide test report for system pressure test.
      c. Provide test report for system operation.
   2. Certificates, Manufacturer's Instructions, and Manufacturer's Field Reports:
      a. Provide a complete manufacturer's written installation, operation and maintenance manual for each type of installed equipment. Clearly annotate the manual to indicate applicable information for the specific equipment model(s) installed.
      b. Include with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
         1). Printed names and signatures of the installers.
         2). Documentation from Manufacturer's representative and Contracting Agency that the equipment has been properly installed and is operational, thus validating the equipment warranty.

**1.06 CLOSEOUT SUBMITTALS**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.07 QUALITY ASSURANCE**

A. See Section 20 00 00 - Mechanical General Requirements.

B. Regulatory Requirements: Products requiring electrical connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.08 DELIVERY, STORAGE, AND HANDLING**

A. See section 20 00 00 - Mechanical General Requirements.

**1.09 WARRANTY**

A. Manufacturer Warranty: See section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Unless specified otherwise, provide products from the same manufacturer as part of a proven pre-engineered and cataloged system:
   1. Rehau (basis of design).
   2. Wirsbo.
   3. Mr. Pex (manufactured by LK Pex AB).
   4. Roth Industries.
   5. Approved equal.

**2.02 TUBING, FITTINGS AND FASTENERS**

A. Tubing:
   1. High density cross-linked polyethylene (PEX) tubing with co-extruded oxygen diffusion barrier, manufactured in accordance with ASTM F877 and DIN 4726. Tubing material shall be fully cross-linked to the specified standard prior to shipment from the manufacturer.

2. Alternative: Polyethylene of Raised Temperature (PE-RT) tubing with co-extruded oxygen diffusion barrier, manufactured in accordance with ASTM F2623 and DIN 4726.
3. Tubing diameter as scheduled or as shown on the drawings. Minimum nominal inside diameter: 1/2 inch.
4. Maximum operating temperature: 180 degrees F.
5. Maximum operating pressure: 100 PSIG.

B. Tube Fittings:
1. Brass compression sleeve and coupling, for locations which are inaccessible after installation.
2. Brass compression union nut fittings, for locations which are accessible after installation.

C. Tubing Anchors:
1. For tubing secured to wire mesh.
a. Molded plastic Star clips.
b. Nylon cable ties.
2. For tubing secured to rigid insulation or wood sub-floor.
a. Molded plastic Screw clips.
b. Molded plastic C-channels with integral tubing clips to allow accurate tube spacing.

**2.03 MANIFOLD SUPPLY AND RETURN HEADERS**

A. Brass construction.
B. Quarter turn ball isolation valves.
C. Individual circuit shutoff valves and balancing valves where shown on the drawings.
D. Air vents with isolation valves.
E. Low point drain valves with 3/4-inch threaded hose connections and end caps.
F. Maximum number of circuits on a single manifold: Twelve.

**2.04 MANIFOLD SUPPLY AND RETURN HEADERS (FOR PE-RT PIPING)**

A. Glass-fiber reinforced polyamide (PA66 GF30 black).
B. Quarter turn ball isolation valves.
C. Individual circuit shutoff valves and balancing valves where shown on the Drawings.
D. Individual circuit flowmeters.
E. Air vents on supply and return trunks, with isolation valves.
F. Low point drain valves with isolation valve and hose connections with end caps.
G. Thermometer on supply and return trunk.
H. Maximum number of circuits per manifold: 20.

**2.05 MANIFOLD ENCLOSURES**

A. Provide a factory-built manifold enclosure (distribution cabinet) of a size appropriate for the manifold, as shown on the drawings:
1. Surface mounted enclosure:
a. Painted steel cabinet.
b. Header mounting rails.
c. Access door.

2. Fully recessed enclosure:
    a. Adjustable floor-mounted base.
    b. Header mounting rails.
    c. Wall Frame.
    d. Cover trim with access door.

B. Field fabricated enclosure assemblies are not acceptable.

**2.06 SENSORS**

A. Temperature sensors:
1. Provide air temperature sensors, slab temperature sensors, supply / return water temperature sensors and other sensors as indicated on the drawings for a complete and operational system.
2. See Section 25 50 00 - Building Automation System for additional sensors.

**2.07 SYSTEM CONTROLS**

A. Manufacturers:
1. Rehau.
2. Wirsbo.
3. Tekmar.
4. Approved equal.

B. For radiant floor systems controlled by the Building Automation System, no separate control system is required. Refer to Section 25 90 00 - Sequence of Operations.

C. Provide a packaged control system, as recommended by the manufacturer, to automatically maintain interior setpoint temperature:
1. Mixing control:
    a. Provide mixing control to maintain appropriate supply water temperature to radiant floor heating system. Mixing control shall have the capability to reset supply water temperature based on outdoor air temperature.
    b. Mixing control shall include connections for sensors, pumps, motorized valves and other components as shown on the drawings, or as required for a fully automatic system.
2. Zone control: Where individual zone control is required, provide thermostat controls, manifold actuators and/or zone valves as appropriate to the system and as shown on the drawings.

**2.08 VALVES**

A. For radiant floor systems controlled by the Building Automation System, motorized valves are provided under Section 25 50 00 - Building Automation System.

B. Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Mixing valves:
1. Brass valve body, stem and slider. Replaceable plugs and seats.
2. Rating: ANSI Class 125 for service at 125 PSIG and 32-250 degrees F.
3. Sizing: 3 PSIG maximum pressure drop at design flow rate.
4. Three- and four-way mixing valves shall have linear flow characteristics.

5. Valve actuators shall provide sufficient torque to close valves against pump shutoff head.

D. Zone valves:
   1. Brass valve body and trim, rising stem, renewable composition disc.
   2. Rating: ANSI Class 125 for service at 125 PSIG and 32-250 degrees F.
   3. Sizing: 3 PSIG maximum pressure drop at design flow rate.
   4. Two-way valves shall have equal percentage characteristics.
   5. Valve actuators shall provide sufficient torque to close valves against pump shutoff head.
   6. Two-way valves shall fail to a Normally Open position, unless otherwise indicated.

E. Balancing valves:
   1. Manufacturers: Bell & Gossett, Taco.
   2. Calibrated plug or ball valve type balancing valves with self-sealing quick connect pressure taps, scale and locking device.

F. Isolation valves: Ball valve, unitized type, bronze body and ball, TFE seats.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Protection: Cover equipment and plug piping connections to protect components from construction dirt and debris.

B. Preparation:
   1. Verify that slab insulation, vapor barrier, reinforcing steel and other structural items are complete and ready for tubing installation.
   2. Verify locations of slab control, construction and expansion joints.
   3. Verify locations of floor penetrations, ventilation floor outlets, underground electrical trenches, structural elements and other items that may affect tubing installation.
   4. Verify that appropriate electrical connections are available, with the proper voltage and phase characteristics.
   5. Coordinate timing of work so that radiant floor tubing installation does not interfere with the work of other trades. Minimize construction activity in the area to prevent damage to tubing and other system components.

### 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions. Where possible, use manufacturer’s specialty tools.

B. Refer to structural drawings for slab construction details. Tubing attachment method and frequency in accordance with manufacturer’s recommendations.

C. Where tubing crosses slab expansion, control or construction joints, route piping under joints or provide a sleeve over tubing extending 10 inches minimum beyond the joint. Sleeve material as specified in the manufacturer’s installation guide.

D. Where tubing exits the slab, provide a sleeve over tubing extending 10 inches minimum into the floor and above the floor. Sleeve material as specified in the manufacturer’s installation guide.

E. Lay out supply piping, pumps, manifolds and other components in a neat and logical fashion. Verify that components are accessible for servicing, adjustment and removal.

F. Install drain valves such that a drain hose may be easily connected, allowing that portion of the system to be completely drained.

## 3.03 CONSTRUCTION

A. Interface with Other Work:

1. Coordinate and sequence installation of radiant floor heating system components with trades responsible for portions of this and other related sections of the project.
2. Rework required because of failure to follow the manufacturer's written installation instructions or to properly coordinate with related work shall be completed at no additional expense to the Owner.

## 3.04 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

## 3.05 FIELD QUALITY CONTROL

A. Flush and purge piping and manifold in accordance with manufacturer's installation guide. Verify that debris and air has been removed from floor circuits, manifold headers and supply piping.

B. Pressure Testing:

1. Prior to pouring the slab, perform a water pressure test as recommended by the manufacturer. Air testing is not acceptable. Pressurize with water for the length of time specified. If the maximum pressure drop is exceeded, repair leaks and re-test.
2. Pressure gauges used for testing must show pressure increments of 1 PSIG and be located at or near the lowest point in the system.
3. Comply with local codes during pressure testing. Where required, pressure tests should be witnessed by the Authority Having Jurisdiction.
4. Maintain operating system pressure during slab installation.
5. Complete the manufacturer's inspection and test reports showing acceptable performance and submit with warranty and IO&M documentation. Include the following:
    a. Manufacturer's Project Start-up and Site Inspection Report.
    b. Documentation demonstrating compliance with the Technical Information Manual.
    c. Other documentation as required.

C. Manufacturer's Field Services:

1. Verify system is installed and operational in accordance with the manufacturer's written installation instructions.
2. Both the Contractor and Manufacturer's Representative(s) shall sign start-up and operational checklist to confirm proper system installation and operation.

## 3.06 CLEANING

A. Upon completion of installation and prior to initial start-up, vacuum clean and wipe down external system components and inside manifold cabinet.

## 3.07 DEMONSTRATION & STARTUP

A. Start-up and operate radiant floor heating systems in accordance with the manufacturer's written installation and operation manual checklist. Allow sufficient slab curing time before startup.

B. During initial startup, bring slab up to temperature slowly in order to minimize the possibility of thermal shock.

C. Demonstrate proper system operation using the building automation system.

D. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

**3.08 BALANCING**

A. Coordinate and work directly with the Balancing and Testing Agency to provide systems in proper operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

**END OF SECTION**

# SECTION 25 30 00
# BUILDING AUTOMATION SYSTEM FIELD DEVICES

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:

1. Requirements, products, procedures, performance requirements, and methods of execution relating to the Building Automation System (BAS) terminal devices and field hardware.
2. Refer to related sections for other technical requirements, products, and methods of execution relating to the controls system for monitoring and control of mechanical systems.

B. Related Sections: Refer to Section 25 50 00 - Building Automation System

### 1.02 REFERENCES

A. Refer to Section 25 50 00 - Building Automation System.

### 1.03 SYSTEM DESCRIPTION

A. Refer to Section 25 50 00 - Building Automation System.

### 1.04 PREINSTALLATION MEETINGS

A. Refer to Section 25 50 00 - Building Automation System.

### 1.05 SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

### 1.06 CLOSEOUT SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

### 1.07 QUALITY ASSURANCE

A. Refer to Section 25 50 00 - Building Automation System.

### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 25 50 00 - Building Automation System.

### 1.09 WARRANTY

A. Refer to Section 25 50 00 - Building Automation System.

## PART 2 PRODUCTS

### 2.01 PRODUCTS AND COMPONENTS FOR CLASSIFIED AREAS

A. Products and components used in environments indicated to be NEC Class I, Division I shall be built and labeled as explosion-proof for the Group.

B. Products and components used in environments indicated to be NEC Class I, Division II shall be listed for Class I Division I environments or Class I Division II environments.

### 2.02 TEMPERATURE SENSOR

A. Digital room sensors:

1. Temperature monitoring range: 55/95 degrees F.
2. Network jack.

3. Output signal: Changing resistance.
4. Accuracy at Calibration point: Plus or minus 0.5 degrees F.
5. Wall Mounted unit with finished cover:
    a. Private offices and rooms:
        1). LCD display, day/night override button, and setpoint slide adjustment override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment.
        2). Set Point and Display Range: 55 degrees to 95 degrees F.
    b. Public Spaces: Blank Cover.

B. Liquid immersion temperature:
1. Temperature monitoring range: Minus 40/240 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: Plus or minus 0.5 degree F.
4. Provide immersion sensor assembly as specified. Immersion sensors shall include a separate thermowell for sensor installation. Annular space between well and sensor shall be filled with heat conductive compound.

C. Duct (single point) temperature:
1. Temperature monitoring range: 20/120 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: Plus or minus 0.5 degrees F.
4. Sensing element shall be located a minimum of 25 percent across duct width.

D. Outside air temperature:
1. Temperature monitoring range: Minus 58/122 degrees F.
2. Output signal: 4-20 mA DC.
3. Accuracy at Calibration point: Plus or minus 0.5 degrees F.
4. Provide NEMA3R rated mounting assembly (rain tight).

**2.03 WALL MOUNTED SENSOR GUARD**

A. Heavy-duty wire cage type with mounting plate.

B. Cast Aluminum Guard and mounting bracket.

C. Clear or opaque butyrate plastic guard, key lock, mounting plate.

**2.04 ELECTRIC THERMOSTAT**

A. Electric Room Thermostats: Low voltage, two position devices as indicated on the plans. Furnish standard manufacturing configurations of single or multi-stage as well as heating/cooling arrangements as required to provide an operable system. Thermostats shall be dual setpoint with deadband for heating and cooling.

B. Unit Heater Thermostat: Amperage capacity sufficient to cycle fan without need for contactor.

**2.05 LOW TEMPERATURE DETECTION THERMOSTAT**

A. Provide low temperature control thermostat, electric type manual reset, non-averaging 20 feet long sensing elements that switch whenever any 12 inch section or more of any portion senses a temperature as low as the thermostat setpoint as specified in sequences.

B. Provide with automatic reset with control system reset.

C. Provide with two sets of contacts, one for hardwired fan shutdown and one for remote monitoring.

**2.06 HIGH AND LOW LIMIT THERMOSTATS**

A. Provide electric, high or low limit thermostats as required by sequence of operation.

B. Freeze Protection Thermostats: Employ a 20 foot element. If any one foot section of the element is subjected to temperatures below 35 degrees F, the respective electric or pneumatic circuit opens, causing action to fans and dampers as required under the sequence of operations. Provide with automatic reset.

C. High Limit Thermostats (Fire Stats, etc.): Employ rod and tube type elements that extend approximately ten inches into the duct. If instrument is subjected to temperatures above 135 degrees F., action required by sequence of operation occurs.

**2.07 DIGITAL STATUS POINTS**

A. Digital status shall be monitored by sensing normally closed contacts (contact closed in alarm conditions). The addition of the monitoring relay shall not affect the operation of the systems involved.

**2.08 DIGITAL COMMAND POINTS**

A. Command relays shall be momentary, automatic, maintained, or magnetic latch fail/safe as required. Maintained contacts located in occupied spaces or plenum spaces shall be mechanically latched. Relays shall be plug in and field replaceable. Contact ratings shall be in accordance with service.

**2.09 DIFFERENTIAL AIR STATIC PRESSURE SENSOR**

A. Provide integral pressure transducer and transmitter in enclosure suitable for wall or panel mounting. 4-20ma output signal proportional to the input pressure span.

B. Transmitter range shall be selected so that the normal operating setpoint is midway between the upper and lower range of the transmitter. Transmitter range shall be bi-directional.

C. The following sensor locations with static pressure ranges are:

1. Fan Room static pressure: Plus or minus 0.1 inch W.C.
2. Supply duct static pressure: Plus or minus 2.0 inch W.C.
3. Filter bank static pressure drop: Plus or minus 1.5 inches W.C.
4. Air flow station: Varies based on manufacturer recommendations.

D. Temperature operating range: 32 to 122 degrees F.

E. Each transmitter shall have field adjustable span and zero adjustments for field calibration. Accuracy plus or minus 0.5 percent of full scale. Linearity plus or minus 0.1 percent.

**2.10 EXTERIOR AIR STATIC PRESSURE REFERENCE HEAD**

A. Accuracy: Capable of sensing outside air pressure within 2 percent of actual value when subjected to radial wind velocities up to 40 mph with approach angles up to 30 degrees to the horizontal.

B. Provide a one-liter capacity volume chamber with restrictor between the exterior air static reference head and the pressure sensor.

**2.11 INTERIOR AIR STATIC PRESSURE PROBE**

A. Provide shielded static air pressure probe with appurtenances for complete installation. Integral volume chamber, sensing ports engineered for quiet, steady operation. Type 316 stainless steel.

B. Accuracy: Capable of sensing room air pressure within 1 percent of actual static pressure value.

C. Manufacturer: Air Monitor Corporation Model S.A.P. (Static Air Probe), or equal.

**2.12 DIFFERENTIAL FLUID PRESSURE SENSOR**

A. Provide integral pressure transducer and transmitter with 4-20 mA output signal proportional to the input pressure span.

B. Provide NEMA 1 aluminum enclosure.

C. Transmitter range shall be selected so that the normal operating setpoint is midway between the upper and lower range of the transmitter. Transmitter range shall be unidirectional.

D. The range for the sensor serving the hydronic heating system is 0-10 PSIG.

E. Temperature operating range: Minus 40 to 175 degrees F.

F. Each transmitter shall have field adjustable span and zero adjustments for field calibration. Accuracy plus or minus 1.0 percent of full scale.

**2.13 FLUID PRESSURE SENSOR**

A. Provide integral pressure transducer and transmitter with 4-20 mA output signal proportional to the input pressure span.

B. Provide watertight enclosure.

C. Transmitter range shall be selected so that the normal operating setpoint is midway between the upper and lower range of the transmitter. Transmitter range shall be unidirectional.

D. The range for the sensor serving the hydronic heating system is 0-50 PSIG.

E. Temperature operating range: Minus 40 to 200 degrees F.

F. Each transmitter shall have field adjustable span and zero adjustments for field calibration. Accuracy plus or minus 1.0 percent of full scale.

**2.14 AIRFLOW MEASURING STATION/DEVICE**

A. One or more sensor probes and a single, remotely mounted, microprocessor-based transmitter capable of independently processing up to 16 independently wired sensor assemblies.

B. Each sensor assembly shall contain two individually wired, hermetically sealed bead-in-glass thermistors. The airflow rate of each sensor assembly shall be equally weighted and averaged by the transmitter prior to output. Devices using less than two thermistors in each sensor assembly are not acceptable.

C. Devices using platinum wire RTDs are not acceptable.

D. Each transmitter shall have a 16-character alpha-numeric display capable of displaying airflow, temperature, system status, configuration settings and diagnostics.

E. Airflow accuracy shall be +/-2 percent of Reading over the entire operating airflow range.

F. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.

G. Temperature accuracy shall be +/-0.15 degrees F over the entire operating temperature range of -20 degrees F to 160 degrees F.

H. The operating humidity range for each sensor probe shall be 0-99 percent RH (non-condensing).

I. Each sensor probe shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter.

J. The number of sensor housings provided for each location shall be as follows:

| Duct or Plenum Area (sq.ft.) | Total # Sensors / Location |
|---|---|
| | |
| <2 | 4 |
| 2 to < 4 | 6 |
| 4 to < 8 | 8 |
| 8 to <16 | 12 |
| >=16 | 16 |

K. Fan inlet sensors may be proposed where appropriate.

L. The transmitter shall communicate directly with the building automation system utilizing a LonWorks protocol.

M. Manufacturer: Ebron Gold Series or equal.

**2.15 CARBON DIOXIDE / VOC SENSOR**

A. Provide carbon dioxide and volatile organic compounds (VOC) sensor with infrared CO2 sensing element and separate VOC sensing element, with integral LCD display. Provide sensor with 0-10 volts DC output signal proportional to carbon dioxide gas concentration levels in the measured air sample.

B. Sensor shall include integral gas permeable filter that prevents particulate contamination of the sensor.

C. Provided sensor with detachable base with field wiring terminals on the base.

D. Measurement Range: 0-2000 ppm.

E. Accuracy:

1. Less than or equal to plus or minus 50 ppm, or plus or minus 2 percent of measured value.
2. No recalibration required for 8 years.

F. Operating Conditions: 32 to 122 degrees F. at 0 to 95 percent RH, non-condensing.

G. Manufacturer: Siemens QPM2102D. This is a multi-sensor and different models will do CO2 only (2100), CO2 & VOC (2102 specified), CO2 & temperature (2160), or CO2 & temp & RH (2162).

**2.16 CURRENT SENSOR**

A. Provide current sensors that convert AC current to a proportional (4-20 mA) DC current.

B. Provide reverse voltage and high over current capacity.

C. Provide red LED light to indicated relay status and power.

D. Temperature operating range: 5 to 140 degrees F.

E. Provide UL Listed device.

## 2.17 CURRENT SENSING RELAY

A. Provide solid-state, self-calibrating, current operated relay suitable for equipment status monitoring. Provide a relay that changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.

B. Provide red LED light to indicated relay activation.

C. Temperature operating range: minus 30 to 140 degrees F.

D. Provide UL Listed device that is rated for plenum installation.

## 2.18 RELAYS

A. Applications: Relays external to the controls shall include (but not be limited to) the following:

1. Control relays for start/stop or open/close control of equipment.
2. Monitoring relays for electrical circuit on/off or open/closed status detection.
3. Interposing relays to provide interface between solid state circuitry and ac-driven control relays.

B. Requirements: Relays shall be housed in dust-tight cases conveniently located for wiring and inspection:

1. Control Relay: Control relays shall be suitable for continuous operation of 120 VAC and be able to interrupt the control circuits of various HVAC equipment. The number of contacts required for the relay shall be determined from the number of independent equipment to be controlled. The number of control relays required for the motor start/stop circuit shall be determined from examination of the equipment to be controlled.
2. Monitoring Relay: Monitoring relays shall be suitable for continuous operation at the voltages of the circuits to be monitored. The monitoring relays shall be connected in such a way that the operation of the relay contact shall represent the change of status of the monitored circuit (i.e. ON/OFF, etc.) or duplicate the operation of the existing alarm circuit (i.e. high/low, etc.). The addition of the monitoring relay shall not affect the operation of the systems involved.
3. Interposing Relay: Interposing relays shall be DC driven and be utilized to provide interface between solid state circuitry and ac-driven control relays as required.

## 2.19 CONTROL VALVE

A. Control Valve: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Globe Valve 2 inch and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and sweat ends.

C. Globe Valve 2-1/2 inch and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.

D. Hydronic system globe valve shall have the following characteristics:

1. Rating: ANSI Class 125 for service at 125 PSIG and 32/250 degrees F operating conditions.
2. Internal Construction:
   a. Replaceable plugs and seats of stainless steel or brass.
   b. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.
   c. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.

3. Sizing: 3 PSIG maximum pressure drop at design flow rate.
4. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics. Operators shall close valves against pump shutoff head.
5. Select heating valves shall fail to a Normally Open to heat position, unless otherwise indicated. Select cooling valves to normally closed to cooling position.
6. Three-way valves: Mixing type, unless otherwise indicated.

**2.20 CONTROL DAMPER**

A. Rectangular:
1. Frame: Five inches by one inch by minimum 0.125 inch 6063-T5 extruded aluminum hat-shaped channel, mounting flanges on both sides of frame, reinforced at corners.
2. Blades: Provide airfoil-shaped, single-piece blades made of heavy-duty 6063-T5 extruded aluminum. Maximum six inch blade width.
3. Bearings: Molded synthetic sleeve, turning in hole in frame.
4. Seals:
   a. Blade: Extruded vinyl type for ultra-low leakage from minus 50 degrees F. to 350 degrees F. Mechanically attached to blade edge.
   b. Jamb: Flexible metal compression type.
5. Linkage: Concealed in frame.
6. Axles: Minimum 1/2-inch diameter plated steel, hex-shaped, mechanically attached to blade.
7. Finish: Mill aluminum.
8. Performance Data:
   a. Temperature Rating: Withstand minus 50 degrees F. to 350 degrees F.
   b. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions:
      1). Closed Position: Maximum pressure of 13 inches W.C. at a 12-inch blade length.
      2). Open Position: Maximum air velocity of 6,000 feet per minute.
   c. Leakage: Maximum 2.0 cubic feet per minute per square foot at 1.0 W.C. for sizes 24 inches wide and above.
   d. Pressure Drop: Maximum 0.03 inch W.C. at 1,500 feet per minute across 24 inch by 24 inch damper.
9. Manufacturer: Ruskin CD50, Louvers and Dampers, Air Balance, Pottorff, or equal.

B. Round:
1. Frame:
   a. Under 6 inches Diameter: 2 inches by 1/2 inch minimum 12 gage galvanized steel tube.
   b. 6 thru 12 inches Diameter: 2 inches by 1/2 inch by minimum 14 gage galvanized steel channel.
   c. Above 12 thru 24 inches Diameter: 2 inches by 1/2 inch by minimum 1/8 inch galvanized steel channel.

d. Above 24 inches Diameter: 2 inches by 1 inch by minimum 3/16 inch galvanized steel channel.

2. Blade: Provide single-piece construction made of the following material:
   a. 18 inches diameter and smaller: Minimum 12 gage galvanized steel.
   b. Over 18 inches diameter: Minimum 10 gage galvanized steel, stiffeners as required.
3. Blade Seals: Closed cell polyethylene foam rubber fully encompassing and mechanically attached to blade edge.
4. Bearings: Self-lubricating stainless steel sleeve.
5. Axles:
   a. 22 inches Diameter and smaller: Minimum 1/2 inch diameter, full length, plated steel, mechanically attached to blade.
   b. Over 22 inches Diameter: Minimum 3/4 inch diameter, full length, plated steel, mechanically attached to blade.
6. Finish: Mill.
7. Performance Data.
   a. Temperature Rating: Withstand maximum 250 degrees F.
   b. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions.
      1). Closed Position: Maximum pressure of 10 inches W.C.
      2). Open Position: Maximum air velocity of 4,000 feet per minute /min.
   c. Leakage: Maximum 10 cubic feet per minute total at 1 inch W.C.
   d. Pressure Drop: Maximum 0.05 inch W.C. at air volume of 7,000 cubic feet per minute through 24 inch diameter damper.
8. Manufacturer: Ruskin CDR25, Louvers and Dampers, Air Balance, Pottorff, or equal.

**2.21 VALVE AND DAMPER ACTUATORS**

A. General:
1. Provide electronic direct-coupled actuation for control valves and dampers.
2. Proportional actuators shall accept a 0-10 VDC or 0-20 mA control input and provide a 2-10 VDC or 4-20 mA operating range. Damper actuators and control valve actuators serving valves larger than 3/4” shall provide a 2-10 VDC position feedback signal. The feedback signal shall be independent of the input signal.
3. Actuators indicated by Normally Closed or Normally Open designation on drawings or in sequence of operation shall be spring return type.
4. The actuator shall have electronic overload circuitry to prevent damage to the actuator.
5. Provide actuators listed by Underwriters Laboratories Standard 873 Standard for Safety Temperature-Indicating and -Regulating Equipment.

B. Damper Actuator:
1. Provide damper actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage.
2. Spring return actuators shall be capable of both clockwise and counterclockwise spring return operation by simply changing the mounting orientation.

3. Non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque capacity shall have a manual crank for this purpose.
4. Provide actuators in sufficient size, quantity, and type to match application. Provide a minimum of one damper actuator for each 24 square feet of damper area. Damper areas shall not exceed manufacturer's ratings.
5. Outside air and return air dampers on mixing boxes shall be linked such that one opens while the other closes. It shall not be possible to close both dampers simultaneously.
6. Dampers: Size for minimum running torque calculated as follows:
    a. Parallel-Blade Damper with Edge Seals: 7 inch-pounds/sq. ft. of damper.
    b. Opposed-Blade Damper with Edge Seals: 5 inch-pounds/sq. ft. of damper.
    c. Parallel-Blade Damper without Edge Seals: 4 inch-pounds/sq. of damper.
    d. Opposed-Blade Damper without Edge Seals: 3 inch-pounds/sq. ft. of damper.
    e. Dampers with 2 to 3 inches WC of Pressure Drop or Face Velocities of 1000 to 2500 FPM: Multiply the minimum full-stroke cycles above by 1.5.
    f. Dampers with 3 to 4 inches WC of Pressure Drop or Face Velocities of 2500 to 3000 FPM: Multiply the minimum full-stroke cycles above by 2.0.
    g. Values noted above do not include normally open or normally closed open spring return dampers. Provide additional torque as required.
7. Size operators with ample power to overcome friction of damper linkage and air pressure acting on the damper blades.

C. Valve Actuator:
1. Provide actuators with enough torque and force required for proper valve close-off against the system pressure.
2. The valve actuator shall be sized based on valve manufacturer's recommendations for flow and pressure differential.

**2.22 INSTRUMENT ENCLOSURE**

A. Steel construction with hinged and lockable doors.

B. NEMA 12 construction only in areas where panels are subject to moisture damage.

C. Wiring connections including I/O and power shall be extended to a numbered, color-coded, and labeled terminal strip for ease of maintenance and expansion.

D. Provide labeling and color coding for wiring. Wiring shall follow a common format typical for the entire facility. Terminal strip color coding and numbering shall follow a common format. Wiring shall be neatly installed in plastic trays or tie-wrapped.

E. Line voltage wiring shall be segregated from I/O wiring and shall be UL listed, 300-volt service and provide adequate clearance for field wiring.

F. Provide a convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers. Provide convenience receptacle for enclosures containing equipment that can be configured or adjusted with a portable computer.

**2.23 POWER SUPPLY**

A. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75 percent of the rated capacity of the power supply.

B. Input: 120 VAC plus 10 percent, 60Hz.

C. Output: 24 VDC.

D. Line Regulation: Plus 0.05 percent for 10 percent line change.

E. Load Regulation: Plus 0.05 percent for 50 percent load change.

F. Provide an appropriately sized fuse and fuse block shall be provided and located next to the power supply.

G. Provide a power disconnect switch shall be provided next to the power supply.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Special Techniques:

1. Wiring:

a. The HVAC Control Contractor shall provide conduit, wiring, accessories, and wiring connections required for the installation of the control system, as herein specified, unless specifically shown in Divisions 26, 27 and 28.

b. Conduit and wiring shall comply with the requirements of applicable portions of Divisions 26, 27 and 28 and local and national electric codes, unless specified otherwise in this section.

c. System input wiring shall be twisted shielded pair, minimum 20 gauge wire. System analog output wiring shall be twisted shielded pair/3-wire as required, minimum 20 gauge wire. Preconfigured cables between Terminal Unit Controllers and Thermostats are acceptable, minimum 24 gauge.

d. Internal panel device wiring for binary outputs and pilot relay shall be minimum 16 gauge wire.

e. Provide separate conduit for control system power wiring including but not limited to 120 VAC and greater. I/O sensor wiring and data communication cabling shall be segregated from 120 VAC control system power wiring.

f. Wiring in mechanical rooms shall be in conduit. Minimum control wiring conduit size 3/4 inch. One half inch conduit may be used for thermostats and valve stub-ups where conduit contains only a single pair.

2. Temperature Sensors:

a. Temperature sensor assemblies shall be readily accessible and adaptable to each type of application in such manner as to allow for quick, easy replacement and servicing without special tools or skills.

b. Outdoor installations shall be of weatherproof construction or in appropriate NEMA enclosures. These installations shall be protected from solar radiation and wind effects. Protective shield shall be stainless steel.

c. Wall Mounted Sensor and Thermostats:

1). Install wall mounted room sensors at a height of four feet six inches above finish floor level.

a) Designer note: Coordinate with architectural for ADA accessible spaces. ADA may require 48” AFF for light switches and thermostats. Coordinate with ADA/ANSI requirements.

2). Locate sensors as shown on the Drawings.

3). Provide insulated base for sensors mounted on sheet metal, steel columns or exterior walls. Wire penetrations shall be caulked airtight to prevent thermal convection.

4). Provide heavy-duty guards for sensors and thermostats in public areas and as shown on the Drawings.

d. Fluid Temperature Sensor: The sensor shall have a separable well suitable for insertion in a pipeline or vessel. Cable connections shall be suitable for the highest temperature expected and low temperature sensors shall be sealed to exclude condensation of atmospheric moisture.

e. Duct Temperature Sensor: The sensor shall measure the representative temperature of the entire cross-section of the duct or plenum. Sensors in ducts shall be mounted in locations to sense the correct temperature of the air only and shall not be located in dead air spaces. Ductwork shall be securely sealed where elements or connections penetrate ducts to avoid measuring false conditions.

f. Mixed Air Temperature Sensors: The sensor shall be of the averaging type. Mount sensors with consideration for stratification of warm and cold air streams. Minimum binding radius for averaging sensors is four inches. Provide a minimum of one foot of averaging sensor element for each square foot of ductwork. Sensing element shall be installed such that it crosses completely through stratified airflow with complete passes. Partial passes are not allowed. If averaging sensor is not available provide one sensor for every four square feet of duct cross section area.

g. Fluid Temperature Sensors: Provide sensors with thermal wells fabricated and installed for the intended service. Wells shall be non-corrosive to the medium being measured and shall have sufficient physical strength to withstand all pressures, (including test pressures) and velocities to which they are subjected. Well shall not restrict flow area to less than 70 percent of line-size-pipe normal flow area. Where piping is smaller than the length of the well or exceeds the area requirements, the well shall be installed at an elbow and installed to effect uniform flow across the well. Sensors installed in wells shall be installed in horizontal piping below the pipe centerline.

h. Low Temperature Detection Thermostats: Mount sensor element similar to Mixed Air Temperature Sensors.

3. Exterior Air Static Pressure Reference Head:

a. Provide four outside static reference heads and locate as shown on the Drawings.

b. Mount reference heads above roof line and in accordance with manufacturer recommendations.

4. Interior Air Static Pressure Probe:

a. Provide interior static pressure probes and locate as shown on the Drawings.

b. Provide surface mount in mechanical spaces. Provide recessed mount in finished spaces.

5. Differential Fluid Pressure Sensor:

a. Locate sensors as shown on the Drawings. Mount in accessible location.

b. Controls subcontractor to furnish differential pressure sensor snubbers. Installation of snubbers by plumbing subcontractor.

6. Fluid Pressure Sensor:

a. Locate sensors as shown on the Drawings. Mount in accessible location.

b. Controls subcontractor to furnish fluid pressure sensor snubbers. Installation of snubbers by plumbing subcontractor.

7. Carbon Dioxide Sensors: Locate sensors as shown on the Drawings.

8. Current Sensors:
    a. Provide flow proof for constant volume fans and pumps with a current sensor connected to the motor wiring at the starter. Set upper alarm limit to the maximum rated current of the motor, or as advised by the TAB Agency. Set lower alarm limit at 1/2 the motor running amps.
    b. Provide flow proof for variable speed control system through utilization of the variable speed drive serial communication option. Drive will communicate directly with BAS system.
9. Digital Status, Digital Command Points, Lighting Controls:
    a. Provide relays in a separate instrument enclosure or control panel adjacent to the monitored or controlled equipment. The relays shall mounted and connected in a manner that does not violate controlled equipment listing or code requirements.
    b. Provide relays that operate in conjunction with the motor control system. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
    c. Coordinate motor control requirements with Divisions 26, 27 and 28.
    d. Coordinate lighting control requirements with Divisions 26, 27 and 28.
10. Identification:
    a. Panel and Instrument Enclosure Identification: Panels and instrument enclosures shall be identified by a plastic engraved nameplate securely fastened to the outside of the controller enclosure.
    b. Field Devices: Field devices shall be identified by a typed (not handwritten) securely attached tag label.
    c. Panel or Instrument Enclosure Devices: Devices shall be identified by a typed label securely fastened to the backplane of the local control panel or instrument enclosure.
    d. Wall Mounted Temperature Sensors: Device covers shall be identified by a typed label securely fastened to the front cover. The label shall indicate the terminal unit zone identification tag.
    e. Raceway Identification: The covers to junction and pull boxes of the control system raceways shall be painted blue or have identification labels stating “Control System” affixed to the covers. This requirement includes control system tubing. Labels shall be typed, not hand written.
    f. Wire Identification: Low and line voltage control wiring shall be identified by a number, as referenced to the associated control diagram, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.

## 3.02 SYSTEM STARTUP

A. Commissioning: Perform tests and verification procedures required for the commissioning process as requested by the Owner and directed by the Owner's Commissioning Authority.

## 3.03 MAINTENANCE

A. Arrange work so that wherever possible serviceable or operable products are located within mechanical or electrical spaces and are accessible.

**END OF SECTION**

**SECTION 25 40 00**

**VARIABLE FREQUENCY DRIVES**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: Requirements for solid-state, pulse-width modulated (PWM) Adjustable Frequency Drives, herein referred to as AC Drives, for use with NEMA design AC motors. The term “VSD” (Variable Speed Drive) is also used in this specification.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 20 05 13 - Common Motor Requirements
4. 20 05 29 - Mechanical Hangers and Supports
5. 20 05 48 - Vibration and Seismic Control
6. 20 05 53 - Mechanical Identification
7. 23 05 93 - Testing, Adjusting and Balancing
8. 23 21 23 - Hydronic Pumps
9. 23 34 00 - HVAC Fans
10. 23 70 00 - Central Air Handling Units
11. 25 30 00 - Building Automation System Field Devices
12. 25 50 00 - Building Automation System
13. 25 90 00 - Sequence of Operations

### 1.02 REFERENCES

A. Codes and Standards:

1. See Section 20 00 00 - Mechanical General Requirements.
2. Institute of Electrical and Electronic Engineers (IEEE): IEEE 519-2014.
3. Underwriters Laboratories (as appropriate): UL 508, 508A, 508C, UL 61800, 61800-5-1, 61800-5-2, UL 1995.
4. The Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA): NEMA ICS 7-2014, Adjustable Speed Drives.
5. National Electric Code (NEC): NEC 430.120, Adjustable-Speed Drive Systems.
6. CSA Group: CSA C22.2 No. 274.
7. International Building Code (IBC): IBC 2018 Seismic – referencing ASCE 7-16 and ICC AC-156.

B. Abbreviations, Acronyms and Definitions:

1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

## 1.03 SYSTEM DESCRIPTION

A. This specification is for a complete Variable Frequency Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use with both asynchronous and permanent magnet motors.

B. The drive manufacturer shall supply the drive and all necessary options as specified. drives installed on this project shall be from the same manufacturer and have a common user interface (control panel). Drives that are manufactured by a third party and “brand labeled” shall not be acceptable.

C. This specification is intended to supplement a drive schedule. The drive schedule identifies the optimized BOM for the project and includes quantity, size, voltage, enclosure rating, options, and harmonic mitigation requirements of the drives. IEEE 519-2014 is an electrical system standard for harmonic mitigation. Drives are a major source of harmonics, therefore the VFD manufacturer shall conduct a harmonic analysis for this particular jobsite to verify compliance with IEEE 519-2014.

## 1.04 PRE-INSTALLATION MEETINGS

A. See Section 20 00 00 - Mechanical General Requirements.

## 1.05 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weights. Customer connection and power wiring diagrams.
2. Complete technical product description with complete list of options provided. Any portions of this specification not met shall be clearly indicated or the Contractor shall be liable to provide all additional components required to meet this specification.
3. Submit shop drawings showing specific VSD mounting arrangements. Include verification that mounting of VSD complies with IBC chapter 16 requirements.
4. Clearly note any exceptions/deviations to this specification with the submittal.
5. Submit information from harmonic analysis demonstrating that the drives have proper internal harmonic mitigation and will not take the system out of compliance with IEEE Standard 519. Notify the Contracting Agency if additional mitigation measures are indicated.
6. Submit the following information:
    a. Combined harmonic content of all drives and combined harmonic content of all drives to be operated on generator.
    b. Amount of regenerated power put back into the distribution system from each drive (include drives operated on generator and drives only operated on normal power).

C. Closeout

1. Furnish two complete sets of Installation, Operation and Maintenance Manuals and other information necessary for the operation and maintenance of the system unless otherwise noted.
2. Submit Startup Service test results as specified under Start-up Service below.

## 1.06 QUALITY ASSURANCES

A. See Section 20 00 00 - Mechanical General Requirements.

B. Drives shall be UL labeled as a complete assembly. The base VFD shall be UL listed for 100 kA Short Circuit Current Rating (SCCR) when installed in accordance with the manufacturer's guidelines.

C. The base drive shall be CE and meet EN 61800-3 for the First Environment restricted distribution (Category C2).

D. The base drive shall be seismically certified per 2018 International Building Code (IBC) with a seismic importance factor of 1.5, and minimum 2.5 SDS rating.

E. The base drive shall be SEMI-F47 certified. The drive must tolerate voltage sags to 50 percent for up to 0.2 seconds, sags to 70 percent for up to 0.5 seconds, and sags to 80 percent for up to one second.

**1.07 DELIVERY, STORAGE AND HANDLING**

A. See Section 20 00 00 - Mechanical General Requirements.

**1.08 WARRANTY**

A. Manufacturer Warranty: See Section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

B. Warranty shall be 24 months from the date of certified startup. The warranty shall include all parts, labor, travel time and expenses. There shall be 24/365 support available via a toll free phone number.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Acceptable Manufacturers are limited to the following:

1. ABB ACH 580 Series (basis of design).
2. Yaskawa.
3. Siemens SED2.

**2.02 VARIABLE FREQUENCY DRIVES**

A. The drive package as specified herein and defined on the drive schedule shall be enclosed in a NEMA Type 12 enclosure.

B. The drive shall provide full rated output from a line of +10 percent to -15 percent of nominal voltage across an ambient temperature range of -15 to 40 degrees C (5 to 104 degrees F).

C. Drives shall utilize the same Advanced Control Panel (keypad) user interface.

1. Plain English text:
   a. The display shall be in complete English words for programming and fault diagnostics.
   b. Safety interlock and run permissive status shall be displayed using predetermined application specific nomenclature, such as: Damper end switch or vibration trip. Customized terms, such as: AHU-1 End Switch or CT-2 Vibration shall also be available.
2. The control panel shall include at minimum the followings controls:
   a. Four navigation keys (Up, Down, Left, Right) and two soft keys.
   b. Hand-Off-Auto selection, Fault Reset, and manual speed control.
   c. A Help key shall include assistance for programming and troubleshooting.
3. There shall be a built-in time clock in the control panel with 10-year battery backup.

4. I/O Summary display with a single screen shall indicate and provide:
    a. The status/values of all analog inputs, analog outputs, digital inputs, and relay outputs.
    b. The function of all analog inputs, analog outputs, digital inputs, and relay outputs.
    c. The ability to force all inputs and outputs to either a high, low, or specific value.
5. The drive shall automatically backup parameters to the control panel. The drive shall allow two additional unique manual backup parameter sets to be stored.
6. The control panel shall be removable, capable of remote mounting.
7. The drive shall be able to support a Bluetooth Advanced Control Panel. The Bluetooth control panel shall be FCC and QDL (Qualified Design Listing) certified.
    a. A free app (iOS and Android) shall replicate the control panel on a mobile device or tablet. The control panel's programming and control functionality shall function on the device. Customizing text, such as AHU-1 End Switch, shall be supported by the device's keyboard.
    b. Bluetooth connectivity shall allow uploading, downloading, and emailing of parameters.
    c. Bluetooth connectivity shall include two pairing modes: Always discoverable with a fixed passcode, and manual discovery with a unique generated passcode every pairing.

D. Drives shall have the following hardware features/characteristics as standard:
1. Two (2) programmable analog inputs, two (2) programmable analog outputs, six (6) programmable digital inputs, and three (3) programmable Form-C relay outputs.
2. The drive shall include an isolated USB port for interface between the drive and a laptop.
3. An auxiliary power supply rated at 24 VDC, 250 mA shall be included.
4. At a minimum, the drives shall have internal impedance equivalent to 5 percent to reduce the harmonics to the power line. 5 percent impedance may be from dual (positive and negative DC link) chokes, or AC line reactor. Drives with only one DC link choke shall add an AC line choke integral to the drive enclosure. Reference the required harmonic analysis to determine if additional harmonic mitigation is required for the system to comply with IEEE 519-2014.
5. The combined harmonic content of all the drives on the project shall be small enough to not interfere with an emergency generator's voltage regulator. The impact of drives capable of regeneration on applications with a generator shall be verified. On projects where drives will be operated on generator, include detailed information in submittals for both items to allow verification of impacts on generator operation.
6. The drive shall have variable speed primary cooling fans.
7. The overload rating of the drive shall be 110 percent of its normal duty current rating for 1 minute every 10 minutes, 130 percent overload for 2 seconds every minute.
8. The input current rating of the drive shall not be greater than the output current rating.
9. Circuit boards shall be coated per IEC 60721-3-3; Chemical gasses Class 3C2 and Solid particles Class 3S2.
10. Coordinated AC transient surge protection system consisting of 4 MOVs (phase-to-phase and phase-to-ground), a capacitor clamp, and internal chokes. The MOVs shall comply with UL 1449 4$^{th}$ Edition.

11. The drive shall include a robust DC bus to provide short term power-loss ride through. An inertia-based ride through function should help maintain the DC bus voltage during power loss events. Drives with control power ride through only, are not acceptable.

E. Drives shall have the following software features as standard:

1. A Fault Logger that stores the last 16 faults in non-volatile memory. The most recent 5 faults save at least 9 data points, including but not limited to: Time/date, frequency, DC bus voltage, motor current, DI status, temperature, and status words.
2. An Event Logger that stores the last 16 warnings or events that occurred, in non-volatile memory. Events shall include, but not limited to: Warning messages, checksum mismatch, run permissive open, start interlock open, and automatic reset of a fault.
3. Programmable start methods: Flying-start, Normal-start, and Brake-on-start.
4. Programmable loss-of-load (broken belt / coupling) indication. This function to include a programmable time delay to eliminate false loss-of-load indications.
5. Motor heating function to prevent condensation build up in the motor. Motor heating adjustment, via parameter, shall be in “Watts.”
6. There shall be a run permissive circuit for damper or valve control.
7. Four separate start interlock (safety) inputs shall be provided. The control panel will display the specific safety(s) that are open.
8. The drive shall include a switching frequency control circuit that reduces the switching frequency based on actual drive temperature. It shall be possible to set a minimum and a target switching frequency.
9. The ability to automatically restart after non-critical faults.
10. PID functionality shall be included in the drive.
11. Drive shall be compatible with an accessory that allows the control board to be powered from an external 24 VDC/VAC source.
12. A computer-based software tool shall be available to allow a laptop to program the drive. The drive shall be able to support programming without the need for line voltage. All necessary power shall be sourced via the laptop USB port.
13. The drive shall include a fireman’s override mode.

F. Security Features:

1. The drive manufacture shall clearly define cybersecurity capabilities for their products.
2. The drive shall include password protection against parameter changes. There shall be multiple levels of password protection including: End User, Service, Advanced, and Override.
3. A checksum feature shall be used to notify the owner of unauthorized parameter changes made to the drive.
4. The “Hand” and “Off” control panel buttons shall have the option to be individually disabled (via parameter) for drives mounted in public areas.

G. Network Communications:

1. The drive shall have an EIA-485 port with removable terminal blocks. The onboard protocols shall be BACnet MS/TP, Modbus, and Johnson Controls N2. Optional communication cards for BACnet/IP and LonWorks shall be available.
2. The drive shall have the ability to communicate via two protocols at the same time, one onboard protocol and one option card-based protocol.

3. The drive shall not require a power cycle after communication parameters have been updated.
4. The embedded BACnet connection shall be a MS/TP interface. The drive shall be BTL Listed to Revision 14 or later.

H. Disconnect:
1. A circuit breaker type disconnect shall be provided.
2. The disconnect shall be door interlocked and padlockable.
3. Drive input fusing shall be included on all packaged units that include a disconnecting means.
4. Disconnect configurations shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

I. A manual bypass system is not desired or required.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that jobsite conditions for installation meet factory-recommended and code-required conditions for VSD installation prior to start-up. These shall include as a minimum:
1. Clearance spacing.
2. Temperature, contamination, dust, and moisture of the environment.
3. Conduit installation of the motor wiring and power wiring separation.

### 3.02 INSTALLATION

A. VSDs shall be furnished under Division 25 and installed under Division 26. Install the drive in accordance with the recommendations of the VSD manufacturer as outlined in the installation manual.

B. Power wiring shall be provided under Division 26. Complete wiring in accordance with the recommendations of the VSD manufacturer as outlined in the installation manual.

C. Verify that the location is ready to receive work and the dimensions are as indicated.

D. Do not install VSD until the building environment can be maintained within the service conditions required by the manufacturer. Before and during the installation, the VSD equipment shall be protected from site contaminants. The VSD shall be covered and protected from construction dust and contamination until the environment is cleaned and ready for operation. The VSD shall not be operated while the unit is covered.

E. Details of the installation shall comply with the manufacturer’s applicable instructions.

F. Minimize the length of conductors between the drive and the motor to avoid motor damage from reflected wave phenomenon.

G. Mounting of VSD shall be suitable for seismic anchorage and/or restraints as required by International Building Code.

### 3.03 WIRING

A. Conductors feeding Variable Frequency Drives (VFDs) and between VFDs and equipment supplied by the VFDs shall be Type XHHW-2.

### 3.04 CONTROL WIRING

A. Control wiring and control devices shall be provided under the specification section in which the controlled equipment is specified. Coordinate related work.

B. Control wiring shall be routed completely separately from power wiring.

### 3.05 PRODUCT SUPPORT

A. Factory trained application engineering and service personnel that are thoroughly familiar with the VSD products offered shall be locally available at both the specifying and installation locations. A 24/365 technical support line shall be available on a toll-free line.

B. A computer based training CD shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the VSD and serial communication.

### 3.06 FIELD QUALITY CONTROL

A. Start up: Certified factory startup shall be provided for each drive by a factory authorized service center. A certified startup form shall be filled out for each drive with copies submitted and included in the O&M Manuals, and a copy kept on file by the manufacturer.

B. Training: Onsite training shall be provided as part of the startup service. The training shall include installation, programming, and operation of the VSD and serial communication.

### 3.07 ADJUSTING

A. Coordinate hydronic and ventilation system static pressure control set points with Section 23 05 93 - Testing, Adjusting and Balancing. Make necessary corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

### 3.08 CLEANING

A. Upon completion of installation and prior to initial operation, vacuum clean and wipe down VSD enclosures. Remove debris for interior of enclosures.

**END OF SECTION**

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**SECTION 25 50 00**

**BUILDING AUTOMATION SYSTEM**

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: This section describes requirements, products, and methods of execution relating to the building automation controls system for the project.

B. Related Sections: Refer to related sections for other technical requirements, products, and methods of execution relating to the controls system for monitoring and control of mechanical systems.

1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 23 05 93 - Testing, Adjusting and Balancing
4. 23 21 23 - HVAC Pumps
5. 23 34 00 - HVAC Fans
6. 23 52 23 - Cast Iron Boilers and Accessories
7. 23 73 23 - Central Air Handling Units
8. 23 82 00 - Terminal Heating and Cooling Units
9. 23 83 16 - Radiant Floor Heating Equipment
10. 25 30 00 - Building Automation System Field Devices
11. 25 40 00 - Variable Speed Drives
12. 25 90 00 - Sequences of Operation
13. Divisions 26, 27 and 28 - Electrical

### 1.02 REFERENCES

A. Codes and Standards. Perform work in accordance with applicable national, state and local codes to include:

1. See Section 20 00 00 - Mechanical General Requirements.
2. ANSI-C2, National Electrical Safety Code - NESC.
3. Underwriters Laboratory (UL) or approved equal.
4. Institute of Electrical and Electronics Engineers - IEEE.
5. National Electrical Manufacturers' Association - NEMA.

B. Abbreviations and Acronyms:

1. Building Automation System (BAS).
2. Direct Digital Control (DDC).

C. Definitions:

1. ASHRAE: The American Society of Heating, Refrigerating and Air-Conditioning Engineers.
2. BACnet: A Data Communication Protocol for Building Automation and Control Networks, ANSI/ASHRAE Standard 135-current edition, developed under the auspices of ASHRAE.
3. Bridge: A device that routes messages or isolates message traffic to a particular segment, sub-net or domain of the same physical communication media.

4. Building Automation System (BAS): Collection of sensors, operators, controllers, and interconnecting wiring that control the operation of the building mechanical and electrical systems as described in these specifications.
5. Field device or field control device: A physical component such as a temperature sensor, pressure sensor, contact, motor operated valve, and motor operated damper. Generally considered to bring only one point to a controller.
6. Gateway: A hardware/software package that allows communication between dissimilar ("foreign") systems and different protocols. Gateways are typically custom built, configured, and used only for transmitting and receiving data between different systems. System programming through gateways is not possible within the scope of this definition.
7. LonTalk: An open protocol for communication developed privately by the Echelon Corporation in Palo Alto, California.
8. Operator workstation: The central personal computer for the user to implement day to day operation of the system.
9. Router: A device for connecting different local-area network segments within a network. Routers that are used between networks with different protocols are limited. Point mapping in this type of router is automatic and requires less than one hour to configure. This device is not capable of storing point map information.
10. TCP/IP (Transmission Control Protocol/Internet Protocol): The communication language or protocol that defines the Internet. TCP/IP can also be used as a communication protocol in private networks.
11. Terminal Unit Controller: A device to control very specific applications such as a VAV box, cabinet unit heater, fan terminal unit and the like. These units may have predefined operating sequences with limited custom programming available. (Also called an "application specific controller").

**1.03 SYSTEM DESCRIPTION**

A. Design Requirements:
1. System shall be compatible with, and integrated with, the existing system provided and serviced by LONG controls.
2. The system shall operate as a low-voltage multiplexed data system. The controls and instrumentation specified herein shall be integrated and installed as a complete package by the Contractor.
3. The completed system shall be integrated such that graphics, reports, and system interfaces from the Operators workstation appears as if there is one system.
4. No BAS system components requiring the use of gateways will be accepted.
5. To provide future flexibility, router domains shall not exceed nominally 75 percent of the maximum number of devices in the domain, unless specified otherwise.

B. Performance Requirements:
1. This section specifies the requirements for the BAS to be installed in conjunction with this project.
2. Controls contractor shall furnish and install an integrated building automation system, incorporating DDC for energy management, equipment monitoring and control, and subsystems as herein specified. Controls contractor will complete the temperature control system as specified herein.
3. Materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project. Systems

and components shall have been thoroughly tested and proven in actual use for at least two years.

4. Controls contractor shall be responsible for BAS and temperature control wiring for a complete and operable system. Wiring shall be done in accordance with Divisions 26, 27 and 28 of this specification and local and national codes.
5. Control and monitoring for mechanical systems installed under this Contract, including:
   a. Building ventilation systems.
   b. Building heating systems.
   c. Boiler monitoring.
6. The Work under this Section includes furnishing and installing wiring, conduit, connectors, terminal strips, and any other equipment required to interface each sensor or control point to the control system.
7. Provide control system and subsystem network cabling, routers, and other devices required for the systems shown and specified, except as specifically noted or shown on the drawings.
8. Providing sequences of operation described in Section 25 90 00 - Sequences of Operation.
9. Installation of control instrumentation and hardware specified in Section 25 30 00 - Building Automation System Field Devices, necessary for a complete system of controls.
10. Integrating the controls under this Contract with the Owner's HVAC Supervisory System.
11. Commissioning support activities as required in 01 91 00 - Commissioning, including requirements in development of commissioning checklists, phased commissioning, installation examination and performance test activities, training and IO&M requirements.
12. System functional requirements include, but are not limited to:
    a. BAS system shall provide all normal and off-normal control functionality without reliance upon PC file server or workstation.
    b. Programming information, graphics, databases, and other information required to restore the entire system in the event of equipment failure or malfunction or human error shall be protected with a centralized back-up system.
    c. Systems shall be designed to maximize multiple-vendor flexibility to replace or modify any portion of the system.
13. Software upgrades for PC and control network operating systems, the supervisory system, web browser, programming/binding tools, etc., without limitation shall be provided at no additional charge for a period of one year after Substantial Completion of the BAS.
14. A training program shall be provided to include: Data acquisition and report generation on the Operator’s workstation.
15. The cost of providing power from the building electrical system shall be included in the bid. Power sources are subject to submittal requirements, and review and approval.

**1.04 PREINSTALLATION MEETINGS**

A. Coordinate installation of the building automation system with trades responsible for portions of this and any other related sections of the Project Manual prior to installation of any components.

## 1.05 SUBMITTALS

A. Refer to Section 20 00 00 - Mechanical General Requirements for general submittal requirements.

B. Product Data:

1. Provide manufacturer's literature that demonstrates compliance with the manufacturing methods, appurtenances and salient features specified.
2. Equipment tagging method specifically listing each device and the identification tag to be applied.
3. Sequence of Operations.
4. Riser Diagrams.
5. Control Diagrams.
6. Panel layouts.
7. Valve and Damper schedules.
8. Point Summary Report.
9. Blank (Reserved for Enhanced Alarm Report).
10. Blank (Reserved for Commented PPCL).
11. Blank (Reserved for Trend Logs).
12. Blank (Reserve for Electronic Plans Room file).

C. Shop Drawings:

1. Riser Diagrams.
2. Control Diagrams.
3. Panel layouts.
4. Valve and Damper schedules.

D. Quality Control Submittals:

1. Pre-functional Installation (PC) and Functional Performance Test (FT) Checklists in accordance with Section 01 91 00 - Commissioning.
2. Incorporate BAS control requirements into the applicable equipment PC/FT checklists.

## 1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. The O&M Manuals will consist of the following (Progression from Submittal to O&M Manual takes place using the same binders):

1. Sequence of Operations.
2. Riser Diagrams.
3. Control Diagrams.
4. Panel layouts.
5. Valve and Damper schedules.
6. Point Summary Report.
7. Enhanced Alarm Report.
8. Commented PPCL (Program Code).
9. Trend Logs.
10. Product Data including items reused from existing control system as noted.

11. Electronic Plans Room file.

**1.07 MAINTENANCE MATERIAL SUBMITTALS**

A. Spare Parts:

B. Extra Stock Materials:

C. Tools:

**1.08 QUALITY ASSURANCE**

A. Qualifications:

1. Manufacturers: Companies specializing in manufacturing the products specified in this section with a minimum of 3 years documented experience.
2. Installers: Minimum 3 years' experience in the installation, programming and start-up of building automaton systems.
3. Testing Agencies: Regulatory requirements for products requiring electrical connection – Listed and classified by Underwriters Laboratories Incorporated, or by a testing firm acceptable to the State of Alaska.

**1.09 DELIVERY, STORAGE, AND HANDLING**

A. Delivery and Acceptance Requirements:

1. Verify equipment and associated appurtenances are delivered in original factory packaging/crating and are free from damage and corrosion.
2. Replace equipment delivered to job site that does not comply with above requirements at no expense to the Owner.

B. Storage and Handling Requirements:

1. Store products in covered storage area, protected from the elements, outside the general construction area until installed.
2. Handle items carefully to avoid breaking, chipping, denting, scratching, or other damage.
3. Replace damaged items with same item in new condition.

**1.10 WARRANTY**

A. Manufacturer Warranty:

1. Provide in accordance with Section 20 00 00 - General Mechanical Requirements.
2. Provide maximum 4 hour response time to service/warranty calls from the Owner during the warranty period.

B. Special Warranty:

1. The warranty shall consist of a commitment by controls contractor to provide, at no cost to the Owner, parts and labor as required to repair or replace such parts of the control system that prove inoperative due to defective materials or installation practices.
2. The warranty expressly excludes routine service such as instrument calibration.

**PART 2 PRODUCTS**

**2.01 ACCEPTABLE PLATFORMS**

A. Provide 3rd party, BACnet compatible, open protocol integration platform:

1. Station Compatibility In: All.
2. Station Compatibility Out: All.
3. Tool Compatibility In: All.

4. Tool Compatibility Out: All.

B. Controls contractor shall host the platform and shall be a factory certified representative with offices in Alaska.

C. Niagra 4 platform, by Tridium, or pre-approved equal.

**2.02 APPLICATION SPECIFIC CONTROLLER (ASC)**

A. General Requirements:

1. Application Specific Controllers shall be equipped with a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.

2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

3. The ASC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.

4. ASC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement.

B. ASC Interface Software:

1. General: ASC shall be configured, not programmed, via PC based interface software. This software shall be a program applet that runs within the network management tool chosen. Intimate knowledge of operation of ASC shall not be required for configuration.

2. ASC shall provide a selection of control applications performable through configuration of the device. Download of new application should not be required for one of these applications.

C. ASC Device Software:

1. General: An ASC shall operate in standalone mode as needed for specified control applications if network communication fails. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.

2. Operating system software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, monitor and manage network communications, and scan inputs and outputs. The operating system shall also contain built in diagnostics.

**2.03 APPLICATION GENERIC CONTROLLER (AGC)**

A. General Requirements:

1. Application Generic Controllers shall be equipped with a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.

2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

3. The AGC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.

4. AGC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement. Network and power wiring shall allow for 'pass-thru' of signal when electronic boards are removed.

B. AGC Interface Software:

1. General: AGC shall be configured, not programmed, via PC based interface software. This software shall be a program applet that runs within the network management tool chosen. Intimate knowledge of operation of AGC shall not be required for configuration.
2. AGC shall provide a selection of control applications performable through configuration of the device. Download of new applications from network management tool shall be possible, but not required.

**2.04 ROUTERS, BRIDGES, REPEATERS AND TRANSCEIVERS**

A. Routers, Bridges and Repeaters:

1. Equip each router and bridge with a network transceiver on each network port (inbound and outbound) as dictated by the network type (Type 1 - FTT, Type 2 - TP, Type 3 - PL, Type 4 - LP, Type 5 - RF).
2. The network router shall be designed to route messages from a segment, sub-net, or domain in full duplex communication mode.
3. Routers with TCP/IP capability shall be provided where TCP/IP backbone is used.
4. Routers, bridges and repeaters shall be fully programmable and permit a systems integrator to define message traffic, destination, and other network management functions.
5. The routers, bridges, and repeaters shall be capable of DIN rail or panel mounting and be equipped with status LED lights for Network traffic and power.

B. Transceivers:

1. Type 1 Network Transceiver, Free Topology, Twisted Pair: Provide a transformer isolated, twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:
    a. Differential Manchester encoded signaling for polarity insensitive network wiring.
    b. Transformer isolated for common mode rejection.
    c. 78 Kbps network bit rate up to distances of 2000 meters.
    d. Free topology supports star, home run, multi drop and loop wiring topologies.
    e. Complies with FCC and VDE requirements.
    f. UL recognized component.
2. Type 2 Network Transceiver, Twisted Pair: Provide a transformer isolated twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:
    a. Differential Manchester encoded signaling for polarity insensitive network wiring.
    b. Transformer isolation for common mode rejection.
    c. 1.25 Mbps network bit rate up to distances of 1000 meters.
    d. Unpotted construction.
    e. Less than 1 mA power consumption with +5VDC input voltage.

f. FCC and VDE Level B requirements compliance.

g. UL Listed.

3. Type 3 Network Transceiver, Power Line:

   a. Provide a direct sequence, spread spectrum power line transceiver which is equipped with the following signal processing and error correction capabilities to provide robust and error free communications.
      1). Forward Error Correction (FEC) to enable the system to read and reconstruct corrupted packets without sacrificing throughput. The FEC shall require only 6 percent overhead for error correction.
      2). Automatic sensitivity adjustment algorithm that dynamically changes the receiver sensitivity based on noise characteristics.
      3). Oversampling correlation filter and adaptive data recovery algorithm to synchronize instantaneously to incoming packets.
      4). Tri-state power amplifier/filter combination to provide a powerful output signal with a minimum number of components.

   b. The transceiver shall be able to operate using the controller power supply and coupling circuit. Provide the following general features as a minimum:
      1). Packaged in a rugged, potted module.
      2). Programmable clock output (1.25, 2.5, 5 or 10 Mhz).
      3). 10 Kbps network transmission rate.
      4). Packet detect output to drive a status indicator LED.
      5). Minus 20 to plus 85 degrees C temperature operating range.
      6). UL Listed.

4. Type 4 Network Transceiver, Link Power: Provide a twisted pair transceiver that utilizes the twisted pair communication media to provide power for controller(s). The transceiver shall meet the following specifications:

   a. Free single-in-line package (SIP) construction.

   b. Send both network data and power on a twisted wire pair.

   c. Differential Manchester encoded signaling for polarity insensitive network wiring.

   d. 78 Kbps network bit rate up to distances of 320 meters.

   e. Supports star, home run, multidrop, and loop wiring.

   f. Supplies +5VDC at 100 mA maximum for node power.

   g. Compliance with FCC and VDE requirements.

   h. UL Listed.

5. Type 5 Network Transceiver, Radio Frequency: Provide a direct sequence, spread spectrum RF transceiver that meets the following specifications:

   a. 100 meter open field range.

   b. Wireless communications extends network between buildings and to vehicles and portable devices.

   c. FCC type certifiable, 48 MHz.

   d. Low-cost miniature circuit board, SMT components.

   e. Carrier detect output to drive a status indicator LED.

   f. Plus 7 to plus 15VDC input voltage.

   g. Minus 20 to plus 60 degrees C temperature operating range.

## 2.05 OPERATOR WORKSTATION

A. Utilize existing workstation for access.

## 2.06 PERSONAL COMPUTER OPERATOR WORKSTATION HARDWARE

A. As required by system design and components, upgrade operator workstation for seamless control and communication between the existing building and the building (gym) addition.

## 2.07 WORKSTATION OPERATOR INTERFACE

A. Basic Interface Description:

1. Operator workstation interface software shall minimize operator training through the use of English language prompting, 30-character English language point identification, on-line help, and industry standard PC application software. Interface software shall simultaneously communicate with up to 4 Building Level Networks and share data between any of the 4 networks. The software shall provide, as a minimum, the following functionality:
    a. Real-time graphical viewing and control of environment.
    b. Scheduling and override of building operations.
    c. Collection and analysis of historical data.
    d. Point database editing, storage and downloading of controller databases.
    e. Alarm reporting, routing, messaging, and acknowledgment.
    f. Display dynamic data trend plot.
    g. Definition and construction of dynamic color graphic displays.
    h. Program editing.
    i. Transfer trend data to third party software.
    j. Scheduling reports.
    k. Operator Activity Log.
2. Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device and "point and click" approach to menu selection.
3. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BAS alarms and monitoring information.
4. Operator specific password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. Operator privileges shall "follow" the operator to any workstation logged onto (up to 999 user accounts shall be supported).
5. Scheduling and Override: Provide a calendar type format for simplification of time-of-day scheduling and overrides of building operations. Schedules reside in the PC workstation, DDC Controller, and HVAC Mechanical Equipment Controller to ensure time equipment scheduling when PC is off-line, PC is not required to execute time scheduling. Provide override access through menu selection or function key.
6. Collection and Analysis of Historical Data: Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or change

of value, both of which shall be user-definable. Trend data may be stored on hard disk for future diagnostics and reporting. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.

B. Dynamic Color Graphic Displays:

1. Create at least one color graphic display for each piece of mechanical equipment, including air handling units, hot water boiler systems, and room level terminal units. Provide floor plans to facilitate navigation. Point information to be displayed on the graphics shall be provided by the BAS contractor to optimize system performance and analysis and to speed alarm recognition.
2. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands. Graphics software shall permit the importing of submittal AutoCAD drawings and scanned pictures for use in the system.
3. Dynamic temperature values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.
4. Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable.
5. The windowing environment of the PC operator workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.
6. A dynamic display of the site-specific architecture showing status of controllers, PC workstations and networks shall be provided.

C. System Configuration and Definition:

1. Network wide control strategies shall not be restricted to a single DDC Controller, but shall be able to include data from any and all other network panels to allow the development of Global control strategies.
2. Provide automatic backup and restore of DDC controller databases on the workstation hard disk. In addition, database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate DDC Controller. Changes made at the DDC Controllers shall be automatically uploaded to the workstation, ensuring system continuity.

D. Alarm Management:

1. Alarm Routing shall allow the user to send alarm notification to selected PC locations based on time of day, alarm severity, or point type.
2. Alarm Display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message. The alarm display shall provide a mechanism for the operator to sort alarms.
3. Alarm messages shall be customizable for each point to display detailed instructions to the user regarding actions to take in the event of an alarm.

## 2.08 NETWORKING COMMUNICATIONS

A. The design of the BAS shall network an operator workstation(s) and stand-alone DDC Controllers. The network architecture shall consist of three levels; a Management Level Network (MLN) Ethernet network based on TCP/IP protocol, a high performance peer-to-peer

building level network (BLN) and DDC Controller floor level local area networks (FLN). Access to the system shall be totally transparent to the user when accessing data or developing control programs.

B. Management Level Network:

1. PCs shall simultaneously direct connect to the Ethernet and Management Level Network without the use of an interposing device.
2. The Management Level Network shall not impose a maximum constraint on the number of operator workstations.
3. Simultaneous user access to network limited to number of sight licenses issued to user.
4. When appropriate, any DDC controller residing on the peer-to-peer building level network shall connect to Ethernet network without the use of a PC.
5. Any PC on the Ethernet Management Level Network shall have transparent communication with controllers on the building level networks connected via Ethernet as well as directly connected building level networks. Any PC shall be able to interrogate any controller on the building level network in addition to being able to download program changes to individual controllers.
6. The Management Level Network shall reside on industry standard Ethernet utilizing standard TCP/IP, IEEE 802.3.
7. Access to the system database shall be available from any client workstation on the Management Level Network.

C. Peer-to-Peer Building Level Network (BLN):

1. The system shall have the ability to support integration of third party systems (fire alarm, security, lighting, variable speed drives, PLCs, condensers, boilers) via a panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. Exchange points shall have full system functionality as specified herein.
2. Data transfer via Ethernet.

D. Floor Level Network (FLN):

1. This level communication shall support a family of application specific controllers and shall communicate with the peer-to-peer network through DDC Controllers for transmission of global data.

**2.09 CONTROL PANELS**

A. Terminal Equipment Controllers will be mounted in enclosed control panels with screwed, removable covers.

B. Control devices located in exposed areas subject to outside weather conditions or near circulator pumps (spray due to shaft seal failures) shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service.

C. Nameplates shall be provided beneath each panel face mounted control device describing the function of each device. Nameplates shall have white letters engraved on blue Lamicoid, or approved equal.

D. Control panels shall bear a UL label compatible with the application.

E. Electrical devices within the panel shall be pre-wired to terminal strips, with inter-device wiring within the panel completed prior to installation of the system.

F. BLN level controllers shall be provided with standby/emergency power to provide power quality and minimum 15 minutes operation.

## 2.10 UNINTERRUPTIBLE POWER SUPPLY

A. Acceptable manufactures are limited to the following:

1. Powerware.
2. Substitution Request required.

## 2.11 ACCESS PANELS

A. Access panels provided by Division 08.

B. Coordinate access panel locations with the Owner's Representative and Division 08. Provide access to concealed control devices.

# PART 3 EXECUTION

## 3.01 INSTALLATION

A. Special Techniques:

1. Mount damper operators and other control devices secured to insulated ductwork on brackets such that the device is external of the insulation. See Section 20 05 29 - Hangers and Supports.
2. Do not install control devices in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.
3. Identification: Permanently tag controllers, switches, relays, thermostats and actuators for identification using the tagging format shown on the BAS control drawings.
4. Sensors and Switches:
   a. Pump flow or fan flow, etc., shall be sensed using current switch unless indicated otherwise. Calibrate current switch to distinguish between loaded or unloaded motor condition due to belt or coupler breakage.
   b. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support with capillary clips and maintain minimum 1 inch tubing bending radius.
5. Wiring:
   a. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories. Install wiring in exposed or inaccessible areas in EMT conduit. Plenum-rated cable may be used in concealed, accessible areas only.
   b. Provide wiring between thermostats and unit heater motors, and control and alarm wiring.
   c. Provide conduit and wiring between the BAS panels and the temperature, humidity, or pressure sensing elements, including low voltage control wiring in conduit or plenum-rated cable.
   d. Provide conduit and control wiring for devices specified in this Section.
   e. Provide conduit and signal wiring between motor starters in motor control centers and high and/or low temperature relay contacts and remote relays in BAS panels located in the vicinity of motor control centers.
   f. Provide conduit and wiring between the PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contactors, and BAS panels, as shown on the drawings or as specified.
   g. Wiring shall be compliant with the Divisions 26, 27 and 28 requirements and the NEC.

h. Provide electrical wall boxes and conduit sleeves for wall-mounted devices. Mount thermostats at 54 inches AFF unless otherwise noted.

i. Ethernet drop at or near designated BAS control panel(s), and as needed.

B. Interface with Other Work:

1. The Contractor is responsible to furnish and install complete and operational systems. The following breakdown is recommend; carefully coordinate work between subcontractors.

2. Products furnished by BAS contractor for installation by the mechanical contractor:

a. Control valves.

b. Wells for hydronic temperature sensors.

3. Products furnished and installed by mechanical contractor:

a. Gauges, thermometers and thread-o-lets for BAS contractor furnished control sensor wells.

b. Airflow measuring stations.

c. Control and balancing dampers.

4. Electrical contractor (Divisions 26, 27, 28) provides:

a. Wiring of power feeds through disconnect starters to electrical motors.

b. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by controls contractor.

c. Duct smoke detectors including installation and wiring.

d. Stand-alone packaged controls and wiring of stand-alone packaged controls to their remote sensors and devices.

e. Mounting and wiring of Variable Speed Drives (VSDs) furnished by the Mechanical Contractor per Divisions 20, 21, 22, 23, 25.

C. System Integration. Products to receive integration under this section:

1. Variable Speed Drives:

a. Connect directly to the BAS through three twisted pair for Start/Stop, speed control and remote communications.

b. Factory-furnished with the appropriate communication hardware and software to allow communication.

c. Connections to VSD provided under this section.

2. Fire Alarm/Life Safety System:

a. The BAS shall communicate with the fire alarm/life safety system via an alarmable point in the form of a dry contact.

b. The device will be provided and terminated by Divisions 26, 27 and 28. This section will provide wiring to the termination device.

**3.02 PROGRAMMING**

A. Programming and graphics shall be included to implement the controls sequences specified in Section 25 90 00 - Sequences of Operation, and to implement the systems and features included in Facility Services Divisions 20 to 28. It shall not be necessary for the Contracting Agency to further program the system.

B. Provide licensed copies of software tools and programming aids used to install, develop and troubleshoot the controls system to the Contracting Agency. Assist the Contracting Agency in registering the software in Contracting Agency's name.

C. Implement the control sequences for the equipment on this project as contained in Section 25 90 00 - Sequences of Operation.

D. Point identifiers shall be chosen for easy identification of the actual equipment being controlled or monitored. They shall include equipment tag identifiers shown on the drawings, and may include additional characters to identify floor, area, etc. Maintain a listing of identifiers used in this project, with their plain English names. Submit the listing for review and information.

**3.03 SITE QUALITY CONTROL**

A. Programming BAS to provide system operation and monitoring in accordance with Section 25 90 00 - Sequences of Operation and other referenced sections.

B. Trend Logs:

1. Prepare trend logs for all points required to demonstrate BAS calibration, control and stability.
2. Trend logs shall document building operation after applicable PC/FT checklists are completed and building site commissioning is satisfactorily completed.
3. Set points, valve positions, etc. may be temporarily adjusted to artificially induce the intended sequences to occur.

**3.04 CLOSEOUT ACTIVITIES**

A. Demonstration:

1. Provide demonstrations in accordance with Section 01 79 00 - Demonstrations and Training.
2. Demonstrate the proper operation and control of systems controlled and monitored by the BAS.
3. The demonstration shall include, but not necessarily be limited to, the following:
   a. Review of the Trend Logs.
   b. Complete and proper operation of control systems including simulations.
   c. Access to devices for required maintenance.
   d. Review of associated graphics on Host.

B. Training:

1. Provide training in accordance with Section 01 79 00 - Demonstrations and Training.
2. In addition, provide forty (40) hours of on-site instruction by BAS contractor to familiarize operating personnel with the control system. Instructions will include:
   a. A brief description of the controls' sequence of operation.
   b. A discussion and explanation of alarms, switches and gauges.
   c. A summary and explanation of steps to be taken in response to specific alarms or control malfunctions.
   d. Building walk-through to physically locate and examine control devices and demonstrate control setpoint adjustment procedures.
   e. Instructions regarding adjustment procedures shall emphasize methods for continual building "fine-tuning".

**END OF SECTION**

# SECTION 25 90 00
# SEQUENCES OF OPERATION

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: This section describes the building automation system (BAS) control sequences for the heating, ventilating and air-conditioning (HVAC) systems, electrical systems and plumbing systems provided for this project.

B. Related Sections: Refer to Section 25 50 00 - Building Automation System

### 1.02 REFERENCES

A. Refer to Section 25 50 00 - Building Automation System.

### 1.03 SYSTEM DESCRIPTION

A. Refer to Section 25 50 00 - Building Automation System.

### 1.04 PREINSTALLATION MEETINGS

A. Refer to Section 25 50 00 - Building Automation System.

### 1.05 SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

### 1.06 CLOSEOUT SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

### 1.07 QUALITY ASSURANCE

A. Refer to Section 25 50 00 - Building Automation System.

B. Qualifications of Installers/Programmers: Minimum 3 years' experience in the installation and programming of direct digital control systems.

### 1.08 WARRANTY

A. Refer to Section 25 50 00 - Building Automation System.

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.01 EXTERIOR LIGHTING CONTROL

A. Building Mounted Site Lighting:

1. Turn off building mounted site lighting automatically via the Panelboard Lighting Control System.
    a. Upon de-activation of the exterior mounted photoelectric switch due to daybreak.
    b. Manually via the BAS at the discretion of the operator.
    c. At a set time at the direction of the Owner. Preliminary on/off times are shown in the Automated Control Switching Matrix. Final programming shall reflect the times provided by the Owner and shall account for a 365-day schedule including special hours for different seasons, weekends and holidays. Submit request to Contracting Agency to obtain Owner's time schedule for lighting operation.
    d. Release manual lighting overrides upon photo electric switch change of state.

2. Turn on building mounted site lighting automatically via the Panelboard Lighting Control System:
    a. Upon activation of the exterior mounted photoelectric switch due to nightfall.
    b. In coordination with the Fire Alarm System when an alarm is received.
    c. In coordination with the security system when an alarm is received.
    d. Manually via the BAS at the discretion of the operator.
    e. Release manual lighting overrides upon photo electric switch change of state.

**3.02 VENTILATION SYSTEM (AHU-3)**

A. General Ventilation System Description:
    1. The ventilation systems for the building toilet / changing rooms, telehealth, hallway and storage spaces consists of one independent heat recovery ventilator (HRV) unit. Proper operation of all air handling equipment is essential for a balanced and functional building.
    2. The unit is supplied with a packaged controller provided with BACNet-IP communication capability. Defrost functions are controlled internally.
    3. Operate the units continuously during occupied mode and as needed during unoccupied mode. Excess supply air from the HRV is used for building pressurization.

B. Set the supply air and exhaust air flowrates using the integral modulating control during TAB effort. The fan speeds will not be modulated during operation.

C. Control the motorized OSA and EF dampers at unit. Open the dampers when the unit is operating. Close the dampers when the unit is not operating.

D. Occupied operation schedule:
    1. Turn unit on at 6 a.m. (adjustable).
    2. Turn unit on at 11 p.m. (adjustable).

E. Unoccupied operation:
    1. Unit is normally off.
    2. If room temperature sensor drops below 70 degrees F, start unit and cycle heating coil.
    3. Once room temperature maintains setpoint for 30 minutes (adjustable), stop unit and close dampers.

F. Airflow monitoring: Monitor the outside air and exhaust airflow CFMs via airflow monitoring stations. Provide local display and connect the signal to the BAS. Monitor the OSA and EF CFM and generate a maintenance alarm if the OSA-EA CFM amount exceeds the scheduled amount, by 50 percent or more for a period of 2 hours or longer.

G. Internal Hydronic Preheat Coil:
    1. Monitor outside air discharge temperature downstream of the PHC and modulate the preheat coil control valve as needed to maintain discharge temperature setpoint temperature.
    2. Initial setpoint: 20 degrees F.

H. Internal Hydronic Heating Coil:
    1. Monitor supply air discharge temperature and modulate the reheat coil control valve as needed to maintain space temperature setpoint temperature.
    2. Initial setpoint: 72 degrees F.

I. Hydronic Reheat Coil:

1. Monitor supply air discharge temperature downstream of the RHC and modulate the reheat coil control valve as needed to maintain space temperature setpoint temperature.
2. Initial setpoint: 75 degrees F.

J. Maintenance and Alarm Monitoring:

1. HRV Supply Fan Monitoring: Monitor supply fan motor and generate an independent “AHU-3” alarm if fan fails when it has been commanded “On” by the BAS.
2. HRV Exhaust Fan Monitoring: Monitor supply fan motor and generate an independent “AHU-3” alarm if fan fails when it has been commanded “On” by the BAS.
3. Air filter replacement monitoring: For each filter bank, generate an “AHU-3 High Filter Differential Pressure” alarm when the filter switch closes.
4. Zone Temperature Monitoring: Generate “AHU-3 Zone Temperature High/Low” alarm if the zone temperature is not being maintained within setpoint band tolerance as described delete me

**3.03 VENTILATION SYSTEM (AHU-4)**

A. General Ventilation System Description:

1. Ventilation for the gymnasium is provided by AHU-4. AHU-4 is located in the mezzanine Fan Room.
2. AHU-4 utilizes a constant volume control strategy incorporating variable speed drive motor controllers to modulate supply fan speed. During periods of low system demand, supply fans automatically reduce speed, minimizing fan horsepower and conserving electrical energy.
3. Return air from AHU flows back through gravity return to the Fan Room. Once back at the Fan Room, return air is either re-circulated through the building by the AHU, or is relieved from the building through the relief fans (RF-2, RF-3).

B. Full Shutdown Mode:

1. Supply fan off.
2. Mixing box outside air damper shut.
3. Mixing box return air damper fully open.
4. Relief fans off.
5. Relief fan damper shut.
6. Heating coil hydronic control valve modulating to maintain 55 degrees F minimum mixing box air temperature.
7. Cooling coil hydronic three-way control valve shut (no flow through coil).

C. Operating mode:

1. Start Sequence:
   a. Provide independent, adjustable, automatic start/stop sequence for each air handling system based on time-of-day schedule.
   b. Provide a minimum 5-second time delay between the start of each AHU supply fan and return fans.
2. Supply Fan Speed Control:
   a. Locate an airflow measuring station in the supply duct off AHU-2. When system is in minimum or heating mode, airflow volume setpoint is at minimum (2,200 CFM). As

the demand for cooling increases, increase the airflow volume setpoint until it reaches its maximum setpoint (3,000 CFM).

b. Utilizing the fan variable speed drive (VSD) controller, modulate supply fan speed to maintain the airflow volume setpoint.

c. Program AHU to go into Full Shutdown Mode in the event of VSD failure. Require manual restart of the system.

3. Building Static Pressure Control:

a. Provide two outdoor ambient pressure sensors on the roof on opposite corners of the building as shown on the drawings.

b. Provide indoor static pressure reference heads in the following location: Gymnasium.

c. Compare indoor static pressure reference head for AHU with the average reading from the outdoor ambient pressure sensors. Modulate relief fan (RF-1) speed to maintain a positive 0.03 inches WC building pressure as measured by its respective indoor static pressure head(s).

4. Supply Temperature Control:

a. Pre-Occupancy Warm-Up/Cool-Down Mode:
   1). Initial Conditions: The ventilating system is in Full Shutdown Mode.
   2). Initiate pre-occupancy warm-up/cool-down cycle one hour prior to scheduled Occupied Mode operation.
   3). Start AHU using the start sequence.
   4). Control AHU fan speed using fan speed control sequence.
   5). Warm-Up: Modulate heating coil hydronic control valve to maintain 65 degrees F supply air setpoint temperature as measured downstream of supply fan. The outside air damper remains shut, the return air damper remains fully open, relief fan remains off, and the relief fan damper remains shut. The building pressure control sequence is disabled.
   6). Economizer Cool-Down: If outdoor air temperature is greater than 45 degrees F and less than 65 degrees F, modulate outside air damper open and modulate return air damper shut to maintain 65 degrees F supply air setpoint temperature. The relief fan modulates speed to maintain an approximately neutral building pressure.
   7). Mechanical Cool-Down: If outdoor air temperature is greater than 65 degrees F, the outside air damper remains shut, the return air damper remains fully open, the relief fan is off, and the relief fan damper remains fully shut. Modulate open hydronic cooling control valve to maintain supply air setpoint temperature.

b. Occupied Mode:
   1). System has completed Pre-Occupancy Warm-Up/Cool-Down Mode and zones are at Occupied Mode temperature setpoints.
   2). Command outside air damper to occupied mode from the BAS. Outside air damper modulates open and controls minimum outside air volume flow rate (CFM) to scheduled value as measured by the airflow measuring station.
   3). Return air damper modulates proportionally to outside air damper.
   4). Relief damper modulates to maintain building static pressure.
   5). Measure mixing box mixed air temperature using duct averaging flexible sensors. If mixed air temperature is less than 55 degrees F setpoint shift to

Heating Mode. Modulate heating coil hydronic control valve to maintain 55 degrees F supply air setpoint temperature measured downstream of supply fan.

6). If mixed air temperature is greater than 55 degrees F setpoint, and the heating coil hydronic control valve has been shut for 3 minutes, shift to Economizer Cooling Mode. Modulate open outside air damper and modulate shut return air damper proportionally to maintain supply air temperature setpoint. Modulate relief fan speed to maintain building static pressure.

7). If the outside air damper is fully open and return air damper is fully shut for 5 minutes, supply air temperature is greater than setpoint temperature, and the outside air temperature is greater than return air temperature, shift to Mechanical Cooling Mode. Modulate the outside air damper to the minimum outside air position. Modulate return air damper open and modulate relief fan speed to maintain building static pressure setpoint. Modulate cooling coil hydronic control valve to maintain supply air temperature setpoint.

c. Unoccupied Mode:

1). AHU is initially operating in Occupied Mode.

2). Shift ventilation system to Full Shutdown Mode.

3). The hydronic heating system operates to maintain 65 degrees F night setback temperature setpoint plus 3, minus 0 degrees F using perimeter heat only.

4). If zone falls below setback temperature setpoint, operate the ventilating system using Pre-Occupancy Warm-Up Mode sequences.

5). Provide 15-minute minimum supply fan run time and 5-minute minimum system off time.

6). If thermostat occupancy override button is pushed, operate the ventilation system in Occupied Mode for a 2-hour period.

D. Safety Shutdowns:

1. General:

a. “Hardwire” system safety shutdowns to provide safe, reliable operation in the event of Building Automation System (BAS) failure.

b. Where equipment is provided with packaged stand-alone controls, capable of operating the equipment independently from the BAS, provide control logic which shifts the equipment to stand-alone operation in the event of BAS failure.

2. Return Duct Smoke Detector Shutdown:

a. Hardwire return air duct smoke detectors directly to the building’s fire alarm panel. Refer to Section 283100 - Addressable Fire Alarm System for sequence of operation.

b. Hardwire return air duct smoke detectors directly to the AHU fan VSD’s to directly shut down fans upon detection of smoke.

c. Monitor fire alarm panel “General Alarm” status from BAS system.

d. On “General Alarm” from fire alarm panel, the BAS shall:

1). Verify AHU supply fan is off. If fan is operating, stop supply fan.

2). Shut outside air dampers.

3). Open return air dampers.

4). Relief fan is off.

5). Shut relief dampers.

6). Stop exhaust fans and shut exhaust fan dampers.

3. High Duct Static Pressure Shutdown:
    a. If ventilating system duct supply static pressure increases to 3.0 inches WC:
        1). Command applicable ventilating system to Full Shutdown Mode.
        2). Provide “AHU-2 High Static Pressure” alarm.
        3). Require manual restart of the ventilation system through the BAS.
4. Low Temperature Shutdown:
    a. If supply air temperature decreases to 45 degrees F or mixed air temperature decreases to 35 degrees F:
        1). Command applicable ventilating system in Full Shutdown Mode.
        2). Provide “AHU-2 Low Temperature Shutdown” alarm.
        3). Require manual restart of the ventilation system through the BAS.

E. Maintenance and Alarm Monitoring:
1. Air filter replacement monitoring:
    a. Provide analog differential pressure sensor at each pre-filter bank:
        1). Normal filter (MERV-8) differential pressure range is 0.27 inches WC (clean) to 0.90 inches WC (dirty) at 500 feet per minute.
        2). Generate “AHU-2 High Filter Differential Pressure” maintenance alarm at 0.80 inches WC.
    b. Provide analog differential pressure sensor at each final filter bank:
        1). Final filter (MERV-14) differential pressure range is 0.32 inches WC (clean) to 1.00 inches WC (dirty).
        2). Generate “AHU-4 High Filter Differential Pressure” maintenance alarm at 0.90 inches WC.
2. Zone Temperature Monitoring:
    a. Generate “AHU-4 Zone Temperature High/Low” maintenance alarm if zone temperature is not being maintained within setpoint band tolerance as described in Occupied Mode and Unoccupied Mode sequences.
    b. During optimized start period, generate “AHU-4 Zone Temperature High/Low” maintenance alarm if zone temperature fails to meet occupied temperature setpoint.
    c. Generate “AHU-4 Zone Low Temperature” critical alarm if zone temperature falls below 55 degrees F.
3. Duct Static Pressure Monitoring:
    a. Generate “Duct Static Pressure High/Low” maintenance alarm if duct pressure falls outside setpoint tolerance, plus or minus 0.05 inches WC.
    b. Provide 3-minute alarm time delay to prevent spurious alarms.
4. AHU Flow Monitoring:
    a. Provide BAS monitoring of variable speed drive enable/disable contacts, analog speed controller, and trouble contacts.
    b. Generate “VSD Fault” alarm if the VSD fan motor controller goes into fault.

**3.04 MECHANICAL ROOM VENTILATION SYSTEM (CF-1)**

A. Description:
1. Mechanical room ventilation system CF-1 provides ventilation cooling for the boiler room whenever heat gain from the boilers exceeds room heat loss and combustion air heating requirements.

2. The system includes an outside air intake louver, mixing box, and cabinet fan with medium efficiency filter section.
3. A direct combustion air wall opening with associated louver and insulated duct elbow provides combustion air to natural gas fired equipment.
4. Excess air from the CF-1 ventilation system is relieved through the combustion air intake louver.

B. Zone Thermostat: Provide wall mounted thermostat with output signal to BAS system.

C. Cooling Mode:
1. Start fan SCF-1 when mechanical room temperature increases above 75 degrees F. (adjustable) setpoint temperature.
2. Modulate mechanically linked mixing box outside air and return air dampers to maintain 55 degrees F. supply-air discharge temperature.
3. When mechanical room temperature falls to 70 degrees F. (adjustable), stop CF-1. Shut outside air damper and fully open return air damper.

D. Low temperature shutdown:
1. Stop fan and close OSA damper if discharge supply temperature is less than 45 degrees F. (adjustable).
2. Provide “CF-1 Low Temperature” alarm to BAS.
3. Provide BAS software reset to initiate the system restart sequence.

E. Minimum Run Timer: Provide 10 minute minimum system run time and 5 minute minimum system off time (adjustable).

F. Filter Monitoring:
1. Provide analog differential pressure sensor across filter bank.
a. Normal filter (2-inch Farr 30/30 GT) differential pressure range is 0.28 inches W.C. (clean) to 0.90 inches W.C. (dirty) at 500 feet per minute.
b. Generate "CF-1 High Filter Differential Pressure" alarm at 0.80 inch W.C. (adjustable).

G. Fan Monitoring: Monitor supply fan motor and generate an independent maintenance alarm if fan fails when it has been commanded “On” by the BAS.

**3.05 HYDRONIC HEATING SYSTEM OPERATION**

A. General System Description:
1. The hydronic heating system consists of two identical cast iron hydronic boilers (BLR-3, BLR-4) each sized for approximately 60 percent of the building's design heating load. The boilers are arranged in a primary/secondary piping arrangement. Each boiler has a dedicated primary loop circulator, pumps PMP-1 and PMP-2 respectively.
2. Two sets of secondary heating loop variable speed pumps (PMP-4/5 and PMP-6/7), arranged in parallel, and each sized for 100 percent system zone flow provide circulation to air handler coils, VAV boxes, reheat coils, perimeter fintube, cabinet unit heaters and unit heaters throughout the facility.

B. Coordination with Packaged Boiler Controls:
1. Fully coordinate connection of the BAS to the packaged burner controllers.
2. Provide boiler enable/disable and sequencing, circulator pump operation and secondary loop temperature reset utilizing the BAS.

C. Full Shutdown Mode (Initial conditions):
   1. All boilers off.
   2. Boiler circulator pumps off (PMP-1, PMP-2 and PMP-3).
   3. Secondary heating loop circulator pumps off (PMP-4/5, PMP- 6/7).
   4. AHU heating coil recirculation pumps off (PMP-8 through PMP-12).

D. Operating Mode:
   1. System Enable:
      a. Manual Mode:
         1). Provide three-position on/off/auto switch located on each burner control cabinet to allow local manual enable, disable or automatic burner control from the BAS (normal condition).
   2. Lead/Lag Control:
      a. Provide lead/lag control for boilers (BLR-1, BLR-2 and BLR-3). Alternate lead boiler monthly (adjustable) during the heating season.
      b. Provide lead/lag control for secondary loop circulators. Alternate lead loop pump monthly (adjustable) during the heating season.
   3. System Start-up:
      a. Start lead secondary loop circulator pumps (PMP-4 and PMP-6). Operate secondary circulator pumps with lead pump in “run” and standby pump in “standby.” If lead pump fails to start as determined by analog current sensor, disable lead pump and start standby pump.
      b. After secondary loop flow has been established for 10 minutes (adjustable), enable boiler operation.
   4. Boiler Operation:
      a. Calculate "secondary loop water temperature setpoint" in accordance with the following linear reset schedule:

| Hydronic System Temperature Reset Schedule | |
|---|---|
| Outside Air Temperature | Secondary Loop Water Temperature Setpoint |
| 60 Degrees F. | 140 Degrees F. |
| 0 Degrees F. | 190 Degrees F. |

      b. Compare actual secondary loop temperature (sensor located downstream of air separator AS-1) with computed secondary loop water temperature as determined by reset schedule.
      c. If actual water temperature is lower than water temperature required by reset schedule:
         1). Start lead boiler circulator pump (PMP-1, PMP-2 or PMP-3).
         2). Command lead boiler to “Low Fire” mode from the BAS system utilizing packaged burner control start-up sequence.
      d. Track the actual secondary loop water temperature rate-of-rise. If one time constant elapses and rate-of-rise is insufficient to achieve “computed water temperature setpoint,” modulate burner to achieve “computed water temperature setpoint.”

e. If lead boiler is modulated to “High Fire” and rate-of-rise is still insufficient to achieve “computed water temperature”:
   1). Start lag boiler circulator pump (PMP-2, PMP-3 or PMP-1).
   2). Command lag boiler to “Low Fire” mode from the BAS system utilizing packaged burner control start-up sequence.

f. Continue boiler sequence until secondary loop temperature setpoint is reached or all boilers are operating in “High Fire” mode.

g. Reverse sequence if actual secondary loop water temperature is greater than computed secondary loop water temperature setpoint.

h. Boilers must modulate to "Low Fire" mode prior to full shutdown. After a boiler is commanded to shutdown, operate associated circulator pump for 5 minutes utilizing a time delay relay.

i. Coordinate with boiler manufacturer’s representative and adjust setpoints and time constants in accordance with manufacturer’s recommendations.

5. System Shutdown:

   a. Initiate Full Shutdown Mode in the following events:
      1). Manual “off” mode.
      2). Low water cutoff shutdown of either boiler.

E. Variable Speed Hydronic Pump Control (PMP-4/5 and PMP-6/7):

1. Provide a separate hydronic system pressure sensor in each main hydronic header branch line (two total). Locate each sensor approximately 3/4 the distance between the secondary loop circulator pump (PMP-4/5 and PMP-6/7) combined discharge and the most remote terminal heating unit control valve in each branch.

2. Adjust VSD controller output to modulate pump speed between 35 percent and 100 percent flow to maintain the lowest reading hydronic header pressure sensor at setpoint pressure. Set initial header pressure setpoint to 5 PSIG (adjustable).

F. AHU Heating Coil Recirculation Pumps (PMP-8 and PMP-10):

1. When outside air (OSA) temperature is 35 degrees F. (adjustable) and decreasing, and associated AHU heating coil control valve opens greater than 0 percent, start applicable heating coil circulator pump (PMP-8 through PMP-10).

2. See AHU operating sequences for additional requirements.

G. Hydronic System Monitoring and Alarm:

1. Boiler safeguard alarms (BLR-1, BLR-2 and BLR-3):

   a. Generate a separate “BLR-X Flame Failure” alarm if any boiler is shut down by its flame safeguard control system.

2. Boiler circulator pump trouble alarms (PMP-1, PMP-2 and PMP-3):

   a. Provide current sensing (analog) for each pump.

   b. Disable applicable flame safeguard circuit and generate an alarm if any pump fails to run when its respective boiler is enabled.

3. Secondary loop pump trouble alarms (PMP-4/5 and PMP-6/7):

   a. Provide current sensing (analog) for each pump.

   b. Generate an alarm if pumps fail to operate in their normal sequence, i.e. alarm if:
      1). Both pumps are off when OSA temperature is below System and Pump Setpoint).
      2). Lead pump fails to operate and system switches to lag pump.

3). Both pumps are running.

4. AHU heating coil recirculation pump trouble alarms (PMP-8 through PMP-10):
   a. Provide current sensing (digital) for each pump.
   b. Generate a separate alarm if either pump fails to operate when outside air temperature is below setpoint.
5. Hydronic System Low Pressure Alarms:
   a. Monitor both the secondary heating loop and the secondary glycol heating loop system pressures with analog sensor pressure sensors.
   b. Generate a separate low-pressure alarm if either system pressure falls below ten (10) PSIG (adjustable).

**3.06 RADIANT SLAB HEATING**

A. Description:
1. The Great Room area utilizes a three zone radiant floor hydronic heating system in combination with the AHU-4 forced air ventilating system to maintain zone temperature and humidity control.
2. The radiant floor heating system operates to maintain a constant floor setpoint temperature utilizing slab floor temperature sensors. Floor temperature is reset based on outside air temperature. Zone temperature setpoint is maintained by the ventilation system.

B. System Shutdown:
1. Zone circulator pumps (PMP-12A, PMP-12B and PMP-12C) off.
2. Injection pumps (PMP-11A, PMP-11B and PMP-11C) off.

C. Typical System Operation:
1. When outside air temperature decreases to 60 degrees F. (adjustable) start zone circulator pumps.
2. Operate circulator pumps for one hour (adjustable) to allow slab temperatures to stabilize.
3. After slab temperature stabilization period, measure floor slab temperature. Modulate injection pumps utilizing VSD controllers to maintain scheduled floor slab temperature based on outside air temperature as follows:

| Floor Slab Temperature Reset Schedule | |
|---|---|
| Outside Air Temperature | Slab Floor Temperature Setpoint |
| Greater than 60 Degrees F. | System off |
| 60 Degrees F. | 65 Degrees F. (adjustable) |
| 0 Degrees F. or below. | 85 Degrees F. (adjustable) |

4. Control injection pump speed (VSD) to limit maximum supply water temperature to 130 degrees F, as measured by supply water temperature sensor located downstream of zone circulator.
5. When outside air temperature increases to 65 degrees F. (adjustable) and increasing, stop zone circulators and injection pumps.

D. Radiant Floor Heating System Monitoring and Alarm:

1. Zone circulator and injection pump trouble alarms (PMP-11A, PMP-11B, PMP-11C, PMP-12A, PMP-12B and PMP-12C).
    a. Provide current sensing (digital) for each pump.
    b. Generate a separate alarm if any pump fails to operate when command to start from the BAS.
2. High Temperature Alarms.
    a. If any zone supply temperature water exceeds 140 degrees F. (adjustable), generate a separate “Zone 1, Zone 2 or Zone 3 High Supply Water Temperature” alarm.
    b. If any slab temperature sensor exceeds 90 degrees F. (adjustable), generate a separate “Zone 1, Zone 2 or Zone 3 High Floor Temperature” alarm.

**3.07 HYDRONIC HEATING SYSTEM DEVICES**

A. Air Handler Heating Coils (AHU-3 and AHU-4): See ventilation system control sequences.

B. Hydronic Unit Heaters:

1. At 65 degrees F. (adjustable) and decreasing, start recirculating fan and open two-way hydronic control valve.
2. At 68 degrees F. (adjustable) and increasing, stop recirculating fan and shut two-way hydronic control valve.

**END OF SECTION**

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**SECTION 26 00 00**

**ELECTRICAL GENERAL REQUIREMENTS**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. This section describes specific requirements, products, and methods of execution, which are typical throughout the electrical work of this project. Additional requirements for the specific systems may modify these requirements.

C. This Section applies to all Divisions 26, 27 and 28 and is part of all other Divisions 26, 27 and 28 Sections.

D. Index of Electrical Specifications:

1. 26 00 00 - Electrical General Requirements
2. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
3. 26 05 26 - Grounding and Bonding for Electrical Systems
4. 26 05 29 - Hangers and Supports for Electrical Systems
5. 26 05 33 - Raceway and Boxes for Electrical Systems
6. 26 05 53 - Identification for Electrical Systems
7. 26 24 16 - Panelboards
8. 26 27 26 - Wiring Devices
9. 26 28 00 - Low Voltage Circuit Protective Devices
10. 26 28 16 - Enclosed Switches and Circuit Breakers
11. 26 29 00 - Low Voltage Controllers
12. 26 31 00 - Photovoltaic Collectors
13. 26 43 00 - Surge Protective Devices
14. 26 50 00 - Lighting Fixtures
15. 27 20 10 - Telecom Distribution System
16. 27 51 16 - Public Address Systems
17. 28 20 00 - Video Surveillance
18. 28 31 00 - Intrusion Detection
19. 28 46 00 - Fire Detection and Alarm

### 1.2 REFERENCES

A. Codes: Perform work in strict accordance with applicable national, state and local codes; including, but not limited to the latest legally enacted editions of the following specifically noted requirements:

1. NFPA 70, National Electrical Code - NEC.
2. ANSI-C2, National Electrical Safety Code - NESC.
3. International Building Code - IBC.
4. International Fire Code - IFC.
5. Underwriters Laboratory (UL) or approved equal.

B. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:

1. American National Standards Institute - ANSI.
2. American Society for Testing and Materials - ASTM.
3. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE.
4. Institute of Electrical and Electronics Engineers - IEEE.
5. Insulated Cable Engineers Association - ICEA.
6. National Electrical Manufacturers' Association - NEMA.
7. National Fire Protection Association - NFPA.

**1.3 DEFINITIONS**

A. "Accessible" means arranged so that an appropriately dressed man, 6 feet-2 inches tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended and may then position himself to properly and safely perform the task to be accomplished, without disassembly or damage to the surrounding installation.

B. “Authority Having Jurisdiction” is the individual official, board, department, or agency established and authorized by the political subdivision created by law to administer and enforce the provisions of the Code as adopted or amended.

C. "As Specified" denotes a product, system, or installation that:

1. Includes all of the salient characteristics identified in the Drawings and Specifications;
2. Meets all of the requirements of the "Basis of Design"; and
3. Is produced by a manufacturer listed as acceptable on the Drawings or in the Specifications.

D. "Basis of Design" refers to products around which the design was prepared. Some or all of the particular characteristics of Basis of Design products may be critical to the fit or performance of the completed installation. Such characteristics are often subtle. Where substitutions are made to products that are the Basis of Design, the Contractor is alerted that nominally acceptable substitutions may produce undesirable side effects such as switchboards that no longer fit the space due to increased product dimensions. The Contractor is responsible for resolving all impacts of substitutions. Approval of a substitution request does not relieve the Contractor of complying with the design intent and all Codes.

E. "Contracting Agency" is the Owner as defined in the General Conditions of the Contract.

F. “Demolish” means to permanently remove a component, equipment, or system and it's appurtenances with no intent for reuse and to properly dispose of it.

G. "Furnish" means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere as noted or agreed to be installed by supporting crafts.

H. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.

I. “Product” is a generic term that includes materials, equipment, fixtures and any physical item used on the project.

J. "Provide" means furnish all products, labor, subcontracts, and appurtenances required and install to a complete and properly operating, finished condition.

K. “Remove” means to remove a component, equipment, or system and it's appurtenances and either store it for re-installation, reuse, or turn it over to the Contracting Agency.

L. "Rough-in and Connect" means provide an appropriate system connection such as conduit with junction boxes, wiring, switches, disconnects, etc., and wiring connections. Equipment furnished is received, uncrated, assembled, and set in place under the Division in which it is specified.

M. "Serviceable" means arranged so that the component or product in question may be properly removed, and replaced without disassembly, destruction or damage to the surrounding installation. "Serviceable" components shall be "accessible".

N. "Shop Drawings" are dimensioned working construction drawings drawn to scale to show an entire area of work in sufficient detail to demonstrate service and maintenance clearances and complete coordination of all trades.

O. "Substitution" is a product, system or installation that is not by a listed manufacturer or does not conform to all salient characteristics identified in the Contract Documents, but which the Contractor warrants meets all specific requirements listed in the Contract Documents.

P. "System Drawing" is a diagrammatic engineered drawing that shows the interconnection and relationship between products to demonstrate how the products interact to accomplish the function intended. Examples of system drawings include control and instrumentation diagrams, and wiring diagrams. Some drawings, such as dimensioned and complete Fire Suppression Drawings may be both System Drawings and Shop Drawings.

**1.4 PERFORMANCE REQUIREMENTS**

A. Provide labor, products and services required for the complete installation, checkout and startup of electrical systems shown and specified. Where the work of several crafts is involved, coordinate related work to provide each system in complete and in proper operating order.

B. Lay out the work in advance and avoid conflict with other work in progress. Physical dimensions shall be determined from existing conditions. Verify locations for junction boxes; disconnect switches, stub-ups, etc., for connection to equipment furnished by others, or in other Divisions of this Work.

C. Refer to the “Suggested Coordination Schedule” in Section 20 00 00 - Mechanical General Requirements.

D. Cooperate with others involved in the project, with due regard to their work, to promote rapid completion of the entire project.

E. Coordinate installation of panels, equipment, system components, and other products to provide proper service areas and access for items requiring periodic maintenance inspection or replacement.

F. Reference to a specific manufacturer’s product (even as “Basis of Design”) does not necessarily establish acceptability of that product without regard to compliance with all other provisions of these specifications.

G. Local Conditions: The Contractor shall thoroughly familiarize himself with the work as well as the local conditions under which the work is to be performed. Schedule work with regard to seasons, weather, climatic conditions and other local conditions which may affect the progress and quality of the work.

H. Utility Coordination: Coordinate work with the serving utilities (electrical, telephone, cable television, etc.) and provide equipment and installation in accordance with the respective utility requirements. Meet with the serving utilities and coordinate the installation and location of the services. Provide a written statement of approval from each serving utility. Provide trenching

from telephone and television stubout locations to property line in accordance with respective utility requirements.

I. Demolition: Coordinate related demolition in support of the project. Restore circuits and systems, which are to remain, but which are affected in any way by demolition Work. Conduct a site visit prior to bid to determine Scope. Refer to Part 3 of this Section for execution requirements.

**1.5 SUBMITTALS**

A. Refer to Division 1 for general submittal requirements.

B. In addition to Division 1 general submittal requirements, prepare Divisions Division 26, 27, and 28 submittals in accordance with the following, and supplemental requirements listed within the specific specification section.

C. The Contracting Agency's obligation to review submittals and to return them in a timely manner is conditioned upon the prior review and approval of the submittals by the Contractor as required by the Construction Contract.

D. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Project Manual.

1. Submittals will not be checked for quantity, dimension, fit, or for proper technical design of manufactured equipment.

2. Provision of a complete and satisfactory working installation is the responsibility of the Contractor.

E. Furnish suppliers with the applicable sections of the Project Manual and review and verify that the suppliers' submittals clearly represent products which comply with the Project Manual.

F. Master Submittal Log

1. Create and maintain a project specific master submittal log for items to be submitted in accordance with Division 26, 27, and 28 submittal requirements to include but not limited to products, test results, inspections, certifications, record drawings, Installation, Operation and Maintenance (IO&M) manuals, etc.

2. Submit master submittal log, as the initial submittal, independent of other submittals, for review and approval by the Contracting Agency.

3. Promptly update the master submittal log with each submittal action.

4. Provide Contracting Agency access to the current master submittal log.

G. Coordination

1. Prior to submittal submission to the Contracting Agency for approval, coordinate with applicable subcontractors for conflicts, clearances, physical space allocation and routing, discrepancies, dimensional errors, omissions, contradictions, departures from the Contract requirements, correct electrical/mechanical services and connections, and provisions for commissioning.

2. Review, revise, correct, and appropriately annotate submittals prior to submission for approval.

H. Product Submittals

1. Provide electronic submittals in PDF format.

2. Reduce PDF file size by removing data and file creation elements not needed for final file presentation. Coordinate maximum file size with the Contracting Agency if necessary.

3. Create PDF documents without security, to be searchable, and to allow for copy and paste functions.

4. For scanned documents, run the optical character recognition (OCR) function to ensure the document is searchable and can be copied and pasted.

I. Product Data

1. General
   a. Prepare electrical product submittals in accordance with Division 1, the general requirements of this section and the additional specific requirements of each individual specification section.
   b. Submittals not provided as specified shall be rejected without review. This procedure is designed to accelerate and improve the accuracy of the technical review process, as well as simplify the future preparation of the IO&Ms.
   c. Product data for each specification section shall be submitted as a complete package, except as noted in this section.
2. Submittal Organization
   a. Organize product submittal information in the same order as the products are specified within each specification section.
   b. Provide a separate electronic file folder under each section number and name (e.g., 26 05 29 –Hangers and Supports for Electrical Systems).
   c. Within each section file, organize product cutsheet information in the same order as the products are specified in Part 2 of each applicable specification section.
   d. Provide electronic bookmarks within each section for the first page of each separate product submittal. Provide product paragraph number/title for each bookmark.
   e. Use PDF editing tools to clearly indicate the salient characteristics of each product and neatly cross out non-applicable information.
   f. If a particular specified product is being omitted from the product submittal or will not be used for the project, provide a single page file identifying the product and annotated with a brief reason why the product is not being submitted (e.g., “NOT USED,” “NO SUBMITTAL REQUIRED,” “TO BE SUBMITTED BY (PROVIDE DATE),” etc.) This will inform the submittal reviewer that the product was not unintentionally omitted.
3. Product Information
   a. Indicate manufacturer's name and address, and local supplier's name, address, phone number.
   b. Indicate each product as “Basis of Design,” “Specified Equal” or “Proposed Substitution.”
   c. Identify catalog designation and/or model number.
   d. Provide manufacturer’s product literature. Neatly annotate to indicate specified salient features, appurtenances and performance criteria for each product specified to demonstrate compliance with the Project Manual to include scheduled information, drawing information and specified information.
   e. Indicate product deviations from the Project Manual and mark out non-applicable items on generic “cut sheets.”
   f. Include manufacturer provided dimensioned equipment drawings with rough-in mechanical and electrical connections.
   g. Include operation characteristics, performance curves and rated capacities.
   h. Include weight of equipment. Including accessories.

i. Provide basic manufacturer's installation instructions.

j. Provide coordination data to check protective devices.

k. Provide information required to verify compliance with the short circuit withstand and interrupting ratings, as shown on the Drawings or further stated in these Specifications.

l. Provide certification that all data shown on the Drawings or further stated in these Specifications concerning available short-circuit currents has been confirmed with the serving Electric Utility.

4. Product Substitutions

a. Clearly indicate both in the section table of contents and on the individual product submittal information each proposed substitution, deviation or change from the product as described in the Project Manual.

b. Submittal approval does not include substitutions, deviations, or changes from the requirements of the Project Manual unless they are specifically itemized and approved. The term "No Exceptions Taken" will not apply to substitutions, deviations or changes not clearly identified.

c. Provision of a satisfactory working installation of equal quality to the system as described in the Project Manual shall be the responsibility of the Contractor.

d. Correct unapproved deviations from the Project Manual discovered in the field as directed by and at no additional cost to the Contracting Agency.

e. Cost of any design modifications because of proposed product substitutions shall be borne by the Contractor.

J. System Drawings

1. Submit System Drawings for dynamic elements/systems of the project which are performance specified to include but not limited to: Fire Alarm Systems, Lightning Protection Systems, and stand-alone packaged equipment.

2. Prepare system drawings on full sized sheets of the same size as the original construction drawings.

3. Include with each system a sequence of operation narrative which describes each mode of system operation in sufficient detail to demonstrate compliance with the Project Manual to the satisfaction of the Contracting Agency.

K. Shop Drawings

1. General

a. The Project Manual documents are not intended for nor are they suitable for use as shop drawings. Project Manual documents shall not be utilized for the actual fabrication or installation of products or equipment.

b. The Drawings are partly diagrammatic and do not show all offsets in piping or ducts and may not show in minute detail all features of the installation; however, provide systems complete and in proper operating order.

c. Locations of products are approximate unless dimensioned.

d. Divisions 26, 27 and 28 products and systems shall not be installed without shop drawings approved by the Contracting Agency.

e. Rework, changes or additional engineering support required because of the installation of products and systems prior to the approval of applicable shop drawings by the Contracting Agency shall be provided at the Contractor's expense.

f. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations or identified on the drawings or specifications.

2. Preparation

a. Review each Divisions 26, 27 and 28 specification section and identify specific shop drawing requirements.

b. Combine the shop drawing requirements first by system (i.e., ventilation system, heating system, plumbing system, etc.) and then by area (i.e., fan room, boiler room, etc.).

c. Prepare shop drawings on full sized sheets of the same size as the original construction drawings.

d. Arrange shop drawings to scale, showing dimensions where accuracy of location is necessary for coordination or communication purposes.

e. Incorporate the actual dimensions and configurations of the products and systems approved through the product submittal process into the shop drawings.

f. Provide dimensioned maintenance clearance areas around each product as recommended by the manufacturer.

g. Coordinate Divisions 26, 27 and 28 work with the interrelated work of other trades including Architectural, Civil, Structural, and Mechanical.

h. Identify and provide recommendations to resolve major conflicts which may impact the design of the systems as shown. Such conflicts will be resolved during the shop drawing review process.

i. Identify locations where field coordination between various trades is necessary to avoid conflicts.

j. Provide shop drawings for all products, systems, system components, and special supportsthat are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor. In addition, provide shop drawings for:
   1). Electrical and telecommunications rooms and spaces, including all equipment. Demonstrate all required clearances and working spaces are provided. In cases where one or more equipment items in a mechanical or electrical room or space differ in dimensions or configuration from Basis of Design equipment, the working drawing shall show the entire area. The drawing shall be dimensioned to indicate that required aisle ways and maintenance clearances are being maintained to at least the degree shown on the Contract Drawings.
   2). Routing and interdisciplinary coordination of groups of conduits numbering more than one and over two inch trade size.
   3). Cable Trays.
   4). Telecom equipment rack elevations.
   5). CCTV equipment rack elevations.
   6). Where noted on the drawings.
   7). Where noted in other Divisions 26, 27 and 28 sections.

k. Coordinate placement of openings and holes through structure, walls, floors, ceilings, and roof with Structural and Architectural.

3. Submittal

a. Submit dimensioned shop drawings as specified to demonstrate proper planning and sequencing of the applicable trades for the installation and arrangement of Divisions 26, 27 and 28 with respect to other interrelated work.

b. Partial shop drawings submittals will be rejected without review, as the interrelationship with other related work and overall system fit cannot be evaluated.

c. It is assumed that shop drawings submitted for review have been thoroughly prepared and coordinated and that the products and systems can and shall be installed as shown. Conflicts which are not clearly identified and annotated on the submitted shop drawings are assumed not to exist.

d. Installation conflicts arising from the failure to properly coordinate the work of related trades shall be provided at the Contractor's expense.

L. Record Drawings

1. General: As the Work progresses, neatly annotate a designated and otherwise unused, set of Divisions 26, 27 and 28 Contract Drawings to show the actual locations and routing of Divisions 26, 27 and 28 Work and the terminal connection points to related Work. As a minimum, include the following:

a. Annotate record drawings to incorporate each applicable addendum.

b. Annotate record drawings as directed by each applicable Request for Information (RFI) and accepted Change Order Proposal.

c. Modify record drawings to show actual equipment sizes and locations.

d. Provide fully dimensioned locations for permanently concealed conduits (i.e. conduit cast in concrete or buried underground/underslab).

e. Show routing of work in permanently concealed blind spaces within the building.

f. Maintain drawings in an up-to-date fashion in conjunction with the actual progress of installation. Accurate progress mark-ups shall be available on-site for examination by the Contracting Agency or his representative at all times.

2. Preparation:

a. Neatly annotate record drawings to provide clear interpretation to support electronic drafting by a third party.

b. Tape electronic sketches from addendums and/or RFIs directly to the record drawings as overlays.

c. Annotate the record drawings in colored pencil using the same symbols and abbreviations as indicated in the Divisions 26, 27 and 28 legends and schedules of the Contract Drawings.
1). Red to add information.
2). Green to delete information.
3). Blue to provide additional clarifying information which is not to be drafted.

d. After submittal to the Contracting Agency, provide additional clarification, information or rework as necessary to support the accurate interpretation and electronic drafting of the record drawings.

3. Submittals:

a. Provide dimensioned underslab record drawings to the Contracting Agency prior to pouring the slab. For slabs poured in multiple sections, provide record drawings for the applicable slab sections to the Contracting Agency prior to each pour.

b. Provide complete record drawings for concealed areas (i.e. above lay-in and hard ceilings and inside walls) to the Contracting Agency prior to concealment.

c. Provide the remaining portion of the record drawings for exposed areas to the Contracting Agency prior to the final completion of the project.

d. Prepare wiring diagramsusing the latest release of AutoCAD for individual special systems as installed. Identify components and show wire and terminal numbers and connections. Include diagrams from the shop drawings and submittals, updated to show as-built condition.

M. Certificates

1. Review the submittal requirements for Certificates for each Divisions 26, 27 and 28 specification section.
2. Submit copies of certificates as specified. This information may be included within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

N. Test and Evaluation Reports

1. Review the submittal requirements for Test and Evaluation Reports for each Divisions 26, 27 and 28 specification section.
2. Submit copies of reports as specified. Also include these reports within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

O. Installation, Operations and Maintenance (IO&M) Manuals

1. Review the submittal requirements for IO&M manuals for each Divisions 26, 27 and 28 specification section.
2. Begin the preparation of the IO&M manuals with a complete and fully approved set of product data submittals organized, annotated and with the product information as indicated within the “Product Data” submittals article above and in each Divisions 26, 27 and 28 section.
3. Next, augment each individual product submittal with the written installation, operations, and maintenance information for each approved product. This type of information is not applicable (or available) for bulk commodity or simplistic products such as copper pipe, basic pipe hangers or equipment tags, etc.
4. Annotate the installation, operations, and maintenance information to indicate applicable information for the specific equipment model(s) installed.
5. Maintenance information shall include:
    a. Preventive maintenance requirements for each product, including the recommended frequency of performing each preventive maintenance task.
    b. Instructions for troubleshooting, minor repair and adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and that require no extensive special training or skills.
    c. Information of a maintenance nature covering warranty items, etc., that have not been discussed in the manufacturers’ literature.
    d. Information on the spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.
    e. Recommended spare parts list.
6. Organize the IO&M manual information files by specification section (not by sub-contractor) with bookmarks for each section. Provide bookmarks for each section (and subsection as appliable) within the IO&M. Label bookmarks in a similar format as used for product submittals.

7. Provide a cover page for the IO&M manual volume, to include:
   a. The Contracting Agency Name.
   b. Project Name.
   c. “Electrical Installation, Operations and Maintenance Manual.”
8. Provide a table of contents which lists the Divisions specification sections and the Part 2 products in the same order as the applicable specification section.
9. Submit copies of Operation and Maintenance Manuals in electronic PDF format.

## 1.6 QUALITY ASSURANCE

A. Qualifications: Perform the Work using qualified workmen that are experienced and usually employed in the trade.

B. Product Testing and Certification:
   1. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors shall be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.
   2. Further details on the specific NRTLs, as well as the product standards that they are specifically recognized to evaluate equipment in accordance with, can be found on the OSHA Web site: http://www.osha.gov/dts/otpca/nrtl/

C. Drawings and Specifications:
   1. The Drawings and specifications are complementary. Do not scale the Drawings. Locations of devices, fixtures, and equipment are approximate unless dimensioned.
   2. The Drawings are partly diagrammatic and do not show precise routing of conduits or exact location of all products, and may not show in minute detail all features of the installation; however, provide all systems complete and in proper operating order.
   3. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations, or called for on the Drawings or in the specifications.

D. Tests and Inspections:
   1. Schedule, obtain, and pay for permits and fees required by local authorities and by these specifications.
   2. Request for Tests: Notify the Contracting Agency a minimum of 24 hours in advance of tests. In the event the Contracting Agency does not witness the test, certify in writing that all specified tests have been made in accordance with the specifications.
   3. Deficiencies: Immediately correct deficiencies that are evidenced during the tests and repeat tests until system is approved. Do not cover or conceal electrical installations until satisfactory tests are made and approved.
   4. Operating Tests: Upon request from the Contracting Agency, place the entire electrical installation and/or any portion thereof, in operation to demonstrate satisfactory operation.
   5. The Contracting Agency may inspect and approve sample installation of systems and equipment prior to general installation of units.
   6. Test Witness: Arrange for the Contracting Agency to witness tests. The Contracting Agency may waive witnessing any specific test at its discretion.

7. Tests: During final inspection, conduct operating tests for approval. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply. Have instruments available for measuring light intensities, voltage, and current values and for the demonstration of continuity, grounds, or open circuit conditions. Furnish personnel to assist in taking measurements and making tests. In the event that systems are not complete and fully operational at the time of final inspection, all costs of any subsequent inspections shall be borne by the Contractor at no additional cost to the Owner.
8. Certificate of Completion: Submit at time of request for final inspection, a complete letter in the following format:
   I,_____(Name), of_____(Firm), certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies of which are attached hereto) and will be ready for final inspection as of_____(Date). I further certify that the following Specifications requirements have been fulfilled:
   a. Megger readings performed, ____ copies of logs attached.
   b. Operating manuals completed and instruction of operating personnel performed, _____ (Date) _____(Signed)
      Owner's Representative
   c. Record document drawings up-to-date, accurate, and ready to deliver to Contracting Agency.
   d. Emergency systems tested and fully operational.
   e. Fire Alarm System tested and fully operational.
   f. Security System tested and fully operational.
   g. Telecommunications System test reports have been submitted to and approved by the Contracting Agency. The test reports shall certify that the Telecommunications System is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.
   h. Generation System and controls tested and fully operational.
   i. Intercom/Clock System tested and fully operational.
   j. Ground-fault system performance test complete, copies of logs attached.
   k. Other tests required by Specifications have been performed.
   l. Specified Owner training complete.
   m. Systems are fully operational. Project is ready for final inspection.

      SIGNED:_____DATE:_____
      TITLE:_____
9. Operating Instructions: Prior to final acceptance, instruct an authorized representative of the Owner for eight hours on the proper operation and maintenance of electrical systems and equipment provided under this contract. This requirement is for several systems, and is in addition to special training specified in other sections. Make available a qualified technician for each component of the installation for this instruction. Give these operating instructions after the operation and maintenance manuals have been furnished to the Owner. Submit written certification, signed by the Contractor and an authorized representative of the Owner, that this has been completed.

E. Job site documents:

1. Maintain current approved submittal hard copies of shop drawings, materials, products, and calculations at the job site.
2. Maintain current RFIs and ASIs hard copies with annotations references on current hard copy shop drawing red lines at the job site.

**1.7 SPARE PARTS**

A. Furnish spare parts for systems and equipment as listed in applicable sections of Divisions 26, 27 and 28.

B. Clearly label each part with name, manufacturers part number, system and/or equipment where used and location.

C. Deliver parts to location and person designated by the Contracting Agency, in durable storage boxes.

D. Group cartons containing smaller items by system or application and deliver in an appropriate number of storage boxes.

**1.8 WARRANTY**

A. Warranty work shall be promptly coordinated and performed at the Contractor's sole expense. Workmanship, labor and materials (without limitation) in this Division shall be warranted for the longer of the following:

1. As called for in the General Conditions of the Contract.
2. For a minimum period of one year from the date of final acceptance.
3. For the extended warranty period specified in a specific Section under this Division.

B. Where a specific product carries a longer warranty as a standard offering of its manufacturer, extended warranty coverage beyond these requirements shall be retained by the Owner. The Owner will have recourse back to the manufacturer only in these cases, when the warranty as specified in A above has expired.

**PART 2 PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT FURNISHED IN DIVISIONS 26, 27 AND 28**

A. Materials furnished and installed in permanent construction shall be new, full-weight, standard in every way, and in first class condition.

B. Materials shall conform to the standards of an organization acceptable to the Authority Having Jurisdiction and concerned with product evaluation that maintains periodic inspection of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner. Only materials designed for the purpose employed shall be used.

C. Materials shall be identical with apparatus or equipment that has been in successful operation for at least two years. Materials of similar class or service shall be of one manufacturer.

D. Capacities, sizes, and dimensions given are minimums unless otherwise indicated. Systems, materials and equipment proposed for use on this project shall be subject to review for adequacy and compliance with Contract Documents.

**2.2 MATERIALS AND EQUIPMENT FURNISHED IN OTHER DIVISIONS**

A. Controls, including conduit, wiring, and control devices required for the operation of systems furnished in other Divisions shall be provided complete under the Division of the Specifications in which the equipment is specified, unless otherwise noted or specified.

B. Work on the project that falls under the jurisdiction of the electrical trade shall be performed by Licensed Electricians in conformance with the electrical specifications.

C. Provide complete power connections to equipment including but not limited to feeders, connections, disconnects and motor running overcurrent protection. Where starters are provided as part of packaged equipment, overcurrent heaters shall be provided under Divisions 26, 27 and 28.

## PART 3 EXECUTION

### 3.1 COORDINATION WITH ROOM NUMBERING

A. Certain systems provided under this Division rely on identification systems that are based on room names or numbers. Systems labeled in this fashion include, but are not limited to, panelboards, circuit directories, communication and data systems identifiers, fire alarm systems, etc.

B. The numbering scheme indicated in these Contract Documents is based on room numbers assigned during the design process. The Owner reserves the right to change the numbers prior to substantial completion, and the final names and numbers will not necessarily match those found in the Documents. Obtain from the Owner the final room numbers prior to commencing the numbering of Divisions 26, 27 and 28 systems. Tag and label all system circuits and devices in accordance with the final numbering scheme at no additional cost.

### 3.2 INSTALLATION

A. Skilled craftsmen shall install materials and equipment. The norms for execution of the work shall be in conformity with NEC Chapter 3 and the National Electrical Contractors' Association "National Electrical Installation Standards", which herewith is made part of these specifications.

B. Repair surfaces and furnish all required material and labor to maintain fireproof, airtight and waterproof characteristics of the construction.

C. Installation of equipment shall be in accordance with manufacturers' instructions.

### 3.3 MULTIWIRE BRANCH CIRCUITS

A. Multiwire branch circuits shall not be used on this project. Each branch circuit shall be provided with its own dedicated neutral conductor.

### 3.4 MOUNTING HEIGHTS

A. Mounting height shall be to center of box above finished floor (AFF) or above finished grade (AFG) as noted below unless otherwise shown or indicated. Other mounting heights are indicated on the Drawings by detail. Specific dimensions AFF are shown adjacent to the symbol. Where devices are shown on architectural elevations, the elevation height shall govern.

| | |
|---|---|
| Lighting switches | 44 inches |
| Convenience outlets and similar devices | 18 inches (see note below) |
| Convenience outlets in mechanical, boiler rooms and workrooms | 44 inches |
| Motor controllers | 60 inches to top |
| Panelboards | 76 inches to top |
| Bracket lights | 84 inches |
| Exterior WP convenience outlets | 24 inches AFG |
| Clocks | 90 inches |

| | |
|---|---|
| Clock/speaker units | 90 inches |
| Telecommunications Outlets | 18 inches (see note below) |
| Range outlets | 6 inches (or as required for access through drawer) |
| Dryer outlets | 36 inches |
| Welder outlets | 44 inches |
| Push Button Controls | 44 inches |
| Wall mounted audible and/or visual appliances such as bells, horns, strobes, speakers, and similar signal devices | 90 inches (or 6 inches below ceiling height for ceiling heights less than 96 inches) |
| Manual fire alarm box | 44 inches |
| Fire alarm control panel | 72 inches to top |
| Fire alarm graphic annunciator | 72 inches to top |
| Fire alarm text annunciator | 60 inches to center |
| Security keypad | 44 inches to center |
| Security card reader | 44 inches to center |
| Intercom handsets and call-in switches | 44 inches |

B. Coordinate exact device elevation with architectural elements including casework, equipment, etc.

C. In locations where baseboard-heating enclosures are to be installed, outlet-mounting height shall be raised to 6 inches above top of enclosure unless otherwise noted on drawings.

**3.5 CUTTING & PATCHING**

A. Obtain written permission of the Contracting Agency before cutting or piercing structural members.

B. Wall and floor penetrations shall be in accordance with Section 26 05 29 - Hangers and Supports.

C. Holes through existing concrete shall be core drilled. X-ray concrete before core drilling. Do not cut rebar without specific authorization from the Contracting Agency. Seal openings with UL Listed fire resistant resilient sealant.

**3.6 VAPOR RETARDER/BARRIER PENETRATIONS**

A. Provide solid blocking installed flat at all vapor retarder penetrations. Provide flat blocking at the interior face of the exterior stud wall. Blocking shall be a minimum of 4 inches larger than the penetration. Locate the penetration at the centerline of the flat blocking. Secure vapor retarder to blocking.

B. Seal the interior of raceways penetrating the vapor retarder inside the building. Between point of sealing inside of raceway (typically at junction box or condulet) and vapor retarder penetration, seal conduit joints (connectors and couplings) with vapor retarder tape, paint on sealer or approved means acceptable to Contracting Agency.

C. To reduce thermal transfer and ensure sealing of raceway, PVC or equivalent conduit shall be used where penetrations of building envelope are made above ground where installation of PVC is allowed by NEC.

D. Penetrations of the building vapor retarder/barrier caused by the electrical installation shall be minimized, and where they are required, the opening in the vapor retarder/barrier shall be cut

smaller than the penetrating object, so that the penetration will be a stretch fit. The penetration shall then be securely sealed with vapor barrier tape or an adhesive or caulk compatible with the surfaces being sealed.

E. Boxes (electrical boxes, outlet boxes and telecommunication boxes, etc) penetrating walls with vapor retarder/barriers shall be sealed airtight using STI Series SSP Firestop Putty Pads. Mold putty pads around electrical junction boxes and conduits and behind vapor retarder/barrier to form an airtight seal in accordance with manufacturer's installation instructions.

**3.7 FIRE RESISTIVE CONSTRUCTION**

A. Provide "tenting" or other protection acceptable to the Authority Having Jurisdiction for devices or fixtures installed in fire resistive construction (i.e., ceilings, walls, etc.) to maintain the fire resistive rating of the complete assembly.

B. Where electrical raceways or other features penetrate fire rated building surfaces, they shall maintain the integrity of the building surface being penetrated. This shall be accomplished with either of the following methods:

1. Sealing the penetration with an approved fire rated caulk or putty.
    a. Fire rated caulk or putty: 3M Fire Barrier Caulk No. CP25, 3M Fire Barrier Moldable Putty, or as approved.
2. A fire rated assembly enclosing the penetration.
    a. Fire rated assembly: STI EZ Path, or as approved.
3. Firestopping shall be applied according to the manufacturer's recommendations, and in a manner that is listed by a nationally recognized independent testing agency (such as UL) as preserving the fire time rating of the construction.

**3.8 SOUND ISOLATION**

A. Where electrical raceways or other features penetrate walls that extend to structure, they shall maintain the integrity of the building surface being penetrated. Refer to the requirements of FIRESTOPPING as specified above. Note that this requirement exists regardless of whether the building surface being penetrated has a fire rating.

B. Boxes (electrical boxes, outlet boxes and telecommunication boxes, etc) penetrating wall types that extend to structure or that contain batts shall be sealed airtight using STI Series SSP Firestop Putty Pads to reduce sound transmission. Mold putty pads around electrical junction boxes and conduits to form an airtight seal in accordance with manufacturer's installation instructions.

**3.9 PROTECTIVE FINISHES**

A. Take care not to scratch or deface factory finish of electrical apparatus and devices. Repaint all marred or scratched surfaces.

B. Provide hot dip galvanized components for ferrous materials exposed to the weather.

**3.10 SEPARATION OF SYSTEMS**

A. Conductors and equipment of different voltage levels, frequency, current characteristics (AC & DC) or functions (normal vs. emergency, etc.) shall not share the same raceways or enclosures unless specifically shown on the Drawings or approved by the Contracting Agency, or inherently necessary for correct system function (i.e., at transfer switches, transformers, etc.)

**3.11 TESTING**

A. Prior to final test, switches, panelboards, devices and fixtures shall be in place.

B. Test electrical systems. They shall be free from short circuits and unintentional grounds.

C. Make changes necessary to balance the actual electrical loads on the complete system. Arrange for balanced conditions of circuits under connected load demands, as contemplated by the normal working conditions. Final load and balance test shall be demonstrated in the presence of the Contracting Agency.

D. Feeder cables and branch circuit cables larger than #4 AWG shall be megger tested prior to final termination. If conductor fails test, replace wiring or correct defect and retest. Perform a 1,000 volt megohm meter test between the following circuit cables in each raceway:

1. A phase and B phase conductors
2. A phase and C phase conductors
3. B phase and C phase conductors
4. A phase and Grounded (Neutral) conductors
5. B phase and Grounded (Neutral) conductors
6. C phase and Grounded (Neutral) conductors
7. A phase and Equipment Grounding conductors
8. B phase and Equipment Grounding conductors
9. C phase and Equipment Grounding conductors
10. Grounded (Neutral) and Equipment Grounding conductors

E. Feeder cables shall be megger tested prior to final termination. If conductor fails test, replace wiring or correct defect and retest. Perform a 1,000 volt megohm meter test on each circuit cable rated 600 volts between the conductor and ground. Submit logs of megger readings. The insulation resistance between conductors shall not be less than 100 Megohms.

F. Furnish one (1) copy of certified test results to the Contracting Agency prior to final inspection.

**3.12 STORAGE AND HANDLING**

A. Items shall be delivered and stored in original containers, which shall indicate manufacturer's name, the brand, and the identifying number. Items subject to moisture and/or thermal damage shall be stored in a dry, heated place. Items shall be covered and protected against dirt, water, chemical, ultraviolet (UV) and/or mechanical damage.

**3.13 PROTECTION OF MATERIAL AND EQUIPMENT**

A. The Contractor shall be responsible for materials and equipment to be installed under this Contract. The Contractor shall make good at his own cost any injury or damage which said materials or equipment may sustain from any source or cause whatsoever before final acceptance.

B. Cover and protect electrical equipment during construction from dust, dirt, debris, overspray, or other construction contaminates.

**3.14 CLEANING AND REPAIR**

A. Throughout the work, the Contractor shall keep the work area reasonably neat and orderly by frequent periodic cleanups.

B. Prior to substantial completion, clean equipment and systems used during construction.

C. Repair surfaces damaged or impacted by the work. Restore to original condition or better. Retexture surfaces to match surrounding surfaces. Repaint affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish.

D. As independent parts of the installation are completed, they may be tested and utilized during construction.

## 3.15 ACCESS DOORS

A. Provide access doors required for access to equipment provided under Divisions 26, 27 and 28. Doors shall be rated for the surrounding construction. Use of access doors shall be minimized, and all locations and cosmetic features shall be submitted for approval in advance.

B. Doors shall be finished to match surrounding surfaces as approved by the Contracting Agency.

## 3.16 DEMOLITION

A. Examination Prior to Bid: Drawings involving existing conditions are based on building record drawings and/or limited field observation. Conduct a site inspection prior to submission of Bid to become thoroughly familiarized with the Scope of Work. Report discrepancies to Contracting Agency. Submission of bid certifies acceptance of existing conditions.

B. Examination Prior to Start of Demolition: Conduct a thorough site inspection before disturbing existing installation. Verify field measurements and circuiting arrangements. Verify that abandoned wiring and equipment serve only abandoned facilities. Beginning of demolition certifies acceptance of existing conditions.

C. Preparation:

1. Disconnect electrical systems in walls, floors, ceilings, etc., scheduled for removal.
2. Coordinate utility service outages with utility companies and Contracting Agency.
3. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
4. Existing Electrical Service: Maintain existing systems in service until new systems are complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Contractor shall not be entitled to any additional compensation due to inability of Owner to grant an outage at the desired time. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
5. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and applicable Fire Department Authorities at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

D. Demolition of Existing Electrical Work:

1. Remove, relocate, and extend existing installations to accommodate new construction.
2. Remove abandoned wiring to source of supply.
3. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut concealed conduit flush with walls and floors, and patch surfaces.
4. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets, which are not removed. In finished areas, blank covers shall be blank plates matching the device plates specified for new work, unless otherwise noted or specified.
5. Disconnect and remove abandoned panelboards and distribution equipment.
6. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

7. Disconnect and remove abandoned light fixtures. Remove brackets, stems, hangers, and other accessories.
8. Repair adjacent construction and finishes damaged during demolition and extension work.
9. Maintain access to existing electrical installations that remain active. Modify installation or provide access panels as appropriate.
10. Restore circuits and systems to remain that are affected in any way by demolition Work, such as loads downstream of demolished equipment, switched lighting circuits where selected fixtures are demolished, etc.
11. Salvage or disposal of removed items shall be as noted on the Drawings or as directed by the Contracting Agency. Items, which the Owner does not desire to retain, shall be disposed of at a legal disposal site.

E. Cleaning and Repair:

1. Clean and repair existing materials and equipment that remain or are to be reused or are affected by this work.
2. Panelboards: Clean exposed surfaces and interior of cabinet and retorque electrical connections. Provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
3. Light Fixtures: Remove existing light fixtures for cleaning. Use mild detergent to clean exterior and interior surfaces; rinse with clean water and wipe dry.

**END OF SECTION**

## SECTION 26 05 19
## LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 GENERAL

#### 1.1 SUMMARY

A. This section includes specific requirements, products, and methods of execution relating to wire and cable, 600 volts or less, approved for use on this project.

B. Related Sections

1. 26 05 33 - Raceways and Boxes for Electrical Systems
2. 26 05 53 - Identification for Electrical Systems

#### 1.2 REFERENCES

A. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.
2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

#### 1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

#### 1.4 QUALITY ASSURANCE

A. Conductors shall be sized according to American Wire Gauge (AWG). Stranding, insulation, rating and geometrical dimensions shall conform to UL and ICEA specifications.

### PART 2 PRODUCTS

#### 2.1 INSULATION TYPES

A. Branch circuit conductors shall be 600 volt insulated, and unless otherwise noted on the Drawings, shall have the following insulation types:

1. Heated indoor spaces - THHN/THWN or XHHW.
2. Outdoors, wet locations (such as slab-on-grade), or other cold locations (such as unheated attics) - XHHW.

B. Feeder conductors shall be 600 volt insulated, and unless otherwise noted on the Drawings, shall have the following insulation types

1. Heated indoor spaces - THHN/THWN or XHHW-2.
2. Outdoors, wet locations (such as slab-on-grade), or other cold locations (such as unheated attics) - XHHW-2.

C. Nylon-jacketed conductors such as Types THHN or THWN shall not be used in any location subject to ambient temperatures below 20° F.

D. Special applications: Conductors in high temperature locations shall have one of the special insulation types suitable for the use and as permitted by the NEC.

E. Conductors feeding Variable Speed Drives (VSDs) and between VSDs and equipment supplied by the VSDs shall be Type XHHW-2.

## 2.2 FLEXIBLE CORD

A. Flexible cord shall be Type SO or ST, or for the larger sizes, Type G.

## 2.3 MISCELLANEOUS

A. Miscellaneous: Miscellaneous wire and cable for special purpose applications and not covered in the categories as indicated above or otherwise specified, shall be as shown on the plans and/or required by the intended use.

## 2.4 MINIMUM SIZE

A. Unless specified otherwise minimum wire sizes shall be as follows:

1. #12 AWG for branch circuit wiring.
2. #20 AWG for low voltage switching circuits if part of an approved cable assembly, #18 AWG otherwise.
3. #14 AWG for control circuit wiring.
4. #16 AWG for light fixture whips, refer to specification Section 26 05 33 - Raceway and Boxes for Electrical Systems, for maximum fixture whip lengths.

B. On 20A circuits, with one-way conductor lengths measured from panel to farthest receptacle, or center of lighting string (as applicable):

1. #10 AWG for 120V circuits of 75 feet to 120 feet.
2. #8 AWG for 120V circuits of 120 feet to 200 feet.
3. #10 AWG for 277V circuits of 130 feet to 215 feet.
4. #8 AWG for 277V circuits of 215 feet to 330 feet.

C. Similar oversizing shall apply to circuits of other ratings and/or greater lengths, as necessary to comply with the voltage drop limitations in Part 3 of this Section.

D. Cable or conductors for fire alarm systems and other special systems shall be as described in other sections of the specifications, noted on the drawing, or recommended by the equipment manufacturer, whichever is greater.

## 2.5 CONDUCTORS

A. Conductors used on this project shall be copper, solid or stranded for wiring #10 and smaller, stranded for #8 and larger.

B. Aluminum conductor of an equivalent ampacity may be used in sizes #4 and larger. Conductor size shall be increased if required to maintain original voltage drop. Conduits shall be re-sized accordingly to maintain original fill ratio.

C. Stranded control, communication, and alarm conductors shall have compression terminations where terminated on screw terminals.

# PART 3 EXECUTION

## 3.1 INSTALLATION

A. Unless otherwise noted or specified, all conductors shall be run in raceways as specified in Section 26 05 33 – Raceways and Boxes for Electrical Systems. Raceways shall be installed as a complete system, free from obstructions, and clean before conductors are installed.

B. Provide conductors from outlet to outlet and splice branch circuit conductors only at outlet or junction boxes. Install all conductors in a single raceway at one time and leave sufficient cable at all fittings or boxes. Keep conductors within the manufacturer's allowable tension. Do not violate minimum bending radii. Lubricants for wire pulling, if used, shall conform to UL requirements for the insulation and raceway material.

C. Do not install Type XHHW conductors in temperatures below -10° F, or the other types in temperatures below +20° F.

D. Conductors that extend below grade shall be suitable for wet locations (type XHHW or XHHW-2). The use of THHN below grade is not acceptable.

**3.2 CONDUCTOR SUPPORT**

A. Provide conductor supports as recommended by the NEC or cable manufacturer in vertical conduits.

**3.3 SPLICING**

A. No splicing or joints are permitted in branch circuits except at outlet or accessible junction boxes. Prior to splicing, conductors shall be stripped to the exposed length recommended by the splicing device manufacturer.

B. Utilize compression type solderless connectors when making splices or taps in conductors No. 8 AWG or larger. Provide heat or cold shrink type insulating tubing on splices and tape outer surface continuously with Scotch #88 plastic tape to secure insulation strength equal to that of the conductors joined.

C. Utilize pre-insulated connectors, hard-shell type only, Ideal Industries, Inc., "Wing-Nut" or “Twister Pro” or "In-Sure Push-in Connectors" for splices and taps in conductors No. 10 AWG and smaller in dry locations.

D. Utilize Ideal “Twister DB Plus”, water repellent, sealant filled, UL 486D Listed connector splices and taps in conductors No. 10 AWG and smaller in damp or wet locations.

E. Utilize “Buchanan pre-insulated crimp connectors” on stranded conductors for fire alarm control and alarm circuits.

F. Feeder conductors shall be installed with no splices unless otherwise noted on the Drawings. Splices in feeder conductors, where specifically allowed, shall be compression type butt splices.

**3.4 CONDUCTOR TERMINATION**

A. Provide power and control conductors that terminate on equipment or terminal strips with solderless lugs or T & B "Sta-Kon" terminals.

B. Prior to termination, conductors shall be stripped to the exposed length recommended by the termination device manufacturer.

**3.5 CONDUCTOR PHASE COLOR CODING**

A. Service, feeder and branch circuit conductors throughout the project secondary electrical system shall be color coded as follows:

| 208/120 Volts | Phase | 480/277 Volts |
|---|---|---|
| Black | A | Brown |
| Red | B | Orange |
| Blue | C | Yellow |
| White | Neutral | Gray (see following) |
| Green | Ground | Green |

Permanently post conductor color code at each panelboard in accordance with NEC Article 210 and Section 26 05 53 – Identification for Electrical Systems

B. Where color coded conductors are not commercially available, colored non-aging, plastic tape may be utilized where permitted by NEC.

C. Where neutrals of different systems exist on the project, neutral conductor identification method shall satisfy the Authority Having Jurisdiction, as to compliance with NEC Article 200. Branch circuit neutral conductors shall have a color stripe matching the corresponding phase conductor where neutral is not shared.

D. Phases in panelboards and similar equipment shall be connected Phase A, B, C from left to right, top to bottom, or front to back.

**3.6 DERATING OF CONDUCTORS**

A. Derating of conductors shall be per National Electrical Code.

**3.7 VOLTAGE DROP**

A. The maximum total voltage drop shall not exceed three (3) percent in branch circuits or feeders, for a total of five (5) percent to the farthest outlet based on steady state design load conditions. Wire sizes shown on the Drawings are for minimum ampacity. Wire and conduit sizes shall be increased to limit voltage drop based upon actual lengths required in the field. Base voltage-drop calculations on NEC Chapter 9, Table 9.

B. Secondary transformer voltage taps may be used to offset voltage drop as long as no load voltage does not exceed 125 volts phase to neutral/ground at transformer secondary.

**3.8 OPEN WIRING ABOVE LAY-IN CEILINGS PROHIBITED**

A. Wiring for all systems shall be installed in one of the raceway systems or cable tray systems listed for this project. Refer to the Drawings and the specific Section under which each system is specified.

B. Wiring installed in cable trays in air-handling ceiling spaces shall be approved for the application and the specific system.

C. Raceways and sleeves shall be sized in accordance with the cabling requirements for the special system involved.

**3.9 TESTING**

A. Feeder and branch circuit cables larger than #4 AWG shall be megger tested prior to final termination in accordance with Section 26 00 00 – Electrical General Requirements.

**END OF SECTION**

## SECTION 26 05 26
## GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SUMMARY

A. This section includes general requirements, products and methods of execution relating to the furnishing and installation of a complete grounding system as required for this project.

#### 1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only, latest edition.

| NUMBER | TITLE |
|---|---|
| ANSI/IEEE C2 | National Electrical Safety Code |
| ANSI/NFPA 70 | National Electrical Code |
| ANSI/TIA/-606-C | Administration Standard for Commercial Telecommunications Infrastructure |
| ANSI/TIA-607-E | Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises |
| IEEE C62.41 | Recommended Practice on Surge Voltages in Low-Voltage Surge Protective Devices |
| IEEE C62.42 | Guide for the Application of Gas Tube Arrester Low-Voltage Surge Protective Devices |
| IEEE Draft P1250 (D4) | Guide on Service to Equipment Sensitive to Momentary Voltage Disturbances |
| IEEE Std 1100 | Recommended Practice for Powering and Grounding Sensitive Electronic Equipment |
| IEEE Std 142 | Recommended Practice for Grounding of Industrial and Commercial Power Systems |
| IEEE STD 81 | Recommended Guide for Measuring Ground Resistance and Potential Gradients in the Earth |
| NFPA 70 | National Electric Code (NEC) - Codebook and Handbook |
| REA PE-33 | (1985) Shield Bonding Connectors |
| UL 1449 Edition 3 | Surge Protective Devices (SPDs) |
| UL 467 Edition 6 | Grounding and Bonding Equipment |
| UL 497 Edition 5 | Protectors for Paired Conductors for Communication Circuits |
| UL 497A Edition 1 | Secondary Protectors for Communication Circuits |
| UL 497B Edition 1 | Protectors for Data Communication and Fire Alarm Circuits |

#### 1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1. Include copies of catalog cuts, data sheets and other descriptive information for all specified materials.

## 1.4 MINIMUM REQUIREMENTS

A. The minimum requirements for the system shall conform to Article 250 of the NEC.

## 1.5 SPECIAL REQUIREMENTS

A. Unless specified elsewhere, the ohmic values for grounds and grounding systems from system to earth shall be as follows:

1. For grounding metal enclosures and frames for electrical and electronically operated equipment -- 5 ohms maximum.
2. For grounding systems to which electrical utilization equipment and appliances are connected -- 5 ohms maximum.
3. For grounding secondary distribution systems, neutrals, noncurrent carrying metal parts associated with distribution systems, and enclosures of electrical equipment not normally within reach of other than authorized and qualified electrical operating and maintenance personnel -- 10 ohms maximum.

## 1.6 TELECOMMUNICATIONS GROUNDING AND BONDING SYSTEM

A. Telecommunications grounding and bonding systems shall be provided as shown on the Contract Drawings and as related herein and shall comply with the requirements of ANSI/TIA-607-E. The telecommunications grounding and bonding infrastructure originates at the electrical service entrance (power) ground, extends throughout the building, and includes the following components.

1. Primary Bonding Busbar (PBB): The PBB serves as a dedicated extension of the building grounding electrode system for telecommunications infrastructure. The PBB also serves as the central attachment point for the TBB(s) and TBC. The PBB is generally located in the main telecommunications room or as shown on the Drawings.
2. Telecommunications Bonding Conductor (TBC): The TBC is the bonding conductor that bonds the PBB to the electrical service entrance (power) ground.
3. Secondary Bonding Busbar (SBB): The SBB is the telecommunications bonding connection point for telecommunication systems and equipment in the area served by a telecom room or closet.
4. Telecommunications Bonding Backbone (TBB): The TBB is a bonding conductor that interconnects all SBBs with the PBB. The intended function of a TBB is to reduce or equalize potential differences. A TBB is not intended to serve as a ground fault return path. The TBB originates at the PBB, extends throughout the building using the telecommunications bonding backbone pathways and/or building structural steel, and connects to SBBs located in telecom rooms.
5. Backbone Bonding Conductor (BBC): The BBC(s) connects TBBs when there are more than one. The BBC is employed to interconnect them through the associated busbars, either on the same floor in a multi-story building or in the same general area of a single-story building.
6. Rack Bonding Busbar (RBB): The RBB provides a local connection point for rack mounted telecom equipment to connect to the facility wide telecommunications system grounding system via a local SBB or the PBB.
7. Alternating Current Equipment Ground (ACEG): When an electrical panelboard is located in the same room or space as the PBB or an SBB, that panelboard's ground bus shall be bonded to the PBB or SBB with an ACEG.
8. Unit Bonding Conductors (UBC): The bonding conductor that bonds telecommunications rack and/or cabinet mounted telecommunications equipment to the rack or cabinet RBB.

9. Telecommunications Equipment Bonding Conductor (TEBC): The bonding conductor that bonds each RBB back to the local PBB or SBB.

## PART 2 PRODUCTS

### 2.1 EQUIPMENT

A. Grounding conductors, ground rods, and equipment required for ground systems shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL), and be in accordance with U.L. 467 and as follows:

1. Ground rods shall be 3/4 inch by 10 foot copper bonded steel. Erico Eritech or approved equal.
2. Grounding conductors shall be copper. Unless specified otherwise, raceway for service grounding conductor shall be Schedule 40 PVC.
3. Grounding conductor for telephone service entrance and telephone/data panels shall be #6 insulated copper, with 6 feet-0 inches slack cable at each panel. Comply with intersystem bonding requirements of NEC.
4. Grounding conductor for television and radio distribution systems shall be #6 AWG insulated copper. Comply with intersystem bonding requirements of NEC.

### 2.2 CONNECTIONS

A. Joints in grounding conductors and mats below grade shall be made with exothermic welding process or hydraulically crimped fittings listed for direct burial. Terminations above grade shall be made with solderless lugs, securely bolted in place.

B. Clamps, lugs, connectors, bonding bushings, and other such grounding and bonding items shall be:

1. Labeled or listed for the purpose.
2. Shall be made (both body and hardware) of hot dip galvanized steel, bronze, or other corrosion resistant alloy (except bushing throats shall be plastic).
3. Shall be the products of O-Z/Gedney, T & B, Raco, or accepted equals.
4. In outdoor, damp, or corrosive environments, metals for these items shall be copper (with or without tin-plating), bronze, or other corrosion resistant alloys only; O-Z/Gedney or accepted equal.

### 2.3 TELECOMMUNICATIONS GROUNDING AND BONDING SYSTEMS

A. PBB and SBB grounding busbars shall be 1/4 inch by 4 inches by 16 inches (minimum) copper with lug patterns for #8 through 1000 KCMIL conductors. Grounding busbars shall be electrolytic copper and mounted on fiberglass insulators rated at 2,700V. Erico or approved equal.

1. Provide one Grounding Busbar for each:
   a. Primary Bonding Busbar (PBB).
   b. Secondary Bonding Busbar (SBB).

B. TBB/TBC conductor size vs length (end to end length):

| TBB/BBC Linear Length meters (feet) | Conductor Size (AWG) |
|---|---|
| Less than 4 (13) | #6 |
| 4 – 6 (14 – 20) | #4 |

| | |
|---|---|
| 6 – 8 (21 - 26) | #3 |
| 8 – 10 (27 – 33) | #2 |
| 10 – 13 (34 - 41) | #1 |
| 13 – 16 (42 – 52) | #1/0 |
| 16 – 20 (53 - 66) | #2/0 |
| 20 – 26 (67 – 84) | #3/0 |
| 26 – 32 (85 – 105) | #4/0 |
| 32 – 38 (106 – 125) | 250 KCMIL |
| 38 – 46 (126 – 150) | 300 KCMIL |
| 46 – 53 (151 – 175) | 350 KCMIL |
| 53 – 76 (176 – 250) | 500 KCMIL |
| 76 - 91 (251 – 300) | 600 KCMIL |
| Greater than 91 (301) | 750 KCMIL |

1. Cable supports shall be strut with distribution rings.

C. Telecommunications Bonding Backbone (TBB): The TBB shall be a 600 volt insulated copper conductor sized at 2 KCMIL per linear foot of conductor length up to a maximum size of 750 KCMIL per the TBC/BBC table above. Mark TBB with green tape at all exposed locations.

D. Backbone Bonding Conductor (BBC): The BBC (if used) shall be sized per the TBC/BBC table above.

E. Rack Bonding Busbars (RBB) shall be Chatsworth P/N 10610-019, 3/16 inch by 3/4 inches by 19 inches copper with #6-32 tapped lug mounting holes on 1-inch centers. Grounding busbars shall be electrolytic copper.

1. Provide one RBB for each installed telecommunications rack or cabinet:

F. Alternating Current Equipment Ground (ACEG): The ACEG shall be a green #6 AWG minimum, 600 volt insulated copper conductor or equivalently sized per the equipment grounding conductor that connects the local electrical panel back to its source.

G. Unit Bonding Conductors (UBC): The UBC shall be a green #6 AWG minimum, 600 volt insulated copper conductor.

H. Telecommunications Equipment Bonding Conductor (TEBC): TEBCs shall be a green #6 AWG minimum, 600 volt insulated copper conductor.

I. Bond telecommunication racks and/or cabinets, ladder racks, cable trays, conduits, and all other telecommunication room and equipment room metallic components to either a PBB or SBB with a green TEBC with a minimum specification of #6 AWG, 600-volt, insulated copper conductor.

J. Bond telecommunication equipment located within a telecommunication rack or cabinet to a local RBB with an UBC with a minimum specification of #6 AWG, 600-volt, insulated copper conductor. Each piece of equipment shall be connected back to the local RBB in a radial configuration, i.e., equipment ground connections shall not be "daisy chained".

K. Bonding of grounding conductors shall be with the following methods as specified herein:

1. Connections to grounding busses: Cool Amp Plating, field applied to both surfaces for bolted and compression connections.

a. Approved gas tight two-hole copper grounding compression lugs T&B 54205 series 2-hole, crimp Cool Amp plated compression type for connection to grounding busses.

b. Fasteners shall be nickel plated steel nuts, bolts and lock washers.

2. Conductor splices and connection to ground rods:

a. Cadweld exothermic welds. Bonds below grade shall be exothermic or hydraulically crimped fittings listed for direct burial.

b. Burndy type “YG” extruded wrought copper prefilled with Pentrox heavy duty compression connectors with probe holes (Type YGA and YGS not acceptable).

## 2.4 IDENTIFICATION AND LABELING

A. Grounding conductors shall be labeled in accordance with Specification Section 26 05 53 and TIA/EIA-606-C.

# PART 3 EXECUTION

## 3.1 ELECTRICAL SERVICE ENTRANCE GROUND

A. Create an equipotential plane for the grounding system for this project at the electrical service entrance equipment by connecting the following to the electrical service entrance ground bus:

1. The commercial system's grounded neutral conductor and, if installed, the standby generator frame.
2. Metallic water services to the building.
3. Grounds specified to be installed.
4. The service entrance equipment and conduits entering and leaving the equipment.
5. The metallic piping systems in the building.
6. The metallic gas piping system upstream from the equipment shutoff valve.
7. Concrete encased electrode, "Ufer ground," as further specified in this Part.
8. Existing electrodes and bonds.
9. Structural steel columns and/or beams as noted elsewhere in this section.
10. Other items or equipment called for on the Drawings.

B. Ground the Emergency Generator in accordance with the requirements for a "Separately Derived System." (Transfer switches shall be 4 pole type that switch the neutral conductor if present.)

C. Current carrying capacity of the grounding and bonding conductors shall be in conformity with Table 250.66 of the NEC. Exception: The bonding conductor for metallic gas piping shall be sized in accordance with Table 250.122 based on the largest overcurrent device protecting feeder conductors exiting the main distribution switchboards.

D. Measure resistance to earth of service grounds by the fall of potential method per IEEE STD 81 “Recommended Guide for Measuring Ground Resistance and Potential Gradients in the Earth”. Record and submit test readings. Grounding system resistance to ground shall not exceed 5 ohms. Make any modifications or additions to the grounding electrode system necessary for compliance without additional cost. Final tests shall ensure that this requirement is met.

### 3.2 EQUIPMENT GROUND

A. The raceway system shall be bonded in conformity with NEC requirements to provide a continuous ground path. Where required by Code or Ordinance or where called for on the plans an additional grounding conductor shall be provided, sized in conformity with Table 250.122 of the NEC, unless larger size is noted.

B. Provide separate grounding conductor securely bonded and effectively grounded to the enclosures at both ends of all non-metallic raceways and all flexible conduit.

C. Provide an equipment grounding conductor sized in conformity with Table 250.122 of the NEC, unless larger size noted, for feeder and branch circuit conduits. Where conductors are adjusted in size to compensate for voltage drop, equipment grounding conductors shall be adjusted proportionately according to circular mil area.

### 3.3 CONCEALED CONNECTIONS

A. Permanent grounding connections, where permitted by the NEC to be concealed, shall not be so concealed until inspected and accepted by the Contracting Agency. Failure to comply with this requirement shall make the Contractor liable for all expenses incurred in the process of re-exposing the connections for inspection, and subsequent repair and patching of the concealing construction, including the work of other trades. The Contractor shall schedule inspection of such connections at least one work week in advance of concealment, and shall not be entitled to any additional compensation or time extension for delays caused by inability of the Contracting Agency's representative to be available at the desired time.

### 3.4 CORDS AND NONMETALLIC CABLES

A. Unless specifically permitted otherwise, cords and nonmetallic cables shall be furnished with integral Code-sized grounding conductor. Securely bond metal components and effectively ground the entire electrical system.

### 3.5 TELECOMMUNICATIONS GROUNDING AND BONDING SYSTEMS

A. Telecommunications Primary Bonding Busbar (PBB):

1. Equipment and metallic raceways located in the same room as the PBB shall be bonded to the PBB. Each piece of equipment shall be connected back to the PBB in a radial configuration, i.e., equipment ground connections shall not be "daisy chained" and then connected to PBB.

2. TBC/TBB connections to the PBB shall be made with listed 2-hole compression connectors or exothermic type welded connections. Each piece of equipment shall be connected back to the local PBB in a radial configuration, i.e., equipment ground connections shall not be "daisy chained" and then connected to PBB.

3. Where a panelboard for telecommunications is located in the same room as the PBB, the panelboards Alternating Current Equipment Ground (ACEG) bus or the enclosure shall be bonded to the PBB.

4. Connect the PBB to the electrical service entrance ground (power) bus with a bolted lug connection.

B. Electrical Service Entrance Ground (power):

1. Provide connection to the electric service entrance ground (power). The Telecommunication Bonding Conductor (TBC) from the PBB to the electrical service entrance ground (power) shall be, at a minimum, the same size as the largest TBB or as shown on the Drawings.

2. Measure resistance to earth of service ground as described in Part 3.

C. Secondary Bonding Busbar (SBB):

1. Equipment and metallic raceways located in the same room as the SBB shall be bonded to the SBB.
2. TBB connections to the SBB shall be made with listed 2-hole compression connectors or exothermic type welded connections.
3. Where a panelboard for telecommunications is located in the same room as the SBB, the panelboards Alternating Current Equipment Ground (ACEG) bus or the enclosure shall be bonded to the SBB.

D. Telecommunications Bonding Backbone (TBB):

1. Connect each SBB to the PBB using a TBB sized in accordance with the TBB/TBC sizing table above.

E. Backbone Bonding Conductors (BBC):

1. Whenever two or more TBBs are used within a multistory building, the TBBs shall be bonded together with a BBC at the top floor and at a minimum of every third floor in between to the lowest floor level. Whenever two or more TBBs are used within a large single-story building, the TBBs shall be bonded together with a BBC at the location farthest from the PBB and at a maximum distance of every 10 m (33 ft) back to the PBB. The BBC shall be, at a minimum, the same size as the largest TBB to which it is connected.

F. Rack Bonding Busbar (RBB):

1. RBB connections to the SBB shall be made with listed 2-hole compression connectors or exothermic type welded connections.

G. Alternating Current Equipment Ground (ACEG): When an electrical panelboard is located in the same room or space as the PBB or an SBB, that panelboard's ground bus shall be bonded to the PBB and/or SBB with an ACEG.

H. Unit Bonding Conductors (UBC): Bond rack and/or cabinet mounted telecommunications equipment to the rack or cabinet RBB with a UBC.

I. Telecommunications Equipment Bonding Conductor (TEBC): Bond RBB within racks and/or telecommunications cabinets to the local PBB or SBB with a TEBC.

J. Conductors

1. Where insulated, the TBC and each TBB, BBC, TEBC, and UBC, shall be green, green with yellow stripe, or marked with a distinctive green color.

K. Use of Structural steel

1. When structural steel is bonded to the building's grounding electrode system it may be used in place of a TBB, a BBC, or both. Before utilizing structural steel in place of a TBB or a BBC, building plans (including as-builts as applicable) and specifications shall be reviewed to ensure the structural steel is electrically continuous or can be made so. Additionally, the two-point continuity test as prescribed by ANSI/TIA-607-E, or equivalent, should be performed on the structural steel to verify electrical continuity and acceptable resistance along the structural steel paths used in lieu of actual bonding conductors

L. Bonding and Connections:

1. General:
   a. Cadweld exothermic welds. Bonds concealed or below grade shall be exothermic or hydraulically crimped fittings listed for direct burial.
   b. Compression connections shall be made using a hydraulic 4 way compression die.

c. Compression connections shall be exposed unless UL Listed for direct burial.

d. Insulated wire splices shall be insulated with preformed wire covers.

2. To Building Steel:

a. Cadweld connections to building steel.

M. Identification and Marking:

1. Show conductors on neatly marked record drawings. Submit to the Contracting Agency.

2. Grounding conductors shall be marked per ANSI/TIA/EIA 606-C and as directed by the Contracting Agency. Mark each cable end using tie wrap style cable markers.

3. Label each PBB/SBB with a sign as depicted below:

IF CONNECTORS OR CABLES ARE LOOSE OR MUST BE REMOVED FROM THIS BUSBAR, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER

N. Performance and Test Requirements

1. Provide two-point ground/continuity testing in accordance with ANSI/TIA-607-E Chapter 9.1 for the following areas:

a. PBB to the electrical service entrance (power) ground in the main electrical room.

b. PBB/SBB to the structural metal (if present).

c. PBB to SBBs.

d. Structural metal (if present) to the electrical service entrance (power) ground.

2. The recommended maximum value for resistance between any point in the telecommunications bonding system and the building's electrical grounding system is 100 milliohms.

3. Record and submit test readings.

## 3.6 EXTERNAL BONDING JUMPERS

A. Not permitted; bonding jumpers shall be run inside the raceways for the circuits they serve.

## 3.7 SEPARATELY DERIVED SYSTEMS

A. Separately derived systems shall be grounded in accordance with NEC Article 250.30.

1. System Bonding jumper:

a. The system bonding jumper shall be sized in accordance with NEC Table 250.102(C)(1). Where the derived phase conductors are larger than 1100 kCMIL copper, the system bonding jumper shall have an area that is not less than 12-1/2 percent of the area of the largest ungrounded phase conductor.

b. The system bonding jumper shall be used to connect the equipment grounding conductor (EGC) of the separately derived system to the grounded circuit conductor.

c. The system bonding jumper shall be located within the enclosure of the source of the separately derived system, unless specifically noted otherwise.

2. Grounding Electrode Conductor:
   a. The grounding electrode conductor shall be sized in accordance with NEC Table 250.66.
   b. The grounding electrode conductor shall be used to connect the system grounded conductor or EGC to a grounding electrode or to a point on the grounding electrode system.
   c. The grounding electrode conductor shall be connected and used to extend the connection to a grounding electrode at any of the following locations in accordance with NEC 250.68(C):
      1). Effectively grounded metal structural frame of a building.
      2). Effectively grounded interior metal water piping located not more than 5 feet from the point of entrance to the building.
      3). Effectively grounded rebar-type concrete-encased electrode, “Ufer Ground”, installed in accordance with NEC 250.52(A)(3) with an additional rebar section extended from its location within the concrete to an accessible location.
3. Grounding electrode:
   a. The grounding electrode shall be as near as practical to and preferably in the same area as the grounding electrode conductor connection to the system.
   b. The building or structure grounding electrode system shall be used as the grounding electrode for the separately derived system.
4. Provide termination lugs for the co-located grounded circuit conductor, grounding electrode conductor and system bonding jumper terminations, using Listed compression-type connectors suitable for all conductors landed at each location.

**END OF SECTION**

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# SECTION 26 05 29
# HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SUMMARY

A. This Section includes:

1. General hanger and support requirements for electrical equipment, conduit and cable trays not required to be vibration and/or seismically controlled.
2. Penetrations, sleeves and seals.

B. Related Sections:

1. 01 91 00 - Commissioning
2. 20 05 48 - Vibration and Seismic Control
3. 26 00 00 - Electrical General Requirements
4. 26 05 33 - Raceways and Boxes for Electrical Systems
5. 26 24 16 - Panelboards
6. 26 29 00 - Low Voltage Controllers
7. 26 50 00 - Lighting Fixtures
8. 27 20 10 -Telecom Distribution System
9. Division 9 - Painting

### 1.2 REFERENCES

A. NFPA 70: National Electrical Code (NEC) latest legally enacted edition.

### 1.3 DESCRIPTION

A. Provide general hanger, support and seismic support requirements for electrical equipment, conduit and cable trays and other nonstructural equipment in accordance with the manufacture's written installation instructions and NFPA 70.

### 1.4 SUBMITTALS

A. See Section 26 00 00 - General Electrical Requirements for general submittal requirements

B. Product Data:

1. Provide manufacturers catalog data for each product specified. Indicate channel gauge and maximum load capacities of the selected products.
2. Manufacturer's Installation Instructions: Include assembly instructions, recommended parts and special procedures as required.

C. Design Requirements:

1. Obtain the services of a specialized and qualified design firm (Seismic Design Firm) to design the overall vibration and seismic control restraint systems for the non-structural elements of this Project in accordance with the International Building Code (IBC) chapters 16 and 17.
2. Duties of the Seismic Design Firm include:
    a. Specialized design, product review, and product selection.
    b. Site verification and written certification that the installed vibration and seismic control and related products and systems meet the specialized design requirements.
3. Exceptions.

a. Pre-engineered seismically designed and certified assemblies in accordance with IBC, accompanied with written “Certificate of Compliance” acceptable to the Authority Having Jurisdiction, AHJ.

b. Pre-manufactured equipment designed in accordance with IBC accompanied with written “Certificate of Compliance” acceptable to the Authority Having Jurisdiction.

D. Shop Drawings:

1. Provide shop drawings to include the following:

a. Housekeeping pads (coordinated with approved electrical equipment footprints and anchor point locations).

b. Pre-engineered and field fabricated support system details for each installation location. To include but not limited to:
1). Raceway and lighting fixture support.
2). Conduit and control panel support.
3). Cable tray and switch box support.
4). Cable tray support (single and multi-tier).
5). Trapeze hangers.
6). Electrical equipment support.

c. Equipment locations and conduit and cable tray routing coordinated with mechanical equipment and systems. Indicate routing height above finished floor.

d. Indicate hanger type/attachment method and hanger spacing intervals.

E. Project Record Information:

1. Indicate installed locations of hangers and supports on project as-built shop drawings.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site:

1. Verify products are delivered in original factory packaging and are free from damage and corrosion.

2. Replace equipment delivered to job site that does not comply with above requirements at no expense to the Owner.

B. Storage and Protection:

1. Store products in covered storage area, protected from the elements, outside the general construction area until installed.

2. Handle items to avoid damage.

3. Replace damaged items with same item in new condition.

## 1.6 WARRANTY

A. Provide warranty in accordance with Section 26 00 00 - General Electrical Requirements.

# PART 2 PRODUCTS

## 2.1 PRE-ENGINEERED SUPPORT SYSTEMS

A. Manufacturers:

1. Unistrut

2. Super-Strut

3. B-Line

4. K-Line

5. Erico.

B. Material:
   1. Cold worked steel.
   2. Type 304 stainless steel: Use for PVC, liquid-tight flex, or plastic-coated conduit installed on wood construction in outdoor, damp, corrosive or marine environments.

C. Finish:
   1. Heated indoor areas: Pre-galvanized zinc coating.
   2. Outdoor areas: Hot dipped galvanized finish. In addition, coat hot dipped galvanized finish channel field cuts with zinc rich paint provided by the support system manufacturer.
   3. Painted areas: Paintable galvanizing or phosphatized and primed.
   4. Surface metal raceways: U.L. Listed epoxy coating.

D. Channel:
   1. Standard Size: 1-5/8 inch x 1-5/8 inch. Gauge thickness as required for attached load.
   2. Standard Hole Pattern: Slotted. Provide solid channel in exposed public areas.

E. Nuts and Hardware:
   1. Channel nuts: Hardened steel (ASTM-A675 and ASTM A36).
   2. Bolts, screws and nuts: Hardened steel (ASTM-A307, ASTM A563 and SAE J429).
   3. Finish: Electroplated zinc.

F. Fittings: Plate steel (ASTM A635). Epoxy or electroplated zinc coating.

G. Electrical Accessories: Provide accessories from the support system manufacturer designed for the specific equipment to be supported to include but not limited to:
   1. Lighting fixture hangers.
   2. Outlet box adapters.
   3. Snap-in closures.
   4. Conduit connection plates.
   5. Junction box adapters.
   6. Strut joiners.
   7. "Caddy" fasteners are permitted for support of conduit to concealed metal studs and for conduit concealed above suspended acoustical ceilings.

## 2.2 SLEEVES, ACOUSTICAL SEALS AND FIRE-STOPPING

A. Sleeves for pipes through fire rated and fire resistive floors and walls, and fireproofing: UL listed prefabricated fire rated sleeves and seals.

## 2.3 WALL/FLOOR PENETRATION WATER SEALS

A. Mechanical seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the wall opening.

B. EPDM seals.

C. 316 Stainless steel bolts and nuts.

D. Hot-dipped galvanized or coated sleeve with full water stop flange with continuous weld on both sides.

E. Manufacturer: Metraflex, Thunderline, Crouse-Hinds, or pre-approved equal.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Prior to installation, prepare detailed shop drawings of the planned installation of hanger and support products specified by this section. Coordinate the location, type and size of hangers and supports, housekeeping pads (thickness/perimeter overhang dimensions) and roof curbs with Architectural and Structural elements utilizing the shop drawing review process.

B. Do not install hangers and supports without approved shop drawings.

### 3.2 GENERAL INSTALLATION

A. Install hangers and supports in accordance with manufacturer's instructions, applicable Code requirements (NFPA 70) and approved shop drawings.

B. See Section 26 00 00 – Electrical General Requirements for electrical equipment wall mounting heights.

### 3.3 VIBRATION AND SEISMIC CONTROL PRODUCT INSTALLATION

A. Install vibration isolators, seismic control and wind restraint systems in strict compliance with the manufacturer's written instructions and certified and approved application engineering installation drawings and details.

### 3.4 INSERT AND ATTACHMENT INSTALLATION

A. Inserts

1. Provide inserts or cast-in-place channels for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
4. Use expansion type anchor bolts with pre-cast concrete including concrete masonry units within loading limits of the pre-cast material and anchor bolt manufacturer's recommendations.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
6. Plastic screw inserts and caulked lead inserts are prohibited, except for mounting instructions and control diagrams.

B. Attach electrical equipment to structure as follows:

1. Hollow masonry: Toggle bolts.
2. Solid masonry and concrete: Preset inserts or expansion bolts.
3. Structural steel: Beam clamps which engage both sides of structural member or have retaining clips or other approved means for positive engagement.
4. Metal surfaces: Machine screws, bolts or welding.
5. Wood construction: Wood or sheet metal screws. Bugle head drywall screws or deck screws are not allowed.
6. Do not use powder actuated fasteners for anchorage in tension applications. Obtain written permission from the Owner prior to using any type of powder powered studs.
7. Attachment to plaster or gypsum board (sheet rock) not approved. Equipment shall be attached to or supported from structure.

## 3.5 RACEWAY INSTALLATION

A. Support raceways using approved types of wall brackets, ceiling trapeze hangers or malleable iron straps utilizing attachment methods described above. "Perforated plumber's strap" is not permitted as a means of support.

B. Support raceways independent of ceiling systems, piping and ductwork. Exceptions: Lighting fixtures and outlet boxes (i.e. ceiling speaker boxes) specifically designed for attachment to suspended ceiling systems

C. Support EMT conduit (1-1/2 inch and smaller/dry locations) using hanger rods with spring steel fasteners.

D. Support cable trays and multi-conduit runs independently from other support systems utilizing double hanger rods at each support point.

## 3.6 LIGHTING INSTALLATION

A. General

1. Attach safety hanger wires to lighting fixtures such that in event of a ceiling suspension system failure, no part of the fixture will drop more than 6 inches below normal ceiling height. Secure each end of each wire with a minimum of three tight wraps.

B. Fixtures (greater than 20 pounds/non-suspended ceiling applications)

1. Support lighting fixtures from structural members capable of supporting the total weight of the fixture and independent from electrical wiring system. Attach to steel members using approved beam clamps and rods.

C. Fixtures (suspended ceiling system applications)

1. Positively attach lighting fixtures to suspended ceiling grid for 100 percent of fixture weight acting in any direction using positive clamping devices that fully surround the supporting member (i.e. Caddy "IDS" or equal).

2. Provide supplemental safety hanger wires as follows:

a. Fixtures (weighting less than 56 pounds): Provide two 12 gauge wires or equivalent chains connected from the diagonal corners of the light fixture housing to the structure above. These wires may be slack.

b. Fixtures (weighting greater than 56 pounds): Provide full direct support from the structure above. Attach wires from within 3 inches of each corner of the fixture.

c. Pendant-hung lighting fixtures

1). For each fixture, provide direct support from the structure above using a minimum of two 12 gauge wires, equivalent aircraft cable or an approved alternate support system without using the ceiling suspension system for direct support. Securely attach wire/cable to fixture, route through fixture stem and securely attached to structure.

2). Provide loop and hook or swivel hanger assemblies fitted with a restraining device to secure stem in the support position during earthquake motion.

3). Support lighting fixtures with flexible hanger device at the attachment point to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.

## 3.7 PENETRATIONS

A. Coordinate electrical penetrations with architectural, structural and mechanical construction details prior to installation. Set sleeves in position in concrete formwork. Provide reinforcement around sleeves as required.

B. Provide compatible materials, fasteners, adhesives, sealants, and other products required for proper installation.

C. Penetrations through roof, exterior walls and floors shall be weather and watertight.

D. Firestopping: Provide UL rated firestopping assemblies for rated roof, wall and floor penetrations in accordance with Division 7.

E. Escutcheons: Provide escutcheons for conduit passing through walls, floors and ceilings in finished areas, below counters and inside closets and casework subject to view when doors are open. Size escutcheons to cover conduits. Secure escutcheons in position.

F. Acoustical Seals

1. Monolithic sound walls (i.e. poured concrete or masonry): Provide wall sleeve with approximately one-inch annular space around conduit. Pack annular space with backer rod or acoustical filler as specified in Division 7. Allow a 1 inch recess at each end of sleeve. Caulk sleeve flush with flexible sealant or fire-stopping material as specified in Division 7.

2. Where acoustical wall is a two component type, such as a staggered or double stud partition, treat each component as a separate wall. Pack and seal each half of penetration sleeve as previously specified, except that only the exposed end of each sleeve portion shall be caulked with sealant or firestop. Provide adequate separation between each sleeve.

G. Wall Penetration Seals

1. Provide pre-engineered wall penetration water seal systems for exterior wall penetrations.

2. Select appropriate wall penetration sealing systems based on conduit material and nominal conduit size in accordance with the manufacturer's selection charts.

3. Install conduit and sealing system prior to waterproofing the wall. Grout void between water seal and outside face of foundation wall to provide continuous bearing surface for waterproofing fabric.

H. Floor Penetration Seals

1. Provide pre-engineered floor penetration water seal systems for conduit floor penetrations in rooms where a pipe leak/failure could result in water damage to adjacent spaces (i.e. mechanical rooms located above the ground floor or basement) and other areas as noted.

2. Extend conduit floor penetration sleeves 2 inches above finished floor.

**3.8 ROOF FLASHING**

A. Provide EDPM pipe penetration and roof curb flashing in accordance with Division 7 as an integral part of the roofing system.

**END OF SECTION**

**SECTION 26 05 33**

**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section includes specific requirements, products, and methods of execution relating to conduit, conduit fittings, surface raceways, multi-outlet assemblies, wireways, outlet boxes, pull boxes and junction boxes approved for use on this project. Type, size and installation methods shall be as shown on Drawings, required by Code and/or specified in this Section.

B. Related Sections

1. 26 05 19 – Low Voltage Electrical Power Conductors and Cables
2. 26 05 26 – Grounding and Bonding for Electrical Systems
3. 26 05 29 – Hangers and Supports for Electrical Systems

### 1.2 REFERENCES

A. American National Standards Institute/Underwriters Laboratory

1. ANSI C80.1 – Electrical Rigid Steel Conduit
2. ANSI C80.3 – Steel Electrical Metallic Tubing
3. ANSI C80.5 – Electrical Rigid Aluminum Conduit
4. ANSI C80.6 – Electrical Intermediate Metal Conduit
5. ANSI/UL 1 – Flexible Metal Conduit
6. ANSI/UL 6 – Electrical Rigid Metal Conduit – Steel
7. UL 6A – Standard for Electrical Rigid Metal Conduit – Aluminum and Stainless Steel
8. UL 360 – Standard for Liquid Tight Flexible Steel Conduit
9. UL 514A – Metallic Outlet Boxes
10. UL 514B – Conduit, Tubing and Cable Fittings
11. UL 651 – Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
12. UL 651A – Type EB and A Rigid PVC Conduit and HDPE Conduit
13. ANSI/UL 651B – Standard for Continuous Length HDPE Conduit
14. ANSI/UL 797 – Electrical Metallic Tubing – Steel
15. ANSI/UL 1242 – Electrical Metal Intermediate Conduit – Steel

B. National Electrical Manufacturers Association

1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)
2. NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
3. NEMA OS 1 – Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports
4. NEMA RN 1 – Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
5. NEMA TC 2 – Electrical Polyvinyl Chloride (PVC) Conduit
6. NEMA TC 3 – Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
7. NEMA WD 6 - Wiring Device Configurations.

C. NECA (National Electrical Contractors Association) Standard of Installation.

**1.3 SUBMITTALS**

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, surface raceway finishes (custom factory pre-painting, color as selected by architect), and accessories.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

**1.4 QUALITY ASSURANCE**

A. Raceways and boxes shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of materials and be in conformity with applicable standards and UL listings.

B. Surface raceways shall be of the latest approved design as manufactured by a nationally recognized manufacturer and shall be listed by the Underwriters' Laboratory and bear the UL label.

C. Pull and junction boxes 50 cubic inches and smaller shall conform to specifications for outlet boxes.

D. Pull and junction boxes larger than 50 cubic inches shall conform to U.L. Standard 50, Cabinets and Boxes.

E. Perform work in accordance with NECA Standard of Installation.

F. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

**PART 2 PRODUCTS**

**2.1 CONDUIT**

A. Conduit types specifically approved for use on this project shall be of the following types only:

1. Galvanized rigid metal conduit - GRC or RMC.
2. Intermediate metal conduit - IMC.
3. Rigid copper-free aluminum conduit.
4. Electrical metallic tubing - EMT.
5. Polyvinyl chloride conduit - PVC: May be Schedule 40 or Schedule 80, except where Schedule 80 is specifically noted or specified.
6. Flexible metal (steel) conduit - FMC or flex: In short lengths as specifically permitted.
7. Liquid-tight flexible steel conduit - LFMC: In short lengths as specifically permitted.
8. Extreme temperature liquid-tight flexible steel conduit - AT: Shall have temperature rating of -67 ° F to +220 ° F, Liquatite “ATLA”, or as approved.
9. Types specifically identified on the Drawings or in the Specifications
10. Other products not specifically approved such as ENT, MC Cable, etc., are not allowed
11. Manufactured wiring systems are not approved.

**2.2 FIRE ALARM CONDUIT**

A. EMT conduit utilized for fire alarm system wiring shall be factory pre-painted with a bright red topcoat, Allied Fire Alarm Red or as approved. Other conduit types utilized for fire alarm

system wiring shall be identified with red paint or red tape wrapped a minimum of 4 times around the conduit every 10 feet and at each fire alarm system junction box.

## 2.3 CONDUIT FITTINGS

A. Fittings utilized with rigid steel, IMC, and aluminum shall be galvanized steel or iron or copper-free aluminum and shall be threaded. Conduit bushings shall be provided and shall be of the insulated types. Where grounding bushings are required, provide insulated grounding bushings with integral pressure type ground lugs, Thomas & Betts “Blackjack”, or as approved.

B. Couplings and connectors for EMT shall be made of steel or malleable iron. Die-cast products shall not be used. Connectors shall have insulated throats. Connectors and couplings shall be setscrew or compression type.

C. Fittings for PVC 40 shall be polyvinyl chloride, installed using PVC solvent to form a watertight joint, except elbows (including bends exceeding 30°) shall be metallic. These metallic elbows shall be of the type specified in this section for the environment in which they are to be installed. Large radius sweeps are not subject to the requirement for metallic elbows.

D. Fittings for flexible metal conduit shall be steel or malleable iron only. Throats shall be insulated.

E. Fittings for liquid-tight flexible conduit shall be steel or malleable iron, of a type incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland, providing a low resistance ground connection. Throats shall be insulated.

## 2.4 CONDUIT WITH INNERDUCTS

A. Provide innerducts in conduits, cable trays and underground ductbanks of the type, size and quantity shown on the Drawings or as specified.

B. Innerducts shall be 1 inch flexible ducts or as specifically shown on the Drawings. Standard color shall be orange, unless otherwise noted.

C. Innerducts shall be field installable. Install all innerducts within a conduit at once, without kinking or crushing.

## 2.5 SURFACE METAL RACEWAY

A. The Basis of Design is equipment from Wiremold, Hubbell or Mono-Systems, to set a standard for quality and style.

B. Large multi-circuit raceways shall be sheet metal channel 4 3/4 inches wide, 1-3/4, inches deep and fitted cover, suitable for use as surface metal raceway, Wiremold Series 4000, or as approved.

C. Small surface metal raceway for individual circuit runs shall be one piece surface metal raceway of the appropriate dimensions for the conductors, Wiremold Series 500/700, or as approved.

D. Finish: Large raceways shall be factory pre-painted a standard color as selected by the Architect. Small raceways shall be furnished with factory color finish as selected by the Architect and field painted to match adjacent surfaces, unless otherwise noted on the Drawings.

E. Large raceways shall have factory pre-punched base channel mounting fastener holes. Provide suitable backing for mounting attachment, hollow wall anchors shall not be used.

F. Provide manufacturer's standard Fittings, Boxes, and Extension Rings:

1. Wall box connectors shall be concealed entry type.

G. Surface metal raceway shall only be used where specifically shown on the Drawings Concealed conduit shall be used in all other locations.

## 2.6 MULTI-OUTLET ASSEMBLY

A. Divided multi-outlet assemblies shall be sheet metal channel 4 3/4 inches wide, 1 3/4 inches deep with metal divider to separate power and communications wiring compartments and fitted cover, suitable for use as surface metal raceway, Wiremold Series 4000, or as approved. Mounting fastener holes shall be factory pre-punched.

B. Single channel multi-outlet assemblies shall be sheet metal channel 2 3/4 inches wide, 1 17/32 inches deep with fitted cover, suitable for use as surface metal raceway, Wiremold Series 3000, or as approved. Mounting fastener holes shall be factory pre-punched.

C. Device fittings shall be suitable to accept a single or duplex standard electrical outlet or multi-telecommunication jack as specified in other Sections, Wiremold 4047, or as approved.

D. Entrance fittings shall accept concealed conductor entry from the back via a flush outlet box in the wall. Entrance fitting cross section shall be identical to the sheet metal channel and shall accept the same fitted cover. Entrance fitting openings shall be factory pre-punched.

E. Finish: Multi-outlet assemblies shall be factory pre-painted a standard color as selected by the Architect.

F. Base channel mounting fastener holes shall be factory pre-punched in raceways. Provide suitable backing for mounting attachment, hollow wall anchors are not allowed.

G. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors.

## 2.7 WIREWAY

A. Unless otherwise noted on the Drawings, surface wireway in exposed or concealed locations shall be sheet metal channel suitable for use as a wiring trough, with hinged or screw cover, sized in accordance with the NFPA 70. Wireway shall be Square D Class 5100, 5120, 5140, as appropriate for the environment, or as approved.

B. Wireway shall be of the NEMA Type (general purpose, oil-tight, dust-tight, rain-tight, etc.) appropriate for the environment where installed.

C. Wireway shall be furnished without factory pre-punched concentric or eccentric conduit knockouts. Knockouts shall be field punched as required for the conduits installed

D. Finish shall be ANSI-49 gray epoxy paint finish applied by cathodic electrodeposition over a corrosion resistant phosphate preparation.

## 2.8 CAST BOXES

A. Cast boxes with threaded hubs, external mounting brackets or holes, and gasketed covers shall be used in the following locations:

1. Exterior locations.
2. Wet or damp locations.
3. Mechanical rooms, and where exposed to mechanical damage.
4. Exposed interior locations below 48 inch above floor where subject to damage.
5. Where shown on Drawings.

## 2.9 STEEL BOXES

A. Galvanized pressed steel boxes may be used wherever they are permitted by code, except in areas indicated in the preceding paragraph.

B. Flush mounted, pressed steel boxes shall be equipped with external mounting brackets for attachment to framing members with screws or nails.

C. Ceiling boxes and wall boxes for bracket lights shall be not less than 4 inch in diameter by 1 ¼ inch deep and shall have 3/8 inch malleable iron fixture studs if required.

D. Grounding Screw: All stamped steel boxes shall have a drilled and tapped hole in the back of the box for a grounding screw.

E. Accessories: Box covers, extension rings, bases, hanger bars, etc., for use in connection with the installation, shall be approved for use in the various applications.

**2.10 TELECOMMUNICATION OUTLET BOXES**

A. Boxes for telecommunication outlets shall be a minimum of 4 inches square by 2 1/8 inches deep.

B. Device rings for telecommunication outlets shall be single-gang, minimum 5/8 inches deep, to provide a minimum internal finished depth of 2 3/4 inches.

**2.11 INDOOR PULL AND JUNCTION BOXES**

A. Indoor pull and junction boxes shall conform to Article 314 of the NEC and the following requirements:

1. Sheet metal boxes are approved for use in all dry, interior, nonhazardous locations.
2. Boxes installed in wet locations shall be NEMA 3R, unless otherwise noted.
3. Furnish such boxes, whether shown or not, in order to conform to requirements for maximum pulling length and maximum number of bends allowed.
4. Special boxes, as noted on the Drawings, shall be installed in areas of specific service and/or hazards.

B. Junction box extension rings will not be accepted on new boxes. Appropriate size boxes shall be used for each application.

**2.12 TELECOMMUNICATION SYSTEM PULL BOXES**

A. Telecommunication system Pull Boxes shall also conform to ANSI/EIA/TIA 569-A and the BICSI Telecommunications Distribution Methods (TDM) Manual.

B. Dimensions:

1. Pull boxes for straight through pulls shall have minimum interior dimensions in accordance with the following Table:

| | Size of Box | | | |
|---|---|---|---|---|
| Maximum Trade Size Conduit | Width (inches) | Length (inches) | Depth (inches) | For Each Additional Conduit Increase Width |
| 1 Inch | 4 | 16 | 3 | 2 inches |
| 1 1/4 Inch | 6 | 20 | 3 | 3 inches |
| 1 1/2 Inch | 8 | 27 | 4 | 4 inches |
| 2 Inch | 8 | 36 | 4 | 5 inches |
| 2 1/2 Inch | 10 | 42 | 5 | 6 inches |
| 3 Inch | 12 | 48 | 5 | 6 inches |
| 3 1/2 Inch | 12 | 54 | 6 | 6 inches |
| 4 Inch | 15 | 60 | 8 | 8 inches |

## 2.13 TELECOMMUNICATION SYSTEM SPLICE BOXES

A. Unless otherwise specified or noted on the Drawings, splice boxes shall not be used in interior horizontal pathway conduits or interior backbone pathway conduits.

B. Where required in a building service entrance or campus backbone pathway system, splice boxes shall be provided in accordance with the requirements of ANSI/EIA/TIA-569-A - Commercial Building Standard for Telecommunications Pathways and Spaces and the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual.

## 2.14 OUTDOOR ABOVE-GROUND PULL AND JUNCTION BOXES

A. Boxes exposed to rain or installed in wet locations shall be NEMA 3R unless otherwise noted.

B. Outdoor pull and junction boxes and conduit bodies for use with galvanized conduits shall be made of galvanized ferrous metal or cast aluminum, with integral threaded hubs or Myers-type weathertight hubs of matching composition and finish.

C. Furnish such boxes, whether shown or not, in order to conform to requirements for maximum pulling length and maximum number of bends allowed.

# PART 3 EXECUTION

## 3.1 CONDUIT USES PERMITTED

A. Conduits shall be of the sizes shown on the Drawings or as required by the NEC, whichever is larger. Base sizes on using type XHHW for wire sizes #6 and smaller and type THHN/THWN wire for wire sizes #4 and larger. Unless otherwise noted, conduits installed in the following locations shall be of the types specifically identified only:

1. Underground or encased in concrete - rigid steel, PVC-40, or IMC.
2. Outdoors aboveground or damp locations - RMC, IMC or extreme temperature liquid-tight flexible steel conduit (where required).
3. Dry indoor locations, concealed or exposed - RMC, rigid aluminum, EMT (where not susceptible to physical damage), flexible conduit where necessary, or IMC.
4. Indoor locations, exposed, where susceptible to physical damage - RMC or IMC.
5. Motor and equipment flexible connections - LFMC or FMC (when installed in plenum spaces).

## 3.2 RACEWAY INSTALLATION METHODS - GENERAL

A. Concealed raceways: In occupied areas, conduit and raceways shall be concealed unless specifically noted otherwise. In service spaces (mechanical equipment rooms, electrical rooms, storage closets, etc.), approved raceways may be surface-mounted for connection to equipment in exposed surface mounted locations.

B. Concealed raceways shall be routed as directly as possible with a minimum of bends. Concealed raceways above lay-in ceilings shall be installed a minimum of 12 inches above the ceiling grid.

C. Exposed Raceways: Where allowed by this Specification or specifically noted on the Drawings, raceways may be mounted on the surface of walls, ceilings and other surfaces. Exposed raceways shall comply with the following:

1. Exposed raceways shall be run parallel or perpendicular to building lines and bent symmetrically or made up with standard elbows or fittings.
2. Surface-mounted conduit, junction boxes, pull boxes, outlet boxes, etc. installed in finished areas shall be painted to match the surrounding surfaces.

3. Connectors and fittings for raceways and conduits installed on the surface in exterior locations shall be suitable for and Listed for use in a wet location.
4. Conduits installed in exterior locations shall be painted to match the exterior finish of the building surface to which they are attached. This shall include conduits attached via racks and stand-off brackets, or attached directly to the surface.

D. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points. Pull boxes added to conduit runs as a result of this requirement shall be in accordance with this Section.

E. Conduit and tubing shall be cut square and reamed smooth at the ends and all joints made tight. Conduit threads shall be lubricated with an approved thread lubricant.

F. Raceway for power wiring shall not be installed in the floor slab beneath telecommunication rooms.

G. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a locknut/bushing on the inside, or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter. Connections shall be made wrench tight. Locknuts shall be the bonding type with sharp edges and shall be installed in a manner that will assure a locking installation. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into threaded connections. Conduit runs shall be protected from the entrance of foreign material prior to the installation of conductors.

H. Conduit or tubing deformed or crushed in any way shall not be installed. Conduit shall be bent only with approved bender (hydraulic or hickey). Bending machines shall be used to make field bends in conduit of 1-1/4 inch size and larger. Open flame torches shall not be used in making conduit bends.

I. Raceways shall be spaced at least 6 inches from parallel runs of heating system pipes, flues, other high temperature piping systems, and other heat sources. This basic spacing shall be increased if necessary to ensure that raceways experience no significant temperature rise from external sources. Raceways shall not be embedded in any spray applied insulation, fireproofing, or other materials that would restrict heat dissipation.

J. Raceways for Audio/Video systems shall be spaced a minimum of 24 inches from parallel runs of conduits and wiring of power, lighting, and Class 1 signaling. Maintain at least 48 inches of separation from dimmed lighting circuits. Where runs are run parallel for less than 50 feet the required spacing may be halved (12 inches, or 24 inches from dimmed lighting circuits). Where runs are adjacent for less than 6 feet, or where conduits cross at right angles, separations of 2 inches may be used.

K. Pull wires shall be provided in spare and unused conduits. (Nylon "jet-line" or as approved.)

L. Clean conduits 3 inches and larger utilizing conduit mandrels.

M. Conduits stubbed up out of floor and terminating inside of an enclosure shall have insulating grounding bushings installed.

N. Raceways penetrating vapor barriers or traversing from warm to cold areas shall be sealed on the inside with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall be taped airtight to the vapor barrier on the outside. Refer to Section 26 00 00 for additional requirements and limitations regarding penetration of vapor barriers.

O. Raceways (particularly PVC) shall be provided with expansion joints where necessary to allow for thermal expansion and contraction. Set initial opening of expansion joints per manufacturer's instructions, to suit the ambient temperature at the time of installation.

P. Provide flexible conduit connection at seismic joints to allow for displacement of conduit in all three axes. Provide appropriate lengths of flexible conduits at seismic joints and appropriate amounts of slack in conduit to allow movement of conduit/cabling in accordance with the design of the seismic joint. Slack shall be maintained in conduit after cabling is installed. Minimum lengths of flexible conduit and minimum amount of slack for various size conduits shall be as follows:

1. 2 inch and greater: 4 foot length, 4-6 inches slack.
2. 1-1/2 inch and smaller: 2 foot length, 3 inches slack.

Q. Flexible metal conduit with supplemental ground jumper shall be used for connection to vibrating equipment, or where installation conditions warrant its use with express permission. Flexible conduit shall not penetrate walls. Liquid-tight flexible conduit with supplemental ground jumper shall be used for motor and transformer connections (except utilize flexible metal conduit in plenum spaces). The ground jumper in flexible conduits shall be routed within the conduit.

R. Length of flexible conduit shall not exceed 36 inches, except for lighting fixture whips and where specifically noted. Fixture whips shall not exceed 72 inches. Flexible conduit shall not penetrate walls or vapor barrier retarder/barrier.

S. Electrical raceways may penetrate roofing membranes only where absolutely necessary. Submit intended locations to Contracting Agency for approval prior to installation. Such penetrations shall be flashed and sealed as required for mechanical piping penetrations of roof. Where practical, conduits stubbed up to roof mounted equipment shall be routed within the equipment curb supporting the equipment.

**3.3 RACEWAY INSTALLATION METHODS – TELECOMMUNICATIONS SYSTEMS**

A. Installation methods for telecommunication system conduits shall comply with Installation Methods – General, above, unless superseded by more stringent requirements of this section.

B. Telecommunications conduits shall comply with the requirements of TIA/EIA-569-A and the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual. Note that some of these requirements are more stringent than the requirements of the National Electrical Code.

C. There shall be no more than two 90-degree bends between pull points in telecommunications conduit. Pull boxes added to conduit runs as a result of this requirement shall be in accordance with this Section. If it is not practical to install a pull box in the run due to field conditions, the conduit size shall be increased to the next trade size for each additional 90-degree bend. Offsets shall be considered as equivalent to a 90-degree bend.

D. Inside radius of conduit bends shall be at least 6 times the internal diameter of the conduit for sizes up to 2 inch trade size; 10 times the internal diameter of the conduit for sizes larger than 2 inch trade size. Where bending machine shoes are not available with the required bending radius for a one-shot field bend, factory bent, large radius 90-degree elbows shall be provided.

E. Conduits stubbed to cable trays shall be terminated within a maximum horizontal distance of 4 inches from the tray and in a vertical zone between 1 to 6 inches above tray. Conduits shall be supported from structure within a maximum horizontal distance of 12 inches from the tray. Conduits shall be provided with a grounding bushing and shall be bonded to the cable tray with a minimum 12 AWG copper conductor.

F. Use of flexible conduit for telecommunications shall be kept to a minimum and shall be at the discretion of the Contracting Agency. Obtain prior written approval for the use of flexible conduit. Where required due to physical considerations, flexible metal conduit may be allowed in lengths not exceeding 4 feet. If used, flexible metal conduit shall be increased by one trade size for the application used (see Conduit Sizes).

G. Conduits entering the telecommunications room or equipment room through the floor shall be terminated 4 inches above finished floor. Conduits entering the telecommunications room or equipment room from above shall be terminated 4 inches below the finished ceiling, but in no case shall the conduits terminate more than 12 inches above the cable pathway support or distribution frame.

H. Layout of conduits shall give consideration to nearby sources of electromagnetic energy such as electrical power wiring, large electric motors and generators, induction heaters, arc welders, variable frequency drives, etc. Maintain the greatest separation practicable between telecommunication raceways and sources of electromagnetic interference (EMI). A minimum of 5 inches of separation shall be maintained between telecommunication raceways and fluorescent lighting ballasts.

I. Pull wires shall be provided in spare and unused conduits. (Nylon “jet-line” or as approved.)

J. Maintain minimum separation from ≤ 480V power wiring in accordance with the following table:

| Condition | Minimum Separation Distance | | |
|---|---|---|---|
| | < 2 kVA | 2-5 kVA | > 5 kVA |
| Unshielded power lines or electrical equipment in proximity to open non-metal telecommunications pathways | 5 inches | 12 inches | 24 inches |
| Unshielded power lines or electrical equipment in proximity to a grounded metal telecommunications conduit pathway | 2.5 inches | 6 inches | 12 inches |
| Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal telecommunications conduit pathway | -- | 3 inches | 6 inches |

**3.4 CONDUIT SIZES – GENERAL**

A. Minimum sizes for rigid steel, IMC, FRE, rigid aluminum and PVC-40 conduits shall be ¾ inch.

B. Minimum size for EMT shall be ½ inch.

C. Minimum size for flexible conduits shall be ½ inch, except fixture whips may be 3/8 inch as allowed by the NEC.

**3.5 CONDUIT SIZES – TELECOMMUNICATIONS SYSTEMS**

A. Minimum size for conduit runs to outlets is 1 inch.

B. Unless indicated otherwise, individual conduit homeruns shall serve no more than one telecommunications outlet.

**3.6 STRUCTURAL COORDINATION**

A. Structural members shall not be cut, drilled, or notched for raceways or other electrical features unless specifically accepted by the Contracting Agency.

B. Underfloor raceways for slab-on-grade construction shall be embedded in the fill under the slab, not in the slab itself. Where raceways are required or permitted to be embedded in concrete, the thickness of concrete on all sides of each raceway shall not be less than 2 inches.

## 3.7 SURFACE RACEWAY INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

C. Provide outlets in locations shown or according to spacing specified on the Drawings. Where spacing is specified, the maximum distance from each end of the raceway to the first outlet shall not exceed one-half of the specified spacing distance. Mounting elevations shall be as noted on the Drawings or as shown on the Architectural Elevations. If a conflict exists, the elevation shown on the Architectural Elevations shall take precedence.

D. Provide field paint touch-up with factory furnished paint to match factory pre-painted finish, for all chips, scraps, scratches, fittings and unpainted sections of the surface raceways and multi-outlet assemblies, after installation of all devices and covers are complete.

E. Provide appropriate separate device finish plates for outlets and telecommunication jacks as specified in other Sections.

F. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

G. Close ends of wireway and unused conduit openings.

H. Ground and bond raceways, multi-outlet assemblies and wireways under provisions of Section 26 05 26 – Grounding and Bonding for Electrical Systems.

## 3.8 OUTLET BOX INSTALLATION

A. Outlet boxes shall be securely fastened in position and supported independently of the conduit system.

B. Outlet boxes located in suspended ceiling system shall be fastened to ceiling "t-bar" system with bar-hanger rods manufactured for the purpose, or from hanger rods with solid supports from structure above. "T-bar" hanger rods shall be clipped to cross-members supported by the main ceiling support members. Outlet boxes supported from the suspended ceiling system shall be provided with one safety wire attached to the box or box support clip, or two safety wires attached to the bar hanger.

C. Boxes shall be installed true to the building lines and at equal heights in conformity with mounting heights specified in other sections of the specification.

D. Provide the best suitable box for each outlet requirement. Extension rings shall not be used on new construction except where needed to bring an outlet box out to 1/8 inch of the finished wall or ceiling line.

E. Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.

F. Boxes shall be rigidly secured in position. Recessed boxes shall be so set that the front edge of the box shall be flush with the finished wall or ceiling line, or not more than 1/8 inch back of same. This requirement is more stringent than NEC requirements.

G. Boxes shall be accessible.

H. Provide boxes for each application that will not violate the fire rating of the wall, floor or ceiling assembly in which the box is installed.

I. Do not place order for floor boxes without ensuring that the Contracting Agency has positively approved submittals for the specific cover types/styles colors necessary for all applications and locations.

J. Recessed boxes shall not be placed back-to-back in adjacent rooms. They shall be offset at least 12 inches, or greater as required by codes and standards applicable to the specific construction.

K. Boxes (electrical boxes, outlet boxes and telecommunication boxes, etc) penetrating fire rated walls, walls with vapor retarder/barriers, wall types that extend to structure or wall types that contain batts shall be sealed airtight with approved Firestop Putty Pads to reduce sound transmission, reduce air transmission and increase fire resistance. Mold putty pads around electrical junction boxes and conduits to form an airtight seal in accordance with manufacturer's installation instructions.

**3.9 JUNCTION BOX AND PULL BOX INSTALLATION**

A. Junction and pull boxes shall be installed so that covers are readily accessible and adequate working clearance is maintained after completion of the installation.

B. Select boxes properly sized per NEC for power and lighting applications.

**3.10 TELECOMMUNICATIONS SYSTEM PULL BOXES**

A. Where a pull box is required in a 1 inch conduit run, outlet boxes as specified in this Section may be used. Where a pull box is required in a conduit run 1 1/4 inch or larger, or where required for multiple raceways, the box shall be sized in accordance with the Table in this Section.

B. Pull boxes shall be located in straight-through sections of horizontal cabling pathways (conduits). Pull boxes shall not be used for angle pulls or to accomplish changes in direction of the pathway.

C. Multiple raceways connecting to telecommunications system pull boxes shall penetrate box walls such that they are distributed evenly along the Box wall.

**3.11 TELECOMMUNICATIONS SYSTEM JUNCTION BOXES**

A. Telecommunications system interior pathways shall not contain junction boxes.

**END OF SECTION**

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**SECTION 26 05 53**

**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

## PART 1 GENERAL

### 1.1 SUMMARY

A. Provide identification of on equipment, raceways, boxes and conductors.

B. Section includes:

1. Nameplates
2. Labels
3. Wire markers
4. Conduit markers
5. Miscellaneous Electrical Identification

C. Related Sections: Divisions 26, 27 and 28 Sections.

### 1.2 SUBMITTALS

A. Division 1 and Section 26 00 00 – Electrical General Requirements.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

## PART 2 PRODUCTS

### 2.1 NAMEPLATES

A. Electrical Distribution Equipment Labels and Nameplates

1. Name equipment in accordance with Contract Documents.
2. Nameplates shall be laminated plastic, 0.125 inch thick, with matte finish and square corners. Minimum lettering size as noted elsewhere in this section.
   a. Label and Nameplate Colors:
      1). Normal Equipment: White letters on a black background.
      2). Emergency Equipment: White letters on a red background.
      3). Standby Equipment: Black letters on a yellow background.
   b. Securely attach labels with threaded fasteners or pop-rivets. Adhesive attachment not acceptable.
   c. Temporary markings not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.
3. Include item designation and branch circuit designation (panel and circuit number) on disconnects, starters, equipment and device nameplates, e.g., "FAN No. 4, Circuit LA-30").

### 2.2 WIRE AND CABLE MARKERS

A. Wire and Cable Markers: Wrap on labels, cloth tape type wire markers or tubing type for all phase, neutral and ground conductors.

## 2.3 LABELS

A. Adhesive film label with clear protective overlay: Machine printed, in black, by thermal transfer process or equivalent. Minimum lettering size as noted elsewhere in this section. Overlay shall provide a weatherproof and UV resistant seal for label.

## 2.4 POWER ONE-LINE DIAGRAM

A. Laminated, approved print of the "As-Built" power distribution system. Install in accordance with Part 3.

# PART 3 EXECUTION

## 3.1 NAMEPLATE INSTALLATION

A. Install nameplate parallel to equipment lines.

B. Mechanically fasten nameplates using threaded fasteners or pop rivets.

C. Mechanical fasteners shall have no sharp edges or points which can damage conductors or injure personnel.

D. Temporary markings are not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.

E. No labeling abbreviations are permitted without prior approval.

## 3.2 DISTRIBUTION AND BRANCH PANELBOARD NAMEPLATES

A. Nameplate shall contain the following information (minimum ½ inch height letters):

1. Line 1: Panel Name as noted on drawings and schedules.
2. Line 2: Voltage and Phase.
3. Line 3: Shall indicate if panelboard is "NORMAL" (black background), or "STANDBY" (yellow background) or "EMERGENCY" (red background).
4. Line 4: Source from which panel is fed, “FED FROM: PANEL NH-031”.

B. Install a 2 inch x 4 inch nameplate on each branch panelboard where a building contains distribution systems of different voltages (minimum 1/8 inch height letters):

| THIS BUILDING CONTAINS TWO WIRING SYSTEMS: | | | | |
|---|---|---|---|---|
| | Phase A | Phase B | Phase C | Neutral |
| 480Y/277V | Brown | Orange | Yellow | Gray |
| 208Y/120V | Black | Red | Blue | White |

## 3.3 NAMEPLATE LOCATIONS

A. Provide 1 inch minimum height letters on following equipment:

1. Service disconnect(s) (red background)
   a. Enclosures containing multiple service disconnects for utility power must clearly identify each switch as a service disconnect along with the load served.
   b. Where the building has multiple electrical services at different locations, provide signage at each service that indicates the total number and location of all electrical service disconnects that control the electrical service to the building.
   c. Where an on-site emergency power source is provided, a sign shall be placed at the service entrance(s) indicating the type and location of on-site emergency power sources.

B. Provide 1/2 inch minimum height letters on following equipment:
   1. Secondary feeder breakers in distribution equipment. Designation as required by load served.
   2. Special equipment housed in cabinets, as designated on plans, on outside of door.
   3. Equipment housed in equipment cabinets, as designated on plans, on inside of cabinet door.
   4. Switchboards, motor control centers, transformers, as designated on plans, on outside of door or equipment.
   5. Emergency system equipment, boxes and enclosures, as designated on plans, on outside of equipment, boxes and enclosures.
   6. Control or low voltage system panels such as Fire Alarm, Security, Video Surveillance, etc., with the following information:
      a. Line 1: Unique panel name as shown on the shop drawings.
      b. Line 2: System description such as Fire Alarm, Security, etc.
      c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.
   7. Automatic Transfer Switches
      a. Nameplate for ATSs shall contain the following information (minimum ½ inch height letters):
         1). Line 1: ATS name, e.g. “ATS-6”
         2). Line 2: Indicate if panelboard is “LIFE SAFETY BRANCH”, "STANDBY BRANCH", “CRITICAL BRANCH” or "EQUIPMENT BRANCH".
         3). Line 3: ATS priority, e.g. “PRIORITY 2-1”.
         4). Line 4: Amps, Voltage, Poles.
         5). Line 5: Normal source from which panel is fed, e.g. “NORMAL FEED: SWITCHBOARD DPN1”.
         6). Line 6: Alternate source from which panel is fed, e.g. “EMERGENCY FEED: GENERATOR SWITCHBOARD”.
         7). Line 7: Load being fed, e.g. “SERVES: MCC1”.

C. Provide 1/4-inch minimum height letters on:
   1. Switchboards, switchgear and panelboards: Provide signage in accordance with NEC 408 indicating maximum available fault current and date of fault current calculation.
   2. Disconnects, starters, VFDs and contactors:
      a. Line 1: Load Served (Use nameplate designation for source).
      b. Line 2: Panelboard and circuit number from which the device is fed.
      c. Line 3: Voltage, Phase, fuse size or circuit breaker size.
   3. Lighting control relays, dimmer controls and remote lighting control equipment.
   4. Switches and receptacles where item controlled is not visible from the switch, or as noted on Drawings.
   5. External Power Sources: Provide 1/4 inch white letters on red background on all starters or controllers that receive power from an external source that is not de-energized by operating the associated disconnecting means.
   6. Designated electrical equipment.

### 3.4 RECEPTACLE AND LIGHT SWITCH DEVICE PLATES CIRCUIT NUMBERS

A. Provide 3/16 inch minimum height letters on receptacle and light switch device plates:

1. Engrave branch circuit designation (panel and circuit number) on receptacle and light switch device plates, e.g., “NHA-30”). Verify final panel designations with Contracting Agency prior to engraving nameplates.

### 3.5 TELECOMMUNICATION LABELING REQUIREMENTS.

A. Provide machine printed labels for all telecommunication racks, cabinets, patch panels, cables, outlets, etc., in accordance with ANSI/TIA/EIA-606-B. Provide labeling nomenclature in accordance with information on the Drawings or Owner’s labeling conventions. Submit labeling samples for all required applications.

B. Labeling and color coding identification for this project shall conform to TIA-606-C for a Class 1 Administrative System.

### 3.6 LABEL LOCATIONS

A. Provide 3/16 inch minimum height letters on the following equipment:

1. Security System Device Labels:

a. Provide label on each security field device, denoting device address. Affix label to device faceplate for ceiling-mounted devices or wall mounted devices above 8’-0” AFF. Affix label inside back box for exterior devices.

2. Fire Alarm Device Labels:

a. Provide label on exterior surface of each initiating device denoting the unique device address corresponding to the text annunciator description. For detectors, the label shall be affixed to the base and not to the detector itself. For pull stations, the label shall be affixed to the top of the device and not to the vandal proof cover.

b. Provide label on each remote test station indicating description and location of device being tested.

c. Provide label on telecom conductors at each end denoting FACP lines for use with the digital alarm communicator transmitter (DACT).

### 3.7 DISTRIBUTION/BRANCH CIRCUIT PANELBOARD CIRCUIT LABELING

A. Distribution Panels and Branch Circuit Panelboard Directories: Provide neatly typed schedule (odd numbered circuits on left side or top, even on right side or bottom) under plastic jacket or protective cover to protect the schedule from damage or dirt. Securely mount on inside face of panelboard door. Define briefly, but accurately, nature of connected load (i.e., Lighting Room 201, Receptacles Janitor Room 155, Etc.) as approved. Sequentially numbered schedules shall not be used.

B. Use final approved room numbers from finished construction (not necessarily as indicated on the drawings).

C. Provide numbering for terminals on terminal strips in the terminal enclosure that identifies the origin, function and destination of each conductor.

D. Install wire marker for each conductor inside panelboards (phase, neutral and ground conductors). Locate label within 6 inches of termination. Labels shall be visible with panel dead front installed.

E. Dedicated branch circuit(s) feeding fire alarm control unit(s) shall be identified as “FIRE ALARM CIRCUIT” in accordance with NFPA 72. The circuit disconnecting means shall be identified with red marking.

F. Provide updated circuit directory in existing panelboards that are modified. Install directory in panelboard in protective cover and submit electronically in the O&M Manual.

## 3.8 EMERGENCY SYSTEM IDENTIFICATION

A. Emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system by the following methods:

1. All equipment, boxes and enclosures (including transfer switches, generators and power panels) for emergency circuits shall be permanently marked as a component of an emergency circuit or system.
2. Where boxes or enclosures are not encountered, exposed cable or raceway shall be permanently marked to be identified as a component of an emergency circuit or system at intervals not to exceed 25 feet.
3. Receptacles supplied from the emergency system shall have a distinctive color (red) and circuit identification on the receptacle cover plate as noted elsewhere in these specifications.

## 3.9 WIRE MARKER INSTALLATION

A. Install wire marker for each conductor (phase, neutral and ground conductors) at panelboards, pull boxes, outlet and junction boxes, and each load connection. Locate label within 6 inches of termination in panelboards. Labels shall be visible with panel dead front installed.

B. Wire markers are not required on conductors in a pull or junction box that contains only an individual branch circuit, however, source panel and circuit number shall be noted on pull or junction box cover as noted elsewhere in this section.

C. Fire Alarm Circuits: Provide cable markers showing Notification Appliance Circuit (NAC) or Signaling Line Circuit (SLC) loop identification number at fire alarm junction boxes and pullboxes.

D. Security System Cables: Install wire marker for each cable at cabinets, pull boxes, junction boxes, and each load connection. Wire ID number shall be as shown on security system shop drawings.

E. Power Circuits: Panelboard name and branch circuit or feeder number.

F. Control Circuits: Control wire number as indicated on schematic and/or shop drawings.

G. Color Code:

1. Color code phases, neutral, and ground per NEC requirements and Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables.
2. Color code all low voltage system wiring in accordance with applicable Sections.

## 3.10 MISCELLANEOUS ELECTRICAL IDENTIFICATION

A. Junction Boxes: Mark the circuit number(s) and panel source of wiring on all junction boxes with sheet steel covers. Mark with indelible black marker. On exposed junction boxes in finished areas mark on inside of cover.

B. Conduits

1. Mark all conduits entering or leaving panelboards with indelible black magic marker with the circuit numbers of the circuits contained inside.
2. Fire Alarm System: Paint fire alarm conduits with a 6 inch band 10 feet on center with red paint where installed in concealed accessible location (or provide red conduit in accordance with Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables and Section 26 05 33 – Raceways and Boxes for Electrical Systems. Where

raceway is installed in exposed locations it shall be painted to match the adjacent surface.

3. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits.

C. Junction Boxes

1. Markings shall be made with indelible black marker.
2. On exposed junction boxes in finished areas markings shall be on inside of cover.
3. Mark the circuit numbers of wiring on all junction boxes with sheet steel covers.
4. Mark all Special System junction boxes with sheet steel covers with appropriate system designation, e.g., "Intercom", "Clock", "Telecom", “Video Surveillance”, etc. Fire Alarm System: Paint all fire alarm junction boxes inside and out with red paint where installed in concealed accessible location. Where installed in exposed locations paint boxes to match the adjacent surface.

D. One-Line Diagram: Mount behind protective cover (1/8-inch minimum thickness clear Plexiglas) in accessible location at main switchboard.

E. Provide a label at the fire alarm control panel that identifies the panelboard and circuit number that supplies the control panel. Provide a red label adjacent to the circuit breaker inside the panelboard that clearly identifies the circuit breaker that feeds the control panel in accordance with NFPA requirements.

**3.11 CODE REQUIRED MARKINGS AND WARNINGS:**

A. Provide all placards, markings and identification systems required by Code and/or the Contract Documents, such as (but not limited to):

1. Arc Flash.
2. Series Rated Systems.
3. Conductor insulation color identification.
4. Special conductor identification and legends.
5. Multiple services placards.
6. Emergency systems markings.
7. Emergency source grounded circuit conductor connected to a grounding electrode at a location remote from the emergency source: Provide a sign at the grounding location identifying all emergency and normal sources connected at that location.
8. Warning messages shall include an appropriate plain language imperative command, such as "DANGER HIGH VOLTAGE - KEEP OUT".
9. Available Fault Current: Service equipment shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date the fault calculation was performed and shall be of sufficient durability to withstand the environment involved.

**3.12 CLEARANCE STRIPING**

A. For electrical equipment located in areas with uncarpeted floors, the clearances dictated by NEC Article 110 shall be indicated by two inches wide colored striping on the floor.

B. Striping shall be of a bright color (typically red or yellow) that contrasts with the floor color, and shall be applied by the most durable process that is commercially available for the particular floor finish. Examples are: epoxy paint on concrete floors, and colored tile segments in

composition tile floors. Striping color and method shall be subject to approval by the Contracting Agency.

C. On the floor immediately inside the striping, stencil in two inch block letters the statement: "ELECTRICAL CLEARANCE – NO STORAGE." For floor types where painted stenciling is not feasible or sufficiently durable, this message shall instead be posted on the wall below the equipment as an engraved nameplate of the type specified in this Section, with 1/2-inch lettering. Note the specific clearance requirements on the engraved nameplate.

**END OF SECTION**

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**SECTION 26 24 16**
**PANELBOARDS**

## PART 1 GENERAL

### 1.1 SUMMARY

A. This section includes general provisions, products, and methods of execution relating to branch circuit panelboards approved for use on this project. Type, size, ratings, etc., shall be as shown on the plans and in accordance with UL Standards 50 and 67.

B. Related Sections:

1. 26 05 26 - Grounding and Bonding for Electrical Systems
2. 26 05 53 - Identification for Electrical Systems
3. 26 28 00 - Low Voltage Circuit Protective Devices
4. 26 43 00 - Surge Protective Devices

### 1.2 REFERENCES

A. The panelboards and circuit breakers referenced herein shall be designed and manufactured according to the latest revision of the following specifications.

1. NEMA PB 1 - Panelboards
2. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. NEMA AB 1 - Molded Case Circuit Breakers
4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
5. UL 50 - Enclosures for Electrical Equipment
6. UL 67 - Panelboards
7. UL 98 - Enclosed and Dead-front Switches
8. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures
9. NFPA 70 - National Electrical Code (NEC)
10. ASTM - American Society of Testing Materials
11. IBC – International Building Code – Seismic compliance requirements
12. NFPA 5000 – NFPA Building Code – Seismic compliance requirements
13. ASCE 7 – American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures – Seismic compliance requirements
14. ICC ES AC156 – International Code Council Evaluation Services Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems – seismic testing protocol

### 1.3 SPECIAL REQUIREMENTS

A. Special features such as integral surge protective devices (SPDs), etc., shall be provided as required by this Section and as noted on the Drawings or on the panel schedules.

1. Trims shall be furnished to be compatible with type of mounting.
2. Provide “Door-in-door” construction on all panelboards unless otherwise noted.

### 1.4 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Submit for approval manufacturer's shop drawings to show weights, dimensions, mounting arrangements, interconnecting diagrams, schedules of overcurrent devices, voltage ratings, and specified accessories.

### 1.5 QUALITY ASSURANCE

A. Panelboards shall be of the latest approved design as manufactured by a nationally recognized manufacturer and shall be listed by the Underwriters' Laboratory and shall bear the UL label.

## PART 2 PRODUCTS

### 2.1 BASIS OF DESIGN

A. The Basis of Design is equipment from Square D Company to set a standard for quality. Equipment from Eaton, Siemens Energy & Automation, ABB, or alternative systems will be considered providing that sufficient documentation is provided to satisfy the CONTRACTING AGENCY that the equipment meets the requirements of the Specifications, and matches the Basis of Design on all points which are pertinent to the Project.

### 2.2 CABINETS AND FRONTS

A. Panelboard assembly shall be enclosed in a steel cabinet. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler type locks with catches and spring-loaded door pulls. All panelboard locks shall be keyed alike. Fronts shall have adjustable, indicating trim clamps that shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4 inch high by 3 inch long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish. Cabinets shall be labeled in accordance with the Drawings and Section 26 00 00 - Electrical General Requirements.

B. “Door-in-door” construction shall be furnished on panelboards unless otherwise noted.

### 2.3 SAFETY BARRIERS

A. The panelboard interior assembly shall be dead front with panelboard front removed.

### 2.4 BUS ASSEMBLY

A. Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Bus structure shall allow 1, 2 and 3-pole breakers of various frame sizes to be mounted in any location and in any combination up to the capability of the panel.

### 2.5 SHORT CIRCUIT CURRENT RATING

A. Each panelboard, as a complete unit, shall have a short circuit current rating (SCCR) equal to or greater than that shown on the panelboard schedule, or as necessary to comply with the requirements stated on the power one-line diagram. The SCCR rating shall not, in any case, be less than 10,000 Amps at 240 volts, and 14,000 Amps at 480 volts.

### 2.6 PROTECTION DEVICES

A. Circuit breakers shall individually comply with Section 26 28 00 – Low Voltage Circuit Protective Devices. The type to be furnished shall be as shown on the plans. If no withstand

rating is specified, minimum requirements shall be as necessary to comply with the preceding requirements.

**2.7 NEUTRAL TERMINAL BAR**

A. Panelboards shall be equipped with an insulated neutral terminal bar.

**2.8 EQUIPMENT GROUNDING TERMINAL BAR**

A. Panelboards shall be equipped with an equipment grounding terminal bar to terminate equipment grounding conductors.

**2.9 HANDLE LOCK-OFF EQUIPMENT**

A. Circuit breakers serving as the required disconnecting means for appliances or other equipment shall be equipped with equipment to allow the breaker to be padlocked in the "off" position.

**2.10 INTEGRAL SURGE PROTECTIVE DEVICE**

A. Provide panelboards with integral Surge Protective Devices (SPDs) as noted on the panel schedules or drawings in accordance with Specification Section 26 43 00 – Surge Protective Devices.

B. Integral SPDs shall be factory installed in the panelboard.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

A. Verify mounting arrangements for each location shown on the plans. Where cabinets are recessed, verify adequate thickness of wall and make arrangements for furring or trim as required. In general, conduits shall enter the top or bottom of panel.

B. Provide additional wire gutters or pull boxes to facilitate orderly entry of conduits into cabinets. Bundle and support wires and arrange them in an orderly manner in the designated wire gutters.

C. Panelboards shall not be used for pull boxes for wiring not terminating in the panelboard.

**3.2 SPARE CONDUITS**

A. Provide spare conduits from flush mounted panels into accessible ceiling or floor spaces as follows:

| No. of Poles (Spares + Spaces) | Spare Conduits |
|---|---|
| 1 - 3 | One 3/4 inch |
| 4 - 6 | Two 3/4 inch |
| 7 or more | Two 3/4 inch, One 1 inch |

**3.3 PANELBOARD LABELS**

A. In addition to applicable NEC requirements for emergency systems, series rated applications, etc., label panelboards in accordance with Section 26 05 53 – Identification for Electrical Systems.

1. First line shall be panelboard name.
2. Second line shall be voltage and phase.
3. Third line shall indicate if panelboard is "NORMAL" (black background), or "STANDBY" (yellow background) or "EMERGENCY" (red background).

4. Fourth line shall be source from which panel is fed, “FED FROM: PANEL NH031”.

B. Install a 2 inch x 4 inch nameplate on each branch panelboard where a building contains distribution systems of different voltages:

| THIS BUILDING CONTAINS TWO WIRING SYSTEMS: | | | | |
|---|---|---|---|---|
| | Phase A | Phase B | Phase C | Neutral |
| 480Y/277V | Brown | Orange | Yellow | Gray |
| 208Y/120V | Black | Red | Blue | White |

## 3.4 SHORT CIRCUIT INFORMATION/PANEL SCHEDULES

A. Refer to the drawings for Short Circuit Information and Panel Schedules.

**END OF SECTION**

**SECTION 26 27 26**
**WIRING DEVICES**

## PART 1 GENERAL

### 1.1 SUMMARY

A. This section includes general provisions, products and methods of execution relating to line voltage wiring devices for use on this project.

B. Related Sections

1. 26 05 33 - Raceway and Boxes for Electrical Systems

### 1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA WD 1 - General Requirements for Wiring Devices.
2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

### 1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Do not place order for devices, plates, etc., without ensuring that the Contracting Agency has positively approved submittals for the specific colors necessary for all applications and locations. Note that the selection of one color for general use does not rule out the selection of other colors for special applications or for aesthetic reasons.

### 1.4 QUALITY ASSURANCE

A. Manufacturers mentioned and catalog numbers specified are for establishment of type, configuration and quality. Other manufacturers and types may be submitted for approval.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Basis of Design is Hubbell commercial grade wiring devices to set a standard for quality. Equal devices manufactured by Arrow Hart (by Cooper Wiring Devices), Pass and Seymour, Leviton and Bryant are acceptable. Provide all similar devices of same manufacturer.

### 2.2 SWITCHES

A. Provide UL listed 20 AMP switches with voltage rating for the load served. Switches shall include the following:

1. Single Pole
2. Three-way
3. Four-way
4. Key Operated
5. Momentary Cont.
6. Double Pole
7. Pilot Switch

B. Multiple 277V switches shall be installed in partition boxes or shall be furnished with shields.

C. Other switch types shall be provided as called for on the Drawings or as required by the application.

## 2.3 RECEPTACLES

A. Provide grounding type receptacles as follows, or as required to match equipment furnished in this or other divisions.

| | |
|---|---|
| 15A-125V | NEMA #5-15R |
| 15A-125V GFCI | NEMA #5-15R |
| 15A-250V Single | NEMA #6-15R |
| Clock hanger 125V | NEMA #5-15R |
| 20A-125V USB Charger Tamper Resistant | NEMA #5-20R |
| 20A-125V | NEMA #5-20R |
| 20A-125V GFCI | NEMA #5-20R |
| 20A-125 SPD | NEMA #5-20R |
| 20A-125V Tamper Resistant | NEMA #5-20R |
| 20A-125V Tamper Resistant (hospital grade) | NEMA #5-20R |
| 20A-250V Single | NEMA #6-20R |
| 30A-250V Dryer | NEMA #14-30R |
| 50A-250V Range | NEMA #14-50R |

B. Outlets requiring ratings and configurations different from those listed above shall be provided as shown on the plans and/or required by the equipment served.

## 2.4 DEVICE COLOR

A. Device color shall match other similar devices throughout the existing building.

B. Receptacles connected to emergency power shall be red.

## 2.5 DEVICE PLATES

A. Device plates shall be constructed of the following materials unless otherwise noted:

1. Satin finished Type 302 stainless steel

B. Indoor device plates for surface mounted boxes in utility spaces shall match the box and device type being used and shall be constructed of the following:

1. Stainless or galvanized steel

C. Weatherproof outlet plates shall be of the safety outlet enclosure type that can be closed to remain weatherproof while in use. The outlet cover/enclosure shall be clearly marked “Suitable for Wet Locations While In Use”, “UL Listed”, and “Extra-Duty”. A gasket shall be provided between the enclosure and the mounting surface, and between the hinged cover and the mounting plate/base to ensure a proper seal. Enclosure shall be oversized depth, single-gang, vertical-mount, with non-locking latch, GFCI opening, cord openings, and cover.

D. Label receptacle and light switch plates in accordance with Section 26 05 53 – Identification for Electrical Systems.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install wiring devices indicated complete with cover plates. Cover plates shall fit snugly against finished surfaces and line up true with adjacent building lines, and be symmetrical in location and appearance.

B. Switches shall be installed so their handles move in a vertical plane, unless otherwise noted.

C. Door swings shall be checked and, if necessary, switches shall be relocated to place them on the strike side of the door.

D. Unless otherwise noted on the drawings, receptacles shall be installed in the vertical position with the grounding pin down unless wording on the face of the device requires other mounting.

E. Receptacles identified as Ground-Fault Circuit Interrupter (GFCI) type shall be provided as individual GFCI receptacles, unless otherwise noted.

**END OF SECTION**

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## SECTION 26 28 00
## LOW VOLTAGE CIRCUIT PROTECTIVE DEVICES

### PART 1 GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Thermal Magnetic Molded Case Circuit Breakers.
2. Electronic Trip Molded Case Circuit Breakers.
3. Fusible switches and fuses.

B. Related Sections:

1. 26 24 13 - Switchboards
2. 26 24 16 - Panelboards
3. 26 43 00 - Surge Protective Devices

#### 1.2 REFERENCES

A. The circuit breaker(s) referenced herein shall be designed and manufactured according to the latest revision of the following standards.

1. ANSI/NFPA 70 - National Electrical Code (NEC).
2. NEMA AB 1 - (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches.
3. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures.
4. UL 943 - Standard for Ground Fault Circuit Interrupters.
5. UL 1053 – Ground Fault Sensing and Relaying Equipment.

#### 1.3 SYSTEM DESCRIPTION

A. Provide overcurrent protective devices as specified herein and as shown on schedules and/or drawings.

#### 1.4 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Submit product data for each type of overcurrent protective device, ground fault protector, accessory, and component indicated. Include dimensions and manufacturer’s technical data on features, performance, electrical characteristics, ratings, and finishes.

C. Provide outline drawings with dimensions, and ratings for voltage, amperage and maximum interruption. Include instructions for circuit breaker mounting, trip unit functions and adjustments, trouble shooting, accessories and wiring diagrams.

D. Coordination data to check protective devices: Manufacturer shall provide electronic and hard copy time/current characteristic trip curves (and Ip & $I^2t$ let through curves for current limiting circuit breakers) for each type of circuit breaker.

E. Provide information required to verify compliance with the short circuit withstand and interrupting ratings, as shown on the Drawings or further stated in these Specifications.

F. Arc Flash Hazard Analysis Study: Provide an Arc Flash Hazard Analysis Study for the revised electrical distribution system provided under this project per the requirements set forth in NFPA 70E-Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E, Annex D.

### 1.5 QUALITY ASSURANCE

A. Devices shall be the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with applicable standards and UL listings.

B. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors installed in the State of Alaska must be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.

C. The overcurrent protection device manufacturing facility shall be Registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9000 Series Standards for quality.

## PART 2 PRODUCTS

### 2.1 PRODUCT

A. The Basis of Design is equipment from Square D by Schneider Electric to set a standard for quality. Equipment from Eaton, Seimens Energy & Automation, ABB, or alternative systems will be considered providing that sufficient documentation is provided to the Contracting Agency that the equipment meets the requirements of the Specifications and matches the Basis of Design on all points that are pertinent to the Project.

### 2.2 MOLDED CASE CIRCUIT BREAKERS

A. General Characteristics:

1. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle, and the accessory mounting area.
2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which shall provide quick make, quick break contact action. The circuit breaker shall have common tripping of all poles.
3. The circuit breaker handle shall reside in a tripped position between on and off to provide local trip indication. Circuit breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings.
4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
5. Each circuit breaker shall be equipped with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes (except Type QO/EDB/EGB/EJB).
6. MCCBs shall be able to receive a device for locking in the isolated position. MCCBs that serve as the main service disconnect shall be provided with a device for locking in the isolated position.
7. Electronic components shall withstand temperatures up to 221°F (105°C).

8. Circuit breakers shall be UL listed to accept field installable/removable mechanical type lugs (except Type (except Type QO/EDB/EGB/EJB/QB/QD/QG/QJ).
9. Lugs shall be UL listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 75°C rated wire or 90 C rated wire, sized according to the 167°F (75°C) temperature rating in the NEC.

B. Trip Unit:
1. General:
a. MCCBs with ratings up to 400 amperes shall be equipped with thermal magnetic trip units.
b. Circuit breakers with permanent trip units shall be UL listed for reverse connection without restrictive line and load markings and shall be suitable for mounting in any position.
c. The trip units shall not augment overall circuit breaker volume.
2. Thermal Magnetic (400 Ampere Frame and Below):
a. Basis of Design: PowerPact Q, H and J Frame, FA, LA, and LH as manufactured by Square D by Schneider Electric.
1). General:
a) Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true RMS sensing and thermally responsive to protect circuit conductor(s) in a 104 F (40 C) ambient temperature.Circuit breaker frame sizes above 150 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker
2). Type QO (for use in NQ Series Panelboards) and Type EDB/EGB/EJB (for use in NF Series Panelboards) as manufactured by Square D by Schneider Electric.
a) Breakers shall have two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing.
3). Where indicated on drawings, Circuit breakers shall be equipped with a ground fault module (GFM) with 20 ampere to 200 ampere sensitivity level or earth leakage module (ELM) with sensitivity ranges between 30 mA and 3 amperes, or approved equal.

C. Accessories:
1. General:
a. Circuit breakers shall be equipped with UL listed electrical accessories as noted on the Drawings or schedules or they may be field installable.
b. The addition of auxiliaries shall not increase the volume of the circuit breaker.
2. Equipment Ground Fault Protection Modules (Thermal Magnetic Circuit Breakers):
a. Basis of Design: PowerPact H and J Frame as manufactured by Square D by Schneider Electric.
b. General:
1). Circuit breakers shall be equipped with a ground fault module (GFM) with 20 ampere to 200 ampere sensitivity level or earth leakage module (ELM) with sensitivity ranges between 30 mA and 3 amperes, or approved equal.
2). Ground fault sensing system shall be modified zero sequence (GFM) or zero sequence (ELM) sensing type.

3). The ground fault system shall require no external power to trip the circuit breaker.
4). Companion circuit breaker shall be equipped with a ground fault shunt trip.
5). The ground fault sensing system shall be suitable for use on solidly grounded systems. The ground fault sensing system shall be suitable for use on three phase, three wire circuits where the system neutral is grounded but not carried through the system or on three phase, four wire systems. ELM shall be suitable for use on three phase, three wire circuits only.
6). Ground fault pickup current setting and time delay shall be field adjustable. A switch shall be provided for setting ground fault pickup point. A means to seal the pickup and delay adjustments shall be provided.
7). The ground fault sensing system shall include, but shall not be limited to, a ground fault memory circuit to sum the time increments of intermittent arcing ground faults above the pickup point.
8). A means of testing the ground fault system to meet the onsite testing requirements of NEC Section 230-95(c) shall be provided.
9). Local visual ground fault trip indication shall be provided.

**2.3 FUSIBLE SWITCHES**

A. Main Fusible Devices

1. Fused Power Circuit Devices

a. Individually fixed mounted bolted pressure switches through 4000 A.

b. Each device shall have power terminals to accommodate either cable or bolted bus connections.

c. The over current protective devices shall be of the fusible bolted pressure contact type as shown on the associated drawings.

d. Switches, with Class L fuse installed, shall be rated for use on systems capable of delivering not more than 200,000 rms symmetrical amperes at 600 VAC maximum. Switches shall have an interrupting rating of 12 times continuous ampere rating at 240, 480, and 600 VAC. Switches shall be 100% rated devices. Lugs shall be rated for use with 90° C wire insulation (sized according to the 75° C temperature rating in the NEC).

e. Switches shall have switch blades which are fully visible in the Open (off) position when the fuse access door is open. Bolted pressure contacts shall be made by providing an additional pressure or clamping action at both ends of the switch blade when the blades are fully closed. Switches having butt-type contacts are not acceptable.

f. Manual operated switches shall have quick-make, quick-break front operating mechanisms.

g. Provisions for locking the switch in the Open (off) position with at least three padlocks shall be provided. Switches shall have dual fuse door interlock designed to prevent the fuse access door from being opened when the switch is Closed (on) and prevents the switch being turned ON while the fuse access door is open. A means of bypassing the interlock by authorized personnel shall be provided to allow the switch to be inspected in the Closed position. An external mechanical flag shall be provided to identify whether the switch is either Open or Closed.

h. Accessories shall be supplied as follows:
1). Capacitor trip power supply
2). Blown main fuse protection
3). Blown main fuse indication

4). Phase failure relay with capacitor trip power supply
5). Key interlock
6). Equipment ground fault protection
a) Provide a zero sequence type ground fault system including current sensor and appropriate relaying equipment. The current sensor shall enclose all phase (and neutral, if present) conductors to be monitored. The current sensor frame shall be so constructed that one leg can be opened to allow the removal of the sensor without disturbing the cables or requiring drop-links in the bussing. A test winding shall be provided to simulate the flow of ground fault current through the current sensor for testing.
b) The ground fault relay shall be of solid state construction and have adjustable pick-up for ground fault currents from 100 amperes to 1200 amperes.
c) Direct adjustable time delay shall be provided by the ground fault relay. The time delay shall be permanently calibrated to preclude tampering after installation.
d) Ground fault system to meet the on-site testing requirements of NEC article 230-95(c).
e) Ground fault system shall be Square D type GC.

i. Switches shall be BOLT-LOC as manufactured by Square D.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

A. Installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the Drawings. Install circuit breakers in accordance with manufacturer's instructions, the National Electrical Code and applicable local codes.

B. Size devices as shown and specified, or as required by the load being served.

**3.2 ADJUSTMENTS**

A. Circuit breaker pick-up level and time delay settings shall be adjusted to values indicated as recommended by the manufacturer.

**3.3 ARC FLASH LABELING**

A. Provide arc flash labels for equipment that provides all of the following:

1. Nominal system voltage
2. Arc flash boundary
3. At least one of the following:
   a. Available incident energy level or arc flash PPE Category in NFPA 70E, Standard for Electrical Safety
   b. Minimum arc rating of clothing
   c. Site specific level of PPE

**END OF SECTION**

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## SECTION 26 28 16
## ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 GENERAL

#### 1.1 SUMMARY

A. This section includes general requirements, products, and methods of execution relating to fusible and non-fusible disconnecting devices approved for use on this project.

B. Related Sections:

1. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
2. 26 05 26 - Grounding and Bonding for Electrical Systems
3. 26 05 29 - Hangars and Supports for Electrical Systems
4. 26 05 53 - Identification for Electrical Systems

#### 1.2 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

#### 1.3 QUALITY ASSURANCE

A. Devices shall be of the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with U.L. listings and the governing NEMA standards.

B. Disconnects shall be of the same manufacturer as switchboards and panelboards.

### PART 2 PRODUCTS

#### 2.1 SAFETY SWITCHES

A. Safety switches, fusible and non-fusible, shall conform to NEMA Standard KS1 for type HD (Heavy Duty) unless otherwise noted.

1. Switch Interior: Switches shall have switch blades that are fully visible in the OFF position when the door is open. Switches shall be of dead front construction with permanently attached arc suppressers. Lugs shall be UL listed for copper and/or aluminum cables and be front removable.
2. Switch Mechanism: Switches shall have a quick-make and quick-break operating handle and mechanism that shall be an integral part of the box, not the cover. Switches shall have a defeatable dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open. The switch shall be capable of being locked in the OFF position with three (3) padlocks.
3. Enclosures: Switch enclosure shall be suitable for the environment in which the switch is mounted. NEMA 1 enclosure shall be code gauge, UL-98, sheet steel, treated with a rust inhibiting phosphate and finished in gray, baked enamel. NEMA 3R enclosure--same requirements as NEMA 1 except galvanized prior to painting.
4. Rating: Ampere, volt and horsepower ratings, as well as number of poles and presence of neutral bar shall be shown on the nameplate.

#### 2.2 CIRCUIT BREAKERS

A. Circuit breakers used as disconnects shall meet requirements specified in Section 26 28 00 – Low Voltage Circuit Protective Devices. Enclosures for same shall meet the requirements as specified above.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Coordinate details pertaining to size of motor and/or equipment, location and requirements to enclosure, ratings, etc., so as to provide the most suitable unit for the intended purpose.

B. Provide nameplates for disconnects. Coordinate names with mechanical equipment lists.

C. Where the rating of a fused disconnect exceeds the ampacity of the conductors being protected, a permanent label noting maximum fuse size shall be installed in a conspicuous location within the switch.

D. Where recommended or required by the equipment manufacturer, or required by underwriters' laboratories, disconnects shall be the fusible type, fused in accordance with the equipment nameplate information.

E. Provide code required disconnects. For equipment under the jurisdiction of the IMC, provide a disconnect within sight of the equipment.

**END OF SECTION**

# SECTION 26 29 00
# LOW VOLTAGE CONTROLLERS

## PART 1 GENERAL

### 1.1 SUMMARY

A. This section includes general requirements, products, and methods of execution relating to manual and magnetic motor starters provided in this and other Divisions. Overloads shall be furnished and installed in Divisions 26, 27 and 28.

B. Related Sections:

1. 26 05 53 - Identification for Electrical Systems

### 1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
2. NEMA FU 1 - Low Voltage Cartridge Fuses.
3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
4. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
5. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
6. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

### 1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

### 1.4 QUALITY ASSURANCE

A. Equipment shall be of the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with the governing standards.

## PART 2 PRODUCTS

### 2.1 BASIS OF DESIGN

A. The Basis of Design is equipment from Square D by Schneider Electric to set a standard for quality. Equipment from alternative systems will be considered providing that sufficient documentation is provided to satisfy the CONTRACTING AGENCY that the equipment meets the requirements of the Specifications and matches the Basis of Design on all points which are pertinent to the Project.

### 2.2 AC FRACTIONAL MANUAL STARTERS

A. The manual starter shall consist of a manually operated toggle switch equipped with red pilot light and melting alloy type thermal overload relay.

B. Thermal unit shall be one piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

### 2.3 AC MANUAL STARTERS--LINE VOLTAGE TYPE

A. Manual starters shall be constructed and tested in accordance with the latest published NEMA standards.

B. The manual starters shall consist of a manually operated switch equipped with red pilot light and melting alloy type thermal overload relays in every phase conductor. Thermal units shall be one piece construction and the starter shall be inoperative if any thermal unit is removed.

C. Starters shall be furnished in a NEMA 1 general purpose enclosure unless otherwise indicated on the plans or required by the conditions of the area in which they are installed.

**2.4 AC MAGNETIC STARTERS--LINE VOLTAGE TYPE**

A. Motor starters shall be across-the-line magnetic type rated in accordance with NEMA standards, sizes and horsepower ratings.

B. Starters shall be mounted in NEMA 1 general purpose enclosures unless otherwise indicated on plans or required by the conditions of the area in which they are installed.

C. Starters shall be furnished with overload relays in every phase conductor and starters shall be inoperative if any overload unit is removed.

1. Overload relays shall be the solid state type. Trip current rating shall be established by selection of overload relay and shall be adjustable (3 to 1 current range). The overload shall be self-powered, provide phase loss and phase unbalance protection, have a permanent tamper guard, and be ambient insensitive. Overload shall be standard trip (Class 20) and shall have a mechanical test function.

D. Starters through NEMA size five (5) shall be equipped with double break silver alloy contacts. Contacts shall be replaceable without removing power wiring or removing starter from panel.

E. Coils shall be of molded construction and shall be 120 VAC. Starters shall have a fused 120V control power transformer in enclosure, or alternatively on 120/208 or 120/240 volt systems, the power system neutral conductor may be utilized. In all cases, control power shall be disconnected by the starter disconnecting means, unless otherwise specifically approved.

F. Starters shall be suitable for field addition of at least four (4) auxiliary electrical interlocks of any arrangement, normally open or normally closed.

G. Starters shall have enclosure mounted red running pilot light and Hand-Off-Auto switch.

**2.5 AC COMBINATION STARTERS WITH FUSIBLE DISCONNECT SWITCH OR CIRCUIT BREAKER**

A. Combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes and horsepower ratings.

B. Disconnect switch combination starters shall consist of a visible blade disconnect switch and a motor starter.

C. Combination starters shall be mounted in NEMA 1 general purpose enclosures unless otherwise indicated on the plans or required by the conditions of the area in which they are installed.

D. The disconnect handle used on combination starters shall always be in control of the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off".

E. Magnetic starters provided under all Divisions of the Specifications shall be in accordance with this Section.

**PART 3 EXECUTION**

**3.1 COORDINATION**

A. Coordinate details pertaining to the motor control equipment with the Division of these specifications where the equipment is specified.

## 3.2 CONTROL WIRING

A. Control wiring and control devices shall be provided under the Specification Division in which the controlled equipment is specified. Coordinate all related work.

## 3.3 CONNECTIONS

A. Provide liquid tight flexible conduit connections to motors and other equipment subject to vibration where LFMC is an acceptable wiring method. Provide flexible conduit connections to motors and other equipment subject to vibration that is located in spaces used for environmental air (e.g. fan rooms). Minimum length 12 inches.

## 3.4 NAMEPLATES

A. Provide engraved nameplates for all starters in accordance with Section 26 05 53 – Identification for Electrical Systems. Coordinate names with mechanical equipment lists.

## 3.5 REDUCED VOLTAGE STARTERS

A. Reduced voltage starters shall be provided for all motors larger than:

| | |
|---|---|
| 208 volts | 25 horsepower |
| 460 volts | 50 horsepower |

1. This requirement shall apply to starters furnished in this Division and other Divisions of the specifications.
2. Motors controlled by Variable Speed Drives (VSDs) are not subject to this requirement.

## 3.6 TWO SPEED STARTERS

A. Provide two speed starters for all two speed motors. Starters shall comply with the requirements of the equipment and motor manufacturers. Refer to Mechanical Equipment Lists for equipment with two speed motors.

B. This requirement shall apply to starters furnished in this Division and other Divisions of the specifications.

**END OF SECTION**

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# SECTION 26 43 00
# SURGE PROTECTIVE DEVICES

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section includes requirements for the Surge Protective Devices (SPDs) devices for the protection of AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching. The SPD devices shall be suitable for application in a Category C and B environment as described in ANSI/IEEE C62.41.

B. Related Sections:

1. 26 24 13 - Switchboards
2. 26 24 16 - Panelboards

### 1.2 REFERENCES

A. U.L. compliance and labeling: Each complete suppression device shall be listed per U.L. 1449 (current edition) as a surge protective device.

B. SPD shall be designed to allow installation in accordance with current National Electrical Code.

C. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits, Category B and C.

D. NEC Article 242 - Overvoltage Protection.

### 1.3 SYSTEM DESCRIPTION

A. Provide labor, materials, equipment and services necessary for and incidental to the installation of the SPD System devices as specified herein. Installations shall be completed in accordance with this specification.

B. Provide SPDs for panelboards as indicated on the panelboard schedules or drawings.

### 1.4 SPECIAL REQUIREMENTS

A. Where this specification or Specification Section 26 24 16 - Panelboards specify a SPD device integral to a panelboard, the SPD shall be installed at the factory, delivered, and warranted by the electrical distribution equipment manufacturer.

### 1.5 WARRANTY

A. The SPD shall have a warranty period of five years, incorporating unlimited replacements of module if destroyed by transients during the warranty period.

### 1.6 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Provide submittal data with the following information:

1. Product data and manufacturer's installation instructions.
2. Dimensional drawing of each suppressor type indicating mounting arrangements.
3. UL 1449, current edition, VPR test data for all modes of SPDs.
4. UL 1283, current edition. Noise Attenuation for SPDs.
5. NEC Article 242 - Overvoltage Protection.

6. UL Documentation verifying short circuit current rating (SCCR), Maximum Continuous Operating Voltage (MCOV) and Device Listing.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Acceptable manufacturers include: Square D, Eaton, or approved equal. The manufacturer shall be regularly engaged in the manufacture of SPDs for at least five years. Specific products are subject to approval.

B. Where SPDs are specified as an integral part of distribution equipment, the manufacturer of the SPD shall be partnered with the distribution equipment manufacturer in providing a UL listed device.

### 2.2 SPDS GENERAL

A. SPD shall be compatible with the electrical system voltage, current, configuration and intended application.

B. SPD shall be parallel in design.

C. SPD shall be modular in design and MOV based. Each MOV shall be rated at 50kA each.

D. SPD shall have a maximum continuous operation voltage (MCOV) not less than 115% of the nominal RMS voltage continuously without degradation. For example, devices that use 130V MOVs for 120V systems are not acceptable.

E. SPD shall provide both visual and audible indication of properly performing protection for each phase.

F. SPD shall have UL1283 EMI/RFI filtering with minimum attenuation of -50dB@100kHz.

G. SPD shall provide full cycle tracking circuitry to provide tight transient clamping regardless of the transient position on the sine wave.

H. SPD modules shall be thermally fused and SPD shall be capable of safely interrupting the power system's available fault current.

I. SPD shall incorporate a low impedance surge diversion platform for the surge current path. The surge current shall be symmetrically disbursed to all suppression elements to insure equal stressing and maximum performance of the suppression elements. The surge diversion platform shall provide equal impedance paths to each suppression element for shunting of high frequency surges. The surge current diversion modules shall be bolted directly to the platform to insure reliable low impedance connections. Small gauge round wiring or plug-in connections shall not be used in the path for surge current diversion.

J. SPD shall have NO/NC dry contacts for remote monitoring capability.

K. A surge counter shall be provided with the SPD. Surge counter shall utilize a non-volatile memory to retain the surge count in the event of a power loss.

### 2.3 BRANCH PANELBOARD SPD

A. SPD shall be tested against ANSI C62.41.2 Category C high impulse and Category C low impulse transients.

B. SPD shall be capable of surviving 5000 sequential ANSI C62.41 B impulses, without failure or degradation of UL 1449 voltage protection rating by more than 10%.

C. SPD shall have a maximum single impulse current rating of 100kA per phase.

D. SPD shall provide protection in the following modes and SPD shall have a U.L. 1449 voltage protection rating (VPR) as follows:

| Nominal Voltage | Configuration | L-N | N-G | L-G | L-L |
|---|---|---|---|---|---|
| | | | | | |
| 120/240 | Grounded Neutral | 700 | 600 | 700 | 1000 |
| 120/208 | Grounded Wye | 700 | 600 | 700 | 1000 |
| 277/480 | Grounded Wye | 1200 | 1200 | 1200 | 2000 |
| | | | | | |
| 240 | Delta | | | 1200 | 1500 |
| 480 | Delta | | | 1800 | 2000 |

### 2.4 SPD INTEGRAL TO DISTRIBUTION EQUIPMENT

A. SPD shall be Component Recognized in accordance with UL 1449, Standard for Safety, Surge Protective Devices.

B. The SPD diagnostic monitoring devices shall be mounted on the front of the equipment enclosure.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Provide SPDs integral to panelboards as indicated on the panel schedules or drawings and in accordance with Specification Section 26 24 16 - Panelboards. SPD shall be installed by and shipped from the electrical equipment manufacturer’s factory.

**END OF SECTION**

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# SECTION 26 50 00
# LIGHTING FIXTURES

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. This section describes general requirements, products and methods of execution relating to lighting fixtures, LEDs, LED drivers and related products approved for use on this project.

B. The Fixture Schedule is a general guide to type, quality and other characteristics. Fixtures of equal or better performance and quality may be substituted, subject to approval.

### 1.2 RELATED SECTIONS

A. 26 05 29 – Hangers and Supports for Electrical Systems

B. 26 05 33 – Raceway and Boxes for Electrical Systems

C. 26 27 26 - Wiring Devices

### 1.3 QUALITY ASSURANCE

A. The lighting fixtures shall be a standard catalog item as described on the Drawings and as made by a nationally recognized manufacturer.

### 1.4 SUBMITTALS

A. Provide submittals for all products in accordance with Section 26 00 00 and Division 1.

B. Fixture mounting shall be clearly identified on submittal information and coordinated with architectural, features, assemblies, details and reflected ceiling plan.

C. Color selection for fixtures and fixture accessories shall be clearly identified on submittal information and coordinated with architectural.

### 1.5 SHOP DRAWINGS

A. Provide fabrication drawings that indicate fixture, type, kind, weight, LEDs, LED drivers, method of fitting and fastening parts together, location and complete details of method of suspension and fastening fixtures in place. Verify fixture dimensions with construction conditions prior to ordering fixtures.

B. Provide wiring diagrams that indicate supply power and interconnections for lighting controls, equipment, and light fixtures. Provide sufficient information to assemble and install equipment at the project site without further instructions.

### 1.6 WARRANTY

A. Special Warranties: Manufacturer’s standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within 60 months from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 GENERAL

A. Provide fixtures in conformance with the Fixture Schedule, with all suspension, supports, flanges, trim, mounting, and operating accessories normally considered necessary for a complete, functional, and safe installation, whether specifically called for in the Contract Documents or not.

B. Linear fixture systems shall be provided with all corners, transitions, adjustable sections, custom angles, etc., to provide continuous linear systems.

### 2.2 LIGHT EMITTING DIODE (LED) FIXTURES

A. LED fixtures shall comply with Illuminating Engineering Society (IES) LM-79 guidelines and shall have a LM-79 photometric test report. Fixture shall utilize components (i.e. LEDs, driver, fixture housing, etc.) included in LM-79 test.

B. LEDs shall comply with Illuminating Engineering Society (IES) LM-80 guidelines.

C. Fixture shall have lumen maintenance testing with minimum test duration of 10,000 hours.

D. Manufacturer stated end of life shall be at 70% light output. Operating life shall be no less than 50,000 hours.

E. Color temperature, and color rendering index (CRI) shall conform to the lighting fixture schedule shown on the Drawings.

F. Fixture components shall be lead free, mercury free and RoHS compliant.

**2.3 FULLY RECESSED FIXTURES**

A. Fixtures shall have thermal protection conforming to the NEC and shall be so identified.

B. Fixtures in direct contact with insulation shall be Type IC rated.

**2.4 EDISON BASE “A” BULBS**

A. Edison Base “A” bulbs installed in air handling units shall be LED A19 Series 75W Equivalent, 5000K, 120V.

**2.5 LED DRIVERS**

A. Characteristics:

1. Input: 120-277V (UL) AC, 50-60Hz
2. Efficiency: >81% at full load
3. Power Factor: >0.9 at full load
4. Total Harmonic Distortion (THD): <20% at full load
5. 0-10V compatibility
6. Flicker-free dimming down to 1%

**2.6 BATTERY POWERED EMERGENCY LIGHTING DRIVER – LED**

A. Provide emergency battery driver for LED fixtures with the following features:

1. Shall be capable of operating at the minimum lumen output specified on the Lighting Fixture Schedule for a minimum of 90 minutes
2. Universal input (120-277 VAC)
3. Compatible with the LED fixture and driver intended for use with.
4. High-temperature long-life, nickel-cadmium battery or as approved. Electronic charger with 24 hour or less recharge time.
5. Charge indicator lamp and test switch, with lamp visible, and test switch accessible, without opening fixture.
6. UL listed.
7. When used with dimmable drivers/fixtures circuity/programming to restore light output to specified lumens in emergency mode shall be provided.

**2.7 FIXTURE ACCESSORIES**

A. Canopies for pendant hung fixtures shall be of the ball joint type. Where more than one pendant is used per fixture, a ball joint fitting shall also be provided in the fixture end of each pendant.

## PART 3 EXECUTION

### 3.1 GENERAL

A. Drivers shall be installed per manufacturer's recommendations.

B. Fixtures with integral drivers shall have the driver installed and prewired at the factory.

C. Internal fixture wiring shall be factory installed in multiple fixtures which share a common driver. All wiring harnesses shall include an integral copper grounding conductor.

### 3.2 INSTALLATION

A. Install fixtures level, plumb and true. Align rows accurately in three dimensions.

B. Support suspended acoustical ceiling fixtures according to the requirements of the IBC and Section 26 05 29 – Hangers and Supports as well as any local amendments.

C. Fixture pendants, canopies, blank sections, corners, tees and other such accessories shall be finished to match their respective fixture.

D. Refer to applicable details on architectural drawings for specific mounting requirements for all fixtures with special mounting requirements such as cove-mounted fixtures and linear fixtures.

E. For linear fixture systems, verify fixture dimensions and mounting type with other trades prior to installation.

F. Utility Rooms: Surface ceiling mount fixtures in rooms/areas with ceilings. In areas without ceilings pendant fixtures down to bottom of structure or height indicated on the Lighting Fixture Schedule. In areas with mechanical equipment, ductwork and piping, pendant fixtures down to bottom of mechanical ductwork or piping as appropriate. Fixture pendants shall be rigid (threaded hangar rods) and shall be sway braced where pendants exceed 24 inches in length.

G. Provide an unswitched circuit connection for the following (as applicable):

1. Exit signs
2. Emergency lighting units (ELUs)
3. Emergency fixtures
4. Emergency night lights
5. Fixtures with emergency battery LED drivers

H. Wiring for fixtures connected to emergency circuits shall be kept entirely independent of all other wiring and equipment in accordance with NEC Article 700.

I. Clean all fixtures and lenses prior to substantial completion and owner occupancy.

### 3.3 FIRE-RESISTIVE CONSTRUCTION

A. Refer to Section 26 00 00 Electrical General Requirements.

**END OF SECTION**

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**SECTION 27 20 10**

**TELECOM DISTRIBUTION SYSTEM (TDS)**

## PART 1 GENERAL

### 1.1 DESCRIPTION AND GENERAL SPECIFICATIONS

A. Provide the equipment, materials, and labor to install the systems shown on the Drawings and specified herein. This shall include (but not be limited to) provision of all trenching and backfill, raceways, sleeves, boxes, gutters, shelves, enclosures, shelf and enclosure supports, backboards, equipment racks, line and low voltage wire and cable, patch cords, pull ropes (in unused conduits), terminal modules, panels, outlets, jacks, splices, connections, cable management, labeling, testing and all other material, equipment, and labor required to make the systems fully operational.

B. The intent of this Specification is to place in working order a complete, fully tested and documented Category 6 system complying with the Codes and Standards referenced herein.

### 1.2 RELATED SECTIONS

A. 26 05 33 - Raceway and Boxes for Electrical Systems

### 1.3 COORDINATION

A. The necessity to coordinate this work with the Serving Utility, Owner and the Contracting Agency is emphasized. The Contractor shall be responsible for any omissions, delays and additional cost due to lack of coordination or approval from the same.

B. Coordinate work with other contractors and trades. The layout and installation of the systems shown on the Drawings and specified herein shall be coordinated such that all special requirements for telecommunications systems shall be provided and incorporated into the project. The systems to be coordinated shall include (but are not limited to) electrical raceway, grounding, fire rated assembly, lighting, power distribution, control and instrumentation, and labeling of cables, terminations, outlets, jacks, etc. Report all conflicts to the Contracting Agency.

C. Downtime for existing systems shall be minimized. It is the responsibility of the Contractor to plan, coordinate, and execute installation activities so that facilities are not unduly interrupted. Periods of unavoidable interruption shall be less than 4 hours in duration and be prior approved by the Contracting Agency.

### 1.4 CODES AND STANDARDS

A. Where a Nationally Recognized Testing Laboratory (NRTL) listing or classification exists for a product and the product is suitable for the purpose specified and indicated, the product shall bear the appropriate marking indicating the listing or classification.

B. Where a UL Standard is in effect, equipment shall:

1. Meet that Standard.
2. Bear the UL Label.

### 1.5 SUBMITTALS

A. The following shall be submitted in accordance with Section 26 00 00 - Electrical General Requirements and Division 1 in sufficient detail to show full compliance with the specification:

1. Manufacturer's Catalog Data shall be submitted for the following items. Data shall include a complete list of parts, special tools, and supplies.
   a. Copper Cable.
   b. Splice Cases.

c. Information Outlets.

d. Patch Panels.

e. Equipment Racks.

f. Terminal Modules.

g. Patch Cords and other accessories.

2. Manufacturer’s Installations Instructions.

3. Labeling System: Coordinate with Contracting Agency for Owner’s labeling conventions. Submit Project labeling system for approval.

4. Contractor qualifications and experience as specified in this Section.

5. Manufacturer’s Warranty as specified elsewhere in this Section, including all warranty provisions and procedures for Owner to follow to obtain warranty service.

6. Quality Assurance Plan: Contractor shall prepare a quality assurance plan which provides a detailed outline of all testing to be accomplished.

7. The Quality Assurance Plan shall include, as a minimum:

a. A schedule of when tests will be performed relative to installation milestones.

b. Specific test procedure that will be used.

c. A list of test equipment that will be used including manufacturer, model number, calibration certification, range and resolution accuracy.

d. A sample test report form with examples of data to be reported.

e. Test plan shall be submitted to the Owner for approval at least 30 days prior to the start of testing.

B. Delete superfluous information from submittal data, such as model numbers and options for equipment contained on manufacturer's data sheets but not used on this project.

C. One copy of approved submittals shall be kept at the job site.

**1.6 SHOP DRAWINGS**

A. Work shall be laid out in advance. Shop drawings shall be submitted to the Contracting Agency for approval before work begins.

B. Shop Drawings shall include dimensioned layout of Telecommunications Rooms, including backboards, patch panels, grounding terminal bus bars, ladder racking, equipment, etc. Layouts shall show lighting fixtures, HVAC equipment, etc., which affect room layouts.

C. Shop Drawings shall include dimensioned layout of major pathways for backbone and horizontal cables, including large conduits (2 inch and larger) and sleeves.

D. Work under this section has been indicated on the Drawings in locations that should allow installation without interfering with the work of other trades; however, exact finish locations cannot be indicated. Therefore, locations of all work and equipment shall be verified to avoid interferences, preserve headroom and keep openings and passageways clear. Review the plans for the work of the other trades and coordinate adjustment of this work, the work of the other trade or both to achieve the best installation for the Owner without additional claims or charges. Shop Drawings shall reflect coordination of work under this Section with the work of other trades.

**1.7 REFERENCE CODES AND STANDARDS**

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only, latest edition. The reference codes and standards are minimum requirements.

| Reference | Title/Revision |
|---|---|
| ANSI/ICEA | Publication S-80-576 |
| ANSI/IEEE C2 | National Electrical Safety Code |
| ANSI/NFPA 70 | National Electrical Code |
| ANSI/T1E1.7/92-004R | Electrical Protection Applied to Telecommunications Network Plant at Entrances to Customer Structures or Buildings |
| ANSI/TIA/EIA-568-B.1 | Commercial Building Telecommunication Cabling Standard Part 1: General Requirements |
| ANSI/TIA/EIA-568-B.2 | Commercial Building Telecommunication Cabling Standard Part 2: Balanced Twisted-Pair Cabling Standards |
| ANSI/TIA/EIA-569-A | Commercial Building Standards for Telecommunications Pathways and Spaces |
| ANSI/TIA/EIA-571 | Environmental Considerations for Telephone Terminals |
| ANSI/TIA/EIA-606-A | Administration Standard for Commercial Telecommunications Infrastructure |
| ANSI/TIA/EIA-607 | Commercial Building Grounding and Bonding Requirements for Telecommunications |
| ## ANSI/TIA/EIA-854-2001 | A Full Duplex Ethernet Specification For 1000mbis/S (1000base-Tx) Operating Over Category 6 Balanced Twisted-Pair Cabling ## |
| BELLCORE TR-EOP-00 00 63 | Bellcore Network Equipment Building Systems Generic Equipment Requirements |
| BICSI | Telecommunications Distribution Methods Manual |
| CFR 47 Part 68 | Connection of Terminal Equipment to the Telephone Network |
| FCC Part 15 | Radio Frequency Devices |
| FCC Part 68 | Connection of Terminal Equipment to the Telephone Network |
| IEEE | LAN Standards: 802.3; 802.4; 802.5; 802.6 |
| IEEE C62.41 | Recommended Practice on Surge Voltages in Low-Voltage Surge Protective Devices |
| IEEE C62.42 | Guide for the Application of Gas Tube Arrester Low-Voltage Surge Protective Devices |
| IEEE Draft P1250 (D4) | Guide on Service to Equipment Sensitive to Momentary Voltage Disturbances |
| IEEE Std 1100 | Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (Emerald Book) |
| IEEE Std 142 | Recommended Practice for Grounding of Industrial and Commercial Power Systems (Green Book) |
| IEEE Std 241 | Recommended Practice for Electric Power Systems in Commercial Buildings (Gray Book) |
| IEEE Std 446 | Recommended Practice for Emergency and Stand-by Power Systems for Industrial and Commercial Applications (Orange Book) |
| NTP 638 - 3031 - 300 STD | Northern Telecom Practice "Bonding and Grounding QCF-Type Bond Clamps Description and Installation” |

| Reference | Title/Revision |
|---|---|
| UL 1283 | Electromagnetic Interference Filters |
| UL 1449 | Transient Voltage Surge Protection |
| UL 1459 | Standard for Telephone Equipment |
| UL 1950 | Standard for Information Technology Equipment, Including Electrical Business Equipment |
| UL 467 | Grounding and Bonding Equipment |
| UL 497 | Protectors for Paired Conductors for Communication Circuits |
| UL 497A | Secondary Protectors for Communication Circuits |
| UL 497B | Protectors for Data Communication and Fire Alarm Circuits |
| UL 910 | Safety Test for Flame-Propagation and Smoke Density Values for Electrical and Optical- Fiber Cables |

**1.8 OPERATING CONDITIONS**

A. The electronic equipment designed for office environments and Telecommunications Rooms shall be rated for continuous operation under ambient environment conditions of 10 degrees C (50 degrees F), to 30 degrees C (85 degrees F) and 35 to 65 percent relative humidity, non-condensing.

**1.9 QUALITY ASSURANCE**

A. Perform all Work in accordance with all regulatory rules and regulations as well as references in this specification.

B. Perform all Testing in accordance with ANSI/TIA/EIA-568-B specifications and submit all printed reports.

**1.10 QUALIFICATIONS**

A. The telecommunications work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for telecommunications work described in this Section shall be specialty telecommunications contractors, who may be a division of the Divisions 26, 27 and 28 Subcontractor.

B. Contractor Certification:

1. This subcontractor shall be a certified installer of the cabling system, pre-qualified by the Manufacturer for the purpose of offering the Extended System Warranty as required in this Section.
2. Provide a signed statement indicating that the subcontractor has the ability to provide the service required by the Contract Documents using factory trained and qualified technicians for each major system type and intends to maintain that capability until the end of the guarantee period.

C. Personnel and Equipment:

1. Specialty subcontractors shall have direct access to all tools and test equipment required to complete the telecommunications work when the work is bid.

**1.11 REGULATORY REQUIREMENTS**

A. Work shall conform to the requirements of NFPA 70 and all local amendments.

B. Work shall conform to the requirements of all Federal, State and Local Electrical and Telecommunications Regulations.

**1.12 SPECIAL WARRANTY**

A. The warranty shall extend from the date of Substantial Completion to the longer of twenty (20) years or the length of the Extended Warranty offered by the successful manufacturer.

B. The warranty shall be extended to the Owner via the manufacturer through a single point of contact and shall be fully backed by the manufacturer.

C. The Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided consisting of the following:

1. Extended Product Warranty - The Extended Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of ANSI/TIA/EIA 568-B and ISO/IEC IS 11801-B, exceed the attenuation and NEXT requirements of ISO/IEC IS 11801-B for cabling links/channels, and that the installation will exceed the loss and bandwidth requirements of ISO/IEC IS 11801-B for links/channels. The warranty shall apply to all passive Telecommunication Distribution System (TDS) components.
2. System Assurance - The System Assurance shall cover the failure of the wiring system to support any existing application, as well as additional application(s) introduced in the future by recognized standards or user forums that use the ANSI/TIA/EIA 568-B or ISO/IEC IS 11801-B component and link/channel specifications for cabling.
3. All communications system components shall be rated for end-to-end system Category 6, or greater performance levels on all pair combinations and warranted to support any existing or future applications which are designed to operate over a 250MHz horizontal channel (as defined in ANSI/TIA/EIA 568-B.2.1), to include support of the following applications. Performance shall be guaranteed under the Special Warranty at 100 meters (328 feet):
    a. IEEE 802.3 10Base-T, 100Base-TX and 100Base-T4.
    b. IEEE 802.5 16 Mbps token ring.
    c. IEEE 802.12 Demand Priority Access Control.
    d. Asynchronous Transfer Mode (ATM) data transmission at 155 Mbps.
    e. IEEE 802.3ab 1000Base-T.
    f. ANSI/TIA/EIA-854-2001 “A Full Duplex Ethernet Specification For 1000mbis/S (1000base-TX) Operating Over Category 6 Balanced Twisted-Pair Cabling”.
    g. Future applications that become certified under the applicable standards as noted above.
4. Extended Product Warranty - The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).
    a. In the event this specialty subcontractor is unable to perform, goes out of business or ceases to exist, the manufacturer shall be responsible for identifying a new contractor to assume the warranty work.
    b. Manufacturers shall bear full responsibility for the work of their certified installer, including all aspects of the design and installation.
    c. In the event this specialty subcontractor fails to provide satisfactory warranty support, the manufacturer shall be responsible for taking all necessary remedial steps including finding a new contractor to provide warranty work.

5. System Certification - Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation.

D. Submit a summary of warranty highlighting major features. Clearly disclose all exceptions to the requirements of this document, and specifically indicate any and all provisions that could potentially void the warranty or reduce its benefit to the Owner.

E. Warranty programs approved as meeting the specified warranty are listed below. Final approval is subject to review and approval of the warranty:

1. Berk-Tek/Ortronics Clarity System Warranty.
2. Avaya Systimax Program.
3. Siemon System 6 Warranty.
4. Krone TrueNet Warranty Program.
5. Ortronics Applications Assurance and Extended Warranty Program (Approved products only).
6. Berk-Tek OASIS Certified Solutions (Approved products only).

**1.13 MANUFACTURERS' RECOMMENDATIONS**

A. Installation procedures shall be in accordance with the recommendations of the manufacturer of the material being installed. Printed copies of these recommendations shall be submitted to the Contracting Agency 30 days prior to installation. Installation of the item shall not proceed until the recommendations are received and approved by the Contracting Agency. A copy of the recommendations shall be kept at the job site.

**1.14 TERMINOLOGY**

A. “TDS” shall refer to the Telecommunication Distribution System cabling and hardware infrastructure internal and external to a building or buildings used to transmit voice, video and data, etc.

B. "Stations" shall refer to individual telephone or computers, or remote peripherals of those systems (e.g., printers, facsimile machines, modems, etc.

C. "Outlets" shall refer to the group of receptacles or jacks at the location where the stations connect.

D. "Jacks" or "Ports" shall refer to the individual receptacles where phones, computers, etc. connect.

E. "Station Cables" shall refer to the horizontal cables connecting patch panels or terminal blocks in the Telecommunications Rooms to the stations.

F. “Pathways” shall refer to conduits, sleeves, cable-trays, distribution rings, etc., which are employed to route backbone and stations cables between equipment rooms, telecommunications rooms, stations, outlets, etc.

G. “Backbone Cables”, "Riser Cables" or "Tie Cables" shall refer to copper cables 25-pair or more and optical fiber cables 6-strand or more, connecting main cross-connect facilities, intermediate cross-connect facilities and telecommunications rooms. These cables may include outside plant cables between buildings and riser cables between floors.

H. “Equipment Rooms” (ER) or "Communication Equipment Rooms" (CER) shall refer to a special-purpose room that provides space and maintains a suitable operating environment for large communications and/or computer equipment. Main rooms may also be referred to as an MDF.

I. "Telecommunications Rooms (TR)" shall refer to a floor-serving facility for housing telecommunications equipment, cable terminations and cross-connect wiring. This is the point at which station cables terminate. It may also be referred to as an IDF.

J. "Terminal Blocks" shall refer to multiple punch down cable terminations.

K. “Patch Panels” shall refer to rack or frame mounted multiple punch down cable terminations with RJ-45 style, 8P8C jacks on the face for “plug and play” cross connect capability.

L. “Cable Management” shall refer to rings, troughs, gutters etc., mounted in conjunction with telecommunications distribution equipment and terminal blocks, for the orderly routing of cables, patch cords, etc.

M. “LEC” shall refer to the Local Exchange Carrier providing telephone service to the facility.

## 1.15 STORAGE AND HANDLING

A. Care shall be exercised in handling materials during construction. Damaged materials shall be repaired or replaced as directed by the Contracting Agency.

## PART 2 PRODUCTS

## 2.1 GENERAL

A. All materials shall be as specified, first quality, manufacturer’s current production.

B. The Basis of Design for copper cabling, connecting hardware, and related hardware in this section is Ortronics hardware with Berk-Tek cable Netclear Warranty as standards for quality and performance. Listed manufacturers meeting all the system quality, performance and warranty requirements of this specification are also acceptable. The burden of proof is on the Contractor to demonstrate that all performance and warranty requirements are met. Any listed manufacturers products submitted without information giving detailed item by item comparison with the Basis of Design will be rejected without review. All manufacturers other than those listed in this section will be rejected without review.

C. The approved alternate cabling products manufacturers are: Below are the alternates. They depend on which Basis of Design you selected above. Delete the BOD from this list.

1. CommScope.
2. KRONE.
3. Belden.
4. Avaya.
5. Berk-Tek.

D. The approved alternate connecting hardware products manufacturers are: Below are the alternates. They depend on which Basis of Design you selected above. Delete the BOD from this list..

1. KRONE.
2. Siemon.
3. Avaya.
4. Ortronics.

E. Products shall provide the standard of performance required under paragraph 1.1 and the Special Warranty above.

## 2.2 SEISMIC BRACING

A. Freestanding equipment racks shall be seismically braced in accordance with requirements of the IBC and as required by Section 26 05 29 - Hangers and Supports, of these Specifications. Seismic bracing shall consist of rigid supports. Cables, wires, chains or other non-rigid

materials shall not be used for seismic support. Provide approved fixed equipment anchorage assemblies as published by the manufacturer. In lieu of manufacturer's published seismic bracing assemblies, the Contractor shall provide seismic installations approved by a licensed structural engineer.

B. Approved drawings of seismic assemblies shall be made available for review by the Contracting Agency or the inspecting Authority Having Jurisdiction upon request.

C. Coordinate the following sections describing equipment racks and cabinets with the fiber specification section (27 20 20 - Telecom Optical Fiber Distribution).

## 2.3 WALL MOUNTED EQUIPMENT RACKS

A. Where specified or shown on the Drawings, provide 19 inch wide, 14 inch deep NEMA standard open-frame, fixed, wall mounted equipment rack with the following features:

1. 25 x 1 3/4 inch mounting spaces.
2. Laser cut steel, with black anodized finish.
3. Side mounted cable management brackets for vertical cables
4. Electrically isolated 3/16 inch by 3/4 inch by 18 5/16 inches ground busbar on the top rear side of the rack. Mount ground busbar on 1 inch insulating bushed standoffs.
5. Top mount cable trough
6. Equipment: Ortronics Mighty MO 4 foot Wall Mount, or as approved.

## 2.4 RACK MOUNTED POWER DISTRIBUTION/SURGE SUPPRESSION STRIPS

A. Where specified or shown on drawings, provide rack mounted power distribution strips/surge suppression strips for mounting in the equipment racks furnished. The power distribution/surge suppression strips shall have the following features:

1. 120 volt input and output.
2. Surge Energy Rating: minimum 480 joules.
3. EMI/RFI Noise rejection (100kHz to 10 MHz): 70.0 dB.
4. Guarded master on/off switch preventing accidental switching.
5. Designed to rack mount in a 19 inch equipment rack.
6. UL 1449 Listed.
7. UL 1449 TVSS Rating: 330V.
8. Equipment: APC Model NET9RM, or as approved.

## 2.5 CABLE MANAGEMENT

A. Backboard mounted cable management:

1. Distribution rings installed in communication rooms shall be "D" ring type. No bridle rings are permitted.
2. Distribution rings shall be sized according the number and size of cables to be supported plus 25% spare capacity.
3. Vertical trough-type cable management shall be minimum 6 inch wide, cable management trough, 110 Vertical Cable Management trough, or as approved.
4. Horizontal trough-type cable management shall be minimum 3-1/2 inch wide, cable management trough, 110 Horizontal Cable Management trough, or as approved.

B. Rack mounted cable management:

1. Distribution rings shall be sized according the number and size of cables to be supported plus 25% spare capacity.
2. Distribution rings installed in communication rooms shall be “D” ring type. No bridle rings are permitted.
3. Vertical trough-type cable management for use with standard 7 foot equipment rack, shall be minimum 4 inches deep.
4. Horizontal trough-type cable management shall be 3-1/2 inch wide with horizontal and vertical routing rings, with 2 inches by 1.5 inch cutouts for through cable routing.

## 2.6 PATCH PANELS

A. Patch Panels: Modular jack panels shall be in 24 or 48 port configurations as shown on the Drawings. Modular jack panels installations shall contain a retaining trough between every panel. Modular Jack Panels shall be wired for T568A configuration.

B. The terminations shall have the following characteristics:

1. Wire Insulation Supported:
   a. Size: 0.05 inches Diameter Over Dielectric maximum for top of connecting block 0.07 inches Diameter Over Dielectric maximum for bottom of connecting block
   b. Types: All plastic insulants (including PVC, irradiated PVC, Polyethylene, Polypropylene, PTFE Polyurethane, Nylon, Teflon)
   c. Termination Type: Insulation displacement, dry, gas tight
2. Wire Size Supported:
   a. Solid Wire Ranges: 22-26 AWG, Re-termination >200
   b. Stranded (7 Strands) Wire Ranges: 22-26 AWG, Re-termination: >200
   c. Wire Insertion force (24 AWG): 13-28 lb. (59-127 Newtons)
   d. Wire pullout force (24 AWG): 2.2 lb. (9.7 Newtons)
   e. Wire retention force (24 AWG): Horizontal 8 lb., Vertical 2 lb.
3. Electrical Specifications:
   a. Meet or exceed performance defined by ANSI/TIA/EIA-568-B.2, for Category 6 component, link and channel performance.
   b. UL Listed.

C. Designation labels for each jack shall be provided for front/rear labeling of each patch panel. All cables shall be terminated in numerical sequence and labeled as to outlet number and jack position (A, B, C, D). Provide color-coded inserts (“icons”) for all jacks at patch panels and at each outlet.

D. Equipment:

1. Category 6: Standard Density Modular Patch Panels
2. Comply with FCC Part 68.
3. ISO 9001 Certified Manufacturer.
4. Equipment: Ortronics Clarity Category 6 Modular to 110 Patch Panels

## 2.7 INFORMATION OUTLETS/JACKS

A. Faceplate Requirements:

1. Configure single gang outlet information outlets in single, duplex, triplex, quad-plex, jack arrangement, as indicated on the Drawings.
2. Provide outlet faceplates with both top and bottom labeling positions.
3. Provided blank module inserts for all unused module locations.
4. Provide full set of color coded snap-in icons for workstation outlets for use by Owner to mark jacks for analog and digital telephones, two unique classes of data, etc. Store icons in clear plastic bags in each IDF/MDF.
5. Equipment: Refer to Specification Section 26 27 26-Wiring Devices for faceplate type/color.

B. Jack Requirements:

1. Jacks for Voice and Data:
   a. Communications jacks shall consist of multi-position 8-pin modular (8P8C) jacks, utilizing T568A termination style.
2. Category 6 Jacks:
   a. Jacks shall be manufactured by the same manufacturer as the modular patch panels.
   b. All Jacks shall conform to ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section and shall meet or exceed the following electrical and mechanical specifications:
      1). Electrical Specifications: Jacks shall meet or exceed performance specifications for the Channel as defined by ANSI/TIA/EIA-568-B.
      2). Mechanical Specifications:
         a) Plug Insertion Life: 750 insertions.
         b) Contact Force: 3.5 oz (99.2 g) minimum using FCC-Approved modular plug.
         c) Plug Retention Force: 30 lb (133 N) minimum between modular plug and jack.
      3). Temperature Range: -40° to 150°F (-40° to 66°C).
      4). Comply with FCC Part 68.
      5). ISO 9001 Certified Manufacturer.
      6). Equipment: Ortronics TracJack outlet.

## 2.8 PATCH CORDS

A. Provide factory assembled Category 6 Modular Patch Cords for each assigned port on the patch panel. All cords shall conform to the requirements of ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and be part of the UL LAN Certification and Follow-up Program. Cords shall be equipped with an 8 pin modular connector on each end and the minimum length patch cord shall be provided in each instance, to make an orderly, manageable connection between the patch panels or equipment being cross-connected.

B. All patch cords shall be round, and consist of 24-AWG copper, stranded conductors, tightly twisted into individual pairs.

C. Patch cords shall be manufactured by the manufacturer of the patch panels and jacks and meet or exceed the Channel performance defined by ANSI/TIA/EIA-568-B.

D. UL or ETL Verified for ANSI/TIA/EIA 568-B Electrical Performance.

E. The patch cord shall have exclusion features to prevent accidental polarity reversals and split pairs.

F. UL Listed for Fire Safety.

G. ISO 9001 Certified Manufacturer.

H. FCC Compliant.

I. Provide Patch Cord storage boxes for all spare patch cords provided in each TR.

**2.9 HORIZONTAL CABLES**

A. General:

1. Data cables shall be extended between the station location and its associated TR and shall consist of 4 pair, 24 gauge, UTP, and shall be terminated on the 8 pin modular jacks provided at each outlet. Cable jacket shall comply with Article 800 NEC for use as a plenum. The 4 pair UTP cable shall be UL Listed Type CMP (plenum).
2. Provide cables with four FEP insulated conductor pairs (4/0 configuration)
3. All cables shall conform to the ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL LAN Certification and Follow-up Program.
4. Cables shall meet or exceed Category 6 performance specifications for the Channel as defined by ANSI/TIA/EIA-568-B.2.
5. Environmental:
   a. Storage temperature: 68° F to 122° F (20° C to 50° C).
   b. Installation Temperature: 32° F to 122° F (0° C to 50° C).
   c. Operating Temperature: 14° F to 140° F (-10° C to 60°.
6. UL or ETL Verified for Category 6 Electrical Performance.
7. UL Listed for Fire Safety.
8. ISO 9001 Certified Manufacturer.
9. Equipment: Berk-Tek LANMARK-1000

**2.10 LABELING**

A. Provide machine printed labels for all patch panels, cables, outlets, etc., in accordance with ANSI/TIA/EIA-606-A. Provide labeling nomenclature in accordance with information on the Drawings or Owner's labeling conventions. Submit labeling samples for all required applications.

B. Machine Printed Label Requirements:

1. PC Compatible.
2. Can save and modify files.
3. Fully integrated with AutoCAD.
4. Editable Fonts and Sizes.
5. Rotate Text and Objects.
6. Vary Line Spacing.
7. Ability to import graphical images.
8. Capable for customization of layout.
9. Re-positional labels.

C. Basis of Design:

1. Brady Electrical/Datacomm Worldwide (latest version of LabelMark).
2. Cable Management Software International (latest version of docIT).
3. Approved alternate.

D. Labeling and color coding identification for this project shall conform to TIA/EIA-606-A for a Class 1 Administrative System.

**2.11 UNSPECIFIED EQUIPMENT AND MATERIAL**

A. Any item of equipment or material not specifically addressed on the Drawings or in this document and required to provide a complete and functional TDS installation shall be provided in a level of quality consistent with other specified items.

**PART 3 EXECUTION**

**3.1 GENERAL**

A. Provide, connect and test all equipment and materials for the systems herein specified and shown on the Drawings. All wiring shall be neatly tied or laced in cabinets and terminated on terminal strips provided for the purpose. Each cable shall be identified by an approved marking system at each end.

B. Outlet/Jacks shall be identified with machine printed labels. Hand lettered labels shall not be used.

C. Provide labels and color-coded inserts for each jack at patch panels, in accordance with TIA/EIA-606-A.

D. Provide full set of snap-in icons for workstation outlets for use by Owner to mark jacks for analog and digital telephones as two unique classes of data. Store icons in clear plastic bags in each IDF/MDF.

E. Wherever materials, methods or placements of materials and equipment for the communications work is provided by other Subcontractors or the Owner, it shall be the responsibility of this specialty Subcontractor to coordinate that work and assure that it is provided in such a manner as to enhance the final system operation.

F. Coordinate installation of lighting, ventilation and all other systems in the communication rooms to avoid interferences.

G. Test the systems, demonstrate operation to the Contracting Agency and provide training as specified.

H. In each TR, IC, MDF, IDF and equipment room provide a minimum of a 30 inches by 42 inches CAD drawing indicating floor plan and telecommunication one-line. The floor plan shall indicate telecommunication outlets with the appropriate outlet designation indicated on the plan. Mount drawing beneath a sheet of 1/8 inch clear Plexiglas on wall. Provide marking pens attached with Velcro to facilitate marking when moves, adds, or changes occur. Plexiglass and floor plan shall be mounted in such a way as to allow easy and rapid updates to the underlying floor plan. Include all copper and optical fiber systems on this drawing.

I. Work under this section shall be closely coordinated with work under other sections of the project.

**3.2 CODES AND PERMITS**

A. Apply and pay for all fees, permits, and obtain serving utility and governmental approvals.

B. Coordinate all work with the serving utility.

C. Raceway fill requirements for communications systems shall be in accordance with ANSI/TIA/EIA-569-A and BICSI.

D. NEC bending radius of all communications ducts, raceways, cabletrays, etc., shall be increased to not less than the installed cable manufacturer's recommendations, and the applicable ANSI and BICSI Standards.

E. Communications work shall be in complete accordance with the following:

1. National Electrical Code (NEC), latest legally enacted edition.
2. Regulations of the State Fire Marshal.
3. National Fire Protection Association (NFPA) Codes.
4. All state, county and local codes and ordinances.

**3.3 DELIVERY AND STORAGE**

A. Materials and Equipment shall be stored with protection from mechanical damage, weather, humidity and temperature variation, dirt and dust, and other contaminants.

B. Materials shall be inspected and inventoried promptly upon receipt.

C. Cables shall be tested immediately upon receipt and received or rejected and returned based upon testing or visual inspection.

D. Report and record all serial numbers received and/or rejected.

E. All inspection and testing shall be performed under the observation of the Contracting Agency at the Contracting Agency’s option. Provide three (3) working days advance notice of tests.

**3.4 LAYOUT**

A. All work shall be laid out in advance. Shop drawings shall be submitted to the Contracting Agency for approval before work begins. Maximum height for terminal blocks and patch panels shall be 6 feet-6 inches, minimum height shall be 1 feet-6 inches. Cables shall be racked and supported in a workmanlike fashion. All work shall be labeled according to ANSI/TIA/EIA 606-A, and color coded according to BICSI Standards. In the absence of details on the drawing governing the layout of terminations, the following guidelines shall apply.

1. All horizontal cables from a common outlet shall terminate sequentially (in groups) on the same patch panel unless the cables are of different performance levels such as Category 5e and 6.
2. Horizontal cables that are of different performance levels, such as Category 5e and 6, shall be terminated on different patch panels, and identified accordingly.
3. Pairs from each cable shall be terminated sequentially from left to right, top to bottom starting with the lowest assigned number at the upper left hand corner of the frame.
4. Trunk or riser cables shall terminate on dedicated terminal blocks, separate from but adjacent to horizontal terminal blocks. Cross-connect or patch cords longer than 18 feet shall be avoided. Install stress relief hardware where needed.

B. Keep up to date "As-built" record drawings at each job site detailing the layout of all data racks and telephone, data and trunk terminations, including a typed listing of cables/rooms served by each terminal block and patch panel. Refer to Section 26 00 00 - Electrical General Requirements for other Record Document requirements.

C. Layout Shop Drawings shall be prepared using CAD. Final approved Shop Drawings shall be updated with precise "as-built" conditions and shall be submitted with the Operations and Maintenance Manuals. File format shall be AutoCAD "DWG" or "DXF."

**3.5 CABLE INSTALLATION**

A. Cable shall be installed in conduit routed to directly to Telecommunication Rooms or via conduit stubbed to cable. The use of so called 'j-hooks" or distribution rings will not be allowed.

B. If cable dimensions shown are exceeded, all cable pathways and supports shall be resized to maintain the original fill ratios based on the dimensions shown.

C. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations.

D. Telecommunication cables shall not be installed in the same raceway as power cables.

E. Cables shall be installed in a neat and orderly manner and shall not cross or interlace other cables except at breakout points.

F. Cables in vertical trays shall be individually retained with straps at a maximum of 6 feet on center.

G. Tie wraps shall not deform the cable insulation when tightened.

H. All cables shall be routed to minimize EMI and RFI interference. All cable shall be routed according to the following table. Spacings are minimum for all Category 3 and higher cable.

Minimum Separation of Telecommunications pathways from 480 volt or less power lines

| Condition | <2 kVA | 2-5 kVA | >5 kVA |
|---|---|---|---|
| Unshielded power lines or electrical equipment in proximity to telecommunications open or nonmetal pathways. | 5 in | 12 in | 24 in |
| Unshielded power lines or electrical equipment in proximity to telecommunications grounded metal conduit pathways | 2.5 in | 6 in | 12 in |
| Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a telecommunications grounded metal conduit pathway | N/A | 3 in | 6 in |
| Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to telecommunications open or nonmetal pathways. | 2.5 in | 6 in | 12 in |
| Mechanical ductwork, metal floors and other metallic planes to telecommunications open or nonmetal pathways. | 2 in | | |
| Mechanical ductwork, metal floors and other metallic planes to telecommunications open or grounded metal conduit pathways. | 0 in | | |
| Fluorescent or HID lighting fixtures | 5 in | 5 in | 5 in |

## 3.6 LUBRICANT

A. Pulling lubricant, shall be used to minimize pulling tension and prevent sheath damage when pulling cables into ducts and conduits. Lubricant shall be applied to the cable sheath with a lubricator. When pulling has been completed, the exposed cable ends shall be wiped clean of lubricant.

B. Lubricants shall be compatible with and intended for use with plastic-sheathed cables. Soap and grease type lubricants shall not be allowed.

C. All equipment and the pulling set shall be checked to minimize interruptions once pulling begins. Cable shall be pulled without stopping until the required amount of the cable has been placed. When the pulling operation is halted before the pull is completed, the tension of the pulling line shall not be released. When pulling is resumed, the inertia of the cable shall be overcome by increasing the tension in small steps a few seconds apart until the cable is in motion. Cable shall be paid from the top of the reel by rotating the reel in the feed direction at the rate of pull. Cable shall not be stripped off the reel by pulling.

**3.7 SEAL**

A. Ducts in which cable is placed shall be sealed with urethane foam duct seal. This material shall be inserted between the cable and the duct and in all unused ducts, in order to prevent damage to the cable sheath and to prevent the entrance of dirt or water into the manhole or vault.

**3.8 DAMAGE AND DEFECTS**

A. Use a tension monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Provide replacement cable if cable manufacturer's maximum pulling tension is exceeded at any time during a pull.

B. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out form the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced at the discretion of the Contracting Agency. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

C. Cable shall be hand guided through intermediate manholes and into the next duct section when making pull-throughs. Proper rigging shall be used in the intermediate manhole to keep the pulling line and cable aligned with the exit duct to prevent the line or cable from rubbing against the edge of the duct. Cables in pull-through manholes shall be set up and racked before the cable ends in adjacent manholes are set up and racked.

D. Cable ends pulled into manholes, vaults, or terminal locations that are not to be racked or otherwise permanently positioned immediately shall be tied in fixed positions to prevent damage to the cables and provide adequate working space.

E. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

**3.9 DISTRIBUTION RINGS AND CABLE SUPPORTS**

A. The use of so called 'j-hooks" or distribution rings will not be allowed on this Project.

**3.10 TERMINATION MODULES**

A. Layout telephone and data terminal blocks as indicated on drawings with spacing as recommended by manufacturer.

B. Ground all metal back frames with #6 insulated copper to the Chassis Ground System (CGS). Use Cool Amp bolted connections or Cadweld connections.

**3.11 CROSS-CONNECTIONS**

A. Cross-Connections at and/or between all terminal hardware shall be provided to form a complete and functioning system.

B. Patch Cords shall be used to make all Cross-Connections.

C. Cross-Connections from Terminal Modules color coded White to Terminal Modules color coded Blue shall be 4-pair wide and serve a single jack or termination in the horizontal distribution.

**3.12 INTERCONNECTIONS**

A. Interconnections at all terminal hardware shall be provided to form a complete and functioning system.

B. Equipment cables shall be interconnected to horizontal cabling on Termination Modules color coded blue.

**3.13 EQUIPMENT RACKS**

A. Equipment racks shall be seismically braced by securely bolting to the structural floor supplemented with additional braces as required for the Seismic Zone.

1. Mount ground bars on insulating bushed standoffs.
2. Connect Wiremold to power outlets.
3. Electrically separate open racks with insulating washers and nonconductive screws.
4. Electrically separate enclosed racks with insulating washers and nonconductive screws.

**3.14 TERMINATIONS**

A. Cables shall be marked with wire markers at both ends, and terminals on terminal blocks or patch panels shall bear the cable number. Trunk cables shall be neatly marked with "From-To" information.

B. Wire twist shall be maintained to within 0.25 inch of the termination.

**3.15 TERMINATION MODULES**

A. Install per manufacturer’s recommendations.

B. Protection modules shall conform to NEC 800-30 and be installed per manufacturer’s recommendations.

**3.16 COMPLETION AND TESTING**

A. Telecommunications System test reports shall be submitted to and approved by the Contracting Agency. The test reports shall certify that the Telecommunications Distribution System is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.

B. After installation and test of each system is complete, each system and the entire system shall be demonstrated and tested for proper operation. The Contractor shall schedule a demonstration with the following representatives present:

1. Contractor's representative.
2. Manufacturer's representative for each major communications subsystem.
3. Contracting Agency's representative.

C. The Contractor shall provide all forms, instrumentation and test equipment, loads, and other consumables required to demonstrate the systems to the Contracting Agency’s satisfaction.

D. Incoming Inspection Tests:

1. Inspect all materials for damage.

E. Patch Cord Testing:

1. All patch cords shall be tested and shown to comply with the applicable Category cord requirements of TIA/EIA-568B.

2. Compliance shall be proven by testing patch cords alone (i.e., not by inserting the patch cords into a channel).
3. Cord performance shall be measured on-site by either using either the TIA method delineated in Annex J or by using a cord-test adapter and a hand-held LAN cable tester. Cord compliance may be demonstrated by actual test reports supplied by the patch cord manufacturer.

F. Final Inspection Tests:

1. Testing of all copper wiring shall be performed prior to system acceptance. 100 percent of the horizontal and riser wiring pairs shall be tested. Link testing of all copper cabling shall be performed. Complete, end to end test results shall be submitted to the Contracting Agency.
   a. Category 6 cable runs shall be tested for conformance to the specifications of EIA/TIA 568-B.2, Category 6. Testing shall be done with a ANSI/TIA/EIA 568-B ETL verified Level II-E test set, with accuracy per Proposed TIA Level III standards.
      1). Test shall include all requirements of ANSI/TIA/EIA 568-B, including wiremap, length, characteristic impedance, insertion loss, ambient and impulse noise, NEXT, PSNEXT, FEXT, ELFEXT, PSELFEXT, return loss, ACR, PSACR, Propagation Delay and Delay Skew.
      2). Supported test frequency shall be 1-350 MHz to provide re-certification capability beyond Category 6 requirements.
      3). “Full Plot” storage shall store entire test, and be capable of uploading saved data and re-characterizing cables against new or evolving performance standards. Testers only saving worst case data are not acceptable. Test data shall be saved and provided to the Owner in neatly bound hardcopy and electronic format compatible with ScopeData Pro® software. Provide a copy of the software with the data.
      4). Reports shall be graphic, showing test results plotted against standards. Reports shall include a pass/fail summary of all network types specified.
      5). Any cables not meeting the requirements of the standard shall be brought into compliance at no charge to the Owner.
      6). Tester shall be equal to Agilent Technologies (HP) WireScope 350, Fluke DSP-4000, or IDEAL LANTEK 6P
2. Test all cable with an approved cable tester in the presence of the Contracting Agency, at the Contracting Agency’s option. Provide three (3) working days advance notice of tests. Record cable numbers on data test reports. Submit reports to Contracting Agency.
3. Test all cables from both ends.
4. Re-test all cable disturbed after testing, at the direction of Contracting Agency.
5. Spare unterminated cable shall be temporarily terminated for testing.

G. Replace all rejected materials.

H. Test AC grounds and voltages in equipment racks.

1. Record voltage at equipment rack power source both at no load and at 15 Amp resistive load.

**3.17 OPERATING AND MAINTENANCE MANUALS**

A. Prepare manuals describing the servicing and maintenance requirements for the equipment being provided as required in this Section of these specifications.

B. Information contained in the manuals shall consist of catalog data on each item, together with parts lists, wiring diagrams, test reports, description of routine maintenance required,

suggested frequency of maintenance and recommended practices, and shall be 8-1/2 inches by 11 inches in size. Catalog pages and data in manuals shall be neat, clean copies. Drawings shall be accordion folded to above size. An index shall be provided which shall list all contents in an orderly manner. Include corrected shop drawings in the maintenance manuals. Each copy of the instruction manual shall be adequately labeled for identification and shall include plastic tabs coordinated with the index.

C. Provide “Step-by-step” instructions for interpreting and utilizing the cable, outlet, jack and equipment identification system, including instruction for use of jack icons.

D. Refer to "Submittals" requirements of this Section for additional O&M requirements.

**3.18 INSTRUCTION AND TRAINING**

A. Provide factory trained and authorized instruction in the proper operation and maintenance of all equipment shown on the Drawings and specified herein.

B. Provide detailed instructions to the Owner on how to obtain warranty service under the Special Warranty.

**END OF SECTION**

# SECTION 27 51 16
# PUBLIC ADDRESS SYSTEMS

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. The contractor shall modify the existing public address system to provide electrically powered audio amplification system for sound reinforcement for the gymnasium addition. The system shall include, but not be limited to, amplifiers, speakers, mixers, microphones, rack, enclosures, equalizers, cables and accessories required to provide a complete and operable system.

### 1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### 1.3 CODES AND STANDARDS

A. All wiring shall be in accordance with the requirements of Article 725 of the National Electrical Code for Class 2 Signaling Systems, applicable to local codes and manufacturer's wiring diagram.

### 1.4 QUALIFICATIONS

A. The sound reinforcement work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for work described in this Section shall be specialty sound reinforcement contractors, who may be a subcontractor of the Divisions 26, 27 and 28 Contractor.

B. Specialty Subcontractors bidding sound reinforcement work shall have a minimum of five years experience in the construction, testing, and servicing of systems of the type and magnitude specified herein. The Subcontractor shall have direct access to all tools and test equipment required completing the sound reinforcement work when the work is bid.

### 1.5 SUBMITTALS

A. Clearly identify product model numbers and options for equipment used on this project by circling, highlighting, or pointing out information on manufacturer's data sheets.

B. Submit for approval one-line, riser, and point-to-point wiring diagrams for the revised system.

C. Submit simplified as-built block diagrams of the revised system giving the essentials of the installation and their functional relations with all inputs, outputs, and wires identified. One copy of the system's diagram shall be mounted inside the rear door of the rack(s).

### 1.6 OWNER'S MANUALS

A. Furnish three complete sets of operating instructions and service maintenance manuals for the equipment employed in the systems. This shall include internal schematics and wiring diagrams. The information in the manuals and on the drawings shall be sufficiently detailed to allow a technician of normal competence to understand, install, operate, maintain, calibrate, and repair the equipment.

### 1.7 GUARANTEE AND SERVICE

A. All components, parts, and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months:

1. Warranty service shall be provided by a trained specialist of the equipment manufacturer.
2. The specialist shall be based in a fully staffed branch office located within a reasonable distance from the job site.

B. The equipment manufacturer shall have a local branch office staffed with trained, full-time employees who are capable of performing testing, inspection, repairing and maintenance services.

**1.8 TRAINING**

A. Training of the Owner's designated operating personnel shall be provided. This shall include at least two hours of instruction in the operation, care and maintenance of the installation for each system. Training shall be scheduled at the mutual convenience of the Owner and Contractor, after demonstration and acceptance testing.

**PART 2 PRODUCTS**

**2.1 GENERAL**

A. Products shall be listed for use with the existing public address system.

B. Products shall be similar to those in the existing fitness center.

C. Provide amplifiers, speakers, wiring, programming and accessories to configure the Gymnasium as a single zone served from the existing public address system and to expand the existing general zone to include the connector bridge and locker rooms.

**2.2 POWER AMPLIFIER**

A. Single Channel 250 watts:

1. The power amplifier shall provide single channel, reliable continuous power of 250 Watts via an internal transformer at 70V.
2. Output connections shall be rear panel screw type terminations.
3. Input connections shall be rear panel plug in barrier strip terminations.
4. Switch selectable balanced/unbalanced inputs.
5. Input sensitivity of 775mV or 300mV shall be switch selectable.
6. 12 dB/octave@125Hz switch selectable high pass filter.
7. Integral short-circuit and thermal protection circuitry shall be provided with automatic reset.
8. Amplifier shall have internal fan.
9. Specifications:
    a. Frequency response: 20Hz to 20kHz.
    b. THD: <1.0% from 100Hz to 15kHz at rated transformer output.
    c. Power consumption: <900 Watts.
10. The amplifier shall be Biamp MPA250 or as approved.

B. Dual Channel 160W

1. The power amplifier shall provide dual channel, reliable continuous power of 65 Watts per channel at 4 ohms.
2. Output connections shall be binding post type terminations.
3. Input connections shall be rear panel plug in barrier strip terminations.
4. Input sensitivity of 775mV.
5. 18 dB/octave@180Hz switch selectable high pass filter.
6. Integral short-circuit and thermal protection circuitry shall be provided with automatic reset.

7. Amplifier shall be passively cooled.
8. Specifications:
    a. Frequency response: 20Hz to 20 kHz.
    b. THD: <2% from 20Hz to 20 kHz at rated transformer output.
    c. Power consumption: <300 Watts.

**2.3 LOUD SPEAKERS (GYMNASIUM)**

A. Natatorium (non-bleacher area)
1. Provide a pendant mounted high power handling speaker system meeting the following requirements:
    a. Frequency Range: 80-22,000 Hz
    b. Sensitivity (89.5 dB/W at 1 meter)
    c. Power Handling: 125 Watts RMS total 250 watts peak
    d. Impedance: 8 ohms nominal, with 70.7v transformer tap
2. Basis of Design: SoundTube RS800I or as approved.

**2.4 LOUD SPEAKERS (CEILING MOUNTED)**

A. General area/Locker Rooms
1. Provide an 8-inch flush ceiling speaker meeting the following requirements:
    a. Frequency Range: 65-17,000 Hz
    b. Sensitivity (1W/1 meter): 93 dB average
    c. Continuous Power Handling: 8W RMS
2. Basis of Design: Rauland ACC1400 with ACC100 Baffle, or as approved.

**2.5 ACCESSORIES**

A. 70V to Line Level Transformer
1. Basis of Design: RDL TX-70A.

B. Direct Box
1. Basis of Design: Pro Co DB-1.

C. Audio Control Relay
1. Basis of Design: RDL ACR-1.

D. Cables:
1. Rack mounted equipment: Furnish interconnecting cables as required.
2. Loudspeaker cable shall be WestPenn 227, 2c-12 Jacketed (for the 8 ohm speakers) or as approved.

E. Surge Suppression:
1. Headend equipment shall incorporate a UL1449 (second edition) listed device to protect all solid state equipment against power line surges and power line over-voltages.

**PART 3 EXECUTION**

### 3.1 OPERATION (GENERAL)

A. During an intercom page to the area served by the sound system, the sound system shall mute temporarily the other audio sources and broadcast the page.

B. The compact disk and the tuner shall also be remotely controlled via a hand held remote control.

C. Provide components for each of the sound systems noted per the following and Part 2 of this Specification.

### 3.2 GENERAL ZONE

A. Modify the general zone with additional speakers in the gymnasium expansion connector bridge and locker rooms as shown on the drawings to amplify and distribute program source.

### 3.3 GYMNASIUM ZONE

A. The system shall amplify and distribute program sources and shall include the following equipment as noted below or on the Drawings:

1. Networked Paging Station-1
2. Pendant Mount Speakers

### 3.4 INSTALLATION

A. Refer to the applicable one-line diagrams on the Drawings for system interconnections.

B. The Contractor shall supply all racks, wire, hardware, conduit, etc., required for the installation, and needed to provide completed usable sound amplification systems.

C. All equipment except portable equipment shall be firmly held in place. This shall include loudspeakers, enclosures, amplifiers, cables, etc. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three. All switches, connectors, jacks, receptacles, shall be clearly, logically and permanently marked. All wires and cables shall be identified at every termination and connection point with permanent type markers. All equipment shall be shock isolated for seismic conditions according to codes and regulations.

D. The Contractor shall take such precautions as are necessary to prevent and guard against electromagnetic and electrostatic hum, to supply adequate ventilation, and to install the equipment so that it shall be safely operated.

E. Care shall be exercised in wiring, to avoid damage to the cables and to the equipment. All joints and connections shall be made with rosin-core solder, or with approved mechanical connectors. All wiring shall be executed in strict adherence to standard broadcast practices.

F. Lines shall be run in separate ferrous conduits for microphone level circuits (levels below minus 20 dBm), line level circuits (up to plus 30 dBm), loudspeaker circuits (above plus 30 dBm), and power circuits. All other conduits shall be spaced not less than two inches from power conduits. Power conduits shall be bonded to the power system ground system. Power system conduits shall not be connected to the racks or to the audio system ground. Microphone and 600-ohm lines shall be insulated from the conduit and from each other for the entire conduit length. Microphone and 600-ohm line conduits shall be electrically grounded to the audio system ground point. Cables in conduit shall not be spliced. Low voltage D.C. for relay control or power supply shall be run in any conduit, except microphone line conduit.

G. The installation of all work shall be neat. All boxes, equipment, etc. shall be plumb and square. The Contractor shall keep the job adequately staffed at all times, including a designated field supervisor present on the job site, and in responsible charge during all phases of installation and checkout. This supervisor shall be the same individual throughout the execution of the work, unless circumstances beyond the control of the Contractor intervene. It shall be the responsibility of the Contractor to cooperate with the Owner in order

to achieve well-coordinated progress and satisfactory results. The Contractor shall schedule his work to prevent conflicts with other activities in the building.

H. Loudspeaker Phasing: For all drivers, red terminal (+) on driver, shall be connected to red terminal (+) on power amplifier, black terminal (-) on driver, shall be connected to black (-) terminal on power amplifier.

I. Freedom from Buzzes, Rattles and Objectionable Distortion: The Contractor shall apply a slow sine-wave sweep from 50 to 10,000 Hz at a level of six dB below rated power amplifier output voltage. The Contractor shall listen carefully for buzzes, rattles, and objectionable distortion. The Contractor shall correct any causes of these defects, unless the cause is clearly outside the sound amplification system equipment and installation, in which case the cause shall be brought to the attention of the Owner.

## 3.5 INITIAL POST-COMPLETION TESTS AND ADJUSTMENTS

A. Upon completion of the installation of all equipment, and when it is in full operating condition, the Contractor shall perform the initial post completion tests and adjustments, as specified hereinafter. Except as otherwise specified, this Contractor shall provide all instruments, equipment, labor, and materials necessary to complete the tests.

B. Loudspeaker Line Impedance: The Contractor shall measure and record the impedance and the resistance of the loudspeaker line, leaving the sound equipment rack (with the line disconnected from its normal driving source) as follows:

1. With the speaker wires disconnected from the speaker and shorted at the speaker end, read and record the speaker line resistance. At this time also check for any shorts to ground. Remove the short and connect the speaker. Read and record the speaker impedance. Note the frequency used for this measurement and record it with the speaker impedance. The impedance should be within 20 percent of the rated impedance of the speaker.

C. Gain Control Settings: The Contractor shall establish and record tentative normal settings for all gain controls. All gain controls on rack-mounted equipment shall be adjusted for optimum signal-to-noise ratio and signal balance and unless they are sub-panel mounted, they shall then be capped to prevent tampering. (Settings shall require further adjustment by the Contractor, a result of testing by the Owner.)

D. Hum and Noise Level: The hum and noise levels of the overall system shall be measured for each microphone input channel and line-level input channel. Gain controls shall be adjusted for optimum signal-to-noise ratio and such that full amplifier output would be achieved with minus 50 dBm input level at a microphone input and 0 dBm at a line-level input. Microphone and line-level inputs shall be terminated with shielded resistors of 150 and 600 ohms, respectively, for these measurements. The loudspeaker lines shall be disconnected and the power amplifier outputs shall be terminated with power resistors for these measurements. The value of the load resistor shall be equal to the nominal output impedance of the amplifier under test with plus 10, minus 0 percent tolerance. The power rating of the resistor shall equal the power rating of the amplifier.

## 3.6 DEMONSTRATION AND ACCEPTANCE TESTING OF COMPLETED INSTALLATION

A. After the Contractor has completed the initial tests and adjustments specified herein before, he shall notify the Owner in writing that the installation fulfills this specification, and is complete and ready for inspection.

B. The acceptance testing of the completed installation shall be performed with the support and cooperation of the Contractor. These tests shall be performed to demonstrate that the equipment is fully furnished and installed in compliance with the terms of the Contract Documents.

C. The Contractor shall demonstrate operation of each major component and of the complete installation, using each microphone furnished, and all other inputs, under all required operating conditions.

D. Listening tests shall include subjective tests by observers at various positions, listening under various operating conditions.

E. For the measurements of the overall frequency response and of the uniformity of sound coverage, the system output shall be adjusted to provide sound pressure levels of 70 to 80 dB, and a minimum measurement of the maximum output level, the system shall be adjusted for maximum level of reproduction without noticeable distortion.

F. To meet the minimum performance requirements the Contractor shall be responsible for:

1. Use of equipment specified in the manner specified: each component's conformance with its manufacturer's published specifications and other requirements as stated herein.
2. For providing and adjusting system equalizers, as specified herein.
3. Adjusting values of fixed equalizers, loss of pads and level balance attenuators and, if necessary, resetting transformer taps.
4. If these tests show that the equipment is in any way defective or at variance with the requirements of these specifications, the Contractor shall make any changes necessary at his expense, and shall also pay the expenses of any subsequent testing required to demonstrate compliance with the specifications in Contract Documents.
5. If the need for further adjustments becomes evident during the demonstration and testing, the Contractor's work shall be continued until the installation operates properly to the satisfaction of the Owner.

**END OF SECTION**

**SECTION 28 20 00**

**VIDEO SURVEILLANCE**

## PART 1 GENERAL

### 1.1 DESCRIPTION AND GENERAL SPECIFICATIONS

A. Provide the equipment, materials, and labor to install the systems shown on the Drawings and specified herein. This shall include (but not be limited to) provision of all cameras, server(s), storage arrays, software, programming, raceways, wire, cable, cabinets, boxes, line and low voltage wire and cable, patch cords, terminal modules, panels, outlets, jacks, connections, cable management, labeling, testing and all other material, equipment, and labor required to make the systems fully operational.

B. The intent of this Specification is to modify an existing Video Surveillance System and Network Video Recording System for viewing, recording, and retention of Video Surveillance video. The system shall be operational, fully tested and documented upon completion of the project. The Video Surveillance System and Network Video Recording System shall comply with the Codes and Standards referenced herein and with the manufacturer's installation instructions and requirements.

### 1.2 DEFINITIONS

A. Contractor: Within this section of the specifications, "Contractor" shall mean the Security Contractor performing this portion of the work.

B. Provide: Within this section of the specifications, "provide" shall mean to furnish and install.

C. NVRS – Network Video Recording System

D. RU – Rack Unit (1-3/4 inches of rack or cabinet space)

E. IPTV – Internet Protocol Closed Circuit Television

### 1.3 PROJECT SUMMARY

A. The project consists of adding cameras to the existing Network Video Recording System (NVRS) at the Yukon Kuskokwim Fitness Center in Bethel, Alaska.

B. The NVRS shall be a network video solution, utilizing a standard IP-based network infrastructure to transport and record digitized video signals from security cameras. The system will allow authorized users to view live and recorded video either locally within the building or remotely through a web interface.

C. IP cameras shall be used to capture the live video images of the areas under surveillance and shall stream digitized video signals over Category 6A cable to Ethernet network switches in the Main Telecom Room.

D. Connect the cameras, telecom horizontal cables, patch cords, fiber optic cable, fiber optic cable patch cords, Ethernet network switches, the Network Video Recording System (NVRS) Server to form a complete and physically separate Network Video Recording System network.

E. The project includes installation of video surveillance equipment, the structured cabling system infrastructure, and electrical upgrades to support the system.

### 1.4 WORK INCLUDED

A. The Contractor shall furnish all labor, equipment, wiring, supplies, materials, and programming necessary for the installation of a complete and operational Network Video Recording System in accordance with these Specifications, the drawings, and the terms and conditions of the Contract, except as specifically noted otherwise. Contractor shall be responsible to provide all system programming, test and checkout, and training for the work specified herein and detailed on the drawings.

B. The work of this section shall include, but not be limited to furnishing and installing the following:

1. Indoor, Fixed Digital (IP) Color Cameras
2. Outdoor Fixed Digital (IP) Lowlight Color Cameras
3. Varifocal Lens
4. Camera Housings
5. Camera Mounts
6. Provide Category 6A UTP patch cords for interconnecting Category 6A horizontal cables to cameras in accordance with Specification Section 27 20 10 Telcom Distribution System.
7. Provide Category 6A UTP patch cords used interconnecting Category 6A horizontal cables at telecom patch panels to the Ethernet network switches and Network Video Recording System Server in accordance with Specification Section 27 20 10 Telecom Distribution System.
8. Electrical boxes and raceways at device locations and equipment cabinets as necessary for mounting devices and interconnecting equipment
9. Firestopping pathways that penetrate fire-rate walls, floors, and ceilings.
10. All ancillary materials, including cable, wire and connectors necessary to provide a complete and operational system
11. Grounding and bonding of installed equipment

## 1.5 RELATED SECTIONS

A. 27 20 10 - Telecom Distribution System

## 1.6 REFERENCES

A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section.

B. H.264/MPEG-4 Part 10 Video Compression Standard

C. M-JPEG 10 Video Compression Standard

D. IEEE 802.3ab Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Gigabit Ethernet Network

E. IEEE 802.3af Power-over-Ethernet (PoE) Standard

F. IEEE 802.3g Wireless LAN Standard

G. IEEE 802.1Q VLAN Trouncing Protocol

H. IEEE 802.1 Quality of Service (QoS)

I. ASTM E-814 Fire Tests of Through-Penetration Fire Stops.

J. UL 1479 Fire Tests of Through-Penetration Firestop.

K. NFPA 70 - National Electrical Code (NEC).

## 1.7 COORDINATION

A. Coordinate the work of this section with the Contracting Agency as required to ensure that the entire work of this project will be carried out in an orderly, complete and coordinated fashion.

B. Supply all necessary supervision and coordination of information to any contractor or subcontractor who is performing work to accommodate the work of this section and minimize interferences.

C. Coordinate the exact mounting location and Field of View (FOV) for each camera with the Contracting Agency prior to installation.

D. The locations of NVRS and Video Surveillance equipment are diagrammatically expressed on the drawings. Exact locations of items of work shall be field coordinated. Report major discrepancies between locations of devices on the drawings and within the field to the Contracting Agency within three days.

**1.8 INTENT OF DRAWINGS**

A. The drawings are diagrammatic unless detailed dimensions are included. Drawings show close approximate locations of equipment and devices. Exact locations are subject to the approval of the Contracting Agency.

B. Anything mentioned in the specifications and not shown in the drawings, or shown in the drawings and not mentioned in the specifications, shall be of like effect as if shown and mentioned in both. In case of differences between the specifications and drawings, the stricter provision, as determined by the Contracting Agency, shall govern. Omissions from the drawings or specifications, or the incorrect description of details of work which are evidently necessary to carry out the intent of the drawings and specifications, shall not relieve the Contractor from performing such work.

**1.9 SUBMITTALS**

A. Product Data and Shop Drawings

1. Submittals shall include product data literature and shop drawings. Submittals shall include adequate descriptive literature, catalog cut sheets, shop drawings and other data necessary for the Contracting Agency to ascertain that the proposed equipment and materials comply with specification requirements.

2. Product data submittals shall consist of catalog cut sheets, technical data sheets, manufacturer specifications, brochures and/or diagrams necessary to illustrate a product, material or system for some portion of the work. Product data literature is required on all items of material and equipment and should be clearly marked, identifying specific items proposed.

3. Shop drawings shall include floor plans showing the exact locations of cameras and detailed elevation views of layouts within the Main Telecom Room and the Satellite Telecom Rooms showing equipment cabinets.

4. Prior to assembling or installing the work, prepare and submit shop drawings and product data literature for review and approval by the Contracting Agency.

B. Calculations

1. Bandwidth Calculations: Provide bandwidth calculations for the digital cameras using the frame rates, resolution and video compression standards specified and submit to the Contracting Agency for review and approval prior to construction. These bandwidth calculations will be used to verify that the specified backbone cable and related infrastructure will meet the required needs of the system.

2. Recording Storage Calculations: Provide recording storage calculations for the system using the total number of digital cameras, frame rates, resolution and video compression standards specified and submit to the Contracting Agency for review and approval prior to construction. These storage calculations will be used to verify that the specified storage will meet the minimum required storage retention time as specified below.

C. The Contractor shall not purchase any materials or equipment prior to receipt of appropriately reviewed and approved Submittals from the Contracting Agency.

D. Review of product data shall not relieve the Contractor from responsibility for deviations from the drawings or specifications, unless the Contractor has, in writing, called attention to such deviations at the time of submission and secured written approval.

E. The Contractor shall develop and submit complete Submittals and do so in a timely manner. By failing to do so, the Contractor agrees to be fully responsible for any and all damages which might be incurred by the Contractor's failure to do so.

F. Submittals shall include four (4) copies of Product Data Submittals and Shop Drawings.

G. Product Data Submittals and Shop Drawings shall be submitted forty (45) days from the date of notice to proceed.

**1.10 REGULATORY REQUIREMENTS**

A. All Work shall conform to the requirements of NFPA 70 and all local amendments.

B. All Work shall conform to the requirements of all Federal, State and Local Electrical and Telecommunications Regulations.

**1.11 QUALITY ASSURANCE**

A. All equipment shall meet or exceed the minimum requirements of NEMA, ASME, ANSI and Underwriters Laboratories.

B. All material and equipment furnished shall be new and unused and free from defects. Equipment shall be clean and free of damage or corrosion, and shall be of the best quality obtainable for the purpose intended.

C. Any specified item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item are not permitted, unless specifically noted otherwise and approved in writing by the Contracting Agency.

D. System hardware and software components shall be produced by a manufacturer regularly engaged in the production of Video Surveillance Systems and Network Video Recording System equipment for a minimum period of 5 years.

**1.12 CONTRACTOR QUALIFICATIONS**

A. The Network Video Recording System (NVRS) work specified in this Section is acknowledged to require special skills mastered by education, experience, or both. Bidders for the work described in this Section shall be specialty contractors, who may be a division of the Divisions 26, 27 and 28 Subcontractor.

B. The installing Contractor shall be a company specializing in the design, installation, and testing of electronic security systems and specifically Video Surveillance and NVRS systems.

C. The installing Contractor shall have a minimum of three years of experience in this specialized field and shall have completed a minimum of three projects similar in scope to this project.

D. All Work shall be performed by qualified individuals having at least three (3) years experience installing and/or maintaining Video Surveillance and NVRS systems. The qualified individuals shall have completed installation of at least two (2) systems of 25 cameras or more within the past five (5) years. Submit evidence of successful installation, Contracting Agency training and maintenance for a minimum of the previous five years. Provide listing of projects with verifiable references with names and telephone numbers. Qualified individuals shall be factory trained for the systems being provided as part of this Contract. Submit evidence of successful factory training no later than 30 days from Notice to Proceed.

**1.13 WARRANTY**

A. All work shall be guaranteed to be free from defects. Any defective materials or workmanship shall be replaced or repaired as directed by the Contracting Agency for the duration of the stipulated guarantee period.

B. The Contractor shall warrant all labor, workmanship, and materials provided under this Contract for a minimum period of 1 year from date of Substantial Completion or as specified elsewhere in these specifications.

C. If items supplied as part of this project have longer warranties, the Contractor shall match the longer warranty duration from the date of Substantial Completion.

D. If other individual Specification Sections require longer warranty, the Contractor shall match the longer warranty duration from the date of Substantial Completion.

E. The Contractor shall guarantee in writing all phases of the work against defective materials and workmanship. Should a failure occur within the warranty period, the Contractor shall provide all labor and materials necessary to restore the system to its' full and operating condition at no cost to the Contracting Agency.

**1.14 MAINTENANCE AND SERVICE**

A. General Requirements: Provide services and equipment necessary to maintain the entire NVRS system in an operational state as specified for a period of 1 year after Substantial Completion of the system. Provide all necessary material required for performing scheduled maintenance or other nonscheduled work.

B. Response Times: For the warranty period the following response times shall be maintained:

1. The initial call to the Contractor shall require the type of call to be classified as critical or non-critical. The nature of the problem and the effect on school operations will be the deciding factor in classifying the problem. For the purpose of defining the priority of the call, the Contractor shall have personnel accessible to DPS personnel via phone call-back within one (1) hour of initial call.

    a. Non-critical Items: These are defined as failures or problems that do not affect the overall safety, security, or operation of the school.

    b. Critical Items: These are defined as failures or problems that do effect the overall safety, security, or operation of the school. The failure of a primary server would be an example of a critical item requiring immediate remedy.

2. Non-critical items: The Contractor shall diagnose and remedy the problem during normal working hours of the next working day. The initial response shall be the morning of the next day if received before noon or by the noon the next day if received before close of business. Normal business hours are defined as 8 AM to 4 PM Monday through Friday.

3. Critical Items: Critical items require the Contractor to respond in an expedition manner. The Contractor shall be on-site within four (4) of the initial call. These calls will possibly need to be responded to outside of normal business hours.

C. If the Contractor fails to respond to the service request within the specified time, the DPS will have the right to repair the system without invalidating the warranty. In the event the Contracting Agency affects repairs because of Contractor non-response, the Contractor will be charged for the repair cost.

D. Software Upgrades: Contractor shall install any updates to the manufacturer's software for the NVRS equipment throughout and up to the end of the warranty period at no cost to the Contracting Agency.

**1.15 TRAINING**

A. Provide on-site training by a qualified, factory-trained instructor for designated operation personnel and maintenance technicians on the operation and maintenance of the system. If trained personnel from the factory are required for training, they shall be provided on-site by the Contractor at no additional cost to the Contracting Agency.

B. Provide the following training upon completion of final testing and acceptance of the system:
   1. Demonstrate operation of system in all modes of operation.
   2. Provide minimum of 2 hours of system maintenance training to designated personnel. Classes shall accommodate up to five (5) students at one time.
   3. Maintenance training shall cover all operations and technical training required for maintenance, preventative maintenance and system adds, moves and changes including detailed instructions on system software modifications.
   4. Provide minimum of 4 hours of operator training to system operators. Classes shall accommodate up to five (5) students at one time.
   5. Provide course syllabus for all training courses in advance of each course, with an outline of the topics, time allotted for each topic, targeted audience and training objectives. Submit training manuals to the Contracting Agency for review and approval a minimum of ten (10) working days in advance of scheduled training. Training shall not commence until training syllabus has been approved.
   6. Provide a sheet accompanying any training that includes basic system terminology and definitions.
   7. All training materials shall be of professional industry standard quality and provided in both hard and soft copy.

C. All training DVDs shall be of professional industry standard quality and produced on an industrial broadcast quality camera with a separate microphone attached to the trainer. Video specifications shall include:
   1. Video shall be shot in broadcast quality formats.
   2. Video shall be edited to eliminate valueless information.

D. Videotape classroom training sessions and provide one (1) master DVD and one (1) copy to the Contracting Agency.

E. Videotape the following training sessions:
   1. One (1) classroom session of the maintenance training for designated personnel.
   2. One (1) classroom session of the operator training for system operators.

**1.16 RECORD DOCUMENTATION**

A. Record documentation shall include:
   1. Operation and Maintenance (O&M) Manuals. (Hard and soft copy)
   2. Complete set of record as-built shop drawings. (Hard and soft copy)
   3. Complete test reports. (Hard and soft copy)
   4. Installed camera serial numbers (Hard and soft copy)
   5. Installed NVR serial numbers (Hard and soft copy)
   6. Installed network switch(es) serial numbers (Hard and soft copy)

B. Operation and Maintenance (O&M) Manuals.
   1. Upon completion of the project, submit a complete set of product data sheets for all products installed. Product data sheets shall be clearly marked, identifying the specific items installed.
   2. Where applicable, submit operations manuals and maintenance manuals for active and passive components of the installed systems.
   3. Submit four (4) identical sets of O& M Manuals.

C. See Section 01 91 00 – Commissioning for product and O&M manual submittal sequencing.

D. Record Drawings

1. Maintain a complete set of contract drawings. Use this set of drawings for showing as constructed installation of systems and equipment. Plans shall include, but not be limited to, showing exact location and heights of devices, and appropriate identification. Detail drawings shall show exact locations of equipment racks, cross-connects, and any other pertinent details.
2. Where any material, equipment, wiring or system components are installed differently from that shown, show such differences clearly and neatly.
3. This set of drawings shall be kept up to date as the job progresses and shall be made available for inspection by the Contracting Agency at all times.
4. Upon completion of the project, incorporate this set of drawings with as constructed details into the Shop Drawings using AutoCAD, version 2010. Submit four (4) full-size sets of drawings and the AutoCAD drawing files on DVD to the Contracting Agency

E. Test Reports

1. The Contractor shall be responsible for recording all test data. Copies of all test results are to be submitted for review by the Contracting Agency as part of final acceptance and subsequently submitted to the Contracting Agency for their records.
2. Submit test reports in both printed format and an electronic format to assist the Contracting Agency in the final review process. Printed test reports shall be provided in 8-1/2” x 11” three ring binders. Electronic copies of the test reports shall be in a pdf format.
3. Refer to the testing section of the specifications for details on the data that shall be included in the test reports.
4. Submit one (1) printed copy of the test reports and three (3) electronic copies of the test reports on separate DVDs to the Contracting Agency.

## 1.17 NETWORK VIDEO RECORDING SYSTEM SCOPE OF WORK

A. System Architecture

1. Provide IP cameras at the locations shown on the drawings to capture live video images of the areas under surveillance.

B. Camera Power Cabling

1. When required to keep cameras at listed operating temperature during cold or adverse weather, provide exterior cameras with built-in heaters and blowers available from the manufacturer. These heaters shall be designed to operate from the 15.4 watts that can be delivered from an IEEE 802.3af compliant Power over Ethernet (PoE) network switch, thus shall not require external power supplies or separate cables for powering of the heater and blowers.
2. Interior cameras shall be powered over the Category 6A cable provided in accordance with Specification Section 27 20 10 Telcom Distribution System from Power-over-Ethernet (PoE) compliant Ethernet network switches provided in accordance with this Specification.

C. Video Recording

1. The digitized video signals transported from the IP cameras over the network shall be stored and recorded on a NVRS server located within the Main Telecom Room.
2. Digitized video signals shall be recorded on the NVRS server for retrieval at a later date as required. Retention time of the stored digital images shall be a minimum of 30 days

before being written over at a frame rate of 8 frames per second for cameras provided under this Contract.

D. Monitoring and Control

1. The system shall be capable of monitoring both live and recorded video on authorized remote workstations. The system shall be capable of transmitting digital video signals from the local archive server or directly from IP cameras from the NVRS dedicated Ethernet LAN and allow remote viewing of live images via a web interface.

## PART 2 PRODUCTS

### 2.1 GENERAL

A. Protect all materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain. If items are damaged, do not install, but take immediate steps to obtain replacement.

B. Acceptable Manufacturers and Substitutions

1. Named manufacturers are the basis of design for this system.
2. The Contractor may submit a request for approval of equal products or materials. The request shall include product literature and a complete compliance checklist with individual specification paragraph performance requirements. The request shall be submitted to the Contracting Agency for review and possible approval within the specified time before the bid.
3. No requests for substitutions shall be considered after the bid opening.

### 2.2 INDOOR FIXED IP CAMERA

A. General

1. Camera shall be IP based and fully integrated and managed through a system software package.
2. Camera shall feature a built-in digital motion detector with alarm output.
3. Minimum Specifications:
   a. Compression: H.265, H.264 and Motion JPEG
   b. Resolution: 5 MP
   c. Frames Per Second:
      1). 30 fps in all resolutions
   d. PoE compliant: 802.3af
   e. Mounting: Ceiling/wall mounted dome enclosure
   f. Enclosure: dome
   g. Power: Power over Ethernet (PoE) from Ethernet network switches
4. Acceptable Manufacturers
   a. Vicon Roughneck AI V2005D

### 2.3 OUTDOOR FIXED MULTISENSOR IP CAMERA

A. General

1. Camera shall be IP based and fully integrated and managed through a system software package.
2. Camera shall feature a built-in digital motion detector with alarm output.

3. Minimum Specifications:
    a. Compression: H.265, H.264 and Motion JPEG
    b. Resolution: 20MP
    c. Frames Per Second:
        1). 30 fps in all resolutions
    d. PoE compliant: 802.3af
    e. Mounting: Ceiling/wall mounted dome enclosure
    f. Enclosure: dome
    g. Power: Power over Ethernet (PoE) from Ethernet network switches
4. Acceptable Manufacturers
    a. Vicon Roughneck AI V2000-WIR-360 Series

**2.4 CAMERA MOUNTING EQUIPMENT**

1. Provide mounting arms, brackets, adaptors, and accessories to mount cameras at the locations shown on the Drawings.

**2.5 VIDEO SURVEILLANCE CAMERA WIRING**

A. Provide one telecommunication horizontal cable to each camera in accordance with Specification Section 27 20 10 Telcom Distribution System.

**2.6 CATEGORY 6A PATCH CABLES**

A. Provide in accordance with Specification Section 27 20 10 Telcom Distribution System.

**2.7 UNSPECIFIED EQUIPMENT AND MATERIAL**

A. Any item of equipment or material not specifically addressed on the Drawings or in this document and required to provide a complete and functional NVRS System shall be provided in a level of quality consistent with other specified items.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

A. Install all equipment in strict accordance with the manufacturer's recommendations.

B. The installation shall comply with the requirements of NEC, OSHA and the rules, regulations and requirements of the FCC.

C. The installation shall also comply with federal, municipality, and state laws, ordinances, regulations, and codes applicable to the installation.

D. The Contractor shall ground all NVRS/Video Surveillance System equipment installed to the grounding bus bars provided in the Video Surveillance or telecom equipment cabinets.

E. All wiring at cameras shall be concealed and not exposed. The Contractor shall install wiring through camera mounts and housing or conduit / flexible conduit where required.

F. Provide labels on installed equipment. Labels shall be permanent, waterproof, and readable from one foot with permanent lettering and shall not be removable by normal cable handling or normal operations.

1. Screws for all junction boxes, pull boxes, and camera mounts and enclosures shall be tamper resistant.

**3.2 CAMERA LOCATION SURVEY**

A. Survey each camera location using a portable camera(s) with a variety of suitable lenses, monitor(s) and a portable power supply to power the equipment. Supply all required equipment and wiring for the survey.

B. Camera heights are not typically indicated on the drawings. Perform a Field Verification Survey with the Contracting Agency to verify the exact mounting locations, heights, and camera field-of-views for each camera prior to installation. Submit printed camera field of view pictures to the Contracting Agency for review and approval prior to mounting cameras.

C. Prepare forms to document information, such as names of participants, date of survey, camera location information, desired field of view, lenses selection, proposed mounting configuration and any other information as may be required.

D. Incorporate data from survey into installation of cameras.

**3.3 CONFIGURATION AND PROGRAMMING**

A. Provide all software, software licenses and programming for a complete and fully operational NVRS system, including but not limited to, all system interfaces graphics development, and camera setup.

B. Identify and request from the Contracting Agency any additional data needed to provide a complete and operational NVRS. Submit request to the Contracting Agency 30 days prior to programming the system. The Contracting Agency shall provide in writing to Contractor 14 days prior to programming any additional details for configuring the system.

C. Program and configure the system according to the specifications and drawings and any additional Contracting Agency requirements. The parameters to configure include, but are not limited to:

1. Camera Frame Rates
2. Video Resolution
3. Video compression
4. Image quality / compression ratio
5. Video Motion Detection
6. Continuous and Event recording
7. IP addressing according to the Contracting Agencys IP scheme
8. Security Management System on archive server and viewing workstations
9. Camera Field of Views from the camera survey
10. Security settings such as password protection
11. Operator and Administrator levels for users
12. Monitor call-ups, if required

D. Program and configure the Client Video Management software on the Monitoring/Control Workstations to enable users to view live and recorded video.

E. Create, develop, and install all graphics required to make the system operational.

**3.4 SYSTEM OPERATION**

A. The system shall provide continuous recording of video signals from cameras during normal operating hours and event recording after hours. Event recording shall be triggered by the use of Video Motion Detection either directly at the camera or programmed into the Video Management System. Coordinate with the Contracting Agency on the exact hours to program into the system for continuous and event recording.

B. The system shall automatically send notification to City of Bethel personnel via email upon activation of event recording after hours.

**3.5 TESTING**

A. Preparation

1. Prior to Final Acceptance Testing the Contractor shall inspect items of equipment and systems to ensure that:
   a. Installation is in accordance with manufacturer's instructions and recommendations.
   b. No defective items have been installed and there are no loose connections.
   c. System software and firmware are completely installed and fully operational.
2. The Contractor is required to provide and submit evidence of their completion of the manufacturer's checklists or test procedures prior to receiving approval to proceed with Cutover for new software installations.
3. Cabling is properly labeled, neat, and properly secured.
4. Power supplies are correct voltage, phasing, and frequency.
5. Grounding and transient protection systems are properly installed.
6. System documentation is complete, accurate, and has been properly submitted.

B. Test Plan

1. The Contractor shall prepare a Test Plan. The approved Test Plan shall serve as the basis for the detailed test procedures used in the field.
2. The Test Plan shall:
   a. Include an overall testing schedule for tests to be performed.
   b. Describe the schedule and method by which the Contractor shall perform testing of the system.
   c. Describe the types of test equipment, software, hardware, and simulators, proposed for each testing phase.
   d. Define and detail the test methodology for verifying the system requirements, satisfying the performance and availability criteria, and satisfying the Specifications.
3. The Contractor shall update the Test Plan as necessary and obtain the Contracting Agency's written acceptance of the Test Plan prior to beginning any testing.

C. Testing

1. Provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
2. Written notification of planned testing shall be given to the Contracting Agency at least 14 days prior to the test, and in no case shall notice be given until after the Contractor has received written approval of the specific Test Plan.
3. Ensure that test procedures confirm each specification statement and manufacturer requirement has been met or exceeded. An actual demonstration of each system function and a simulation of each system failure shall be provided.
4. An acceptance test period of thirty days shall begin at the start of the acceptance test. Any system failure during the acceptance test period will suspend the acceptance test. The thirty-day test period will restart when the required repairs have been made and certified.

5. Perform all tests in the presence of the Contracting Agency. The Contracting Agency reserves the right to accept any portion or activate any phase prior to acceptance of entire system.
6. As part of the field testing, make a DVD recording showing typical day and night views of each camera in the system and deliver the DVD with the report to the Contracting Agency. The DVD shall be recorded using the R/W DVD installed at the site. Submit the original DVD to the Contracting Agency as part of the documentation of the system.
7. The field testing shall as a minimum include:
    a. Verification that the video and signal or control cabling has been installed, tested, and approved.
    b. Verification that the NVRS is fully functional.
    c. Operation of all electrical, mechanical and software controls and verification that the control performs the designed function.
    d. Verification that all other ancillary and remote video equipment is functioning properly.
    e. Verification that video equipment with alarm indicators annunciate alarms properly and under the correct conditions.

**3.6 FIRESTOPPING**

A. Firestop, per the applicable codes, all fire-rated walls, floors or ceilings penetrated when installing the devices provided under this Specification Section.

B. Provide fire resistant UL approved firestopping systems to restore fire ratings to all wall, floor or ceiling penetrations. Firestopping systems shallt be UL classified.

C. All firestopping materials shall be installed in accordance with the manufacturer’s directions and recommendations.

**END OF SECTION**

# SECTION 28 31 00
# INTRUSION DETECTION

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. This section describes general requirements, products and methods of execution relating to the Security System for the project.

### 1.2 SCOPE

A. Modify the existing electrically operated security system as described herein. The system shall include, but not be limited to, programming, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and accessories required to provide a complete operating system.

### 1.3 CODES AND STANDARDS

A. Comply with the applicable codes and meet all requirements by Underwriters' Laboratories, Inc. and FCC Rules Part 68.

B. Provide all wiring in accordance with Article 725 of the National Electrical Code and local ordinances, and other sections of these specifications.

C. System shall meet all requirements of the Authority Having Jurisdiction.

### 1.4 TYPE OF SYSTEM

A. These specifications are based on existing equipment from NAPCO Security Systems, Inc., to set a standard for design and quality. No other manufacturers will be approved.

### 1.5 SUBMITTALS

A. Provide submittals for all products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Submit for approval manufacturer's catalog information with complete description of all panel mounted and remote equipment.

C. Include complete one-line risers, point-to-point wiring diagrams and graphic zone map.

D. Delete all superfluous information from submittal data such as model numbers and options for equipment contained on manufacturer's data sheets but not used on this project.

### 1.6 OWNER'S MANUALS

A. Furnish two (2) complete sets of Owner's Operation and Maintenance Manuals and other information necessary for use and upkeep of the system.

### 1.7 WARRANTY AND SERVICE

A. Warrant all components, parts and assemblies against defects in materials and workmanship for a period of 12 months. Warranty service shall be provided by a trained specialist of the equipment manufacturer.

B. Warranty response time shall not exceed seventy two (72) hours.

### 1.8 OPERATOR INSTRUCTION

A. After the system provided in this section is completely installed and operational, and at a time chosen by the Owner, provide the Owner's system operators with a total of two (2) hours of instruction on the operation of all equipment provided under this Section of the Specifications. This instruction shall also include the operation of all equipment that the alarm controller monitors, such as door switches, motion detectors and the building temperature monitoring device.

## PART 2 PRODUCTS

### 2.1 SEQUENCE OF OPERATION

A. Upon actuation of any automatic detection device, breaking of any magnetic contact, or a keypad initiated alarm, all alarm functions shall operate in appropriate fashion. Alarms shall continue to be actuated until manually reset on-site by authorized personnel.

B. The following additional functions shall be performed in the event of an alarm, as shown:

1. Security alarms shall activate the remote signaling circuit of the security panel, which shall seize the first voice line and dial a coded alarm message to the remote Central Station. If the first voice line seized is not usable, the second voice line shall be seized. Security panel shall transmit to a second telephone number, a duplicate of all the information sent to the first telephone number.
2. Building systems "trouble" signals shall be transmitted to the remote location as separate and distinct signals.
3. Shutdown of the system shall be accomplished at the panel by authorized personnel.

C. The arming procedure shall be as follows:

1. Entering the arming code on the keyboard shall cause the system to be armed.
2. System shall give visual and audible indication if it is armed while a non-auto-shunted zone is in trouble status. A low battery condition shall give an audible alarm upon arming.
3. System shall test standby battery and burglary alarm on arming by briefly activating the burglary alarm from the standby battery.
4. System shall dial the Central Station number to give a closing system status report and shall give visual or audible indication of the Central Station verification signal (ring back).
5. After system has been successfully armed and ring back has been received, the exit delay period (user programmable up to 4 minutes) shall begin (if the delay has not been canceled by the operator), allowing the operator to exit the building without causing an alarm.

D. The disarming procedure shall be as follows:

1. Entering the disarming code on the keyboard shall cause the burglary zones to be disarmed. The other zones shall remain operational.
2. The system shall dial the Central Station number to give an opening report and shall give visual or audible indication of the central station verification signal (ring back).

E. To enter the programming mode, the user shall be required to enter the correct keypad programming authorization code.

### 2.2 CONTROL PANEL

A. Provide additional cards, batteries and other accessories in the existing control panel to support devices added under the Gymnasium Expansion Project.

### 2.3 INITIATING DEVICES

A. Security Alarm:

1. Magnetic Door Switches: Provide magnetic door switches, equal to Sentrol #1078W, on all doors as shown on plans. Switch rated 1 ampere at 24VDC; 500 milliamperes at 48VDC. Contact transfer time 10 milliseconds maximum.

2. Passive Infrared Motion Detector: Provide passive infrared motion detectors with the following features:
   a. Long Range, Corridor Application (100 feet by 6 feet).
      1). Adaptive sensor utilizing passive infrared with automatic detection modes.
      2). 20 zones.
      3). Voltage 9 to 18 VDC.
      4). Current Drain: 15 mA @12 VDC.
      5). Alarm Output: SPDT, form C, normally closed 100 mA @ 30VDC; reset 2 sec ± 1 sec.
      6). Tamper output: SPST, 100 mA @ 30VDC.
      7). Adjustable Catch Sensitivity.
      8). Dimensions: 5.67 inches Diameter by 2.59 inches Height.
      9). Operating Temperature: +14 ° F to 122 ° F.
      10). Ceiling or wall mount to j-box.
      11). UL listed.
      12). PULNiX # PA-7030E with accessories required for location, mounting and application.
   b. Wide Range, Room Application (40 feet by 40 feet).
      1). Adaptive sensor utilizing passive infrared with automatic detection modes.
      2). 56 zones.
      3). Voltage 9 to 18 VDC.
      4). Current Drain: 15 mA @12 VDC.
      5). Alarm Output: SPDT, form C, normally closed 100 mA @ 30VDC; reset 2 sec ± 1 sec.
      6). Tamper output: SPST, 100 mA @ 30VDC.
      7). Adjustable Catch Sensitivity.
      8). Dimensions: 5.67 inches diameter by 2.59 inches high.
      9). Operating Temperature: +14 ° F to 122 ° F.
      10). Ceiling or wall mount to j-box.
      11). UL listed.
      12). PULNiX # PA-7012E with accessories required for location, mounting and application.
3. Glass Break Detector: Provide passive acoustic glass break detectors as shown on the plans with the following features:
   a. Recessed ceiling or wall mounted. Field adjust locations to maximize coverage of exterior glass.
   b. Omni-Directional electret microphone, tuned to peak frequency of breaking glass.
   c. Integrated-circuit digital signal analysis, for rejection of nuisance alarming by common sounds.
   d. Suitable for all glass types up to a 1/4 inch.
   e. 25 foot, 360 degree coverage pattern (measured to farthest point of glass).
   f. Tamper contact and latching or non-latch LED.
   g. Voltage: 9-16 VDC, powered from the security panel.
   h. Current Drain: 12 mA typ., 25 mA max.
   i. Relay: 16V, 50 mA, open 4 seconds on alarm.
   j. U.L. Listed.

k. Sentrol Recessed ShatterPro II Model 5822A-W, with 5829A-W mounting plate or as approved.

**2.4 CONDUCTORS**

A. All conductors shall be solid or stranded copper, of a size and type recommended by the manufacturer for each input and output.

B. Telephone wiring for use in conduit shall be No. 24 AWG copper, NEC Type CM, REA PE-71.

1. Provide two 4-pair cables (one pair is spare) between Security panel and telephone terminal board, for transmission of signals via telephone lines to the Central Station.

2. Terminate all four active pairs at both ends, and cap off the spares.

3. Provide RJ-series plugs, cords, and jacks as recommended by manufacturer or required by Serving Telephone Utility.

**2.5 SUBSCRIBER CODES AND SYSTEM PROGRAMMING**

A. Provide full programming of the System for all functions required by these Specifications, and any shown on the Drawings.

1. Coordinate with the OWNER to identify new zone(s) and programming requirements.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

A. Install conductors in accordance with Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables. Field devices shall be installed in accordance with Section 26 05 33 - Raceway and Boxes for Electrical Systems. All wiring shall be in conduit.

B. Provide 8 ½ inch by 11 inch graphic zone map, neatly drafted CAD plan, showing the floor plan, final zoning, locations of all keypads, and with “you are here” locator symbol. Mount under a piece of beveled edge Plexiglas and securely fasten to the wall adjacent to each keypad. Submit graphic for approval prior to fabrication.

C. Coordinate exact mounting locations with manufacturer's requirements and Owner prior to rough-in. Obtain statement of Owner approval.

D. Adjust sensitivity of system components in accordance with manufacturer's recommendations for the specific location.

**3.2 ZONING**

A. Except as otherwise specified herein, keep all existing building zones intact, and re-terminate as separate zones on the new Security Panel.

B. Locate existing end-of-line resistors, and replace as recommended by system manufacturer.

C. Extend existing Entry/Exit zone to serve new devices indicated on the Drawings.

D. Security devices in the Gymnasium Expansion shall be on one zone.

**END OF SECTION**

**SECTION 28 46 00**

**FIRE DETECTION AND ALARM**

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. This specification covers the requirements for the materials, installation, programming and configuration of modifications to the existing Addressable Fire Alarm System.

B. Furnish labor, equipment and materials to modify the existing fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein this Section.

### 1.2 RELATED SECTIONS

A. 26 00 00 - Electrical General Requirements

B. 26 05 19 - Low Voltage Electrical Power Conductors and Cables

C. 26 05 33 - Raceways and Boxes for Electrical Systems

### 1.3 REFERENCES

A. The equipment and installation shall comply with the current provisions of the following Codes and Standards:

1. National Electric Code, Article 760.
2. National Fire Protection Association Standards:
    a. NFPA 72 National Fire Alarm and Signaling Code
    b. NFPA 101 Life Safety Code
3. Local and State Building Codes.
4. Local Authorities Having Jurisdiction.
5. ULC, CSFM, BSA
6. Underwriters Laboratories Inc.

B. The system and components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:

| | |
|---|---|
| ULC S527 | Control Units for Fire Alarm Systems |
| UL 864 | Fire Detection and Control (UOJZ) |
| UL 268 | Smoke Detectors for Fire Protective Signaling Systems |
| UL 268A | Smoke Detectors for Duct Applications |
| UL 217 | Smoke Detectors Single Station |
| UL 521 | Heat Detectors for Fire Protective Signaling Systems |
| UL 228 | Door Holders for Fire Protective Signaling Systems |
| UL 464 | Audible Signaling Appliances |
| UL 1076 | Proprietary Alarm Units – Burglar (APOU) |
| UL 1638 | Visual Signaling Appliances |
| UL 38 | Manually Activated Signaling Boxes |
| UL 346 | Waterflow Indicators for Fire Protective Signaling Systems |
| UL 1971 | Standard for Signaling Devices for the Hearing Impaired |

| | |
|---|---|
| UL 1481 | Power Supplies for Fire Protective Signaling Systems |
| UL 1711 | Amplifiers for Fire Protective Signaling Systems |
| UUKL | Smoke Control Service |
| UL 2572 | Mass Notification Systems (PGWM) |

C. Americans with Disabilities Act (ADA).

D. International Standards Organization (ISO).

1. ISO-9000.
2. ISO-9001.

**1.4 SCOPE**

A. Provide in operating condition an electrically operated, electrically supervised digital fire alarm system as described herein. The system shall include, but not be limited to, control unit, power supplies, alarm initiating and notification devices, conduit, conductors, fittings and accessories required to provide a complete operating system. Units shall be located in accordance with plans.

B. Provide all related demolition in support of the project. Refer to the Plans and Section 26 00 00 Electrical General Requirements for additional requirements and information.

**1.5 QUALITY ASSURANCE**

A. Qualifications of Contractor

1. The Contractor shall be certified to work on the existing Simplex fire alarm system.
2. The Contractor shall have in house engineering and project management capability consistent with the requirements of this project. Qualified and approved representatives of the system manufacturer shall:
   a. Perform the detailed engineering design of central and remote control equipment.
   b. Produce panel and equipment drawings and submittals, and operating manuals.
   c. Coordinate system installation requirements, and final system testing and commissioning in accordance with these specifications.
3. The installation of the system shall conform to State of Alaska regulations.
4. The Manufacturer shall be a nationally recognized company specializing in fire alarm systems and shall employ factory trained, NICET certified technicians. The Manufacturer shall maintain a service organization in Alaska and have a minimum of 5 years of experience in the fire alarm industry.
5. The installer shall be a company specializing in the installation of fire alarm systems and be factory certified by the Manufacturer for their system. The installer shall have a minimum of 3 years of experience installing fire alarm systems. The installation shall be fully field verified by a factory trained and authorized technician with NICET Level III certification.

**1.6 SUBMITTALS**

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Submit Contractor Qualifications with first equipment submittal. See Quality Assurance above for specific requirements.

C. Delete or strike out superfluous information from submittal data, such as model numbers and options for equipment contained on manufacturer's data sheets but not used on this project.

D. Submit product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

E. Shop Drawings shall include drawings, details and calculations as required per IFC 907.1.2 Fire Alarm Shop Drawings and the Authority Having Jurisdiction (AHJ) **##** and the Municipality of Anchorage (MOA) per Title 23 (23.15.907.1.2 – Shop Drawings). **##**

F. Submit shop drawings of the system. Shop Drawings shall include the following:

1. Manufacturer's catalog information with complete description of panel mounted and remote equipment.
2. Conduit and device layouts, including location of the Fire Alarm Control Panels (FACPs), devices, circuiting and annunciator(s).
3. One-line risers and point-to-point wiring diagrams prepared specifically for this project.
4. Calculations verifying that SLC and notification appliance circuit's voltage drops do not exceed the limits further specified in this Section.
5. Calculations verifying standby battery capacity per NFPA 72, including manufacturer's published current consumption data for all equipment on the System.
6. Layout for the main FACP detailing the display and controls layout. Details shall include display, pushbuttons, switch and softkey controls with control labels and designations.
7. System Sequence of Operation: description and matrix including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. A list of input and output points in the system shall be provided with a label indicating location or use of IDC, SLC, NAC, relay, sensor, and auxiliary control circuits.
8. Product certification signed by a certified representative of the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
9. Records of system acceptance and certification. Submit upon completion of system testing certification.

G. Submit required Shop Drawings and documentation to the Authority Having Jurisdiction and obtain a written statement of Approval of the proposed system.

H. Operation and Maintenance Manuals: Submit electronic (pdf) files for review of the Operation and Maintenance Manuals (O&M Manuals) in accordance with Section 26 00 00 - Electrical General Requirements and Division 1. Upon final acceptance of the O&M Manuals review; furnish electronic (pdf) files of the final approved O&M Manuals .

## 1.7 WARRANTY AND SERVICE

A. Warrant components, parts and assemblies against defects in materials and workmanship for a period of 12 months from date of final completion. Warranty service shall be provided by a trained specialist of the equipment manufacturer. The specialist shall be based in a fully staffed branch office located within a reasonable distance from the job site.

B. Service availability: The supplier shall have sufficient stock on hand and have a fully equipped service organization capable of guaranteeing response time within 24 hours of service calls, 24 hours a day, 7 days a week to service completed systems.

# PART 2 PRODUCTS

## 2.1 GENERAL

A. These specifications are based on the existing Simplex 4100ES system. No other manufacturers are acceptable.

B. Equipment furnished for this project shall be new and unused. Components and systems shall be designed for uninterrupted duty. Equipment, materials, accessories, devices, and other facilities covered by this specification or noted on contract drawings and installation specifications shall be suited for the intended use and shall be provided by a single manufacturer. If the equipment submitted under this Specification is provided by different manufacturers, then that equipment shall be recognized as compatible by both manufacturers, and “Listed” as such by Underwriters’ Laboratories or other approved Nationally Recognized Testing Laboratory (NRTL).

C. UL Listed under UL 864 for Fire Detection and Control (UOJZ) and Smoke Control Service (UUKL).

D. Equipment shall be listed for use with the existing system.

**2.2 FIRE ALARM CONTROL PANEL**

A. Provide cards, batteries and other accessories in the existing Simplex 4100ES fire alarm panel as required to support the Gymnasium Expansion.

B. Connect devices installed under this project to the existing fire alarm control panel.

**2.3 ADDRESSABLE DETECTORS**

A. General:

1. Each addressable detector shall include a sensor base containing a microprocessor control unit for scanning the sensor, analyzing the sensor output and communicating the sensor status to the FACP and a separate sensor containing the actual sensing instrumentation.

2. The sensor shall connect to the sensor base with a twist-locking plug connection. No special tools shall be required to remove sensor from the base once it has been installed. Removal of the sensor from the base shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.

3. The control unit shall scan each sensor for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor, but shall indicate a "Wrong Device" trouble condition.

4. The sensor's electronics shall be immune from nuisance alarms caused by electromagnetic and radio frequency interference.

5. Detectors shall not require resetting or readjustment after actuation to restore normal operation.

6. Removal of the sensor head for cleaning shall not require the resetting of addresses or remapping of the device.

7. Detector assemblies shall be suitable for operation in the following environment:

a. Temperature: 32$^{o}$F to 120$^{o}$F (0$^{o}$C to 49$^{o}$C).

b. Humidity: 10-95% RH, non-condensing.

B. Sensor Bases

1. Standard Detector Mounting Base:

a. Bases shall be listed for ceiling or wall mounting.

b. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

c. Each sensor base shall include a communication transmitter and receiver having a unique identification and capability for status reporting to the FACP. Device address shall be located in sensor base to eliminate false addressing when replacing sensors.

2. Supervised Relay Mounting Bases:

a. Supervised relay mounting bases shall have the features of the standard sensor base and include a two or four wire connection for supervised relay.

b. In addition to supervised relay connection, supervised relay mounting bases shall have a wired connection for Remote LED Alarm Indicator or Unsupervised Relay.

3. Isolator Bases:

a. Isolator Bases shall have the features of the standard sensor base and shall have short circuit wiring isolation such that the input wiring is isolated from the output wiring when a short circuit occurs.

b. Isolator bases shall report back to the FACP when a short circuit is detected.

4. In-Duct Mounting

a. Where a smoke detector is required to be directly inserted into a low velocity duct, 4000 ft/min maximum air flow, 3 ft (0.91m) high x 3 ft (0.91m) wide maximum size, provide in-duct mounting base.

b. Detector housing shall have visible LED indicator showing power and alarm status.

5. Photoelectric Smoke Detector:

a. Photoelectric smoke detectors shall have the ability to set the sensitivity and alarm verification of each individual detector on the circuit. Each smoke detector may be individually programmed to operate at any one of seven (7) sensitivity settings. The detection algorithm shall incorporate intelligent data evaluation to filter out false and nuisance alarms caused by dust, dirt, etc. Detectors shall automatically generate a dirty sensor status and transmit that status to the control panel.

6. Multi-sensor Detector:

a. Multi-sensor detectors shall include photoelectric and fixed temperature/rate of rise sensors within the same device. Sensing characteristics shall be the same as described for each standalone sensor detailed above.

C. Duct Smoke Detector Housing:

1. Provide smoke detector duct housing assemblies to accept a standard, relay or isolator detector mounting base and sensor. The housing shall protect the measuring chamber from damage and insects. The housing shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing.

2. Provide remote status/alarm LEDs and Remote Test Stations as shown on the plans or as required by the AHJ.

3. Detector housing shall be listed for operation between 300 and 4,000 FPM (2 and 20.3 m/sec) air velocity.

**2.4 ADDRESSABLE CONTROL MODULES**

A. General:

1. Modules shall be capable of monitoring or controlling one or more system components that are not otherwise equipped for addressable communication. Modules shall be used

for monitoring of waterflow, valve tamper, non-addressable devices, and for control of AHU systems.

2. Addressable Modules shall be capable of mounting in a standard North American single gang box. Modules include cover plates to allow surface or flush mounting. Modules shall receive their operating power from the signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.
3. Modules shall have a diagnostic LED visible on the finished cover plate. The LED shall flash to confirm communication.
4. Modules shall be suitable for operation in the following environment:
   a. Temperature: 32°F to 120°F (0°C to 49°C).
   b. Humidity: 0-93% RH, non-condensing.

B. Provide module styles and quantities as required to meet design requirements:

**2.5 ADDRESSABLE MANUAL FIRE ALARM STATION**

A. The manual fire alarm station shall have a diagnostic LED visible from the front of the station without removing the cover. The led shall flash to indicate communication and go solid to indicate that the station has been activated.

B. Manual fire alarm stations shall be suitable for operation in the following environment:
1. Temperature: 32°F to 120°F (0°C to 49°C).
2. Humidity: 0-93% RH, non-condensing.

C. Provide Manual Fire Alarm Station single action type, red LEXAN. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units. Station shall be pull lever type; with integral addressable module arranged to communicate manual station status (normal, alarm, or trouble) to fire alarm control unit. Indoor Protective Shield: Where required, or indicated on the drawings, provide a factory fabricated, tamperproof, clear LEXAN enclosure shield and red frame that easily fits over manual pull stations that shall be hinged at the top to permit lifting for access to initiate a local alarm. Unit shall be NRTL listed. Lifting the cover shall actuate an integral battery powered audible horn intended to discourage false alarm operation. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

**2.6 NON-ADDRESSABLE NOTIFICATION APPLIANCES**

A. General:
1. Strobe appliances or combination appliances with strobes shall be capable of providing the “Equivalent Facilitation” which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA (AG)), and shall be UL 1971, and ULC S526 Listed.
2. Strobe appliances under this section are xenon strobe flash tube and associated lens/reflector system unless otherwise noted.
3. Strobe appliances under this section shall be synchronized via Autocall; fire alarm panels with NACs selected, IDNet NAC Extenders, separate strobe Synchronization Modules or separate Smart Sync Control Modules.
4. Shall be available in both wall mount and ceiling mount configuration.
5. The appliance shall be available in red or white housing and mount in standard electrical boxes.
6. Mounting accessories and wire guard as required for the installation or as noted on the drawings.

7. Notification device color shall match existing similar devices.

B. Strobes - V/O (Visible Only) :

1. Strobe shall be listed to UL 1971. The V/O enclosure shall mount directly to standard single gang, double gang or 4 inch square electrical box, without the use of special adapters or trim rings.
2. The appliance shall be provided with flash intensities of 15cd, 30cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific appliance.

C. Strobes (High Intensity) - V/O (Visible Only) :

1. Strobe shall be listed to UL 1971.
2. The V/O appliance shall mount directly to standard single gang, double gang or 4 inch square electrical box, without the use of special adapters or trim rings.
3. V/O appliances shall be provided with flash intensities of 135cd, 177cd and 185cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific appliance.

D. Horns – A/O (Audible Only :

1. Multi-tone appliance shall be listed to UL 464.
2. Tone selection of 520 Hz Horn, Broadband Horn, Bell, Chime, High/Low, Slow Whoop, or Siren shall be selected using an on-board DIP Switch. Output level shall be selectable as high or low.
3. 520 Hz tone shall be compliant with NFPA 72 Low Frequency Signal Requirements for Sleeping Areas.
4. Appliance shall mount directly to a standard single gang, double gang or 4 inch square electrical box, without the use of special adapter or trim rings.

E. Horn/Strobes - A/V (Audible Visible) :

1. Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464.
2. The appliance shall provide flash intensities of 15cd, 30cd, 75cd, 110cd, 135, and 185 candela. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe.
3. Appliance shall be listed to UL 464. Appliance shall include 520 Hz Horn, Broadband Horn, Bell, Chime, High/Low, Slow Whoop, or Siren and may be selected using an on-board DIP Switch. Output level shall be selectable as high or low. 520 Hz tone shall be compliant with NFPA 72 Low Frequency Signal Requirements for Sleeping Areas.
4. Appliance shall mount directly to a standard single gang, double gang or 4 inch square electrical box, without the use of special adapter or trim rings.

## 2.7 ANCILLARY DEVICES

A. Multi Voltage Control Relays:

1. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT or DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

## 2.8 CONDUCTORS

A. In general, conductors shall be of the sizes and types recommended by the system manufacturer.

B. Voltage drop on Notification Appliance Circuits shall not exceed 10% at the most distant device on each circuit.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. The entire system shall be installed in a workmanlike manner in accordance with approved manufacturer's manuals and wiring diagrams. Furnish conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices required for the complete installation. Wiring shall be of the type recommended by the NEC, approved by local authorities having jurisdiction for the purpose.

B. Penetration of floor slabs and fire walls shall be fire stopped in accordance with Section 26 00 00 - Electrical General Requirements and local fire codes.

C. Wiring shall be in metal raceways shared by no other system. Raceways shall be installed in accordance with Section 26 05 33 – Raceway and Boxes for Electrical Systems.

D. Field devices shall be installed in accordance with Section 26 05 33 – Raceway and Boxes for Electrical Systems. Paint boxes and covers red.

E. Wall mounted devices in finished areas such as manual fire alarm boxes and notification appliances shall be recessed in flush mounted junction boxes. Surface mounted box extensions shall not be used.

F. Install Conductors in accordance with Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables. No wire nuts shall be used. Wires shall be landed on device terminals, or terminal strips or blocks, and shall be labeled and numbered at their terminations. Wiring shall be installed in a neat and workmanlike manner. Bundles of wiring shall be secured with self-locking nylon cable ties, not tape.

G. Coordinate exact mounting locations with the reflected ceiling plans. Coordinate exact mounting heights with architectural elevations.

1. Where field conditions (such as conflicts with other features, obstructions that violate the placement rules of the applicable Fire Code, and the like) make it necessary to relocate detectors from the positions shown on the plans, such relocations shall be made in strict accordance with the applicable Fire Code, and shall be made at no additional cost to the Owner.

2. As far as possible within the rules of the applicable Fire Code, the final placement of exposed detectors shall present a uniform appearance.

H. Adjust each detector in accordance with manufacturer's recommendations for the specific location and circumstance.

I. Coordinate installation of duct mounted detectors with Divisions 23 and 25. Duct detectors shall be installed in accordance with NFPA 72 and manufacturer's recommendation to the greatest extent practicable. Proposed duct detector locations shall be submitted for approval prior to installation of equipment. Submit duct detector differential pressure measurements to verify proper operation of duct detectors.

J. Control relays shall be located within 3 feet of the device or circuit controlled in accordance with NFPA 72.

K. System installation and operations shall be verified by the manufacturer's representative and a verification certificate presented upon completion. The manufacturer's representative shall be responsible for an onsite demonstration of the operation of the system and staff training as required by the Contracting Agency.

L. Detectors and horn/strobes in the gymnasium shall be equipped with vandal resistant wire guards. Provide backing in ceiling and walls to withstand all forces that the guards must withstand.

M. Provide 3/4 inch C.O. with pull string between Fire Alarm Control Panel (FACP) and Telephone Terminal Board (TTB) for future use. This conduit shall be in addition to any conduits required for this project.

**3.2 FIRE ALARM SYSTEM SEQUENCE OF OPERATION**

A. The system shall identify off normal conditions and log each condition into the system database as an event.

1. The system shall automatically display on the control panel Liquid Crystal Display the first event of the highest priority by type. The priorities and types shall be alarm, supervisory, trouble, and monitor.
2. The system shall have a Queue operation, and shall not require event acknowledgment by the system operator. The system shall have a labeled color coded indicator for each type of event; alarm - red, supervisory - yellow, trouble - yellow, monitor - green. When an unseen event exists for a given type, the indicator shall flash. When all events of a given type have been displayed, the indicator shall change from flashing to steady.
3. For each event, the display shall include the current time, the total number of events, the type of event, the time the event occurred.
4. The user shall be able to review each event by simply selecting scrolling keys (up-down) for each event type.
5. New alarm, supervisory, or trouble events shall sound a silenceable audible signal at the control panel.

B. Operation of any alarm initiating device shall automatically:

1. Update the control/display as described above.
2. Sound alarm signals throughout the building at the evacuation rate.
3. Turn on strobe lights throughout the building.
4. Turn on a red alarm zone LED at the fire alarm control panel.
5. Operate control relay contacts to shut down air supply fans. Shutdowns shall be hardwired from the Fire Alarm System (i.e., not implemented via building automation controls) and immediate acting, and shall not be overridden by Hand-Off-Auto switches or other controls.
6. Operate control relay contacts to release all magnetically held smoke doors throughout the building. Provide separate circuit(s) as necessary for operation of door holders. If door holders are 120VAC, circuits shall be from the same panelboard used to supply the fire alarm control panel. If door holders are 24V, circuits shall be from the fire alarm control panel using 120VAC to 24VAC transformers. Door holder circuits shall be fused as necessary to prevent damage to the Fire Alarm System. Submit for approval proposed power sources prior to installation or connection of equipment.
7. Visually annunciate the zone of alarm on the remote annunciator panel. The visual indication shall remain on until the alarm condition is reset to normal.

**3.3 PROTECTION OF FIRE ALARM CONTROL UNITS**

A. Provide automatic smoke detection at the location of each fire alarm control unit(s) including fire alarm control panels, remote power supplies and remote battery supplies.

### 3.4 REMOTE DETECTOR INDICATORS

A. Provide remote LED indicators for duct mounted smoke detectors where the detector is mounted where the LED alarm indicator is not easily visible. Provide a descriptive label in accordance with Section 26 00 00 - Electrical General Requirements - IDENTIFICATION.

### 3.5 DEMONSTRATION

A. Each of the intended operations of the installed Fire Alarm System shall be demonstrated to the Contracting Agency and the Local Authority Having Jurisdiction by the Installing Engineered System Distributor.

### 3.6 TESTING AND REPORTS

A. Upon completion of the system installation, an Approved representative of the system manufacturer shall conduct a thorough test of the system and related devices and components of the system, and submit a written report of the findings to the Contracting Agency at least 72 hours prior to the substantial completion site observation**.**

B. Testing shall be in accordance with NFPA 72 requirements for re-acceptance testing of an existing system after modification.

C. The testing shall include, at the least, verification of the following:

1. The functional operation of each resettable initiating device (manual fire alarm boxes, detectors, etc.) and circuit.
2. The functional operation of each and every alarm device and circuit.
3. The functional operation of each monitored device circuit.
4. The functional operation of each control and output circuit.
5. The supervision function of each Initiating, Indicating, Monitoring, Control and Supply Circuit.
6. Central Station automatic signaling.
7. Proper initiation and execution of mechanical systems control sequences.
8. Verify that wire size, power supply, number of devices on a circuit, etc. are suitable to support 100% of devices being in alarm or operated simultaneously. Test shall include the following as a minimum:
    a. Place all detectors and monitor modules in alarm. Each shall display its address and alarm condition. At least the first ten devices on each circuit shall also have their alarm LEDs lighted, where applicable.
    b. Operate all control modules for the alarm or operated condition. Each module shall display its address and condition.
    c. Reset all alarmed and operated devices. The panel shall display the address of any off normal devices.
9. Test a representative number of detectors for alarm verification by momentarily testing for alarm. The detectors shall not initiate an alarm. Then test by placing the detectors in alarm such that it remains in alarm for the selected verification time. The detector shall initiate an alarm.
10. Test a representative number of detector for trouble by removing the detector from its base. The address and trouble condition for each shall be displayed. Insert a different type of detector into the base. The address and trouble condition shall be displayed. The detector shall return to normal only when the proper detector type is reinserted into the base.

11. Print out the English-language descriptor, currently sensed value, prealarm threshold value, alarm threshold value and status of each sensor in the system. Also print out the English-language descriptor and status of each module in the system. The printout shall also include the date and time.

**3.7 TRAINING**

A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

B. After the system provided in this Section is completely installed and operational, and at a time chosen by the Owner, provide the Owner's system operators and maintenance personnel and representatives of the local Fire Department with a total of four (4) hours of instruction on the operation, maintenance, and troubleshooting of equipment provided under this Section.

C. Training sessions shall be presented by a fully qualified, trained representative of the equipment manufacturer, who is thoroughly knowledgeable on the specific installation. Separate sessions shall be given for operation personnel (i.e.: facility staff and Fire Department) and maintenance personnel, with the length and content of the sessions tailored to the respective groups.

D. Provide an additional two (2) hours of follow-up instruction for review and clarification at a later time mutually agreed on with the Owner, if the Owner deems it necessary.

**3.8 DEMOLITION**

A. Provide related demolition in support of the project. Refer to the Plans and Section 26 00 00 - Electrical General Requirements for additional requirements and information.

**END OF SECTION**

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# Bethel 2045 Comprehensive Plan

JULY 2023


**Prepared for:**

City of Bethel
300 State Highway
Bethel, AK 99559

**Prepared by:**

DOWL
5015 Business Park Boulevard, Suite 4000
Anchorage, AK 99503

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# Acknowledgements

## Land Acknowledgment:

***The City of Bethel is located on the traditional lands of the Yup'ik People. We respectfully acknowledge the Yup'ik People's deep connection and stewardship with this land and honor their enduring presence and contributions to this community.***

Thank you to all Bethel community members who contributed to the planning process through Community Meetings, written comments, and the online Public Comment Map. The following groups and individuals also participated in the planning process through stakeholder meetings and other formal engagements:

| City of Bethel | Stakeholder Working Group | Other Groups |
|---|---|---|
| Peter Williams, City Manager | Ryan Butte | City Council |
| John Sargent, Grant Manager | Gisela Chapa | Planning Commission |
| Lori Strickler, City Clerk | Calvin Cockroft | Community Parks and Recreation Committee |
| Ted Meyer, Planning Director *(retired)* | Clarence Daniel | Port Commission |
| Pauline Boratko, Planning Assistant | Michelle DeWitt | Public Safety and Transportation Commission |
| Bill Arnold, Public Works Director | Kimberly Hankins | Public Works Committee |
| Xavier Mason, Finance Director | Ana Hoffman | |
| Leonard Hicks, Police Chief | Joseph Laraux | |
| Daron Solesbee, Fire Chief | Deanna Latham | |
| Ed Flores, Port Director | Brian Lefferts | |
| Evon Fox, Transit Manager | Philana Miles | |
| Stacey Reardon, Fitness Center Director | Stacey Reardon | |

CITY OF BETHEL
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June 7, 2023
Bethel Residents
Bethel, AK  99559

## Dear Community Member:

The City of Bethel is proud to present the Bethel 2045 Comprehensive Plan. The Plan is meant to guide development decisions over the next twenty years. It should be a useful tool for the City Planner, developers, and organizations as we work to secure funds for projects that improve the quality of life for residents, visitors, and provide an incentive for future employees and entrepreneurs to relocate to Bethel.

One consistent characteristic of Bethel is its ever-changing workforce. People move in and out of town on a regular basis. Recruitment and retention are major concerns for all employers in town, from the largest employers like the Yukon Kuskokwim Health Corporation and the Lower Kuskokwim School District to the smallest employers like auto repair businesses, restaurants, and hotels. The Comprehensive Plan will help us improve the roads, utilities, parks, and other critical infrastructure so that the social, economic, and educational life of Bethel inhabitants is not just acceptable, but preferable.

The City must move away from hauled water and sewer services as fast as possible and toward piped infrastructure. The City is under tremendous pressure to recruit and retain those with commercial driver's licenses with tanker endorsements to drive water and sewer haul trucks. There are 18 positions in the budget for drivers, but typically only 9 positions are occupied. The long-term solution to this problem is to purchase, install, and operate a piped water and sewer system and this is reflected in the Plan. In the short-term, the revenue generated from the 3% increase in water and sewer rates every July 1st will not be enough to sustain the water and sewer enterprise fund and keep it in

the black. The pending rate study by DOWL will show that the water system pays for itself, while the cost of the sewer system is increasing faster than the sewer system revenue contribution. Bethel City Council will have to take a hard look at the study once it is published and see if they have the political will to increase rates.

City administrators and council members will have to answer some hard questions like these: (1) Should we raise the sales tax rate? (2) Should we reallocate the .05% sales tax portion currently going to the YK Fitness Center back to the General Fund? (3) Should the City stop giving away a portion of the alcohol tax revenues in the form of Community Action Grants and dedicate that money to the General Fund?

Hardening the City-owned gravel roads with new palliatives like EK35 in Bethel is vital for dust control. Minimizing dust reduces the harmful respiratory effects on people (especially pedestrians and bicyclists), improves visibility, and keeps the roads intact.

The City faces the challenge of working with federal and state rules and regulations that often function as barriers to small communities like Bethel. The City continually seeks grant funds with minimal match requirements or loans with large forgiveness provisions. The City hopes it gets traction with its recently expressed criticisms of USDA-RD program conditions and EPA-funded State Village Safe Water provisions to federal congressional delegates and State commissioners.

The community of Bethel needs more low-income housing. The recent Covid-19 pandemic years and high inflation aftermath have hurt low-income families. The City must work to assist developers in planning, design, and constructing safe, affordable homes and apartments.

The City Dock, Petro Port, Seawall, Small Boat Harbor, and Float Plane Landing Area represent the collective waterfront responsibilities of the Port of Bethel. Seeking funding to repair and replace these facilities is essential. Waterfront operations impact neighboring river communities and regional villages through transshipments and access to Bethel by boat.

As inflation skyrockets, Bethel must search for alternative revenue sources and exploit current revenue streams to its advantage. It must purchase gravel and road implements to maintain 18 miles of gravel roads that increase in number every time a new subdivision comes online. It must operate and maintain its 31 buildings and 30 pieces of heavy equipment. The General Fund consists of sale taxes and fees. It’s these funds that are used to maintain buildings and roads belonging to the City. The City might need to raise the sales tax in the future to maintain these services.

The 2045 Comprehensive Plan is full of goals, strategies, and action plans to accomplish the goals. It is truly comprehensive in nature. It covers housing and land use, local and regional transportation, public facilities and services, people, and the economy. The Plan provides historical context as it weaves in the diverse human elements that form the Bethel community and lays out logical paths for future development.

Bethel is the largest rural community in Alaska. It is the heart of the YK Delta region, home to 26,000 Yup'ik people in 56 village communities. Bethel will continue to grow as a hub community and serve as a prominent place for regional organizations, state and federal agencies, and new businesses to thrive.

Thank you to all the stakeholders who contributed to the development of the Comprehensive Plan. Your voices were heard and incorporated into the plan. DOWL did an excellent job soliciting input from the community, asking questions that only we could answer for ourselves, putting our ideas on paper, and editing those ideas to shape the final version of the plan. This plan is truly a collaborative effort that we can all use to for our mutual betterment.

As I retire from City of Bethel employment, I hope those that come after me delve into the Bethel 2045 Comprehensive Plan and the City's Long Range Transportation Plan and use them in their work to make practical decisions that make Bethel a fantastic place to live, work, and play.

Sincerely,



**Peter A. Williams**
City Manager



# CHAPTER 1
## Introduction

# 1: Introduction

## 1.1 Plan Purpose

A comprehensive plan guides the long-term physical, social, and economic development of a community. Because it can be difficult to keep long-term community goals in sight while working on day-to-day functions, cities use the comprehensive plan as a reference tool that guides community decisions and actions. That is the critical function of the Comprehensive Plan: it serves as a tool to spotlight community goals and identify the strategies and specific actions that are needed to work towards those goals.

The authority for land use regulations in Alaska is detailed in the Alaska Statutes Title 29, Municipal Government. Per Alaska state law, incorporated cities such as Bethel are required to prepare comprehensive plans that are reviewed and updated as necessary – usually every ten years. A comprehensive plan should be adopted by ordinance, and it may be reviewed and revised as needed. Bethel's Comprehensive Plan was last updated in 2011 and set goals for the City looking towards 2035. Using the 2035 plan as a starting point, the plan has been updated to consider and identify the community's vision for Bethel in 2045.

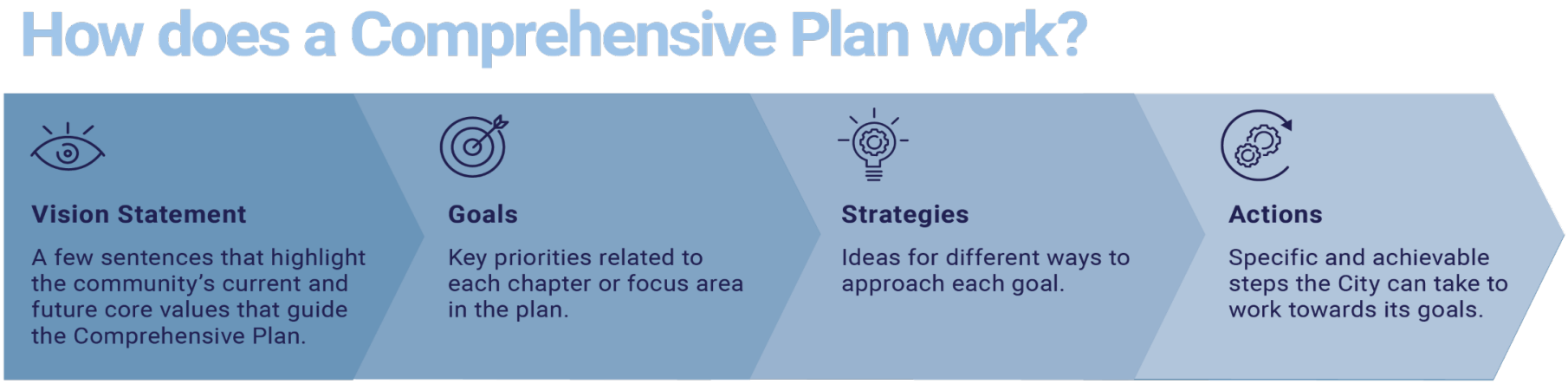
The typical comprehensive plan is based on a 20-year horizon and is intended to be flexible enough to adjust to unanticipated changes in social or economic conditions, while providing sufficient guidance to move the community in the desired direction.

A comprehensive plan is a policy document that guides the long-term physical, social and economic development of a community. As suggested by the word "comprehensive," this type of plan looks at a variety of issues that contribute to or are affected by land use development patterns. The comprehensive plan outlines the City's vision and goals, and explores policies intended to guide decision making by the City government. Most importantly, the purpose of the plan is to inspire action and be incorporated into everyday decision making. The Comprehensive Plan will continually play an active role in community planning and decisions.



## 1.2 Components of this Plan

A thorough examination of existing community conditions is critical to inform the comprehensive plan update. Chapter 2 of this document provides the existing conditions basis for this document. The baseline conditions described in Chapter 2 inform the Vision Statement of this document and the Goals, Strategies, and Actions for each plan chapter. The Vision Statement, Goals, Strategies, and Actions components are defined in the graphic below.




The chapters in this plan are organized by topic: Housing and Land Use (Chapter 3), Local Transportation (Chapter 4), Regional Transportation (Chapter 5), Utility Infrastructure (Chapter 6), Public Facilities and Services (Chapter 7) and People and Economy (Chapter 8). Each chapter identifies several goals, or high-level priorities, related to the topic for that chapter. Under each goal, strategies bridge the gap between the goal and the actions needed to achieve the goal. Lastly, actions serve as a "to-do list" for the City to work towards its goals and vision.

## 1.3 Plan Development Process

To update the Comprehensive Plan, the project team reviewed each section of the past plan and conducted research on changes within the community and its priorities. This process included extensive discussions with City staff, committees, commissions, stakeholder organizations, and community members. The focus of the update was to write action items that are concise, implementable, and in line with City goals for 2045.

Community input was critical to the update process. A Stakeholder Working Group was formed with representatives from various organizations in Bethel, including:

| | |
|---|---|
| **City of Bethel** *(the City)* | **Bethel Native Corporation** *(BNC)* |
| **Orutsararmiut Traditional Native Council** *(ONC)* | **Lower Kuskokwim School District** *(LKSD)* |
| **Association of Village Council Presidents** *(AVCP)* | **Alaska Department of Transportation and Public Facilities** *(DOT)* |
| **Yukon-Kuskokwim Health Corporation** *(YKHC)* | **Yukon-Kuskokwim Fitness Center** |

Two Community Meetings to collect public input were held in March of 2022 and April of 2023. Presentations or work sessions were completed with most of the City Commissions and Committees, as well as City Council. The project team created a public project website with information and an interactive Public Comment Map to collect place-specific input. Other feedback and input was gathered through direct communication from community members.



## 1.4 Vision Statement

Stakeholder input was received through workshops with the City of Bethel and conversations with the Bethel community to establish a vision statement. This vision statement serves as the foundation for the updated Comprehensive Plan's goals, strategies, and action items – the guiding idea as Bethel looks towards how it will grow and change in the future.

**Vision Statement**

**Bethel is the hub that connects the communities of the rural Yukon-Kuskokwim Delta region.**

**Bethel is a growing, diverse community that strives to improve quality of life, affordability, and opportunities through strategic development that responds to Bethel's remote location.**

## 1.5 Plan Overview and Organization

The main body of the Comprehensive Plan is organized by areas of interest, providing background information and relevant goals, strategies, and action items in each chapter. To assist with the implementation of the plan, the appendices of this document organize the action items by the department that would be responsible for leading the implementation. Even as the people in City leadership and community members involved in planning may change over time, the organization of the Comprehensive Plan can provide continuity.

The Plan Chapters and the Plan Appendices are outlined in Table 1 below.

*Table 1: Plan Chapters and Plan Appendices*

| | Plan Chapters | Plan Appendices |
|---|---|---|
| Organization | Organized into chapters that focus on different topics (like Housing & Land Use, Local Transportation, etc.), as well as more focused sections (like GIS Mapping, Public Transportation, etc.) | Organized into lists for each City department (like City Clerk, Grant Manager, Planning Department, etc.) |
| Contents | ■ Background information and map figures<br>■ Goals, Strategies, and Actions relevant to each chapter. *Actions have symbols indicating which department is responsible, or which Appendix to reference for more notes about implementation.* | ■ Goals, Strategies, and Actions relevant to each department<br>■ Detailed additional notes to help with implementing the Actions – past context, clarifications, new ideas, other departments to collaborate with, etc. |

The areas of interest from Chapters 3 through 8 are outlined below:

## Chapter 3: Housing & Land Use

1. Address potential barriers to housing development.
2. Facilitate more affordable housing development and access to affordable housing.
3. Reserve land to accommodate community needs and desired development.
4. Identify areas that are good candidates for infill development and take steps to facilitate their development.
5. Using the Future Land Use Plan Map and its land use designations, encourage future development to have an organization of uses that is compatible.
6. Make spatial information and maps available to the public online using GIS.

## Chapter 4: Local Transportation

1. Use the Long Range Transportation Plan (LRTP) to guide all local transportation facility planning.
2. Plan for an organized, proactive approach to surface transportation facility maintenance.
3. Develop the surface transportation network to reduce travel times, alleviate congestion, and support future development.
4. Design new and reconstructed streets with a focus on providing safe and comfortable routes for all transportation modes and all users.
5. Improve and expand the trail system.
6. Strategically seek funding for transportation facility construction and maintenance.
7. Improve the public transit system to be more convenient and responsive to the community's needs.
8. Evaluate site development codes to better support safe access for all transportation modes.

## Chapter 5: Regional Transportation

1. Create a well-functioning airport area for travelers and businesses.
2. Support DOT&PF in airport operations and planning.
3. Study and plan for potential changes to the river's course that may impact port operations.
4. Maintain adequate port infrastructure to support shipping operations.
5. Maintain infrastructure to support the use of small boats and float planes for transportation, commerce, subsistence, and recreation.
6. Support the improvement and expansion of other modes of regional transportation.

## Chapter 6: Utility Infrastructure

1. Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gases.
2. Regularly seek ways to lower water and sewer bills for customers.
3. Transition Bethel's water and sewer utilities to fully piped systems serving all residences and businesses.
4. Facilitate broadband development within the City of Bethel to advance community access to reliable internet service.
5. Prolong the life of the existing landfill.

## Chapter 7: Public Facilities & Services

1. Enhance the reliability and efficiency of the City workforce.
2. Communicate regularly and effectively with the community through various channels.
3. Optimize the management of City revenue and spending.
4. Manage City-owned land in an efficient, cost-effective, and forward-thinking manner.
5. Manage updates to City facilities and equipment in an efficient, cost-effective, and forward-thinking manner.
6. Improve public safety facilities and services in Bethel.
7. Target specific public safety concerns within Bethel.
8. Enhance the role of parks in the Bethel community.
9. Enhance recreational facilities and programs in Bethel.
10. Enhance the network of trails and open spaces in Bethel.

## Chapter 8: People & Economy

1. Promote broad access to high-quality education, training, and employment opportunities in Bethel.
2. Minimize potential negative impacts to Bethel from the Donlin Mine efforts and maximize potential benefits.
3. Support subsistence rights and access to subsistence resources in Bethel and the surrounding region.
4. Prepare the City for a broad range of potential climate change impacts.
5. Support locally-specific cultural activities and attractions in Bethel.
6. Foster a thriving local business community.
7. Support and expand tourism and visitation to Bethel.

## Appendices

As discussed above, the Appendices repeat action items from the Plan Chapters, but categorized by which City department is responsible for leading the implementation. Each appendix serves as a "to-do list" for a separate City department, along with additional context or ideas gathered during plan development that are not included in the chapters.

The Appendices are listed in order below. To show which department is responsible for each action in the Plan Chapters, the circular icons below are used throughout the plan.

| | | | |
|---|---|---|---|
| Appendix 1: | City Clerk | CC | |
| Appendix 2: | City Manager | CM CM* | *If action items in plan chapters are listed as CM*, they are not intended to be City Manager actions; the City Manager should assign them to the appropriate party.* |
| Appendix 3: | Finance Department | FI | |
| Appendix 4: | Fire Department | FD | |
| Appendix 5: | Grant Manager | GM | |
| Appendix 6: | Human Resources | HR | |
| Appendix 7: | Information Technology | IT | |
| Appendix 8: | Landfill Manager | LM | |
| Appendix 9: | Parks and Recreation | PR | *Some action items are assigned to Parks and Recreation although this is not currently a City department, recognizing that the community is advocating for greater emphasis on the management of parks and recreation. In the interim, Public Works and the City Manager should continue to work together to track and work on these action items until a Parks and Recreation department is created. The Community Parks and Recreation Committee can also assist with providing input on delegation of responsibilities.* |
| Appendix 10: | Planning Department | PL | |
| Appendix 11: | Police Department | PD | |
| Appendix 12: | Port of Bethel | PO | |
| Appendix 13: | Public Works Department | PW | |
| Appendix 14: | Transit Manager | TM | |

# CHAPTER 2
## Existing Conditions

# 2: Existing Conditions

The City of Bethel is the regional hub of the Yukon-Kuskokwim Delta (Y-K Delta). The city is situated on the outer bank of a bend in the Kuskokwim River, approximately 40 miles inland from the Bering Sea. Much of Bethel's 44 square miles is undeveloped land within the Yukon Delta National Wildlife Refuge, and the city is remotely located off the Alaskan road network, about 400 air miles from Anchorage.

The delta region stretches across 59,000 square miles and is the historic home of the Yup'ik people; 56 villages across the region rely on Bethel as a major resource for transportation, government, education, health services, and commerce.




*Aerial view of Bethel, its city limits, and the locations of a few of the surrounding communities.*

## 2.1 History of Bethel

The Yukon-Kuskokwim Delta region has been home to Native cultures, including Yup'ik, Siberian Yup'ik, and Cup'ik people, for thousands of years. Several Yup'ik settlements were located near present-day Bethel's location. In 1867, shortly after the United States purchased Alaska from Russia, the Alaska Commercial Company opened three trading posts on the Kuskokwim River. In 1885, the Moravian Church established a mission, store, and school near one of these trading posts and a Yup'ik village called "Mumtrekhlogamute" or "Mamterillermuit" (translated to "smokehouse people" or "village of many fish caches").

In the early twentieth century, Bethel began to emerge as the regional hub it is today, with the establishment of a post office, the mapping of a key deep-water channel for freight, the opening of federal and state agency offices, and the establishment of schools to serve families moving to the region. After a series of epidemics in the area, many native children from villages across the region were placed in orphanages in Bethel, further expanding the Bethel population. Building on existing aviation and government activities, the U.S. Military had a presence in Bethel since World War II and the Cold War era.

Bethel was incorporated as a city in 1957. A regional high school was built in the early 1970s. By the 1980s, Bethel had grown to be the largest town in western and arctic Alaska; public and private industry increased, and subdivision development boomed. Today, Bethel is the eighth most populous city in Alaska.

## 2.2 Population and Demographic Information

According to U.S. Census Bureau data for 2020, the population of Bethel is approximately 6,325 people. The table below shows a general trend of population growth over the decades of the past century, as well as an increasing percent of the census area living within Bethel city limits. However, Bethel's population and percentage of the census area population decreased between 2009 and 2020. Recent acceleration of migration out of villages and rural Alaska is likely the result of high energy and food costs and changing generational expectations. This trend is both drawing people from villages to regional hubs like Bethel, and from regional hubs like Bethel to Anchorage.

Bethel is a growing and diverse community. According to the 2020 American Community Survey (ACS), 79 percent of the population identify as people of color, and 63 percent identify as Alaska Native. Alaska Native organizations in the area include tribal government Orutsararmiut Traditional Native Council (ONC), village corporation Bethel Native Corporation (BNC), and regional corporation Calista Corporation. As of 2019, only six percent of Bethel residents were born outside of Alaska (down from 30 percent in 2000).

The median age of the Bethel region is 29, with people 17 years and under contributing to 31 percent of the population. According to the ONC and City of Bethel 2010 Long Range Transportation Plan, two important and fast-growing population subgroups in Bethel are seniors and youth. It is anticipated that Bethel will continue to evolve as a center for education and workforce development for area youth, and as a center for specialized facilities and services for the region's elderly residents, further accelerating the growth of these population subgroups.

According to the 2020 ACS, there are approximately 1,618 households in Bethel, with an average of 3.3 people per household (significantly above the U.S. average of 2.51 people per household). The median household income in Bethel is $86,624 (including income outside of work such as Alaska Permanent Fund or Native corporation dividends) and the median household earnings for work is $42,247.

*Table 2: City of Bethel and Bethel Census Area Population over Time*

| Year | City of Bethel | Bethel Census Area | Bethel as % of Census Area |
|---|---|---|---|
| 1920 | 221 | - | - |
| 1930 | 178 | - | - |
| 1939 | 376 | 4,026 | 9.3 |
| 1950 | 651 | 4,670 | 13.9 |
| 1960 | 1,258 | 6,360 | 19.8 |
| 1970 | 2,416 | 8,917 | 27.1 |
| 1980 | 3,576 | 10,999 | 32.5 |
| 1990 | 4,674 | 13,656 | 34.2 |
| 2000 | 5,471 | 16,006 | 34.2 |
| 2009 | 6,522 | 17,352 | 37.6 |
| 2020 | 6,325 | 18,666 | 33.9 |

*Source: U.S. Census Bureau. The Y-K Delta includes the approximately 37 villages of the Bethel Census Area and 19 additional villages of the Wade Hampton Census Area at the north end of the Delta. The data above does not include the population of the Wade Hampton Census Area.*

## 2.3 Economy

Bethel's status as a regional hub has driven the growth of its population over the city's history. For this to continue, available local opportunities will need to be able to support residents in the face of a very high cost of living. The cost of fuel increases the cost of household or business expenses like heating, electricity, and transportation. Most goods bear an extra cost since they must be shipped to the city by barge or plane.

According to 2020 ACS data, just over 30 percent of the employed population in Bethel works in Educational Services, Health Care, and Social Assistance. Other prominent employment sectors include Transportation, Warehousing, and Utilities (about 10 percent of the working population) and Professional, Scientific, and Management, and Administrative and Waste Management Services (another approximately 10 percent). While there is some overlap with the previously mentioned industries, it is also notable that almost 30 percent of the workforce is classified as government workers.

Economic activity in Bethel extends beyond employment with larger organizations. There are currently over 500 businesses licensed in Bethel. Several local artisans produce artwork, jewelry, clothing, and other items that are sold locally, in Anchorage, and worldwide. Some of the economy is supported by visitors including business travelers and people visiting friends and relatives, and some tourists come for outdoor recreation activities including bird watching and sport fishing. Subsistence activities including fishing, hunting, and berry

picking are an important part of life in Bethel and supplement many residents' incomes.

According to 2022 labor statistics from the Alaska Department of Labor and Workforce Development, the Bethel unemployment rate has recently been hovering around 10 to 11 percent, while the statewide unemployment rate is currently closer to approximately 4 or 5 percent. The City has noted shortages of certain types of skilled workers, such as for jobs in the Public Works department. This indicates an opportunity to improve local career training and help connect people with work, which would also help with retaining homegrown talent in the Bethel workforce.

## 2.4 Land Use and Transportation Patterns

Bethel's role as a regional transportation hub has shaped its development. Historically, the city grew around its port and along the Kuskokwim River, with older neighborhoods, parks, trails, and water access for the port, small boat harbor, float plane access, and seasonal ice road access on the eastern side of town. Further inland, the Chief Eddie Hoffman Highway extends from the airport at the west side of town and east towards the civic and commercial center of Bethel; this highway is the only road in Bethel that is classified as an Alaska State Highway and connects the airport to critical destinations such as the post office, hospital, and government offices. The airport is Part 139 certified by the Federal Aviation Administration (FAA) and typically ranked the second-busiest general aviation airport in the state due to its role as the primary hub for the region. Transportation within Bethel includes a variety of modes, including personal vehicle; public transportation (City bus service); foot transportation along roads, trails, and boardwalks; bicycle; four-wheeler or snowmachine; or taxicab.

Bethel's "downtown" is primarily oriented along the highway; this corridor also includes the cultural center, tribal organization offices, the University of Alaska-Fairbanks Kuskokwim Campus, stores, restaurants, and religious institutions. At the end of the highway, Ridgecrest Drive curves north to provide access to the Lower Kuskokwim School District campus, public works facilities including the sewage lagoon and landfill, the Fitness Center, Pinky's Park, and many residential subdivisions. Other residential subdivisions have emerged throughout Bethel, sprouting from other locations along the highway.

An aerial view of Bethel shows development along a curved "spine" of the highway and other major roads, with a large undeveloped area north of the highway, south of Ptarmigan Street, west of the part of town along Ridgecrest Drive, and east Tundra Ridge Road (currently in progress) and H-Marker Lake. This area is often referred to as the "Donut Hole." It includes some areas of tundra that are likely to remain open space, but also City, BNC, and other privately-owned land or native allotments that could potentially be developed, especially if more road connections are made through the space. For example, the City plans to support infill opportunities and improved connectivity with a new north-south road that would connect the highway north to the Fitness Center and beyond to Ptarmigan Street (currently being nicknamed "Donut Hole Road" during the planning process).

## 2.5 Environmental Challenges

### Climate Change and Thawing Permafrost

Weather and climate in Bethel are characterized by "high humidity, frequent fogs, considerable cloudiness and many periods of rain or snow (ONC LRTP, 2020)." Summer temperatures typically range from 40 to 62 degrees Fahrenheit, and winter temperatures typically

range from -2 to 19 degrees. Frost in Bethel averages from around early September to the end of May. According to a 2011 study of communities in the surrounding region by Alaska Native Tribal Health Consortium (ANTHC), annual temperatures in the region are expected to get warmer and wetter. For example, annual temperatures are expected to rise by five to eight degrees, and four to twelve degrees in the winter (depending on timeframe and greenhouse gas emissions scenarios). Residents are reporting climate change impacts already, with an earlier spring breakup season and different weather patterns including periods with more rain than had been typical, but also dry periods with fires.

The warming climate is already having an impact on the built environment in Bethel. Permafrost in the area is characterized as "warm" permafrost, averaging around 31.2 degrees Fahrenheit, according to the City. Community members are now observing permafrost at 4 to 6 feet below ground surface. This poses a problem to local construction and increases maintenance costs, as thawing permafrost impacts building foundations, roads, and utility infrastructure. Local soil types already pose challenges to development, so the changing permafrost may only make construction and maintenance more complicated in the future.

Winter travel on frozen lakes and the river is also becoming more challenging as annual temperatures rise. The Kuskokwim River is freezing later and breaking up earlier. Ice conditions throughout the winter are becoming more variable, which prevents reliable and safe ice road routes. Recent winters have brought less snow, so road surfaces have been exposed and dry, causing dust problems which were typically only an issue during the summer.

### Erosion and Flooding

Bethel has experienced erosion along the river since the community was originally founded; it is natural for rivers to change over time. The community was once protected by a series of small islands in the main channel of the Kuskokwim River. As of 1939, the river eroded these protective islands. Bethel has a steep riverbank, made up of easily erodible materials, often exacerbating the erosion problem. Other factors contributing to erosion are direct sunlight in the southeast portion of the bank which causes melting of permafrost, as well as high foot traffic which destroys protective vegetation. Climate change impacts are anticipated to exacerbate riverbank erosion.

Bethel experiences seasonal flooding due to ice jams during "break up," the springtime melting season. This has led to the riverbank adjacent to Bethel eroding over the last 40 years. A historic flood in 1995 created a cove measuring 350 feet wide and 200 feet inland, which posed a danger to structures within the city. Later in 1995, the U.S. Army Corps of Engineers (USACE) installed a rock seawall along 600 linear feet of the dock and riverbank. To combat further erosion, USACE initiated a $24 million project which included an 8,000-foot bank stabilization. The City reports there is always more work to be done to improve and maintain the critical seawall infrastructure.

Due to the changing course of the river and the eroding riverbank, there will likely be impacts to the deep water channel and Port of Bethel. As the region relies on the river for the delivery of fuel and other cargo, further study and mitigation planning is necessary.

### Subsistence Resources and Environmental Impacts

Bethel is situated in a generally flat area of the tundra. Vegetation includes low-growing shrubs, herbs, grasses, and sedges rooted

in a mat of mosses and lichens. Commonly found plants include sphagnum moss and Labrador tea, crowberry, birch, willow, and berries, such as currants, blueberries, cranberries, blackberries, and salmonberries – the environment is rich with foods that can be harvested. There are abundant waterfowl and other bird habitats around Bethel. Moose are one of the most common subsistence land mammals (comprising of over half of land mammals harvested), followed by caribou. Commonly harvested furbearers include rabbits, beaver, fox, wolves, and mink.

No federally listed endangered species or critical habitats currently exist in Bethel. However, Bethel is among many coastal Alaskan communities being impacted by decreasing fish populations. Bethel's rivers and lakes are home to several types of fish including arctic char, all five salmon species, lake trout, dolly varden, rainbow trout, arctic grayling, northern pike, sculpin, whitefish, burbot, stickleback, and blackfish. Fish have been significantly less abundant, and those who rely on fish for their livelihood or supplementing their diet are subject to sometimes unpredictable closures in order to protect fish populations. Overfishing, changing migration patterns, warming water temperatures, environmental contamination, and melting permafrost are all anticipated to continue to have impacts on subsistence resources across the region, which will in turn impact communities such as Bethel that rely on subsistence foods to keep the cost of living more manageable.

## 2.6 Public Facilities and Services

The city is governed by a Mayor, City Manager, and seven-member City Council. All council members are elected at large for 2-year terms. The Mayor is elected by the City Council, and the City Manager oversees the daily operations of the City.

Commissions and Committees include the Board of Ethics, Community Action Grant Committee, Finance Committee, Port Commission, Planning Commission, Public Safety and Transportation Commission, Public Works Committee, and Community Parks and Recreation Committee.

Administrative services for the City of Bethel are provided by the City Manager, Grants Manager, and Human Resources Department. Other departments focus on specific City facilities and/or services.

### Administration:

**The City Manager** is appointed by the City Council and serves as the chief executive officer for the City, directing the day-to-day operations of the City in accordance with municipal law. The City Manager hires and supervises department heads, carries out implementation of the annual budget with the Capital Improvement Plan, manages City property, and is responsible for managing quality service delivery to City residents, as well as other interdisciplinary programs and initiatives.

**The Grants Manager** obtains grant funding for various City capital and operating needs.

**The Human Resources Department** organizes City hiring and human resources.

### Other City Departments:

**The City Clerk** is appointed by City Council and acts as their parliamentary advisor, responsible for assuring compliance with local and state laws associated with municipal records and public meetings. The Clerk's Office also conducts research and processing of Council requests and actions, prepares agenda packets, administers municipal elections, serves as notary public, manages and writes City ordinances and resolutions, manages City Council and Clerk budgets, manages City public relations (currently assisted by a contractor), and works with other governmental representatives and agencies.

**The City Attorney** is appointed by City Council and is the legal advisor of the governing body, representing the City in civil and criminal proceedings. The Legal Department (led by the City Attorney) advises City leases, contracts, and other matters such as ordinances.

**The Finance Department** is led by the Finance Director, who is appointed by the City Manager to be the ex officio treasurer, data processing manager, city accountant, and internal auditor responsible for supervising fiscal operations of other departments and employees. The Finance Department manages City money and investments, administering tax collections as well as payments made by the City.

**The Technology Department** maintains the information and communications technology for all City departments.

**The Planning Department** provides guidance and reviews for all new development and redevelopment in the City to ensure code compliance. The department also manages permit records and makes recommendations for changes to code when needed to better promote health, safety, and responsible development in the community.

**The Port of Bethel** oversees shipping, receiving, and distribution of petroleum products and barged freight for the Yukon-Kuskokwim Delta. Port infrastructure includes the Cargo Dock, Petro Port, Small Boat Harbor, Float Plane Beach, and Seawall.

**The Fire Department** oversees emergency fire, hazardous materials, and medical response.

**The Police Department** oversees public safety and law enforcement, in collaboration with regional and state law enforcement and safety entities. The Police Department also oversees animal care and control (including in collaboration with the non-profit organization **Bethel Friends of Canines** (BFK9)).

**The Public Works Department** oversees City services (water, wastewater, and solid waste), transportation and other infrastructure, buildings, vehicles, equipment, and Parks and Recreation.

### Other utilities and services provided by other public agencies or private entities include:

**Fuel:** Crowley, Delta Western, and Vitus currently supply fuel to Bethel.

**Electricity:** Alaska Village Electric Cooperative (AVEC), a member-owned rural electric cooperative, provides electricity for Bethel and nearby villages.

**Telephone:** In-state telephone services are provided by United Utilities, Inc., a GCI company. GCI provides long-distance service.

**Internet:** Internet is available locally to community members through

GCI. At the time of updating this Comprehensive Plan, satellite internet providers such as Starlink were rapidly expanding into the region.

**Health services:** Health services are provided by the Yukon Kuskokwim Health Center (YKHC), and the Bethel Family Clinic (a federally funded community health center).

**Homelessness services:** Bethel Winter House is a non-profit organization that provides services for individuals and families at-risk of or experiencing homelessness.

**Other human services:** Bethel Community Services Foundation (BCSF) is a non-profit organization that provides other community-based programs and services across the YK Delta region.

**Post office:** The U.S. Postal Service (USPS) operates a full post office in Bethel.

**Education:** Bethel is home of the Kuskokwim Campus of the University of Alaska Fairbanks, Adult Basic Education, the Lower Kuskokwim School District (LKSD), Bethel Regional High School, Mikelnguut Elitnaurviat School, Bethel Alternative Boarding School, a Yupik Immersion School (Ayaprun Elitnaurvik), Involved Parents Preschool, Headstart, and Junior ROTC. Yuut Elitnaurviat (People's Learning Center) provides vocational training, and Bethel also has a flight school.

**Museum and community center:** The Yupiit Piciryarait Cultural Center and Museum provides a gathering space for community-wide events in Bethel. The museum was founded in 1965 as the "Bethel Museum" by the City and transferred to the Association of Village Council Presidents (AVCP) in 1995. Galleries display exhibits of Yup'ik, Cup'ik, and Athabascan people of the YK Delta in ancient and contemporary times.

**Library:** In conjunction with the University of Alaska, Bethel operates the Kuskokwim Consortium Library.

**Fitness Center:** The YK Fitness Center is a community multipurpose gym and swimming pool facility owned by the City and currently operated by contractors.




*Bethel City Hall.*

# CHAPTER 3
## Housing & Land Use

# 3: Housing & Land Use

## 3.1 Introduction

As discussed in Chapter 2: Existing Conditions, land use in Bethel has been shaped by a variety of factors including the changing river-front, soil conditions, or ownership. These factors have helped shape Bethel's development, with a mixed-use core and a small number of major roads spreading out in different directions to serve primarily residential development further out.

Any development in Bethel is challenging and expensive. Materials must be shipped in, buildings must be constructed on piles to re-spond to permafrost and wetlands, and there are not always enough people available locally who have skills to design and/or construct buildings and the infrastructure to serve them. Due to the spread-out development pattern, roads and utilities must travel farther, increas-ing construction and maintenance cost.

This can create insurmountable challenges for potential developers, homeowners, renters, and business owners. The City's vision for 2045 focuses on easing the high cost of living and improving quality of life, and facilitating land use development that is more efficient will play a significant role in this effort. This plan seeks to identify ways the City can streamline land use processes, lessen barriers that the City code may pose, provide helpful land use information, and shape development patterns to move the City towards its goals.

## 3.2 Housing

### Need for More Housing

Bethel homes are in short supply and are difficult for buyers and rent-ers to afford. Finding ways to assist with the development of more (and particularly more affordable) housing is a major priority for the City. Community members have observed that housing is urgently needed for those who wish to live in Bethel, but there is also a need for shorter-term housing for workers on temporary contracts or visiting Bethel for shorter periods of time to work. Generally, a variety of housing is needed to serve a variety of user groups and make it easier to find a suitable place to live or stay.

In 2021, a team including Orutsararmiut Traditional Native Council (ONC), NeighborWorks America and Alaska, Enterprise Community Foundation, the City of Bethel, Cook Inlet Housing Authority and Cook Inlet Lending Center, Agnew::Beck, DOWL, and SALT pub-lished "Clean Water Makes a Healthy Home: A Concept Paper for an Innovative Approach to Infrastructure Investment in Rural Alaska." This concept paper included a study of housing needs in Bethel and the infrastructure needed to support more housing. The project focused on how to reduce costs and expand revenue sources for housing development, developing partnerships, and providing ade-quate water and sewer infrastructure. The water and sewer findings are discussed in greater detail in Chapter 6: Utility Infrastructure.

Per the study, 11 percent of households are severely overcrowded, and there is a potential demand for an additional 577 units of housing over the next 10 to 20 years. This will need to include both devel-

oping new housing and replacing aging and substandard units. The rental market is limited, and approximately 38 percent of households pay more than 30 percent of their income for housing. Lack of available and affordable housing could discourage people from staying in Bethel or moving to Bethel, in turn negatively impacting local economic sustainability.

### Streamline Processes

There are several well-established residential subdivisions throughout Bethel, mostly including single- and two-family homes. These continue to be popular housing options for those who can afford them (whether to buy or rent). Though slowly, new subdivisions of this type continue to be developed in Bethel. There are also some multifamily options in various locations around Bethel. However, the pace of development for any of these housing options is not meeting the community's needs.

The City can help facilitate and/or encourage housing development through a variety of means, particularly through Planning Department actions. This could include sharing information on funding assistance, streamlining development and permitting processes, and proposing code changes (such as to clarify how Planned Unit Developments can be developed or to allow greater density in some areas). The City could also explore other ways to incentivize development.

It is important to note that facilitating development does not mean sacrificing processes that are in place to protect the quality of life in Bethel and the rights and interests of property owners. Ensuring compliance with code and working within existing regulatory processes is critical to avoiding delays in the housing pipeline, including the provision of necessary infrastructure like utilities and roads. For example, the Haroldson Subdivision (located to the northeast of town) was created prior to the adoption of the required subdivision agreement process. The access road to the subdivision traverses a City-owned parcel but without a public right-of-way. Neither the access road nor the roads within the subdivision were constructed to adequate standards to support public vehicular traffic, so the City was not able to take on ownership and maintain the roads until the issue was resolved, delaying the roll-out of much-needed residential lots. While the subdivision agreement process is an additional step in development, it helps protect the City and ensure adequate infrastructure is provided for future residents. Like any other process in Bethel Municipal Code (BMC), it may evolve over time to best suit the needs of the City and the community.

## GOAL 1: Address potential barriers to housing development.

### Strategy 1: Streamline the land use approval process.

**Action A:** Every five years, audit the Planning Department website and application forms used for land use processes and revise for clarity and ease of use. PL

**Action B:** If an element of the code or process repeatedly causes unnecessary difficulty or undue delay for housing developers, the City Planner should consider whether it would be of public benefit to make a change to the code and bring the suggested change forward to the Planning Commission and City Council. PL

### Strategy 2: Ensure that subdivision, development, and design standards are enforced.

**Action A:** Require compliance with all subdivision standards for approval, including the standard subdivision agreement process. PL

**Action B:** Consider changes to the subdivision approval and agreement process to improve clarity and efficiency. PL

**Action C:** Develop a position description to potentially hire a code enforcement officer. PL

**Action D:** Examine code sections related to non-conformance and coming closer to compliance to determine if changes may be needed. PL

### Strategy 3: Encourage development by collaboratively working with developers to install public infrastructure, including piped water and sewer systems and roads.

**Action A:** As part of the subdivision agreement process, consider designing a standardized "impact fee" mechanism to have developers participate in funding when their development will impact the overall system (water and sewer or other infrastructure such as roads). CM PL

**Action B:** Create a guide for infrastructure development grants or other funding assistance programs, in order to assist developers with finding information needed to pursue supplemental development financing. GM PL

### Focus on Density

Denser housing typically costs less for developers and residents. Smaller homes require less materials to build and require less energy to heat. Denser development located closer to the center of town may also mean more residents don't have to travel as far to get to work, school, healthcare, food, or other destinations. To provide more affordable and workforce housing in Bethel, there should be a focus on facilitating multifamily developments such as apartment buildings or townhomes, as well as opportunities to build smaller homes on smaller lots for more accessible ownership or "starter home" opportunities.

Existing provisions in BMC, such as the Planned Unit Development (PUD) model, already allow greater development layout flexibility to help facilitate more compact residential development and the potential for greater density balanced with shared open space. However, these code sections may need to be reviewed for clarity and/or promoted in the community, as they have not been frequently used. Other parts of zoning code could benefit from closer study and potential changes to encourage higher density and multifamily residential development.

Like any change to zoning code, creating a new zoning district would require the City to develop the proposed code changes. The proposed code changes would then be subject to a public review process. Finally, any code changes would need to be adopted by the Planning Commission and City Council as part of a public hearing process.

## GOAL 2: Facilitate more affordable housing development and access to affordable housing.

**Strategy 1: Use zoning to encourage multifamily and more dense housing development.**

**Action A:** Develop a working group to assist the City Planner to study and create code changes and zoning map changes for a new Multifamily Residential zoning district that can be brought forward to the Planning Commission and City Council for approval. PL
**Action B:** Encourage the implementation of the new Multifamily Residential zone and existing Downtown Commercial and Neighborhood Commercial zones through the Future Land Use Plan Map. PL
**Action C:** Consider rezoning some City-owned land to Multifamily Residential where recommended in the Future Land Use Plan Map. PL
**Action D:** Encourage use of the Planned Unit Development model, which allows flexibility on dimensional standards for multifamily development to allow denser residential developments with shared open spaces (such as townhomes, "tiny home" communities, or other compact residential styles). PL

**Strategy 2: Support access to information on housing assistance programs.**

**Action A:** Consider completing a housing needs assessment in collaboration with community partners such as ONC or BNC. CM
**Action B:** Work with various community partners, potentially including the U.S. Department of Housing and Urban Development (HUD), Alaska Housing Finance Corporation (AHFC), ONC, or BNC, to research potential economic housing assistance that could be available to Bethel residents. GM



*Aerial view of the “Donut Hole” in Bethel.*

## 3.3 Strategic Development

Housing is a priority, but the organization of other land uses within Bethel must also be strategically coordinated to ensure the City has the public infrastructure needed as it continues to grow. The available land and varying constraints must be considered while evaluating the land uses that the community will need in the future.

As discussed in the Housing section above, denser development has many benefits. Less utility and road infrastructure is needed to connect denser development, saving the City money. Shorter distances between developments also saves time and money spent on transportation for Bethel residents and public service providers.

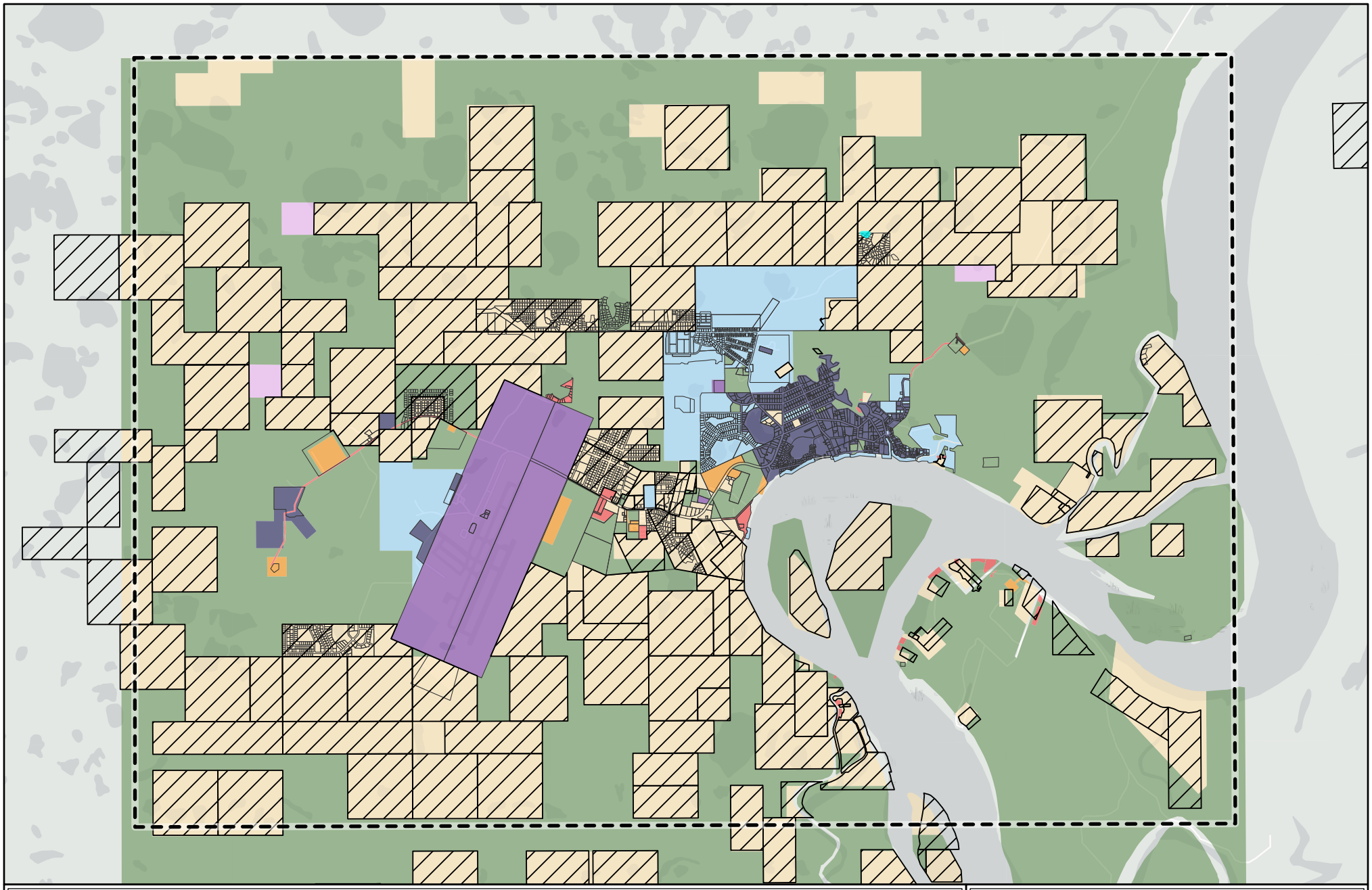
Yet, development in Bethel must respond to a variety of constraints, including varying ownership and soil types that complicate development. So far, the City has grown along a curved spine, with a largely undeveloped area nicknamed the “Donut Hole” in the middle. The community has expressed a desire to reserve valuable areas as open space (providing areas for recreation or berry picking, for example), but other properties might be better suited for development to continue.

Given the high cost of development in Bethel, along with the expense of expanding and maintaining infrastructure such as roads, infill development has become more common. The City should apply this principle to projects on land it owns or might seek to purchase, and can also seek ways to encourage private development to be located closer to already-developed areas of the City.

Current zoning dictates where more dense infill development would be allowed and most suitable. For example, more dense or mixed-use development would not generally be allowed in established Residential-zoned neighborhoods. However, areas that are not far from the center of town, are not developed, and are not yet zoned (or are zoned General Use) could be good candidates for new multi-family housing or mixed-use development (such as with a new Multifamily Residential zone, as discussed in Section 3.2 above). The Future Land Use Plan Map in Section 3.4, which is a planning tool to help inform how zoning could look in the future, was developed with these ideas in mind – established residential neighborhoods in the Residential zone and further-out areas are suggested to be less dense residential development, whereas areas in the Donut Hole are suggested to be “Mixed-Use Neighborhoods.”

On the next page is a map of land ownership in Bethel. Areas of existing development can be identified as denser concentrations of property lines in gray – primarily along the bend in the Kuskokwim River and extending west in two sections: along the Chief Eddie Hoffman Highway (CEHH) towards the airport to the south and along Ptarmigan Road to the north. H-Marker Lake and the in-progress Tundra Ridge Road form the western boundary of the “Donut Hole” of undeveloped land. As shown in the color coding on the map, this area consists of a mix of land owned by the City, Bethel Native Corporation (BNC), and private native allotment owners.

**** The map on the next page is not a full reflection of current ownership in Bethel and is included to show general land ownership patterns. The ownership data in the map is primarily sourced from a 1997 map; some information was not available or has changed. Because Bethel does not collect property taxes, current ownership is not regularly tracked and would require extensive title research.*




# General Ownership

City of Bethel Comprehensive Plan

DOWL

Date: July 2023

Figure 1

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*Service Layer Credits: Light Gray Base: State of Alaska, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA*

## GOAL 3: Reserve land to accommodate community needs and desired development.

### Strategy 1: Inventory City-owned properties.

**Action A:** Inventory all City-owned properties, including their current use or any use requirements/restrictions or other encumbrances associated with original BLM conveyance to the City. PL

### Strategy 2: Create and regularly maintain a list of community facility and infrastructure needs that will require land.

**Action A:** Create and maintain a list of community facility and infrastructure needs in order of priority, and include specific spatial needs such as general location and approximate area of land required. PW CM

**Action B:** As applicable, identify and initiate coordination with entities that need to be involved in the implementation of community facilities and infrastructure (such as the Public Works department for wastewater facilities, or AVEC for alternative energy generation sites). PW CM

**Action C:** Research and identify if there are any City-owned sites that should be reserved for specific community facilities or infrastructure. PL

**Action D:** As needed, create a plan to obtain land or lease a property to satisfy each priority community infrastructure need. CM

### Strategy 3: Use the Future Land Use Plan Map to designate priority areas for residential and commercial development.

*See Future Land Use Plan Map section and Goal 5 below.*

### Strategy 4: Sell, trade, or lease City-owned properties that the City does not need in the future so that more private development can occur.

**Action A:** Evaluate City-owned properties that should be considered to sell or lease for private development. CM

**Action B:** Create a plan for how the City will dispose of (sell or lease) certain properties over time. CM

**Action C:** Initiate the process to dispose of these properties according to the plan. CM

## GOAL 4: Identify areas that are good candidates for infill development and take steps to facilitate their development.

### Strategy 1: Identify the best areas for infill development.

**Action A:** Create a map that highlights "priority development areas" including the best / most likely areas for infill development as Bethel grows *(more information on factors included in Appendix 10)*. PL

**Action B:** Regularly update the priority development area map based on new developments and environmental information, such as changing permafrost and hydrologic information. PL

### Strategy 2: Investigate how private landowners within priority development areas might be encouraged to participate in community development goals.

**Action A:** Explore partnership opportunities to achieve desired development, such as with BNC. CM

**Action B:** Compile and share information from BIA about how native allotment owners can prepare for potential development. CM

**Action C:** Coordinate with the Association of Village Council Presidents (AVCP) Realty Department to learn more about potential land exchanges between BNC and native allotment owners for "in-town" native allotments. CM

### Strategy 3: Decrease barriers to additional commercial development and incentivize development patterns that support more commercial activity.

**Action A:** Revise zoning code to allow shopping centers in appropriate zoning districts. PL

**Action B:** Consider setting aside a space to host markets where small businesses can rent booths and sell goods or services. PL

### Strategy 4: Facilitate redevelopment of properties that are underutilized, dilapidated, or abandoned.

**Action A:** Compile a list of sites that appear to be underutilized, dilapidated, or vacant / abandoned. PL

**Action B:** Implement a vacant building registration ordinance. PL

**Action C:** Examine and revise the Public Nuisance Abatement code (BMC 9.36) to improve its effectiveness and the efficiency of enforcement. PL

**Action D:** Consider funding available for the purchase of dilapidated or abandoned properties, potentially for use in partnership developments. GM

## 3.4 Future Land Use Plan Map

The Future Land Use Plan Map is a key component of every Comprehensive Plan for every city. It is a tool used to help shape what types of land uses and neighborhoods develop in different parts of town in the future. It is important to note that land use designations in the Future Land Use Plan Map are not the same as zoning. Land use designations are broader categories than zoning districts; multiple different zoning districts could be implemented depending on the future land use designation in an area. The table below outlines differences between the Zoning Map and the Future Land Use Plan Map.

*Table 3: Zoning versus Future Land Use Plan*

| Zoning Map | Future Land Use Plan Map |
|---|---|
| Areas are called zoning districts. | Areas are called **future land use designations**. |
| Part of Bethel Municipal Code, which is law. | Part of the Comprehensive Plan, which is a **planning document (not law)**. |
| Shows current zoning. | Shows the community's **vision for the future**. |
| Dictates what land uses are currently legal on each property. | **Does not impact current zoning.** This is part of the consideration if a property owner is interested in applying to change the zoning on their property (which is a public hearing process).<br><br>Suggests what zoning would be generally suitable in different areas, based on current conditions and expectations for how the City could change over time. |
| Sets requirements for lot sizes, setbacks, and whether other specific design elements or permits are required, based on which land use is being proposed in which zoning district. | Implies a general type of neighborhood – a variety of uses and zoning districts may be possible in each designation. |

Both: Considered as part of every planning application review in the City, and used to provide compatibility amongst land uses.

The Future Land Use Plan Map is especially important in reviewing rezone applications; changes to the Zoning Map must be supported by the Future Land Use Plan Map and the contents of this section of the Comprehensive Plan in order to be approved.



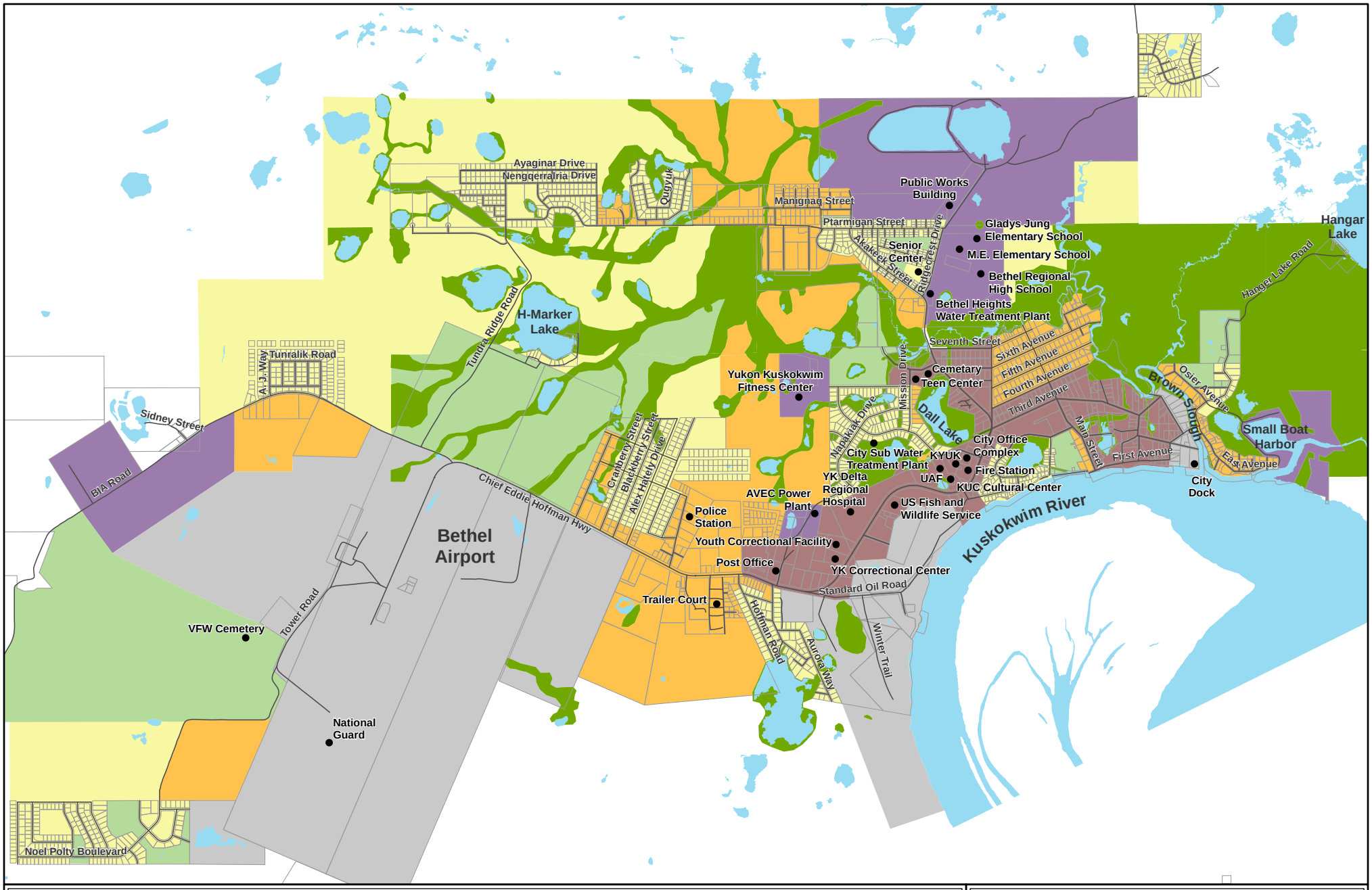
It is important to note that the Future Land Use Plan Map is not intended or able to dictate what development occurs. It is still up to individual landowners to determine how their property may be developed as it relates to the current zoning and allowed uses. Instead, the Future Land Use Plan Map serves to show community goals for land use patterns in different areas. Since the Comprehensive Plan itself is only a guiding document, the plan does not implement new zoning designations, but it can and should be used to guide rezones or future zoning for areas that are currently not zoned. Any changes to the currently adopted zoning map require a public hearing, and any changes to zoning code require an even more robust public process involving both the Planning Commission and City Council.

When considering both the current Zoning Map and the Future Land Use Plan Map created as part of the 2011 Comprehensive Plan, it was noted that the General Use zoning district and Mixed-Use future land use designations might be too general to help shape desired development. The designations created for this updated plan seek to improve clarity on which uses are encouraged where. The Future Land Use Plan Map and definitions below provide examples of land use designations that are consistent with community goals and potential zoning districts that could be considered for each future land use designation.

*Table 4: Future Land Use Designations*

| Future Land Use Designation | Definition / Intent | Implementing Zoning Districts and Uses |
|---|---|---|
| **Single- and Two-Family Residential Neighborhood** | Compared to the Multi-Use Neighborhood, this designation is more similar to traditional single-family and two-family neighborhoods. It is typically located farther from the commercial and civic center of town. R should be the most common zoning district in this designation, and lot sizes and homes tend to be larger as farther-out development is more expensive and better suited to this type of lower-density residential development.<br><br>Multifamily and commercial development is possible, but should typically be reserved for the edges of neighborhoods or along major roads. | **R**<br>Could include some R2 (*new zoning district recommended in this plan*) and NC along neighborhood edges or major roads<br>Parks and recreation facilities, open space |
| **Multi-Use Neighborhood** | Of the two main "neighborhood" designations, this is the more "urban" of the two. The most common implementing zoning district in this designation should be the new R2, Multifamily Residential district, which emphasizes higher density, multifamily housing types. This designation is typically located close to major roads and commercial / civic centers, so that more people may access transit and/or pedestrian-friendly areas.<br><br>In line with the more "urban" and "walkable" feel, these neighborhoods are well-suited to including residential-compatible commercial uses, including mixed-use developments. (For example, restaurants and offices as opposed to auto-repair shops.)<br><br>Parks and open space associated with multifamily developments or Planned Unit Developments are encouraged in every residential neighborhood, so space should be set aside for this in Multi-Use neighborhoods. | **R2** (*new zoning district recommended in this Plan*)<br>**NC**, mostly along neighborhood edges or roads but can include a mix of uses<br>Could include some DC on major roads<br>Parks and recreation facilities, open space |
| **Commercial / Civic Center** | This designation is intended to generally follow the commercial and civic corridor along the highway and into the heart of "Old Bethel." This is where most commercial and institutional activities are located. These areas typically contain employment centers or common "destinations" that people need or want to go, including the hospital, government offices, groceries, restaurants, and other gathering spaces.<br><br>With the most convenient access to Bethel's commercial and civic center, housing developed within or near to this area should typically emphasize higher density, multi-family options. | **DC**<br>**PLI**<br>**NC** and/or **R2**<br>Parks and recreation facilities |

| | | |
|---|---|---|
| **Community Infrastructure** | This designation is intended to include public infrastructure and facilities, such as the landfill, sewage lagoon, school district campus, fitness center, and small boat harbor. In the future, this could also include facilities for alternative energy generation. | **PLI**<br>Parks and recreation facilities, open space<br>*Other zones / uses are possible within Community Infrastructure, if compatible* |
| **Industrial / Heavy Commercial** | This designation is intended to include industrial and heavy commercial uses that support Bethel's role as a hub for transportation and cargo for the region. This includes areas around the port and airport. This may also include land reserved for utilities-related uses. | **I**<br>**PLI**<br>**DC** |
| **Public Open Space** | This designation indicates areas that are recommended to be reserved as larger public open spaces, such as for recreation uses. This does not necessarily include all parks in Bethel, as these can be smaller and within residential or commercial/civic areas.<br><br>This designation is often used adjacent to the Preservation zone, such as in some areas of the "Donut Hole," where the intent is to reserve areas for recreation and subsistence in "green belts" adjacent to areas that must be preserved.<br><br>This designation also makes sense to be applied to areas on the periphery of Bethel that are unlikely to be developed and would remain as open space, such as a potential refuge at the end of BIA Road. | **OS**<br>**PLI** |
| **Zoning District** | **Definition / Intent** | |
| **Preservation** | **Areas zoned P are likely to remain undeveloped given that they generally contain significant wetlands and drainageways that should be preserved. Thus, this zone represents areas that are unlikely to be developed in the future.**<br><br>It is the intent of the city that the boundaries of the P district be consistent with boundaries of general permit 83-4 issued by USACE, and that amendments to the official map will be made when the boundaries of the general permit are changed.<br><br>Permitted uses include greenbelts, trails, boardwalks, subsistence, recreational uses, or other accessory uses that do not require the use of fill material. | **P** |




**Future Land Use Designation**

- Single- and Two-Family Residential Neighborhood
- Multi-Use Neighborhood
- Commercial/Civic Center
- Community Infrastructure
- Industrial/Heavy Commercial
- Public Open Space

**Zoning Designation**

- Preservation

- City of Bethel Parcel Boundary

N

0 0.13 0.25 0.5 Miles

# Future Land Use Plan Map

City of Bethel Comprehensive Plan

DOWL

Date: July 2023

Figure 2

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As discussed above, the updated Future Land Use Plan Map emphasizes that denser (and generally more affordable) housing development should be located near the commercial and civic center of Bethel. This commercial and civic center is mostly the older core of Bethel, which has primarily General Use or PLI zoning. In order to encourage the use of newer and more focused zoning districts (including Neighborhood Commercial, Downtown Commercial, and the proposed higher-density residential district), which align better with the updated Future Land Use Plan Map, the General Use zone should be phased out of use. This will give the City more ability to shape the types and locations of development in the future. There is still flexibility through the use of conditional use permits where applicable.

As Bethel continues to expand, there will likely be more commercial and civic development needed to support farther-out residential development. The definitions provided in Table 3 above help describe the mix of uses intended for residential areas, along with guidance for where commercial uses could be located relative to the residential (such as along major roads). This will help commercial and residential development support each other but remain compatible.



## GOAL 5: Using the Future Land Use Plan Map and its land use designations, encourage future development to have an organization of uses that is compatible.

### Strategy 1: Implement and raise awareness about the Future Land Use Plan Map and how it is used.

**Action A:** Add the Future Land Use Plan Map to the City's GIS maps. PL

**Action B:** Post the explanation of Zoning versus Future Land Use Plan Map from this plan, as well as the table with Future Land Use designations, definitions, and implementing districts, to the Planning Department website. PL

**Action C:** Use the Future Land Use Plan Map as the basis for initiating discussions with landowners that could potentially develop their land in the priority development area. PL

### Strategy 2: Create a working group to alter code for zoning designations so that future development is more strategically organized.

**Action A:** Create a working group to assist the City Planner on potential changes to zoning code that could be brought forward to the Planning Commission and City Council for approval. PL

**Action B:** Create an organized table for all uses and all zoning districts, clarifying which uses are permitted, and which require additional permitting or are not permitted. PL

**Action C:** Consider eliminating the General Use (GU) zone. PL

**Action D:** Once the new Multifamily Residential zone is created (see Goal 2, Strategy 1, Action B), consider altering the traditional R zoning district to emphasize its focus on a less dense model that would encourage single-family and duplex development. PL

**Action E:** Consider City-led rezones to help phase out the GU district and assign more specific zones (including newly implemented zoning districts) to applicable areas. PL

**Action F:** Examine the list of uses that require conditional use permits for all zoning districts and consider changes based on the intent of each district; the changes could be brought forward to the Planning Commission and City Council for approval. PL

## 3.5 GIS Mapping

GIS stands for Geographic Information Systems. Using contemporary GIS software, there are infinite possibilities of spatial information and maps that can be created and shared online. Many entities with a major stake in land within Bethel may already use GIS to track spatial data, including ONC, BNC, AVCP, BIA, and ADFG. The City already uses GIS as well but is currently working on the ability to share GIS information with the public online; the first GIS map planned to be released is the Current Zoning map.

Once each property within the City is represented in this digital space, any additional information can be added, including land use, ownership, address numbers, and more. Accessing the information will be much easier for the Planning Department, the Planning Commission, developers, members of the public, and anyone else who may need to reference it. This is a tool that is available and growing in many other communities and can make land use processes much clearer and more efficient.

**GOAL 6: Make spatial information and maps available to the public online using GIS.**

**Strategy 1: Publish online GIS maps that provide information that was identified as the highest priority for stakeholders.**

**Action A:** Publish the GIS version of the Zoning Map online. PL

**Action B:** Publish an online, interactive GIS map that can provide property lines, zoning, street addresses, and ownership information (when available). PL

**Action C:** Publish an online GIS version of the Future Land Use Plan Map. PL

**Strategy 2: The Planning Department can continue to add to the GIS maps used internally or available to the public online, based on suggestions made by the community.**

**Action A:** Create a map or maps showing easements for trails, rights-of-way, and utilities. PL

**Action B:** Create a map that shows wetlands, stream or floodplain setbacks, contaminated sites, or other limitations to development related to preservation. PL

**Action C:** Explore opportunities to collaborate with other entities with local GIS data (such as ONC, BNC, AVCP, BIA, ADFG), forming a joint database. PL



# CHAPTER 4
## Local Transportation

# 4: Local Transportation

## 4.1 Introduction

The primary mechanism for transportation planning decisions in Bethel is the Long Range Transportation Plan (LRTP). The LRTP is intended to be revised every five years and used in conjunction with the Comprehensive Plan. Based on traffic analysis and extensive public input, it provides more specific transportation engineering and planning guidance for the City. Each time the LRTP is revised, it should be reviewed by relevant committees and commissions, as well as City Council, and then be adopted as ordinance to help ensure it is implemented.

The most recent LRTP was fully prepared and finalized in 2020, but never officially adopted. It should be adopted by the City Council so that it can be publicly shared and used.

Future LRTP revisions should continue to involve extensive public input, as the LRTP informs what maintenance will be prioritized, along with new potential transportation facilities including roads, trails, and port facilities. The City should educate the community that the LRTP is a main opportunity to specifically provide input on transportation planning projects and needs.

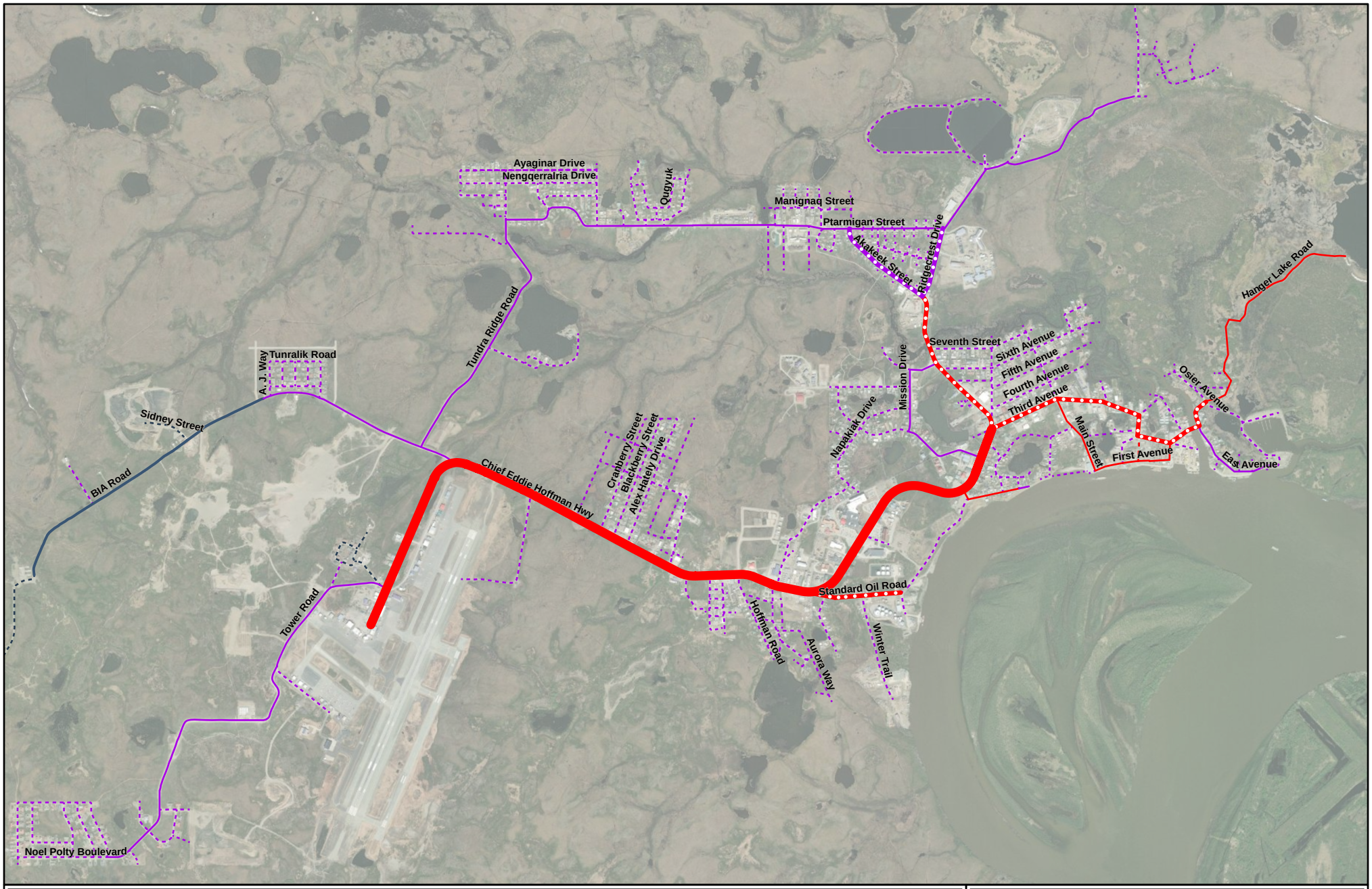
**GOAL 1: Use the Long Range Transportation Plan (LRTP) to guide all local transportation facility planning.**

**Strategy 1: Emphasize the LRTP process and recommendations in Bethel.**

**Action A:** Adopt the 2020 Draft LRTP. CM
**Action B:** Every five years, revisit (through a public process) and update the LRTP. CM
**Action C:** Coordinate with other organizations that prepare transportation planning documents for the area, including DOT&PF and ONC, to find overlaps and collaboration opportunities. CM

## 4.2 Road System

As shown in the Road Classification and Maintenance Map on the next page, most roads in Bethel are classified as “collectors” or “local” roads, which refers to a relatively low amount of traffic (compared to major roads in places like Anchorage). Most are City-maintained and surfaced with gravel. Some of the major roads, including the Chief Eddie Hoffman Highway (the only Minor Arterial and the only Alaska State Highway in Bethel), are paved and maintained by the State of Alaska Department of Transportation and Public Facilities (DOT&PF). Road maintenance is an ongoing funding and capacity challenge in Bethel, so this section has many action items focused on improving maintenance procedures to be more effective and efficient. After all, road maintenance is critical to public health and safety, and finding better ways to address issues such as dust and drainage in the longer term must continue to be priorities for the City.




**Road Classification**

- Minor Arterial
- Major Collector
- Minor Collector
- Local

**Current Road Management Responsibility**

- State Highway Agency
- City or Municipal Agency
- Federal Agency

N

0 0.13 0.25 0.5 Miles

# Road Classification and Management

City of Bethel Comprehensive Plan

DOWL

Date: July 2023

Figure 3

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## GOAL 2: Plan for an organized, proactive approach to surface transportation facility maintenance.

### Strategy 1: Clarify surface transportation facility maintenance responsibilities.

**Action A:** Building on publicly available DOT&PF maps, create a maintenance responsibility map for all transportation facilities in Bethel (including roads and trails). PW
**Action B:** Maintain copies of maintenance agreements for transportation facilities that are not solely under City jurisdiction (such as DOT&PF roads or private facilities). CM
**Action C:** Work with DOT&PF to update existing state road MOUs, including exploring the possibility of the City assuming responsibility for maintenance of DOT&PF-managed roads in Bethel. CM

### Strategy 2: Identify and address key transportation facility maintenance issues.

**Action A:** Prioritize identifying and implementing the most effective ways to control dust on gravel roads, shoulders, and trails, such as watering, emulsifiers, chip sealing, or other surface treatments. PW
**Action B:** Regularly inspect roads for major potholes that need to be filled / grated, and complete maintenance work as needed. PW
**Action C:** Regularly inspect transportation facilities for overgrowth, blockage, or freezing culverts and other drainage facilities, and complete maintenance work as needed. PW
**Action D:** As part of the snow removal prioritization plan, incorporate sites for storing snow, to avoid large berms building up within the road ROW. PW
**Action E:** Monitor City signage to ensure it meets public needs for wayfinding and safety. Maintain areas around signs to ensure that visibility is not impacted by vegetation overgrowth, snow/ice cover, vandalism, or other issues. PW
**Action F:** Enforce the removal of ROW encroachments that hinder road maintenance operations. PW

### Strategy 3: Establish improved systems to track maintenance operations.

**Action A:** Raise awareness about the Report a Problem feature on the City website that should be used to report road maintenance needs. PW
**Action B:** Investigate and consider implementing a software program to track maintenance operations. PW IT
**Action C:** Create a typical maintenance schedule based on expected work needed on a seasonal basis, as well as best practices for responding to maintenance needs. PW
**Action D:** Create a map of all City transportation supporting elements such as signage, lighting, culverts, other drainage systems, etc. PW

### Strategy 4: Create a prioritized City road maintenance plan.

**Action A:** Create a prioritized City road maintenance plan, and incorporate it into the transportation facility funding strategy and Capital Improvement Plan (*see Goal 6 below*). PW
**Action B:** Identify and prioritize more major road rehabilitation projects, and incorporate them into the transportation facility funding strategy (*see Goal 6 below*). PW

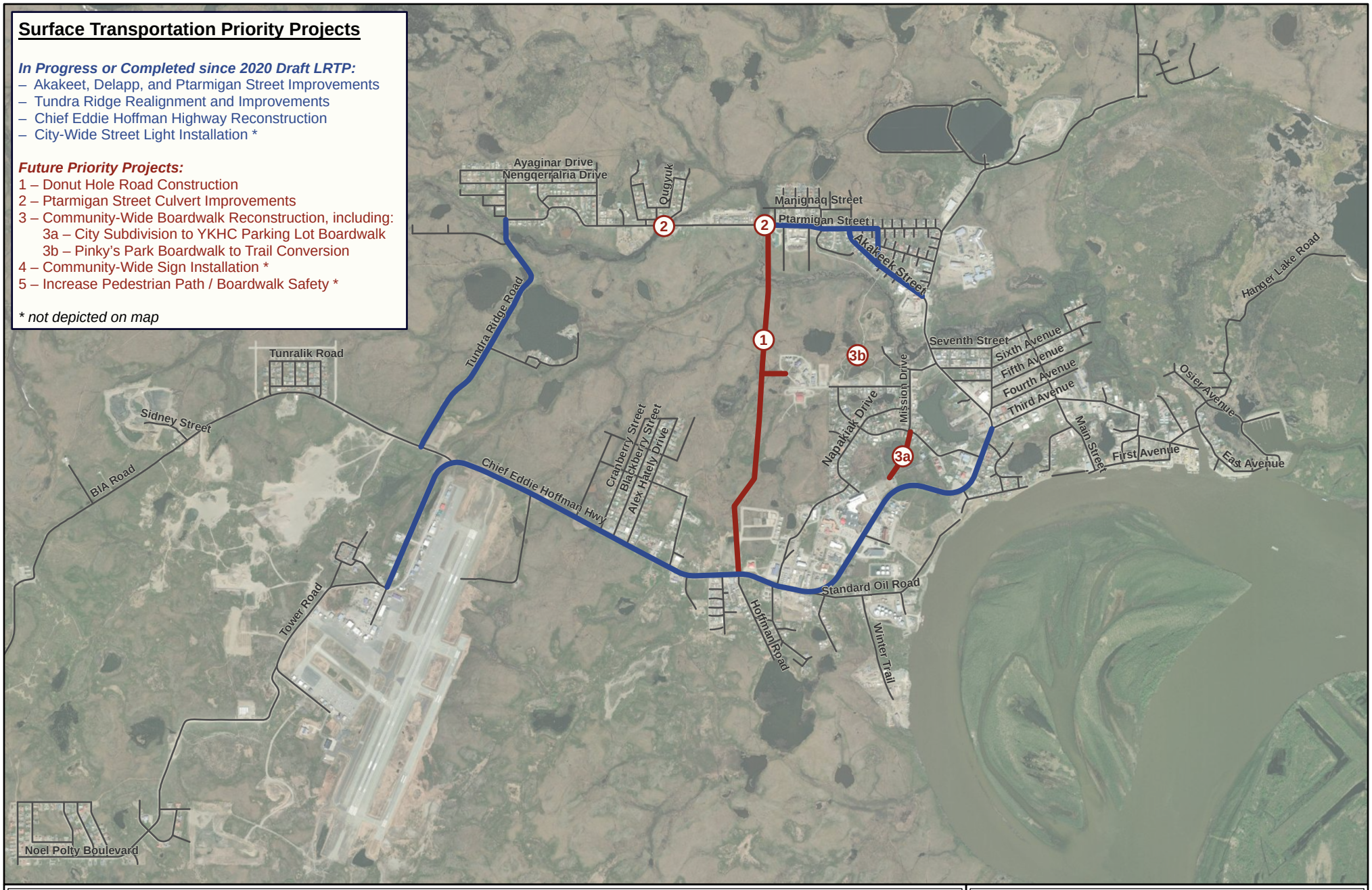
**Strategy 5: Design new and rehabilitated road and other transportation facilities to proactively minimize maintenance needs.**

**Action A:** Continually evaluate materials for road surfacing and other transportation facility construction to improve quality/durability and reduce dust, such as chip sealing, emulsifiers, or other innovative construction methods. PW
**Action B:** As paving technology continues to improve and become more available, use paved surfaces instead of gravel for new or rehabilitated roads of collector classification and above. PW
**Action C:** Improve the implementation of adequate drainage facilities, keeping in mind maintenance needs. PW
**Action D:** At the same time as undertaking road rehabilitation projects, assess whether there is additional ROW needed or encroachments that need to be addressed; address these as part of the design process. PW

Besides maintenance of existing roads, planning new connections to support current and future development is also an important consideration. The road system in Bethel has developed in response to the relatively spread-out development patterns described in Chapter 3 – Housing and Land Use. Large areas in the middle and western parts of town remain undeveloped, leaving a gap in the transportation network, with a particular lack of north-south connections. This creates issues for access, efficiency of travel, and emergency response; it is also tied to maintenance issues, as heavy and concentrated traffic wears down roads more quickly and makes it difficult for the City to close certain key roads for maintenance.

Tundra Ridge Road has recently been undergoing formalization and construction to provide a connection between the northwest residential areas along Ptarmigan Street and the airport area along the highway. The previous LRTP and Comprehensive Plan also recommended to connect the highway north through the central undeveloped area of Bethel (known as the “Donut Hole”), connecting to the Fitness Center and all the way to Ptarmigan Street. Not only would these new connections support current land uses, but they may also help make new development more feasible in areas where it couldn’t be considered previously.

The map on the next page shows an updated version of the Transportation Priority Projects map from the 2020 Draft LRTP. As shown, some projects have been started or completed since the original map was created. Other projects have moved up the priority list. As part of the action items in this chapter, the City will identify new projects to add to this living list / map going forward. It is important to note that the routes shown on the Transportation Priority Projects Map are for planning purposes only; routes could change as these potential connections are studied more closely as part of a design process. A design process would involve more engineering and environmental considerations as well as assessing ROW property acquisition feasibility.




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## GOAL 3: Develop the surface transportation network to reduce travel times, alleviate congestion, and support future development.

### Strategy 1: Identify missing links in the surface transportation network.

**Action A:** Track traffic data, population and traffic forecasts, and significant future development plans and use these to assist with the identification and prioritization of surface transportation projects through LRTP updates. PW

Action B: Starting with the Priority Projects map in the 2020 LRTP, create a map that shows new road connections that may be needed in the future. PW

**Action C:** Based on locations of likely future land development, add locations of potential future road and other surface transportation connections that would support connectivity for this additional development. PW

### Strategy 2: Use the LRTP to prioritize and guide implementation of new surface transportation construction projects.

**Action A:** Based on the map, create a prioritized list of new surface transportation construction projects. PW

**Action B:** Incorporate the prioritized list of new transportation projects into the funding strategy – *see Goal 6 below.* PW

**Action C:** Working with key stakeholders and the community, use the five-year LRTP update cycle as an opportunity to revisit and update the prioritized list of new road projects. PW

## 4.3 Connectivity for All Users

The surface transportation network in Bethel includes a lot more than just vehicular transportation on roads. Bethel's roads and other routes are shared by a wide variety of users, and ensuring the safety of all users (including "motorized" and "non-motorized" users) is a top priority.

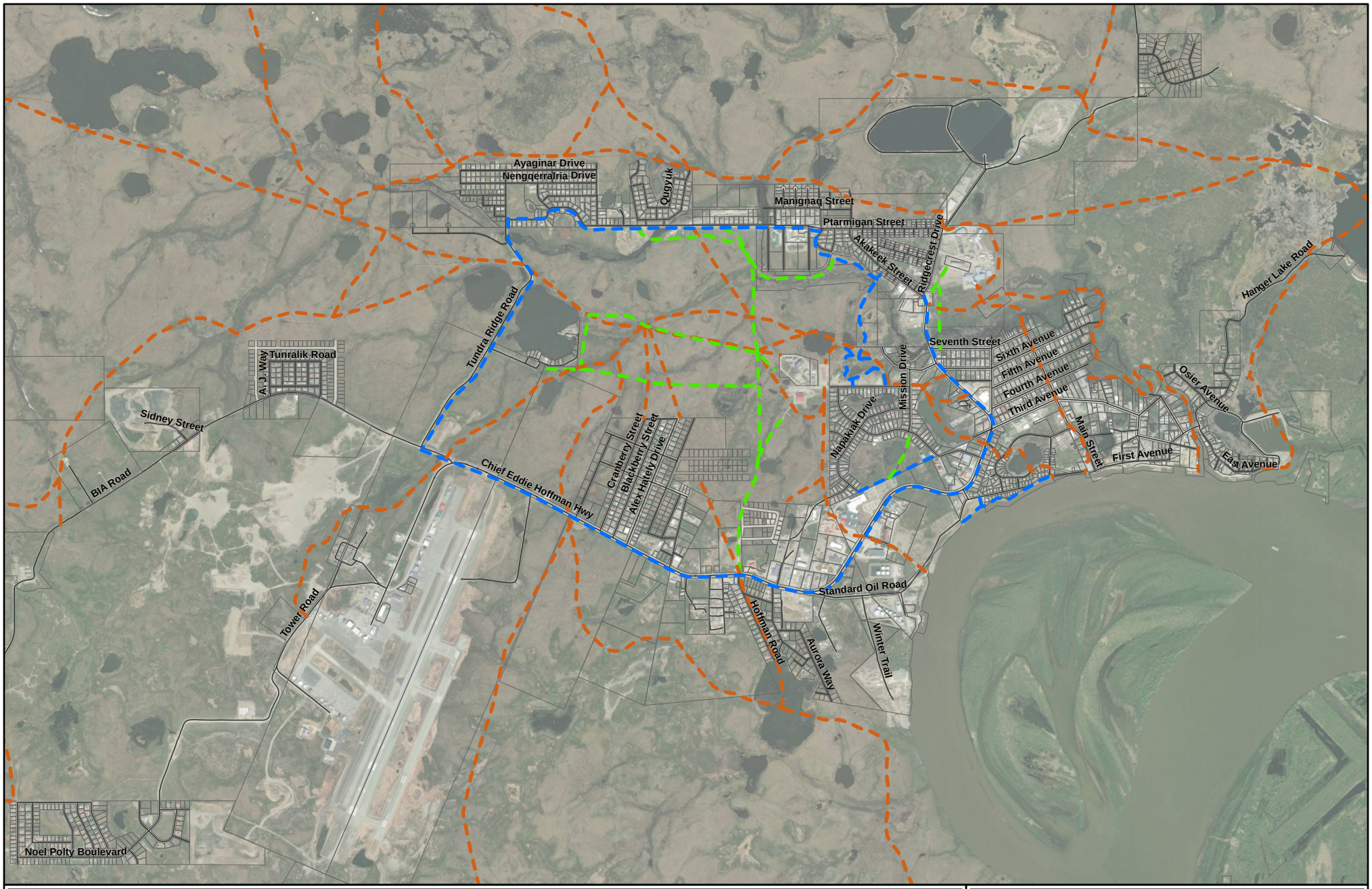
Many Bethel residents use non-motorized modes of transportation (such as walking, bicycling, etc. – basically any mode besides vehicles driving on the road) to get around town. There is a non-motorized transportation "system" made up of a combination of formal trails and boardwalks, paths or shoulders alongside roads, shared roads, and an infinite number of other informal routes people may use depending on their mode of transportation and/or the season. Non-motorized transportation is not always the most comfortable option in Bethel, as distances can be long and weather conditions can be harsh in the dark, cold winters and windy, dusty summers. To support non-motorized transportation in the future, community members had many suggestions to improve access, safety, and comfort.

Progress has been made in designing reconstructed or new streets to provide safe and comfortable access for non-motorized users in addition to drivers on the road. Nationwide, the U.S. Department of Transportation has been increasingly emphasizing safety for all users with their Safe System Approach and grant programs such as Safe Streets and Roads for All, which provides funding opportunities for safety improvements ranging from city-wide safety action plans down to smaller projects like pedestrian safety improvements. A related concept growing in importance in transportation planning is Complete Streets, which emphasizes design features that contribute to a safe, convenient, or comfortable travel experience for all users; transportation projects in Bethel are required to incorporate Complete Streets as part of BMC 12.05.

When it comes to trails, some projects are more complicated due to unclear ownership or maintenance responsibilities or other challenges. As such, many of the action items in this section focus on formalizing the trail system when possible and helpful to its users.

The map on the following page shows existing facilities that are formally established in blue (including paths/trails, boardwalks, and designated shoulders intended for non-motorized use) and potential future routes in green. The potential future routes shown are a starting point for future trail planning based on routes that the community has already been discussing. The rest of the routes shown in orange are "Approximate / Unconfirmed Snowmachine Routes," and attempt to paint a picture of common routes that some people may use, including to travel outside Bethel; it is important to note that many of these likely cross private properties. Other than showing approximate snowmachine routes, the map included in this plan does not distinguish between which facilities are dedicated to particular users and which facilities are multi-use; action items under Goal 5 in this chapter provide a roadmap for the City to create a more sophisticated trails map that can provide more detailed information and evolve over time.

In future revisions of the LRTP and through coordination with the Community Parks and Recreation Committee (which has a focus on the trail system in Bethel), the City should continue to edit the trail system map (as discussed in action items below) and identify its priorities for non-motorized facility improvements.




Existing Formal Facilities

Approximate/Informal Snowmachine Routes

Potential New Routes

City of Bethel Parcel Boundary

N

0 0.13 0.25 0.5 Miles

# Trail System

City of Bethel Comprehensive Plan

DOWL

Date: July 2023

Figure 5

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## GOAL 4: Design new and reconstructed streets with a focus on providing safe and comfortable routes for all transportation modes and all users.

### Strategy 1: Throughout the local transportation system, increase the focus on safety for all users.

**Action A:** Regularly evaluate crash data; pedestrian, bicyclist, and motorist use; and other road safety data to identify areas for improvement. PW

**Action B:** Using community input, identify locations (especially along key routes for non-motorized users) that need safety improvements such as crosswalks, additional lighting, and/or signage. PW

**Action C:** Plan safety improvements as individual projects and/or as part of other transportation projects, keeping in mind that federal Safe Streets and Roads for All (SS4A) funding may be available. PW

### Strategy 2: Ensure adequate ROW for sharing the road and implementing Complete Streets.

**Action A:** Ensure that new ROWs created as part of subdivisions meet minimum width requirements per code. PW

**Action B:** When plats are submitted, require the dedication of additional ROW when the current ROW does not meet width requirements. PL

**Action C:** Consider developing a set of typical roadway cross-sections for reference in City or private development projects involving new or reconstructed roads. PW

### Strategy 3: When implementing Complete Streets, prioritize the most safe and comfortable facilities for non-motorized transportation that space will allow.

**Action A:** Ensure that Complete Streets (BMC 12.05) is being considered and used to the extent possible in the design of new and reconstructed roads. PW

**Action B:** When deciding the location and type of non-motorized facilities to be included in a Complete Streets project, prioritize a separated pathway or boardwalk on at least one side over a shoulder for non-motorized users, when possible. PW

When there is insufficient space for a separated pathway or boardwalk, create a shoulder or shoulders for walkers, bicyclists, and other non-motorized users. PW

**Action C:** Along existing and new shoulders for non-motorized transportation, implement measures to discourage the shoulders' use as parking or an unofficial turn lane. PW

**Action D:** If a shoulder or separated path for non-motorized users will be gravel, consider implementing methods to reduce dust impacts. PW

## GOAL 5: Improve and expand the trail system.

### Strategy 1: Gradually and as funding is available, improve safety and comfort on the trail system.

**Action A:** Continually monitor and test new trail building techniques and materials that are affordable, easy to maintain, and suitable for the frequently changing character of the tundra ground. PW

**Action B:** Transition Bethel trail building methods (including reconstruction of existing routes) away from high-cost and difficult-to-maintain boardwalks and towards less expensive surface-level trails with footbridges and ramps to cross streams and pipes where necessary. PW

**Action C:** Add pedestrian amenities such as lighting and benches to more frequently used non-motorized routes. PW PR

**Action D:** Add amenities for bicyclists at parks and recreation facilities, such as bike racks and bike "fix-it" stations. PW PR

### Strategy 2: Address trail and boardwalk maintenance needs more efficiently.

**Action A:** Encourage the use of the Report a Problem feature on the City website for the public to report trail and boardwalk maintenance issues, including hazards or vandalism. PW

**Action B:** Initiate an Adopt-a-Trail and/or boardwalk and trail maintenance volunteer group to assist when City maintenance staff does not have capacity to respond to trail / boardwalk maintenance issues. PW PR

**Action C:** As maintenance issues are reported and repairs are made, record any recurring maintenance issues (types of issues or problematic areas). PW

**Action D:** Alter trail maintenance and construction best practices over time to mitigate common maintenance issues. PW

### Strategy 3: Clarify the existing City-managed trail system.

**Action A:** Create an updated and easy-to-read map of existing formal City trails. PR

**Action B:** On the City trails map, identify which users and modes of transportation are allowed on each trail. PR

**Action C:** On the trails map, include a layer that shows important community "centers" such as the hospital and other health centers, schools, parks, the Fitness Center, the library, and others. PR

**Action D:** Make the trails map and information (including type of facility, users allowed, accessibility information, and distances) easily available on the City website. PR

**Action E:** Post signs with the trails map and information at key points within the trail system, such as at parks and recreation facilities. PR

**Strategy 4: Expand the trail system by formalizing popular trails and adding new trails.**

**Action A:** For internal planning purposes, mark popular but informal trails on the map in dotted lines. PR

**Action B:** Based on community input and gaps in pedestrian access to important community "centers," add other potential new trail / boardwalk routes to the map in dotted lines. PR

**Action C:** Investigate what would be needed to obtain easements to formalize informal and potential new trails. PW

**Action D:** Coordinate with owners of properties that have informal or potential new trails through them to obtain easements or agreements. PW

**Action E:** For trails within or through larger properties, consider forming agreements or partnerships for private management / maintenance of the trails. PW



*Vehicles and pedestrians sharing a gravel road in Bethel.*

## 4.4 Funding for Facility Construction and Maintenance

Transportation projects are complex and often span many years to plan, design, fund, and construct. The City must constantly adapt and prioritize to be able to fund both maintenance and new construction projects. Annually, the City prepares a Capital Improvement Plan, including prioritized projects to be funded by the City general fund. The City also collaborates with contractors and engineering support staff to prepare cost estimates and identify other funding that may be needed, such as from federal, state, or other sources.

Depending on funding sources, additional requirements and regulations from state or federal agencies may come into play and impact project cost and community impacts, such as the potential need for right-of-way acquisitions; the Grant Manager plays a critical role in identifying outside funding sources and tracking the additional considerations that may accompany them.

**GOAL 6: Strategically seek funding for transportation facility construction and maintenance.**

**Strategy 1: Leverage opportunities available in Alaska to secure potential funding sources for implementing transportation projects.**

**Action A:** Work with Alaska Municipal League and DOT&PF to use the Alaska Transportation Funding Opportunity Hub to identify potential funding sources for different types of surface transportation projects, and to prioritize Bethel's projects through the Hub Intake Survey. GM

**Action B:** Continue to leverage existing transportation construction support and funding through collaboration with other local entities, such as ONC. CM

**Strategy 2: Create a prioritized list of all transportation facility construction and maintenance projects.**

**Action A:** Combine the lists of maintenance / rehabilitation and new transportation facility projects created for roads and trails, and add details on estimated design and construction cost and grant-related considerations. GM

**Action B:** Order the list based on priority and when each project should be completed. GM

**Strategy 3: Pursue funding to complete priority projects.**

**Action A:** Continue to review priority projects annually to select those that could be funded through the Capital Improvement Plan. GM

**Action B:** Nominate priority projects for state owned / managed facilities to the STIP, and nominate City owned / managed facilities to other state programs for federal funding such as the Community Transportation Program (CTP). GM

**Action C:** Apply for grants to fund other priority projects, focusing on time-sensitive funding opportunities. GM

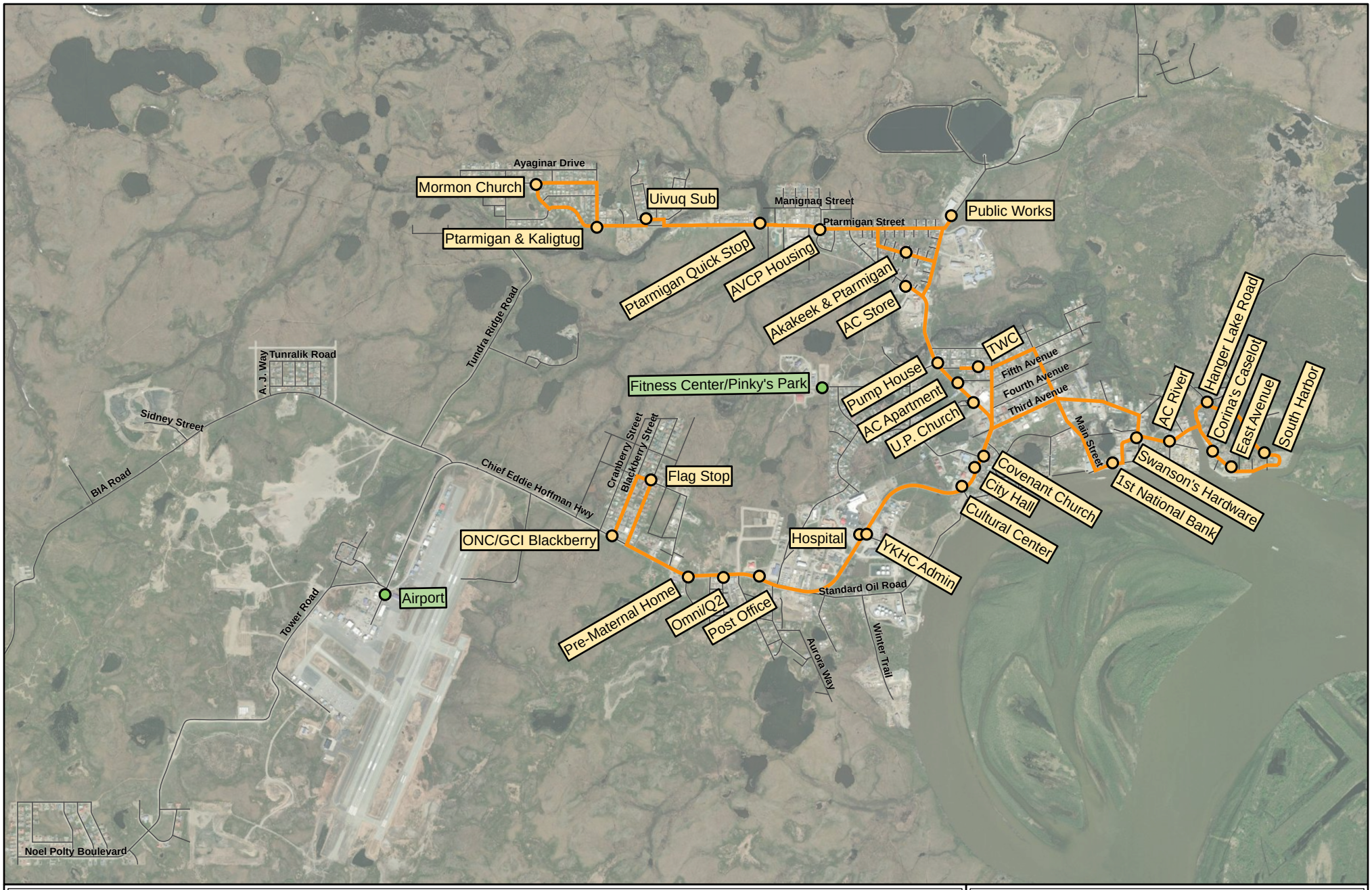
## 4.5 Public Transportation

The Bethel Transit System is an important means of transportation for those without vehicles, and its service should be improved and expanded in the future. (While there are many taxi cabs available to serve community and visitor needs, the bus is much less expensive.) Community members noted that while the Transit Manager currently collects some passenger data, there could be opportunities to collect more targeted data and start using it to inform decisions about priority changes as well as to support potential grant applications.

Over time, the transit system has already been making changes in response to community requests and ridership patterns. At times there were two routes instead of one, and some stops have been added and/or removed. The map on the next page includes current Bethel Transit System routes and stops, as well as two potential new stops that have been commonly requested by community members: the airport and the fitness center. Both of these stops have been tested in the past, but there may be opportunities to improve their implementation if reestablished. Changes to the road system may influence routes, and more multifamily development in Bethel may help support shorter headways (time between buses at each particular stop). As more grant funding is secured, new buses can be purchased, both to replace buses that are quickly worn out on Bethel's difficult road conditions and to help expand routes to farther out areas like Kasayulie.




*Bethel Transit System sheltered bus stop.*




Bus Stop

Potential Future Bus Stop

Bus Route

N

0 0.13 0.25 0.5 Miles

# Transit System

City of Bethel Comprehensive Plan

DOWL

Date: July 2023

Figure 6

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## GOAL 7: Improve the public transit system to be more convenient and responsive to the community's needs.

### Strategy 1: Use data collection to inform changes to the transit system or back up capital needs and potential grant applications.

**Action A:** Expand data collected on ridership to reflect times of day and days of the week. TM
**Action B:** Expand data collected on ridership to reflect how many passengers enter or exit the bus at each stop. TM
**Action C:** Create a comment form on the City website's transit page to collect questions, comments, or issues reported by riders. TM

### Strategy 2: Improve access to information about the transit system.

**Action A:** Post signs with schedules and routes at bus stops and inside key community facilities. TM
**Action B:** Continue to periodically print transit information in the newspaper, and also consider printing it in the City newsletter. TM
**Action C:** Incorporate transit information into visitor information on the City's website. TM
**Action D:** When there are updates to routes or schedules, share within the City to be posted on City social media (as well as in the newspaper and City newsletter to continue to remain accessible to those not using social media). TM

### Strategy 3: Make changes or expansions to the transit services provided.

**Action A:** Consider adding a stop at the airport or partnering with another organization to add another transit link between the airport and the central city. TM
**Action B:** Annually, evaluate altering the transit route(s) to include additional stops that are commonly requested by community members, such as the Fitness Center. TM
**Action C:** Review ridership data and/or community comments to consider running the transit system later into the evening. TM
**Action D:** Consider decreasing headways from one hour to half an hour, either throughout the day or during times of peak use. TM

### Strategy 4: Maintain and improve the transit fleet.

**Action A:** Use a database to track maintenance needs and expected lifespans of buses and make repairs and/or replace buses as needed. TM
**Action B:** Consider adding features to buses to improve accessibility and convenience. TM

## 4.6 Other Local Transportation Links

While roads and trails connect people with the places they live, work, and recreate in Bethel, sites need adequate driveways and parking facilities to avoid negative impacts on the adjacent roadways and parcels. The actions in this section focus on parking facilities and the routes non-motorized travelers use to access their destinations.

**GOAL 8: Evaluate site development codes to better support safe access for all transportation modes.**

**Strategy 1: Provide for adequate and safe parking facilities and practices.**

**Action A:** Examine code to make sure appropriate numbers of parking spaces are provided for each type of land use. (If changes are warranted, see Action C below.) PL

**Action B:** Facilitate shared parking between adjacent properties and uses when appropriate. PL

**Action C:** If changes are warranted to parking requirements or shared parking provisions in code, provide changes to the Planning Commission and City Council for approval. PL

**Action D:** Using signage and/or announcements via various City channels, clarify locations where street parking is not permitted in areas with compliance issues. PW

**Action E:** Continue inter-departmental collaboration to enforce parking violations that impact road safety and maintenance. PD PW

**Strategy 2: Provide for safe access for vehicles and non-motorized users.**

**Action A:** Consider consolidating driveway and parking design provisions in code or creating a separate driveway standards worksheet. PL

**Action B:** Review commercial site design code to identify opportunities to improve safety provisions such as those encouraged by Crime Prevention through Environmental Design (CPTED) principles. PL

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# CHAPTER 5
## Regional Transportation

# 5: Regional Transportation

Like many communities in Alaska, Bethel is not accessible by any road system and is isolated from surrounding villages. However, Bethel has a critical role as the air and water transportation hub of the Y-K Delta region for both people and goods.

## 5.1 Airport

Practically everyone traveling to or from any community in the Y-K Delta must travel through the Bethel Airport at some point in their journey; as such, Bethel is sometimes nicknamed the “gateway to the region.” Bethel’s airport is typically ranked the second-busiest general aviation airport in the state, and it is owned and operated by DOT&PF. The airport in Bethel includes an Alaska Airlines terminal as well as other smaller airlines serving the region.

While DOT&PF manages airport facilities and operations, and individual airlines leasing within the airport have control over their own facilities, the City has an interest in participating in planning for the airport and surrounding area given its importance to the community.



## GOAL 1: Create a well-functioning airport area for travelers and businesses.

### Strategy 1: Facilitate efficient and organized access to the airport.

**Action A:** Between the City, DOT, and airline tenants leasing land and/or buildings on airport land, determine (and formalize in agreements if needed) which party is responsible for managing roads, parking, signage, and other elements within the airport area. CM

**Action B:** Advocate for clear loading and unloading areas for taxicabs and private vehicles at the main jet terminal. PW

**Action C:** Consider adding a transit stop around the airport. TM

**Action D:** Create a guide to transportation options available to/from the airport with a map of where to access them, to be distributed and displayed in buildings for the passenger airline(s). CM*

**Action E:** Advocate for more wayfinding signage in the airport area to direct parking and pick-up / drop-off traffic, as well as pedestrian traffic between different airlines, parking areas, and other amenities. PW

### Strategy 2: Facilitate adequate parking at the airport.

**Action A:** Once parking management is determined, advocate for exploring the potential of designating short-term and long-term parking lots and an associated parking fee system with time limits. CM*

**Action B:** Once parking management is determined, advocate for the completion of a parking study to evaluate whether more parking is needed near the main jet terminal and if so, make plans to provide additional parking space. CM*

### Strategy 3: Support the development of relevant industrial uses and commercial amenities within the airport area.

**Action A:** Coordinate with DOT&PF to determine if an Airport zoning overlay district is needed, and what this overlay district would look like. PL

## GOAL 2: Support DOT&PF in airport operations and planning.

### Strategy 1: As requested by the FAA and/or DOT&PF, take actions that support smooth and secure airport operations.

**Action A:** Examine FAA requirements and recommendations when reviewing potential land uses near the airport. PL

**Action B:** If a new landfill or sewage lagoon is constructed, place it as far from the airport as practicable to avoid attracting wildlife that could be harmed, damage airport equipment, and disrupt operations. LM PW

**Action C:** Coordinate with the airport management / DOT&PF to schedule security drills. CM

### Strategy 2: Participate in planning for the future of the airport.

**Action A:** Maintain regular coordination (such as quarterly meetings) with DOT&PF and representatives from airlines operating at the airport to track near- and long-term plans impacting the Bethel airport. CM

**Action B:** Encourage public participation in airport planning projects so that the City and community's needs are factored into plans. PL

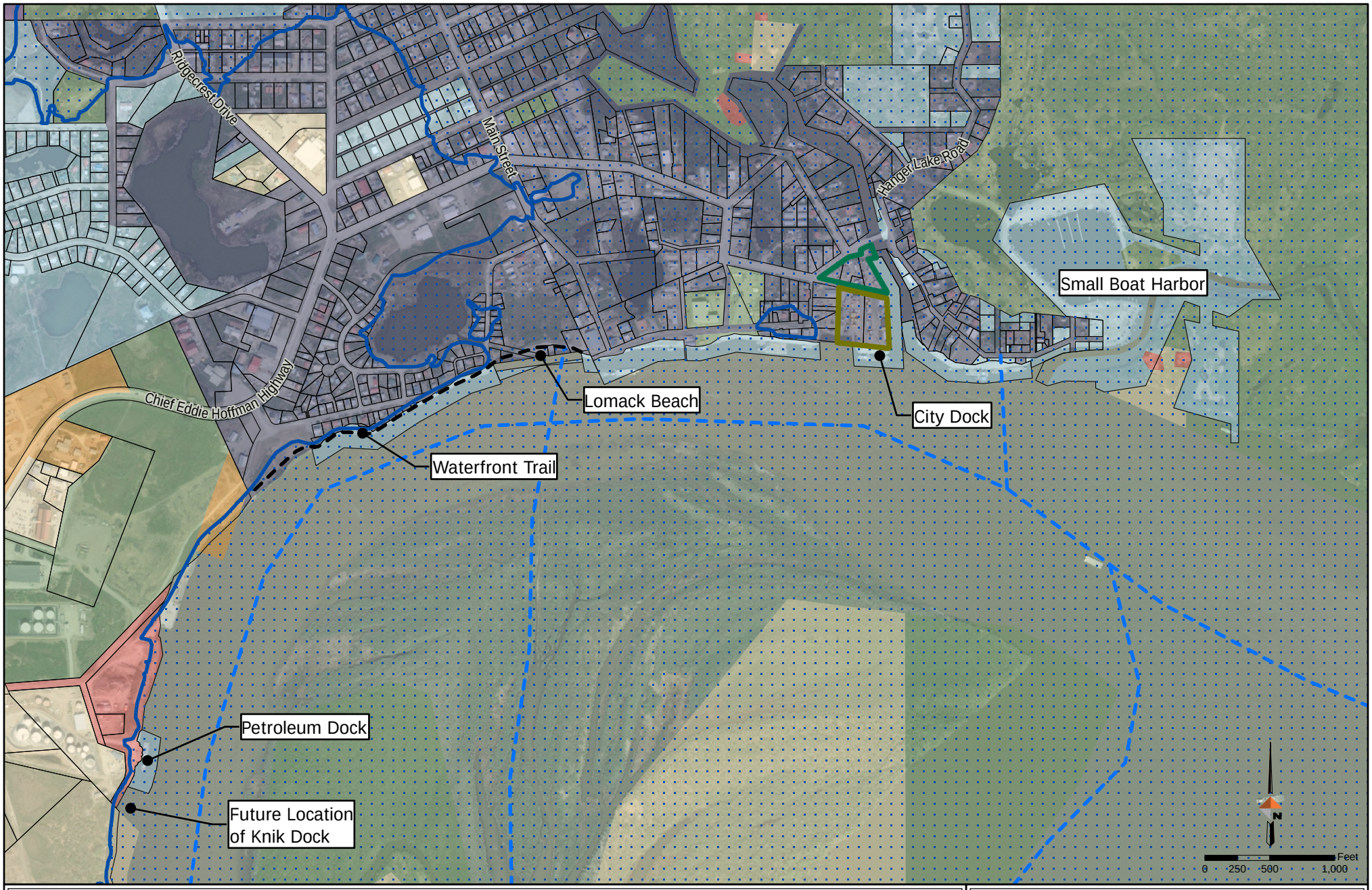


## 5.2 Port and River

The Port of Bethel, managed by the City, is the only port in Southwest Alaska that is not dependent on high tides for access; as such, it is the shipping hub for the region. The Port facilities include the Port Office, City Dock (for freight) and secure cargo storage yard, the small boat harbor, Lomack Beach (including float plane access), the petroleum port, and the seawall (which mitigates erosion along the riverbank). The City works closely with USACE to track changes in the course of the river that could impact all of this critical regional infrastructure and by extension access to the entire region; the City also works with USACE on dredging, studies, seawall maintenance, and other essential infrastructure improvements and repairs at the Port.

Besides the critical commercial and industrial uses of the cargo and petroleum port facilities (including 15-20 freight barges per year and smaller river barges to carry goods farther upriver), the Port facilities including the small boat harbor and Lomack Beach are vital to commercial fishing and subsistence activities, as well as transportation for the general public, government agencies, businesses, and non-profit organizations.

Given heavy use of Port of Bethel infrastructure and changes in the river, there is consistently more maintenance and planning needed.




**General Ownership (1997 City of Bethel Comprehensive Plan)**

- ANCSA^
- Bethel Native Corporation*
- City of Bethel
- Federal
- Private
- State of Alaska
- Information Unavailable

^includes ANCSA 14c1/c2 and ANCSA c3
*a small number of properties are also part federal or private ownership

**Ownership from Other Sources (Unverified)**

- City of Bethel
- State of Alaska

- Waterfront Trail
- Ice Road
- 100-Year Floodplain [FEMA]
- City of Bethel Parcel Boundary

# Waterfront

City of Bethel Comprehensive Plan

DOWL

Date: July 2023

Figure 7

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*Service Layer Credits: World Imagery: Maxar*

## GOAL 3: Study and plan for potential changes to the river's course that may impact port operations.

### Strategy 1: Keep up with regular dredging operations.

**Action A:** Continue to complete hydrographic studies every two years, as required by USACE. PO
**Action B:** Continue to dredge Brown's Slough annually. PO
**Action C:** As needed and based on the hydrographic studies, dredge the river between the petroleum port and the entrance to the small boat harbor. PO

### Strategy 2: Plan for potential future changes in the Kuskokwim River's course to mitigate potential impacts.

**Action A:** Request assistance from USACE for funding and conducting a feasibility study for a potential navigation study of the river. PO
**Action B:** Following the feasibility study, complete a navigation study to determine how changes in the river may impact larger ships' ability to access Bethel's port. PO
**Action C:** Continue to work with USACE to monitor the sea wall conditions to determine if, and at what rate, the river is undercutting the sea wall. PO
**Action D:** Develop an action plan for studies, monitoring, and maintenance activities needed to mitigate riverfront erosion and ensure navigability of the river around Bethel's port. PO
**Action E:** Incorporate the Port's mitigation efforts into the City's regularly-updated Hazard Mitigation Plan (*discussed further in Chapter 8 – People & Economy*). PO

### Strategy 3: Collaborate with other major waterfront property owners on riverfront management efforts.

**Action A**: As part of coordination with the private entity constructing a new cargo dock near the petroleum port in Bethel, explore partnership opportunities to obtain funding for hydrographic or navigation studies, sea wall monitoring, and maintenance or dredging efforts. PO
**Action B:** If other major waterfront developments occur in Bethel, coordinate with the property owners / developers to incorporate measures to mitigate erosion and participate in City efforts to monitor and take action according to changes in the river. PO
**Action C:** Coordinate with other property owners along the Kuskokwim River to identify collaboration and cost-sharing opportunities for studies, dredging, and other maintenance. PO



*Shipping containers on the City Dock and small boats in Browns Slough.*

## GOAL 4: Maintain adequate port infrastructure to support shipping operations.

**Strategy 1: Efficiently manage port infrastructure maintenance and repairs.**

**Action A:** Regularly inspect all public port infrastructure for a condition assessment and to predict future maintenance needs. PO

**Action B:** Create and maintain a list of maintenance needs at the port. PO

**Action C:** Prioritize the list, determine whether current maintenance staff have the skills and equipment to complete the work or if specialized contractors will be needed, and prepare cost estimates. PO

**Action D:** Pursue funding opportunities for more significant maintenance projects at the port, such as grants (which could be pursued in partnership with other entities such as tribal organizations), or partnership with private entities like Lynden. PO

**Strategy 2: Identify new infrastructure that may be needed to improve port operations.**

**Action A:** Coordinate with port management, current shipping operators, and other stakeholders to identify infrastructure needs to support current and future shipping operations. PO

**Action B:** As part of the regular LRTP process, document the port's existing conditions, issues, and needs; this would be used to create a prioritized list of infrastructure and maintenance needed. PO

**Action C:** Pursue funding opportunities for additional infrastructure expansions that would improve port operations, such as grants (which could be pursued in partnership with other entities such as tribal organizations), and partnership with private entities like Lynden. PO

**GOAL 5: Maintain infrastructure to support the use of small boats and float planes for transportation, commerce, subsistence, and recreation.**

**Strategy 1: Maintain infrastructure for small boat users.**

**Action A:** Regularly inspect the existing small boat harbor infrastructure and manage its use to help determine maintenance and/or expansion needs. PO

**Action B:** Consider developing additional parking at the small boat harbor. PO

**Action C:** Facilitate transit and taxi access to and from the small boat harbor by incorporating signage to direct passengers to appropriate loading areas. PO

**Action D:** Add any maintenance needs to the prioritized list created as part of Goal 4, Strategy 1 above. PO

**Action E:** Evaluate the costs associated with maintaining small boat harbor infrastructure and dredging. PO

**Action F:** Based on approximate yearly costs for maintenance as well as other longer-term projects that may need funding, consider gradual fee increases and/or creating new fees for various types of small boat harbor users (such as for businesses using the harbor, or vehicle parking fees) to help fund operations and improvements. PO

**Strategy 2: Maintain infrastructure for float plane users.**

**Action A:** Continue to place gravel on Lomack Beach to protect it from erosion associated with launching float planes. PO

**Action B:** Create a maintenance agreement with DOT&PF to clarify land and facility ownership and shared maintenance responsibility for Hangar Lake Road and the float plane docks at Hangar Lake. PO

**Action C:** Consider partnerships (with government agencies and/or private entities) or ways to levy user fees for float plane facilities on the river and lakes in and around Bethel to help fund erosion control measures. PO

## 5.3 Expanding Regional Access

As the transportation hub for the region, Bethel has an opportunity to play a leadership role in regional collaboration on transportation initiatives that can improve and expand the many ways people travel between Y-K Delta communities, including the ice road, trails, and future opportunities for inter-community transit and new road development. Regular collaboration can help Bethel and its neighbors make connections and start sharing more ideas and funding for transportation projects that can benefit the entire region.

## GOAL 6: Support the improvement and expansion of other modes of regional transportation.

**Strategy 1: As the hub of regional transportation, organize a City-led regional transportation coordination group to plan routes, maintenance, and funding.**

**Action A:** Establish a regional transportation coordination group, including DOT&PF, representatives from villages and tribal organizations, shipping companies, and transportation companies. CM

**Action B:** The group should meet regularly to discuss existing routes, maintenance responsibilities and issues, potential new routes or transportation methods, and grant opportunities. CM

**Action C:** Jointly create a funding strategy including participation from private entities as well as grant applications and pursuing tribal transportation and/or STIP funding. GM

**Strategy 2: Work with the regional transportation coordination group to improve reliability of ice road maintenance.**

**Action A:** Create a map of the typical ice road route, including all the villages it connects. CM*

**Action B:** Create a typical snow-clearing schedule, including what party or parties are responsible for clearing and marking. CM*

**Action C:** Collect data on past years' freezing and break up and monitor freezing, ice thickness, and break up each year. Share this data and changes over time to help reduce the risk of incidents where vehicles fall through the ice. CM*

**Strategy 3: Work with the regional transportation coordination group to improve the reliability of the trail network.**

**Action A:** Work with the group and DOT&PF to develop a map of the most used trails between Bethel and the surrounding villages, including user groups, trail markers, hazards, and other landmarks. CM*

**Action B:** Identify whether easements are needed for places where trails cross private property, and coordinate with property owners. CM*

**Action C:** Create a regional trail maintenance strategy that is responsive to different seasons, various types of trail users (snowmachine versus ATV, for example), and changing conditions over time. CM*

**Strategy 4: Facilitate potential regional transit opportunities as they arise.**

**Action A:** Coordinate with the hovercraft operator to determine if they may consider providing passenger transit again in the future. CM*

**Action B:** If interest in a river (and/or ice road) transit or taxi service arises, explore how the City's port can help accommodate it. PO

**Strategy 5: Explore potential road connections between Bethel, Oscarville, Napaskiak, and Napakiak.**

**Action A:** Work specifically with Oscarville, Napaskiak, and Napakiak representatives in the transportation coordination group to gauge interest in pursuing surface road routes between each village and Bethel. CM

**Action B:** Explore partnership agreement opportunities to implement future road connections. CM




*Passenger loading area in front of the Alaska Airlines terminal at the Bethel Airport.*



# CHAPTER 6
## Utility Infrastructure

# 6: Utility Infrastructure

Contemporary homes need a network of utility services in order to function, including energy for electricity and heating, water and sewer service, internet access, and a way to dispose of solid waste. These utilities are central to quality of life. Providing the needed infrastructure can be challenging in remote communities like Bethel due to the lack of locally available materials and skilled labor, which has significant impacts on the cost of the infrastructure. However, updating infrastructure can bring savings and sustainability improvements.

## 6.1 Energy

Energy production in Bethel has historically relied on non-renewable, expensive methods such as diesel generators, which cost approximately 60 cents per kilowatt per hour. This is more than 300% higher than the national rate of approximately 14 cents. This high cost is added on top of an already high cost of living in Bethel including other essentials like housing, transportation, and groceries.

The Alaska Village Electric Cooperative (AVEC) is the largest source of energy for the region, and Bethel is AVEC's largest member community. As a member-owned rural electric cooperative, AVEC serves more than 50 remote member communities. Its Bethel power plant provides power to nearby communities of Oscarville and Napakiak in addition to Bethel.

The 2011 Comprehensive Plan outlined goals to reduce energy consumption, improve existing infrastructure, and develop new alternative energy sources to reduce costs. Stakeholders have stressed the importance of pursuing alternative energy sources; not only are they more environmentally sustainable, but they also will reduce costs in the long run.



*A solar array near the Fitness Center in Bethel.*

Since 2011, the following are some examples of progress made:

- Until 2014, Bethel electricity was provided by Bethel Utility Company (BUC, Inc.), a private, investor-owned utility, but the 2011 Comprehensive Plan identified a cooperative as the ideal model for Bethel. Now that AVEC provides energy since 2014, there may be more opportunities for regional coordination on alternative energy sources and infrastructure advancements.
- In 2014, one wind turbine capable of putting out 100 kW was constructed to help power the new Yukon-Kuskokwim Regional Aquatic Health and Safety Center, which features a six-lane swimming pool, weight room, hot tub, and more for Bethel residents and surrounding communities. The wind turbine produces 40% of the facility's electricity.
- In 2020, a new 900 kilowatt-capacity wind turbine was constructed about 3.3 miles from the diesel-fired prime power plant. AVEC selected Bethel as the place to locate its first MW-range wind turbine due simply to the size of the grid. In its first 15 months of operation - October 2018 through December 2019 - it produced nearly 5% of all the power generated and consumed on the Bethel grid.
- In 2020, the 45-year-old power plant in Bethel was improved to maintain proper voltage regulation and provide more surge protection.

Stakeholders identified wind turbines, solar panels, hydroelectric facilities, natural gas, and small-scale nuclear power as avenues to pursue in order to diversify Bethel's energy sources away from diesel. The City can pursue integrating these energy sources for its own facilities, o. Even though the City is not responsible for electricity serving the community, the City should support AVEC system upgrades and alternative energy projects. For example, AVEC is interested in taking greater advantage of wind energy as Bethel experiences a significant amount of wind, so the City could help identify suitable sites for turbines or wind farms and help AVEC work through regulatory processes.



## GOAL 1: Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gases.

### Strategy 1: Facilitate large-scale projects to introduce more alternative energy sources to the local network.

**Action A:** Assign a City "energy point person" to coordinate regularly with AVEC. CM

**Action B:** Working with AVEC, create a strategic plan that identifies ways for the City to support a transition to more alternative energy generation. CM

**Action C:** Create a guide to zoning code and permitting requirements that are applicable to alternative energy infrastructure such as wind turbines or solar panels, and work with AVEC to identify and propose changes to requirements that may create unnecessary barriers. PL

**Action D:** As part of the strategic plan discussed in Action B, identify the best locations in Bethel for wind, solar, or other alternative energy generation and storage, and examine City-owned sites for suitability. PW

**Action E:** Monitor and support AVEC in applying for grant opportunities for alternative energy generation and storage that could be implemented in Bethel. GM

**Action F:** Pursue partnerships with tribal entities to work together on grant applications and gain access to more potential funding. GM

### Strategy 2: Update City facilities to be more energy efficient.

**Action A:** When updating existing City facilities or constructing new City facilities, design should consider including alternative energy sources, such as solar or wind power instead of diesel. PW



*Water and sewer pipes serving homes in the Bethel Heights neighborhood.*

## 6.2 Water and Sewer

Bethel currently has a mix of truck-hauled and piped water and sewer services. The truck-haul system serves approximately 1,100 residences, compared to approximately 500 served by piped water and sewer. Due to Bethel's high groundwater and discontinuous permafrost, pipes are installed above ground so they are better able to withstand ground movement.

The City is focused on upgrading to a fully piped system. Piped water and sewer offer several advantages over the haul system, including improved public health, reduced road wear and safety concerns from haul trucks, and reduced risk of spills and leaks. The City experiences a chronic shortage of truck drivers, and operating the piped system costs the City about a third as much as the haul system. Residents generally prefer the unlimited capacity allowed by the piped system and support eliminating haul trucks from the roadways.

Recent price escalations of both materials and labor pushed the capital cost of water and sewer pipe construction to approximately $2 million for every 1,000 feet, which could make future upgrades cost prohibitive for the City. However, piped water and sewer remain a top priority to reduce cost of living and improve quality of life for the City in the long run.

Since the 2011 Comprehensive Plan, the City has undertaken many water and sewer projects including:

- Extended and improved piped water and sewer in the Institutional Corridor (including facilities like the hospital and City Hall)
- New pumps, a generator, and a Fats, Oils, and Grease (FOG) mixer for the Main Lift Station
- Ongoing security improvements, including a fence around the City Subdivision Water Treatment Plant water tank
- Design of the Avenues Piped Water and Sewer project to serve 110 residences is underway, with construction anticipated to begin in 2023.

The Bethel Heights-Martina Oscar Piped Water and Sewer project, which includes new services to 25 houses, expansion of the Bethel Heights Water Treatment Plant, and repairs to existing pipes (in response to frost jacking), is expected to begin in 2024. The City also implemented corrosion control measures to address water discoloration concerns in Bethel Heights.

Based on the most recent rate study, a new rate structure could be implemented to address the cost disparity between piped and hauled service. Looking ahead to Bethel's goal of a fully piped system, in 2022 the City completed a Community-Wide Piped Water and Wastewater Preliminary Engineering Report (PER) to evaluate potential buildout of the piped system to almost all Bethel households. This was a requirement in order to qualify for certain federal grants available for implementing water and sewer improvements.

The PER outlines a 12-phased approach to extending the piped utilities. The phases present more readily constructible and fundable projects than piping the entire community at once. The series of projects starts with a new truck fill and distribution center, followed by extending pipes and adding lift stations to each residential subdivision. There are a few alternatives possible for planning for sewer, such as adding an additional sewage lagoon cell when needed or using modular treatment plants for each subdivision. Another project recommended in the PER is the construction of a backup well for another water source for the City.

## GOAL 2: Regularly seek ways to lower water and sewer bills for customers.

**Strategy 1: While the hauled portion of the Bethel water and sewer system continues, evaluated hauled operations to look for efficiencies that may help reduce rates.**

**Action A:** Seek grants to evaluate adding additional lift station points or watering points. GM
**Action B:** Work with DOT&PF to get exemptions to allow for heavier (more efficient) water and sewer haul trucks. PW

**Strategy 2: Expand the piped water and sewer system, as it operates profitably and offsets losses from the hauled network.**

**Action A:** Investigate and pursue funding options including grants, low interest loans, and bonds to expand the City's piped water and sewer network to reduce the amount of hauling. GM
**Action B:** Repair existing deficiencies to the existing piped water and sewer network to maximize the system's efficiencies. PW

**Strategy 3: Evaluate and reduce costs associated with production and distribution of water and collection and treatment of wastewater.**

**Action A:** Seek grants to conduct energy audits and make energy efficiency improvements at water treatment plants and amongst the haul fleet. GM
**Action B:** Request an audit of water and sewer operations and maintenance from the Alaska Rural Utility Collaborative with a focus on improving cost, efficiency, resilience, and reliability. PW
**Action C:** Increase financial efficiency, automate operations and billing, explore cost effective freeze protection efforts, and explore subsidized technical support through non-profits and state and federal agencies. PW

## GOAL 3: Transition Bethel's water and sewer utilities to fully piped systems serving all residences and businesses.

### Strategy 1: Complete each phase of projects outlined in the PER.

**Action A:** Obtain grant and loan funding for new water and sewer projects, including from the USDA. GM
**Action B:** Identify available land and begin acquiring easements (as needed) for future facilities, such as the truck fill station, pipes, and additional source water well. PW
**Action C:** Implement each phase of the PER. PW
**Action D:** As PER phases are implemented, monitor the capacity of the existing sewage lagoon to determine if another lagoon cell will be needed, and when it may be needed. PW

### Strategy 2: Focus on maintenance to protect the City's utility investments and avoid unnecessary costs.

**Action A:** Construct security fences around all water treatment plants. PW
**Action B:** Improve Supervisory Control and Data Acquisition (SCADA) compatibility of Bethel's water treatment plants and lift stations to reduce the manual monitoring tasks performed by staff. PW
**Action C:** Provide information to the community on how to use the piped sewer system, restrictions on what can be dumped into the system, and who is responsible for maintenance costs associated with different elements of the system. PW

### Strategy 3: During the phases of the PER and beyond, manage the piped system to be as efficient and accessible as possible, as well as equitable in cost.

**Action A:** Complete a rate study every 10 years; utilize results of the rate study to set rates appropriately. PW
**Action B:** Establish a process for non-residential properties to be informed about the piped system progress in their area and how and when to connect to the piped system. PW
**Action C:** For new development or redevelopment, work with industry experts to investigate how the City could implement an "impact fee" system in which there are clear expectations related to new or upgraded infrastructure cost to the developer. CM
**Action D:** Provide City assistance with finding potential grant or loan funding for new commercial connections or subdivision developments not currently included in the 2022 PER phases. GM
**Action E:** If water usage becomes an issue due to water supply or excessive usage, install meters in conjunction with a tiered rate system to encourage less water usage and increase revenue. PW

## 6.3 Internet

Bethel's current lack of access to adequate broadband internet service limits economic development as well as the efficiency of services by health care providers, schools, tribal entities, businesses, and residents. Widespread access to broadband will remove barriers to public health innovation and schooling options and would stimulate economic growth.

Fast and reliable communications through deployment of broadband networks are a priority for the State of Alaska, which recently developed a State Office of Broadband Development and, along with other federal agencies, will be funding large scale deployment in the next 5-10 years. According to the State of Alaska Governor's Task Force on Broadband, Alaska "must prioritize broadband service expansion in unserved and underserved areas" as 63.7% of Alaskans living in rural areas have access to fixed terrestrial broadband at speeds of at least 25 Mbps. Additionally, Alaska will receive at least $100 million through a new federal program to expand high-speed internet to underserved rural areas to promote workforce development.

GCI is currently the sole internet service provider for community members in Bethel, with microwave system-based speeds of 10 Megabits per second (Mbps), but GCI is planning to expand access to Bethel through a combination of projects. Though the City is not directly involved in providing internet service to residents, fast and reliable internet would greatly improve efficiency for City government, local businesses, and residents seeking to connect with those outside the region; the City should do what it can to help GCI bring in broadband. At the time of updating this Comprehensive Plan, satellite internet providers such as Starlink were also rapidly expanding into the region.

**GOAL 4: Facilitate broadband development within the City of Bethel to advance community access to reliable internet service.**

**Strategy 1: Monitor the buildout of internet-related infrastructure in Bethel.**

**Action A:** Request information from GCI regarding locations of existing fiber optic cable within Bethel. PW

**Strategy 2: When possible, streamline permitting of internet-related infrastructure.**

**Action A:** Prioritize facilitation of rights-of-way within city-owned land or city-held easements for laying fiber optic cable. PW
**Action B:** Review and amend tall tower permitting code to be simpler and more efficient. PL
**Action C:** If / as needed to help facilitate improved internet connectivity in Bethel, review and amend other sections of BMC that may impact permits required for different types of internet-related infrastructure (besides cables and towers). PL

## 6.4 Solid Waste

Part of the Public Works Department's maintenance and operations responsibilities for the City include solid waste management. Trash is primarily collected in residential and commercial dumpsters located throughout the city before being placed in the landfill.

The Bethel landfill was constructed in 1991 and has completed several studies throughout the years to determine its remaining capacity. Per a 2019 study, the landfill is projected to reach capacity in 2043. Landfill closure, continued monitoring that would be required after closure, and the opening of another landfill would be very expensive, so the City of Bethel is motivated to prolong the life of the existing landfill as much as possible. Reducing existing volume of waste and managing new waste entering the landfill are two main strategies to achieve this goal.

Based on Alaska Department of Environmental Conservation (ADEC) inspections, Bethel has continued to improve landfill operations. The city has purchased a shredder to reduce waste volume. There are also opportunities to reduce the amount of waste that heads for the landfill in the first place. Since the latest Comprehensive Plan in 2011, the recycling program in Bethel has been discontinued due to the high cost of shipping out materials, which has led to an increase in reusable / recyclable material in the landfill.

Though the City is no longer recycling, there are other reuse, recycling, and specific types of waste collection programs that exist in the community, such as a recycling program run by ONC. These efforts could become more collaborative so that they can be amplified. Some of the strategies in this section focus on the City working with the community to find ways to divert more waste from the landfill, which both prolongs the landfill's life and protects the environment and public health of the community.




*Refrigerators being stored separately from other waste at the Bethel Landfill.*

**GOAL 5: Manage the landfill to be useable as long as possible and with minimal environmental impacts, through more efficient and environmentally responsible practices.**

**Strategy 1: Continuously monitor the capacity of the landfill to assess if / when a new landfill might be needed in the future.**

**Action A:** Conduct a new landfill closure study approximately every five years to measure and evaluate progress and determine what strategic changes might be necessary. LM

**Strategy 2: Utilize best solid waste management practices and compliance with ADEC standards to reduce the volume of waste in the landfill.**

**Action A:** Regularly review guidance on the ADEC Solid Waste website and incorporate recommendations based off of the annual state inspection and new technology as it becomes available. LM

**Action B:** Improve separation of waste by establishing cells (such as for lumber or scrap metal and vehicles). LM

**Action C:** Train personnel on the use of the shredder and other techniques to reduce volume of waste. LM

**Action D:** Provide continual education and staff training for properly disposing of hazardous materials, such as freon removal with Total Reclaim, the Rural Alaska Landfill Operator (RALO) course, and/or HAZWOPER. LM

**Action E:** In the longer term, consider building an additional storage garage to store and protect heavy equipment. LM

**Strategy 3: Pursue ways to redirect more types of waste from the landfill, both to prolong the landfill's life and to minimize impacts to the environment and public health.**

**Action A:** Provide regularly updated information to the public on existing City waste separation programs and what types of waste can and cannot be disposed in dumpsters. LM

**Action B:** Research types of waste that can be reused or recycled locally as well as the market for recyclables in Anchorage and/or Seattle; stage these items for public salvaging or separate for local recycling and/or shipping out in collaboration with ONC's recycling program or as part of a renewed City recycling program. LM

**Action C:** Research potential partners for a new City-wide e-waste collection and recycling program to build on periodic local collections. LM

**Action D:** Research how to implement a compost program for food waste and potentially cardboard and paper products; this could potentially be incorporated into Parks and Recreation and Community Garden programming. LM PR

**Action E:** As local recycling becomes more feasible, consider starting by working with organizations such as schools, hospitals, and businesses that may have a steady supply of uniform recyclable materials (like paper, certain types of packaging, etc.). LM

**Action F:** Research funding or partnership opportunities for barging out other kinds of waste, particularly harmful waste. LM GM

**Action G:** Research and initiate community discussions about ways to address negative impacts of junk vehicles located on private properties and in the landfill. LM

**Action H:** Pursue other funding opportunities geared towards environmentally friendly landfill and recycling programs for the City. GM

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# CHAPTER 7
## Public Facilities & Services

# 7: Public Facilities & Services

Details on the responsibilities of each City department are provided in Chapter 2 – Existing Conditions.

## 7.1 City Operations and Communications

The City has reported ongoing difficulty in finding people to work in City jobs, particularly since the Covid-19 pandemic. Many departments are short-staffed, creating challenges when trying to keep up with the needs of the growing city. For example, there is little room for delaying delivery of Public Works Department services like water and sewer or road maintenance. Generally, the City should evaluate how each department operates to help determine whether services can be provided with existing staff and resources, or if there are ways to alter technology used or department structures to maintain reliability for the community while minimizing personnel costs (which in turn increase some service costs for the community).

Vacancies in City committees and commissions also reduce their ability to effectively meet and make decisions, as meetings cannot be held without a quorum. Strategies such as implementing new technology or establishing mentorship, chains of command, and transition plans can improve City operations in the face of staffing challenges and help retain and develop City employees and volunteers. The City should pursue new ways to recruit potential employees and volunteers. This will also require strategic bolstering of ways the City communicates with the community in order to increase engagement.

**GOAL 1: Enhance the reliability and efficiency of the City workforce.**

**Strategy 1: Optimize and monitor the staffing and operations of each City department to ensure efficiency and support staff retention and hiring efforts.**

**Action A:** Ensure every department has clearly outlined responsibilities with documented and regularly updated policies, procedures, and job descriptions to facilitate staff training and operations evaluations. CM HR

**Action B:** Conduct an evaluation of each department's operational efficiency on an annual basis and when considering hiring additional personnel. CM FI

**Action C:** As evaluations of operations are completed, consider altering the structure of departments (for example, implementing new technology to increase efficiency, or establishing mentorship and chains of command that facilitate staff advancement into leadership roles). CM HR

**Action D:** Establish transition plans so that department operations are minimally impacted by the departure of key staff. CM HR

**Strategy 2: Implement new technology in order to save money spent on some City functions and decrease each City department's workload.**

**Action A:** Transition the City to an online customer portal system with abilities to manage utility service preferences and pay bills. Over time, this self-serve system could expand to include the ability to manage business licensing and sales tax payments, submit site plans, and other potential applications. IT

**Action B:** Transition City departments to an electronic timekeeping system. IT

**Action C:** Explore more automated technology systems that could be used to track City department budgets and produce reports, in order to help departments manage their own budgets and lighten the load on the Finance Department. FI IT

**Strategy 3: Regularly raise awareness about current and upcoming job and committee / commission openings within Bethel.**

**Action A:** Informed by operations evaluations completed as part of Strategy 1, create a running list of staffing needs within the City, and order it based on priority. HR

**Action B:** Post open position advertisements to national recruitment websites, featuring the highest priority openings as identified in Action A. HR

**Action C:** Set up an automated email alert service that sends updates to potentially interested parties when there are openings at the City, featuring the highest priority openings as identified in Action A. IT

**Action D:** Organize an annual City of Bethel Opportunity Fair, where representatives from each department and committee / commission can raise awareness about their activities and meet potentially interested candidates. HR

**Action E:** Advertise current and upcoming openings as well as the opportunity fair and any other relevant events through typical channels within Bethel. HR

**Strategy 4: Work with educational programs to create a pipeline of trained candidates for City jobs.**

**Action A:** Work with local schools, including the high school, vocational school, and university, to create a pipeline of potential City employees. HR

**Action B:** Identify other vocational schools in Alaska and advertise job openings through their channels. HR

**Action C:** Request that the University of Alaska help share job openings with their network to broaden the reach across Alaska. HR

**Strategy 5: Broaden recruitment channels around the region and Alaska.**

**Action A:** Invite people from villages in the region to attend hiring events and apply for jobs at the City. HR

**Action B:** Work with tribal organizations and native corporations to raise awareness about jobs at the City with a statewide audience. HR

**Action C:** Consider working with recruiters to help find candidates. HR

| GOAL 2: Communicate regularly and effectively with the community through various channels. |
|---|
| **Strategy 1: Expand the reach of the City's newsletter, "In the Loop."** |
| **Action A:** Maintain easy public access to the current month's newsletter on the homepage of the City website, with historical newsletters also available on the website. CC<br>**Action B:** Create a City information flier to laminate and place around town, including URLs and QR codes for the current newsletter and other key sites to access. CC<br>**Action C:** Print some copies of the newsletter to leave in key locations around town. CC |
| **Strategy 2: Expand the City's presence on social media.** |
| **Action A:** Designate a social media "point person" within City staff, to be responsible for monitoring City activities that should be posted to social media and regularly checking in with all the departments for updates. (This could be the City Clerk or someone the Clerk designates.) CC |
| **Strategy 3: Optimize the City website and update it regularly.** |
| **Action A:** Each year, conduct a review of the website to determine if there are particular pages or sections that need to be added, deleted, reorganized, or updated. CC<br>**Action B:** As needed, update the home page (and/or other pages) with more new information and links. CC<br>**Action C:** Make it easier to find contact information to use for different types of inquiries to the City. CC |

## 7.2 City Finances

The City of Bethel's financial structure includes certain types of revenue contributing to a general fund to pay for things like City employee salaries and building operation costs. Current funding sources include bed tax, sales tax (including selective sales tax on certain items like alcohol, marijuana, and tobacco), gaming fees, and payment in lieu of taxes. The Finance Department oversees business licensing and sales tax collection and is focusing on completing audits to improve compliance.

Other fees are structured as "enterprise funds" that fund services and facilities that are supposed to be self-supporting, such as water and sewer, solid waste services, or the municipal dock enterprise fund. The Fitness Center is also considered an enterprise fund for auditing purposes, and most of its funding comes from sales taxes. Enterprise funds may not always be self-supporting as they could become too expensive to residents – they may require subsidizing through other revenue sources. This is something the Finance Department should take the lead on managing as discussed in Strategy 1 below. Generally, the Finance Department can play an active role in continually assessing the City's fiscal structure and making changes based on priorities and needs.

There are currently no property taxes in Bethel, unlike the large majority of Alaskan cities of Bethel's size. This is because there is such a mix of Native allotments and other privately owned land, and Native allotments are not taxable.

## GOAL 3: Optimize the management of City revenue and spending.

**Strategy 1: Continually evaluate and consider reshaping the City's fiscal structure for efficiency and as City priorities change over time.**

**Action A:** Working with other City departments as well as the Finance Committee, consider ways to augment, diversify, and allocate City revenue sources, such as based on particular projects that may need funding. FI

**Action B:** In the longer term, conduct a comprehensive study of municipal finances to determine the most efficient and effective fiscal structure. FI

**Strategy 2: Regularly update fees and other charges.**

**Action A:** Continue annual updates to the City's fee schedule (as required by BMC 4.04.025), including consideration of whether new fees should be levied. FI

**Action B:** Keep up-to-date utility rates by completing utility rate studies every 10 years. PW

**Strategy 3: Improve clarity and consistency of sales tax collection and business licensing.**

**Action A:** Consolidate and improve clarity of information on the City website related to businesses, licensing, and sales tax collection. FI

**Action B:** Before local business licenses are issued or renewed, require a code compliance review from the Planning Department. FI

**Action C:** Enforce compliance with business licensing requirements and sales tax collection by completing 80 sales tax audits per year. FI

**Action D:** Expand resources to help people start local businesses. FI

**Strategy 4: Shape sales taxes and fees to positively influence public health and sustainability and fund key community projects.**

**Action A:** Over time, consider proposing expansions to taxes on alcohol, marijuana, and tobacco sales, as well as gambling. CM

**Action B:** Propose a "bag tax" for disposable bags from stores and restaurants. CM

**Action C:** Consider proposing vehicle parking fees in some areas, such as for long-term parking near the airport or boat harbor. CM

**Strategy 5: Maximize grant funding that can be obtained.**

**Action A:** Expand the grant writing and research capacity of the City beyond the Grants Manager, including assistance from other departments and/or hiring consultants to prepare some grant applications. GM

**Action B:** Explore partnerships with other organizations to fund some projects. GM

## 7.3 Public Facilities & Equipment

In addition to the revenue sources discussed above in Section 7.2, the City holds assets including land, equipment, transportation and other infrastructure, buildings, and other public facilities. To best serve the community, the City must manage potential land uses for its holdings or otherwise navigate leases or sales. Equipment, public utility, and building facilities must be maintained, updated, and expanded when necessary, but this requires advance planning to make sure there is adequate funding available and that public services are not interrupted while the City waits for new equipment to arrive, for example. The City regularly completes a Capital Improvement Plan (CIP) to plan allocation of City funds, but this system might benefit from more strategic updates. Goals 4 and 5 below provide guidance for managing City-owned land and other assets as well as planning to prioritize where to obtain and/or allocate funding in the future.

**GOAL 4: Manage City-owned land in an efficient, cost-effective, and forward-thinking manner.**

**Strategy 1: Maintain a map of City-owned lands and ownership changes.**

**Action A:** Create a map of City-owned lands using GIS and an associated database. PL

**Action B:** Identify undeveloped or underutilized properties currently owned by the City on the map. PL

**Action C:** Using the community land use needs identified as part of the goals in Chapter 3 – Housing and Land Use, identify community needs that may be met with City-owned properties or underutilized properties. Use this information to identify where there are gaps, which could lead to identifying properties that may be pursued for acquisition by the City. CM

**Action D:** Update the map as properties are acquired or sold, also tracking properties identified as potential acquisitions or potential properties to sell. PL

**Strategy 2: Improve processes for City property acquisition, sales, and leasing.**

**Action A:** When the City needs to buy or lease land, release requests to negotiate lease or sale agreements with other property owners in order to help find available land that meets City purposes. CM

**Action B:** Work with the City Attorney to clarify appropriate options of processes for leasing land / facilities to non-profits, businesses, or other types of entities, including determining fair rental costs relative to appraised value, bid processes, or other ways to enter into lease agreements. CM

**Action C:** The City currently offers heavily discounted rental and utility rates for some non-profit lessees; evaluate the community value of these leases and consider evolving the practice to rent at appraised values, still with the potential for discounts depending on purpose. CM

**Action D:** Examine publicly owned lands for all potential uses, including open space use, before disposition. PL

## GOAL 5: Manage updates to City facilities and equipment in an efficient, cost-effective, and forward-thinking manner.

### Strategy 1: Maintain the Capital Improvement Plan (CIP).

**Action A:** Update the CIP every year. CM

**Action B:** Ensure that items in the CIP advance City goals for improving energy efficiency and a transition to alternative energy sources in the future. CM

**Action C:** Continue to use the insurance schedule to anticipate items that the City may need to spend money on in the future, such as repairing frozen pipes. CM

### Strategy 2: Continually seek funding for additions, improvements, and repairs to City facilities and equipment.

**Action A:** Remain up-to-date on funding opportunities, including special infrastructure funding through federal or state programs. GM

**Action B:** Apply to grants to fund infrastructure, such as BUILD grants. GM

**Action C:** Consider allocating other funding sources for some infrastructure improvements, including through collaboration and potentially facilities-sharing with organizations such as ONC. GM




*Bethel Heights water treatment plant.*

## 7.4 Public Safety

The Bethel Fire Department currently includes the Fire Chief, the Fire Captain, three Fire Lieutenants, and six Firefighter / Emergency Medical Technicians (EMTs), in addition to approximately 20 volunteer firefighters, EMTs, and/or paramedics. The department operates two Class-A pumpers, one aerial apparatus, three Type-1 Advanced Life Support Ambulances, a fire rescue boat, two wildland firefighting ATVs, and several support vehicles out of the fire station in the middle of town (near City Hall and the Cultural Center). The City has a mutual aid agreement with the state-owned Bethel airport to provide services, as well as a cooperative agreement with the State of Alaska Bureau of Land Management, Division of Forestry and Fire Protection for access to additional equipment and personnel when needed.

Prevention and education programs include a home fire safety program, fire prevention classes, and fire drills for children through field trips and school visits (including Fire Prevention Month in October), and a program in which fire department personnel regularly examine commercial and residential properties in areas of the community where a significant fire problem might develop. Smoke detectors are available and can be tested year-round at the fire station; the department will also provide, test, or install detectors in homes for those without the means to do so themselves.

The Bethel Police Department currently includes 19 sworn personnel that handle a significantly larger number of calls for service than other cities of its size. Bethel police also respond to calls outside of city limits as the public safety answering point (PSAP) for the Alaska State Troopers.

In addition to police, Bethel has a state grant-funded Community Service Patrol program that currently includes three full-time employees.

This program helps with the police department's response load for certain types of cases, such as bringing intoxicated people to the sobering center operated in partnership with YKHC.

Capital improvements completed since the last Comprehensive Plan include a new police headquarters, a new Community Service Patrol vehicle (funded with Covid-19 relief money), a new ladder truck, a new pumper-tender truck, and refurbishment of an existing ambulance. It is important to note that many improvements that fall under the Public Works department, including for improved roads and water systems, would also benefit the emergency response operations and help lengthen the life of equipment.

**GOAL 6: Improve public safety facilities and services in Bethel.**

**Strategy 1: Continue to improve fire and emergency medical infrastructure and services.**

**Action A:** Construct a new fire station near the airport. FD
**Action B:** As the City's piped water system is expanded, install fire hydrants. PW
**Action C:** Address maintenance needs for the fire station. FD
**Action D:** Continue to recruit and provide training to fire and EMS staff and volunteers. FD
**Action E:** Address other public safety capital improvement needs as they arise and new technology becomes needed and/or available. FD
**Action F:** Continue and increase the delivery of existing fire prevention and education programs. FD

**Strategy 2: Continue to improve police service.**

**Action A:** Continually upgrade public safety dispatch and communications equipment. PD
**Action B:** Purchase additional surveillance and other evidence collection equipment, as needed. PD
**Action C:** Provide additional training to Police and Community Service Patrol staff, as needed. PD
**Action D:** Make other upgrades and additions to police department facilities as needed, including the vehicle impound yard. PD



*Bethel Fire Department trucks located outside of the fire station.*

Other than general Fire and Police Department updates, locally specific, targeted initiatives have been successful at improving public safety in the past. One example is the progress made on the "Kids Don't Float" program, which was listed as an action item in the previous Comprehensive Plan. To help prevent drowning, safety information signage and life jackets or other flotation devices have been placed near water access.

There could be other opportunities for public safety initiatives that respond to safety issues that are specific to Bethel, which may be spearheaded by the Fire and/or Police Departments or in partnership with other organizations, depending on the specific issue.

## GOAL 7: Target specific public safety concerns within Bethel.

### Strategy 1: Improve maritime safety through educational programs.

**Action A:** Continue to work with the Fitness Center to offer swim classes for all ages, including pursuing a partnership with the school district to incorporate swim lessons into their required physical education programming during elementary school. PR
**Action B:** Through the Port, organize boating safety classes. PO

### Strategy 2: Improve ATV and snowmachine safety, on and off Bethel roads.

**Action A:** Pursue a partnership with the State of Alaska to offer ATV and snowmachine safety information and/or classes. PD
**Action B:** Require ATV registration to drive ATVs on roads within City limits. PD

### Strategy 3: Reduce drug abuse in Bethel.

**Action A:** Through the renewed Parks and Recreation department *(see Section 7.5)*, provide programming for all ages that focuses on physical and emotional wellbeing through recreation, including the potential for mentorship and volunteering opportunities. PR
**Action B:** Continue collaboration with the Western Alaska Alcohol and Narcotics Team (WAANT, which includes Bethel Police, Kotzebue Police, Kodiak Police, and the Alaska State Troopers) to penalize drug trafficking and illegal alcohol bootlegging. PD
**Action C:** Continue operation of the Community Service Patrol, the grant-funded service that picks up individuals under the influence and drops them off at places such as YKHC or their sobering center. PD

### Strategy 4: Support organizations that provide services to people experiencing homelessness in Bethel.

**Action A:** Continue to support the Bethel Winter House nonprofit organization. CM*

### Strategy 5: Improve animal care and control programs.

**Action A:** Continue discussions on whether to hire a dedicated City animal control staff person to catch loose dogs and issue citations for animal cruelty. PD
**Action B:** Support and coordinate with Bethel Friends of Canines (BFK9) on the new animal shelter project. PD

## 7.5 Parks and Recreation

Bethel's recreation facilities include parks, trails, the Fitness Center and pool, and other facilities. These facilities are heavily used by the community and identified as a key community resource that contributes to quality of life in Bethel. As such, there is a desire to expand recreational facilities for people of all ages. In the past, expansion efforts have involved grants, special funding allocation from City taxes, and community partnerships and volunteer efforts. Given the strong public interest in more parks, trails, and other facilities, it is likely similar collaborative efforts could be enacted for future projects. These projects will also improve the visitor experience of Bethel and provide more spaces for sports and cultural events held in the City, which is important to economic development, as discussed in Chapter 8 – People and Economy.

Bethel Parks and Recreation are currently managed by the Public Works department. In the past, there was a dedicated Parks and Recreation department, and the Community Parks and Recreation Committee (which advises City Council) is advocating for the recreation of this department to increase capacity for parks and recreation planning and programming. An interim step could be working with a contractor to provide recreational services support to the community for desired programming expansion; the Committee is currently working with Public Works on an RFP to this effect. The Fitness Center is owned by the City but currently run by a contractor; the center could potentially be restructured as "headquarters" for a Parks and Recreation department.

Many of the action items in this section are assigned to Parks and Recreation despite this not being a City department at this time, recognizing that the community is advocating for greater emphasis on the management of parks and recreation. As a shift towards a greater focus on Parks and Recreation occurs, Public Works and the City Manager should continue to work together to track and work on these action items. The Community Parks and Recreation Committee can also assist with providing input on delegation of responsibilities.




*Yukon-Kuskokwim Fitness Center.*

## GOAL 8: Enhance the role of parks in the Bethel community.

### Strategy 1: Expand the City's capacity to manage and maintain parks.

**Action A:** Recreate the Parks and Recreation department and/or designate an interim Parks and Recreation manager within the City who will be responsible for leading coordination with contractors (current and potential future), parks and recreation improvement projects, and coordination with the Community Parks & Recreation Committee. CM

**Action B:** Continue efforts to hire and train Public Works maintenance staff, including for seasonal positions and/or potential for volunteer involvement. HR

**Action C:** Monitor general and ongoing maintenance issues related to parks (such as vandalism) and discuss ideas for solutions with the Community Parks & Recreation Committee. PR

### Strategy 2: Expand and improve key central parks in Bethel with the goal of making them community landmarks and gathering spaces.

**Action A:** Create a new park on the former Kilbuck School site, as the neighborhood park for the Avenues / Alligator Acres area. PR

**Action B:** Identify waterfront park investment opportunities to create an iconic and central civic space that represents Bethel. PR

**Action C:** At Pinky's Park, add amenities that are focused on community gathering and comfort for all ages. PR

### Strategy 3: Establish a network of Bethel parks to serve all neighborhoods.

**Action A:** Create and regularly update an online guide and map of all the parks in Bethel. PL

**Action B:** Using the development of the parks guide and map, identify areas with less access to nearby parks. PL

**Action C:** Pursue the development of new City parks in underserved areas. PW

**Action D:** Require that new residential subdivisions reserve space for a park or open space. PL

### Strategy 4: Improve park facilities for sports and other recreational activities.

**Action A:** Continue to upgrade and add facilities to Pinky's Park, including new playground equipment and potentially new gravel trails to replace run-down boardwalks. PR

**Action B:** Consider creating additional facilities such as picnic shelters, a recreational campground, a dog park, non-motorized winter recreation such as cross-country skiing or mushing, additional skate park facilities, or new sports fields or courts. PR

### Strategy 5: Pursue special funding and collaboration opportunities for enhancing Bethel parks.

**Action A:** Pursue Land and Water Conservation Fund or similar outdoors-related grant money to help with parks projects. GM

**Action B:** Add more community gardening opportunities to parks, potentially in partnership with Alaska Native organizations or other sponsor entities. GM

## GOAL 9: Enhance recreational facilities and programs in Bethel.

### Strategy 1: Expand the facilities and operations of the Fitness Center to accommodate more activities and all ages.

**Action A:** Expand the fitness center with potential improvements such as a gym and/or fitness track. PR

**Action B:** As the City is able, transition the City towards managing the Fitness Center (which is currently run by a contractor). PR

**Action C:** Develop programming within the fitness center oriented towards youth / younger people, such as classes or recreational sports leagues. PR

**Action D:** Develop programming within the fitness center and/or pool that is oriented towards seniors. PR

**Action E:** Based out of the Fitness Center but potentially including other facilities in town, consider establishing adult recreational sports leagues. PR

### Strategy 2: Support expansions to childcare, teen activities, and senior activities.

**Action A:** Support upgrades and expansions to the Bethel 4-H Youth Center facilities and programming, including food programs, classes, and recreation for teens and afterschool youth. PR

**Action B:** Support recreational programming dedicated to seniors, such as upgrades to the existing Senior Center Park or other programs. PR

### Strategy 3: Explore collaborations for recreational activities at other facilities in Bethel.

**Action A**: Coordinate with the school district to identify opportunities to use school facilities for programming outside of school hours. PR

**Action B:** Support expansions to recreational facilities and resources, such as the Cultural Center and the Kuskokwim Consortium Library. PR

## GOAL 10: Enhance the network of trails and open spaces in Bethel.

### Strategy 1: Improve access and comfort for trails.

*See Chapter 4 – Local Transportation for trail and other non-motorized transportation goals.*

**Action A**: Add trails to the map and guide of parks and recreation facilities. PL

### Strategy 2: Maintain a network of open spaces.

**Action A:** Identify and map open spaces within and around the developed area of Bethel that can be used for public recreation. PL

**Action B:** Identify key future transportation connections across currently open areas such as the “Donut Hole.” PL

Action C: Based on the map of key future connections through currently open space, as well as mapped areas that must be pre-served due to wetlands or drainage, identify suitable locations for potential green belts. PL

# CHAPTER 8
## People & Economy

# 8: People & Economy

To restate the community's Vision Statement,

**Bethel is the hub that connects the communities of the rural Yukon-Kuskokwim Delta region.**

**Bethel is a growing, diverse community that strives to improve quality of life, affordability, and opportunities through strategic development that responds to Bethel's remote location.**

As a remote hub city, Bethel provides opportunities to build businesses, careers, homes, and community connections. Its economic development strategy should be tied to attracting, retaining, and connecting the people who make the community great. The economy is dominated by employment in local government (city, tribal, and school) as well as government-funded organizations (like the Association of Village Council Presidents and Yukon Kuskokwim Health Corporation), but there are opportunities to expand local commercial activity. Partnerships between public and private entities, including non-profit organizations and businesses, can yield innovative new programs. With investments in local people and culture, locally generated economic growth is expected to follow.

## 8.1 Education and Career Training

As the regional hub of the Yukon-Kuskokwim Delta, Bethel is the also the de facto educational hub for the surrounding villages. Schools and career training are an important piece of Bethel's economic sustainability and growth. Bethel is home to many educational facilities, as listed in Chapter 2 – Existing Conditions. However, Bethel (like many remote Alaskan communities) struggles to fill job vacancies with local community members who have the appropriate training. It may be that residents with more education and training locally are moving to larger communities such as Anchorage, in part due to the high cost of living in Bethel.

Facing the continued rise in cost of living, Bethel should continue to encourage residents to seek out job training and explore new ideas for the retention and recruitment of local and regional talent. This will not only build local recruitment pipelines, but it will also give more Bethel residents higher-paying jobs and contribute to the overall resiliency of the community. These goals will require quality education at all levels.

**GOAL 1: Promote broad access to education, training, and employment opportunities in Bethel.**

**Strategy 1: Identify community priorities for education and career training.**

**Action A:** City of Bethel staffing is an important priority; see Chapter 7 – Public Facilities & Services, Goal 1: "*Enhance the reliability and efficiency of the City workforce.*" HR
**Action B:** Work with City departments and community partners to identify key community staffing needs. CM
**Action C:** Identify gaps between community unemployment and community job openings. CM*
**Action D:** Working with community partners and the business community, monitor which employment sectors are likely to increase in importance and which employment sectors are likely to decrease in importance in 2045. CM*

**Strategy 2: Foster a city-wide culture of emphasizing local hiring and training for specific local opportunities.**

**Action A:** Lead the community in the creation of a local "job board" that helps businesses find suitable hires. HR
**Action B:** Create a focused internship and apprenticeship program that offers introductory training and support leading to employment with City of Bethel or through partnerships with community organizations or businesses. HR

## 8.2 Donlin Mine

The Donlin Mine has long been discussed as a controversial project on the horizon that may have significant impacts on Bethel. After years of uncertainty about whether the project would proceed, it now seems to be moving forward; as such, it will be important to plan for the potential impacts. In the future, there could be other major projects in the Bethel region to prepare for and track.

The Donlin Gold Project would include development of an open pit mine approximately 150 miles northeast of Bethel. All key federal and state approvals have been obtained, and planning for construction is in progress. Bethel (along with a barge landing on the Kenai Peninsula) would be a primary accumulation point for pipeline materials during construction. Construction of the mine site, transportation facilities, and pipeline is anticipated to take about 3-4 years. This would begin with moving equipment, supplies, and personnel to the project site using various transportation modes. The Donlin Mine is expected to cost approximately $1.2 billion in labor; at peak construction, the proposed Donlin Gold Project would annually require up to 3,200 workers, including 2,500 for mine site and transportation facilities construction and 650 for natural gas pipeline construction.

The Donlin Gold Project would occur over a period of approximately 30 years, representing nearly a full generation of workers and residents. Approximately 50 to 60 percent of the peak year workforce would be drawn from communities within the Y-K region, and there are strong training programs to support local hiring. Employment during operations would be less but still substantial, estimated to impact 4 to 4.5 percent of households in the region. A portion of those employees at the Donlin Gold Mine may relocate their household outside of the region. Based on experience at Red Dog Mine, about 50 percent of employees would out-migrate to Bethel or Anchorage.

As part of mine development, an EIS was conducted which evaluated potential impacts to Bethel, including the following:

- Increased employment and income from the mine may go to residents of Bethel, which could increase the population above current projections by the Alaska Department of Labor and may also change Bethel's cultural composition (e.g., percentage of Alaska Natives and non-Natives).
- Infrastructure improvements for the Port of Bethel would be necessary, as the project is expected to approximately double the number of freight and fuel barges annually.
- Some local businesses in the Y-K region could experience an increase in activity during construction (likely concentrated in Bethel, as there are few retail and service outlets in smaller communities).
- An influx of capital and labor to small communities such as Bethel (small when viewed from a state-wide perspective) as a result of project construction could also have a negative economic effect in the form of inflationary pressure. Basically, this could increase the prices of goods and services for residents, especially impacting those not employed by the project.

The City of Bethel provided feedback for the EIS with the following key points:

- Emergency Management and Response: Collaborate with the Department of Homeland Security and local emergency services to create a comprehensive plan for mitigating and responding to incidents involving hazardous materials. Bethel's first responders may need additional training and resources to handle environmental spills or injuries related to cyanide, mercury, and high explosives.
- Hazardous Materials: Develop a thorough plan for the safe transportation and storage of hazardous substances, including specific protocols for handling and storing explosives, along with enhanced security measures.
- Infrastructure: Evaluate and potentially upgrade the existing water and sewer systems to accommodate new developments.
- In addition, there may be other potential impacts such as inflation, cultural changes, housing demands due to seasonal workers and new residents, and increased strain on support services.

**GOAL 2: Minimize potential negative impacts to Bethel from the Donlin Mine efforts and maximize potential benefits.**

**Strategy 1: Ensure effective coordination with the Donlin Mine Project.**

**Action A:** Develop a Memorandum of Understanding with Donlin Mine project leaders for ongoing coordination, including holding annual strategy meeting for conflict resolution and identify partnering opportunities. CM

**Action B:** Establish a communications plan to outline ways to keep Bethel residents informed of construction schedules and status of barge traffic, as well as to keep Donlin informed of the location and timing of commercial and subsistence fishing activities and other concerns or questions. CM

**Strategy 2: Work with the Donlin project to plan for additional traffic associated with Donlin Mine.**

**Action A:** Obtain full details about the planned dock construction south of the Bethel petroleum dock (associated with the Donlin Mine project). PO

**Action B:** Given Donlin's significant anticipated impacts to the Port of Bethel, jointly work with Donlin on port and waterway studies and improvements needed. PO

**Action C:** Coordinate with DOT&PF to monitor potential impacts to the capacity of Chief Eddie Hoffman Highway and whether improvements would be needed. PW

## 8.3 Fishing and Subsistence

For decades, commercial fishing was a key source of income in Bethel. Recently, however, commercial fishing has declined significantly due to falling fish population and prices. Since the 1990s, revenue from commercial fishing in Bethel decreased by nearly 50 percent. In 2016, the Coastal Villages Region Fund (CVRF) stopped buying and processing fish from the Kuskokwim region. CVRF was the largest buyer for 20 villages surrounding Bethel in Western Alaska. Since 2016, the region has been without a processor, making it nearly impossible to sell fish. Local fishermen tried to organize a cooperative to work with an external fish processor but had no success.

Many residents in Bethel and the broader region participate in subsistence fishing, just as people in the Yup'ik villages in the area had done long before the establishment of Bethel. Many people have small boats and travel along the river to fish camps. Subsistence food, including fish, makes up nearly half of residents' annual diet. However, salmon runs have been extremely low in recent years, causing Alaska Department of Fish and Game (ADFG) to limit how many fish people can catch. This has put strain on Bethel and other river communities as they are forced to rely more heavily on expensive imported groceries and less on traditional subsistence ways of life.

In additional to fish in the river, there are many other subsistence foods harvested around Bethel that supplement residents' diets. Beyond food, harvested materials can be used for clothing, tools, crafts, shelter, and more. These practices are important to the local culture and way of life for many Bethel residents, including but not limited to Alaska Natives. Most harvesting occurs during the summer and fall months, when the growing season and typical hunting season occur. Year-round, there is also informal sharing and trading of subsistence foods.

Many City of Bethel residents will continue to be impacted by the local salmon decline and other environmental challenges that are likely to impact subsistence resources (like climate change, which is already changing characteristics of the tundra). While the City cannot directly interfere with ADFG or U.S. Fish and Wildlife Service resource management policies, there may be opportunities to provide information or other resources to assist with local organizations' research and advocacy efforts.

Several organizations in the region are involved in advocacy to address issues impacting salmon populations, including climate change, pollution, and salmon bycatch in the Bering Sea pollock fishery. One

example is the Kuskokwim River Inter-Tribal Fish Commission, which advocates for stricter restrictions on salmon bycatch in the Bering Sea and continued coordination with Alaska Native tribes that can provide traditional ecological knowledge. Other groups include the ONC Fisheries Department and the Kuskokwim River Salmon Management Working Group.

**GOAL 3: Support subsistence rights and access to subsistence resources in Bethel and the surrounding region.**

**Strategy 1: Protect physical access to subsistence resources around Bethel.**

**Action A:** Maintain the small boat harbor facility, and identify future expansion needs and priorities for funding to ensure sufficient access for subsistence users. PO

**Action B:** Require the dedication of parks and/or open spaces, such as green belts, in new subdivisions in order to maintain access to the undeveloped tundra. PL

**Action C:** Work to obtain public access easements over trails used to access fishing, hunting, or plant harvesting areas. PL

**Strategy 2: Support research and advocacy efforts that seek to protect access to subsistence resources.**

**Action A:** As opportunities arise, provide information or resources to support the activities of subsistence resource advocacy groups. PO

## 8.4 Climate Resilience Planning

As discussed in Chapter 2 – Existing Conditions, and according to the Alaska Department of Community & Regional Affairs (DCRA), Bethel is considered an Environmentally Threatened Community at risk from infrastructure damage caused primarily by flood, erosion, and permafrost degradation exacerbated by climate change. DCRA assistance may be available to help Bethel plan for mitigating the impacts of climate change. The City should take advantage of this and other programs that may exist, as any of these efforts could help protect human life and property.

The primary assistance available to communities to mitigate natural and other hazards is from the Federal Emergency Management Agency (FEMA) through development of a Hazard Mitigation Plan. Bethel's Hazard Mitigation Plan was completed in 2017 and is overdue for an update. These collaborative plans include a risk and capability assessment which identifies hazards and develops a mitigation strategy to be implemented by the City to prepare for natural and man-made hazards that could occur in the future.

Other communities have developed Climate Action Plans or Climate Adaptation Plans to more comprehensively address climate change. However, Hazard Mitigation Plans offer similar benefits as all are collaborative efforts involving various City departments as well as community members and other organizations. With more awareness of potential hazards, the community and surrounding region's people and local economies can be more prepared and resilient in the face of climate change. The City should also consult with DCRA to determine if a more focused Climate Adaptation Plan should be prepared as well.

**GOAL 4: Prepare the City for a broad range of potential climate change impacts.**

**Strategy 1: Using the help of state and/or federal climate resilience resources, create City plans for climate adaptation and community resilience.**

**Action A:** Update the City's Hazard Mitigation Plan every five years. CM PL

**Action B:** Consult with DCRA and consider preparing a Community Resilience and Climate Adaptation Plan. PL CM

**Action C:** Monitor other funding or support resources that may become available. GM

## 8.5 Local History and Culture

As the hub city for the YK Delta region, Bethel is both the gateway to the villages of the region and the gateway from the region to the rest of the world. Bethel represents a confluence of cultures, and community members referred to it as the "heartland of the Yup'ik people" and a very diverse community. Due to its remote location, community members describe a strong sense of interconnectedness, community, and self-reliance. At times, large numbers of people from around the region, state, and world come together in Bethel around traditional activities and expressions of community and culture. The cultural environment in Bethel includes not only Yup'ik traditions that have existed for thousands of years, but also contemporary sports that bring people together and a common value for the beauty of the river and the tundra. The City can play a role in supporting the cultural fabric that makes Bethel a great community in which to live, with a strong sense of place and local identity and pride.




*Bethel Farmers Market shed.*

## 8.6 Local Businesses

Community members report that it is very difficult to start a small business in Bethel. The City should try to help foster a local business friendly environment, as local production and commerce is a great way to decrease reliance on imports, oftentimes lowering the cost of living and keeping money flowing in the local economy.

The right balance between regulations and policies that ease the way for small businesses needs to be found. In the past, it was sometimes difficult for the City to enforce business licensing that allows the City to collect sales tax, an important source of City revenue to fund public facilities and services. When Covid-19 relief money came into the community to assist businesses, more businesses were forced to get licenses in order to access funding; this is an example of an incentive that helped formalize more businesses in Bethel.

The City could start getting more involved with supporting local businesses by designating a Business Community Liaison. Currently, there is no Chamber of Commerce in Bethel, but a Business Community Liaison could work with business leaders to reinvigorate the Chamber, opening more regular lines of communication and opportunities for the City and business leaders to collaborate on community events and programs that build up the local economy.

**GOAL 6: Foster a thriving local business community.**

**Strategy 1: Encourage the reinvigoration of the Chamber of Commerce.**

**Action A:** Assign a staff person within the City (likely in the Finance Department) to serve as the Business Community Liaison. CM

**Action B:** Identify and reach out to business leaders in the community about the City's interest in more coordination with the business community, including potentially supporting the reinvigoration of the Chamber of Commerce. FI

**Action C:** Organize a City space for representatives from the business community / Chamber of Commerce to meet on a quarterly basis. FI

**Strategy 2: Expand resources to help people start local businesses.**

**Action A:** Continue to provide information on licensing and permitting required, as well as enforcement. FI

**Action B:** Pursue a partnership with an organization such as UAF to offer business planning assistance. FI

**Action C:** Raise awareness about resources available to help small businesses, such as the Alaska Small Business Development Center and related guides or workshops. FI

**Strategy 3: Create a business-friendly environment in Bethel.**

**Action A:** Identify any barriers that the City may be able to address to assist with starting and running businesses. FI

**Action B:** Examine BMC to consider allowing some small businesses to be a legal in residential zoned areas. PL

**Action C:** Develop a directory of local businesses that is updated regularly. FI

**Action D:** Work with the business community to organize events that highlight local businesses, such as markets or events that encourage people to visit businesses around town. CM*

## 8.7 Visitor Experience

People visit Bethel for a variety of reasons. The most common group visiting the area is made up of people visiting friends and relatives, known in tourism research as VFRs. Other common reasons for visiting Bethel include business trips, medical care, shopping, and community events. There is also a small segment of visitors seeking birdwatching, hunting, or flyfishing experiences. Each of these groups may be encouraged to spend more time in Bethel if investments are made in marketing and better accessibility of information about local attractions and amenities. This should increase spending and in turn help fund improvements to attractions for visitors, also improving the local quality of life and community sense of pride.

**GOAL 7: Support and expand tourism and visitation to Bethel.**

**Strategy 1: Expand information and marketing for visitors.**

**Action A:** Provide general visitor information on the City website, including information such as lodging, dining, and transportation (in collaboration with the Chamber of Commerce). CM*

**Action B: Create regularly updated visitor marketing materials specific to different visitor groups:**

**Family-friendly** – focused on people visiting friends and relatives (aka VFRs) with children and/or seniors in their groups

**Business travelers** – focused on coffee / breakfast, lunch and dinner dining, catering for meetings, wifi hangout spots, the fitness center, and "quick" attractions to visit

**Nature tourists** – focused on in-town attractions, equipment shops or rental services, and regional transportation and wilderness guiding services

**Visitors from villages** – focused on resources they may be coming to access and include Yup'ik translation

**New residents** – overview of key community resources as well as popular spots for locals and residents to help people who recently moved to "get to know Bethel" CM*

**Action C:** In collaboration with the Chamber of Commerce, encourage businesses and community facilities to provide up-to-date contact, website information, and photos on Google Maps. FI

**Action D:** In collaboration with organizers of large annual events and the Chamber of Commerce, assess the capacity of Bethel lodging available relative to expected peak demands to determine if shortages are anticipated and how the community could address this if/as visitation is expected to grow. CM*

**Strategy 2: Improve attractions for visitors.**

**Action A:** Emphasize locally specific natural and cultural attractions. PR
**Action B:** Work with the Chamber of Commerce and other organizations to develop a calendar of community events. PR
**Action C:** Develop and implement a beautification plan for the downtown area (roughly between the Cultural Center and Brown's Slough) and the waterfront. PR



*Waterfront trail in Bethel.*



Bethel 2045 Comprehensive Plan Update

JULY 2023

# Bethel 2045 Comprehensive Plan

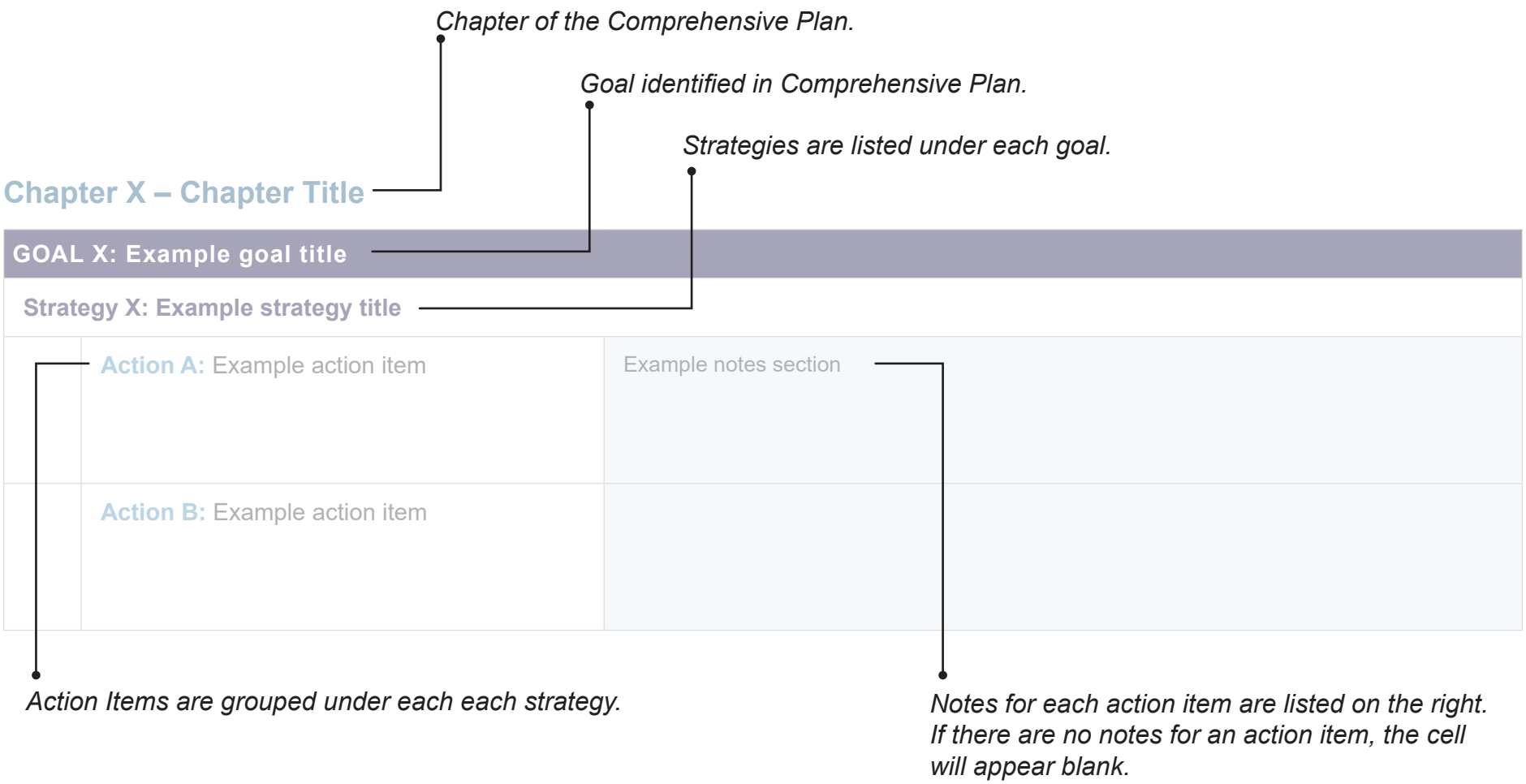
# Appendices

# Appendices


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# Appendix Guide

Each Appendix is categorized by group responsible as indicated on the previous page. The appendices are oragnized by Comprehensive Plan chapter, and contain chapter goals, strategies, actions, and notes. Below is a diagram illustrating the table formatting.



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# APPENDIX 1:
# CITY CLERK ACTION ITEMS

# Appendix 1 – City Clerk Action Items CC

## Chapter 7 – Public Facilities & Services

| GOAL 2: Communicate regularly and effectively with the community through various channels. | | |
|---|---|---|
| **Strategy 1: Expand the reach of the City's newsletter, "In the Loop."** | | |
| | **Action A:** Maintain easy public access to the current month's newsletter on the homepage of the City website, with historical newsletters also available on the website. | There is a page on the City website for the newsletter that includes a link to sign up to receive it. The reach of this newsletter could be expanded by publishing it directly online, as well as pursuing other ways to spread the word.<br><br>On the newsletter page of the website, also include an archive of past newsletters. |
| | **Action B:** Create a City information flier to laminate and place around town, including URLs and QR codes for the current newsletter and other key sites to access. | The flier can include URLs and QR codes for the City website, City Facebook page, and current City newsletter. Good locations may include City Hall, the Cultural Center, the Post Office, the airport, the small boat harbor, and the hospital. |
| | **Action C:** Print some copies of the newsletter to leave in key locations around town. | Printed copies may be more accessible for more residents. Another possibility could be to charge a small fee to receive printed copies via mail. On printed versions, adequate font size will also be important for accessibility. |

| | | |
|---|---|---|
| **Strategy 2: Expand the City's presence on social media.** | | |
| | **Action A:** Designate a social media "point person" within City staff, to be responsible for monitoring City activities that should be posted to social media and regularly checking in with all the departments for updates. (This could be the City Clerk or someone the Clerk designates.). | The City's public relations contractor currently helps manage the City's Facebook page. Many staff within various City departments also have admin privileges on the Facebook page and are currently responsible for sharing updates, but this effort could be more organized to increase regularity of communication with the community.<br><br>It is important for the page to remain active so that it is a useful tool that people look to for community updates. The page description can include links to important pages on the City website. Updates can include election or application reminders, key staff or contact changes, exciting announcements of City achievements like grants obtained or projects started or completed, and other similar topics. When special meetings outside of regular City meetings are held, these could be announced; if the City wishes to raise more awareness about an event and/or collect a rough RSVP, an Event can be created. |
| **Strategy 3: Optimize the City website and update it regularly.** | | |
| | **Action A:** Each year, conduct a review of the website to determine if there are particular pages or sections that need to be added, deleted, reorganized, or updated. | This could be organized by the City's contracted public relations firm. |
| | **Action B:** As needed, update the home page (and/or other pages) with more new information and links. | |
| | **Action C:** Make it easier to find contact information to use for different types of inquiries to the City. | |

| GOAL 5: Support locally-specific cultural activities and attractions in Bethel. | | |
|---|---|---|
| **Strategy 1: Work with community organizations to continue to highlight Yup'ik culture in Bethel.** | | |
| | **Action A:** Identify needs and opportunities to expand existing Yup'ik translation services provided as part of City functions. | For example, Yup'ik language assistance is provided associated with local elections. There are many speakers in Bethel, including visitors from villages and elders who may rely on translation services more. There is also a Yup'ik immersion school and Yup'ik programming through UAF. |

# APPENDIX 2:
# CITY MANAGER ACTION ITEMS

# Appendix 2 – City Manager Action Items CM CM*

If action items in plan chapters are listed as CM*, they are not intended to be City Manager actions but will need to be assigned to an appropriate party by the City Manager. These action items are listed at the conclusion of this Appendix.

## Chapter 3 – Housing & Land Use

| GOAL 1: Address potential barriers to housing development. | | |
|---|---|---|
| **Strategy 3: Encourage development by collaboratively working with developers to install public infrastructure, including piped water and sewer systems and roads.** | | |
| | **Action A:** As part of the subdivision agreement process, consider designing a standardized "impact fee" mechanism to have developers participate in funding when their development will impact the overall system (water and sewer or other infrastructure such as roads). | The impact fee could include funding for engineering, materials, and/or construction.<br><br>A transparent, standardized process will be important in making expectations clear to potential developers. |

| GOAL 2: Facilitate more affordable housing development and access to affordable housing. | | |
|---|---|---|
| **Strategy 2: Support access to information on housing assistance programs.** | | |
| | **Action A:** Consider completing a housing needs assessment in collaboration with community partners such as ONC or BNC. | A study of community housing needs was completed in 2018 by a team including ONC, NeighborWorks America and Alaska, City of Bethel, and other organizations – *see background information in Section 3.2 for additional information.* An updated and more formal housing needs assessment could be completed to determine key types of housing expected to be needed. |

| GOAL 3: Reserve space to accommodate community needs and desired development. | | |
|---|---|---|
| **Strategy 2: Create and regularly maintain a list of community facility and infrastructure needs that will require land.** | | |
| | **Action A:** Create and maintain a list of community facility and infrastructure needs in order of priority, and include specific spatial needs such as general location and approximate area of land required. | The City Manager and the Planning Department should create and maintain the list of facilities and infrastructure needs, in collaboration with leaders from each department. Some items on the list would go hand-in-hand with the Capital Improvement Plan *(see Chapter 7 – Public Facilities & Services).*<br><br>As a start, consider including the following space needs for the community (other than housing):<br>▪ Additional schools that may be needed as the population continues to grow<br>▪ Additional civic or public works buildings needed<br>▪ Parks and open space, distributed around different areas of Bethel<br>▪ Port expansion areas, as needed<br>▪ Water and wastewater treatment facilities *(see Chapter 6 – Utility Infrastructure for more discussion of water and sewer)*<br>▪ Alternative energy generation (wind, solar, etc.) and energy storage sites<br>▪ Likely new road and other transportation corridors |
| | **Action B:** As applicable, identify and initiate coordination with entities that need to be involved in the implementation of community facilities and infrastructure (such as the Public Works department for wastewater facilities, or AVEC for alternative energy generation sites). | *See Chapter 6, Utility Infrastructure for more information on coordination with Public Works and AVEC, for example.* |
| | **Action D:** As needed, create a plan to obtain land or lease a property to satisfy each priority community infrastructure need. | *Also see Chapter 7 – Public Facilities & Services, Goal 4 regarding management of City land.* |

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| **Strategy 4: Sell, trade, or lease City-owned properties that the City does not need in the future so that more private development can occur.** | | |
| | **Action A:** Evaluate City-owned properties that should be considered to sell or lease for private development. | |
| | **Action B:** Create a plan for how the City will dispose of (sell or lease) certain properties over time. | Through RFP processes and/or purchase and sale agreements, the City can maintain some control over what gets developed, whether with formal public-private partnership or simply the terms of the agreement. This can help ensure that the land is utilized for community benefit. |
| | **Action C:** Initiate the process to dispose of these properties according to the plan. | City land disposal decisions would require a City Council vote. |

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| **GOAL 4: Identify areas that are good candidates for infill development and take steps to facilitate their development.** | | |
| **Strategy 2: Investigate how private landowners within priority development areas might be encouraged to participate in community development goals.** | | |
| | **Action A:** Explore partnership opportunities to achieve desired development, such as with BNC. | *See Goal 3 above for more discussion of desired development.*<br><br>The City could potentially approach land owners considering development in the priority development area and assist with elements such as infrastructure funding. This could be used to help encourage developments that would be beneficial for the whole community, such as multifamily housing or alternative energy generation facilities. |
| | **Action B:** Compile and share information from BIA about how native allotment owners can prepare for potential development. | There is a formal process the City could go through with BIA Realty to invite native allotment owners to participate in development. |

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| | **Action C:** Coordinate with the Association of Village Council Presidents (AVCP) Realty Department to learn more about potential land exchanges between BNC and native allotment owners for "in-town" native allotments. | Coordination with BIA would also be helpful. The AVCP Realty Department offers support to native allotment holders for a variety of actions they could take with their land, including land exchanges, rights-of-way, or subdivision.<br><br>BNC owns a significant amount of land around the peripheries of the official boundary of Bethel; they may have good candidate properties for land trades that are still near Bethel. The City could then partner with BNC to encourage development on the in-town parcels. |
| **Strategy 4: Facilitate redevelopment of properties that are underutilized, dilapidated, or abandoned.** | | |
| | **Action D**: Consider funding available for the purchase of dilapidated or abandoned properties, potentially for use in partnership developments. | The City could potentially assist with cleaning up sites in order to facilitate redevelopment. Many owners of defunct / dilapidated properties can't afford to clean up the property and/or don't live on the premises. |

## Chapter 4 – Local Transportation

| | | |
|---|---|---|
| **GOAL 1: Use the Long Range Transportation Plan (LRTP) to guide all local transportation facility planning.** | | |
| **Strategy 1: Emphasize the LRTP process and recommendations in Bethel.** | | |
| | **Action A:** Adopt the 2020 Draft LRTP. | This LRTP was fully prepared but never officially adopted. It should be adopted by the City Council so that it can be publicly shared and used. |
| | **Action B:** Every five years, revisit (through a public process) and thoroughly update the LRTP. | Reviewing and updating the LRTP should continue to involve extensive public input, as it informs what maintenance will be prioritized, along with new potential transportation facilities including roads, trails, and port facilities. The City should make it clear to the community that the LRTP is their main opportunity to provide input on transportation planning. |
| | **Action C:** Coordinate with other organizations that prepare transportation planning documents for the area, including DOT&PF and ONC, to find overlaps and collaboration opportunities. | |

| GOAL 2: Plan for an organized, proactive approach to surface transportation facility maintenance. | | |
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| **Strategy 1: Clarify surface transportation facility maintenance responsibilities.** | | |
| | **Action B:** Maintain copies of maintenance agreements for transportation facilities that are not solely under City jurisdiction (such as DOT&PF roads or private facilities). | One example is for BIA Road, which is currently maintained by a federal entity with occasional City involvement; this arrangement should be clarified in an agreement and would also be important to have in place to help manage future road improvement funding opportunities. A joint maintenance agreement was also recommended in the 2020 Draft LRTP to allow the City and ONC to share TTP funds. |
| | **Action C:** Work with DOT&PF to update existing state road MOUs, including exploring the possibility of the City assuming responsibility for maintenance of DOT&PF-managed roads in Bethel. | The City currently has five MOUs with DOT&PF, under which the airport manager is responsible for maintenance of state-owned roads in Bethel. Without a local crew as involved in road maintenance, DOT&PF may be less equipped to manage local road maintenance than the City. Public Works would like to explore the possibility of assuming maintenance of all of these roads, potentially except CEHH. This would require coordination with DOT&PF to negotiate and agree to the terms of the transition, including examining how it could impact STIP funding eligibility. Assuming maintenance of the roads would shift the financial responsibility to the City, so this would need to be factored into the City's budget. |

| GOAL 6: Strategically seek funding for transportation facility construction and maintenance. | | |
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| **Strategy 1: Leverage opportunities available in Alaska to secure potential funding sources for implementing transportation projects.** | | |
| | **Action B:** Continue to leverage existing transportation construction support and funding through collaboration with other local entities, such as ONC. | Currently, ONC provides some support to construction projects such as through providing gravel; fostering these types of collaborations should continue to factor into transportation funding. |

| GOAL 1: Create a well-functioning airport area for travelers and businesses. | | |
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| **Strategy 1: Facilitate efficient and organized access to the airport.** | | |
| | **Action A:** Between the City, DOT, and airline tenants leasing land and/or buildings on airport land, determine (and formalize in agreements if needed) which party is responsible for managing roads, parking, signage, and other elements within the airport area. | |

| GOAL 2: Support DOT&PF in airport operations and planning. | | |
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| **Strategy 1: As requested by the FAA and/or DOT&PF, take actions that support smooth and secure airport operations.** | | |
| | **Action C:** Coordinate with the airport management / DOT&PF to schedule security drills. | |
| **Strategy 2: Participate in planning for the future of the airport.** | | |
| | **Action A:** Maintain regular coordination (such as quarterly meetings) with DOT&PF and representatives from airlines operating at the airport to track near- and long-term plans impacting the Bethel airport. | |

| GOAL 6: Support the improvement and expansion of other modes of regional transportation. | | |
|---|---|---|
| **Strategy 1: As the hub of regional transportation, organize a City-led regional transportation coordination group to plan routes, maintenance, and funding.** | | |
| | **Action A:** Establish a regional transportation coordination group, including DOT&PF, representatives from villages and tribal organizations, shipping companies, and transportation companies. | |
| | **Action B:** The group should meet regularly to discuss existing routes, maintenance responsibilities and issues, potential new routes or transportation methods, and grant opportunities. | |
| **Strategy 5: Explore potential road connections between Bethel, Oscarville, Napaskiak, and Napakiak.** | | |
| | **Action A:** Work specifically with Oscarville, Napaskiak, and Napakiak representatives in the transportation coordination group to gauge interest in pursuing surface road routes between each village and Bethel. | There are already power lines connecting Bethel with Napakiak and Oscarville. Community members have expressed interest in surface connections in the past since these villages are close to Bethel.<br>▪ For Oscarville, only a few miles of road and a creek crossing would be needed. There have been efforts to fund a bridge to cross the creek.<br>▪ Napaskiak is just across the river from Oscarville, so a bridge would be needed.<br>▪ Napakiak is also close to Bethel, and there was recently a DOT&PF RFP released to explore aviation and surface connections between village and the City. That RFP was canceled due to a funding issue, but this idea may arise again soon, and DOT&PF will be important to the discussion. |
| | **Action B:** Explore partnership agreement opportunities to implement future road connections. | The City would likely not lead these efforts, but can help coordinate through the transportation group. |

## Chapter 6 – Utility Infrastructure

| GOAL 1: Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gasses. | | |
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| **Strategy 1: Facilitate large-scale projects to introduce more alternative energy sources to the local network.** | | |
| | **Action A:** Assign a City "energy point person" to coordinate regularly with AVEC. | In the past, there was an Energy Committee that held discussions around energy, but there is no clear person or group within the City that focuses on energy now. |
| | **Action B:** Working with AVEC, create a strategic plan that identifies ways for the City to support a transition to more alternative energy generation. | Bethel has an interest in lowering energy costs for residents, and a shift to more renewable energy is anticipated to be the best way to do this. Alternative energy generation also is generally less harmful to the already-fragile Alaskan tundra and river environment on which Bethel depends.<br><br>Bethel should work with AVEC to identify ways Bethel can help transition the grid to more alternative energy sources, such as working together on acquiring and/or setting aside land for wind or solar farms. AVEC currently needs to weigh in if the City applies for alternative energy grants, but in the future there could be opportunities for the two organizations to work together more collaboratively to obtain funding. As the largest member community within AVEC, Bethel may have an opportunity to play an influential role in support AVEC's alternative energy transition. |

| GOAL 3: Transition Bethel's water and sewer utilities to fully piped systems serving all residences and businesses. | | |
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| **Strategy 3: During the phases of the PER and beyond, manage the piped system to be as efficient and accessible as possible, as well as equitable in cost.** | | |
| | **Action C:** For new development or redevelopment, work with industry experts to investigate how the City could implement an "impact fee" system in which there are clear expectations related to new or upgraded infrastructure cost to the developer. | Other communities have systems in place for development to bear some or all of the cost of public infrastructure associated with the development. Eventually, this system should be added to municipal code. Clear expectations for private contributions, how this funding would be managed, and how the City can assist could help avoid discouraging development from high installation costs. |

| GOAL 1: Enhance the reliability and efficiency of the City workforce. | | |
|---|---|---|
| **Strategy 1: Optimize and monitor the staffing and operations of each City department to ensure efficiency and support staff retention and hiring efforts.** | | |
| | **Action A:** Ensure every department has clearly outlined responsibilities with documented and regularly updated policies, procedures, and job descriptions to facilitate staff training and operations evaluations. | Work with the Human Resources Department on this action item. |
| | **Action B:** Conduct an evaluation of each department's operational efficiency on an annual basis and when considering hiring additional personnel. | Work with the Finance Department on this action item. |
| | **Action C:** As evaluations of operations are completed, consider altering the structure of departments (for example, implementing new technology to increase efficiency, or establishing mentorship and chains of command that facilitate staff advancement into leadership roles). | Work with the Human Resources Department on this action item. |
| | **Action D:** Establish transition plans so that department operations are minimally impacted by the departure of key staff. | Work with the Human Resources Department on this action item. |

| GOAL 3: Optimize the management of City revenue and spending. | | |
|---|---|---|
| **Strategy 4: Shape sales taxes and fees to positively influence public health and sustainability and fund key community projects.** | | |
| | **Action A:** Over time, consider proposing expansions to taxes on alcohol, marijuana, and tobacco sales, as well as gambling. | If the City decides to pursue expansions to these selective sales taxes, this would likely require an approval process with City Council. |
| | **Action B:** Propose a "bag tax" for disposable bags from stores and restaurants. | Frequently called a "bag tax" in other communities, this is a small (few cents) fee per disposable bag used at stores. The "bag tax" could encourage more environmentally friendly behaviors including using reusable bags and reusing paper or plastic bags instead of throwing them away after one use. This change would help extend the life of the landfill.<br><br>Creating a new "bag tax" would likely require an approval process with City Council. |
| | **Action C:** Consider proposing vehicle parking fees in some areas, such as for long-term parking near the airport or boat harbor. | Implementation and/or enforcement could be challenging, but there is room to expand parking fees at these locations. In the past, parking fees were tested at the harbor, but there was confusion around whether a harbor permit includes vehicle parking already. At the airport, coordination with the airport manager and DOT&PF would be required. |

| GOAL 4: Manage City lands in an efficient, cost-effective, and forward-thinking manner. | | |
|---|---|---|
| **Strategy 1: Maintain a map of City-owned lands and ownership changes.** | | |
| | **Action C:** Using the community land use needs identified as part of the goals in Chapter 3 – Housing & Land Use, identify community needs that may be met with City-owned properties or underutilized properties. Use this information to identify where there are gaps, which could lead to identifying properties that may be pursued for acquisition by the City. | |

| Strategy 2: Improve processes for City property acquisition, sales, and leasing. | | |
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| | **Action A:** When the City needs to buy or lease land, release requests to negotiate lease or sale agreements with other property owners in order to help find available land that meets City purposes. | |
| | **Action B:** Work with the City Attorney to clarify appropriate options of processes for leasing land / facilities to non-profits, businesses, or other types of entities, including determining fair rental costs relative to appraised value, bid processes, or other ways to enter into lease agreements. | While appraised values factor in market conditions, the City has noted that additional flexibility to negotiate sale or lease agreements would be helpful depending on the situation. Especially when leasing City property to others, the City could benefit from a Rental Market Analysis to factor in location, size, property type, and other considerations.<br><br>An additional consideration is to track and observe any outside limitations that may exist (for example, if federal dollars were used to acquire a property and could have come with additional stipulations requiring exact appraised value be used in future deals). |
| | **Action C:** The City currently offers heavily discounted rental and utility rates for some non-profit lessees; evaluate the community value of these leases and consider evolving the practice to rent at appraised values, still with the potential for discounts depending on purpose. | |

| GOAL 5: Manage updates to City facilities and equipment in an efficient, cost-effective, and forward-thinking manner. | | |
|---|---|---|
| **Strategy 1: Maintain the Capital Improvement Plan (CIP).** | | |
| | **Action A:** Update the CIP every year. | There is currently a focus on upgrades to heavy equipment, and facility upgrades (such as the need for a new Public Works building) have been deferred. Priorities may shift over time, and unexpected expenses may arise. Updating the CIP each year is a comprehensive approach to planning for capital improvements.<br><br>At the time of the preparation of this Comprehensive Plan, the City noted the following examples of facilities that need upgrades:<br><br>▪ New Public Works Building is needed (current estimated cost $36.4 million)<br><br>▪ Library and Cultural Center need repairs and a new paint job |
| | **Action B:** Ensure that items in the CIP advance City goals for improving energy efficiency and a transition to alternative energy sources in the future. | *Reference the Energy section of Chapter 6 – Utility Infrastructure.* |
| | **Action C:** Continue to use the insurance schedule to anticipate items that the City may need to spend money on in the future, such as repairing frozen pipes. | |

| GOAL 8: Enhance the role of parks in the Bethel community. | | |
|---|---|---|
| **Strategy 1: Expand the City's capacity to manage and maintain parks.** | | |
| | **Action A:** Recreate the Parks and Recreation department and/or designate an interim Parks and Recreation manager within the City who will be responsible for leading coordination with contractors (current and potential future), parks and recreation improvement projects, and coordination with the Community Parks & Recreation Committee. | The past Comprehensive Plan designates many action items for the Parks & Recreation Department. However, this department no longer exists at the time this plan update is being written. The Community Parks & Recreation Committee is very active, but it would greatly increase the City's ability to improve parks and recreation to have at least one staff person dedicated to this role, and potentially more people involved on a seasonal basis. In addition to working with the Committee, this designated leader of parks-related efforts would need to collaborate with the City's property maintenance team and Planning Department. |

## Chapter 8 – People & Economy

| GOAL 1: Promote broad access to education, training, and employment opportunities in Bethel. | | |
|---|---|---|
| **Strategy 1: Identify community priorities for education and career training.** | | |
| | **Action B:** Work with City departments and community partners to identify key community staffing needs. | Key staff may include childcare workers, commercial drivers, and maintenance staff for the City or other organizations. The Chamber of Commerce is not currently active, but if it does resume activities, this would be a good resource to consult with on staffing needs. |

| GOAL 2: Minimize potential negative impacts to Bethel from the Donlin Mine efforts and maximize potential benefits. | | |
|---|---|---|
| **Strategy 1: Ensure effective coordination with the Donlin Mine Project.** | | |
| | **Action A**: Develop a Memorandum of Understanding with Donlin Mine project leaders for ongoing coordination, including holding annual strategy meeting for conflict resolution and identify partnering opportunities. | The MOU could discuss Donlin participation in studies and maintenance that may be needed related to causing increased traffic for the Port and the highway. Additional heavy vehicles on roads could accelerate their wear, and additional barge traffic could exacerbate erosion concerns, so impact fees could be considered in an MOU. The MOU should also consider planning for breaches of facilities and monitoring / mitigation of environmental contamination events / impacts.<br>The MOU could also specify responsibilities for Donlin and the City for funding upgrades of water and sewer infrastructure, providing extra resources and training for hazardous material handling and response, and detailing the review process of hazardous material handling and spill response plans. |

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| | **Action B**: Establish a communications plan to outline ways to keep Bethel residents informed of construction schedules and status of barge traffic, as well as to keep Donlin informed of the location and timing of commercial and subsistence fishing activities and other concerns or questions. | The communications plan could involve notices in the City's newsletter, discussed in Chapter 7 – Public Facilities & Services. |

| **GOAL 4: Prepare the City for a broad range of potential climate change impacts.** | | |
|---|---|---|
| **Strategy 1: Using the help of state and/or federal climate resilience resources, create City plans for climate adaptation and community resilience.** | | |
| | **Action A:** Update the City's Hazard Mitigation Plan every five years. | The primary assistance available to communities to mitigate natural and other hazards is from the Federal Emergency Management Agency (FEMA) through development of a Hazard Mitigation Plan. Bethel's Hazard Mitigation Plan was completed in 2017 and is overdue for an update. These collaborative plans include a risk and capability assessment which identifies hazards and develops a mitigation strategy to be implemented by the City to prepare for natural and man-made hazards that could occur in the future. |
| | **Action B:** Consult with DCRA and consider preparing a Community Resilience and Climate Adaptation Plan. | Other communities have developed Climate Action Plans or Climate Adaptation Plans to more comprehensively address climate change. However, Hazard Mitigation Plans offer similar benefits. The City should consult with DCRA to determine if a more focused Climate Adaptation Plan should be prepared in addition to the Hazard Mitigation Plans, as this could potentially open the door to additional support or funding. |

| GOAL 6: Foster a thriving local business community. | | |
|---|---|---|
| **Strategy 1: Encourage the reinvigoration of the Chamber of Commerce.** | | |
| | **Action A:** Assign a staff person within the City (likely in the Finance Department) to serve as the Business Community Liaison. | The liaison role may make the most sense to be held by someone in the Finance Department who already works with businesses on licensing. |

## CM* Action Items – Chapter 5 – Regional Transportation

| GOAL 1: Create a well-functioning airport area for travelers and businesses. | | |
|---|---|---|
| **Strategy 1: Facilitate efficient and organized access to the airport.** | | |
| | **Action D:** Create a guide to transportation options available to/from the airport with a map of where to access them, to be distributed and displayed in buildings for the passenger airline(s). | The guide should include parking options, taxicab pickup areas and phone numbers, the nearest transit stop, the hospital shuttle, car or other vehicle rental services, the location of passenger airlines at the airport, and any other transportation options available around town. The guide should be posted in the Alaska Airlines terminal and elsewhere if deemed helpful. |
| **Strategy 2: Facilitate adequate parking at the airport.** | | |
| | **Action A**: Once parking management is determined, advocate for exploring the potential of designating short-term and long-term parking lots and an associated parking fee system with time limits. | Designating short term and long term parking may help with the issue of limited parking around the airport. Because of fees, those planning to be traveling for a while may choose to find another way to the airport instead of leaving their vehicle there. |
| | **Action B:** Once parking management is determined, advocate for the completion of a parking study to evaluate whether more parking is needed near the main jet terminal and if so, make plans to provide additional parking space. | |

| GOAL 6: Support the improvement and expansion of other modes of regional transportation. | | |
|---|---|---|
| **Strategy 2: Work with the regional transportation coordination group to improve reliability of ice road maintenance.** | | |
| | **Action A:** Create a map of the typical ice road route, including all the villages it connects. | Identify a representative from each village that the ice road connects to participate in the coordination group. |
| | **Action B:** Create a typical snow-clearing schedule, including what party or parties are responsible for clearing and marking. | In the past, Lynden would periodically plow the river to support their shipping needs, which resulted in easier access for anyone using the ice road. Napaimute Corporation is planning to take charge of ice road maintenance and recently received additional funding for the effort.<br><br>With maintenance schedule and responsibility information shared amongst the coordination group, it will be easier to collaborate and work together to fill in any gaps (such as for funding). |
| | **Action C:** Collect data on past years' freezing and break up and monitor freezing, ice thickness, and break up each year. Share this data and changes over time to help reduce the risk of incidents where vehicles fall through the ice. | |

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| **Strategy 3: Work with the regional transportation coordination group to improve the reliability of the trail network.** | | |
| | **Action A:** Work with the group and DOT&PF to develop a map of the most used trails between Bethel and the surrounding villages, including user groups, trail markers, hazards, and other landmarks. | Many of the trails outside of Bethel primarily run through DNR and other federal agency land; these agencies may have their own trail system and maps. ONC has also worked on mapping and marking historic routes. The coordination group should consult with and collect prior efforts of these agencies when developing the map.<br><br>The map should include pedestrian, ATV, and snowmachine trails. It should also mark creek crossings to encourage caution. |
| | **Action B:** Identify whether easements are needed for places where trails cross private property, and coordinate with property owners. | If a trail crosses public agency land (like DNR or other federal agencies), mark the agency managing the trail on the map. |
| | **Action C:** Create a regional trail maintenance strategy that is responsive to different seasons, various types of trail users (snowmachine versus ATV, for example), and changing conditions over time. | This may be able to be funded by tribal transportation funds, especially since trails are often used to travel between villages. It is important to note that these trails are located in the tundra and may have challenging conditions. Due to climate change, there is a decreasing portion of the year during which snowmachines can be used; increasing ATV use may damage the tundra ecosystem and become an increasing maintenance issue down the road. The coordination group should discuss these issues to reach appropriate solutions. |
| **Strategy 4: Facilitate potential regional transit opportunities as they arise.** | | |
| | **Action A:** Coordinate with the hovercraft operator to determine if they may consider providing passenger transit again in the future. | The hovercraft can travel on difficult terrain in the region including tundra, water, snow, and ice. As climate change makes conditions less predictable, it could become even more useful to transporting cargo in the area. The hovercraft used to have approximately 12 passenger seats, and the transportation coordination group can work with the operator to determine if there are opportunities to once again provide passenger transportation. |

## CM* Action Items – Chapter 6 – Utility Infrastructure

| GOAL 1: Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gasses. | | |
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| **Strategy 3: Encourage efficiency updates for private energy users.** | | |
| | **Action A:** Develop outreach materials to encourage commercial and residential users on energy efficiency best practices and grants that may be available for installing private alternative energy facilities. | The Cold Climate Housing Research Center may have some useful information to contribute to these outreach materials. Coordination with AVEC will also be needed. |
| | **Action B:** Work with AVEC to develop and share a guide to approval processes required for private alternative energy facilities and opportunities to sell excess power back to the grid. | Independent power producers may be eligible to have their AVEC bill reduced, and there could be opportunities to sell surplus power back to the grid. Information about necessary processes and related opportunities should be shared on the City website. |

## CM* Action Items – Chapter 7 – Public Facilities & Services

| GOAL 7: Target specific public safety concerns within Bethel. | | |
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| **Strategy 4: Support organizations that provide services to people experiencing homelessness in Bethel.** | | |
| | **Action A:** Continue to support the Bethel Winter House nonprofit organization. | The Winter House facility provides nighttime shelter during the winter for people experiencing homelessness, as well as limited services during other months, depending on funding. The organization runs almost entirely on donations and volunteer work, so any support with funding/grants, projects, and raising awareness about the Winter House efforts that the City can provide is helpful. This could include working in partnership with the Bethel Community Services Foundation, which leads the Bethel Housing & Homelessness Coalition. |

## CM* Action Items – Chapter 8 – People & Economy

| GOAL 1: Promote broad access to education, training, and employment opportunities in Bethel. | | |
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| **Strategy 1: Identify community priorities for education and career training.** | | |
| | **Action C:** Identify gaps between community unemployment and community job openings. | This could be an opportunity to partner with low-income and/or social service providers, to connect economically vulnerable community members with work. |
| | **Action D:** Working with community partners and the business community, monitor which employment sectors are likely to increase in importance and which employment sectors are likely to decrease in importance in 2045. | For example, the City has noted that it is difficult to establish wind power facilities without local staff with the training needed to service the turbines; it may be expected that this sector would grow and thus more staff would be needed.<br><br>Elder care may also be expected to grow, given that Bethel is a healthcare hub with a growing population of seniors. |

| GOAL 5: Support locally-specific cultural activities and attractions in Bethel. | | |
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| **Strategy 1: Work with community organizations to continue to highlight Yup'ik culture in Bethel.** | | |
| | **Action C:** When possible, partner with Bethel Council on the Arts and Alaska Native organizations to sponsor cultural facilities and events in Bethel, such as arts and crafts markets, cultural exhibits, or the Camai dance festival. | These events can be a part of Parks and Recreation activities that add to the quality of life in Bethel; they also attract visitors to the community *(see the Visitor Experience section below in this chapter).* |

| GOAL 6: Foster a thriving local business community. | | |
|---|---|---|
| **Strategy 3: Create a business-friendly environment in Bethel.** | | |
| | **Action D:** Work with the business community to organize events that highlight local businesses, such as markets or events that encourage people to visit businesses around town. | Small businesses run out of people's homes could benefit from market-style events that bring people together to check out tables from different organizations. Other ideas could include several business organizing a time to provide scheduled events to encourage people to patronize several local businesses. |

| GOAL 7: Support and expand tourism and visitation to Bethel. | | |
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| **Strategy 1: Expand information and marketing for visitors.** | | |
| | **Action A:** Provide general visitor information on the City website, including information such as lodging, dining, and transportation (in collaboration with the Chamber of Commerce). | This should include information on lodging options, transit and cab information, airport information, dining, shopping, recreational opportunities, services that visitors may need to access, and so on. The information should be simple and easy to read, with contact and location information. |

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| | **Action B: Create regularly updated visitor marketing materials specific to different visitor groups:**<br><br>▪ **Family-friendly** – focused on people visiting friends and relatives (aka VFRs) with children and/or seniors in their groups<br>▪ **Business travelers** – focused on coffee / breakfast, lunch and dinner dining, catering for meetings, wifi hangout spots, the fitness center, and "quick" attractions to visit<br>▪ **Nature tourists** – focused on in-town attractions, equipment shops or rental services, and regional transportation and wilderness guiding services<br>▪ **Visitors from villages** – focused on resources they may be coming to access and include Yup'ik translation<br>▪ **New residents** – overview of key community resources as well as popular spots for locals and residents to help people who recently moved to "get to know Bethel" | Visitor marketing materials should also be included on the City website, and could be prepared with the City's public relation contractor in collaboration with organizations such as the Chamber of Commerce. Separating types of attractions by who might be interested in them will make information more accessible and relevant to everyone visiting the website. The City can also work with organizations that consistently bring people to Bethel (such as the hospital) to distribute these marketing materials.<br><br>People who have moved to Bethel have noted it can be difficult to find information on community resources, cost of living, etc. without having connections in the community through family or work already; supporting prospective residents should be an area of focus. |
| | **Action D:** In collaboration with organizers of large annual events and the Chamber of Commerce, assess the capacity of Bethel lodging available relative to expected peak demands to determine if shortages are anticipated and how the community could address this if/as visitation is expected to grow. | There may be shortages during large community events such as the Camai dance festival. If shortages are expected to worsen, the City could examine initiatives such as incentives for lodging development. |

# APPENDIX 3:
# FINANCE DEPARTMENT ACTION ITEMS

# Appendix 3 – Finance Department Action Items FI

## Chapter 7 – Public Facilities & Services

| GOAL 1: Enhance the reliability and efficiency of the City workforce. | | |
|---|---|---|
| **Strategy 1: Optimize and monitor the staffing and operations of each City department to ensure efficiency and support staff retention and hiring efforts.** | | |
| | **Action B:** Conduct an evaluation of each department's operational efficiency on an annual basis and when considering hiring additional personnel. | Work with the City Manager on this action item. |
| **Strategy 2: Implement new technology in order to save money spent on some City functions and decrease each City department's workload.** | | |
| | **Action C:** Explore more automated technology systems that could be used to track City department budgets and produce reports, in order to help departments manage their own budgets and lighten the load on the Finance Department. | Under the current budget system, the City submits fund balances and data comparing budgets to actual money spent to City Council. However, the Finance Department has capacity challenges, leading the information to typically be running one to two months behind. Using technology to help automate some portions of the system could help departments better track their own expenditures, in turn lightening the load on the Finance Department and helping everyone remain up-to-speed. |

| GOAL 3: Optimize the management of City revenue and spending. | | |
|---|---|---|
| **Strategy 1: Continually evaluate and consider reshaping the City's fiscal structure for efficiency and as City priorities change over time.** | | |
| | **Action A:** Working with other City departments as well as the Finance Committee, consider ways to augment, diversify, and allocate City revenue sources, such as based on particular projects that may need funding. | Departments can collaborate to change the strategy over time based on key projects that need funding. For example, one-half-percent of City sales taxes were previously allocated to raise funds for the construction of the Fitness Center. For more ideas, *see Strategy 5* within this goal. |
| | **Action B:** In the longer term, conduct a comprehensive study of municipal finances to determine the most efficient and effective fiscal structure. | Depending on how the City is operating, the best structure for different funds or departments can change over time. For example, the Fitness Center is currently considered an enterprise fund for auditing purposes, but the City has discussed whether to treat it as a department and put the budget into the general fund like Fire, Police, and other departments. How each facility and/or department operated by the City is budgeted should be considered as part of the fiscal structure study. |
| **Strategy 2: Regularly update fees and other charges.** | | |
| | **Action A:** Continue annual updates to the City's fee schedule (as required by BMC 4.04.025), including consideration of whether new fees should be levied. | This should be organized by the Finance Department in coordination with all other departments. City Council approves the fee schedule annually, and it is posted to the City website. The relevant page should note that the fees are current as of when they went into effect. |
| **Strategy 3: Improve clarity and consistency of sales tax collection and business licensing.** | | |
| | **Action A:** Consolidate and improve clarity of information on the City website related to businesses, licensing, and sales tax collection. | Currently, some information is housed under Businesses, while some is under the Finance Department page in the Government tab. Business owners also receive information from the City when registering. Reorganizing the information could make it more accessible and easier to use. This should include a clear list of all types of economic activities that require different types of licensing and the collection of sales tax. |

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| | **Action B:** Before local business licenses are issued or renewed, require a code compliance review from the Planning Department. | This should be noted in the information for businesses on the City website and added to the Finance Department's procedures. Before the Finance Department issues a license, they should be required by Department procedure to send the relevant information to the Planning Department for review. |
| | **Action C:** Enforce compliance with business licensing requirements and sales tax collection by completing 80 sales tax audits per year. | In 2022, the new Finance Director worked to bring a large percentage of businesses into compliance and used various communication strategies to spread the word about the effort, including sending letters, publishing in the newspaper, and posting on social media. The goal is to use the audits to bring more businesses into compliance over time. |
| | **Action D:** Expand resources to help people start local businesses. | *See the Local Businesses section in Chapter 8 – People and Economy.* |

## Chapter 8 – People & Economy

| **GOAL 6: Foster a thriving local business community.** | | |
|---|---|---|
| **Strategy 1: Encourage the reinvigoration of the Chamber of Commerce.** | | |
| | **Action B:** Identify and reach out to business leaders in the community about the City's interest in more coordination with the business community, including potentially supporting the reinvigoration of the Chamber of Commerce. | The "Business Community Liaison," as determined by the City Manager as part of Action A in this strategy, would be responsible for this.<br><br>It is important to note that the Chamber of Commerce previously dissolved due to lack of interest. If there is still insufficient interest in a formal Chamber even as Bethel's business community grows over time, it could still be worthwhile for the City to coordinate regularly with business leaders about the state of the business community. |
| | **Action C:** Organize a City space for representatives from the business community / Chamber of Commerce to meet on a quarterly basis. | The "Business Community Liaison" would be responsible for organizing this. |

| | | |
|---|---|---|
| **Strategy 2: Expand resources to help people start local businesses.** | | |
| | **Action A:** Continue to provide information on licensing and permitting required, as well as enforcement. | The City website currently provides information on the applicable federal, state, and local requirements, but it may be helpful to optimize the information on the website to be more user-friendly – *see Chapter 7 – Public Facilities & Services.* |
| | **Action B:** Pursue a partnership with an organization such as UAF to offer business planning assistance. | There could also be opportunities to connect new businesses with students or young professionals who may be help with some elements of starting up a new business, like building a website or social media accounts. |
| | **Action C:** Raise awareness about resources available to help small businesses, such as the Alaska Small Business Development Center and related guides or workshops. | These resources are already linked on the Business Licensing page within the Finance Department section under the Government Tab of the City website, but this may be difficult to find, and people may not be aware of the resources available. The Chamber of Commerce is currently inactive, but if it resumes activities, the City could also work with them to improve the accessibility of these resources. *Also see Chapter 7 – Public Facilities & Services.* |
| **Strategy 3: Create a business-friendly environment in Bethel.** | | |
| | **Action A:** Identify any barriers that the City may be able to address to assist with starting and running businesses. | The "Business Community Liaison" could work with the Chamber of Commerce to conduct a survey of business owners to identify key challenges. |
| | **Action C:** Develop a directory of local businesses that is updated regularly. | The "Business Community Liaison" could work with the Chamber of Commerce to develop this directory, which should be made available online. |

| | | |
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| **GOAL 7: Support and expand tourism and visitation to Bethel.** | | |
| **Strategy 1: Expand information and marketing for visitors.** | | |
| | **Action C:** In collaboration with the Chamber of Commerce, encourage businesses and community facilities to provide up-to-date contact, website information, and photos on Google Maps. | Many visitors turn to map applications like Google Maps to plan and navigate, but the information currently available is inconsistently complete. More information could make visitors feel more comfortable navigating Bethel as an outsider. |

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# APPENDIX 4:
# FIRE DEPARTMENT ACTION ITEMS

# Appendix 4 – Fire Department Action Items FD

## Chapter 7 – Public Facilities & Services

| GOAL 6: Improve public safety facilities and services in Bethel. | | |
|---|---|---|
| **Strategy 1: Continue to improve fire and emergency medical infrastructure and services.** | | |
| | **Action A:** Construct a new fire station near the airport. | The station would house a vehicle and equipment and serve as a gathering place for volunteers responding to fires and medical emergencies. This would help serve the Kasayulie and Tundra Ridge subdivisions as well as the airport; some existing homes and buildings within this area are subject to significantly higher insurance rates due to their distance from the current fire station. This could also help serve more development that could occur in this area. |
| | **Action C:** Address maintenance needs for the fire station. | The station may need repairs to the foundation, piles, and retaining walls, as well as improved drainage on the site. As noted in the previous Comprehensive Plan, the fire training tower is also planned to be replaced, likely closer to the fire station than its previous location near the sewage lagoon. |
| | **Action D:** Continue to recruit and provide training to fire and EMS staff and volunteers. | It has at times been challenging to attract volunteers; the City may need to brainstorm additional recruitment ideas for this volunteer opportunity. *See Chapter 8 – People & Economy for more information on education and career training that may be relevant.* |
| | **Action E:** Address other public safety capital improvement needs as they arise and new technology becomes needed and/or available. | The Fire Department's detection equipment is obsolete. New chemical analyzation and radiation detection equipment, including CBRNE response training (i.e. - Hazardous Materials Technician), is needed. |
| | **Action F:** Continue and increase the delivery of existing fire prevention and education programs. | The Fire Department organizes programs such as fire prevention classes, school visits, and home safety inspections; these types of activities should continue and can be further promoted through social media. |

# APPENDIX 5:
# GRANT MANAGER ACTION ITEMS

# Appendix 5 – Grant Manager Action Items GM

## Chapter 3 – Housing & Land Use

| GOAL 1: Address potential barriers to housing development. | | |
|---|---|---|
| **Strategy 3: Encourage development by collaboratively working with developers to install public infrastructure, including piped water and sewer systems and roads.** | | |
| | **Action B:** Create a guide for infrastructure development grants or other funding assistance programs, in order to assist developers with finding information needed to pursue supplemental development financing. | The Grant Manager can prepare and maintain this list, to be shared with the Planning Department for use in their discussions with potential developers. As part of the subdivision agreement process, the City Planner can ensure that this guide is readily available to developers. It should also be posted to the City website to help encourage development by improving awareness of resources available.<br><br>For road development, the City can help developers apply for transportation funding via the Alaska Transportation Funding Opportunity Hub *(see Chapter 4 – Local Transportation, Goal 6 for more discussion).*<br><br>For water and sewer, there are other grants that may be able to help with funding, such as the grants the City will use to fund projects outlined in Chapter 6 – Utility Infrastructure. For subdivisions developed by tribal organizations, additional funding sources may be available. |

| GOAL 2: Facilitate more affordable housing development and access to affordable housing. | | |
|---|---|---|
| **Strategy 2: Support access to information on housing assistance programs.** | | |
| | **Action B:** Work with various community partners, potentially including the U.S. Department of Housing and Urban Development (HUD), Alaska Housing Finance Corporation (AHFC), ONC, or BNC, to research potential economic housing assistance that could be available to Bethel residents. | It is possible some existing housing assistance programs are organized such that Bethel residents would not qualify based on locally specific conditions. Depending on the results of the Grant Manager's research, the City could advocate for changes to these programs so that they are inclusive of rural Alaskan communities like Bethel.<br><br>If the Grant Manager can identify relevant programs, a guide could be created to be shared with the Planning Department for use in their discussions with potential developers. This could also be posted to the City website to help encourage development by improving awareness of resources available. |

| GOAL 4: Identify areas that are good candidates for infill development and take steps to facilitate their development. | | |
|---|---|---|
| **Strategy 4: Facilitate redevelopment of properties that are underutilized, dilapidated, or abandoned.** | | |
| | **Action D:** Consider funding available for the purchase of dilapidated or abandoned properties, potentially for use in partnership developments. | The City could potentially assist with cleaning up sites in order to facilitate redevelopment. Many owners of defunct / dilapidated properties can't afford to clean up the property and/or don't live on the premises. |

## Chapter 4 – Local Transportation

| GOAL 6: Strategically seek funding for transportation facility construction and maintenance. | | |
|---|---|---|
| **Strategy 1: Leverage opportunities available in Alaska to secure potential funding sources for implementing transportation projects.** | | |
| | **Action A:** Work with Alaska Municipal League and DOT&PF to use the Alaska Transportation Funding Opportunity Hub to identify potential funding sources for different types of surface transportation projects, and to prioritize Bethel's projects through the Hub Intake Survey. | While the STIP nomination process can be used for projects on DOT&PF facilities, other funding must be secured for any other transportation projects. The Alaska Municipal League and DOT&PF have partnered to improve access across Alaska to project development and funding opportunities.<br><br>A project intake survey should be completed for all potential projects to support matching project opportunities with funding sources and assist with securing funds to complete surface transportation improvement projects in Bethel. |
| **Strategy 2: Create a prioritized list of all transportation facility construction and maintenance projects.** | | |
| | **Action A:** Combine the lists of maintenance / rehabilitation and new transportation facility projects created for roads and trails, and add details on estimated design and construction cost and grant-related considerations. | Use the list and funding strategy developed for Strategy 1 above to inform potential funding sources for projects. Deadlines and schedules for different funding sources could impact how projects are prioritized. |

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| | **Action B:** Order the list based on priority and when each project should be completed. | The prioritization should factor in community need, cost, funding opportunities available, and what timing makes sense based on other transportation projects and/or developments. It should also consider the funding opportunity application windows to align projects with grants and increase the chances of success when seeking grant applications. The Alaska Transportation Funding Opportunity Hub can be used to support programming of projects to align them with funding opportunities. |
| **Strategy 3: Pursue funding to complete priority projects.** | | |
| | **Action A:** Continue to review priority projects annually to select those that could be funded through the Capital Improvement Plan. | Note that the STIP only applies to state-managed facilities. If MOUs for management change, this could impact funding eligibility. |
| | **Action B:** Nominate priority projects for state owned / managed facilities to the STIP, and nominate City owned / managed facilities to other state programs for federal funding such as the Community Transportation Program (CTP). | Some of these funding applications may include working with partners, such as tribal organizations like ONC who have access to different funding opportunities, including the Tribal Transportation Program (TTP). Matching funds with organizations that have access to different funding can enable the City to take on more significant projects. |
| | **Action C:** Apply for grants to fund other priority projects, focusing on time-sensitive funding opportunities. | Some of these funding applications may include working with partners, such as tribal organizations like ONC who have access to different funding opportunities, including the Tribal Transportation Program (TTP). Matching funds with organizations that have access to different funding can enable the City to take on more significant projects.<br><br>It is important to note that for federally funded projects, design and construction need to meet federal standards, which could also impact project cost. |

## Chapter 5 – Regional Transportation

| GOAL 6: Support the improvement and expansion of other modes of regional transportation. | | |
|---|---|---|
| **Strategy 1: As the hub of regional transportation, organize a City-led regional transportation coordination group to plan routes, maintenance, and funding.** | | |
| | **Action C:** Jointly create a funding strategy including participation from private entities as well as grant applications and pursuing tribal transportation and/or STIP funding. | There have been examples of this type of collaboration in the past, such as villages obtaining tribal transportation funds to clear snow from the ice road and passing it to the City to do the plowing work. |

## Chapter 6 – Utility Infrastructure

| GOAL 1: Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gasses. | | |
|---|---|---|
| **Strategy 1: Facilitate large-scale projects to introduce more alternative energy sources to the local network.** | | |
| | **Action E:** Monitor and support AVEC in applying for grant opportunities for alternative energy generation and storage that could be implemented in Bethel. | AVEC would be responsible for taking the lead on major projects impacting AVEC assets in the overall City electric system, but the City can assist by keeping tabs on potential funding opportunities and supporting AVEC when applying for funding. There may also be opportunities for collaboration with AVEC when pursuing funding for alternative energy projects that would be City-owned. |
| | **Action F:** Pursue partnerships with tribal entities to work together on grant applications and gain access to more potential funding. | The City's "energy point person" and representatives from local tribal entities could look for opportunities with the ANTHC Rural Energy Initiative and the ANTHC Rural Energy Technical Assistance Program. |

| GOAL 2: Regularly seek ways to lower water and sewer bills for customers. | | |
|---|---|---|
| **Strategy 1: While the hauled portion of the Bethel water and sewer system continues, evaluated hauled operations to look for efficiencies that may help reduce rates.** | | |
| | **Action A:** Seek grants to evaluate adding additional lift station points or watering points. | |
| **Strategy 2: Expand the piped water and sewer system, as it operates profitably and offsets losses from the hauled network.** | | |
| | **Action A:** Investigate and pursue funding options including grants, low interest loans, and bonds to expand the City's piped water and sewer network to reduce the amount of hauling. | |
| **Strategy 3: Evaluate and reduce costs associated with production and distribution of water and collection and treatment of wastewater.** | | |
| | **Action A:** Seek grants to conduct energy audits and make energy efficiency improvements at water treatment plants and amongst the haul fleet. | |

| GOAL 3: Transition Bethel's water and sewer utilities to fully piped systems serving all residences and businesses. | | |
|---|---|---|
| **Strategy 1: Complete each phase of projects outlined in the PER.** | | |
| | **Action A:** Obtain grant and loan funding for new water and sewer projects, including from the USDA. | It may be advantageous to collaborate with other local organizations to obtain grants, such as ONC, which is able to access additional tribal funding sources. It is also important to recognize that the long-term cost savings from operating piped systems in place of hauled systems represents funds that can be used to repay loans. The Grant Manager may need to educate potential lenders or grantors on the very high cost for infrastructure, as project costs increasingly rise yet they are still needed.<br>▪ City: USDA Rural Development (grant and loan), Community Development Block Grant, EPA Alaska Native Villages and Rural Communities Water, State Revolving Fund<br>▪ ONC: Indian Community Development Block Grant, Indian Housing Block Grant additional competitive funds, EPA Tribal Set-Aside Drinking Water and Infrastructure |
| **Strategy 3: During the phases of the PER and beyond, manage the piped system to be as efficient and accessible as possible, as well as equitable in cost.** | | |
| | **Action D:** Provide City assistance with finding potential grant or loan funding for new commercial connections or subdivision developments not currently included in the 2022 PER phases. | |

| GOAL 5: Manage the landfill to be useable as long as possible and with minimal environmental impacts, through more efficient and environmentally responsible practices. | | |
|---|---|---|
| **Strategy 3: Pursue ways to redirect more types of waste from the landfill, both to prolong the landfill's life and to minimize impacts to the environment and public health.** | | |
| | **Action F:** Research funding or partnership opportunities for barging out other kinds of waste, particularly harmful waste. | Work with the Landfill Manager on this action item. |

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| | **Action G:** Pursue other funding opportunities geared towards environmentally friendly landfill and recycling programs for the City. | |

## Chapter 7 – Public Facilities & Services

| **GOAL 3: Optimize the management of City revenue and spending.** | | |
|---|---|---|
| **Strategy 5: Maximize grant funding that can be obtained.** | | |
| | **Action A:** Expand the grant writing and research capacity of the City beyond the Grants Manager, including assistance from other departments and/or hiring consultants to prepare some grant applications. | |
| | **Action B:** Explore partnerships with other organizations to fund some projects. | Some funding organizations may encourage or require cooperative arrangements for grants. One example of a collaboratively funded and implemented project in the past was the City's partnership with the University of Alaska Fairbanks Cooperative Extension to provide a community garden for all Bethel residents to use. Such projects could also include considerations for ongoing revenue to support the project, such as rental fees for garden plots. |

| **GOAL 5: Manage updates to City facilities and equipment in an efficient, cost-effective, and forward-thinking manner.** | | |
|---|---|---|
| **Strategy 2: Continually seek funding for additions, improvements, and repairs to City facilities and equipment.** | | |
| | **Action A:** Remain up-to-date on funding opportunities, including special infrastructure funding through federal or state programs. | This should include improvements and repairs to existing City facilities, but the City should also remain informed about funding opportunities specific to adding new types of facilities and equipment. For example, there may be funding available specifically for updating the technology used in City offices. |
| | **Action B:** Apply to grants to fund infrastructure, such as BUILD grants. | For example, a new Public Works building is needed. Currently, the cost of construction is estimated at approximately $36.4 million and could be a candidate for BUILD grant funding. |

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| | **Action C:** Consider allocating other funding sources for some infrastructure improvements, including through collaboration and potentially facilities-sharing with organizations such as ONC. | *See Goal 3, Strategy 6, Action B above.* |

| **GOAL 8: Enhance the role of parks in the Bethel community.** | | |
|---|---|---|
| **Strategy 5: Pursue special funding and collaboration opportunities for enhancing Bethel parks.** | | |
| | **Action A:** Pursue Land and Water Conservation Fund or similar outdoors-related grant money to help with parks projects. | As part of a past Land and Water Conservation Fund grant award, the City was required to designate Pinky's Park for outdoor recreation in perpetuity. For other parks projects in the future, this or similar funding may be available. |
| | **Action B:** Add more community gardening opportunities to parks, potentially in partnership with Alaska Native organizations or other sponsor entities. | There is currently a community garden that was developed as part of a partnership between the City and the University of Alaska Fairbanks Cooperative Extension; there could be opportunities to expand this type of facility through partnerships.<br><br>Chapter 8 – People & Economy also discusses opportunities for incorporating Native place names and public art. |

## Chapter 8 – People & Economy

| **GOAL 4: Prepare the City for a broad range of potential climate change impacts.** | | |
|---|---|---|
| **Strategy 1: Using the help of state and/or federal climate resilience resources, create City plans for climate adaptation and community resilience.** | | |
| | **Action C:** Monitor other funding or support resources that may become available. | The Alaska Department of Community & Regional Affairs (DCRA) may be a good resource for additional guidance, support, or resources. The Center for Arctic Policy Studies (CAPS) at the University of Alaska Fairbanks may also be able to provide guidance on funding for climate resilience planning and mitigation efforts. |

| GOAL 5: Support locally-specific cultural activities and attractions in Bethel. | | |
|---|---|---|
| **Strategy 3: Celebrate natural and historic resources and sites in Bethel.** | | |
| | **Action F:** Pursue grants for City-led incorporation of signage, public art, or other elements that highlight local culture, history, and natural environment. | |

# APPENDIX 6:
# HUMAN RESOURCES ACTION ITEMS

# Appendix 6 – Human Resources Action Items HR

## Chapter 7 – Public Facilities & Services

| GOAL 1: Enhance the reliability and efficiency of the City workforce. | | |
|---|---|---|
| **Strategy 1: Optimize and monitor the staffing and operations of each City department to ensure efficiency and support staff retention and hiring efforts.** | | |
| | **Action A:** Ensure every department has clearly outlined responsibilities with documented and regularly updated policies, procedures, and job descriptions to facilitate staff training and operations evaluations. | Work with the City Manager on this action item.<br><br>Maintaining consistent procedures and ways of operating has been a challenge for some departments due to lack of staff continuity. Establishing and following consistent procedures could assist current and future staff in running the department properly and efficiently. |
| | **Action C:** As evaluations of operations are completed, consider altering the structure of departments (for example, implementing new technology to increase efficiency, or establishing mentorship and chains of command that facilitate staff advancement into leadership roles). | Work with the City Manager on this action item. |
| | **Action D:** Establish transition plans so that department operations are minimally impacted by the departure of key staff. | Work with the City Manager on this action item. |
| **Strategy 3: Regularly raise awareness about current and upcoming job and committee / commission openings within Bethel.** | | |
| | **Action A:** Informed by operations evaluations completed as part of Strategy 1, create a running list of staffing needs within the City, and order it based on priority. | For example, water and sewer truck drivers and utility maintenance workers play a critical role in the City, and hiring for these types of roles should be prioritized.<br><br>This and other actions related to hiring should be completed in collaboration with representatives from relevant departments when searching for specific roles. |

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| | **Action B:** Post open position advertisements to national recruitment websites, featuring the highest priority openings as identified in Action A. | |
| | **Action D:** Organize an annual City of Bethel Opportunity Fair, where representatives from each department and committee / commission can raise awareness about their activities and meet potentially interested candidates. | Private employer partners could also participate and help organize an event like this. |
| | **Action E:** Advertise current and upcoming openings as well as the opportunity fair and any other relevant events through typical channels within Bethel. | *Also see Chapter 7 – Public Facilities & Services, Goal 2 on communications.* |
| **Strategy 4: Work with educational programs to create a pipeline of trained candidates for City jobs.** | | |
| | **Action A:** Work with local schools, including the high school, vocational school, and university, to create a pipeline of potential City employees. | For more discussion of working with schools in Bethel, *see Chapter 8 – People and Economy.* |
| | **Action B:** Identify other vocational schools in Alaska and advertise job openings through their channels. | |
| | **Action C:** Request that the University of Alaska help share job openings with their network to broaden the reach across Alaska. | |

| | | |
|---|---|---|
| **Strategy 5: Broaden recruitment channels around the region and Alaska.** | | |
| | **Action A:** Invite people from villages in the region to attend hiring events and apply for jobs at the City. | |
| | **Action B:** Work with tribal organizations and native corporations to raise awareness about jobs at the City with a statewide audience. | |
| | **Action C:** Consider working with recruiters to help find candidates. | |

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| **GOAL 8: Enhance the role of parks in the Bethel community.** | | |
| **Strategy 1: Expand the City's capacity to manage and maintain parks.** | | |
| | **Action B:** Continue efforts to hire and train Public Works maintenance staff, including for seasonal positions and/or potential for volunteer involvement. | *See Chapter 7, Goal 1* for more actions related to City recruitment. |

## Chapter 8 – People & Economy

| GOAL 1: Promote broad access to education, training, and employment opportunities in Bethel. | | |
|---|---|---|
| **Strategy 1: Identify community priorities for education and career training.** | | |
| | **Action A:** City of Bethel staffing is an important priority; see Chapter 7 – Public Facilities & Services, Goal 1: "*Enhance the reliability and efficiency of the City workforce*." | This section discusses strategies for the City to hire new City staff, which are applicable to providing opportunities in Bethel and can also be applied to opportunity development beyond City roles. |
| **Strategy 2: Foster a city-wide culture of emphasizing local hiring and training for specific local opportunities.** | | |
| | **Action A:** Lead the community in the creation of a local "job board" that helps businesses find suitable hires. | *Also see strategies in Chapter 7 – Public Facilities & Services.* |
| | **Action B:** Create a focused internship and apprenticeship program that offers introductory training and support leading to employment with City of Bethel or through partnerships with community organizations or businesses. | This program could have an education component and be developed in partnership with LKSD, UAF, and/or the vocational school. This could allow job training as part of education programs that helps students find employment opportunities in their field earlier, particularly in those sectors which are most needed by the community and will be of increasing importance in the future. |

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# APPENDIX 7:
# INFORMATION TECHNOLOGY ACTION ITEMS

# Appendix 7 – Information Technology Action Items

## Chapter 4 – Local Transportation

| GOAL 2: Plan for an organized, proactive approach to surface transportation facility maintenance. | | |
|---|---|---|
| **Strategy 3: Establish improved systems to track maintenance operations.** | | |
| | **Action B:** Investigate and consider implementing a software program to track maintenance operations. | There may be options that directly interface with something like the Report a Problem form, allowing both the public and City staff to input records of issues. As Public Works keeps record of action taken and other information in this type of system, a useful record would be created to help inform future planning. |

## Chapter 7 – Public Facilities & Services

| GOAL 1: Enhance the reliability and efficiency of the City workforce. | | |
|---|---|---|
| **Strategy 2: Implement new technology in order to save money spent on some City functions and decrease each City department's workload.** | | |
| | **Action A:** Transition the City to an online customer portal system with abilities to manage utility service preferences and pay bills. Over time, this self-serve system could expand to include the ability to manage business licensing and sales tax payments, submit site plans, and other potential applications. | Customers can currently pay utility bills online, but this type of self-serve system could be expanded to allow starting, stopping, increasing, or decreasing service. To assist the Finance Department, businesses could be allowed to manage licensing, sales tax payments, and other processes via an online system. This could also benefit the Planning Department by allowing applicants to upload photos and other materials, reducing staff time currently taken to visit sites to take photos. |
| | **Action B:** Transition City departments to an electronic timekeeping system. | The City currently has access to electronic timekeeping through its accounting system, but it hasn't been fully set up; instead, employees submit paper timesheets which travel through a series of reviews before being sent to a third part for completion. Electronic timekeeping would likely reduce payroll processing errors and make the process more efficient. |

| | | |
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| | **Action C:** Explore more automated technology systems that could be used to track City department budgets and produce reports, in order to help departments manage their own budgets and lighten the load on the Finance Department. | Under the current budget system, the City submits fund balances and data comparing budgets to actual money spent to City Council. However, the Finance Department has capacity challenges, leading the information to typically be running one to two months behind. Using technology to help automate some portions of the system could help departments better track their own expenditures, in turn lightening the load on the Finance Department and helping everyone remain up-to-speed. |
| **Strategy 3: Regularly raise awareness about current and upcoming job and committee / commission openings within Bethel.** | | |
| | **Action C:** Set up an automated email alert service that sends updates to potentially interested parties when there are openings at the City, featuring the highest priority openings as identified in Action A. | This service could allow candidates to select types of jobs or departments for which they'd like to be alerted. Because this service is via email, people anywhere could add themselves to the list, not just in Bethel. |

| GOAL 3: Optimize the management of City revenue and spending. | | |
|---|---|---|
| **Strategy 1: Implement new technology in order to save money spent on some City functions and decrease each City department's workload.** | | |
| | **Action A:** Transition the City to an online customer portal system with abilities to manage utility service preferences and pay bills. Over time, this self-serve system could expand to include the ability to manage business licensing and sales tax payments, submit site plans, and other potential applications. | Customers can currently pay utility bills online, but this type of self-serve system could be expanded to allow starting, stopping, increasing, or decreasing service. To assist the Finance Department, businesses could be allowed to manage licensing, sales tax payments, and other processes via an online system. This could also benefit the Planning Department by allowing applicants to upload photos and other materials, reducing staff time currently taken to visit sites to take photos. |
| | **Action B:** Transition City departments to an electronic timekeeping system. | The City currently has access to electronic timekeeping through its accounting system, but it hasn't been fully set up; instead, employees submit paper timesheets which travel through a series of reviews before being sent to a third part for completion. Electronic timekeeping would likely reduce payroll processing errors and make the process more efficient. |
| | **Action C:** Explore more automated technology systems that could be used to track City department budgets and produce reports, in order to help departments manage their own budgets and lighten the load on the Finance Department. | Under the current budget system, the City submits fund balances and data comparing budgets to actual money spent to City Council. However, the Finance Department has capacity challenges, leading the information to typically be running one to two months behind. Using technology to help automate some portions of the system could help departments better track their own expenditures, in turn lightening the load on the Finance Department and helping everyone remain up-to-speed. |

# APPENDIX 8:
# LANDFILL MANAGER ACTION ITEMS

# Appendix 8 – Landfill Manager Action Items LM

## Chapter 5 – Regional Transportation

| GOAL 2: Support DOT&PF in airport operations and planning. | | |
|---|---|---|
| **Strategy 1: As requested by the FAA and/or DOT&PF, take actions that support smooth and secure airport operations.** | | |
| | **Action B:** If a new landfill or sewage lagoon is constructed, place it as far from the airport as practicable to avoid attracting wildlife that could be harmed, damage airport equipment, and disrupt operations. | The FAA recommends new landfills be six miles from airports, but many Alaskan communities receive exemptions due to their small size. The existing landfill is under six miles away, but it is located away from the airport. |

## Chapter 6 – Utility Infrastructure

| GOAL 5: Manage the landfill to be useable as long as possible and with minimal environmental impacts, through more efficient and environmentally responsible practices. | | |
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| **Strategy 1: Continuously monitor the capacity of the landfill to assess if / when a new landfill might be needed in the future.** | | |
| | **Action A:** Conduct a new landfill closure study approximately every five years to measure and evaluate progress and determine what strategic changes might be necessary. | The main priority will be to use a multitude of strategies to preserve the life of the existing landfill as long as possible, as constructing a new one would be very expensive and difficult. The strategy to manage the landfill may need to evolve over time. |

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| **Strategy 2: Utilize best solid waste management practices and compliance with ADEC standards to reduce the volume of waste in the landfill.** | | |
| | **Action A:** Regularly review guidance on the ADEC Solid Waste website and incorporate recommendations based off of the annual state inspection and new technology as it becomes available. | The current inspection contains some recommendations, including:<br>▪ Maintain adequate cover<br>▪ Establish secondary containments (e.g., liner) for staged/impounded vehicles |
| | **Action B:** Improve separation of waste by establishing cells (such as for lumber or scrap metal and vehicles). | Currently, some waste is deposited in designated piles, such as for construction material, vehicles, tires, or trees and branches, but this practice could be expanded and improved according to ADEC guidance. |
| | **Action C:** Train personnel on the use of the shredder and other techniques to reduce volume of waste. | Compact shredded waste within the landfill, maintaining stable slopes. The City could pursue dynamic compaction using a crane as another technique. There may be funding available for this through grants. |
| | **Action D:** Provide continual education and staff training for properly disposing of hazardous materials, such as freon removal with Total Reclaim, the Rural Alaska Landfill Operator (RALO) course, and/or HAZWOPER. | This is critical to minimizing environmental impacts and protecting public health and safety in Bethel, so the training should be regularly provided to ensure staff remain up to date on the latest best practices. |
| | **Action E:** In the longer term, consider building an additional storage garage to store and protect heavy equipment. | This was recommended by the State as part of their inspection. Equipment such as the shredder should be protected to ensure the longest lifespan to help extend the life of the landfill. |

| Strategy 3: Pursue ways to redirect more types of waste from the landfill, both to prolong the landfill's life and to minimize impacts to the environment and public health. | | |
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| | **Action A:** Provide regularly updated information to the public on existing City waste separation programs and what types of waste can and cannot be disposed in dumpsters. | Alaska State Statutes dictate what can and cannot go in the landfill; in addition to the landfill management enforcing this, the public should be educated so as to avoid these items arriving at the landfill in the first place.<br><br>Outreach programs could include educational programs for children in local schools and partnerships with rural development programs out of University of Alaska Fairbanks. |
| | **Action B:** Research types of waste that can be reused or recycled locally as well as the market for recyclables in Anchorage and/or Seattle; stage these items for public salvaging or separate for local recycling and/or shipping out in collaboration with ONC's recycling program or as part of a renewed City recycling program. | Other relevant recyclables may include glass, aluminum, and #1 PET plastic. The City worked with a Seattle recycling center in the past that wanted metals to be pre-shredded; now that the City has a shredder, this may be an option.<br><br>In addition to junk vehicle parts salvage, the City currently separates wood out for the public to be able to come take. There is also a program that recycles wood into pallets that can be burned in pallet stoves for heating. While equipment is currently expensive, this could be something to keep on the City's radar in the future. As more technology is developed, there may be other reuse opportunities that emerge and could help the City divert more waste from the landfill. |
| | **Action C:** Research potential partners for a new City-wide e-waste collection and recycling program to build on periodic local collections. | ONC used to run an e-waste collection and recycling program, but they are not currently due to lack of capacity to manage it. There may be other organizations that could partner with the City to assist with starting a new program. |
| | **Action D:** Research how to implement a compost program for food waste and potentially cardboard and paper products; this could potentially be incorporated into Parks and Recreation and Community Garden programming. | Work with Parks and Recreation on this action item. |

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| | **Action E:** As local recycling becomes more feasible, consider starting by working with organizations such as schools, hospitals, and businesses that may have a steady supply of uniform recyclable materials (like paper, certain types of packaging, etc.). | |
| | **Action F:** Research funding or partnership opportunities for barging out other kinds of waste, particularly harmful waste. | Backhaul Alaska is one example of an organization that coordinates hauling harmful waste. |
| | **Action G:** Research and initiate community discussions about ways to address negative impacts of junk vehicles located on private properties and in the landfill. | |

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# APPENDIX 9:
# PARKS AND RECREATION ACTION ITEMS

# Appendix 9 – Parks and Recreation Action Items PR

## Chapter 4 – Local Transportation

| GOAL 5: Improve and expand the trail system. | | |
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| **Strategy 1: Address trail and boardwalk maintenance needs more efficiently.** | | |
| | **Action C:** Identify and potentially add pedestrian amenities to more locations, including lighting and benches. | Lighting has been installed in some areas, but this should continue along more boardwalks or major trails.<br><br>There is potential for benches to be funded by individual sponsorships (such as in exchange for a dedication plaque on the bench). These could be located along trails and/or at parks and other key public locations. |
| | **Action D:** Add amenities for bicyclists at parks and recreation facilities, such as bike racks and bike "fix-it" stations. | |
| **Strategy 2: Address trail and boardwalk maintenance needs more efficiently.** | | |
| | **Action B:** Initiate an Adopt-a-Trail and/or boardwalk and trail maintenance volunteer group to assist when City maintenance staff does not have capacity to respond to trail / boardwalk maintenance issues. | To assist City maintenance staff, the community could help with trail and boardwalk maintenance. This could be through an Adopt-a-Trail program with opportunities for sponsorship signage. This could also be a community service opportunity for younger people, and it would encourage more people to feel a sense of ownership over the public boardwalks, potentially reducing vandalism. |

| Strategy 3: Clarify the existing City-managed trail system. | | |
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| | **Action A:** Create an updated and easy-to-read map of existing formal City trails. | The trails map created for the past Comprehensive Plan may include trails that are not officially / legally under City jurisdiction – they may cross private land without easements, and maintenance responsibility may be unclear. The trails map created for the 2020 LRTP includes formal and informal trails, including snowmachine trails. A trails map is needed to support non-driver transportation and recreation in Bethel, but to avoid potential liability issues, the City should only map formally City-managed trails. This can be the starting point for taking steps to formalize other popular trails in Bethel and clarifying who is responsible for maintenance.<br><br>This plan includes a map that is a starting point, and the Parks & Recreation Committee and Public Safety & Transportation Commission should be involved as the map develops over time. |
| | **Action B:** Clarify which users and modes of transportation are allowed on each trail. | Many existing trails in Bethel are currently shared amongst pedestrians, bicyclists, and small motorized users such as ATVs, motorcycles, and snowmachines. On City-managed trails, the City should clarify which users may be present to help all users stay aware of who to look out for on the trail. Boardwalks may not be built to accommodate motorized users, so they should be clearly identified for pedestrians and bicyclists only. Information on which users are permitted on different facilities should be provided to the public in various ways – *see Actions C and D below.* |
| | **Action C:** On the trails map, include a layer that shows important community "centers" such as the hospital and other health centers, schools, parks, the Fitness Center, the library, and others. | |
| | **Action D:** Make the trails map and information (including type of facility, users allowed, accessibility information, and distances) easily available on the City website. | |

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| | **Action E:** Post signs with the trails map and information at key points within the trail system, such as at parks and recreation facilities. | |
| **Strategy 4: Expand the trail system by formalizing popular trails and adding new trails.** | | |
| | **Action A:** For internal planning purposes, mark popular but informal trails on the map in dotted lines. | This information would be useful for community discussions about formalizing and expanding the trail system, but it should not be posted on the City website or around town in a way that might cause confusion over which trails are official and City-maintained. |
| | **Action B:** Based on community input and gaps in pedestrian access to important community "centers," add other potential new trail / boardwalk routes to the map in dotted lines. | These new routes could fill gaps in the system and could be informed by potential locations for future roads, such as through the Donut Hole.<br><br>Some stakeholders have also discussed interest in more trails in the southwest area of town, near the gravel extraction pit. Some areas near this location have been designated Public Open Space on the Future Land Use Plan Map; this designation could evolve to include more areas in the southwest part of town if interest in additional trails continues. |

## Chapter 6 – Utility Infrastructure

| GOAL 5: Manage the landfill to be useable as long as possible and with minimal environmental impacts, through more efficient and environmentally responsible practices. | | |
|---|---|---|
| **Strategy 3: Pursue ways to redirect more types of waste from the landfill, both to prolong the landfill's life and to minimize impacts to the environment and public health.** | | |
| | **Action D:** Research how to implement a compost program for food waste and potentially cardboard and paper products; this could potentially be incorporated into Parks and Recreation and Community Garden programming. | Work with the Landfill Manager on this action item. |

## Chapter 7 – Public Facilities & Services

| GOAL 7: Target specific public safety concerns within Bethel. | | |
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| **Strategy 1: Improve maritime safety through educational programs.** | | |
| | **Action A:** Through the Fitness Center, continue to offer swim classes for all ages, including pursuing a partnership with the school district to incorporate swim lessons into their required physical education programming during elementary school. | In the past, there have been some efforts to provide swim lessons, and these should continue. Given its location on the Kuskokwim River, with many creeks and other water bodies in the vicinity, Bethel and regional residents should be prepared with swimming and boating skills to prevent drowning. Some communities require swim lessons as a school graduation requirement. Another model could be offering and encouraging classes for all ages for a fee, with scholarships available. |

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| **Strategy 3: Reduce drug abuse in Bethel.** | | |
| | **Action A:** Through the renewed Parks and Recreation department *(see Section 7.5)*, provide programming for all ages that focuses on physical and emotional wellbeing through recreation, including the potential for mentorship and volunteering opportunities. | |

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| **GOAL 8: Enhance the role of parks in the Bethel community.** | | |
| **Strategy 1: Expand the City's capacity to manage and maintain parks.** | | |
| | **Action C:** Monitor general and ongoing maintenance issues related to parks (such as vandalism) and discuss ideas for solutions with the Community Parks & Recreation Committee. | As mentioned in the action item, vandalism is one example of a general issue related to parks that is difficult to prevent. One of the benefits of having multiple types of people / groups focusing on parks in the community (including the person the City Manager may designate to lead this effort per Action A in this strategy) is the ability to brainstorm solutions together; as this and other potential issues arise in the future, they should be raised for discussion. |
| **Strategy 2: Expand and improve key central parks in Bethel with the goal of making them community landmarks and gathering spaces.** | | |
| | **Action A:** Create a new park on the former Kilbuck School site, as the neighborhood park for the Avenues / Alligator Acres area. | The site is currently being used for storage since the school burned down. There are several easements through the property and changes to the site that would be needed.<br><br>Ideas for the park include a track or walking path, playground equipment, basketball courts, volleyball courts, and a gazebo. The park design could be site specific, perhaps with playground equipment referencing its history as a school.<br><br>The site is large; there is also potential for housing to be developed on a portion of the property. |

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| | **Action B:** Identify waterfront park investment opportunities to create an iconic and central civic space that represents Bethel. | The site at the intersection of 1st Avenue and Bluff Drive already has benches / picnic tables and marks the start of the City-maintained waterfront trail. The trail could be marked with public art and gateway features, and the park could be improved. It is very near the cultural center and library, so this could be a natural gathering space for outdoor events with an amphitheater or picnic shelter.<br><br>The City has also identified the underutilized site owned by the Moravian Church behind Lomack Beach; this could also be developed as a waterfront park, and the site is large enough that there could be space to add parking. |
| | **Action C:** At Pinky's Park, add amenities that are focused on community gathering and comfort for all ages. | This could include a picnic shelter or gazebo with benches and tables, more trails, and placemaking features like signage and public art. |
| **Strategy 3: Establish a network of Bethel parks to serve all neighborhoods.** | | |
| | **Action C:** Pursue the development of new City parks in underserved areas. | Beyond looking at the map of parks created as part of Actions A and B in this strategy, this will require community coordination, including:<br><br>▪ coordination with neighborhood residents/community to identify a site<br><br>▪ navigating potential ownership changes<br><br>▪ brainstorming funding mechanisms, such as sponsorships from private entities or grants<br><br>▪ determining park maintenance cost and how maintenance will be managed and funded<br><br>▪ addressing potential liability concerns associated with the new park space, depending on whether the City is managing maintenance |

| Strategy 4: Improve park facilities for sports and other recreational activities. | | |
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| | **Action A:** Continue to upgrade and add facilities to Pinky's Park, including new playground equipment and potentially new gravel trails to replace run-down boardwalks. | As noted in Strategy 1, Pinky's Park is a main park for the community including the Big Dipper multipurpose field used for soccer, frisbee, and football and other amenities. Recently, a volleyball court was added to its collection of sport facilities.<br><br>The community has expressed a desire for further improvements to the park; the City has obtained grant funding for new playground equipment to be installed in summer 2023 and is currently in the process of applying for funds to improve Pinky's Park trails.<br><br>Other Pinky's Park improvements the City could potentially pursue include:<br><br>▪ Artificial turf for fields to reduce maintenance needs – grass doesn't survive long and becomes very uneven. Artificial turf would likely need to be engineered, but is becoming less expensive.<br><br>▪ New ice rink |
| | **Action B:** Consider creating additional facilities such as picnic shelters, a recreational campground, a dog park, non-motorized winter recreation such as cross-country skiing or mushing, additional skate park facilities, or new sports fields or courts. | Some additional facilities could be established with the help of partnerships, such as with non-profit organizations willing to sponsor their maintenance. |

| GOAL 9: Enhance recreational facilities and programs in Bethel. | | |
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| **Strategy 1: Expand the facilities and operations of the Fitness Center to accommodate more activities and all ages.** | | |
| | **Action A:** Expand the fitness center with potential improvements such as a gym and/or fitness track. | Currently, expansion of the fitness center is estimated to cost approximately $20 million and could be eligible for BUILD grant funding. A plan has been drafted, alternatives are being considered, and fundraising is underway. |

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| | **Action B:** As the City is able, transition the City towards managing the Fitness Center (which is currently run by a contractor). | The Community Parks and Recreation Committee is advocating for the City to further develop its recreation program. The current contract for management of the Fitness Center includes a provision for recreation services, but the City is also considering a separate contract for these services. If the City reassumes management of the Fitness Center, likely as part of the development of a Parks and Recreation management role or department, these responsibilities would shift accordingly. Some Committee members noted that City management of the Fitness Center was part of the original business plan for the facility. |
| | **Action C:** Develop programming within the fitness center oriented towards youth / younger people, such as classes or recreational sports leagues. | Some younger people in the community may feel intimidated by the adults who primarily use the fitness center, so a greater effort should be made to include them and make them feel comfortable through classes and programs that are offered or specific hours for the youth to use the gym. This can help youth create lifelong healthier lifestyles. |
| | **Action D:** Develop programming within the fitness center and/or pool that is oriented towards seniors. | Certain times or specially designed classes could be set aside for senior residents to ensure safety. There could be special classes oriented towards older residents. |
| | **Action E:** Based out of the Fitness Center but potentially including other facilities in town, consider establishing adult recreational sports leagues. | |
| **Strategy 2: Support expansions to childcare, teen activities, and senior activities.** | | |
| | **Action A:** Support upgrades and expansions to the Bethel 4-H Youth Center facilities and programming, including food programs, classes, and recreation for teens and afterschool youth. | UAF leases the building from the City, so this is their project. They did receive grant funding to help. This is a good example of a community partnership for the City to work with a separate organization to fill a community need.<br><br>The center offers some “life skills” programming and could potentially work more with the City by providing volunteer community service and internship opportunities.<br><br>At the center or elsewhere (since it is sometimes very heavily used), the City could also explore partnering with another organization to provide childcare programs for City and partner organization’s children. |

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| | **Action B:** Support recreational programming dedicated to seniors, such as upgrades to the existing Senior Center Park or other programs. | The Senior Center Park is run by the Alaska State Housing Authority. As the older population in Bethel continues to grow, there may be a need for additional facilities and/or programming. |
| **Strategy 3: Explore collaborations for recreational activities at other facilities in Bethel.** | | |
| | **Action A:** Coordinate with the school district to identify opportunities to use school facilities for programming outside of school hours. | This has been limited in the past due to liability concerns, scheduling constraints, and the need for supervision. However, there may be staff that works for the school district that could help with childcare programming outside of school hours as well; this should be explored. |
| | **Action B:** Support expansions to recreational facilities and resources, such as the Cultural Center and the Kuskokwim Consortium Library. | Libraries in many communities organize a variety of programming for the benefit of the community, not necessarily related to reading. This could include creative or "life skills" classes, or the establishment of a "materials library" where Bethel residents can check out household tools or electronic equipment. |

## Chapter 8 – People & Economy

| **GOAL 5: Support locally-specific cultural activities and attractions in Bethel.** | | |
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| **Strategy 1: Work with community organizations to continue to highlight Yup'ik culture in Bethel.** | | |
| | **Action B:** Seek opportunities to incorporate Alaska Native place names and art into public spaces in Bethel, such as parks and trails. | |
| | **Action C:** When possible, partner with Bethel Council on the Arts and Alaska Native organizations to sponsor cultural facilities and events in Bethel, such as arts and crafts markets, cultural exhibits, or the Camai dance festival. | These events can be a part of Parks and Recreation activities that add to the quality of life in Bethel; they also attract visitors to the community *(see the Visitor Experience section in Chapter 8 – People & Economy).* |

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| **Strategy 2: Work with community organizations to continue to highlight Yup'ik culture in Bethel.** | | |
| | **Action A:** Pursue the expansion of the fitness center to make space for more sports activities, such as basketball and other sports. | *Also see Chapter 7 – Public Facilities & Services – Parks and Recreation section.* |
| | **Action B:** Pursue the expansion of organized winter sports facilities and activities, such as mushing and cross-country skiing. | *Also see Chapter 7 – Public Facilities & Services – Parks and Recreation section.* |
| | **Action C:** Work with community organizations to organize "food fairs" highlighting diverse cuisines of people and restaurants in Bethel. | This action item could also be pursued in collaboration with the reinvigorated Chamber of Commerce, as discussed in Goal 5 in this chapter. |
| **Strategy 3: Celebrate natural and historic resources and sites in Bethel.** | | |
| | **Action A:** Work with other community organizations and public input to complete an "asset mapping" exercise to identify cultural, historical, and natural attractions in Bethel. | |
| | **Action B:** Emphasize preservation of natural landscapes and native plants in the management and design of open spaces and parks. | *Also see Chapter 7 – Public Facilities & Services – Parks and Recreation section.* |
| | **Action C:** Create a guide to natural features, spaces and parks, and wildlife viewing opportunities such as a network of birding trails, for the education and appreciation of residents and visitors. | *Also see Chapter 7 – Public Facilities & Services – Parks and Recreation section and the Chapter 8 - People & Economy - Visitor Experience section.* |

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| | **Action D:** Identify and map buildings or historic sites that are of historic significance, and consider development of a historical walking route that focuses on Bethel's history. | The Moravian Bookstore and other older Moravian buildings may be eligible for nomination to the National Register of Historic Places. The City could work with community members to identify other places that are significant to the history of Bethel. |
| | **Action E:** Develop and implement an informational signage system for parks and significant places of interest. | |

| **GOAL 7: Support and expand tourism and visitation to Bethel.** | | |
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| **Strategy 2: Improve attractions for visitors.** | | |
| | **Action A:** Emphasize locally specific natural and cultural attractions. | This could include plant and animal observation areas and references to local and regional guiding services.<br><br>*Also see Goal 4 above.* |
| | **Action B:** Work with the Chamber of Commerce and other organizations to develop a calendar of community events. | This can include cultural events, entertainment or educational events, and other types of events that would not appear on the City's calendar or be consolidated in any other location. This could be coordinated with the administrators of the It's going on in Bethel! Facebook group where people currently tend to advertise community events. |
| | **Action C:** Develop and implement a beautification plan for the downtown area (roughly between the Cultural Center and Brown's Slough) and the waterfront. | Work with Chamber of Commerce to develop plans and find volunteer organizations that can help fund and participate in installing signage, planting and maintaining flowers, organizing public art, and trash pick-up. The beautification plan could identify specific projects that should occur seasonally, or phases for completing larger projects over time. |

# APPENDIX 10:
# PLANNING DEPARTMENT ACTION ITEMS

# Appendix 10 – Planning Department Action Items PL

## Chapter 3 – Housing & Land Use

| GOAL 1: Address potential barriers to housing development. | | |
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| **Strategy 1: Streamline the land use approval process.** | | |
| | **Action A:** Every five years, audit the Planning Department website and application forms used for land use processes and revise for clarity and ease of use. | Bethel Municipal Code (BMC) Titles 15 through 18 govern land use and development. BMC is available online and updated regularly as changes are made to the code. Planning application forms are also available online on the City website. These materials are intended to make it accessible for anyone working on projects to access the information they need to get approval and complete their projects, but processes can be overwhelming for those not frequently using them; clarifying information available helps reduce time the Planning Department must help walk applicants through the process.<br><br>It may be helpful to create flowcharts explaining the most common land use approval processes, including references to relevant code sections. The department may also consider creating a schedule of application submission cut-off dates for each Planning Commission hearing. |
| | **Action B:** If an element of the code or process repeatedly causes unnecessary difficulty or undue delay for housing developers, the City Planner should consider whether it would be of public benefit to make a change to the code and bring the suggested change forward to the Planning Commission and City Council. | Code and development ideas are always changing, so there needs to be room for flexibility and the ability to adapt as needed. One process in the code that can be used to address some cases, such as dimensional and parking requirements, is a Variance. Variances require a public hearing and approval before the planning commission. However, if an element of the code or process repeatedly causes unnecessary difficulty or undue delay for housing developers, the City Planner may consider whether it would be of public benefit to consider a code change that would be brought forward to the Planning Commission and City Council. |

| Strategy 2: Ensure that subdivision, development, and design standards are enforced. | | |
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| | **Action A:** Require compliance with all subdivision standards for approval, including the standard subdivision agreement process. | In the past, standards and enforcement of ROW widths and roadway construction may have been inconsistent; many roads in Bethel are narrow or have ROW encroachments. The subdivision agreement process was in part created to avoid this; insufficient ROW can cause safety, liability, or funding issues.<br><br>One example of issues arising was the Haroldson Subdivision to the northeast of town, where the roads constructed without City oversight or review, which made it difficult for the city to officially accept and maintain the roadways. Later, the City had to work with the subdivision developer to inspect and bring roads up to a standard that could be accepted by the City for ownership and maintenance responsibilities. If subdivision standards are not enforced prior to or during development, this can cause complex issues with various private property owners within the subdivision. |
| | **Action B:** Consider changes to the subdivision approval and agreement process to improve clarity and efficiency. | While more housing is needed in Bethel and some might consider standards to be a barrier to development, they are necessary to ensuring that the City can provide for adequate quality of life in Bethel. Still, ways to improve the clarity and efficiency of the process may arise, so the Planning Department should be open to changes in the future. |
| | **Action C:** Develop a position description to potentially hire a code enforcement officer. | Currently, the planning director or whomever they appoint is designated as the “land use administrator,” who is tasked with enforcing code. There has been discussion within the City as to whether or not there is sufficient work to justify hiring a full-time code enforcement officer, while some people think a code enforcement officer would be very busy. Funding the role may also be a challenge.<br><br>Hiring a code enforcement officer may be the most effective way to combat compliance issues. There may also be opportunities for them to undertake other duties, such as documenting maintenance issues across the City, including drainage concerns, vegetation overgrowth, or vandalism. They could also assist with handling derelict vehicles and abandoned buildings. |
| | **Action D:** Examine code sections related to non-conformance and coming closer to compliance to determine if changes may be needed. | |

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| **Strategy 3: Encourage development by collaboratively working with developers to install public infrastructure, including piped water and sewer systems and roads.** | | |
| | **Action A:** As part of the subdivision agreement process, consider designing a standardized "impact fee" mechanism to have developers participate in funding when their development will impact the overall system (water and sewer or other infrastructure such as roads). | This could include funding for engineering, materials, and/or construction.<br><br>A transparent, standardized process will be important in making expectations clear to potential developers. |
| | **Action B:** Create a guide for infrastructure development grants or other funding assistance programs, in order to assist developers with finding information needed to pursue supplemental development financing. | The Grant Manager can prepare and maintain this list, to be shared with the Planning Department for use in their discussions with potential developers. As part of the subdivision agreement process, the City Planner can ensure that this guide is readily available to developers. It should also be posted to the City website to help encourage development by improving awareness of resources available.<br><br>For road development, the City can help developers apply for transportation funding via the Alaska Transportation Funding Opportunity Hub *(see Chapter 4 – Local Transportation, Goal 6 for more discussion).*<br><br>For water and sewer, there are other grants that may be able to help with funding, such as the grants the City will use to fund projects outlined in Chapter 6 – Utility Infrastructure. For subdivisions developed by tribal organizations, additional funding sources may be available. |

| GOAL 2: Facilitate more affordable housing development and access to affordable housing. | | |
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| **Strategy 1: Use zoning to encourage multifamily and more dense housing development.** | | |
| | **Action A:** Develop a working group to assist the City Planner to study and create code changes and zoning map changes for a new Multifamily Residential zoning district that can be brought forward to the Planning Commission and City Council for approval. | While multifamily development is currently possible in several zones, there may be code requirements that hinder its feasibility or discourage it.<br><br>Creating a new Multifamily Residential zoning district would require an amendment to zoning code. A working group could conduct analysis to determine exact requirements and standards associated with this district. Units allowed per acre should be higher than other districts, which currently only allow four maximum, and lot sizes should be viable to fit triplexes or larger. Ideally a CUP would not be required under some threshold of units (instead, only a site plan permit). The Future Land Use Plan Map in this plan should be used to guide where this new zoning district would be appropriate. |
| | **Action B:** Encourage the implementation of the new Multifamily Residential zone and existing Downtown Commercial and Neighborhood Commercial zones through the Future Land Use Plan Map. | When people consider completing projects, the City Planner can provide information and advice about potential zoning changes. |
| | **Action C:** Consider rezoning some City-owned land to Multifamily Residential where recommended in the Future Land Use Plan Map. | |
| | **Action D:** Encourage use of the Planned Unit Development model, which allows flexibility on dimensional standards for multifamily development to allow denser residential developments with shared open spaces (such as townhomes, “tiny home” communities, or other compact residential styles). | To demonstrate the potential of PUD or other creative multifamily residential development projects, the City could release an RFP to examine multi-family or mixed-use projects as examples of the PUD model. |

| GOAL 3: Reserve land to accommodate community needs and desired development. | | |
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| **Strategy 1: Inventory City-owned properties.** | | |
| | **Action A:** Inventory all City-owned properties, including their current use or any use requirements/restrictions or other encumbrances associated with original BLM conveyance to the City. | This should be included in the City's GIS mapping efforts; *see Goal 6.* To determine and potentially change encumbrances that may exist on City properties, coordination with BLM may be required. |
| **Strategy 2: Create and regularly maintain a list of community facility and infrastructure needs that will require land.** | | |
| | **Action C:** Research and identify if there are any City-owned sites that should be reserved for specific community facilities or infrastructure. | If appropriate, the sites should be identified on the Future Land Use Plan Map – *see Goal 5 below*. Existing City property that can serve community needs should be considered first. If adequate or appropriately located property is not available for a particular need, look into other properties that may make sense to pursue trading or acquiring (Action D). |
| **Strategy 3: Use the Future Land Use Plan Map to designate priority areas for residential and commercial development.** | | |
| | *See Section 3.4 - Future Land Use Plan Map.* | |

| GOAL 4: Identify areas that are good candidates for infill development and take steps to facilitate their development. | | |
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| **Strategy 1: Identify the best areas for infill development.** | | |
| | **Action A:** Create a map that highlights "priority development areas" including the best / most likely areas for infill development as Bethel grows. | The map could include:<br>▪ The area within and around existing Bethel development, or the areas that would not require long road extensions to reach them<br>▪ Remove already-developed parcels – just leave parcel boundaries to show there is development there<br>▪ Remove areas that are not reasonably developable, such as waterways and floodplains in the Preservation zone (this should be updated as areas classified by the Corps as wetlands may change over time)<br>▪ Show land ownership for the remaining parcels or areas |
| | **Action B:** Regularly update the priority development area map based on new developments and environmental information, such as changing permafrost and hydrologic information. | It is important to note that the City's environment is constantly changing due to natural changes in the river as well as climate change impacts. New developments can also alter drainage patterns over time. |
| **Strategy 3: Decrease barriers to additional commercial development and incentivize development patterns that support more commercial activity.** | | |
| | **Action A:** Revise zoning code to allow shopping centers in appropriate zoning districts. | |
| | **Action B:** Consider setting aside a space to host markets where small businesses can rent booths and sell goods or services. | *See Chapter 8 - People & Economy.* This may be an opportunity to co-locate businesses to help more small businesses get off the ground and share spaces, parking, and customers. It would also be inclusive of artisans who run small businesses out of their homes and don't have a physical retail space. This type of event could be hosted in an existing space like the cultural center or school. |

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| **Strategy 4: Facilitate redevelopment of properties that are underutilized, dilapidated, or abandoned.** | | |
| | **Action A:** Compile a list of sites that appear to be underutilized, dilapidated, or vacant / abandoned. | This list can begin by considering some sites recommended by the community as part of the Comprehensive Plan Update process:<br>▪ Former Kilbuck School site. The site has been vacant since the school burned down. Though the site may be more complicated than it looks due to old utilities running down the middle, it could be replatted and these elements could be addressed. It has been suggested that it become a park; the site could also include additional residential and/or commercial development.<br>▪ The school district has a property with old fuel tanks that may no longer be in use. If that is the case, the tanks could be removed and the site could be redeveloped. There may be grants available to help with any remediation that might be needed. |
| | **Action B:** Implement a vacant building registration ordinance. | This would be a proactive approach to give the City a way to track, assist with clean-up or demolition, and potentially acquire vacant and/or abandoned properties. This can also facilitate sale of the properties while maintenance is completed. |
| | **Action C:** Examine and revise the Public Nuisance Abatement code (BMC 9.36) to improve its effectiveness and the efficiency of enforcement. | Currently, abatement is a very time-intensive process that makes it difficult for the City to undertake. Legal guidance would be needed to revise the code, and a potential Code Enforcement Officer could assist with abatement efforts. |

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| **GOAL 5: Using the Future Land Use Plan Map and its land use designations, encourage future development to have an organization of uses that is compatible.** | | |
| **Strategy 1: Implement and raise awareness about the Future Land Use Plan Map and how it is used.** | | |
| | **Action A:** Add the Future Land Use Plan Map to the City's GIS maps. | *See Mapping section and Goal 6 below.* |

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| | **Action B:** Post the explanation of Zoning versus Future Land Use Plan Map from this plan, as well as the table with Future Land Use designations, definitions, and implementing districts, to the Planning Department website. | |
| | **Action C:** Use the Future Land Use Plan Map as the basis for initiating discussions with landowners that could potentially develop their land in the priority development area. | *See Goal 4, Strategies 1 and 2 above.* |
| **Strategy 2: Create a working group to alter code for zoning designations so that future development is more strategically organized.** | | |
| | **Action A:** Create a working group to assist the City Planner on potential changes to zoning code that could be brought forward to the Planning Commission and City Council for approval. | This would include the addition of the proposed new Multifamily Residential zone discussed above in Goal 2, Strategy 1 and below in Action C. |
| | **Action B:** Create an organized table for all uses and all zoning districts, clarifying which uses are permitted, and which require additional permitting or are not permitted. | A current version of this table should be used to help guide working group discussions. Once the working group has prepared potential code changes, they should create a proposed updated version of the table that could be adopted as part of zoning code. |
| | **Action C:** Consider eliminating the General Use (GU) zone. | Existing uses in the GU zone would be grandfathered in, and new developments could not rezone to GU anymore. This would encourage more specific requirements according to the Future Land Use Plan Map.<br><br>The grandfathered GU zone could also be amended to include guidelines for redeveloping properties to incentivize making improvements according to surrounding development / Future Land Use Plan Map designation. |

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| | **Action D:** Once the new Multifamily Residential zone is created (see Goal 2, Strategy 1, Action B), consider altering the traditional R zoning district to emphasize its focus on a less dense model that would encourage single-family and duplex development. | The creation of the proposed new Multifamily Residential (R2) zone is discussed in Goal 2, Strategy 1 above. Differentiating R2 from R could help clarify the difference and encourage both of their uses. |
| | **Action E:** Consider City-led rezones to help phase out the GU district and assign more specific zones (including newly implemented zoning districts) to applicable areas. | |
| | **Action F:** Examine the list of uses that require conditional use permits for all zoning districts and consider changes based on the intent of each district; the changes could be brought forward to the Planning Commission and City Council for approval. | This may provide insight on how to streamline the permitting process and help encourage the use of newer zoning districts, such as Neighborhood and Downtown Commercial and the proposed Multifamily Residential zone. |

| **GOAL 6: Make spatial information and maps available to the public online using GIS.** | | |
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| **Strategy 1: Publish online GIS maps that provide information that was identified as the highest priority for stakeholders.** | | |
| | **Action A:** Publish the GIS version of the Zoning Map online. | |
| | **Action B:** Publish an online, interactive GIS map that can provide property lines, zoning, street addresses, and ownership information (when available). | Where possible, add the land uses present on each property (for example, single-family home, duplex, retail, and so on.) |
| | **Action C:** Publish an online GIS version of the Future Land Use Plan Map. | |

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| **Strategy 2: The Planning Department can continue to add to the GIS maps used internally or available to the public online, based on suggestions made by the community.** | | |
| | **Action A:** Create a map or maps showing easements for trails, rights-of-way, and utilities. | |
| | **Action B:** Create a map that shows wetlands, stream or floodplain setbacks, contaminated sites, or other limitations to development related to preservation. | |
| | **Action C:** Explore opportunities to collaborate with other entities with local GIS data (such as ONC, BNC, AVCP, BIA, ADFG), forming a joint database. | This could be helpful for mapping trails, ownership, rights of way, and other features that are important to all of the major local stakeholder entities discussed in the introduction of Section 3.5. |

## Chapter 4 – Local Transportation

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| **GOAL 4: Design new and reconstructed streets with a focus on providing safe and comfortable routes for all transportation modes and all users.** | | |
| **Strategy 2: Ensure adequate ROW for sharing the road and implementing Complete Streets.** | | |
| | **Action B:** When plats are submitted, require the dedication of additional ROW when the current ROW does not meet width requirements. | |

| GOAL 8: Evaluate site development codes to better support safe access for all transportation modes. | | |
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| **Strategy 1: Provide for adequate and safe parking facilities and practices.** | | |
| | **Action A:** Examine code to make sure appropriate numbers of parking spaces are provided for each type of land use (If changes are warranted, see Action C below). | Stakeholders indicated that some uses may not require sufficient spaces, while others may require too many. The Planning Department could lead a study of parking requirements in City code and any recommended revisions to the code, likely with the assistance of technical advisors. |
| | **Action B:** Facilitate shared parking between adjacent properties and uses when appropriate. | City code already provides for the possibility of shared parking between two or more contiguous uses (18.48.170.C). Shared parking agreements can help create more efficient site layouts and should be encouraged when possible / helpful to landowners.<br><br>During site plan review applications, the Planning Department could assist property owners by helping identify shared parking opportunities. Then, the owners could coordinate with each other on potential agreements. The City could also provide a standardized agreement that property owners could use and record to memorialize the agreement. |
| | **Action C:** If changes are warranted to parking requirements or shared parking provisions in code, provide changes to the Planning Commission and City Council for approval. | The Planning Department could review these sections and try to make them easier to understand if there are sections that are confusing or cause issues for applicants. |
| **Strategy 2: Provide for safe access for vehicles and non-motorized users.** | | |
| | **Action A:** Consider consolidating driveway and parking design provisions in code or creating a separate driveway standards worksheet. | There are some existing code sections regarding driveway widths and distances from intersections, but the information could be consolidated. One option is for the City to remove it from code and instead create a driveway standards memo that can be updated more frequently and easily, as needed. Since the driveway standards are currently part of the City's code, a variance is required for any deviations from the requirements. |
| | **Action B:** Review commercial site design code to identify opportunities to improve safety provisions such as those encouraged by Crime Prevention through Environmental Design (CPTED) principles. | This could include requiring site lighting, which is especially important for the safety of non-motorized users. |

| GOAL 1: Create a well-functioning airport area for travelers and businesses. | | |
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| **Strategy 3: Support the development of relevant industrial uses and commercial amenities within the airport area.** | | |
| | **Action A:** Consider creating an Airport zoning overlay to allow commercial development, such as grocery/convenience stores or dining in the industrial area within and around the airport. | Existing zoning districts may not facilitate the mix of uses desired within the airport area. For example, the Industrial zoning district does not currently allow commercial development, but this may be convenient for travelers. If the City and DOT determine that an overlay district would be helpful, a resolution creating it would likely require approval from the Planning Commission and City Council.<br><br>Also note that the City owns some land near the airport, which could be leased and redeveloped if not needed by the City. |

| GOAL 2: Support DOT&PF in airport operations and planning. | | |
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| **Strategy 1: As requested by the FAA and/or DOT&PF, take actions that support smooth and secure airport operations.** | | |
| | **Action A:** Examine FAA requirements and recommendations when reviewing potential land uses near the airport. | The Planning Department should factor this into reviews and may consider making recommendations. Requirements like tower height limits are already examined, but there are other recommendations that may be relevant. For example, residences near the airport are recommended to have bear proof trash containers. |
| **Strategy 2: Participate in planning for the future of the airport.** | | |
| | **Action B:** Encourage public participation in airport planning projects so that the City and community's needs are factored into plans. | The Planning Department can assist DOT and the City administration with tracking airport planning projects in order to help publicize meetings and comment opportunities, including via City social media. |

## Chapter 6 – Utility Infrastructure

| GOAL 1: Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gases. | | |
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| **Strategy 1: Facilitate large-scale projects to introduce more alternative energy sources to the local network.** | | |
| | **Action C:** Create a guide to zoning code and permitting requirements that are applicable to alternative energy infrastructure such as wind turbines or solar panels, and work with AVEC to identify and propose changes to requirements that may create unnecessary barriers. | For example, this could include considering changes to BMC tall tower permitting requirements. The existing code section is long and complex; it should be reviewed and simplified to facilitate these processes, especially since there is often additional permitting required. |

| GOAL 4: Facilitate broadband development within the City of Bethel to advance community access to reliable internet service. | | |
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| **Strategy 2: When possible, streamline permitting of internet-related infrastructure.** | | |
| | **Action B:** Review and amend tall tower permitting code to be simpler and more efficient. | Sometimes internet-related infrastructure requires constructing new towers or making changes to existing towers, which could trigger BMC tall tower permitting requirements. The existing code section is long and complex; it should be reviewed and simplified to facilitate these processes, especially since there is often additional permitting required. |
| | **Action C:** If / as needed to help facilitate improved internet connectivity in Bethel, review and amend other sections of BMC that may impact permits required for different types of internet-related infrastructure (besides cables and towers). | |

## Chapter 7 – Public Facilities & Services

| GOAL 4: Manage City lands in an efficient, cost-effective, and forward-thinking manner. | | |
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| **Strategy 1: Maintain a map of City-owned lands and ownership changes.** | | |
| | **Action A:** Create a map of City-owned lands using GIS and an associated database. | *See the GIS section in Chapter 3 – Housing & Land Use.* |
| | **Action B:** Identify undeveloped or underutilized properties currently owned by the City on the map. | |
| | **Action D:** Update the map as properties are acquired or sold, also tracking properties identified as potential acquisitions or potential properties to sell. | |
| **Strategy 2: Improve processes for City property acquisition, sales, and leasing.** | | |
| | **Action D:** Examine publicly owned lands for all potential uses, including open space use, before disposition. | |

| GOAL 8: Enhance the role of parks in the Bethel community. | | |
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| **Strategy 3: Establish a network of Bethel parks to serve all neighborhoods.** | | |
| | **Action A:** Create and regularly update an on-line guide and map of all the parks in Bethel. | This should include discussion of the amenities included at each. It should also include a map showing the trails that connect the park system *(see Goal 10 in this chapter).*<br><br>The guide should be posted to the City website. Also, through the website, there is potential to organize rentals of certain facilities, such as gazebos or picnic shelters for private events.<br><br>Note that some public areas in the City have unclear management responsibility, such as the cemetery west of the airport. It should be clarified whether this is part of the City's park maintenance responsibilities. |
| | **Action B:** Using the development of the parks guide and map, identify areas with less access to nearby parks. | This should also identify underutilized park areas. For example, comments were received from the community that there is a run-down park area between Akakeek and Atsaq Streets. |
| | **Action D:** Require that new residential sub-divisions reserve space for a park or open space. | This may require code changes to implement the requirement for open space. New subdivisions could be encouraged to follow the Planned Unit Development model or set aside park space in another way. Additional incentives should be explored that would encourage developments to have parks and open space. Like discussed in Action Item C, there would be a need to negotiate maintenance, construction, and liability for these open spaces, especially depending on final ownership / management. |

| GOAL 10: Enhance the network of trails and open spaces in Bethel. | | |
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| **Strategy 1: Improve access and comfort for trails.** | | |
| | **Action A:** Add trails to the map and guide of parks and recreation facilities. | *See Goal 8, Strategy 3 above.* |

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| **Strategy 2: Maintain a network of open spaces.** | | |
| | **Action A:** Identify and map open spaces within and around the developed area of Bethel that can be used for public recreation. | Note that this would include much of the Donut Hole, though some areas are privately held. There has been some desire expressed to preserve this as permanent open space. However, this is a logical place for development to expand. Future development should preserve some open space areas – *see Action Items B and C below*. |
| | **Action B:** Identify key future transportation connections across currently open areas such as the "Donut Hole." | This is proposed to be completed as part of trail planning (*see Chapter 4 – Local Transportation*). |
| | **Action C:** Based on the map of key future connections through currently open space, as well as mapped areas that must be preserved due to wetlands or drainage, identify suitable locations for potential green belts. | Green belts are open strips of land on which building is restricted. Designating one or more green belt within the Donut Hole could help reserve an area to remain as open space, including paths and public recreation areas, even as parts of the Donut Hole might fill in with development. This would help maintain the natural character and recreational opportunities in the middle of Bethel, even as development might spread inward.<br><br>While potential locations for green belts could be brainstormed at any time, it would make the most sense to designate them during future design processes for transportation corridors and/or subdivisions. |

## Chapter 8 – People & Economy

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| **GOAL 3: Support subsistence rights and access to subsistence resources in Bethel and the surrounding region.** | | |
| **Strategy 1: Protect physical access to subsistence resources around Bethel.** | | |
| | **Action B:** Require the dedication of parks and/or open spaces, such as green belts, in new subdivisions in order to maintain access to the undeveloped tundra. | *See Chapter 3 – Housing & Land Use and Chapter 7 – Public Facilities & Services, Parks and Recreation section* for more action items on preserving open space. |
| | **Action C:** Work to obtain public access easements over trails used to access fishing, hunting, or plant harvesting areas. | *See Chapter 4 – Local Transportation and Chapter 5 – Regional Transportation* for more discussion of formalizing existing trails. |

| GOAL 4: Prepare the City for a broad range of potential climate change impacts. | | |
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| **Strategy 1: Using the help of state and/or federal climate resilience resources, create City plans for climate adaptation and community resilience.** | | |
| | **Action A:** Update the City's Hazard Mitigation Plan every five years. | The primary assistance available to communities to mitigate natural and other hazards is from the Federal Emergency Management Agency (FEMA) through development of a Hazard Mitigation Plan. Bethel's Hazard Mitigation Plan was completed in 2017 and is overdue for an update. These collaborative plans include a risk and capability assessment which identifies hazards and develops a mitigation strategy to be implemented by the City to prepare for natural and man-made hazards that could occur in the future. |
| | **Action B:** Consult with DCRA and consider preparing a Community Resilience and Climate Adaptation Plan. | Other communities have developed Climate Action Plans or Climate Adaptation Plans to more comprehensively address climate change. However, Hazard Mitigation Plans offer similar benefits. The City should consult with DCRA to determine if a more focused Climate Adaptation Plan should be prepared in addition to the Hazard Mitigation Plans, as this could potentially open the door to additional support or funding. |

| GOAL 6: Foster a thriving local business community. | | |
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| **Strategy 3: Create a business-friendly environment in Bethel.** | | |
| | **Action B:** Examine BMC to consider allowing some small businesses to be a legal in residential zoned areas. | For many small business owners, it can be cost-prohibitive to rent a space besides one's home. Many small businesses can be compatible with residential settings, such as small arts and crafts operations or professional services that can be provided from a home office.<br><br>The Chamber of Commerce, City Planning Department and Planning Commission could collaborate on this effort. |

# APPENDIX 11:
# POLICE DEPARTMENT ACTION ITEMS

# Appendix 11 – Police Department Action Items PD

## Chapter 4 – Local Transportation

| GOAL 8: Evaluate site development codes to better support safe access for all transportation modes. | | |
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| **Strategy 1: Provide for adequate and safe parking facilities and practices.** | | |
| | **Action E:** Continue inter-departmental collaboration to enforce parking violations that impact road safety and maintenance | The Public Works Department and Bethel Police Department (BPD) can work together to clarify where street parking is not permitted and priority areas for enforcement. To prevent people from continuing to park along streets where not permitted, BPD will need to enforce parking violations. Currently, the Public Works department lets BPD know if vehicles are hindering road maintenance, or BPD may identify derelict vehicles during patrols. Notices may be placed on vehicles to provide a deadline for them to be moved, and then BPD calls a towing operator to move vehicles to the landfill if necessary.<br><br>The City Administration determines fines that could be charged for vehicles left in ROWs or on City property. |

## Chapter 7 – Public Facilities & Services

| GOAL 6: Improve public safety facilities and services in Bethel. | | |
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| **Strategy 2: Continue to improve police service.** | | |
| | **Action A:** Continually upgrade public safety dispatch and communications equipment. | The Bethel Police Department will be looking at replacing repeaters and console radios, updating its electronic dispatch infrastructure (e-911), and installing separate police communications infrastructure (radio tower) at the new police station. The new 80-foot tower will allow the department to move its existing antennas and other equipment from the KYUK Radio Station to the police station, where it will be more secure and save money in rental fees. The department also has a 311 non-emergency number that residents can call for information and services, but coordination is needed to allow cell phone users to be able to make calls. |
| | **Action B:** Purchase additional surveillance and other evidence collection equipment, as needed. | The department received grants in the past for new equipment. Additional surveillance equipment, such as at the Port, in parks, or on police vehicles, could also benefit investigations and safety. |

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| | **Action C:** Provide additional training to Police and Community Service Patrol staff, as needed. | |
| | **Action D:** Make other upgrades and additions to police department facilities as needed, including the vehicle impound yard. | Recent additions include Council signing an agreement for police housing in apartments. The City is also collaborating with Bethel Friends of Canines (BFK9) on a new shelter project. |

| **GOAL 7: Target specific public safety concerns within Bethel.** | | |
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| **Strategy 2: Improve ATV and snowmachine safety, on and off Bethel roads.** | | |
| | **Action A:** Pursue a partnership with the State of Alaska to offer ATV and snowmachine safety information and/or classes. | The State of Alaska already has some safety initiatives related to ATV safety, such as organizing opportunities to have ATVs checked for safety features. |
| | **Action B:** Require ATV registration to drive ATVs on roads within City limits. | Licensing processes are managed by the State of Alaska, but Bethel is already working on a smaller-scale registration system. The primary challenge is bringing people into compliance. |
| **Strategy 3: Reduce drug abuse in Bethel.** | | |
| | **Action B:** Continue collaboration with the Western Alaska Alcohol and Narcotics Team (WAANT, which includes Bethel Police, Kotzebue Police, Kodiak Police, and the Alaska State Troopers) to penalize drug trafficking and illegal alcohol bootlegging. | As part of efforts to reduce drug trafficking in Bethel, the Police Department recently obtained funding for a drug sniffing dog. |
| | **Action C:** Continue operation of the Community Service Patrol, the grant-funded service that picks up individuals under the influence and drops them off at places such as YKHC or their sobering center. | In turn, YKHC can help connect individuals with recovery resources. |

| Strategy 5: Improve animal care and control programs. | | |
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| | **Action A:** Continue discussions on whether to hire a dedicated City animal control staff person to catch loose dogs and issue citations for animal cruelty. | Depending on staff resources available and ability to fund another position, there may be opportunities to combine these responsibilities with other existing operations. |
| | **Action B:** Support and coordinate with Bethel Friends of Canines (BFK9) on the new animal shelter project. | BFK9 provides dog care and training education, provides treatment to stray dogs (including for rabies and spay/neutering), and helps coordinate with animal rescue groups in Alaska to rehome animals. The Police Department and BFK9 are collaborating on a new shelter near the Public Works building, as well as programming. |

# APPENDIX 12:
# PORT OF BETHEL ACTION ITEMS

# Appendix 12 – Port of Bethel Action Items PO

## Chapter 5 – Regional Transportation

| GOAL 3: Study and plan for potential changes to the river's course that may impact port operations. | | |
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| **Strategy 1: Keep up with regular dredging operations.** | | |
| | **Action A:** Continue to complete hydrographic studies every two years, as required by the U.S. Army Corps of Engineers (USACE). | Note that a hydrographic study is different from a navigation study. This regularly completed study helps determine where dredging may be needed in the river by determining the depth of the water. |
| | **Action B:** Continue to dredge Brown's Slough annually. | This needs to be completed annually between the river and the bridge to allow passage for boats. There are a few different methods, including suction, dredge and biosolids press, or excavation during winter. There is some agency permitting required, and the work could be eligible for BUILD grant funding. The cost depends on the dredging method used. |
| | **Action C:** As needed and based on the hydrographic studies, dredge the river between the petroleum port and the entrance to the small boat harbor. | This makes the river more navigable for tugs, pilot boats, barges, and subsistence users. It is currently difficult for the City to predict how often this would need to be done, but continued regular completion of hydrographic studies may assist with determining a maintenance schedule.<br><br>The City's current goal is to dredge the river in front of the entrance to the small boat harbor every five years, but the actual frequency has been closer to every ten years. The City could consider pursuing funding partnerships for this effort, such as with tribal organizations who share an interest in ensuring transportation to and from villages as well as access to subsistence fishing on the river. This could be organized as part of collaboration efforts discussed in Goal 6 of this chapter. |
| **Strategy 2: Plan for potential future changes in the Kuskokwim River's course to mitigate potential impacts.** | | |
| | **Action A:** Request assistance from USACE for funding and conducting a feasibility study for a potential navigation study of the river. | USACE indicated that this will be necessary before the City can complete a navigation study to look into how the course of the river may change. Both studies will likely use a cost sharing mechanism between the City and the Corps. |
| | **Action B:** Following the feasibility study, complete a navigation study to determine how changes in the river may impact larger ships' ability to access Bethel's port. | This is more extensive than the regular hydrographic studies and includes studying potential choke points for larger ships up and down the river. |

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| | **Action C:** Continue to work with USACE to monitor the sea wall conditions to determine if, and at what rate, the river is undercutting the sea wall. | The City has approximately 10,000 feet of sea wall and rip rap to mitigate erosion. If the sea wall were to be undercut by the river, this would have major consequences. Regular monitoring of the seawall to determine required maintenance is needed. |
| | **Action D:** Develop an action plan for studies, monitoring, and maintenance activities needed to mitigate riverfront erosion and ensure navigability of the river around Bethel's port. | The action plan should be a living document that continually evolves in response to new issues and resources. |
| | **Action E:** Incorporate the Port's mitigation efforts into the City's regularly-updated Hazard Mitigation Plan (*discussed further in Chapter 8 – People & Economy*). | The Hazard Mitigation Plan was last updated in 2017 and includes discussion of several hazards relevant to the Port and waterfront, such as flooding and erosion. In the future, the Port should continue to participate in similar planning processes. As conditions can change more quickly than a Hazard Mitigation Plan may be updated, the Port should also focus on evolving its own mitigation planning and activities on a more frequent basis, as discussed in Action D above. |
| **Strategy 3: Collaborate with other major waterfront property owners on riverfront management efforts.** | | |
| | **Action A:** As part of coordination with the private entity constructing a new cargo dock near the petroleum port in Bethel, explore partnership opportunities to obtain funding for hydrographic or navigation studies, sea wall monitoring, and maintenance or dredging efforts. | Associated with the Donlin Mine project, a new private cargo dock is planned near the existing petroleum port dock in Bethel. As part of the City's response to the Donlin Mine project, an action item in Chapter 8 – People and Economy is to maintain consistent communication with them as the project ramps up. As another major user of the Bethel riverfront, Donlin can be asked to participate in funding and/or applying for grants for necessary upkeep so that everyone can continue to rely on the critical port infrastructure in Bethel. |
| | **Action B:** If other major waterfront developments occur in Bethel, coordinate with the property owners / developers to incorporate measures to mitigate erosion and participate in City efforts to monitor and take action according to changes in the river. | This should include BNC, which owns a significant portion of the undeveloped waterfront within Bethel. |

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| | **Action C:** Coordinate with other property owners along the Kuskokwim River to identify collaboration and cost-sharing opportunities for studies, dredging, and other maintenance. | *See Goal 6 in this chapter.*<br><br>BNC and other village corporations own a lot of land up and down the river. Erosion that impacts Bethel impacts the entire region. Erosion is happening elsewhere as well and severely impacting fish camps. |

| **GOAL 4: Maintain adequate port infrastructure to support shipping operations.** | | |
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| **Strategy 1: Efficiently manage port infrastructure maintenance and repairs.** | | |
| | **Action A:** Regularly inspect all public port infrastructure for a condition assessment and to predict future maintenance needs. | |
| | **Action B:** Create and maintain a list of maintenance needs at the port. | Some projects that have been identified include:<br>▪ Repair city dock<br>▪ Replace east timber wall at City dock |
| | **Action C:** Prioritize the list, determine whether current maintenance staff have the skills and equipment to complete the work or if specialized contractors will be needed, and prepare cost estimates. | Existing City maintenance staff are sometimes unable to complete some specialized repairs or construction work., due to lack of training or equipment The City should determine whether contractors would be better suited to complete the work. |
| | **Action D:** Pursue funding opportunities for more significant maintenance projects at the port, such as grants (which could be pursued in partnership with other entities such as tribal organizations), or partnership with private entities like Lynden. | Both projects listed above alongside Action B were estimated to cost around $11 million and may be eligible for BUILD, or other grant funding. |

| Strategy 2: Identify new infrastructure that may be needed to improve port operations. | | |
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| | **Action A:** Coordinate with port management, current shipping operators, and other stakeholders to identify infrastructure needs to support current and future shipping operations. | This could include Lynden, petroleum companies, and discussions guided by the Port Commission.<br><br>Examples of infrastructure additions that have been identified include:<br>▪ Improved security infrastructure for the port<br>▪ Potential expansion of the petroleum / freight dock (estimated cost would be $17 million) |
| | **Action B:** As part of the regular LRTP process, document the port's existing conditions, issues, and needs; this would be used to create a prioritized list of infrastructure and maintenance needed. | *See Chapter 4 – Local Transportation – Goal 1 for additional context on the LRTP process.*<br><br>A feasibility study was completed in the past, which included concept plans for the future of the port, but a separate Port Master Plan would be difficult to fund. |
| | **Action C:** Pursue funding opportunities for additional infrastructure expansions that would improve port operations, such as grants (which could be pursued in partnership with other entities such as tribal organizations), and partnership with private entities like Lynden. | |

| GOAL 5: Maintain infrastructure to support the use of small boats and float planes for transportation, commerce, subsistence, and recreation. | | |
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| **Strategy 1: Maintain infrastructure for small boat users.** | | |
| | **Action A:** Regularly inspect the existing small boat harbor infrastructure and manage its use to help determine maintenance and/or expansion needs. | |
| | **Action B:** Consider developing additional parking at the small boat harbor. | There is a nearby City-owned lot that may be able to be developed for additional parking to support the small boat harbor. The City might also consider charging vehicle parking fees beyond the existing boat mooring fees. |
| | **Action C:** Facilitate transit and taxi access to and from the small boat harbor by incorporating signage to direct passengers to appropriate loading areas. | |
| | **Action D:** Add any maintenance needs to the prioritized list created as part of Goal 4, Strategy 1 above. | |
| | **Action E:** Evaluate the costs associated with maintaining small boat harbor infrastructure and dredging. | It would be helpful for the Port to determine approximate yearly costs to assist in setting mooring and other potential fee amounts; longer-term project costs could also be factored into the cost and fee considerations. |
| | **Action F:** Based on approximate yearly costs for maintenance as well as other longer-term projects that may need funding, consider gradual fee increases and/or creating new fees for various types of small boat harbor users (such as for businesses using the harbor, or vehicle parking fees) to help fund operations and improvements. | Increased mooring fees can assist with funding that may be obtained as part of the implementation of projects on the prioritized list created in Goal 4, Strategy 1. |

| Strategy 2: Maintain infrastructure for float plane users. | | |
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| | **Action A:** Continue to place gravel on Lomack Beach to protect it from erosion associated with launching float planes. | There are float plane docks located on H-Marker and Hangar Lakes, but these lakes are not long enough for fully loaded planes to taxi. Therefore, some float plane traffic does need to take off on the river despite concerns about various types of traffic conflicts on the river.<br><br>Some community members have suggested a float plane dock be constructed at the beach to mitigate erosion, but others do not believe this is something the City should invest in; there could be issues related to current, weather, and skiffs using the dock instead of planes. For now, placing gravel seems to be the solution as it relates to erosion. |
| | **Action B:** Create a maintenance agreement with DOT&PF to clarify land and facility ownership and shared maintenance responsibility for Hangar Lake Road and the float plane docks at Hangar Lake. | Currently, the City occasionally assists the State in maintaining Hangar Lake Road by placing gravel along the roadway, but the responsibility mostly lies with the State for road maintenance and oversight of float plane use of Hangar Lake. There are existing docks, but they are located in a swampy area and could use improvements; this has been a challenge as ownership of the docks is unclear. For longer-term maintenance and improvement of Hangar Lake as a key float plane facility for Bethel, research should be completed to determine the ownership of existing facilities and, MOUs may be needed to clarify the responsibilities for the roadway, lake, and associated facilities. |
| | **Action C:** Consider partnerships (with government agencies and/or private entities) or ways to levy user fees for float plane facilities on the river and lakes in and around Bethel to help fund erosion control measures. | The City should explore partnerships or other funding opportunities to help find a better long-term solution to address erosions concerns other than placing gravel on Lomack Beach, such as:<br><br>▪ Working with DOT&PF and/or a private entity to construct a float plane dock on the river that works despite the concerns discussed as part of Action A above<br><br>▪ Encouraging more float plane use of Hangar Lake when possible, based on plane loads<br><br>Finding appropriate and feasible ways to charge fees for facility use could help fund these types of projects. |

| GOAL 6: Support the improvement and expansion of other modes of regional transportation. | | |
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| **Strategy 4: Facilitate potential regional transit opportunities as they arise.** | | |
| | **Action B:** If interest in a river (and/or ice road) transit or taxi service arises, explore how the City's port can help accommodate it. | Currently, some people informally ferry people back and forth from villages. The City is unlikely to provide a river transit service, but it could help support landing facilities if a private operator or tribal organization were interested. The small boat harbor only handles skiffs and no larger vessels, so there may be a need to set space aside. |

## Chapter 7 – Public Facilities & Services

| GOAL 7: Target specific public safety concerns within Bethel. | | |
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| **Strategy 1: Improve maritime safety through educational programs.** | | |
| | **Action B:** Through the Port, organize boating safety classes. | The Port used to offer boating safety classes, but they are now only offered occasionally by other organizations. Either by organizing its own classes or partnering with other organizations, the Port should work to make safety classes available on a yearly basis. |

## Chapter 8 – People & Economy

| GOAL 2: Minimize potential negative impacts to Bethel from the Donlin Mine efforts and maximize potential benefits. | | |
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| **Strategy 2: Work with the Donlin project to plan for additional traffic associated with Donlin Mine.** | | |
| | **Action A:** Obtain full details about the planned dock construction south of the Bethel petroleum dock (associated with the Donlin Mine project). | |

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| | **Action B:** Given Donlin's significant anticipated impacts to the Port of Bethel, jointly work with Donlin on port and waterway studies and improvements needed. | A port and waterway study and improvements could also be included in the MOU that the City Manager will coordinate, discussed in this goal, Strategy 1, Action A.<br><br>For further discussion of port and waterway studies and improvements, *see Chapter 5 – Regional Transportation.* |

| **GOAL 3: Support subsistence rights and access to subsistence resources in Bethel and the surrounding region.** | | |
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| **Strategy 1: Protect physical access to subsistence resources around Bethel.** | | |
| | **Action A:** Maintain the small boat harbor facility, and identify future expansion needs and priorities for funding to ensure sufficient access for subsistence users. | *See more information about the Port, including the small boat harbor, in Chapter 5 – Regional Transportation.* |
| **Strategy 2: Support research and advocacy efforts that seek to protect access to subsistence resources.** | | |
| | **Action A:** As opportunities arise, provide information or resources to support the activities of subsistence resource advocacy groups. | For further discussion of advocacy groups, such as the Kuskokwim River Inter-Tribal Fish Commission, see the background information in this Fishing and Subsistence section. |

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# APPENDIX 13:
# PUBLIC WORKS DEPARTMENT ACTION ITEMS

# Appendix 13 – Public Works Department Action Items PW

## Chapter 3 – Housing & Land Use

| GOAL 3: Reserve space to accommodate community needs and desired development. | | |
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| **Strategy 2: Create and regularly maintain a list of community facility and infrastructure needs that will require land.** | | |
| | **Action A**: Create and maintain a list of community facility and infrastructure needs in order of priority, and include specific spatial needs such as general location and approximate area of land required. | The City Manager and the Planning Department should create and maintain the list, in collaboration with leaders from each department. Some items on the list would go hand-in-hand with the Capital Improvement Plan *(see Chapter 7 – Public Facilities & Services).*<br><br>As a start, consider including the following space needs for the community (other than housing):<br>▪ Additional schools that may be needed as the population continues to grow<br>▪ Additional civic or public works buildings needed<br>▪ Parks and open space, distributed around different areas of Bethel<br>▪ Port expansion areas, as needed<br>▪ Water and wastewater treatment facilities *(see Chapter 6 – Utility Infrastructure for more discussion of water and sewer)*<br>▪ Alternative energy generation (wind, solar, etc.) and energy storage sites<br>▪ Likely new road and other transportation corridors |
| | **Action B:** As applicable, identify and initiate coordination with entities that need to be involved in the implementation of community facilities and infrastructure (such as the Public Works department for wastewater facilities, or AVEC for alternative energy generation sites). | *See Chapter 6, Utility Infrastructure for more information on coordination with Public Works and AVEC, for example.* |

| GOAL 2: Plan for an organized, proactive approach to surface transportation facility maintenance. | | |
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| **Strategy 1: Clarify surface transportation facility maintenance responsibilities.** | | |
| | **Action A:** Building on publicly available DOT&PF maps, create a maintenance responsibility map for all transportation facilities in Bethel (including roads and trails). | The Public Works Department should be responsible for this effort. This should include a map showing management and maintenance responsibility for each transportation facility. The Ownership and Maintenance Responsibility map in the 2020 Draft LRTP can serve as a starting point.<br><br>This map could eventually be published online using GIS – *see the Mapping section in Chapter 3 – Housing & Land Use.* |
| **Strategy 2: Clarify surface transportation facility maintenance responsibilities.** | | |
| | **Action A:** Prioritize identifying and implementing the most effective ways to control dust on gravel roads, shoulders, and trails, such as watering, emulsifiers, chip sealing, or other surface treatments. | This is a top priority for the community. Part of identifying the best methods will include testing. As part of the typical maintenance schedule and best practices created for Strategy 3 below, a schedule could be established for when different types of treatments should be applied to gravel roads based on weather conditions and/or dust levels. |
| | **Action B:** Regularly inspect roads for major potholes that need to be filled / grated, and complete maintenance work as needed. | As part of the typical maintenance schedule and best practices created for Strategy 3 below, guidance should be provided on roadway deterioration to minimize the risk of larger and more costly repairs and damage to vehicles. |
| | **Action C:** Regularly inspect transportation facilities for overgrowth, blockage, or freezing culverts and other drainage facilities, and complete maintenance work as needed. | As part of the typical maintenance schedule and best practices created for Strategy 3 below, best practices could be established for how and when to clear culvert and drainage facility issues and whether preventative measures could help. |
| | **Action D:** As part of the snow removal prioritization plan, incorporate sites for storing snow, to avoid large berms building up within the road ROW. | If there is excess space on City properties, these areas should be evaluated for use as snow disposal areas. The City could also consider approaching owners of conveniently located vacant properties and creating snow disposal agreements to use that space for snow storage. For any snow disposal area, consideration should be given to existing drainage and impacts to adjacent properties. |

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| | **Action E:** Monitor City signage to ensure it meets public needs for wayfinding and safety. Maintain areas around signs to ensure that visibility is not impacted by vegetation over-growth, snow/ice cover, vandalism, or other issues. | As part of the typical maintenance schedule and best practices created for Strategy 3 below, maintain a database to track regular sign inspections and maintenance that may be needed. |
| | **Action F:** Enforce the removal of ROW encroachments that hinder road maintenance operations. | This can include the City trimming vegetation that extends into the ROW from private property and ordering the removal of other encroachments, including objects such as junk cars.<br><br>The removal of illegally parked vehicles is also addressed more specifically in Section 4.6, Goal 8, Strategy 1, Action E. |
| **Strategy 3: Establish improved systems to track maintenance operations.** | | |
| | **Action A:** Raise awareness about the Report a Problem feature on the City website that should be used to report road maintenance needs. | Residents reporting issues may tend to use Text My Gov, but they should be referred to use Report a Problem when appropriate; this may help track the life cycle of maintenance issues, identify recurring issues, and plan future maintenance strategy. |
| | **Action B:** Investigate and consider implementing a software program to track maintenance operations. | There may be options that directly interface with something like the Report a Problem form, allowing both the public and City staff to input records of issues. As Public Works keeps record of action taken and other information in this type of system, a useful record would be created to help inform future planning. |
| | **Action C:** Create a typical maintenance schedule based on expected work needed on a seasonal basis, as well as best practices for responding to maintenance needs. | This should include expected amounts of surface repairs or treatment and drainage facility clearing in the warmer months and snow and ice clearing and management schedules for the winter.<br><br>This would help in creating budgets and compiling the overall prioritized list of transportation facility projects that also includes larger construction projects. It would also help predict staffing needs. |

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| | **Action D:** Create a map of all City transportation supporting elements such as signage, lighting, culverts, other drainage systems, etc. | This could also be used to help track recurring maintenance issues based on location. GIS could be used to prepare a map for the Public Works department to reference and continually update.<br><br>The Environmental Assessment prepared for the private Donlin Mine project may contain information that is helpful for this effort, particularly related to drainage in Bethel. While expensive, lidar could be used to map topography and better understand drainage. |
| **Strategy 4: Create a prioritized City road maintenance plan.** | | |
| | **Action A:** Create a prioritized City road maintenance plan, and incorporate it into the transportation facility funding strategy and Capital Improvement Plan (*see Goal 6 below*). | The Public Works Department has been leading related efforts. Currently, approximately three gravel roads get prioritized for rehabilitation each year, and gravel lasts 3-5 years, so the City has determined this is sufficient to get through all the roads as needed; this calculation will continue to change as Bethel grows.<br><br>A more detailed, prioritized maintenance plan should identify which roads are paved or graveled, how and when to address issues such as potholes or drainage problems, and snow maintenance prioritization. This prioritized plan, maintenance schedule, and best practices created for Action G above can inform each other as they are developed. |
| | **Action B:** Identify and prioritize more major road rehabilitation projects, and incorporate them into the transportation facility funding strategy (*see Goal 6 below*). | Road rehabilitation projects are more significant projects than regular maintenance. This could be the mechanism for identifying existing gravel roads that should be reconstructed as paved roads. |
| **Strategy 5: Design new and rehabilitated road and other transportation facilities to proactively minimize maintenance needs.** | | |
| | **Action A:** Continually evaluate materials for road surfacing and other transportation facility construction to improve quality/durability and reduce dust, such as chip sealing, emulsifiers, or other innovative construction methods. | Consider innovative materials and construction methods that may work specifically for Bethel. The Denali Commission, University of Alaska, and DOT&PF continues to complete research on Alaska and permafrost-specific design.<br><br>A project is currently underway to test Bethel soil samples to determine the type of emulsifier that would best work with the soil. This could make a significant difference in durability. Emulsifiers were difficult to use in the past since roads need to be temporarily closed and the Bethel road system is limited, but with the new Tundra Ridge Road for an alternative route, emulsifiers could be more broadly used in Bethel in the future. |

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| | **Action B:** As paving technology continues to improve and become more available, use paved surfaces instead of gravel for new or rehabilitated roads of collector classification and above. | Contemporary paving materials and construction techniques lend themselves to easier maintenance and can be designed to anticipate conditions that are likely to occur, like frost-heaving. |
| | **Action C:** Improve the implementation of adequate drainage facilities, keeping in mind maintenance needs. | The City has identified a need to continually acquire and install more culverts around town. They have recently been installed at a rate of about eight per year, which has not been enough to keep up with the existing drainage issues experienced in the City.<br><br>In some cases, drainage analysis may be needed to determine the best solution. For example, in some locations, bridges instead of culverts may be needed (such as on Ptarmigan Street, where beavers are repeatedly damming culverts for a below-grade creek crossing).<br><br>City maintenance workers who are often tasked with installing drainage may not have the training needed. The City could consider contracting out this work or enlisting the help of organizations such as the Alaska Municipal League or DOT&PF for additional training to improve decision-making and installation practices. |
| | **Action D:** At the same time as undertaking road rehabilitation projects, assess whether there is additional ROW needed or encroachments that need to be addressed; address these as part of the design process. | Some roads are not located where they are supposed to be based on the plats or other documents that created them – some centerlines are significantly off-center, making some road projects complicated. While the City knows there may be many similar issues around town, when projects are happening an optimal time to verify documentation and make any replatting or other changes as needed.<br><br>The City also expressed concern that there are some roads so narrow that paving them does not seem worthwhile. If it is possible to obtain additional ROW at the time of road rehabilitation, this could help make more effective roads for moving cars and other users as well as providing space for snow storage and drainage. |

| GOAL 3: Develop the surface transportation network to reduce travel times, alleviate congestion, and support future development. | | |
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| **Strategy 1: Identify missing links in the surface transportation network.** | | |
| | **Action A:** Track traffic data, population and traffic forecasts, and significant future development plans and use these to assist with the identification and prioritization of surface transportation projects through LRTP updates. | When available, the City should use traffic data to understand changes in travel demand and congestion and assist with planning roadway improvements that respond to future population and traffic needs. The City should coordinate with ADOT&PF to obtain data they collect on Bethel roads. On top of ADOT&PF data, the City should assess if other traffic data is needed based on potential future road improvements or new road connections. If so, the City can work to collect data on roughly an annual basis for key locations; this could help show growth or changes in traffic patterns over time.<br><br>ADOT&PF completes traffic studies in Bethel and could likely share the results with the City upon request. |
| | **Action B:** Starting with the Priority Projects map in the 2020 LRTP, create a map that shows new road connections that may be needed in the future. | Tundra Ridge Road is one example of a road connection that has existed informally for some time, but is now becoming a formalized ROW that will help reduce travel times across town and alleviate congestion on CEHH.<br><br>There are other road connections identified in the 2020 Draft LRTP that should be included in this map, and additional potential connections should be added as they are identified by the City and/or community. |
| | **Action C:** Based on locations of likely future land development, add locations of potential future road and other surface transportation connections that would support connectivity for this additional development. | See *Chapter 3 – Housing & Land Use* for discussion on locations of likely future development. Development through parts of the "Donut Hole" in the middle of town would be the most efficient location for additional development, so the following connections have been discussed (which would also help alleviate current traffic):<br><br>▪ The City is applying for funding for the north-south "Donut Hole Road" between CEHH and Ptarmigan Street (stopping at the fitness center on the way) to help address increasing traffic associated with the YKHC campus. This would mostly travel through City land.<br><br>▪ An east-west connection across the Donut Hole, connecting to the north or south side of H-Marker Lake<br><br>Potential future connections should be considered as part of each LRTP process and tentatively mapped. |

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| **Strategy 2: Use the LRTP to prioritize and guide implementation of new surface transportation construction projects.** | | |
| | **Action A:** Based on the map, create a prioritized list of new surface transportation construction projects. | This would likely start with the prioritized list from the 2020 LRTP, and the list could be adjusted as needed through future LRTP updates. |
| | **Action B:** Incorporate the prioritized list of new transportation projects into the funding strategy (*Goal 6)*. | Use the prioritized list of new surface transportation projects to inform the funding strategy to support the highest priority projects being funded first. |
| | **Action C:** Working with key stakeholders and the community, use the five-year LRTP update cycle as an opportunity to revisit and update the prioritized list of new road projects. | |

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| **GOAL 4: Design new and reconstructed streets with a focus on providing safe and comfortable routes for all transportation modes and all users.** | | |
| **Strategy 1: Throughout the local transportation system, increase the focus on safety for all users.** | | |
| | **Action A:** Regularly evaluate crash data; pedestrian, bicyclist, and motorist use; and other road safety data to identify areas for improvement. | |
| | **Action B:** Using community input, identify locations (especially along key routes for non-motorized users) that need safety improvements such as crosswalks, additional lighting, and/or signage. | Some examples that have been identified include:<br>▪ There is significant pedestrian traffic near the Cultural Center, including children who need to cross the road.<br>▪ In locations where there are currently no set-aside facilities for non-motorized users, signage or striping can help remind drivers to be mindful of non-motorized users on the road. |

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| | **Action C:** Plan safety improvements as individual projects and/or as part of other transportation projects, keeping in mind that federal Safe Streets and Roads for All (SS4A) funding may be available. | ADOT&PF utilized this funding for signage and crosswalk striping near the schools in Bethel; when planning road projects, Bethel should seek to provide safety improvements whenever possible given that special funding programs exist to help with these types of costs. |
| **Strategy 2: Ensure adequate ROW for sharing the road and implementing Complete Streets.** | | |
| | **Action A:** Ensure that new ROWs created as part of subdivisions meet minimum width requirements per code. | |
| | **Action C:** Consider developing a set of typical roadway cross-sections for reference in City or private development projects involving new or reconstructed roads. | |
| **Strategy 3: When implementing Complete Streets, prioritize the most safe and comfortable facilities for non-motorized transportation that space will allow.** | | |
| | **Action A:** Ensure that Complete Streets (BMC 12.05) is being considered and used to the extent possible in the design of new and reconstructed roads. | |

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| | **Action B:** When deciding the location and type of non-motorized facilities to be included in a Complete Streets project, prioritize a separated pathway or boardwalk on at least one side over a shoulder for non-motorized users, when possible.<br><br>When there is insufficient space for a separated pathway or boardwalk, create a shoulder or shoulders for walkers, bicyclists, and other non-motorized users. | This is especially important when constructing facilities along busy gravel roads. Road dust is an issue for pedestrians and other non-motorized users on roadway shoulders. Also, separated facilities are safer and more comfortable.<br><br>If the project is a reconstruction and it requires significant property acquisitions to have sufficient ROW, alternative mechanisms to provide non-motorized facilities (i.e., walkway easements) may be appropriate. |
| | **Action C:** Along existing and new shoulders for non-motorized transportation, implement measures to discourage the shoulders' use as parking or an unofficial turn lane. | On paved roads, this should minimally include a solid line to indicate the space is not a lane and should only be used by vehicles in an emergency. Other delineating techniques could be used when a painted line is not an option, such as reflective elements. Regardless of road surface material, "No Parking" or other signage indicating that the shoulder is intended for non-motorized use would also assist to demarcate space and make it clear that road sharing is a priority. |
| | **Action D:** If a shoulder or separated path for non-motorized users will be gravel, consider implementing methods to reduce dust impacts. | |

| **GOAL 5: Improve and expand the trail system.** | | |
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| **Strategy 1: Address trail and boardwalk maintenance needs more efficiently.** | | |
| | **Action A:** Continually monitor and test new trail building techniques and materials that are affordable, easy to maintain, and suitable for the frequently changing character of the tundra ground. | |

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| | **Action B:** Transition Bethel trail building methods (including reconstruction of existing routes) away from high-cost and difficult-to-maintain boardwalks and towards less expensive surface-level trails with footbridges and ramps to cross streams and pipes where necessary. | The Community Parks and Recreation Committee emphasized that the City may have further success expanding the trail network if it adopts a strategy that allows for inexpensive trail surfacing for "better" trails (without the need for striving for more "perfect" trails). This strategy would have to factor in the potential need for more frequent maintenance.<br><br>One option for an inexpensive material could be utilizing locally made woodchips from clearing operations, though this would require further discussion as there may be additional equipment needed and/or specifications for the woodchips used. The Committee recognized that woodchips would likely sink into the tundra like other materials have, but at least the organic material would be less expensive and might be less harmful to the environment as compared to rubber or plastic products. |
| | **Action C:** Identify and potentially add pedestrian amenities to more locations, including lighting and benches. | Lighting has been installed in some areas, but this should continue along more boardwalks or major trails.<br><br>There is potential for benches to be funded by individual sponsorships (such as in exchange for a dedication plaque on the bench). These could be located along trails and/or at parks and other key public locations.<br><br>This action can be pursued in collaboration with Parks and Recreation. |
| | **Action D:** Add amenities for bicyclists at parks and recreation facilities, such as bike racks and bike "fix-it" stations. | This action can be pursued in collaboration with Parks and Recreation. |
| **Strategy 2: Address trail and boardwalk maintenance needs more efficiently.** | | |
| | **Action A:** Encourage the use of the Report a Problem feature on the City website for the public to report trail and boardwalk maintenance issues, including hazards or vandalism. | By enlisting the help of trail users in the community to report issues, this could cut down on the need for maintenance staff or public safety personnel to go around town and inventory issues. |

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| | **Action B:** Initiate an Adopt-a-Trail and/or boardwalk and trail maintenance volunteer group to assist when City maintenance staff does not have capacity to respond to trail / boardwalk maintenance issues. | To assist City maintenance staff, the community could help with trail and boardwalk maintenance. This could be through an Adopt-a-Trail program with opportunities for sponsorship signage. This could also be a community service opportunity for younger people, and it would encourage more people to feel a sense of ownership over the public boardwalks, potentially reducing vandalism. |
| | **Action C:** As maintenance issues are reported and repairs are made, record any recurring maintenance issues (types of issues or problematic areas). | This information should be maintained by the Public Works Department. The data may reveal which types of trails or areas need the most maintenance, or which repair materials need to be ordered and how often. This may also indicate materials that don't hold up as well over time.<br><br>The City has already reported that the wood construction used for boardwalks is expensive and is a maintenance issue; a goal is to use gravel or some similar surface material to lower cost of construction and maintenance. |
| | **Action D:** Alter trail maintenance and construction best practices over time to mitigate common maintenance issues. | If boardwalks continue to exist in Bethel, there may be a more weatherproof, synthetic treatment or material that could be tested.<br><br>Otherwise, the City has expressed a desire to focus on gravel trails going forward; there is a project planned to replace the Pinky's Park boardwalks with gravel due to continuous maintenance challenges. Gravel trails sometimes settle over time, so additional types of fill or structural enhancements could continue to be tested as well as emulsifiers. |
| **Strategy 4: Expand the trail system by formalizing popular trails and adding new trails.** | | |
| | **Action C:** Investigate what would be needed to formalize informal and potential new trails. | This will include determining property ownership to be able to seek easements. If existing popular trails cannot be formalized, new alternative routes that connect the same locations could be proposed. |

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| | **Action D:** Coordinate with owners of properties that have informal or potential new trails through them to obtain easements or use agreements. | If there are certain routes that cannot be formalized, they may be rerouted through locations where property owners are more willing to allow passage through. The City could also consider the use of relocatable trail easements that allow flexibility of maintaining the trails as well as moving the trail easements as areas are further developed.<br><br>For example, the City-managed waterfront trail is popularly used and well-maintained. However, the trail informally continues through private property at the south end. The owner has allowed people to use it but is not committed to creating a permanent trail as future development plans have not yet been determined and may not be compatible with a walking trail. The waterfront trail may need to more clearly end where it formally ends or be re-routed elsewhere.<br><br>Potential trails through the Donut Hole are another example of the need for coordination with private property owners (such as BNC) in order to determine if they would be open to connections in certain locations. |
| | **Action E:** For trails within or through larger properties, consider forming agreements or partnerships for private management / maintenance of the trails. | For example, community members expressed a desire for the trail system on BNC land in southwest Bethel to be improved. Stakeholders indicated that this is a popular area for berry picking. The City could discuss with BNC whether they have interest in officially maintaining public access to these trails, and the City could potentially show the trails on the trails map (with a note that this area is BNC land and subject to their management). |

| **GOAL 8: Evaluate site development codes to better support safe access for all transportation modes.** | | |
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| **Strategy 1: Provide for adequate and safe parking facilities and practices.** | | |
| | **Action D:** Using signage and/or announcements via various City channels, clarify locations where street parking is not permitted in areas with compliance issues. | Stakeholders have noted that people sometimes park on shoulders or along roads that pedestrians frequently use creating safety concerns for non-motorized users. Signage could be installed in certain areas, or rules around parking in shoulders could be developed and enforced. |

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| | **Action E:** Continue inter-departmental collaboration to enforce parking violations that impact road safety and maintenance | The Public Works Department and Bethel Police Department (BPD) can work together to clarify where street parking is not permitted and priority areas for enforcement. To prevent people from continuing to park along streets where not permitted, BPD will need to enforce parking violations. Currently, the Public Works department lets BPD know if vehicles are hindering road maintenance, or BPD may identify derelict vehicles during patrols. Notices may be placed on vehicles to provide a deadline for them to be moved, and then BPD calls a towing operator to move vehicles to the landfill if necessary.<br><br>The City Administration determines fines that could be charged for vehicles left in ROWs or on City property. |

## Chapter 5 – Regional Transportation

| **GOAL 1: Create a well-functioning airport area for travelers and businesses.** | | |
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| **Strategy 1: Facilitate efficient and organized access to the airport.** | | |
| | **Action A:** Advocate for clear loading and unloading areas for taxicabs and private vehicles at the main jet terminal. | As part of Action A in this strategy, assigned to the City Manager, responsibility for managing loading areas in the airport area will be determined. While this may be the responsibility of DOT&PF or an airline operator, Public Works can help advocate for improvements to help with traffic flow. |
| | **Action E:** Advocate for more wayfinding signage in the airport area to direct parking and pick-up / drop-off traffic, as well as pedestrian traffic between different airlines, parking areas, and other amenities. | As part of Action A in this strategy, assigned to the City Manager, responsibility for managing signage in the airport area will be determined. While this may be the responsibility of DOT, Public Works can help advocate for improvements to help with directing traffic.<br><br>Wayfinding signage could be for directing people to different airlines or parking areas, for example. During peak times (typically based on the Alaska Airlines jet schedule), the City has reported that the road gets narrow due to loading traffic. Crosswalks for pedestrian safety may also be needed. |

| GOAL 2: Support DOT&PF in airport operations and planning. | | |
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| **Strategy 1: As requested by the FAA and/or DOT&PF, take actions that support smooth and secure airport operations.** | | |
| | **Action B:** If a new landfill or sewage lagoon is constructed, place it as far from the airport as practicable to avoid attracting wildlife that could be harmed, damage airport equipment, and disrupt operations. | Like landfills, sewage lagoons can be wildlife attractants. The FAA recommends such facilities be six miles from airports, but many Alaskan communities receive exemptions due to their small size. The existing sewage lagoon is under six miles away, but it is located away from the airport. |

## Chapter 6 – Utility Infrastructure

| GOAL 1: Advance projects in Bethel to increase electricity production from alternative energy sources to reduce both costs and generation of greenhouse gasses. | | |
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| **Strategy 1: Facilitate large-scale projects to introduce more alternative energy sources to the local network.** | | |
| | **Action D:** As part of the strategic plan discussed in Action B, identify the best locations in Bethel for wind, solar, or other alternative energy generation and storage, and examine City-owned sites for suitability. | The City could identify unused open space on already-developed City property that could be offered to AVEC for small-scale lease projects, like single wind turbines or solar panels. If there are larger areas of City land that are not identified for other potential uses, the City and AVEC could look into setting them aside for alternative energy production leases. |
| **Strategy 2: Update City facilities to be more energy efficient.** | | |
| | **Action A:** When updating existing City facilities or constructing new City facilities, design should consider including alternative energy sources, such as solar or wind power instead of diesel. | It is important to note that AVEC needs to be informed of proposed alternative energy projects and provide approval. Until energy storage innovations are hopefully made in the future, facilities likely still need to be connected to the AVEC grid for when they are not generating sufficient electricity by alternative means. |

| GOAL 2: Regularly seek ways to lower water and sewer bills for customers. | | |
|---|---|---|
| **Strategy 1: While the hauled portion of the Bethel water and sewer system continues, evaluated hauled operations to look for efficiencies that may help reduce rates.** | | |
| | **Action B:** Work with DOT&PF to get exemptions to allow for heavier (more efficient) water and sewer haul trucks. | |
| **Strategy 2: Expand the piped water and sewer system, as it operates profitably and offsets losses from the hauled network.** | | |
| | **Action B:** Repair existing deficiencies to the existing piped water and sewer network to maximize the system's efficiencies. | |
| **Strategy 3: Evaluate and reduce costs associated with production and distribution of water and collection and treatment of wastewater.** | | |
| | **Action B:** Request an audit of water and sewer operations and maintenance from the Alaska Rural Utility Collaborative with a focus on improving cost, efficiency, resilience, and reliability. | |
| | **Action C:** Increase financial efficiency, automate operations and billing, explore cost effective freeze protection efforts, and explore subsidized technical support through non-profits and state and federal agencies. | |

| GOAL 3: Transition Bethel's water and sewer utilities to fully piped systems serving all residences and businesses. | | |
|---|---|---|
| **Strategy 1: Complete each phase of projects outlined in the PER.** | | |
| | **Action B:** Identify available land and begin acquiring easements (as needed) for future facilities, such as the truck fill station, pipes, and additional source water well. | |
| | **Action C:** Implement each phase of the PER. | Provide updates to the community so that they are aware of the progress. |
| | **Action D:** As PER phases are implemented, monitor the capacity of the existing sewage lagoon to determine if another lagoon cell will be needed, and when it may be needed. | |
| **Strategy 2: Focus on maintenance to protect the City's utility investments and avoid unnecessary costs.** | | |
| | **Action A:** Construct security fences around all water treatment plants. | |
| | **Action B:** Improve Supervisory Control and Data Acquisition (SCADA) compatibility of Bethel's water treatment plants and lift stations to reduce the manual monitoring tasks performed by staff. | |
| | **Action C:** Provide information to the community on how to use the piped sewer system, restrictions on what can be dumped into the system, and who is responsible for maintenance costs associated with different elements of the system. | Examine City code to determine if additional clarification is needed with regards to maintenance cost responsibilities. |

| | | |
|---|---|---|
| **Strategy 3: During the phases of the PER and beyond, manage the piped system to be as efficient and accessible as possible, as well as equitable in cost.** | | |
| | **Action A:** Complete a rate study every 10 years; utilize results of the rate study to set rates appropriately. | |
| | **Action B:** Establish a process for non-residential properties to be informed about the piped system progress in their area and how and when to connect to the piped system. | Commercial properties in central areas will likely be required to plan and fund their own connections to the piped system as it comes to their area. Responsibilities between the City and property owners will need to be clear and transparent. |
| | **Action E:** If water usage becomes an issue due to water supply or excessive usage, install meters in conjunction with a tiered rate system to encourage less water usage and increase revenue. | |

| | | |
|---|---|---|
| **GOAL 4: Facilitate broadband development within the City of Bethel to advance community access to reliable internet service.** | | |
| **Strategy 1: Monitor the buildout of internet-related infrastructure in Bethel.** | | |
| | **Action A:** Request information from GCI regarding locations of existing fiber optic cable within Bethel. | The City is aware that GCI has already installed a significant amount of cable in Bethel, including across Brown's Slough and Tundra Ridge. GCI likely obtained easements or rights from either the City or other property owners / easement holders (such as sharing AVEC easements). It would be helpful information for the City to keep tabs on the existing system as it develops. |
| **Strategy 2: When possible, streamline permitting of internet-related infrastructure.** | | |
| | **Action A:** Prioritize facilitation of rights-of-way within city-owned land or city-held easements for laying fiber optic cable (FOC). | |

## Chapter 7 – Public Facilities & Services

| GOAL 3: Optimize the management of City revenue and spending. | | |
|---|---|---|
| **Strategy 2: Regularly update fees and other charges.** | | |
| | **Action B:** Keep up-to-date utility rates by completing utility rate studies every 10 years. | |

| GOAL 6: Improve public safety facilities and services in Bethel. | | |
|---|---|---|
| **Strategy 1: Continue to improve fire and emergency medical infrastructure and services.** | | |
| | **Action B:** As the City's piped water system is expanded, install fire hydrants. | Like the Fire Department's action item to construct a new fire substation, more fire hydrants would also help lower insurance rates. |

## Chapter 8 – People & Economy

| GOAL 2: Minimize potential negative impacts to Bethel from the Donlin Mine efforts and maximize potential benefits. | | |
|---|---|---|
| **Strategy 2: Work with the Donlin project to plan for additional traffic associated with Donlin Mine.** | | |
| | **Action C:** Coordinate with DOT&PF to monitor potential impacts to the capacity of Chief Eddie Hoffman Highway and whether improvements would be needed. | Monitoring capacity and potential needed improvements to Chief Eddie Hoffman Highway could be included in the MOU that the City Manager will coordinate, discussed in Strategy 1, Action A.<br><br>For further discussion of roadway transportation planning considerations, *see Chapter 4 – Local Transportation.* |

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# APPENDIX 14:
# TRANSIT MANAGER ACTION ITEMS

# Appendix 14 – Transit Manager Action Items TM

## Chapter 4 – Local Transportation

| GOAL 7: Improve the public transit system to be more convenient and responsive to the community's needs. | | |
|---|---|---|
| **Strategy 1: Use data collection to inform changes to the transit system or back up capital needs and potential grant applications.** | | |
| | **Action A:** Expand data collected on ridership to reflect times of day and days of the week. | The Transit Manager currently collects total number of passengers using each stop on a monthly basis. This shows which stops are most popular and what areas rely on transit service the most. However, additional data such as daily passenger counts could help inform if there are days of the week when more frequent service would be most useful for transit riders. |
| | **Action B:** Expand data collected on ridership to reflect how many passengers enter or exit the bus at each stop. | Currently, the transit system counts passengers per stop, but does not differentiate between passengers entering or exiting the bus. Adding this distinction in the data could help determine which stops are the most popular trip origins versus destinations. |
| | **Action C:** Create a comment form on the City website's transit page to collect questions, comments, or issues reported by riders. | Transit riders may have suggestions to improve the system. |
| **Strategy 2: Improve access to information about the transit system.** | | |
| | **Action A:** Post signs with schedules and routes at bus stops and inside key community facilities. | Durable printed versions of the schedule and route could be posted at bus stops as well as on bulletin boards in key community facilities. These could include a QR code that people could scan with smartphones to access the Transit page of the City website. The City has reported frequent vandalism of signs at bus stops, so City maintenance staff could monitor this and make repairs when needed. |
| | **Action B:** Ensure that Complete Streets (BMC 12.05) is being considered and used to the extent possible in the design of new and reconstructed roads. | |

| | | |
|---|---|---|
| | **Action C:** Incorporate transit information into visitor information on the City's website. | *See Chapter 8 – People & Economy.* |
| | **Action D:** When there are updates to routes or schedules, share within the City to be posted on City social media (as well as in the newspaper and City newsletter to continue to remain accessible to those not using social media). | |
| **Strategy 3: Make changes or expansions to the transit services provided.** | | |
| | **Action A:** Consider adding a stop at the airport or partnering with another organization to add another transit link between the airport and the central city. | While a stop at the airport is commonly suggested, it was tested in recent years. The stop seemingly had low ridership, making it difficult to justify funding that stop, and there is no designated space for luggage on buses. Most people who do not drive to the airport use taxi cabs or YKHC's shuttle.<br><br>If a stop is implemented again, the following strategies could be used:<br><br>▪ The City could work with the airport to post wayfinding and signs showing transit routes and schedules.<br><br>▪ The schedule could be limited to times based on the passenger jet schedule.<br><br>▪ The stop could be located slightly up the road at Tower Road to avoid congestion in front of the terminal.<br><br>▪ *See Strategy 4, Action B for ideas related to luggage space.*<br><br>Alternatively, the City could pursue a partnership with YKHC's shuttle to provide a transfer pass to allow people to pay to ride to YKHC and then transfer to the existing transit services there at the hospital. |

| | | |
|---|---|---|
| | **Action B:** Annually, evaluate altering the transit route(s) to include additional stops that are commonly requested by community members, such as the Fitness Center. | There used to be a second transit route in addition to the current transit route. It served the City Subdivision area, including the Fitness Center, Pinky's Park, the vocational school, and the surrounding area; these stops are commonly requested. An additional bus was recently purchased, to arrive in the next couple of years, so some of these stops may be reinstated in a second route. If / when routes are changed or expanded to include new destinations like the Fitness Center, this should be advertised to help raise awareness and garner ridership to these destinations.<br><br>Over time, routes should be examined and reconfigured to incorporate new stops in the most strategic and efficient way. For example, Tundra Ridge Road could influence the shape that routes take. All new road connections should be considered as they are completed. |
| | **Action C:** Review ridership data and/or community comments to consider running the transit system later into the evening. | This was provided in the past when there were two transit routes and may become more feasible going forward. Evaluate running transit services to 8pm or 10pm. This may be the key to more people using transit to access destinations such as the Fitness Center. It may be possible to organize evening routes to skip stops not typically used in the evening. This would need to be informed by the data collected. |
| | **Action D:** Consider decreasing headways from one hour to half an hour, either throughout the day or during times of peak use. | This could potentially be implemented only during peak times, informed by the ridership data that is gathered as part of Actions in Strategy 1. |
| **Strategy 4: Maintain and improve the transit fleet.** | | |
| | **Action A:** Use a database to track maintenance needs and expected lifespans of buses and make repairs and/or replace buses as needed. | Due to poor road conditions in Bethel, buses need frequent repairs and wear out very quickly. If routes expand, this will lead to even more wear and tear on buses. Besides continuing to strive for better roads, Bethel will need to regularly plan for repairs and purchasing new buses. Buses sometimes take a couple of years to arrive, and the City noted that ideally there would be one more vehicle in the fleet than the number of routes, so this needs to be proactive. To help track all of this information, the Transit Manager should use a database to track the year buses were purchased, their expected lifespan, and repairs needed and/or completed. |

| | | |
|---|---|---|
| | **Action B:** Consider adding features to buses to improve accessibility and convenience. | The City noted that typical wheelchair lifts for buses break quickly, and there are no local businesses able to fix them. Alternative lift designs or incentivizing a local business to undertake repairs is recommended.<br><br>Also, additional storage capacity on buses would assist with improving passenger use and comfort, including:<br><br>▪ Luggage or cargo space, especially if a stop is added at the airport. This could also help with people transporting groceries.<br><br>▪ Bicycle racks<br><br>The Public Works department should work with the Grant Manager to explore grant applications to fund new buses (which could potentially include installation of cargo space or bicycle racks, since the need for funding to cover these improvements could be discussed in grant applications). |

## Chapter 5 – Regional Transportation

| **GOAL 1: Create a well-functioning airport area for travelers and businesses.** | | |
|---|---|---|
| **Strategy 1: Facilitate efficient and organized access to the airport.** | | |
| | **Action C:** Consider adding a transit stop around the airport. | *See the Public Transit Section in Chapter 4 – Local Transportation for considerations about this potential stop.* |

**Rural Energy**

Rural Energy Reports & Community Audits

Rural Energy Project Success Stories

Rural Energy Program

Rural Energy Technical Assistance Request

# Rural Energy Technical Assistance Request

*Request technical assistance in planning and implementing renewable energy and energy efficiency projects in your community*



**Rural Energy Program**
(907) 729-3600
energy@anthc.org

Interested in finding out how the Rural Energy Program can help your community water and sanitation services become more self-reliant, energy efficient and sustainable?

Start here to begin the process of partnering with ANTHC in planning and implementing a project in your community.

To help us determine if your request fits within the program's scope and can be addressed with available resources, please provide the information requested at the link below.

*Note: This link will send you to the U.S. Department of Energy, Office of Indian Energy's webpage. Requests for assistance are routed to ANTHC.*

Request Technical Assistance [DOE webpage]

4000 Ambassador Drive
Anchorage, AK 99508

(907) 729-1900

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# City of Bethel, Alaska

## City Manager's Office

## December 12, 2024 – January 8, 2025

### Personnel

**Resignations:**
Caleb Sleppy, Piped Services Foreman
Allie Batchelor, Accounting Specialist II

Both employees provided significant value to our organization. We are sad to see them go but with them the very best in their new endeavors.

### Capital Project Updates

**Public Safety Communications Tower**

This construction project was funded primarily through a State Legislative appropriation of $500,000 with a $200,000 City match. This project consists of the construction of a City owned radio tower at the Police Department for first responders communications. The project is near completion. The final step is to remove the antennas located on the KYUK tower which the City is playing a leas on. This removal is planned to take place prior to January 17, 2025.

**Community Center Design**

A meeting was held with UIC, the construction contractors, DOWL, the City's engineering team and Architects Alaska, the design team to go over the final concepts for the design before the 65% design is due near the end of January. One item discussed was the mezzanine walking track as requested by the public, council, and committee. It was determined to design and make accommodations for a future install of a walking track on the second floor, the City should expect to pay an additional $2 million now. The increased costs would be in response to the need for an elevator to access the walking track as well as needing to widen the area to ensure the walking track wouldn't interfere with the basketball courts. The team determined the cost was too great to consider the phased inclusion of the walking track mezzanine.

### Grant Updates

**Safe Streets for All**

The City has been awarded $52,800 to develop a pedestrian safety plan. There is a $13,000 match for the City. The City will work with DOWL to create the plan through community outreach. We won't have the funds for another two months. In the meantime, I will be requesting a subcommittee consisting of one member of Planning, Public works, Public


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907-543-1373

Safety and Community Parks be created. I hope to have that approval document drafted for the January 14th meeting so that we can add the appointments to the agendas for February.

## Financial Updates

As of December 31, 2024:
Total Taxes Collected were $7,179,197 out of the budgeted $11,669,000, this is 38.5% of expected earnings and we are 50% through the fiscal year.

## Operational Updates

**Finance General**

- Continuation-The end of the year is busy for our sales tax team. They are working with just over twenty businesses that are delinquent in their sales tax so that they can be compliant with the code requirements for their sales tax certificate renewals.
- Continuation-We continue to work on a plan for our FY26 budget. The goal of this budget cycle will be to streamline the processes from start to finish.
- The City should expect to see the FY23 draft audit the second week of February. The contracted third party auditor will begin auditing the City's FY24 audit likely in November, and the FY25 Audit in January. This progression should get us back on a regular audit review rotation for FY26.
- We look forward to publishing the sales tax delinquency list within the first quarter of 2025.
- We will be releasing a request for proposals for business audit services in the month of January.
- We have created an online form to allow new businesses to register their business. Business registration renewals are able to use their current online account to renew, saving everyone time.
- Administration has been paying close attention to the Alaska Remote Sellers list which is managed by the Alaska Remote Sellers Sales Tax Commission. We will be providing a list of sellers to the public to help ensure those vendors operating outside of Bethel are fully registered and paying taxes.
- We are preparing public education materials for residents and business owners to help ensure those operating a business know that they are and know what to do to maintain compliance with our sales tax remittance requirements.
- The State of Alaska Public Employees Retirement System has been facing challenges accepting PERS contributions from agencies since November. In late December the City worked with the state to set up a manual entry process not yet afforded to many municipalities. While our employee contributions are now held with the State and will be for future months, many employees will still see a delay in the way those contributions are applied because there is a manual entry process required. The State is testing the new system out now and we are hopeful that the situation improves soon.

**Finance Utility Billing/Utilities**

- Utility Billing and their coordination with hauled utilities will be changing a bit to help support the operations when staff is out of the office. Additional admin support will be trained to help cover offices to ensure uninterrupted communication with our customers.
- The hauled utility department will begin calling residents if a property isn't accessible for the hauled service. This will be in conjunction with the familiar blue tag but will provide more immediate notice to the customer which may allow them to correct the impacts of the delivery prior to the end of the route allowing for a later delivery.

**Human Resources**

- We are reviewing our travel and training policy and have updated the employee travel and training form. We hope to release the new policy and form by the end of January.

**Port**

- There are two Request for Proposals/Bids nearly ready for release to contractors. The first is for the smaller port wall repairs, the east wing wall, and the impact location.


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# CITY OF BETHEL
## OFFICE OF
## JAMES C. HARRIS
## CHIEF OF PUBLIC SAFETY
## harrisjc@cityofbethel.net


**November 2024 Monthly Report**
**Police Department**

**Personnel:**

| Current Staffing | | | |
|---|---|---|---|
| **Position** | **Allocated** | **Staffed** | **Vacant** |
| **Safety Patrol** (three grant funded) | **3** | **3** | **0** |
| **Community Service Officer** | **2** | **2** | **0** |
| **Evidence and Record Custodian** | **1** | **1** | **0** |
| **Administrative Assistant/Taxi Inspector** | **1** | **1** | **0** |
| **Public Safety Dispatcher** (one E911 funded) | **5** | **5** | **0** |
| **Public Safety Dispatch Supervisor** | **1** | **1** | **1** |
| **Peace Officers** (one grant funded/reimbursed SRO) | **20** | **15** | **5** |

**Operations:**

| Operations Tempo | | | | |
|---|---|---|---|---|
| | **December 2024** | **November 2024** | **December 2023** | **2024 Total** |
| **Calls Total** | **1311** | **958** | **1029** | **19541** |
| **Reports Total** | **95** | **91** | **82** | **1478** |
| **Intoxicated Pedestrian Calls** | **170** | **150** | **180** | **1986** |
| **Driving Under Influence Calls** | **21** | **13** | **5** | **176** |
| **Domestic Violence Reports** | **17** | **9** | **18** | **302** |
| **Disturbance Calls** | **85** | **73** | **71** | **1066** |
| **Subject Removal Calls** | **113** | **85** | **109** | **910** |
| **Animal Calls** | **35** | **40** | **17** | **428** |
| **Animal Bite Reports** | **2** | **2** | **0** | **12** |
| **Sexual Assault Reports** | **5** | **4** | **6** | **42** |
| **Death Investigation Reports** | **1** | **0** | **2** | **13** |


**Dispatch: (907) 543-3781 FAX: (907) 543-5086**

# CITY OF BETHEL
## OFFICE OF
## JAMES C. HARRIS
## CHIEF OF PUBLIC SAFETY
**harrisjc@cityofbethel.net**


**PERSONNEL:**

Background has been completed on Mr. James Harrington, Certified officer from Indiana, request to hire has been submitted. Mr. Harrington is going to move to bethel to live full time.

Background has been completed on Ceaira Preuett, certified officer out of Fairbanks and Michelle Griesheimer From Washington, Both will begin work on January 27,2025

Background has been completed on Jamarsa Hill from Luisiana. Will begin work on

Karen Pitts has been hired as dispatch supervisor, will start work 01/06/2025.

Bethel Police Department and Fire Department teamed up to conduct a cops with kids event during the Christmas Holiday. With the assistance of AC toys were provided to children in need.

**Bethel Fire Department December Report**
**Total Calls: 137**
**Fire Calls**: 17
**EMS Calls: 120**
Most fire calls were either false alarms, odor/smoke removal or vehicle/house lockouts.
**Notable Fire Calls**
On 12/11/2024 Firefighters responded to the area of 2nd ave for a powerline on fire, Upon arrival crews witnessed an arcing wire that had disconnected and was shorted to another wire. AVEC was notified crews shut down the road while AVEC secured the power. There were no injuries reported.
On 12/14/2024 Firefighters responded to the area of Larson for a steamhouse that was on fire. Crews were able to extinguish the fire before it could reach any nearby buildings. The fire was extinguished and there were no injuries reported.
**Notable EMS Calls**
On 12/6/2024 EMS responded to the area of tundra ridge for a report of a Pt bleeding from the head. Bleeding was controlled and pt was seen for further care.
**STAFFING**
**Career staffing:** 9 out of 12 positions are filled
**Volunteer Staffing:** 26 Volunteers
**Injury's:** Currently there are no injuries to be reported

# CITY OF BETHEL
## OFFICE OF
## JAMES C. HARRIS
## CHIEF OF PUBLIC SAFETY
**harrisjc@cityofbethel.net**



**Dispatch: (907) 543-3781  FAX: (907) 543-5086**

William Arnold, Public Works Director
1155 Ridgecrest Drive
PO Box 649 Bethel, AK 99559
P: (907) 543-3110
F: (907) 543-2046
warnold@cityofbethel.net

**MEMORANDUM**
**DATE: 12.31.2024**
**TO: City Manager**
**FROM: Bill Arnold, Public Works Director**
**SUBJECT: Manager's Report – Public Works Department**

**Programs/Divisions**

**Chemical Storage Building is about 90% complete, Work at the Bethel Heights Water Treatment Plant is about 95% complete.**

**Hauled Utilities: I would like to thank the V&E department for the time and efforts they have put into the water and sewer trucks to keep them on the road. I need to acknowledge the help we have routinely received from road maintenance. Thank you building maintenance for keeping Tamara warm and for the other repairs you have done on the hauled services end of the building. Hauled water and sewer have had a successful month. We have kept all service routes on schedule with help from Jim Boan, Randy Turner and Buzz Chaney.**

- **Utility Maintenance: 5 alarms on residential lift stations were responded to, requiring 4 repairs.**
- **Monthly meter readings and service connections/ shut offs were completed.**
- **Tundra Center lift station is still in dire need of repairs/ replacement. Currently, lift station is not functioning at full capacity/ has required creativity to modify pump to continue to operate.**
- **Mixing and degreasing our larger lift-stations to prevent FOG build up.**
- **Leveling activities on low-flow and plugged sewer lines.**

**Currently have 2 vacant positions.**

## Property Maintenance:

| | |
|---|---|
| **Pool Building** | |

| | |
|---|---|
| | **12/03 Go over water heating system with Long technician** |
| | **12/06 Look at broken lock assembly on storage room door.** |
| | **12/09 Work on broken lock assembly and order new one** |
| | **12/18 Check computer for windmill controls** |
| | **12/19 Work on handles in women's showers** |
| | **12/19 Repair late in women's locker room** |
| | **12/28 Work on glycol pumps upstairs for heating system** |
| | **12/30 Work on Pumps 13 and 14 at Pool** |
| | |
| **Public Works Building** | |
| | **12/03 Thaw floor drain southside** |
| | **12/03 Adjust thermostats in building** |
| | **12/04 Work on exhaust duct for waste oil burner** |
| | **12/05 Replace coil in steamer 1** |
| | **12/06 Replace coil in steamer 2** |
| | **12/07 Lower all flags half-mast for Pearl Harbor Day observance** |
| | **12/12 Made Court House key for Midnight Sun Cleaners** |
| | **12/12 Replace fuel pump on steamer** |
| | **12/16 Clear clog in upstairs toilet** |
| | **12/16 Worked on HPL** |
| | **12/17 Worked spray nozzle for pressure washer wand** |
| | **12/18 Order cores and keys for new chemical storage building** |
| | **12/18 Work on exhaust duct for waste oil burner** |
| | **12/23 Stamped 30 new keys CS1 for new chemical storage building** |
| | |
| **City Hall** | **12/04 Salt side entrance** |
| | **12/04 Pickup trash front entrance** |
| | **12/05 Check zone valve in city manager's office** |
| | **12/17 Attend Parks and Rec meeting** |
| | **12/26 Unlock IT office door so Finance could get a printer ribbon** |
| | |
| **Fire Department** | **12/04 Check holding tank pump for reported noise** |
| | **12/11 Relace air intake control on boiler** |
| | **12/16 Clear clog in toilet** |
| | |
| | |
| **Police Department** | **12/02 Turn downstairs temp up** |
| | **12/04 Unstop toilet** |

| | |
|---|---|
| | **12/10 Boiler in shop hard lockout. Cleaned Eye** |
| | **12/11 Replace photocell for outside lighting** |
| | **12/20 Replace glycol pump** |
| | **12/27 Work on wind block for shop boiler air intake** |
| | **12/30 Work on lift station** |
| **Bethel Heights Water Plant** | **12/2 Replace fuel gauge on boiler** |
| | **12/12 Replace pressure relief valve boiler 1** |
| | **12/12 Added glycol to boiler system** |
| **Courthouse Building** | **12/03 Replace fuel pump on boiler** |
| | **12/04 Clean pee trap** |
| | **12/05 Replace fill valve on toilet** |
| | **12/06 Check for cause of reported burning smell planning department** |
| | **12/23 Boiler in lockout. Reset** |
| | **12/27 Escort elevator inspector** |
| | |
| **Transit Bus Building** | **12/03 Cut trees behind building** |
| | **12/04 Build cover for rear entrance to hook up HPL** |
| | **12/06 Move hook up and turn on HPL** |
| | **12/08 Refuel HPL** |
| | **12/10 Refuel HPL** |
| | **12/11 Start HPL adjust unit temp for outside temp** |
| | **12/16 Drop off fuel for boilers** |
| | **12/16 Fill fuel HPL** |
| | **12/17 Move HPL to recycle building** |
| | **12/24 Move old glycol pumps to Facility Maintenance office** |
| | |
| | |
| **Port Office Building** | **12/23 Replace fire stop on boiler 1** |
| **Streets and Roads Building** | **12/16 Bleed fuel for unit heater** |
| | |
| | |
| **Teen Center** | **12/11 Replaced photocell for outside lighting** |
| | **12/17 Move HPL to recycle building for frozen lift station** |

| | |
|---|---|
| | **12/18 HPL not starting move to public works building for repairs** |
| | **12/18 Place HPL back to continue thawing lift station** |
| | **12/18 Add fuel to HPL** |
| | **12/19 Remove HPL and bring to public works for service** |
| **City Center Generator Building** | **12/26 Replaced fan motor and fan on heater** |
| **Dog Pound** | **12/27 Work on fresh water holding tank.** |
| **Play Parks in General** | |
| **x10 Parks** | **12/16 Check all city parks for trash** |
| | **12/01/2024 Building checks and rounds** |
| **All City Buildings** | **12/02/2024 Building checks and rounds** |
| | **12/03/2024 Building checks and rounds** |
| | **12/04/2024 Building checks and rounds** |
| | **12/05/2024 Building checks and rounds** |
| | **12/06/2024 Building checks and rounds** |
| | **12/06/2024 Building checks and rounds** |
| | **12/07/2024 Building checks and rounds Lower and raise flags for Pearl Harbor Day** |
| | **Refuel HPL** |
| | **12/08/2024 Building checks and rounds Refuel HPL** |
| | **12/09/2024 Building checks and rounds** |
| | **12/10/2024 Building checks and rounds** |
| | **12/11/2024 Building checks and rounds** |
| | **12/12/2024 Building checks and rounds** |
| | **12/13/2024 Building checks and rounds** |
| | **12/14/2024 Building checks and rounds** |
| | **12/15/2024 Building checks and rounds** |
| | **12/16/2024 Building checks and rounds** |
| | **12/17/2024 Building checks and rounds** |
| | **12/18/2024 Building checks and rounds** |
| | **12/19/2024 Building checks and rounds** |
| | **12/20/2024 Building checks and rounds** |
| | **12/21/2024 Building checks and rounds** |
| | **12/22/2024 Building checks and rounds** |
| | **12/23/2024 Building checks and rounds** |
| | **12/24/2024 Building checks and rounds** |
| | **12/25/2024 Building checks and rounds** |
| | **12/26/2024 Building checks and rounds** |
| | **12/27/2024 Building checks and rounds** |

| | |
|---|---|
| | **12/28/2024 Building checks and rounds** |
| | **12/29/2024 Building checks and rounds** |
| | **12/30/2024 Building checks and rounds** |
| | **12/31/2024 Building checks and rounds** |

**Road Maintenance: Business as usual. Clear and cold.**

**Vehicles and Equipment: Servicing and repairing all city vehicles and equipment as needed**

**Transit System:** First of all, I would like to thank my Transit Drivers for an awesome year that they provided for the riders of City of Bethel. Huge thanks also to the Maintenance crew for keeping the Transit buses on the road along with the Streets and Roads crew for always keeping the roads and driveways of the Transit Barn clear of snow and the Water and Sewer crew for always providing water and keeping the sewer tank empty.
December's riders consisted of 2,695 Seniors, 21 Youth, 106 Adults, 82 Disabled, and 1,058 Pass riders. TS 1 logged 1,591 miles and used 181.251 gallons of fuel and TS 2 logged 938 miles and 86.753 gallons.
86 Day and 13 Month passes were purchased making the total fares of $2,935.00.
ONC purchased for their clients JAN-MAR month passes.
Looking forward to 2025 new year!

**Landfill & Hauled Refuse: First of all, I would like to thank the crew that I have working for me. December the Dumpster trash truck brought 82 loads of trash to the landfill, Misc. city trucks brought 5 loads to the landfill, there was 918 cubic yards of trash brought in by Commercial customers, we received 4 refrigerators to remove the freon from before we dispose of them, and 1 auto.**

**Staffing Issues/Concerns/Training:**

City of Bethel

Finance Department

Manager's Report for December 2024

Date: January 6, 2025

To: Lori Strickler, City Manager

From: Cynthia Sharp, Deputy Finance Director

Subject: Management Report

## Current Events within the Finance Department

December has been a busy and productive month for the Finance Department.

Front Desk stays busy answering phone calls, processing payments, taking care of walk in customers

Sales Tax has been busy getting the Sales Tax Certificate renewals processed and sent out.

Utility Billing is now sending all Commercial Account bills VIA email.

AP/Payroll: Is getting ready to launch the new online timecard

General Ledger: Keeps us all in balance-Sam is busy as always

We are still working on the FY23 Audit as well as the FY26 Budget

### Finance Committee

The Finance Committee had a quorum and was able to meet. Discussed revision of BMC 4.14.050-Transient Lodging Delinquency Penalties Proposal, Approval of 2025 Meeting calendar and declared a vacancy for the Finance Committee.

### Personnel/Open positions: Finance Director

### Accounting Specialist I

**MEMORANDUM**

DATE: January 6, 2025

TO: Lori Strickler, Acting City Manager

FROM: John Sargent, Grant Manager

SUBJECT: Grant Manager's Report for January 14, 2025 Bethel City Council Meeting

## Grant Award

### Energy Efficiency and Conservation Block Grant

The City of Bethel was awarded $75,220 from the U.S. Department of Energy to purchase and install solar panels on the rooftop of the YK Fitness Center. Upon installation of the 20.50 kW system, the City is expected to save $4,642/yr. In electricity cost.

## Grant Applications in Preparation

### State Capital Requests

I am preparing three State Capital Requests for funds based on the three capital priorities established by Bethel City Council: 1) Expansion of Bethel Community Center; 2) Planning, Permitting, and Design of Port of Bethel East Wall; and 3) Planning, Permitting, and Design of New Public Works Building.

### EPA Grant for Removal of Derelict Vessels

The City must apply for a grant from the Environmental Protection Agency in order to secure the $5.018 million appropriation from Senator Murkowski's Office.

### State Homeland Security Program Grant

I will prepare and submit three equipment requests for the City's State Homeland Security Program Grant application: 1) Port of Bethel cameras, 2) security cameras for Police Station, and 3) card reader system for Police Station doors.

### State Revolving Loan Fund

I am preparing three Questionnaires for three projects: 1) Sewer Haul Truck, 2) Water Haul Truck, and 3) Q2 Lift Station Rehabilitation. The City is hopeful that the loan requests result in an allocation of forgiveness money for one or more projects.

## Grant Administration

### Health & Equitable Communities Grant

As the City's Healthy & Equitable Communities grant drew to a close on December, 31, 2024, the City obtained permission to spend the balance of $959.16 on floating dumbell weights and floating punching bags for the pool. Stacey Reardon made the purchase before the deadline. The City used this grant to purchase and install two playgrounds in Bethel, purchase a volleyball net, and exercise equipment for the fitness center. The City also contributed $13,500 in grant funds to the Winter House. This grant was a COVID-19 inspired grant that the City chose to use to support healthy outdoor and indoor recreation and fitness activity.

### Current Grants

See list on following pages.

**City of Bethel Current Grants**

| # | Grant | Amount | Expiration |
|---|---|---|---|
| 1 | **Coronavirus Capital Project Fund** | $ 9,000,000 | 12/31/2026 |
| | Design and construction of Bethel Multiuse Community Center (gym, computer facilities). This fund has yet to be tapped for design/construction costs. | | |
| 2 | **Denali Commission Grant** | $ 500,000 | 9/30/2026 |
| | Design and construction of Bethel Multiuse Community Center (gym, computer facilities). This fund has yet to be tapped for design/construction costs. | | |
| 3 | **CSP - DHSS FY 2025** | $ 323,081 | 6/30/2025 |
| | The new report asks for verification that the CSP program saves lives of those unable to care for themselves. | | |
| 4 | **23SHSP-GY23 – Virtual Simulator & Fencing** | $ 268,000 | 9/30/2025 |
| | The City must complete the Environmental, Historical and Preservation documents necessary for | | |
| 5 | **Coronavirus Local Fiscal Recovery Fund (ARPA)** | $ 3,361,604 | 12/31/2024 |
| | The City must spend the remaining grant funds by December 31, 2024. The construction of the Chemical Storage Building and engineer fees are expected to consume the grant balance. | | |
| 6 | **Designated Legislative Grant > YK Fitness Center Gym/Track Design** | $ 500,000 | 6/30/2026 |
| | DOWL, LLC and Architects Alaska are working on the 65% design of the new Community Center to be attached to the YK Fitness Center. The City needs about $3.5 million in additional funds to cover the construction cost revealed at the 35% Design stage. A cost estimating firm was hired to complete an independent cost estimate at the 95% Design stage. | | |
| 7 | **Designated Legislative Grant > Public Safety Communication Tower** | $ 500,000 | 6/30/2028 |
| | STG, Inc. is nearly complete with the installation of the Public Safety Communications Tower. | | |
| 8 | **Designated Legislative Grant > Dust Control** | $ 1,200,000 | 6/30/2029 |
| | City will make purchases that include hydroseeder equipment, calcium chloride, and gravel. | | |
| 9 | **State and Local Cybersecurity Grant Program (SLCGP)** | $ 75,000 | 9/30/2026 |
| | The City of Bethel plans to hire a consultant to conduct a cybersecurity review of the City's IT network, equipment, software, and physical layout. The City plans to use recommendations in the plan as grant requests next year. | | |
| 10 | **Healthy & Equitable Communities Funding** | $ 242,057 | 12/31/2024 |
| | I will prepare and submit the final progress report and final financial report in January 2025. The City is preparing to close this grant by December 31, 2024. | | |
| 11 | **VSW Capital Improvement Project Grant** | $ 13,860,000 | |
| | City hired Sturgeon Electric to complete the water treatment plant improvements. These improvements are necessary to make the plant ready to connect water pipes to the new school and the Martina Oscar Subdivision. | | |

| | | | |
|---|---|---|---|
| 12 | **APEI Safety Grant** | $ 5,000 | 9/30/2025 |
| | The City's Streets and Roads Division purchased orange cones and barricades to keep workers and the public safe during road work. | | |
| 13 | **Last Frontier Housing Initiative** | $ 5,000,000 | 12/31/2026 |
| | Alaska Housing Finance Corporation is the grantor. City hired Urban KNKT to construct and operate three rental units to serve low-income residents. The City hired Kuqo Construction to construct three professional housing two-bedroom units. | | |
| | | | |
| 14 | **State Homeland Security Program Grant - SFY 25** | $ 9,000 | 9/30/2026 |
| | This grant will cover the cost of paying a trainer to come to Bethel to teach ICS-300, an Incident Command System course for first responders and municipal administrators who may play a role in a major emergency situation. | | |
| 15 | **Safe Streets 4 All Grant** | $ 52,800 | TBD |
| | The City was awarded a grant to pay DOWL to develop a Safety Action Plan for the community of Bethel. Infrastructure, equipment, road signs, and other hardware recommended in the safety plan become eligible for funding in the next Safe Streets 4 All grant opportunity. | | |
| 16 | **Justice Assistance Grant (JAG)** | $ 11,116 | 9/30/2025 |
| | Security cameras and access control system installation at Police Station. The City is applying for Homeland Security grant funds to match this grant for the full purchase of cameras and card reader equipment. | | |
| 17 | **Energy Efficiency and Conservation Block Grant (EEBG)** | $ 75,220 | 9/30/2026 |
| | Solar panel installation on YK Fitness Center. | | |
| 18 | **Rasmuson Foundation Grant** | $ 250,000 | TBD |
| | This grant will cover part of the cost of constructing a new animal shelter in Bethel. | | |

Total $ 35,787,416

# MEMORANDUM

Date: January 2, 2025
To: Lori Strickler, City Manager
From: Lee Foley. Planning Director
Subject: Planning Director's December 2024 Report

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December 2024 Events

- Property Issues/Public Nuisance Updates
  1. 244 Akiak – Owner in non-compliance
  2. 410 Owl Street – Landlord lives in Billings, Montana. Certified letter received but no response to date
  3. 229 Akiak – Owner in non-compliance
  4. 808 Ptarmigan Road – Owner in non-compliance
  5. 800 & 800A Tundra Road – Owner in non-compliance
  6. 236 Akiak – Nuisance issues being corrected
  7. 9330 Nengqerralria – Owner in non-compliance
  8. 1111 Uivik – Certified letter received but no response
  9. IPHC – Alaska 4th & Main – No updates
  10. 9316 Nengqerrarlia Drive – Still trying to determine ownership
  11. Abandoned Home on 6th Avenue with no address: Nuisance issues Corrected. Case closed
  12. 017 A, B, & C Kwethluk – Sent certified letter to possible owner in Las Vegas, Nevada, but the letter came back undelivered.
  13. 140 Togerson – Owner in non-compliance
  14. 621 Setter – Owner in non-compliance

Planning will work with the City Attorney and City Manager to bring the cases of non-compliant owners before the City Council for initial resolution.

- Site Plan Permits – No Site Plan Permit Applications for December 2024

- Planning Commission – Provided updates on property issues/public nuisances, Blue Sky Subdivision open space/park use, and proposed creation of new City Park on Fifth Avenue

- Abandoned Vehicles – Addressed in nuisance letters

- Vacancies – Fully staffed

- Large Projects:
  1. Ptarmigan Street Encroachments – No updates
  2. City of Bethel Professional Housing Project – Checked site 01/02/25. The external appearance of buildings has not changed. All possible entrances are boarded up and no one was on the site so I could not view the internal spaces.
  3. AC Store Construction – No updates

# PORT OF BETHEL

Post Office Box 1388
Bethel, Alaska 99559
Voice: 907-543-2310
Fax: 907-543-2311

To: Lori Strickler, City Manager

From: Edward Flores, Port Director

Subject: December 2024 Managers Report

- **Small Boat Harbor**
  December was a quite month for the Small Boat Harbor. Vehicles in the harbor is at zero to one at anytime. We have worked for the past few winters to clear out all the vehicles during the off season. hopefully the weather has been cold enough to make sufficient ice in the harbor, next week we are planning on checking the ice to see if we can start work on the approaches. We will start with the northwesternmost approach the week of the 7th of January.

- **City Dock/Beach 1/Petro Port**
  The City Dock and Beach 1 are at their slowest points of the year. I believe we had maybe three companies access the dock and beach 1 this last month. Bowhead Transport's footprint on the dock is spread out more than what they would like but this is due to lack of stackable equipment on their part. I have talked with the company and they are trying to get a representative out here to try and lessen their footprint, for the Port it is a non issue we can work around their stuff without a problem.
- **Port Office**
  The port office is running well. We have no issues with connectivity or heat. Building Maintenance Has turned on the second boiler, so now we are running both boilers for the winter months. We did have an incident where one of the boilers went down near the end of last year, but building Maintenance took care of the problem and it is resolved now. we will be spreading ice melt as needed for foot traffic around the office.

- **Admin**
  Our monthly storage is prepared and will leave the Port office this first week of January.. The Port Commission did not meet in December, Our next scheduled meeting will be at 7 p.m. on January 20th, 2024. At City Council Chambers.

- **Misc.**
  We do have a couple of ramps for the small boat harbor that need to be worked on, we have identified ones that need the most work and have taken the first one to the sand shed to be assessed and fixed. And when that one is done we will bring the next one down.
  The Port has been helping out with the mail since the last half of November and will continue to do so for the rest of the month of January. We will be working on an RFP for the floats in the Harbor.

BETHEL TRANSIT SYSTEM

03 JAN 2025

Happy New Year!

Bethel Transit System has been a busy year. Both buses (439 & 440) were getting to be on their last legs. After a site visit from both state and federal representatives, I was told that the primary bus 440 which was in operation had to have a backup. The Maintenance crew did an awesome job making 439 operable. Both buses had many Bethel miles on them, which made them rattle a lot mainly from the chairlifts.

Huge thanks go to John Sargent, who made it all possible with FTA grant funds for the City to purchase 2 new buses which Transit desperately needed. Both buses arrived at the last barge in September 2024. After the maintenance inspection, TS 1 made its first debut on 04 OCT 2024. TS 2 will be a back up. I have received a lot of good comments from the riders regarding the new buses.

Here are the following numbers for the year 2024. 7,352 Elders, 186 Youth, 1,124 Adults, 1,196 Disabled, and 14,255 Pass riders. Total for all riders is 24,113.

1,211 Day and 189 Month passes were purchased and Transit profited $25,433.00.

The annual road miles were 23,592 and fuel purchased was 3,193.736 gallons

Looking for to 2025. Thank you.

Regards,

Evon A. Fox, Jr.

Transit Manager

# City of Bethel, Alaska

## City Clerk's Office

**Council Meetings this month**

January 6, 2025 Special City Council Meeting
January 14, 2025 Regular City council Meeting
January 28, 2025 Regular City Council Meeting
Possible Joint meeting with ONC (TBA)

**City Clerk's Office**

-The Clerk's Office received a renewal of license notice from the Alcohol Marijuana Control Board for Essenkay LLC, doing business as Kusko Kush. The Administrative Review is scheduled for the January 14, 2025 meeting. The deadline for the Council to protest the renewal is February 3, 2025.
- The Clerk's Office received a renewal of license notice from the Alcohol Marijuana Control Board for Good Vibes LLC, doing business as Good Vibes Bethel. The Administrative Review is scheduled for the February 11, 2025 meeting. The deadline for the Council to protest the renewal is March 6, 2025.
- Coordinating travel for Council Members to attend the Alaska Municipal League Winter Conference in Juneau.
- Reviewing the committee/commission memberships and notifying those whose terms are expiring. Members who wish to remain on their committee/commissions have until January 30, 2025 to reapply.
- Earned a Certified Municipal Clerk Certificate from the International Institute of Municipal Clerks.
- The Clerk's Office was closed December 24-27th, and December 31-January 3rd; personal leave.

| Task | Period Total | Year to Date Total (ending Jan. 7th, 2025 |
|---|---|---|
| Passport Appointments | 4 | 78 |
| Burial Permits/Reservations | 2 | 47 |
| Notary Services | 1 | 32 |
| Meeting Minutes Drafted | 1 | 27 |
| Resolutions Drafted | - | 8 |
| Ordinances Drafted | - | 2 |
| AM/IM Drafted | 2 | 10 |

| **Committee/Commission Vacancies** | **Regular** | **Alternate** |
|---|---|---|
| Community Parks and Recreation Committee | 1 | 2 |
| Planning Commission | full | 2 |
| Port Commission | 1 | 2 |
| Public Safety and Transportation Commission | 2 | 2 |
| Community Action Grant Technical Review Board | 3 | 2 |
| Public Works Committee | 4 | 2 |
| Finance Committee | 5 | 2 |
| Ethics Board | 3 | 1 |


cityclerk@cityofbethel.net
907-543-1384