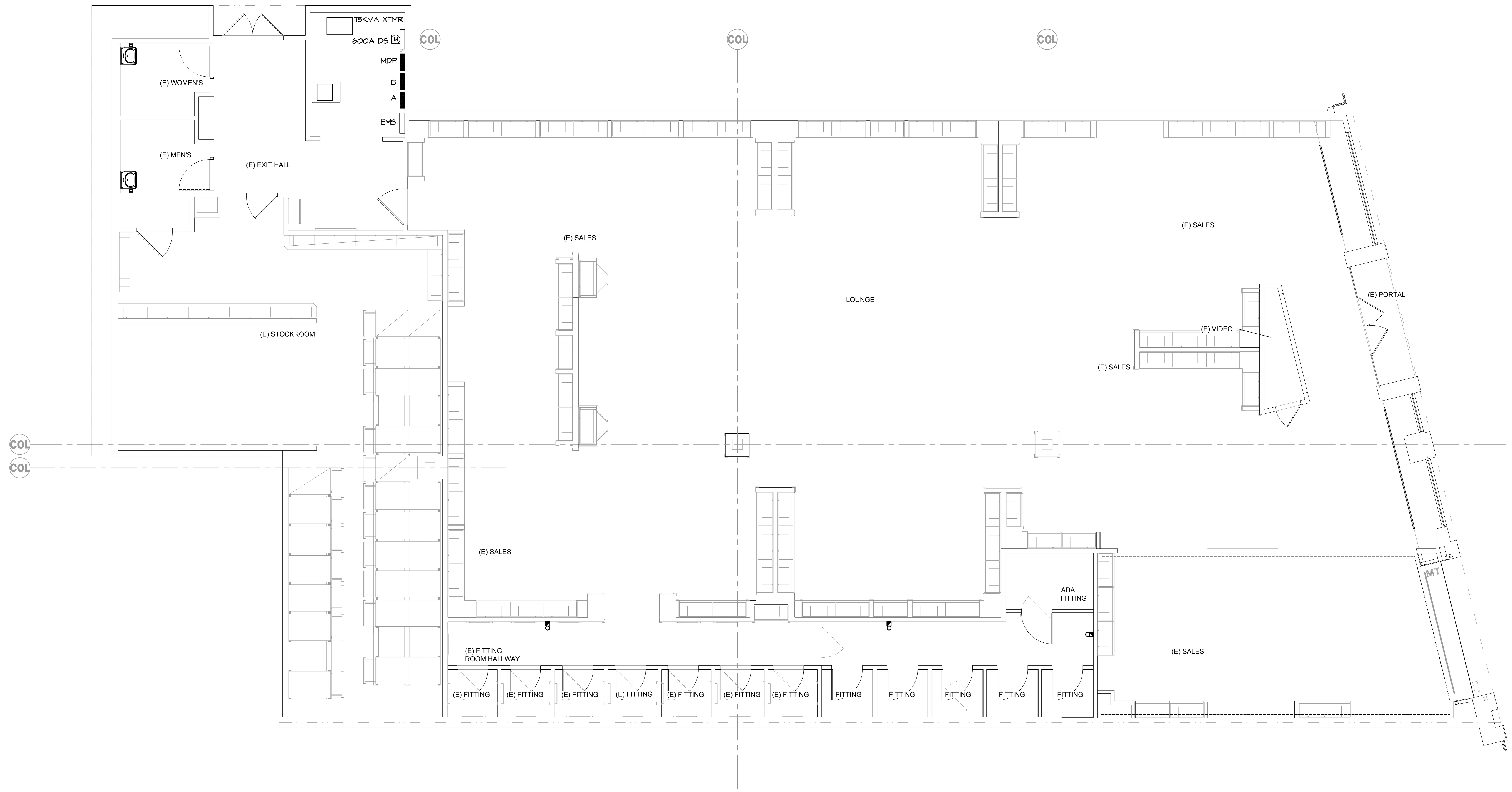


N

FIRE ALARM PLAN

SCALE: 3/16"=1'-0"

GENERAL NOTES

A. THE FIRE ALARM SYSTEM MUST BE INSTALLED IN ACCORDANCE WITH PLANS AND SPECIFICATIONS AND MUST MEET ALL STATE & LOCAL CODE REQUIREMENTS. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ALL CODE REQUIRED DOCUMENTS INCLUDING, BUT NOT LIMITED TO THE FOLLOWING:
  1. A FLOOR PLAN WHICH INDICATES THE USE OF ALL ROOMS.
  2. LOCATIONS OF ALARM-INITIATING AND NOTIFICATION APPLIANCES.
  3. ALARM CONTROL AND TROUBLE SIGNALING EQUIPMENT.
  4. ANNUNCIATION.
  5. POWER CONNECTION.
  6. BATTERY CALCULATIONS.
  7. CONDUCTOR TYPE AND SIZES.
  8. VOLTAGE DROP CALCULATIONS.
  9. MANUFACTURERS, MODEL NUMBERS AND LISTING INFORMATION FOR EQUIPMENT, DEVICES AND MATERIALS.
  10. DETAILS OF CEILING HEIGHT AND CONSTRUCTION.
  11. THE INTERFACE OF FIRE SAFETY CONTROL FUNCTIONS.
  12. THESE DOCUMENTS MUST BE PREPARED, AND STAMPED AND SIGNED, BY A CERTIFIED FIRE ALARM DESIGNER AND MUST BE SUBMITTED TO THE LOCAL AUTHORITIES FOR REVIEW AND APPROVAL PRIOR TO START OF WORK.

B. A STAMPED SET OF APPROVED FIRE ALARM DRAWINGS SHALL BE AT THE JOB SITE AND SHALL BE USED FOR INSTALLATION.

C. UPDATE AN AS-BUILT DRAWING SET DAILY WITH JOB PROGRESS. PROVIDE AN AS-BUILT DRAWING SET TO OWNER NO LATER THAN 7 DAYS AFTER FINAL TEST.

D. EQUIPMENT: ALL DEVICES, COMBINATIONS OF DEVICES, APPLIANCES AND EQUIPMENT SHALL BE LISTED FOR THE PURPOSE FOR WHICH THEY ARE USED AND SHALL BE INSTALLED IN COMPLIANCE WITH APPLICABLE CODES, STANDARDS AND MANUFACTURER'S INSTRUCTIONS.

E. SYSTEM DEVICES, BACK-BOXES, AND ENCLOSURES MUST BE RATED FOR THE ENVIRONMENT WHICH IT IS INSTALLED. FURNISH AND INSTALL CONDUIT SEALS WHERE RACEWAYS PASS BETWEEN CONDITIONED AND UNCONDITIONED SPACES.

F. NOTIFICATION DEVICE COVERS SHALL BE WHITE WITH RED LETTERING, UNLESS OTHERWISE REQUIRED.

G. ALL WIRING SHALL BE IN CONDUIT, UNLESS DIRECTED OTHERWISE. DO NOT RUN ANY OTHER WIRING IN THE SAME CONDUIT WITH ALARM WIRING. DO NOT RUN 120VAC WIRING WITH ALARM WIRING. ALL WIRE TO BE SHIELDED CABLE. ALL J-BOXES ASSOCIATED WITH THE SUPERVISORY ALARM SYSTEM SHALL BE SPRAY PAINTED "FIRE ENGINE" RED.

H. ALL WIRE & CABLE MUST BE RATED PER THE LATEST REVISION OF THE NATIONAL ELECTRIC CODE SECTION 760.

I. CONFIRM ALL WIRING REQUIREMENTS WITH THE MANUFACTURER OF THE PROPOSED FIRE ALARM EQUIPMENT BEING FURNISHED PRIOR TO BID AND PROVIDE IN ACCORDANCE THEREWITH. WIRING SHOWN ON THIS DIAGRAM REPRESENTS THE MINIMUM SIZE REQUIRED. WIRE SIZES SHALL BE INCREASED AS REQUIRED FOR VOLTAGE DROP.

J. FIRE ALARM CIRCUITS SHALL BE IDENTIFIED IN ACCORDANCE WITH APPROPRIATE SECTION OF NEC 760. MARK ALL FIRE ALARM WIRES IN ACCORDANCE WITH NEC 760 SECTIONS FOR POWER LIMITED AND NON-POWER LIMITED WIRE.

K. WIRING SHALL BE CONTINUOUS FROM ONE DEVICE TO THE NEXT. SPLICING IS PROHIBITED.

L. THE TYPICAL WIRING DIAGRAM IS NOT INTENDED TO SHOW QUANTITIES OF DEVICES. REFER TO PLANS FOR QUANTITIES.

M. WHERE PROPOSED ROUTING OF SYSTEM CONDUIT AND WIRING IS INDICATED ON PLANS, DETAILS AND DIAGRAMS, SAID ROUTING IS DIAGRAMMATIC. EXACT ROUTING OF CONDUITS AND WIRING TO BE DETERMINED IN THE FIELD BY THE INSTALLING CONTRACTOR TO SUIT CONDITIONS. INSTALLATION SHALL COMPLY WITH CODE AND PROJECT REQUIREMENTS. ALL MODIFICATIONS SHALL BE CLEARLY INDICATED ON THE RECORD DRAWINGS.

N. ALL CONDUCTORS INCLUDING SHIELDS MUST TEST FREE OF OPENS, SHORTS & GROUNDS BEFORE MAKING CONNECTIONS TO THE FIRE ALARM CONTROL PANEL.

O. EACH FIRE ALARM PANEL AND ANCILLARY EQUIPMENT REQUIRES A DEDICATED 120VAC CIRCUIT. RUN 3-#12 (INCLUDES THE GREEN GROUND WIRE) FROM A 20 AMP CIRCUIT BREAKER. PROVIDE A LOCK-ON CLIP & RED MARKING ON THE BREAKER AND IDENTIFY AS "FIRE ALARM CIRCUIT CONTROL." THE LOCATION OF THE CIRCUIT DISCONNECTING MEANS (CIRCUIT BREAKER) SHALL BE PERMANENTLY IDENTIFIED AT THE FIRE ALARM CONTROL PANEL AND ANCILLARY EQUIPMENT.

P. DO NOT APPLY POWER TO SYSTEM EXCEPT IN THE PRESENCE OF A FACTORY TRAINED TECHNICAL REPRESENTATIVE.

Q. INSTALLATION OF SYSTEM DEVICES SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. POWER LIMITED AND NON-POWER LIMITED FIELD WIRING MUST BE INSTALLED WITHIN EQUIPMENT ENCLOSURES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND NEC

R. SMOKE DETECTOR SOUNDER BASES AND SPEAKER/HORN/STROBES FOR SLEEPING AREAS SHALL UTILIZE A LOW FREQUENCY SOUNDER WITH A 520HZ(+/-10%) SQUARE WAVE IN COMPLIANCE WITH NFPA 72 SECTION 18.4.5.

S. STROBES SHALL BE WIRED SEPARATELY FOR SYNCHRONOUS OPERATION. PROVIDE SYNCHRONIZATION MODULES AS REQUIRED TO COMPLY WITH CODE.

T. SMOKE DETECTOR HEADS MUST BE INSTALLED FREE OF DUST OR ANY OTHER CONTAMINATION. SMOKE DETECTORS SHALL NOT BE MOUNTED WITHIN 3'-0" OF A SUPPLY OR RETURN AIR GRILLE. COORDINATE SMOKE DETECTOR LOCATIONS WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION.

U. IN ALL ROOMS REQUIRING SMOKE DETECTION, IF THERE IS NOT A SMOOTH, FLAT CEILING, THEN DETECTION SHALL BE SPACED PER NFPA 72. IF THERE ARE BEAM DEPTHS LESS THAN 10% OF THE CEILING HEIGHT (0.1 X H), SMOOTH CEILING SPACES SHALL BE PERMITTED. IF THERE ARE BEAM DEPTHS EQUAL OR GREATER THAN 10% OF THE CEILING HEIGHT (0.1 X H), AND THE BEAM SPACING IS EQUAL TO OR GREATER THAN 40% OF THE CEILING HEIGHT (0.4 X H), SPOT SMOKE DETECTORS SHALL BE LOCATED ON THE CEILING IN EACH BEAM POCKET PER NFPA 72 2007, 5.7.3.2.4.

V. DUCT DETECTORS SHALL HAVE REMOTE TEST STATIONS INSTALLED IN AN ACCESSIBLE LOCATION AND BE CLEARLY LABELED TO INDICATE THEIR FUNCTION AND THE MECHANICAL UNIT ASSOCIATED WITH EACH DETECTOR. DUCT DETECTOR TEST STATIONS SHALL BE LOCATED AS CLOSE TO THE APPLIANCES AS POSSIBLE FOR EASE IN LOCATING AND UNLESS ASSOCIATED WITH ROOF TOP MECHANICAL UNITS.
  1. IF THERE IS A DROP CEILING, THE REMOTE TEST STATIONS SHALL BE MOUNTED IN CEILING TILES BELOW THE DUCT DETECTORS.
  2. IF THERE IS A HARD CEILING, THE REMOTE TEST STATIONS SHALL BE LOCATED IN THE CEILING NEXT TO A MINIMUM OF A 2'x4' OR 3'x3' ACCESS PANEL LOCATED BELOW THE DUCT DETECTOR.
  3. IF THERE IS NO CEILING, THE REMOTE TEST STATIONS SHALL BE MOUNTED ON A PILLAR OR WALL AS CLOSE TO THE DEVICE AS POSSIBLE.

W. THE LOCATION OF ALL DETECTORS IN AIR DUCT SYSTEMS SHALL BE PERMANENTLY AND CLEARLY IDENTIFIED AND RECORDED.

X. ALL DETECTORS NOT ACCESSIBLE STANDING AT FINISHED FLOOR SHALL BE PROVIDED WITH A REMOTE TEST SWITCH WITH INDICATOR LIGHT. LOCATIONS OF ALL FIRE ALARM REMOTE TEST STATIONS SHALL BE LABELED PER LOCAL LOCAL AUTHORITY REQUIREMENTS. TEST STATION LOCATIONS SHALL BE FIELD VERIFIED WITH LOCAL AUTHORITY PRIOR TO ROUGH-IN.

Y. DUCT DETECTORS SHALL BE INSTALLED AND POSITIONED TO ALLOW EASY ACCESS FOR PERIODIC INSPECTION AND TESTING.

Z. FURNISH AND INSTALL A KNOX BOX AS REQUIRED BY LOCAL FIRE DEPARTMENT. EXACT QUANTITIES AND LOCATIONS AS DETERMINED BY LOCAL AUTHORITY. KNOX BOX MANUFACTURER SHALL BE AS REQUIRED BY LOCAL AUTHORITY. PROVIDE AN ADDRESSABLE MONITOR MODULE WHEN REQUIRED.

AA. THE FIRE ALARM SUPPLIER SHALL PROVIDE A COPY OF THE PROGRAMMING CODES AND OPERATION MANUALS IN A SLEEVED BINDER ATTACHED TO THE FIRE ALARM CONTROL PANEL.

AB. PROVIDE CONNECTION TO REMOTE SUPERVISION AS DIRECTED FOR SUPERVISION OF SYSTEM IN COMPLIANCE WITH LOCAL AUTHORITY & OWNER. PROVIDE ALL INTERFACE REQUIRED TO INITIATE REMOTE SUPERVISION.

AC. PROVIDE & INSTALL A CEILING MOUNTED SMOKE DETECTOR IN FRONT OF FIRE ALARM CONTROL PANEL AND EACH REMOTE MOUNTED AUXILIARY PANEL IN ADDITION TO THE DEVICES SHOWN ON THE FLOOR PLANS.

AD. PROVIDE & INSTALL MANUAL STATIONS WHERE REQUIRED BY LOCAL AUTHORITIES TO MEET THE REQUIREMENTS OF NFPA-72 SECTION 3-8.1.2 IN ADDITION TO THE DEVICES SHOWN ON THE PLANS. VERIFY WITH LOCAL AUTHORITY PRIOR TO BIDDING & INDICATE COST IN BID PRICE.

AE. INCLUDE ON-SITE SERVICES OF A CERTIFIED TECHNICIAN TO PROVIDE TECHNICAL INSTALLATION SUPPORT FOR EQUIPMENT START UP, PROGRAM EDITING, TROUBLESHOOTING OF THE SYSTEM, AND ASSISTANCE TO THE INSTALLER FOR ONE COMPLETE FINAL SYSTEM CHECKOUT.

AF. THE COMPLETED FIRE ALARM SYSTEM SHALL BE FULLY TESTED IN ACCORDANCE WITH NFPA-72, AND LOCAL AND STATE CODE REQUIREMENTS, BY THE INSTALLER, IN THE PRESENCE OF THE G.C., OWNER'S REPRESENTATIVE AND AUTHORITY HAVING JURISDICTION. UPON COMPLETION OF A SUCCESSFUL TEST, THE INSTALLER SHALL SO CERTIFY, IN WRITING, TO THE OWNER AND GENERAL CONTRACTOR.

SYMBOL LEGEND

SYMBOL	DESCRIPTION
(strobe symbol)	FIRE ALARM STROBE

HOLLISTER CALIFORNIA

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NEW ALBANY, OHIO 43054
614-283-6500

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Project # - 01202631.25

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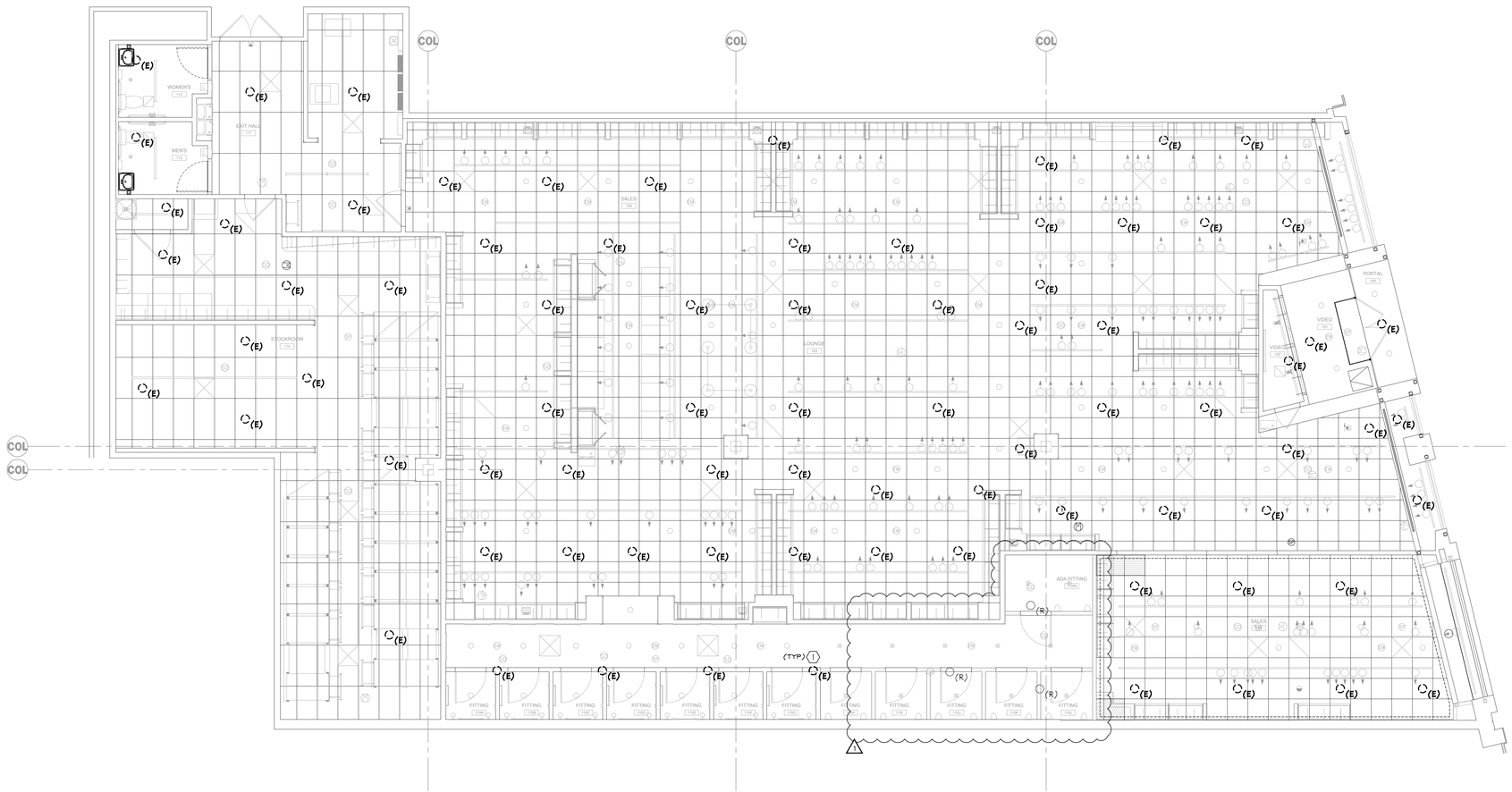
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Project No.: 260387
Drawn By: MJF

Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

FIRE ALARM PLAN

FA2.00



N

FIRE SPRINKLER HEAD PLAN

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

FIRE SPRINKLER GENERAL NOTES

A. EQUIPMENT AND INSTALLATION

1. SPRINKLER HEADS:
   - A. ALL SPRINKLER HEADS SHALL BE NEW (HEADS IN EXISTING STORES ARE NOT TO BE REPLACED UNLESS NOTED OTHERWISE). HEADS SHALL BE U.L., F.M. LISTED AND APPROVED AUTOMATIC SPRAY TYPE AS MANUFACTURED BY CENTRAL SPRINKLER CO., GLOBE, GRINNELL, RELIABLE, STAR, OR VIKING.
   - B. ALL SPRINKLER HEADS SHALL BE RATED FOR 165°F UNLESS INDICATED OTHERWISE ON DRAWINGS OR REQUIRED BY LOCAL CODES.
   - C. ALL SPRINKLER HEADS ARE TO HAVE A FACTORY APPLIED COLOR FINISH. VERIFY HEAD TYPES AND COLORS WITH BRAND CONSTRUCTION MANAGER AND SUBMIT WITH SPRINKLER DRAWINGS FOR PERMIT.
   - D. SPRINKLER HEAD TYPES SHALL BE AS FOLLOWS:
     1. "SALES" AREA SPRINKLER HEADS ARE TO BE FLAT OR MATTE BLACK UPRIGHT PENDANT HEADS WITH FLAT OR MATTE BLACK ESCUTCHEON. BASED ON RELIABLE AND ALTERNATE MAY BE VIKING OR GRINNELL AND MUST BE APPROVED BY THE OWNER'S CONSTRUCTION MANAGER PRIOR TO ORDERING AND ANY INSTALLATIONS. ALL EXPOSED PIPING SHALL BE PAINTED BLACK IN COLOR AND MUST BE COORDINATED WITH ALL TRADES.
     2. "NON-SALES" AREA SPRINKLER HEADS ARE TO BE WHITE UPRIGHT PENDANT HEADS WITH WHITE ESCUTCHEON. BASED ON RELIABLE AND ALTERNATE MAY BE VIKING OR GRINNELL.
     3. "NON-SALES" OFFICE AND LAVATORY AREA SPRINKLER HEADS ARE TO BE SEMI RECESSED TYPE WITH WHITE ESCUTCHEON.
     4. "MALL BULKHEAD" AREA SPRINKLER HEADS ARE TO BE FULLY CONCEALED ADJUSTABLE SCREW TYPE WITH WHITE COVER PLATE.
2. PIPING:
   - A. SCHEDULE 40, BLACK STEEL PIPE, ASTM A-53 FOR FERROUS PIPING, WELDED AND SEAMLESS, ANSI B-36-10-70 FOR WROUGHT STEEL PIPE.
   - B. CAST IRON OR MALLEABLE IRON SCREWED FITTINGS FOR PIPES 2 INCHES AND SMALLER. SCREWED OR CAST IRON FLANGED JOINTS FOR PIPES LARGER THAN 2 INCHES.
   - C. GALVANIZED OR BLACK MALLEABLE IRON WITH BRASS SEAT SCREWED UNIONS FOR PIPES 2 INCHES AND SMALLER.
   - D. VICTUALIC TYPE COUPLINGS ARE ACCEPTABLE, WHERE APPROVED BY CODE AND THE LANDLORD.
   - E. ALL SPRINKLER PIPING THAT IS EXPOSED SHALL BE CLEANED & PRIMED FOR PAINT APPLICATION.
3. A FIRE PROTECTION SYSTEM TAP IS NORMALLY FURNISHED BY THE LANDLORD. VERIFY IN FIELD PRIOR TO BID. SPRINKLER SPACING SHALL NOT EXCEED 130 SQ. FT. IN "SALES" AREAS AND 100 SQ. FT. IN "STOCK" AREAS. COMPLY WITH LANDLORD'S DESIGN CRITERIA AND LOCAL CODES IF MORE STRINGENT. PIPE SIZING SHALL BE BASED ON NFPA 13 ORDINARY HAZARD CLASSIFICATION.
4. ALL SPRINKLER LINES SHALL BE INSTALLED CONCEALED, AVOIDING INTERFERENCE WITH LIGHTS, DUCTS, PIPES, STORAGE DECK, ETC. FIRE PROTECTION CONTRACTOR SHALL PREPARE COORDINATED SHOP DRAWINGS INDICATING THE LOCATIONS OF ALL SPRINKLER HEADS, SPRINKLER LINES, LIGHTS, DIFFUSERS, GRILLES AND REGISTERS PRIOR TO INSTALLATION.
5. WHERE POSSIBLE, REWORK THE EXISTING SPRINKLER SYSTEM TO MEET THE NEW REQUIREMENTS OF THIS DESIGN. RELOCATE ALL MAINS AND BRANCHES INTERFERING WITH CEILING HEIGHTS, EQUIPMENT, AND MAJOR COMPONENTS INCLUSIVE OF ADJACENT TENANTS AND MALL COMMON AREAS. REMOVE ALL UNUSED PIPING.
6. FURNISH AND INSTALL A VALVED TEST CONNECTION IN AN ACCESSIBLE LOCATION FOR THE SPRINKLER SYSTEM AS REQUIRED OR REQUESTED BY THE MALL, LOCAL INSPECTOR, OR INSURANCE CARRIER. COORDINATE LOCATION WITH LOCAL FIRE PROTECTION OFFICIAL PRIOR TO ROUGH IN.
7. PROPERLY COMPLETED AND SIGNED "SPRINKLER CONTRACTOR'S MATERIAL AND TEST CERTIFICATES" SHALL BE FURNISHED TO THE LANDLORD, AUTHORITIES HAVING JURISDICTION, AND HOLLISTER'S CONSTRUCTION MANAGER.
8. SPRINKLER HEADS LOCATED IN CEILINGS OR WALLS BELOW 8'-0" ABOVE THE FINISHED FLOOR AND ABOVE STORAGE DECKS ARE TO BE CONCEALED.
9. FURNISH AND INSTALL 10 LB. TYPE "ABC" FIRE EXTINGUISHERS, WITH CABINETS IF REQUIRED, AND AT LEAST A "2A10BC" RATING. LOCATIONS TO BE ESTABLISHED IN THE FIELD BY THE LOCAL FIRE PROTECTION OFFICIAL. MAXIMUM TRAVEL DISTANCE BETWEEN EXTINGUISHERS SHALL BE 75 FEET OR LESS AS REQUIRED BY LOCAL CODES.
10. SPRINKLER CONTRACTOR IS RESPONSIBLE FOR THE ENTIRE SPRINKLER SYSTEMS. WATER TIGHT INTEGRITY UNTIL SUCH TIME AS HOLLISTER OCCUPIES THE FACILITY. ANY WATER DAMAGE PRIOR TO THIS TIME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
11. PROVIDE SPRINKLER HEADS (UP RIGHT) ABOVE THE CEILING IN CONCEALED SPACES HAVING EXPOSED COMBUSTIBLE CONSTRUCTION.
12. ALL FIRE PROTECTION EQUIPMENT ESSENTIAL TO SUCCESSFUL SYSTEM OPERATION SHALL BE UL LISTED FOR FIRE PROTECTION SERVICE.
13. ALL VALVES CONTROLLING WATER SUPPLIES SHALL BE PROVIDED WITH TAMPER SWITCHES (SEE NOTE E).
14. THE FIRE SPRINKLER SYSTEM SHALL BE SUPERVISED BY AN APPROVED CENTRAL STATION, PROPRIETARY STATION, OR REMOTE STATION MONITORING SYSTEM IN ACCORDANCE WITH N.F.P.A. 72, AND LOCAL AUTHORITY HAVING JURISDICTION.
15. THE FIRE PROTECTION CONTRACTOR SHALL COORDINATE WIRING OF ALL ELECTRICAL FIRE PROTECTION DEVICES AND EQUIPMENT WITH THE ELECTRICAL AND/OR FIRE ALARM CONTRACTOR. ALL FIRE ALARM WIRING BY ELECTRICAL CONTRACTOR. ALL DEVICES SHALL BE FURNISHED AND INSTALLED BY THE FIRE PROTECTION CONTRACTOR.
16. THE FIRE PROTECTION CONTRACTOR SHALL COORDINATE THE LAYOUT OF THE FIRE PROTECTION SYSTEM WITH ALL TRADES AND ARCHITECTURAL REFELECTED CEILING PLAN PRIOR TO INSTALLATION.
17. THE FIRE PROTECTION CONTRACTOR SHALL CENTER (WITHIN 1") ALL PENDENT SPRINKLER HEADS INSTALLLED IN ACOUSTICAL LAY-IN CEILING TILES. ALL SPRINKLER HEADS IN CEILINGS SHALL BE SYMMETRICAL WITH LIGHTING AND AIR DEVICES. SPRINKLER HEADS ARE REQUIRED ABOVE THE CEILING IN ALL AREAS OF CONCEALED SPACES.
18. A LANDLORD APPROVED FIRE PROTECTION CONTRACTOR SHALL BE EMPLOYED BY THE MECHANICAL CONTRACTOR TO PERFORM ALL SPRINKLER SYSTEM MODIFICATIONS.
19. PROVIDE O.S. & Y. VALVE, FLOW SWITCH AND TAMPER SWITCH AT CONNECTION(S) TO LANDLORD'S SPRINKLER MAIN.
20. WHENEVER POSSIBLE ALIGN SPRINKLER HEADS WITH LIGHT FIXTURES, AIR DEVICES AND TO CENTER OF TILE. THE PATTERN IN EACH ROOM SHALL BE CONSIDERED INDEPENDENT OF OTHER ROOMS.
21. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR CEILING HEIGHTS AND GENERAL COORDINATION.
22. ROUTE ALL PIPING AROUND ELECTRICAL PANELS. COORDINATE WITH ELECTRICAL CONTRACTOR.
23. PROVIDE SPRINKLER HEADS GUARDS IN ALL LOCATIONS SUBJECT TO DAMAGE.
24. THE INTENT OF THIS PLAN IS TO INDICATE THE GENERAL LAYOUT OF THE SPRINKLER HEAD LOCATIONS. FIRE PROTECTION CONTRACTOR IS RESPONSIBLE FOR THE EXACT LOCATION OF ALL SPRINKLER HEADS AND TYPES OF HEADS USED.
25. SPRINKLER PIPES FEEDING COVERAGE BELOW STORAGE DECKS ARE TO BE FED BY ROUTHING LINES DOWN FULL HEIGHT WALLS AROUND PERIMETER OF DECK. FULL OPEN CLEARANCE OF STORAGE DECK IS TO BE MAINTAINED.
26. HYDRAULIC DESIGN CRITERIA FOR LIGHT HAZARD AREAS:

DENSITY:	0.10 GPM/SQ.FT
DESIGN AREA:	MOST DEMANDING 1500 SQ. FT.
MAX SPRINKLER COVERAGE:	225 SQ. FT./HEAD (130 SQ. FT. FOR DRY SYSTEM)
HOSE DEMAND:	100 GPM
DURATION:	30 MINUTES

27. ORDINARY HAZARD (GROUP 2) AREAS:

DENSITY:	0.20 GPM/SQ.FT
DESIGN AREA:	MOST DEMANDING 1500 SQ. FT.
MAX SPRINKLER COVERAGE:	130 SQ. FT./HEAD
HOSE DEMAND:	250 GPM
DURATION:	60 MINUTES

28. WHEN COMPLETED, THE ENTIRE FIRE PROTECTION PIPING SYSTEM SHALL BE HYDROSTATICALLY TESTED AS REQUIRED BY THE RULES AND REGULATIONS OF THE AUTHORITIES HAVING JURISDICTION. SYSTEM SHALL SHOW NO SIGNS OF LEAKAGE OR OTHER DEFECTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO THE WORK OF THE OTHER CONTRACTORS OR TO THE BUILDING, OR TO ITS CONTENTS, PEOPLE, ETC., CAUSED BY LEAKS IN ANY OF THE EQUIPMENT INSTALLED BY HIM. ALL REPAIRS OR REPLACEMENT OF DAMAGES SHALL BE AT THE CONTRACTOR'S EXPENSE.

FIRE SPRINKLER HEAD PLAN NOTES (X)

1. FIELD VERIFY THAT THE LOCATION OF EXISTING SPRINKLER IS IN ACCORDANCE WITH NFPA 13 CODE REQUIREMENTS AND WITH HAZARD OCCUPANCY GROUP.

LEGEND

SYMBOL	DESCRIPTION
(W)	SEMI RECESSED SPRINKLER HEAD (WHITE)
●	CONCEALED SPRINKLER HEAD WITH BLACK FINISH
○	CONCEALED SPRINKLER HEAD WITH WHITE FINISH
(B)	SEMI RECESSED SPRINKLER HEAD (BLACK)
(U)	UPRIGHT SPRINKLER HEAD
⊘	PENDANT SPRINKLER HEAD
(E)	EXISTING SPRINKLER HEAD
(R)	RELOCATED SPRINKLER HEAD

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Project No.:	260387
Drawn By:	ESS

Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

FIRE SPRINKLER HEAD PLAN

FP2.00

SECTION 23 0523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. APPLICATIONS.
- B. GENERAL REQUIREMENTS.
- C. BALL VALVES.
- D. CHECK VALVES.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. USE THE FOLLOWING PRECAUTIONS DURING STORAGE:
  1. MAINTAIN VALVE END PROTECTION AND PROTECT FLANGES AND SPECIALTIES FROM DIRT.
     - a. PROVIDE TEMPORARY INLET AND OUTLET CAPS.
     - b. MAINTAIN CAPS IN PLACE UNTIL INSTALLATION.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. SEE DRAWINGS FOR SPECIFIC VALVE LOCATIONS.
- B. REQUIRED VALVE END CONNECTIONS FOR NON-WAFER TYPES:
  1. STEEL PIPE:
     - a. 2 NPS (50 DN) AND SMALLER: THREADED ENDS.
     - b. 2-1/2 NPS (65 DN) AND LARGER: GROOVED ENDS.
  2. COPPER TUBE:
     - a. 2 NPS (50 DN) AND SMALLER: THREADED ENDS (EXCEPTION: SOLDER-JOINT VALVE-ENDS).
     - b. 2-1/2 NPS (65 DN) AND LARGER: GROOVED ENDS.
- C. CHILLED WATER VALVES:
  1. 2 NPS (50 DN) AND SMALLER, BRASS, BRONZE VALVES:
     - a. THREADED ENDS.
     - b. BALL: FULL PORT, ONE PIECE, BRASS TRIM.
     - c. SWING CHECK: BRONZE DISC, CLASS.
  2. 2-1/2 NPS (65 DN) AND LARGER, IRON VALVES:
     - a. BALL: 2-1/2 NPS (65 DN) TO 10 NPS (250 DN), CLASS 150.
     - b. GROOVED-END CHECK: 3 NPS (80 DN) TO 12 NPS (300 DN), 300 CWP.
     - c. CENTER-GUIDED CHECK: COMPACT-WAFER, METAL SEAT, CLASS 125.
     - d. PLATE-TYPE CHECK: SINGLE PLATE, METAL SEAT, CLASS 125.
- D. CONDENSER WATER VALVES:
  1. 2 NPS (50 DN) AND SMALLER, BRASS, BRONZE VALVES:
     - a. THREADED ENDS.
     - b. BALL: FULL PORT, ONE PIECE, BRASS TRIM.
     - c. SWING CHECK: BRONZE DISC, CLASS 125.
     - d. GATE: NRS, CLASS 125.
  2. 2-1/2 NPS (65 DIN) AND LARGER, IRON VALVES:
     - a. BALL: 2-1/2 NPS (65 DN) TO 10 NPS (250 DN), CLASS 150.
     - b. GROOVED-END SWING CHECK: 3 NPS (80 DN) TO 12 NPS (300 DN), 300 CWP.
     - c. IRON CENTER-GUIDED CHECK: 2-1/2 NPS (65 DN) TO 24 INCH (600 MM), COMPACT-WAFER, METAL SEAT, CLASS 125.
     - d. IRON PLATE-TYPE CHECK: SINGLE PLATE, METAL SEAT, CLASS 125.
     - e. IRON GATE: NRS, CLASS 125.
- E. HEATING HOT WATER VALVES:
  1. 2 NPS (50 DN) AND SMALLER, BRASS, BRONZE VALVES:
     - a. THREADED ENDS.
     - b. BALL: FULL PORT, ONE PIECE, BRASS TRIM.
     - c. SWING CHECK: BRONZE DISC, CLASS 125.
  2. 2-1/2 NPS (65 DN) AND LARGER, IRON VALVES:
     - a. BALL: 2-1/2 NPS (65 DN) TO 10 NPS (250 DN), CLASS 150.
     - b. GROOVED-END SWING CHECK: 3 NPS (80 DN) TO 12 NPS (300 DN), 300 CWP.
     - c. CENTER-GUIDED CHECK: COMPACT-WAFER, METAL SEAT, CLASS 125.
     - d. PLATE-TYPE CHECK: SINGLE PLATE, METAL SEAT, CLASS 125 .

2.02 GENERAL REQUIREMENTS

- A. VALVE PRESSURE AND TEMPERATURE RATINGS: NO LESS THAN RATING INDICATED; AS REQUIRED FOR SYSTEM PRESSURES AND TEMPERATURES.
- B. VALVE SIZES: MATCH UPSTREAM PIPING UNLESS OTHERWISE INDICATED.
- C. VALVE ACTUATOR TYPES:
  1. GEAR ACTUATOR: QUARTER-TURN VALVES 8 NPS (200 DN) AND LARGER.
  2. HANDWHEEL: VALVES OTHER THAN QUARTER-TURN TYPES.
  3. HAND LEVER: QUARTER-TURN VALVES 6 NPS (150 DN) AND SMALLER.
- D. VALVES IN INSULATED PIPING: PROVIDE 2 NPS (50 DN) STEM EXTENSIONS AND THE FOLLOWING FEATURES:
  1. GATE VALVES: RISING STEM.
  2. BALL VALVES: EXTENDED OPERATING HANDLE OF NON-THERMAL-CONDUCTIVE MATERIAL, AND PROTECTIVE SLEEVE THAT ALLOWS OPERATION OF VALVE WITHOUT BREAKING THE VAPOR SEAL OR DISTURBING INSULATION.
  3. BUTTERFLY VALVES: EXTENDED NECK.
  4. MEMORY STOPS: FULLY ADJUSTABLE AFTER INSULATION IS INSTALLED.
- E. VALVE-END CONNECTIONS:
  1. THREADED END VALVES: ASME B1.20.1.
  2. FLANGES ON IRON VALVES: ASME B16.1 FOR FLANGES ON IRON VALVES.
  3. SOLDER JOINT CONNECTIONS: ASME B16.18.
  4. GROOVED END CONNECTIONS: AWWA C606.
- F. GENERAL ASME COMPLIANCE:
  1. BUILDING SERVICES PIPING VALVES: ASME B31.9.

2.03 BRONZE BALL VALVES

- A. ONE PIECE, REDUCED PORT WITH BRONZE TRIM:
  1. COMPLY WITH MSS SP-110.
  2. CWP RATING: 400 PSIG (2760 KPA).
  3. BODY: BRONZE.
  4. ENDS: THREADED.
  5. SEATS: PTFE.
- B. TWO PIECE, STANDARD PORT, FULL PORT WITH BRONZE OR BRASS TRIM:
  1. COMPLY WITH MSS SP-110.
  2. SWP RATING: 150 PSIG (1035 KPA).
  3. CWP RATING: 600 PSIG (4140 KPA).
  4. BODY: BRONZE.
  5. ENDS: THREADED.
  6. SEATS: PTFE .
- C. THREE PIECE, FULL PORT WITH STAINLESS STEEL TRIM:
  1. COMPLY WITH MSS SP-110.
  2. SWP RATING: 150 PSIG (1035 KPA).
  3. CWP RATING: 600 PSIG (4140 KPA).
  4. BODY: BRONZE.
  5. ENDS: THREADED.
  6. SEATS: PTFE.

2.04 BRONZE SWING CHECK VALVES

- A. CLASS 125: CWP RATING: 200 PSIG (1380 KPA), CLASS 150: CWP RATING: 300 PSIG (2070 KPA).
  1. COMPLY WITH MSS SP-80, TYPE 3.
  2. BODY DESIGN: HORIZONTAL FLOW.
  3. BODY MATERIAL: BRONZE, ASTM B62.
  4. ENDS: THREADED.
  5. DISC: BRONZE.

2.05 IRON, GROOVED-END SWING CHECK VALVES

- A. 300 CWP:
  1. 10 NPS (250 DN) TO 12 NPS (300 DN).
  2. CWP RATING: 300 PSIG (2070 KPA).
  3. BODY MATERIAL: ASTM A536, GRADE 65-45-12 DUCTILE IRON.
  4. SEAL: EPDM, NITRILE.
  5. DISC: DUCTILE IRON.
  6. COATING: BLACK, NON-LEAD PAINT.

2.06 IRON, PLATE-TYPE CHECK VALVES

- A. CLASS 125 SINGLE-PLATE:
  1. COMPLY WITH API STD 594.
  2. BODY DESIGN: WAFER, SPRING-LOADED PLATE.
  3. BODY MATERIAL: ASTM A126, GRAY IRON.
  4. RESILIENT SEAT: EPDM, NBR.
- B. CLASS 125 DUAL-PLATE:
  1. COMPLY WITH API STD 594.
  2. BODY DESIGN: WAFER, SPRING-LOADED PLATES.
  3. BODY MATERIAL: ASTM A126, GRAY IRON.

PART 3 EXECUTION

3.01 EXAMINATION

- A. DISCARD ALL PACKING MATERIALS AND VERIFY THAT VALVE INTERIOR, INCLUDING THREADS AND FLANGES, ARE COMPLETELY CLEAN WITHOUT SIGNS OF DAMAGE OR DEGRADATION THAT COULD RESULT IN LEAKAGE.
- B. VERIFY VALVE PARTS TO BE FULLY OPERATIONAL IN ALL POSITIONS FROM CLOSED TO FULLY OPEN.
- C. CONFIRM GASKET MATERIAL TO BE SUITABLE FOR THE SERVICE, TO BE OF CORRECT SIZE, AND WITHOUT DEFECTS THAT COULD COMPROMISE EFFECTIVENESS.
- D. SHOULD VALVE IS DETERMINED TO BE DEFECTIVE, REPLACE WITH NEW VALVE.

3.02 INSTALLATION

- A. PROVIDE UNIONS OR FLANGES WITH VALVES TO FACILITATE EQUIPMENT REMOVAL AND MAINTENANCE WHILE MAINTAINING SYSTEM OPERATION AND FULL ACCESSIBILITY FOR SERVICING.
- B. PROVIDE SEPARATE VALVE SUPPORT AS REQUIRED AND LOCATE VALVE WITH STEM AT OR ABOVE CENTER OF PIPING, MAINTAINING UNIMPEDED STEM MOVEMENT.
- C. INSTALL CHECK VALVES WHERE NECESSARY TO MAINTAIN DIRECTION OF FLOW AS FOLLOWS:
  1. LIFT CHECK: INSTALL WITH STEM PLUMB AND VERTICAL.
  2. SWING CHECK: INSTALL HORIZONTAL MAINTAINING HINGE PIN LEVEL.

SECTION 23 0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. SUPPORT AND ATTACHMENT COMPONENTS FOR EQUIPMENT, PIPING, AND OTHER HVAC/HYDRONIC WORK.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. COORDINATION:
  1. COORDINATE SIZES AND ARRANGEMENT OF SUPPORTS AND BASES WITH THE ACTUAL EQUIPMENT AND COMPONENTS TO BE INSTALLED.
  2. COORDINATE THE WORK WITH OTHER TRADES TO PROVIDE ADDITIONAL FRAMING AND MATERIALS REQUIRED FOR INSTALLATION.
  3. COORDINATE COMPATIBILITY OF SUPPORT AND ATTACHMENT COMPONENTS WITH MOUNTING SURFACES AT THE INSTALLED LOCATIONS.
  4. COORDINATE THE ARRANGEMENT OF SUPPORTS WITH DUCTWORK, PIPING, EQUIPMENT AND OTHER POTENTIAL CONFLICTS INSTALLED UNDER OTHER SECTIONS OR BY OTHERS.
  5. NOTIFY ARCHITECT OF ANY CONFLICTS WITH OR DEVIATIONS FROM CONTRACT DOCUMENTS. OBTAIN DIRECTION BEFORE PROCEEDING WITH WORK.
- B. SEQUENCING:
  1. DO NOT INSTALL PRODUCTS ON OR PROVIDE ATTACHMENT TO CONCRETE SURFACES UNTIL CONCRETE HAS FULLY CURED IN ACCORDANCE WITH SECTION 03 3000.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. RECEIVE, INSPECT, HANDLE, AND STORE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. GENERAL REQUIREMENTS:
  1. PROVIDE ALL REQUIRED HANGERS, SUPPORTS, ANCHORS, FASTENERS, FITTINGS, ACCESSORIES, AND HARDWARE AS NECESSARY FOR THE COMPLETE INSTALLATION OF PLUMBING WORK.
  2. PROVIDE PRODUCTS LISTED, CLASSIFIED, AND LABELED AS SUITABLE FOR THE PURPOSE INTENDED, WHERE APPLICABLE.
  3. STEEL COMPONENTS: USE CORROSION RESISTANT MATERIALS SUITABLE FOR THE ENVIRONMENT WHERE INSTALLED.
     - a. INDOOR DRY LOCATIONS: USE ZINC-PLATED STEEL OR APPROVED EQUIVALENT UNLESS OTHERWISE INDICATED.
     - b. OUTDOOR AND DAMP OR WET INDOOR LOCATIONS: USE GALVANIZED STEEL, STAINLESS STEEL, OR APPROVED EQUIVALENT UNLESS OTHERWISE INDICATED.
     - c. ZINC-PLATED STEEL: ELECTROPLATED IN ACCORDANCE WITH ASTM B633.
     - d. GALVANIZED STEEL: HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123/A123M OR ASTM A153/A153M.
- B. METAL CHANNEL (STRUT) FRAMING SYSTEMS: FACTORY-FABRICATED CONTINUOUS-SLOT METAL CHANNEL (STRUT) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE REQUIRED FOR FIELD-ASSEMBLY OF SUPPORTS.
  1. PROVIDE FACTORY-FABRICATED CONTINUOUS-SLOT METAL CHANNEL (STRUT) AND ASSOCIATED FITTINGS, ACCESSORIES, AND HARDWARE REQUIRED FOR FIELD-ASSEMBLY OF SUPPORTS.
  2. COMPLY WITH MFMA-4.
  3. CHANNEL MATERIAL:
     - a. INDOOR DRY LOCATIONS: USE PAINTED STEEL, ZINC-PLATED STEEL, OR GALVANIZED STEEL.
     - b. OUTDOOR AND DAMP OR WET INDOOR LOCATIONS: USE GALVANIZED STEEL.
  4. MINIMUM CHANNEL THICKNESS: STEEL SHEET, 12 GAGE, 0.1046 INCH (2.66 MM).
  5. MINIMUM CHANNEL DIMENSIONS: 1-5/8 INCH (41 MM) WIDTH BY 13/16 INCH (21 MM) HEIGHT.
- C. HANGER RODS: THREADED ZINC-PLATED STEEL UNLESS OTHERWISE INDICATED.
  1. MINIMUM SIZE, UNLESS OTHERWISE INDICATED OR REQUIRED:
     - a. PIPING UP TO 1 INCH (27 MM) NOMINAL: 1/4 INCH (6 MM) DIAMETER.
     - b. PIPING LARGER THAN 1 INCH (27 MM) NOMINAL: 3/8 INCH (10 MM) DIAMETER.
     - c. TRAPEZE SUPPORT FOR MULTIPLE PIPES: 3/8 INCH (10 MM) DIAMETER.
- D. THERMAL INSULATED PIPE SUPPORTS:
  1. GENERAL CONSTRUCTION AND REQUIREMENTS:
     - a. INSULATED PIPE SUPPORTS TO BE PROVIDED AT HANGER, SUPPORT, AND GUIDE LOCATIONS ON PIPE REQUIRING INSULATION OR ADDITIONAL SUPPORT.
     - b. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD INDEX/SMOKE DEVELOPED INDEX OF 5/30, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E84 OR UL 723.
     - c. PIPE SUPPORTS TO BE PROVIDED FOR NOMINALLY SIZED, 1/2 INCH TO 30 INCH (12.7 MM TO 762 MM) IRON PIPES.
     - d. INSULATION INSERTS TO CONSIST OF RIGID POLYISOCYANURATE (URETHANE) INSULATION SURROUNDED BY A 360 DEGREE, PVC JACKETING.
  2. PVC JACKET:
     - a. PIPE INSULATION PROTECTION SHIELDS TO BE PROVIDED WITH A BALL BEARING HINGE AND LOCKING SEAM.
     - b. MINIMUM SERVICE TEMPERATURE: MINUS 40 DEGREES F (MINUS 40 DEGREES C).
     - c. MAXIMUM SERVICE TEMPERATURE: 180 DEGREES F (82 DEGREES C).
     - d. MOISTURE VAPOR TRANSMISSION: 0.0071 PERM INCH (0.0092 NG/PA S M), WHEN TESTED IN ACCORDANCE WITH ASTM E96/E96M.
     - e. THICKNESS: 60 MIL (1.524 MM).
     - f. CONNECTIONS: BRUSH ON WELDING ADHESIVE.
  3. PIPE INSULATION PROTECTION SHIELDS TO BE PROVIDED AT THE HANGER POINTS AND GUIDE LOCATIONS ON PIPES REQUIRING INSULATION AS INDICATED ON DRAWINGS.
- E. PIPE SUPPORTS:
  1. LIQUID TEMPERATURES UP TO 122 DEGREES F (50 DEGREES C):
     - a. OVERHEAD SUPPORT: MSS SP-58 TYPES 1, 3 THROUGH 12.
     - b. SUPPORT FROM BELOW: MSS SP-58 TYPES 35 THROUGH 38.
- F. PIPE STANCHIONS: FOR PIPE RUNS, USE STANCHIONS OF SAME TYPE AND MATERIAL WHERE VERTICAL ADJUSTMENT IS REQUIRED FOR STATIONARY PIPE.
  1. MATERIAL: MALLEABLE IRON, ASTM A47/A47M; OR CARBON STEEL, ASTM A36/A36M.
  2. PROVIDE COATED OR PLATED SADDLES TO ISOLATE STEEL HANGERS FROM DISSIMILAR METAL TUBE OR PIPE.
- G. BEAM CLAMPS: MSS SP-58 TYPES 19 THROUGH 23, 25 OR 27 THROUGH 30 BASED ON REQUIRED LOAD.
  1. MATERIAL: ASTM A36/A36M CARBON STEEL OR ASTM A181/A181M FORGED STEEL.
  2. PROVIDE CLAMPS WITH HARDENED STEEL CUP-POINT SET SCREWS AND LOCK-NUTS FOR ANCHORING IN PLACE.
- H. RISER CLAMPS:
  1. PROVIDE COPPER PLATED CLAMPS FOR COPPER TUBING SUPPORT.
- I. OFFSET PIPE CLAMPS: DOUBLE-LEG DESIGN TWO-PIECE PIPE CLAMP.
- J. STRUT CLAMPS: TWO-PIECE PIPE CLAMP.
- K. INSULATION CLAMPS: TWO BOLT-TYPE CLAMPS DESIGNED FOR INSTALLATION UNDER INSULATION.
- L. PIPE HANGERS: FOR A GIVEN PIPE RUN, USE HANGERS OF THE SAME TYPE AND MATERIAL.
  1. MATERIAL: MALLEABLE IRON, ASTM A47/A47M; OR CARBON STEEL, ASTM A36/A36M.
  2. PROVIDE COATED OR PLATED HANGERS TO ISOLATE STEEL HANGERS FROM DISSIMILAR METAL TUBE OR PIPE.
- M. NONMETALLIC PIPE HANGERS:
- N. INTERMEDIATE PIPE GUIDES: USE PIPE CLAMPS WITH OVERSIZE PIPE SLEEVE THAT PROVIDES CLEARANCE AROUND PIPE.
  1. PIPE DIAMETER 6 INCHES (150 MM) AND SMALLER: PROVIDE MINIMUM CLEARANCE OF 0.16 INCH (4 MM).
  2. PIPE DIAMETER 8 INCHES (200 MM): PROVIDE U-BOLTS WITH DOUBLE NUTS PROVIDING MINIMUM CLEARANCE OF 0.28 INCH (7 MM).
  3. PIPE DIAMETER 8 INCHES (200 MM): 0.625 INCH (16 MM) U-BOLT.
  4. PIPE DIAMETER 10 INCHES (250 MM): 0.75 INCH (19 MM) U-BOLT.
  5. PIPE DIAMETER 12 TO 16 INCHES (300 TO 400 MM): 0.875 INCH (24 MM) U-BOLT.
  6. PIPE DIAMETER 18 TO 30 INCHES (450 TO 750 MM): 1 INCH (25 MM) U-BOLT.
- O. PIPE ALIGNMENT GUIDES: GALVANIZED STEEL.
  1. PIPE DIAMETER 8 INCHES (200 MM) AND SMALLER: SPIDER OR SLEEVE TYPE.
  2. PIPE DIAMETER 10 INCHES (250 MM) AND LARGER: ROLLER TYPE.
- P. DIELECTRIC BARRIERS: PROVIDE BETWEEN METALLIC SUPPORTS AND METALLIC PIPING AND ASSOCIATED ITEMS OF DISSIMILAR TYPE; ACCEPTABLE DIELECTRIC BARRIERS INCLUDE RUBBER OR PLASTIC SHEETS OR COATINGS ATTACHED SECURELY TO PIPE OR ITEM.

PART 3 EXECUTION

3.01 EXAMINATION

- A. VERIFY THAT FIELD MEASUREMENTS ARE AS INDICATED.
- B. VERIFY THAT MOUNTING SURFACES ARE READY TO RECEIVE SUPPORT AND ATTACHMENT COMPONENTS.
- C. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK.

3.02 INSTALLATION

- A. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- B. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, CONDUIT, OR OTHER SYSTEMS.
- C. UNLESS SPECIFICALLY INDICATED OR APPROVED BY ARCHITECT, DO NOT PROVIDE SUPPORT FROM SUSPENDED CEILING SUPPORT SYSTEM OR CEILING GRID.
- D. UNLESS SPECIFICALLY INDICATED OR APPROVED BY ARCHITECT, DO NOT PROVIDE SUPPORT FROM ROOF DECK.
- E. DO NOT PENETRATE OR OTHERWISE NOTCH OR CUT STRUCTURAL MEMBERS WITHOUT APPROVAL OF STRUCTURAL ENGINEER.
- F. PROVIDE THERMAL INSULATED PIPE SUPPORTS COMPLETE WITH HANGERS AND ACCESSORIES. INSTALL THERMAL INSULATED PIPE SUPPORTS DURING THE INSTALLATION OF THE PIPING SYSTEM.
- G. EQUIPMENT SUPPORT AND ATTACHMENT:
  1. USE METAL FABRICATED SUPPORTS OR SUPPORTS ASSEMBLED FROM METAL CHANNEL (STRUT) TO SUPPORT EQUIPMENT AS REQUIRED.
  2. USE METAL CHANNEL (STRUT) SECURED TO STUDS TO SUPPORT EQUIPMENT SURFACE-MOUNTED ON HOLLOW STUD WALLS WHEN WALL STRENGTH IS NOT SUFFICIENT TO RESIST PULL-OUT.
  3. USE METAL CHANNEL (STRUT) TO SUPPORT SURFACE-MOUNTED EQUIPMENT IN WET OR DAMP LOCATIONS TO PROVIDE SPACE BETWEEN EQUIPMENT AND MOUNTING SURFACE.
  4. SECURELY FASTEN FLOOR-MOUNTED EQUIPMENT. DO NOT INSTALL EQUIPMENT SUCH THAT IT RELIES ON ITS OWN WEIGHT FOR SUPPORT.
- H. PRESET CONCRETE INSERTS: USE MANUFACTURER-PROVIDED CLOSURE STRIPS TO INHIBIT CONCRETE SEEPAGE DURING CONCRETE POUR.
- I. SECURE FASTENERS ACCORDING TO MANUFACTURER'S RECOMMENDED TORQUE SETTINGS.
- J. REMOVE TEMPORARY SUPPORTS.

SECTION 23 0548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES.
- B. VIBRATION ISOLATORS.
- C. EXTERNAL SEISMIC SNUBBER ASSEMBLIES.
- D. SEISMIC RESTRAINT SYSTEMS.
- E. VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. COORDINATION:
  1. COORDINATE SELECTION AND ARRANGEMENT OF VIBRATION ISOLATION AND/OR SEISMIC CONTROL COMPONENTS WITH THE ACTUAL EQUIPMENT TO BE INSTALLED.
  2. COORDINATE THE WORK WITH OTHER TRADES TO PROVIDE ADDITIONAL FRAMING AND MATERIALS REQUIRED FOR INSTALLATION.
  3. COORDINATE COMPATIBILITY OF SUPPORT AND ATTACHMENT COMPONENTS WITH MOUNTING SURFACES AT THE INSTALLED LOCATIONS.
  4. SEISMIC CONTROLS:
     - a. COORDINATE THE ARRANGEMENT OF SEISMIC RESTRAINTS WITH PIPING, CONDUIT, EQUIPMENT, AND OTHER POTENTIAL CONFLICTS INSTALLED UNDER OTHER SECTIONS OR BY OTHERS.
     - b. COORDINATE THE WORK WITH OTHER TRADES TO ACCOMMODATE RELATIVE POSITIONING OF ESSENTIAL AND NONESSENTIAL COMPONENTS IN CONSIDERATION OF SEISMIC INTERACTION.
  5. NOTIFY ARCHITECT OF ANY CONFLICTS WITH OR DEVIATIONS FROM CONTRACT DOCUMENTS. OBTAIN DIRECTION BEFORE PROCEEDING WITH WORK.
- B. SEQUENCING:
  1. DO NOT INSTALL PRODUCTS ON OR PROVIDE ATTACHMENT TO CONCRETE SURFACES UNTIL CONCRETE HAS FULLY CURED IN ACCORDANCE WITH SECTION 03 3000.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. RECEIVE, INSPECT, HANDLE, AND STORE PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

PART 2 PRODUCTS

2.01 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

- A. DESCRIPTION: STEEL SNUBBING ASSEMBLIES DESIGNED FOR EXTERNAL ATTACHMENT TO BOTH EQUIPMENT AND SUPPORTING STRUCTURE THAT, AS PART OF A COMPLETE SYSTEM, RESTRAIN EQUIPMENT MOTION IN ALL DIRECTIONS DURING A SEISMIC EVENT WHILE MAINTAINING VIBRATION ISOLATION DURING NORMAL OPERATION.
- B. SEISMIC SNUBBING ELEMENTS:
  1. AIR GAP: BETWEEN 0.125 INCHES (3 MM) AND 0.25 INCHES (6 MM) UNLESS OTHERWISE INDICATED.
  2. POINTS OF CONTACT: CUSHIONED WITH RESILIENT MATERIAL, MINIMUM 0.25 INCH (6 MM) THICK; CAPABLE OF BEING VISUALLY INSPECTED FOR DAMAGE AND REPLACED.

2.02 SEISMIC RESTRAINT SYSTEMS

- A. DESCRIPTION: SYSTEM COMPONENTS AND ACCESSORIES SPECIFICALLY DESIGNED FOR FIELD ASSEMBLY AND ATTACHMENT OF SEISMIC RESTRAINTS.
- B. CABLE RESTRAINTS:
  1. COMPLY WITH ASCE 19.
  2. CABLES: PRE-STRETCHED, GALVANIZED STEEL WIRE ROPE WITH CERTIFIED BREAK STRENGTH.
  3. CABLE CONNECTIONS: USE ONLY SWAGED END FITTINGS. CABLE CLIPS AND WEDGE TYPE END FITTINGS ARE NOT PERMITTED IN ACCORDANCE WITH ASCE 19.
  4. USE PROTECTIVE THIMBLES FOR CABLE LOOPS WHERE POTENTIAL FOR CABLE DAMAGE EXISTS.
- C. RIGID RESTRAINTS: USE MFMA-4 STEEL CHANNEL (STRUT), STEEL ANGLE, OR STEEL PIPE FOR STRUCTURAL ELEMENT; SUITABLE FOR BOTH COMPRESSIVE AND TENSILE DESIGN LOADS.

2.03 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

- A. VIBRATION ISOLATION CURBS:
  1. NONSEISMIC CURB RAIL:
     - a. LOCATION: BETWEEN EXISTING ROOF CURB AND ROOFTOP EQUIPMENT.
     - b. CONSTRUCTION: ALUMINUM.
     - c. INTEGRAL VIBRATION ISOLATION TO COMPLY WITH REQUIREMENTS OF THIS SECTION.
     - d. WEATHER EXPOSED COMPONENTS CONSIST OF CORROSION RESISTANT MATERIALS.
  2. NONSEISMIC CURB:
     - a. LOCATION: BETWEEN STRUCTURE AND ROOFTOP EQUIPMENT.
     - b. CONSTRUCTION: ALUMINUM.
     - c. INTEGRAL VIBRATION ISOLATION TO COMPLY WITH REQUIREMENTS OF THIS SECTION.
     - d. WEATHER EXPOSED COMPONENTS CONSIST OF CORROSION RESISTANT MATERIALS.
  3. SEISMIC CURB:
     - a. LOCATION: BETWEEN STRUCTURE AND ROOFTOP EQUIPMENT.
     - b. CONSTRUCTION: STEEL.
     - c. INTEGRAL VIBRATION ISOLATION TO COMPLY WITH REQUIREMENTS OF THIS SECTION.
     - d. SNUBBERS CONSIST OF MINIMUM 0.25 INCH (6 MM) THICK RESILIENT PADS TO AVOID METAL-TO-METAL CONTACT WITHOUT COMPROMISING VIBRATION ISOLATING CAPABILITIES.
     - e. WEATHER EXPOSED COMPONENTS CONSIST OF CORROSION RESISTANT MATERIALS.
- B. SEISMIC TYPE NONISOLATED CURB AND FABRICATED EQUIPMENT PIERS:
  1. LOCATION: BETWEEN STRUCTURE AND ROOFTOP EQUIPMENT.
  2. CONSTRUCTION: STEEL.
  3. WEATHER EXPOSED COMPONENTS CONSIST OF CORROSION RESISTANT MATERIALS.

PART 3 EXECUTION

3.01 EXAMINATION

- A. VERIFY THAT FIELD MEASUREMENTS ARE AS SHOWN ON THE DRAWINGS.
- B. VERIFY THAT MOUNTING SURFACES ARE READY TO RECEIVE VIBRATION ISOLATION AND/OR SEISMIC CONTROL COMPONENTS AND ASSOCIATED ATTACHMENTS.
- C. VERIFY THAT CONDITIONS ARE SATISFACTORY FOR INSTALLATION PRIOR TO STARTING WORK.

3.02 INSTALLATION

- A. INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- B. INSTALL ANCHORS AND FASTENERS IN ACCORDANCE WITH ICC EVALUATION SERVICES, LLC (ICC-ES) EVALUATION REPORT CONDITIONS OF USE WHERE APPLICABLE.
- C. SECURE FASTENERS ACCORDING TO MANUFACTURER'S RECOMMENDED TORQUE SETTINGS.
- D. INSTALL FLEXIBLE PIPING CONNECTIONS TO PROVIDE SUFFICIENT SLACK FOR VIBRATION ISOLATION AND/OR SEISMIC RELATIVE DISPLACEMENTS AS INDICATED OR AS REQUIRED.
- E. VIBRATION ISOLATION SYSTEMS:
  1. VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES:
     - a. PROVIDE SPECIFIED MINIMUM CLEARANCE BENEATH BASE.
  2. SPRING ISOLATORS:
     - a. POSITION EQUIPMENT AT OPERATING HEIGHT; PROVIDE TEMPORARY BLOCKING AS REQUIRED.
     - b. LIFT EQUIPMENT FREE OF ISOLATORS PRIOR TO LATERAL REPOSITIONING TO AVOID DAMAGE TO ISOLATORS.
     - c. LEVEL EQUIPMENT BY ADJUSTING ISOLATORS GRADUALLY IN SEQUENCE TO RAISE EQUIPMENT UNIFORMLY SUCH THAT EXCESSIVE WEIGHT OR STRESS IS NOT PLACED ON ANY SINGLE ISOLATOR.
  3. ISOLATOR HANGERS:
     - a. USE PRECOMPRESSED ISOLATOR HANGERS WHERE REQUIRED TO FACILITATE INSTALLATION AND PREVENT DAMAGE TO EQUIPMENT UTILITY CONNECTION PROVISIONS.
     - b. LOCATE ISOLATOR HANGERS AT TOP OF HANGER RODS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
  4. THRUST RESTRAINTS:
     - a. ADJUST RESTRAINT MOVEMENT UNDER NORMAL OPERATING STATIC PRESSURE.
  5. CLEAN DEBRIS FROM BENEATH VIBRATION-ISOLATED EQUIPMENT THAT COULD CAUSE SHORT-CIRCUITING OF ISOLATION.
  6. USE ELASTOMERIC GROMMETS FOR ATTACHMENTS WHERE REQUIRED TO PREVENT SHORT-CIRCUITING OF ISOLATION.
  7. ADJUST ISOLATORS TO BE FREE OF ISOLATION SHORT CIRCUITS DURING NORMAL OPERATION.
  8. DO NOT OVERTIGHTEN FASTENERS SUCH THAT RESILIENT MATERIAL ISOLATOR PADS ARE COMPRESSED BEYOND MANUFACTURER'S MAXIMUM RECOMMENDED DEFLECTION.
- F. SEISMIC CONTROLS:
  1. PROVIDE SPECIFIED SNUBBING ELEMENT AIR GAP; REMOVE ANY FACTORY-INSTALLED SPACERS, DEBRIS, OR OTHER OBSTRUCTIONS.
  2. USE ONLY SPECIFIED COMPONENTS, ANCHORAGE, AND HARDWARE EVALUATED BY SEISMIC DESIGN. COMPLY WITH CONDITIONS OF SEISMIC CERTIFICATION WHERE APPLICABLE.
  3. WHERE MOUNTING HOLE DIAMETER EXCEEDS BOLT DIAMETER BY MORE THAN 0.125 INCH (3 MM), USE EPOXY GROUT, ELASTOMERIC GROMMET, OR WELDED WASHER TO REDUCE CLEARANCE TO 0.125 INCH (3 MM) OR LESS.
  4. EQUIPMENT WITH SHEET METAL HOUSINGS:
     - a. USE BELLEVILLE WASHERS TO DISTRIBUTE STRESS OVER A LARGER SURFACE AREA OF THE SHEET METAL CONNECTION INTERFACE AS APPROVED BY MANUFACTURER.
     - b. ATTACH ADDITIONAL STEEL AS APPROVED BY MANUFACTURER WHERE REQUIRED TO TRANSFER LOADS TO STRUCTURE.
     - c. WHERE MOUNTING SURFACE IS IRREGULAR, DO NOT SHIM HOUSING; REINFORCE HOUSING WITH ADDITIONAL STEEL AS APPROVED BY MANUFACTURER.
  5. CONCRETE HOUSEKEEPING PADS:
     - a. SIZE IN ACCORDANCE WITH SEISMIC DESIGN TO MEET ANCHOR REQUIREMENTS.
     - b. INSTALL PAD REINFORCEMENT AND DOWELING IN ACCORDANCE WITH SEISMIC DESIGN TO ENSURE INTEGRITY OF PAD AND ASSOCIATED CONNECTION TO SLAB.
  6. SEISMIC RESTRAINT SYSTEMS:
     - a. DO NOT ATTACH SEISMIC RESTRAINTS AND GRAVITY SUPPORTS TO DISSIMILAR PARTS OF STRUCTURE THAT MAY MOVE DIFFERENTLY DURING AN EARTHQUAKE.
     - b. INSTALL RESTRAINTS WITHIN PERMISSIBLE ANGLES IN ACCORDANCE WITH SEISMIC DESIGN.
     - c. INSTALL CABLE RESTRAINTS STRAIGHT BETWEEN COMPONENT/RUN AND STRUCTURAL ATTACHMENT; DO NOT BEND AROUND OTHER NONSTRUCTURAL COMPONENTS OR STRUCTURAL ELEMENTS.
     - d. INSTALL CABLE RESTRAINTS FOR VIBRATION-ISOLATED COMPONENTS SLIGHTLY SLACK TO PREVENT SHORT-CIRCUITING OF ISOLATION.
     - e. INSTALL HANGER ROD STIFFENERS WHERE INDICATED USING ONLY SPECIFIED CLAMPS; DO NOT WELD STIFFENERS TO HANGER ROD.

3.03 FIELD QUALITY CONTROL

- A. SEE SECTION 01 4000 - QUALITY REQUIREMENTS, FOR ADDITIONAL REQUIREMENTS.
- B. INSPECT VIBRATION ISOLATION AND/OR SEISMIC CONTROL COMPONENTS FOR DAMAGE AND DEFECTS.
- C. VIBRATION ISOLATION SYSTEMS:
  1. VERIFY ISOLATOR STATIC DEFLECTIONS.
  2. VERIFY VIBRATION ISOLATION PERFORMANCE DURING NORMAL OPERATION; INVESTIGATE SOURCES OF ISOLATION SHORT CIRCUITS.
- D. SEISMIC CONTROLS:
  1. VERIFY SNUBBING ELEMENT AIR GAPS.
- E. CORRECT DEFICIENCIES AND REPLACE DAMAGED OR DEFECTIVE VIBRATION ISOLATION AND/OR SEISMIC CONTROL COMPONENTS.

SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. NAMEPLATES.
- B. TAGS.
- C. STENCILS.
- D. PIPE MARKERS.
- E. CEILING TACKS.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. AIR HANDLING UNITS: NAMEPLATES.
- B. AIR TERMINAL UNITS: TAGS.
- C. AUTOMATIC CONTROLS: TAGS. KEY TO CONTROL SCHEMATIC.
- D. CONTROL PANELS: NAMEPLATES.
- E. DAMPERS: CEILING TACKS, WHERE LOCATED ABOVE LAY-IN CEILING.
- F. HEAT TRANSFER EQUIPMENT: NAMEPLATES.
- G. PIPING: TAGS.
- H. PUMPS: NAMEPLATES.
- I. SMALL-SIZED EQUIPMENT: TAGS.
- J. THERMOSTATS: NAMEPLATES.
- K. VALVES: TAGS AND CEILING TACKS WHERE LOCATED ABOVE LAY-IN CEILING.

2.02 NAMEPLATES

- A. MANUFACTURERS:
  1. ADVANCED GRAPHIC ENGRAVING, LLC.
  2. BRIMAR INDUSTRIES, INC.
  3. SETON IDENTIFICATION PRODUCTS, A TRICOR DIRECT COMPANY.
- B. LETTER COLOR: WHITE.
- C. LETTER HEIGHT: 1/4 INCH (6 MM).
- D. BACKGROUND COLOR: BLACK.

2.03 TAGS

- A. MANUFACTURERS:
  1. ADVANCED GRAPHIC ENGRAVING.
  2. BRADY CORPORATION.
  3. BRIMAR INDUSTRIES, INC.
  4. SETON IDENTIFICATION PRODUCTS, A TRICOR COMPANY.
- B. PLASTIC TAGS: LAMINATED THREE-LAYER PLASTIC WITH ENGRAVED BLACK LETTERS ON LIGHT CONTRASTING BACKGROUND COLOR. TAG SIZE MINIMUM 1-1/2 INCH (40 MM) DIAMETER.
- C. METAL TAGS: BRASS WITH STAMPED LETTERS; TAG SIZE MINIMUM 1-1/2 INCH (40 MM) DIAMETER WITH SMOOTH EDGES.
- D. VALVE TAG CHART: TYPEWRITTEN LETTER SIZE LIST IN ANODIZED ALUMINUM FRAME.

2.04 STENCILS

- A. MANUFACTURERS:
  1. BRADY CORPORATION.
  2. SETON IDENTIFICATION PRODUCTS, A TRICOR COMPANY.
- B. STENCILS: WITH CLEAN CUT SYMBOLS AND LETTERS OF FOLLOWING SIZE:
  1. 3/4 TO 1-1/4 INCH (20-30 MM) OUTSIDE DIAMETER OF INSULATION OR PIPE: 8 INCH (200 MM) LONG COLOR FIELD, 1/2 INCH (15 MM) HIGH LETTERS.
  2. 1-1/2 TO 2 INCH (40-50 MM) OUTSIDE DIAMETER OF INSULATION OR PIPE: 8 INCH (200 MM) LONG COLOR FIELD, 3/4 INCH (20 MM) HIGH LETTERS.
  3. 2-1/2 TO 6 INCH (65-150 MM) OUTSIDE DIAMETER OF INSULATION OR PIPE: 12 INCH (300 MM) LONG COLOR FIELD, 1-1/4 INCH (30 MM) HIGH LETTERS.
  4. 8 TO 10 INCH (200-250 MM) OUTSIDE DIAMETER OF INSULATION OR PIPE: 24 INCH (600 MM) LONG COLOR FIELD, 2-1/2 INCH (65 MM) HIGH LETTERS.

2.05 PIPE MARKERS

- A. MANUFACTURERS:
  1. BRADY CORPORATION.
  2. BRIMAR INDUSTRIES, INC.
  3. SETON IDENTIFICATION PRODUCTS, A TRICOR COMPANY.
- B. COLOR: COMPLY WITH ASME A13.1.
- C. PLASTIC PIPE MARKERS: FACTORY FABRICATED, FLEXIBLE, SEMI- RIGID PLASTIC, PREFORMED TO FIT AROUND PIPE OR PIPE COVERING; MINIMUM INFORMATION INDICATING FLOW DIRECTION ARROW AND IDENTIFICATION OF FLUID BEING CONVEYED.
- D. PLASTIC TAPE PIPE MARKERS: FLEXIBLE, VINYL FILM TAPE WITH PRESSURE SENSITIVE ADHESIVE BACKING AND PRINTED MARKINGS.
- E. COLOR CODE AS FOLLOWS:
  1. HEATING, COOLING, AND BOILER FEEDWATER: GREEN WITH WHITE LETTERS.
  2. COMPRESSED AIR: BLUE WITH WHITE LETTERS.

2.06 CEILING TACKS

- A. MANUFACTURERS:
  1. CRAFTMARK PIPE MARKERS.
- B. DESCRIPTION: STEEL WITH 3/4 INCH (20 MM) DIAMETER COLOR CODED HEAD.
- C. COLOR CODE AS FOLLOWS:
  1. HVAC EQUIPMENT: YELLOW.
  2. FIRE DAMPERS AND SMOKE DAMPERS: RED.
  3. HEATING/COOLING VALVES: BLUE.

PART 3 EXECUTION

3.01 PREPARATION

- A. DEGREASE AND CLEAN SURFACES TO RECEIVE ADHESIVE FOR IDENTIFICATION MATERIALS.
- B. PREPARE SURFACES IN ACCORDANCE WITH SECTION 09 9123 FOR STENCIL PAINTING.

3.02 INSTALLATION

- A. INSTALL NAMEPLATES WITH CORROSIVE-RESISTANT MECHANICAL FASTENERS, OR ADHESIVE. APPLY WITH SUFFICIENT ADHESIVE TO ENSURE PERMANENT ADHESION AND SEAL WITH CLEAR LACQUER.
- B. INSTALL TAGS WITH CORROSION RESISTANT CHAIN.
- C. APPLY STENCIL PAINTING IN ACCORDANCE WITH SECTION 09 9123.
- D. INSTALL PLASTIC PIPE MARKERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- E. INSTALL PLASTIC TAPE PIPE MARKERS COMPLETE AROUND PIPE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
- F. USE TAGS ON PIPING 3/4 INCH (20 MM) DIAMETER AND SMALLER.
  1. LOCATE IDENTIFICATION NOT TO EXCEED 20 FEET (6 M) ON STRAIGHT RUNS INCLUDING RISERS AND DROPS, ADJACENT TO EACH VALVE AND TEE, AT EACH SIDE OF PENETRATION OF STRUCTURE OR ENCLOSURE, AND AT EACH OBSTRUCTION.
- G. LOCATE CEILING TACKS TO LOCATE VALVES OR DAMPERS ABOVE LAY-IN PANEL CEILINGS. LOCATE IN CORNER OF PANEL CLOSEST TO EQUIPMENT.

SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. TESTING, ADJUSTMENT, AND BALANCING OF AIR SYSTEMS.
- B. TESTING, ADJUSTMENT, AND BALANCING OF HYDRONIC, STEAM, AND REFRIGERATING SYSTEMS.
- C. MEASUREMENT OF FINAL OPERATING CONDITION OF HVAC SYSTEMS.
- D. SOUND MEASUREMENT OF EQUIPMENT OPERATING CONDITIONS.

1.02 SUBMITTALS

- A. TAB PLAN: SUBMIT A WRITTEN PLAN INDICATING THE TESTING, ADJUSTING, AND BALANCING STANDARD TO BE FOLLOWED AND THE SPECIFIC APPROACH FOR EACH SYSTEM AND COMPONENT.
  1. INCLUDE AT LEAST THE FOLLOWING IN THE PLAN:
     - a. LIST OF ALL AIR FLOW, WATER FLOW, SOUND LEVEL, SYSTEM CAPACITY AND EFFICIENCY MEASUREMENTS TO BE PERFORMED AND A DESCRIPTION OF SPECIFIC TEST PROCEDURES, PARAMETERS, FORMULAS TO BE USED.
     - b. COPY OF FIELD CHECKOUT SHEETS AND LOGS TO BE USED, LISTING EACH PIECE OF EQUIPMENT TO BE TESTED, ADJUSTED AND BALANCED WITH THE DATA CELLS TO BE GATHERED FOR EACH.
     - c. FINAL TEST REPORT FORMS TO BE USED.
     - d. PROCEDURES FOR FORMAL DEFICIENCY REPORTS, INCLUDING SCOPE, FREQUENCY AND DISTRIBUTION.
- B. CONTROL SYSTEM COORDINATION REPORTS: COMMUNICATE IN WRITING TO THE CONTROLS INSTALLER ALL SETPOINT AND PARAMETER CHANGES MADE OR PROBLEMS AND DISCREPANCIES IDENTIFIED DURING TAB THAT AFFECT, OR COULD AFFECT, THE CONTROL SYSTEM SETUP AND OPERATION.
- C. FINAL REPORT: INDICATE DEFICIENCIES IN SYSTEMS THAT WOULD PREVENT PROPER TESTING, ADJUSTING, AND BALANCING OF SYSTEMS AND EQUIPMENT TO ACHIEVE SPECIFIED PERFORMANCE.
  1. REVISE TAB PLAN TO REFLECT ACTUAL PROCEDURES AND SUBMIT AS PART OF FINAL REPORT.
  2. SUBMIT DRAFT COPIES OF REPORT FOR REVIEW PRIOR TO FINAL ACCEPTANCE OF PROJECT. PROVIDE FINAL COPIES FOR ARCHITECT AND FOR INCLUSION IN OPERATING AND MAINTENANCE MANUALS.
  3. PROVIDE REPORTS IN SOFT COVER, LETTER SIZE, 3-RING BINDER MANUALS, COMPLETE WITH INDEX PAGE AND INDEXING TABS, WITH COVER IDENTIFICATION AT FRONT AND SIDE. INCLUDE SET OF REDUCED DRAWINGS WITH AIR OUTLETS AND EQUIPMENT IDENTIFIED TO CORRESPOND WITH DATA SHEETS, AND INDICATING THERMOSTAT LOCATIONS.
  4. INCLUDE ACTUAL INSTRUMENT LIST, WITH MANUFACTURER NAME, SERIAL NUMBER, AND DATE OF CALIBRATION.
  5. FORM OF TEST REPORTS: WHERE THE TAB STANDARD BEING FOLLOWED RECOMMENDS A REPORT FORMAT USE THAT; OTHERWISE, FOLLOW ASHRAE STD 111.
  6. UNITS OF MEASURE: REPORT DATA IN I-P (INCH-POUND) UNITS ONLY.
  7. INCLUDE THE FOLLOWING ON THE TITLE PAGE OF EACH REPORT:
     - a. NAME OF TESTING, ADJUSTING, AND BALANCING AGENCY.
     - b. ADDRESS OF TESTING, ADJUSTING, AND BALANCING AGENCY.
     - c. TELEPHONE NUMBER OF TESTING, ADJUSTING, AND BALANCING AGENCY.
     - d. PROJECT NAME.
     - e. PROJECT LOCATION.
     - f. PROJECT ARCHITECT.
     - g. PROJECT ENGINEER.
     - h. PROJECT CONTRACTOR.
     - i. PROJECT ALTITUDE.
     - j. REPORT DATE.
- D. PROJECT RECORD DOCUMENTS: RECORD ACTUAL LOCATIONS OF FLOW MEASURING STATIONS AND BALANCING VALVES AND ROUGH SETTING.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. PERFORM TOTAL SYSTEM BALANCE IN ACCORDANCE WITH ONE OF THE FOLLOWING:
  1. AABC (NSTSB), AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE.
  2. ASHRAE STD 111, PRACTICES FOR MEASUREMENT, TESTING, ADJUSTING AND BALANCING OF BUILDING HEATING, VENTILATION, AIR-CONDITIONING, AND REFRIGERATION SYSTEMS.
  3. SMACNA (TAB).
- B. BEGIN WORK AFTER COMPLETION OF SYSTEMS TO BE TESTED, ADJUSTED, OR BALANCED AND COMPLETE WORK PRIOR TO SUBSTANTIAL COMPLETION OF THE PROJECT.
- C. WHERE HVAC SYSTEMS AND/OR COMPONENTS INTERFACE WITH LIFE SAFETY SYSTEMS, INCLUDING FIRE AND SMOKE DETECTION, ALARM, AND CONTROL, COORDINATE SCHEDULING AND TESTING AND INSPECTION PROCEDURES WITH THE AUTHORITIES HAVING JURISDICTION.
- D. TAB AGENCY QUALIFICATIONS:
  1. COMPANY SPECIALIZING IN THE TESTING, ADJUSTING, AND BALANCING OF SYSTEMS SPECIFIED IN THIS SECTION.
  2. HAVING MINIMUM OF THREE YEARS DOCUMENTED EXPERIENCE.
  3. CERTIFIED BY ONE OF THE FOLLOWING:
     - a. AABC, ASSOCIATED AIR BALANCE COUNCIL: WWW.AABC.COM/#SLE; UPON COMPLETION SUBMIT AABC NATIONAL PERFORMANCE GUARANTY.
     - b. NEBB, NATIONAL ENVIRONMENTAL BALANCING BUREAU: WWW.NEBB.ORG/#SLE.
     - c. TABB, THE TESTING, ADJUSTING, AND BALANCING BUREAU OF NATIONAL ENERGY MANAGEMENT INSTITUTE: WWW.TABBCERTIFIED.ORG/#SLE.
- E. TAB SUPERVISOR AND TECHNICIAN QUALIFICATIONS: CERTIFIED BY SAME ORGANIZATION AS TAB AGENCY.

3.02 EXAMINATION

- A. VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE BEFORE COMMENCING WORK. ENSURE THE FOLLOWING CONDITIONS:
  1. SYSTEMS ARE STARTED AND OPERATING IN A SAFE AND NORMAL CONDITION.
  2. TEMPERATURE CONTROL SYSTEMS ARE INSTALLED COMPLETE AND OPERABLE.
  3. PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT.
  4. FINAL FILTERS ARE CLEAN AND IN PLACE. IF REQUIRED, INSTALL TEMPORARY MEDIA IN ADDITION TO FINAL FILTERS.
  5. DUCT SYSTEMS ARE CLEAN OF DEBRIS.
  6. FANS ARE ROTATING CORRECTLY.
  7. FIRE AND VOLUME DAMPERS ARE IN PLACE AND OPEN.
  8. AIR COIL FINS ARE CLEANED AND COMBED.
  9. ACCESS DOORS ARE CLOSED AND DUCT END CAPS ARE IN PLACE.
  10. AIR OUTLETS ARE INSTALLED AND CONNECTED.
  11. DUCT SYSTEM LEAKAGE IS MINIMIZED.
  12. HYDRONIC SYSTEMS ARE FLUSHED, FILLED, AND VENTED.
  13. PUMPS ARE ROTATING CORRECTLY.
  14. PROPER STRAINER BASKETS ARE CLEAN AND IN PLACE.
  15. SERVICE AND BALANCE VALVES ARE OPEN.
- B. SUBMIT FIELD REPORTS. REPORT DEFECTS AND DEFICIENCIES THAT WILL OR COULD PREVENT PROPER SYSTEM BALANCE.
- C. BEGINNING OF WORK MEANS ACCEPTANCE OF EXISTING CONDITIONS.

3.03 PREPARATION

- A. HOLD A PRE-BALANCING MEETING AT LEAST ONE WEEK PRIOR TO STARTING TAB WORK.
  1. REQUIRE ATTENDANCE BY ALL INSTALLERS WHOSE WORK WILL BE TESTED, ADJUSTED, OR BALANCED.

3.04 ADJUSTMENT TOLERANCES

- A. AIR HANDLING SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN FOR SUPPLY SYSTEMS AND PLUS OR MINUS 10 PERCENT OF DESIGN FOR RETURN AND EXHAUST SYSTEMS.
- B. AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 10 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.
- C. HYDRONIC SYSTEMS: ADJUST TO WITHIN PLUS OR MINUS 10 PERCENT OF DESIGN.

3.05 RECORDING AND ADJUSTING

- A. FIELD LOGS: MAINTAIN WRITTEN LOGS INCLUDING:
  1. RUNNING LOG OF EVENTS AND ISSUES.
  2. DISCREPANCIES, DEFICIENT OR UNCOMPLETED WORK BY OTHERS.
  3. CONTRACT INTERPRETATION REQUESTS.
  4. LISTS OF COMPLETED TESTS.
- B. ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.
- C. PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.
- D. MARK ON DRAWINGS THE LOCATIONS WHERE TRAVERSE AND OTHER CRITICAL MEASUREMENTS WERE TAKEN AND CROSS REFERENCE THE LOCATION IN THE FINAL REPORT.
- 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.

3.06 AIR SYSTEM PROCEDURE

- A. ADJUST AIR HANDLING AND DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, AND EXHAUST AIR QUANTITIES AT SITE ALTITUDE.
- B. MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PITOT TUBE TRAVERSE OF ENTIRE CROSS SECTIONAL AREA OF DUCT.
- C. MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.
- D. ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.
- E. USE VOLUME CONTROL DEVICES TO REGULATE AIR QUANTITIES ONLY TO EXTEND THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS. EFFECT VOLUME CONTROL BY DUCT INTERNAL DEVICES SUCH AS DAMPERS AND SPLITTERS.
- F. VARY TOTAL SYSTEM AIR QUANTITIES BY ADJUSTMENT OF FAN SPEEDS. PROVIDE DRIVE CHANGES REQUIRED. VARY BRANCH AIR QUANTITIES BY DAMPER REGULATION.
- G. MEASURE STATIC AIR PRESSURE CONDITIONS ON AIR SUPPLY UNITS, INCLUDING FILTER AND COIL PRESSURE DROPS, AND TOTAL PRESSURE ACROSS THE FAN. MAKE ALLOWANCES FOR 50 PERCENT LOADING OF FILTERS.
- H. ADJUST OUTSIDE AIR AUTOMATIC DAMPERS, OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS FOR DESIGN CONDITIONS.
- I. MEASURE TEMPERATURE CONDITIONS ACROSS OUTSIDE AIR, RETURN AIR, AND EXHAUST DAMPERS TO CHECK LEAKAGE.
- J. WHERE MODULATING DAMPERS ARE PROVIDED, TAKE MEASUREMENTS AND BALANCE AT EXTREME CONDITIONS. BALANCE VARIABLE VOLUME SYSTEMS AT MAXIMUM AIR FLOW RATE, FULL COOLING, AND AT MINIMUM AIR FLOW RATE, FULL HEATING.
- K. MEASURE BUILDING STATIC PRESSURE AND ADJUST SUPPLY, RETURN, AND EXHAUST AIR SYSTEMS TO PROVIDE REQUIRED RELATIONSHIP BETWEEN EACH TO MAINTAIN APPROXIMATELY 0.05 INCHES (12.5 PA) POSITIVE STATIC PRESSURE NEAR THE BUILDING ENTRIES.
- L. FOR VARIABLE AIR VOLUME SYSTEM POWERED UNITS SET VOLUME CONTROLLER TO AIR FLOW SETTING INDICATED. CONFIRM CONNECTIONS PROPERLY MADE AND CONFIRM PROPER OPERATION FOR AUTOMATIC VARIABLE AIR VOLUME TEMPERATURE CONTROL.
- M. ON FAN POWERED VAV BOXES, ADJUST AIR FLOW SWITCHES FOR PROPER OPERATION.

3.07 WATER SYSTEM PROCEDURE

- A. ADJUST WATER SYSTEMS TO PROVIDE REQUIRED OR DESIGN QUANTITIES.
- B. USE CALIBRATED VENTURI TUBES, ORIFICES, OR OTHER METERED FITTINGS AND PRESSURE GAGES TO DETERMINE FLOW RATES FOR SYSTEM BALANCE. WHERE FLOW METERING DEVICES ARE NOT INSTALLED, BASE FLOW BALANCE ON TEMPERATURE DIFFERENCE ACROSS VARIOUS HEAT TRANSFER ELEMENTS IN THE SYSTEM.
- C. ADJUST SYSTEMS TO PROVIDE SPECIFIED PRESSURE DROPS AND FLOWS THROUGH HEAT TRANSFER ELEMENTS PRIOR TO THERMAL TESTING. PERFORM BALANCING BY MEASUREMENT OF TEMPERATURE DIFFERENTIAL IN CONJUNCTION WITH AIR BALANCING.
- D. EFFECT SYSTEM BALANCE WITH AUTOMATIC CONTROL VALVES FULLY OPEN TO HEAT TRANSFER ELEMENTS.
- E. EFFECT ADJUSTMENT OF WATER DISTRIBUTION SYSTEMS BY MEANS OF BALANCING COCKS, VALVES, AND FITTINGS. DO NOT USE SERVICE OR SHUT-OFF VALVES FOR BALANCING UNLESS INDEXED FOR BALANCE POINT.
- F. WHERE AVAILABLE PUMP CAPACITY IS LESS THAN TOTAL FLOW REQUIREMENTS OR INDIVIDUAL SYSTEM PARTS, FULL FLOW IN ONE PART MAY BE SIMULATED BY TEMPORARY RESTRICTION OF FLOW TO OTHER PARTS.

3.08 SCOPE

- A. TEST, ADJUST, AND BALANCE THE FOLLOWING:
  1. HVAC PUMPS.
  2. PACKAGED ROOF TOP HEATING/COOLING UNITS.
  3. PACKAGED TERMINAL AIR CONDITIONING UNITS.
  4. UNIT AIR CONDITIONERS.
  5. AIR COILS.
  6. AIR HANDLING UNITS.
  7. FANS.
  8. AIR FILTERS.
  9. AIR TERMINAL UNITS.
  10. AIR INLETS AND OUTLETS.

3.09 MINIMUM DATA TO BE REPORTED

- A. ELECTRIC MOTORS:
  1. MANUFACTURER.
  2. MODEL/FRAME.
  3. HP/BHP.
  4. PHASE, VOLTAGE, AMPERAGE; NAMEPLATE, ACTUAL, NO LOAD.
  5. RPM.
  6. SERVICE FACTOR.
  7. STARTER SIZE, RATING, HEATER ELEMENTS.
  8. SHEAVE MAKE/SIZE/BORE.
- B. V-BELT DRIVES:
  1. IDENTIFICATION/LOCATION.
  2. REQUIRED DRIVEN RPM.
  3. DRIVEN SHEAVE, DIAMETER AND RPM.
  4. BELT, SIZE AND QUANTITY.
  5. MOTOR SHEAVE DIAMETER AND RPM.
- C. PUMPS:
  1. IDENTIFICATION/NUMBER.
  2. MANUFACTURER.

HOLLISTER CALIFORNIA

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Project No.:	260387
Drawn By:	AJB
Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

MECHANICAL SPECIFICATIONS

M0.01

3. SIZE/MODEL.
4. IMPELLER.
5. SERVICE.
6. DESIGN FLOW RATE, PRESSURE DROP, BHP.
7. ACTUAL FLOW RATE, PRESSURE DROP, BHP.
8. DISCHARGE PRESSURE.
9. SUCTION PRESSURE.
10. TOTAL OPERATING HEAD PRESSURE.

D. AIR COOLED CONDENSERS:
1. IDENTIFICATION/NUMBER.
2. LOCATION.
3. MANUFACTURER.
4. MODEL NUMBER.
5. SERIAL NUMBER.
6. ENTERING DB AIR TEMPERATURE, DESIGN AND ACTUAL.
7. LEAVING DB AIR TEMPERATURE, DESIGN AND ACTUAL.
8. NUMBER OF COMPRESSORS.

E. COOLING COILS:
1. IDENTIFICATION/NUMBER.
2. LOCATION.
3. SERVICE.
4. MANUFACTURER.
5. AIR FLOW, DESIGN AND ACTUAL.
6. ENTERING AIR DB TEMPERATURE, DESIGN AND ACTUAL.
7. ENTERING AIR WB TEMPERATURE, DESIGN AND ACTUAL.
8. LEAVING AIR DB TEMPERATURE, DESIGN AND ACTUAL.
9. LEAVING AIR WB TEMPERATURE, DESIGN AND ACTUAL.
10. WATER FLOW, DESIGN AND ACTUAL.
11. WATER PRESSURE DROP, DESIGN AND ACTUAL.
12. ENTERING WATER TEMPERATURE, DESIGN AND ACTUAL.
13. LEAVING WATER TEMPERATURE, DESIGN AND ACTUAL.
14. AIR PRESSURE DROP, DESIGN AND ACTUAL.

F. HEATING COILS:
1. IDENTIFICATION/NUMBER.
2. LOCATION.
3. SERVICE.
4. MANUFACTURER.
5. AIR FLOW, DESIGN AND ACTUAL.
6. WATER FLOW, DESIGN AND ACTUAL.
7. WATER PRESSURE DROP, DESIGN AND ACTUAL.
8. ENTERING WATER TEMPERATURE, DESIGN AND ACTUAL.
9. LEAVING WATER TEMPERATURE, DESIGN AND ACTUAL.
10. ENTERING AIR TEMPERATURE, DESIGN AND ACTUAL.
11. LEAVING AIR TEMPERATURE, DESIGN AND ACTUAL.
12. AIR PRESSURE DROP, DESIGN AND ACTUAL.

G. ELECTRIC DUCT HEATERS:
1. MANUFACTURER.
2. IDENTIFICATION/NUMBER.
3. LOCATION.
4. MODEL NUMBER.
5. DESIGN KW.
6. NUMBER OF STAGES.
7. PHASE, VOLTAGE, AMPERAGE.
8. TEST VOLTAGE (EACH PHASE).
9. TEST AMPERAGE (EACH PHASE).
10. AIR FLOW, SPECIFIED AND ACTUAL.
11. TEMPERATURE RISE, SPECIFIED AND ACTUAL.

H. AIR MOVING EQUIPMENT:
1. LOCATION.
2. MANUFACTURER.
3. MODEL NUMBER.
4. SERIAL NUMBER.
5. AIR FLOW, SPECIFIED AND ACTUAL.
6. RETURN AIR FLOW, SPECIFIED AND ACTUAL.
7. OUTSIDE AIR FLOW, SPECIFIED AND ACTUAL.
8. TOTAL STATIC PRESSURE (TOTAL EXTERNAL), SPECIFIED AND ACTUAL.
9. INLET PRESSURE.
10. DISCHARGE PRESSURE.
11. SHEAVE MAKE/SIZE/BORE.
12. NUMBER OF BELTS/MAKE/SIZE.
13. FAN RPM.

I. RETURN AIR/OUTSIDE AIR:
1. IDENTIFICATION/LOCATION.
2. DESIGN AIR FLOW.
3. ACTUAL AIR FLOW.
4. DESIGN RETURN AIR FLOW.
5. ACTUAL RETURN AIR FLOW.
6. DESIGN OUTSIDE AIR FLOW.
7. ACTUAL OUTSIDE AIR FLOW.
8. RETURN AIR TEMPERATURE.
9. OUTSIDE AIR TEMPERATURE.

J. EXHAUST FANS:
1. LOCATION.
2. MANUFACTURER.
3. MODEL NUMBER.
4. SERIAL NUMBER.
5. AIR FLOW, SPECIFIED AND ACTUAL.
6. TOTAL STATIC PRESSURE (TOTAL EXTERNAL), SPECIFIED AND ACTUAL.
7. INLET PRESSURE.
8. DISCHARGE PRESSURE.
9. SHEAVE MAKE/SIZE/BORE.
10. NUMBER OF BELTS/MAKE/SIZE.
11. FAN RPM.

K. DUCT TRAVERSES:
1. SYSTEM ZONE/BRANCH.
2. DUCT SIZE.
3. AREA.
4. DESIGN VELOCITY.
5. DESIGN AIR FLOW.
6. TEST VELOCITY.
7. TEST AIR FLOW.
8. DUCT STATIC PRESSURE.
9. AIR TEMPERATURE.

L. DUCT LEAK TESTS:
1. DESCRIPTION OF DUCTWORK UNDER TEST.
2. DUCT DESIGN OPERATING PRESSURE.
3. DUCT DESIGN TEST STATIC PRESSURE.
4. DUCT CAPACITY, AIR FLOW.
5. MAXIMUM ALLOWABLE LEAKAGE DUCT CAPACITY TIMES LEAK FACTOR.
6. TEST APPARATUS:
   a. BLOWER.
   b. ORIFICE, TUBE SIZE.
   c. ORIFICE SIZE.
   d. CALIBRATED.
7. TEST STATIC PRESSURE.
8. TEST ORIFICE DIFFERENTIAL PRESSURE.
9. LEAKAGE.

M. FLOW MEASURING STATIONS:
1. IDENTIFICATION/NUMBER.
2. LOCATION.
3. SIZE.
4. MANUFACTURER.
5. MODEL NUMBER.
6. SERIAL NUMBER.
7. DESIGN FLOW RATE.
8. DESIGN PRESSURE DROP.
9. ACTUAL/FINAL PRESSURE DROP.
10. ACTUAL/FINAL FLOW RATE.

N. TERMINAL UNIT DATA:
1. MANUFACTURER.
2. TYPE, CONSTANT, VARIABLE, SINGLE, DUAL DUCT.
3. IDENTIFICATION/NUMBER.
4. LOCATION.
5. MODEL NUMBER.
6. SIZE.
7. MINIMUM DESIGN AIR FLOW.
8. MAXIMUM DESIGN AIR FLOW.
9. MAXIMUM ACTUAL AIR FLOW.

O. AIR DISTRIBUTION TESTS:
1. AIR TERMINAL NUMBER.
2. ROOM NUMBER/LOCATION.
3. TERMINAL TYPE.
4. TERMINAL SIZE.
5. AREA FACTOR.
6. DESIGN VELOCITY.
7. DESIGN AIR FLOW.
8. TEST (FINAL) VELOCITY.
9. TEST (FINAL) AIR FLOW.

P. SOUND LEVEL REPORTS:
1. LOCATION.
2. OCTAVE BANDS - EQUIPMENT OFF.
3. OCTAVE BANDS - EQUIPMENT ON.

SECTION 23 0713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. DUCT INSULATION.
B. DUCT LINER.
C. INSULATION JACKETS.

1.02 DELIVERY, STORAGE, AND HANDLING
A. ACCEPT MATERIALS ON SITE IN ORIGINAL FACTORY PACKAGING, LABELLED WITH MANUFACTURER'S IDENTIFICATION, INCLUDING PRODUCT DENSITY AND THICKNESS.
B. PROTECT INSULATION FROM WEATHER AND CONSTRUCTION TRAFFIC, DIRT, WATER, CHEMICAL, AND MECHANICAL DAMAGE, BY STORING IN ORIGINAL WRAPPING.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS
A. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD INDEX/SMOKE DEVELOPED INDEX OF 25/50, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E84 OR UL 723.

2.02GLASS FIBER, FLEXIBLE
A. MANUFACTURER:
1. CERTAINTEED CORPORATION.
2. JOHNS MANVILLE.
3. KNAUF INSULATION; ATMOSPHERE DUCT WRAP.
4. OWENS CORNING CORPORATION.
B. INSULATION: ASTM C553; FLEXIBLE, NONCOMBUSTIBLE BLANKET.
1. K (KSI) VALUE: 0.36 AT 75 DEGREES F (0.052 AT 24 DEGREES C), WHEN TESTED IN ACCORDANCE WITH ASTM C518.
2. MAXIMUM SERVICE TEMPERATURE: 1200 DEGREES F (649 DEGREES C).
3. MAXIMUM WATER VAPOR ABSORPTION: 5.0 PERCENT BY WEIGHT.
C. VAPOR BARRIER JACKET:
1. KRAFT PAPER WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM.
2. MOISTURE VAPOR PERMEABILITY: 0.02 PERM INCH (0.029 NG/PA S M), WHEN TESTED IN ACCORDANCE WITH ASTM E96/E96M.
3. SECURE WITH PRESSURE SENSITIVE TAPE.
D. VAPOR BARRIER TAPE:
1. KRAFT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM, WITH PRESSURE SENSITIVE RUBBER BASED ADHESIVE.
E. INDOOR VAPOR BARRIER MASTIC:
1. VINYL EMULSION TYPE ACRYLIC OR MASTIC, COMPATIBLE WITH INSULATION, BLACK COLOR.
F. OUTDOOR VAPOR BARRIER MASTIC:
1. VINYL EMULSION TYPE ACRYLIC OR MASTIC, COMPATIBLE WITH INSULATION, BLACK COLOR.

2.03GLASS FIBER, RIGID
A. MANUFACTURER:
1. CERTAINTEED CORPORATION.
2. JOHNS MANVILLE.
3. KNAUF INSULATION.
4. OWENS CORNING CORPORATION; 700 SERIES FIBERGLAS INSULATION:.
B. INSULATION: ASTM C612; RIGID, NONCOMBUSTIBLE BLANKET.
1. K (KSI) VALUE: 0.24 AT 75 DEGREES F (0.036 AT 24 DEGREES C), WHEN TESTED IN ACCORDANCE WITH ASTM C518.
2. MAXIMUM SERVICE TEMPERATURE: 450 DEGREES F (232 DEGREES C).
3. MAXIMUM WATER VAPOR ABSORPTION: 5.0 PERCENT.
4. MAXIMUM DENSITY: 8.0 LB/CU FT (128 KG/CU M).
C. VAPOR BARRIER JACKET:
1. KRAFT PAPER WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM.
2. MOISTURE VAPOR PERMEABILITY: 0.02 PERM INCH (0.029 NG/PA S M), WHEN TESTED IN ACCORDANCE WITH ASTM E96/E96M.
3. SECURE WITH PRESSURE SENSITIVE TAPE.
D. VAPOR BARRIER TAPE:
1. KRAFT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM, WITH PRESSURE SENSITIVE RUBBER BASED ADHESIVE.
E. PROTECTIVE COATING:
1. MANUFACTURERS:
   a. DESIGN POLYMERICS; DP 2540 WATER BASED, LOW VOC, EPA REGISTERED ANTI-MICROBIAL PROTECTIVE COATING: WWW.DESIGNPOLY.COM/#SLE.
F. INDOOR VAPOR BARRIER FINISH:
1. VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH INSULATION, BLACK COLOR.

2.04FLEXIBLE ELASTOMERIC CELLULAR INSULATION
A. MANUFACTURERS:
1. AEROFLEX USA, INC; AEROCEL SHEET & ROLL WITH PSA: WWW.AEROFLEXUSA.COM/#SLE.
2. ARMACELL LLC; AP ARMAFLEX ; [______]: WWW.ARMACELL.US/#SLE.
3. K-FLEX USA LLC; INSUL-SHEET: WWW.KFLEXUSA.COM/#SLE.
B. INSULATION: PREFORMED FLEXIBLE ELASTOMERIC CELLULAR RUBBER INSULATION COMPLYING WITH ASTM C534/C534M GRADE 1, IN SHEET FORM.
1. MINIMUM SERVICE TEMPERATURE: MINUS 40 DEGREES F (MINUS 40 DEGREES C).
2. MAXIMUM SERVICE TEMPERATURE: 180 DEGREES F (82 DEGREES C).
3. CONNECTION: WATERPROOF VAPOR BARRIER ADHESIVE.
C. ELASTOMERIC FOAM ADHESIVE: AIR DRIED, CONTACT ADHESIVE, COMPATIBLE WITH INSULATION.

2.05JACKETS
A. CANVAS JACKET: UL LISTED 6 OZ/SQ YD (220 G/SQ M) PLAIN WEAVE COTTON FABRIC TREATED WITH DILUTE FIRE RETARDANT LAGGING ADHESIVE.
1. LAGGING ADHESIVE:
   a. COMPATIBLE WITH INSULATION.
B. FLEXIBLE WEATHER-PROOFING OUTDOOR JACKET: SELF-HEALING, FIELD-APPLIED OUTDOOR CLADDING.
1. MATERIAL: ALUMINUM FOIL/POLYMER LAMINATE WITH RUBBERIZED ASPHALT LAYER AND ACRYLIC ADHESIVE.
2. THICKNESS: 34 MILS (0.86 MM).
3. FINISH: EMBOSSED.
4. COLOR: WHITE.
5. WATER VAPOR TRANSMISSION: 0.002 PERM INCH (0.0029 NG/PA S M), MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E96/E96M.
6. MOLD RESISTANCE: PASS WHEN TESTED IN ACCORDANCE WITH ASTM C1338.
7. EMISSIVITY: 0.30 WHEN TESTED IN ACCORDANCE WITH ASTM C1371.

2.06DUCT LINER
A. MANUFACTURERS:
1. ARMACELL LLC; AP COILFLEX.
2. CERTAINTEED CORPORATION.
3. DUCTMATE INDUSTRIES, INC, A DMI COMPANY.
4. JOHNS MANVILLE.
5. KNAUF INSULATION.
6. OWENS CORNING CORPORATION; QUIETR ROTARY DUCT INSULATION.
B. ELASTOMERIC FOAM INSULATION: PREFORMED FLEXIBLE ELASTOMERIC CELLULAR RUBBER INSULATION COMPLYING WITH ASTM C534/C534M GRADE 1, IN SHEET FORM.
1. MINIMUM SERVICE TEMPERATURE: MINUS 40 DEGREES F (MINUS 40 DEGREES C).
2. MAXIMUM SERVICE TEMPERATURE: 180 DEGREES F (82 DEGREES C).
3. FUNGAL RESISTANCE: NO GROWTH WHEN TESTED ACCORDING TO ASTM G21.
4. CONNECTION: WATERPROOF VAPOR BARRIER ADHESIVE.
C. ELASTOMERIC FOAM ADHESIVE: AIR DRIED, CONTACT ADHESIVE, COMPATIBLE WITH INSULATION. COMPLY WITH ASTM C916.
D. LINER FASTENERS: GALVANIZED STEEL, SELF-ADHESIVE PAD WITH INTEGRAL HEAD.

PART 3 EXECUTION

3.01 EXAMINATION
A. TEST DUCTWORK FOR DESIGN PRESSURE PRIOR TO APPLYING INSULATION MATERIALS.
B. VERIFY THAT SURFACES ARE CLEAN, FOREIGN MATERIAL REMOVED, AND DRY.

3.02INSTALLATION
A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
B. INSTALL IN ACCORDANCE WITH NAIMA NATIONAL INSULATION STANDARDS.
C. INSULATED DUCTS CONVEYING AIR BELOW AMBIENT TEMPERATURE:
1. PROVIDE INSULATION WITH VAPOR BARRIER JACKETS.
2. FINISH WITH TAPE AND VAPOR BARRIER JACKET.
3. CONTINUE INSULATION THROUGH WALLS, SLEEVES, HANGERS, AND OTHER DUCT PENETRATIONS.
4. INSULATE ENTIRE SYSTEM, INCLUDING FITTINGS, JOINTS, FLANGES, FIRE DAMPERS, FLEXIBLE CONNECTIONS, AND EXPANSION JOINTS.
D. INSULATED DUCTS CONVEYING AIR ABOVE AMBIENT TEMPERATURE:
1. PROVIDE WITH OR WITHOUT STANDARD VAPOR BARRIER JACKET.
2. INSULATE FITTINGS AND JOINTS. WHERE SERVICE ACCESS IS REQUIRED, BEVEL AND SEAL ENDS OF INSULATION.
E. DUCTS EXPOSED IN MECHANICAL EQUIPMENT ROOMS OR FINISHED SPACES: FINISH WITH CANVAS JACKET SIZED FOR FINISH PAINTING.
F. SLOPE EXTERIOR DUCTWORK TO SHED WATER.
G. EXTERNAL DUCT INSULATION APPLICATION:
1. SECURE INSULATION WITH VAPOR BARRIER WITH WIRES AND SEAL JACKET JOINTS WITH VAPOR BARRIER ADHESIVE OR TAPE TO MATCH JACKET.
2. SECURE INSULATION WITHOUT VAPOR BARRIER WITH STAPLES, TAPE, OR WIRES.
3. INSTALL WITHOUT SAG ON UNDERSIDE OF DUCT. USE ADHESIVE OR MECHANICAL FASTENERS WHERE NECESSARY TO PREVENT SAGGING. LIFT DUCT OFF TRAPEZE HANGERS AND INSERT SPACERS.
4. SEAL VAPOR BARRIER PENETRATIONS BY MECHANICAL FASTENERS WITH VAPOR BARRIER ADHESIVE.
5. STOP AND POINT INSULATION AROUND ACCESS DOORS AND DAMPER OPERATORS TO ALLOW OPERATION WITHOUT DISTURBING WRAPPING.
H. DUCT AND PLENUM LINER APPLICATION:
1. ADHERE INSULATION WITH ADHESIVE FOR 90 PERCENT COVERAGE.
2. SECURE INSULATION WITH MECHANICAL LINER FASTENERS. REFER TO SMACNA (DCS) FOR SPACING.
3. SEAL AND SMOOTH JOINTS. SEAL AND COAT TRANSVERSE JOINTS.
4. SEAL LINER SURFACE PENETRATIONS WITH ADHESIVE.
5. DUCT DIMENSIONS INDICATED ARE NET INSIDE DIMENSIONS REQUIRED FOR AIR-FLOW. INCREASE DUCT SIZE TO ALLOW FOR INSULATION THICKNESS.

3.03SCHEDULES
A. ~~EXHAUST DUCTS WITHIN 10 FT (3 M) OF EXTERIOR OPENINGS.~~
B. ~~EXHAUST DUCTS EXPOSED TO OUTDOOR AIR.~~
C. ~~OUTSIDE AIR INTAKE DUCTS.~~
D. ~~PLENUMS.~~
E. ~~PLENUMS (COOLING SYSTEM).~~
F. SUPPLY DUCTS: 1-1/2" BLANKET TYPE
G. ~~SUPPLY DUCTS FROM FANS TO VERTICAL DUCTS IN SHAFTS (COOLING SYSTEM).~~
H. ~~SUPPLY DUCTS IN VERTICAL SHAFTS (COOLING SYSTEMS).~~
I. ~~SUPPLY DUCTS AFTER TERMINAL BOXES.~~
J. ~~RETURN AND RELIEF DUCTS IN MECHANICAL ROOMS.~~

SECTION 23 0716 - HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. EQUIPMENT INSULATION.

1.02 DELIVERY, STORAGE, AND HANDLING
A. ACCEPT MATERIALS ON SITE IN ORIGINAL FACTORY PACKAGING, LABELED WITH MANUFACTURER'S IDENTIFICATION, INCLUDING PRODUCT DENSITY AND THICKNESS.
B. PROTECT INSULATION FROM WEATHER AND CONSTRUCTION TRAFFIC, DIRT, WATER, CHEMICAL, AND MECHANICAL DAMAGE, BY STORING IN ORIGINAL WRAPPING.

1.03 FIELD CONDITIONS
A. MAINTAIN AMBIENT TEMPERATURES AND CONDITIONS REQUIRED BY MANUFACTURERS OF ADHESIVES, MASTICS, AND INSULATION CEMENTS.
B. MAINTAIN TEMPERATURE DURING AND AFTER INSTALLATION FOR MINIMUM PERIOD OF 24 HOURS.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS
A. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD INDEX/SMOKE DEVELOPED INDEX OF 25/50, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E84 OR UL 723.

2.02FLEXIBLE ELASTOMERIC CELLULAR INSULATION
A. MANUFACTURER:
1. AEROFLEX USA, INC; AEROCEL AC SHEET AND ROLL.
2. ARMACELL LLC; ARMAFLEX ULTRA WITH FLAMEDEFENSE.
3. K-FLEX USA LLC; INSUL-SHEET.
B. INSULATION: PREFORMED FLEXIBLE ELASTOMERIC CELLULAR RUBBER INSULATION COMPLYING WITH ASTM C534/C534M GRADE 1, IN SHEET FORM.
1. MINIMUM SERVICE TEMPERATURE: MINUS 40 DEGREES F (MINUS 40 DEGREES C).
2. MAXIMUM SERVICE TEMPERATURE: 220 DEGREES F (104 DEGREES C).
3. CONNECTION: WATERPROOF VAPOR BARRIER ADHESIVE.
C. ELASTOMERIC FOAM ADHESIVE: AIR DRIED, CONTACT ADHESIVE, COMPATIBLE WITH INSULATION.

PART 3 EXECUTION

3.01 EXAMINATION
A. VERIFY THAT EQUIPMENT HAS BEEN TESTED BEFORE APPLYING INSULATION MATERIALS.
B. VERIFY THAT SURFACES ARE CLEAN AND DRY, WITH FOREIGN MATERIAL REMOVED.

3.02INSTALLATION
A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
B. FACTORY INSULATED EQUIPMENT: DO NOT INSULATE.
C. EXPOSED EQUIPMENT: LOCATE INSULATION AND COVER SEAMS IN LEAST VISIBLE LOCATIONS.
D. APPLY INSULATION CLOSE TO EQUIPMENT BY GROOVING, SCORING, AND BEVELING INSULATION. FASTEN INSULATION TO EQUIPMENT WITH STUDS, PINS, CLIPS, ADHESIVE, WIRES, OR BANDS.
E. FILL JOINTS, CRACKS, SEAMS, AND DEPRESSIONS WITH BEDDING COMPOUND TO FORM SMOOTH SURFACE. ON COLD EQUIPMENT, USE VAPOR BARRIER CEMENT.
F. INSULATED EQUIPMENT CONTAINING FLUIDS BELOW AMBIENT TEMPERATURE; INSULATE ENTIRE SYSTEM.
G. FOR HOT EQUIPMENT CONTAINING FLUIDS OVER 140 DEGREES F (60 DEGREES C), INSULATE FLANGES AND UNIONS WITH REMOVABLE SECTIONS AND JACKETS.
H. COVER GLASS FIBER INSULATION WITH METAL MESH AND FINISH WITH HEAVY COAT OF INSULATING CEMENT.

3.03SCHEDULE
A. HEATING SYSTEMS:
1. PUMP BODIES: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
2. HEAT EXCHANGERS/CONVERTERS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
3. AIR SEPARATORS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
4. EXPANSION TANKS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
5. HOT THERMAL STORAGE TANKS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
6. BOILER FEED WATER STORAGE TANKS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
B. COOLING SYSTEMS:
1. PUMP BODIES: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
2. AIR SEPARATORS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
3. EXPANSION TANKS: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR
4. EQUIPMENT EXPOSED TO FREEZING WITH HEAT TRACING: 1 INCH FLEXIBLE ELASTOMERIC CELLULAR

SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. PIPING INSULATION.
B. FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION.
C. JACKETS AND ACCESSORIES.

1.02 FIELD CONDITIONS
A. MAINTAIN AMBIENT CONDITIONS REQUIRED BY MANUFACTURERS OF EACH PRODUCT.
B. MAINTAIN TEMPERATURE BEFORE, DURING, AND AFTER INSTALLATION FOR MINIMUM OF 24 HOURS.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS
A. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD INDEX/SMOKE DEVELOPED INDEX OF 25/50, MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E84 OR UL 723.

2.02GLASS FIBER, RIGID
A. MANUFACTURERS:
1. CERTAINTEED CORPORATION.
2. JOHNS MANVILLE CORPORATION.
3. KNAUF INSULATION; EARTHWOOL 1000 DEGREE PIPE INSULATION.
4. OWENS CORNING CORPORATION; FIBERGLAS PIPE INSULATION ASJ.
B. INSULATION: ASTM C547 AND ASTM C795; RIGID MOLDED, NONCOMBUSTIBLE.
1. K (KSI) VALUE: ASTM C177, 0.24 AT 75 DEGREES F (0.035 AT 24 DEGREES C).
2. MAXIMUM SERVICE TEMPERATURE: 850 DEGREES F (454 DEGREES C).
3. MAXIMUM MOISTURE ABSORPTION: 0.2 PERCENT BY VOLUME.
C. VAPOR BARRIER JACKET: WHITE KRAFT PAPER WITH GLASS FIBER YARN, BONDED TO ALUMINIZED FILM; MOISTURE VAPOR TRANSMISSION WHEN TESTED IN ACCORDANCE WITH ASTM E96/E96M OF 0.02 PERM-INCHES (0.029 NG/PA S M).

2.03FLEXIBLE ELASTOMERIC CELLULAR INSULATION
A. MANUFACTURERS:
1. AEROFLEX USA, INC; AEROCEL STAY-SEAL WITH PROTAPE (SSPT).
2. ARMACELL LLC; ARMAFLEX ULTRA WITH FLAMEDEFENSE.
3. K-FLEX USA LLC; K-FLEX TITAN.
B. INSULATION: PREFORMED FLEXIBLE ELASTOMERIC CELLULAR RUBBER INSULATION COMPLYING WITH ASTM C534/C534M GRADE 1; USE MOLDED TUBULAR MATERIAL WHEREVER POSSIBLE.
1. MINIMUM SERVICE TEMPERATURE: MINUS 40 DEGREES F (MINUS 40 DEGREES C).
2. MAXIMUM SERVICE TEMPERATURE: 180 DEGREES F (82 DEGREES C).
3. CONNECTION: WATERPROOF VAPOR BARRIER ADHESIVE.

2.04JACKETS
A. PVC PLASTIC.
1. MANUFACTURERS:
   a. JOHNS MANVILLE CORPORATION.
2. JACKET: ONE PIECE MOLDED TYPE FITTING COVERS AND SHEET MATERIAL, OFF-WHITE COLOR.
   a. MINIMUM SERVICE TEMPERATURE: 0 DEGREES F (MINUS 18 DEGREES C).
   b. MAXIMUM SERVICE TEMPERATURE: 150 DEGREES F (66 DEGREES C).
   c. MOISTURE VAPOR PERMEABILITY: 0.002 PERM INCH (0.0029 NG/PA S M), MAXIMUM, WHEN TESTED IN ACCORDANCE WITH ASTM E96/E96M.
   d. THICKNESS: 10 MIL (0.25 MM).
   e. CONNECTIONS: BRUSH ON WELDING ADHESIVE.

PART 3 EXECUTION

3.01 EXAMINATION
A. TEST PIPING FOR DESIGN PRESSURE, LIQUID TIGHTNESS, AND CONTINUITY PRIOR TO APPLYING INSULATION MATERIALS.
B. VERIFY THAT SURFACES ARE CLEAN AND DRY, WITH FOREIGN MATERIAL REMOVED.

3.02INSTALLATION
A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
B. INSTALL IN ACCORDANCE WITH NAIMA NATIONAL INSULATION STANDARDS.
C. EXPOSED PIPING: LOCATE INSULATION AND COVER SEAMS IN LEAST VISIBLE LOCATIONS.
D. INSULATED PIPES CONVEYING FLUIDS BELOW AMBIENT TEMPERATURE:
1. INSULATE ENTIRE SYSTEM, INCLUDING FITTINGS, VALVES, UNIONS, FLANGES, STRAINERS, FLEXIBLE CONNECTIONS, PUMP BODIES, AND EXPANSION JOINTS.
E. GLASS FIBER INSULATED PIPES CONVEYING FLUIDS BELOW AMBIENT TEMPERATURE:
1. PROVIDE VAPOR BARRIER JACKETS, FACTORY-APPLIED OR FIELD-APPLIED; SECURE WITH SELF-SEALING LONGITUDINAL LAPS AND BUTT STRIPS WITH PRESSURE SENSITIVE ADHESIVE. SECURE WITH OUTWARD CLINCH EXPANDING STAPLES AND VAPOR BARRIER MASTIC.
2. INSULATE FITTINGS, JOINTS, AND VALVES WITH MOLDED INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJACENT PIPE. FINISH WITH GLASS CLOTH AND VAPOR BARRIER ADHESIVE OR PVC FITTING COVERS.
F. FOR HOT PIPING CONVEYING FLUIDS OVER 140 DEGREES F (60 DEGREES C), INSULATE FLANGES AND UNIONS AT EQUIPMENT.
G. GLASS FIBER INSULATED PIPES CONVEYING FLUIDS ABOVE AMBIENT TEMPERATURE:
1. PROVIDE STANDARD JACKETS, WITH OR WITHOUT VAPOR BARRIER, FACTORY-APPLIED, OR FIELD-APPLIED. SECURE WITH SELF-SEALING LONGITUDINAL LAPS AND BUTT STRIPS WITH PRESSURE-SENSITIVE ADHESIVE. SECURE WITH OUTWARD CLINCH EXPANDING STAPLES.
2. INSULATE FITTINGS, JOINTS, AND VALVES WITH INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJOINING PIPE. FINISH WITH GLASS CLOTH AND ADHESIVE OR PVC FITTING COVERS.
H. INSERTS AND SHIELDS:
1. APPLICATION: PIPING 1-1/2 INCHES (40 MM) DIAMETER OR LARGER.
2. SHIELDS: GALVANIZED STEEL BETWEEN PIPE HANGERS OR PIPE HANGER ROLLS AND INSERTS.
3. INSERT LOCATION: BETWEEN SUPPORT SHIELD AND PIPING AND UNDER THE FINISH JACKET.
4. INSERT CONFIGURATION: MINIMUM 6 INCHES (150 MM) LONG, OF SAME THICKNESS AND CONTOUR AS ADJOINING INSULATION; MAY BE FACTORY FABRICATED.
I. CONTINUE INSULATION THROUGH WALLS, SLEEVES, PIPE HANGERS, AND OTHER PIPE PENETRATIONS. FINISH AT SUPPORTS, PROTRUSIONS, AND INTERRUPTIONS. AT FIRE SEPARATIONS, SEE SECTION 07 8400.
J. PIPE EXPOSED IN MECHANICAL EQUIPMENT ROOMS OR FINISHED SPACES (LESS THAN 10 FEET (3 METERS) ABOVE FINISHED FLOOR): FINISH WITH PVC JACKET AND FITTING COVERS .
K. EXTERIOR APPLICATIONS: PROVIDE VAPOR BARRIER JACKET. INSULATE FITTINGS, JOINTS, AND VALVES WITH INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJOINING PIPE, AND FINISH WITH GLASS MESH REINFORCED VAPOR BARRIER CEMENT. COVER WITH ALUMINUM JACKET WITH SEAMS LOCATED ON BOTTOM SIDE OF HORIZONTAL PIPING. PROVIDE TWO COATS OF UV RESISTANT FINISH FOR FLEXIBLE ELASTOMERIC CELLULAR INSULATION WITHOUT JACKETING.
L. BURIED PIPING: PROVIDE FACTORY-FABRICATED ASSEMBLY WITH INNER ALL-PURPOSE SERVICE JACKET WITH SELF-SEALING LAP, AND ASPHALT IMPREGNATED OPEN MESH GLASS FABRIC, WITH ONE MIL (0.025 MM) THICK ALUMINUM FOIL SANDWICHED BETWEEN THREE LAYERS OF BITUMINOUS COMPOUND; OUTER SURFACE FACED WITH POLYESTER FILM.
M. HEAT TRACED PIPING: INSULATE FITTINGS, JOINTS, AND VALVES WITH INSULATION OF LIKE MATERIAL, THICKNESS, AND FINISH AS ADJOINING PIPE. SIZE LARGE ENOUGH TO ENCLOSE PIPE AND HEAT TRACER. COVER WITH ALUMINUM JACKET WITH SEAMS LOCATED ON BOTTOM SIDE OF HORIZONTAL PIPING.

3.03SCHEDULE
A. HEATING SYSTEMS:
1. HEATING WATER SUPPLY AND RETURN: 1 INCH
2. GLYCOL HEATING SUPPLY AND RETURN: 1 INCH
3. BOILER FEED WATER: 1 INCH
B. COOLING SYSTEMS:
1. CHILLED WATER: 1 INCH
2. CONDENSER WATER: 1 INCH
3. DUAL TEMPERATURE WATER: 1 INCH
4. GLYCOL COOLING SUPPLY AND RETURN: 1 INCH
5. CONDENSATE DRAINS (PVC): NONE
6. CONDENSATE DRAINS (COPPER): 1/2 INCH
7. REFRIGERANT SUCTION: 1/2 INCH
8. REFRIGERANT HOT GAS: 1/2 INCH
C. OTHER SYSTEMS:
1. ENGINE EXHAUST PIPING: 2-1/2 INCH
2. PIPING EXPOSED TO FREEZING WITH HEAT TRACING: 2-1/2 INCH

SECTION 23 2113 - HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. HYDRONIC SYSTEM REQUIREMENTS.
B. HEATING WATER PIPING, ABOVE GRADE.
C. HEATING WATER AND GLYCOL PIPING, ABOVE GRADE.
D. CHILLED WATER PIPING, ABOVE GRADE.
E. CONDENSER WATER PIPING, ABOVE GRADE.
F. EQUIPMENT DRAINS AND OVERFLOWS.
G. UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS.
H. VALVES:
1. BALL VALVES.
2. BUTTERFLY VALVES.
3. CHECK VALVES.
4. PRESSURE INDEPENDENT TEMPERATURE CONTROL VALVES AND BALANCING VALVES.
I. FLOW CONTROLS.

1.02 DELIVERY, STORAGE, AND HANDLING
A. ACCEPT VALVES ON SITE IN SHIPPING CONTAINERS WITH LABELING IN PLACE. INSPECT FOR DAMAGE.
B. PROVIDE TEMPORARY PROTECTIVE COATING ON CAST IRON AND STEEL VALVES.
C. PROVIDE TEMPORARY END CAPS AND CLOSURES ON PIPING AND FITTINGS. MAINTAIN IN PLACE UNTIL INSTALLATION.
D. PROTECT PIPING SYSTEMS FROM ENTRY OF FOREIGN MATERIALS BY TEMPORARY COVERS, COMPLETING SECTIONS OF THE WORK, AND ISOLATING PARTS OF COMPLETED SYSTEM.

1.03 FIELD CONDITIONS
A. DO NOT INSTALL UNDERGROUND PIPING WHEN BEDDING IS WET OR FROZEN.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS
A. COMPLY WITH ASME B31.9 AND APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
B. PIPING: PROVIDE PIPING, FITTINGS, HANGERS, AND SUPPORTS AS REQUIRED, AS INDICATED, AND AS FOLLOWS:
1. WHERE MORE THAN ONE PIPING SYSTEM MATERIAL IS SPECIFIED, PROVIDE JOINING FITTINGS THAT ARE COMPATIBLE WITH PIPING MATERIALS AND ENSURE THAT THE INTEGRITY OF THE SYSTEM IS NOT JEOPARDIZED.
2. USE NON-CONDUCTING DIELECTRIC CONNECTIONS WHENEVER JOINTING DISSIMILAR METALS.
3. GROOVED MECHANICAL JOINTS MAY BE USED IN ACCESSIBLE LOCATIONS ONLY.
   a. ACCESSIBLE LOCATIONS INCLUDE THOSE EXPOSED ON INTERIOR OF BUILDING, IN PIPE CHASES, AND IN MECHANICAL ROOMS, ABOVEGROUND OUTDOORS, AND AS APPROVED BY ARCHITECT.
   b. GROOVED MECHANICAL CONNECTIONS AND JOINTS COMPLY WITH AWWA C606.
      1) DUCTILE IRON: COMPLY WITH ASTM A536, GRADE 65-45-12.
      2) STEEL: COMPLY WITH ASTM A106/A106M, GRADE B OR ASTM A53/A53M.
   c. USE RIGID JOINTS UNLESS OTHERWISE INDICATED.
   d. DEPENDING ON PIPE SIZE, THREE OR FOUR FLEXIBLE JOINTS MAY BE USED IN LIEU OF A FLEXIBLE CONNECTOR.
   e. USE GASKETS OF MOLDED SYNTHETIC RUBBER WITH CENTRAL CAVITY, PRESSURE-RESPONSIVE CONFIGURATION, AND COMPLYING WITH ASTM D2000, GRADE 2CA615A15B44F17Z FOR CIRCULATING MEDIUM UP TO MAXIMUM 230 DEGREES F (110 DEGREES C) OR GRADE M3BA610A15B44Z FOR CIRCULATING MEDIUM UP TO MAXIMUM 200 DEGREES F (93 DEGREES C).
   f. PROVIDE STEEL COUPLING NUTS AND BOLTS COMPLYING WITH ASTM A183.
4. PROVIDE PIPE HANGERS AND SUPPORTS IN ACCORDANCE WITH ASME B31.9 OR MSS SP-58 UNLESS INDICATED OTHERWISE.
C. PIPE-TO-VALVE AND PIPE-TO-EQUIPMENT CONNECTIONS: USE FLANGES, UNIONS, OR GROOVED COUPLINGS TO ALLOW DISCONNECTION OF COMPONENTS FOR SERVICING; DO NOT USE DIRECT WELDED, SOLDERED, OR THREADED CONNECTIONS.
1. WHERE GROOVED JOINTS ARE USED IN PIPING, PROVIDE GROOVED VALVE/EQUIPMENT CONNECTIONS IF AVAILABLE; IF NOT AVAILABLE, PROVIDE FLANGED ENDS AND GROOVED FLANGE ADAPTERS.
D. VALVES: PROVIDE VALVES WHERE INDICATED:
1. PROVIDE DRAIN VALVES WHERE INDICATED, AND IF NOT INDICATED, PROVIDE AT LEAST AT MAIN SHUT-OFF, LOW POINTS OF PIPING, BASES OF VERTICAL RISERS, AND AT EQUIPMENT. USE 3/4 INCH (20 MM) GATE VALVES WITH CAP; PIPE TO NEAREST FLOOR DRAIN.
2. ON DISCHARGE OF CONDENSER WATER PUMPS, USE SPRING-LOADED CHECK VALVES.
3. ISOLATE EQUIPMENT USING BUTTERFLY VALVES WITH LUG END FLANGES OR GROOVED MECHANICAL COUPLINGS.
4. FOR THROTTLING, BYPASS, OR MANUAL FLOW CONTROL SERVICES, USE GLOBE, BALL, OR BUTTERFLY VALVES.
5. FOR THROTTLING AND ISOLATION SERVICE IN CHILLED AND CONDENSER WATER SYSTEMS, USE ONLY BUTTERFLY VALVES.
6. IN HEATING WATER, CHILLED WATER, OR CONDENSER WATER SYSTEMS, BUTTERFLY VALVES MAY BE USED INTERCHANGEABLY WITH GATE AND GLOBE VALVES.
7. FOR SHUT-OFF AND TO ISOLATE PARTS OF SYSTEMS OR VERTICAL RISERS, USE GATE, BALL, OR BUTTERFLY VALVES.
8. FOR THROTTLING SERVICE, USE PLUG COCKS. USE NON-LUBRICATED PLUG COCKS ONLY WHEN SHUT-OFF OR ISOLATING VALVES ARE ALSO PROVIDED.

2.02HEATING WATER AND GLYCOL PIPING, ABOVE GRADE
A. STEEL PIPE: ASTM A53/A53M, SCHEDULE 40, BLACK, USING ONE OF THE FOLLOWING JOINT TYPES:
1. WELDED JOINTS: ASTM A234/A234M, WROUGHT STEEL WELDING TYPE FITTINGS; AWS D1.1/D1.1M WELDED.
B. COPPER TUBE: ASTM B88 (ASTM B88M), TYPE K (A), DRAWN, USING ONE OF THE FOLLOWING JOINT TYPES:
1. SOLDER JOINTS: ASME B16.18 CAST BRASS/BRONZE OR ASME B16.22 SOLDER WROUGHT COPPER FITTINGS.
   a. SOLDER: ASTM B32 LEAD-FREE SOLDER, HB ALLOY (95-5 TIN-ANTIMONY) OR TIN AND SILVER.
   b. BRAZE: AWS A5.8M/A5.8 BCUP COPPER/SILVER ALLOY.
2. TEE CONNECTIONS: MECHANICALLY EXTRACTED COLLARS WITH NOTCHED AND DIMPLED BRANCH TUBE.

2.03CHILLED WATER PIPING, ABOVE GRADE
A. STEEL PIPE: ASTM A53/A53M, SCHEDULE 40, BLACK; USING ONE OF THE FOLLOWING JOINT TYPES:
1. WELDED JOINTS: ASTM A234/A234M, WROUGHT STEEL WELDING TYPE FITTINGS; AWS D1.1/D1.1M WELDED.
2. THREADED JOINTS: ASME B16.3, MALLEABLE IRON FITTINGS.
3. GROOVED JOINTS: AWWA C606 GROOVED PIPE, FITTINGS OF SAME MATERIAL, AND MECHANICAL COUPLINGS.
B. COPPER TUBE: ASTM B88 (ASTM B88M), TYPE K (A), HARD DRAWN; USING ONE OF THE FOLLOWING JOINT TYPES:
1. SOLDER JOINTS: ASME B16.18 CAST BRASS/BRONZE OR ASME B16.22, SOLDER WROUGHT COPPER FITTINGS.
   a. SOLDER: ASTM B32 LEAD-FREE SOLDER, HB ALLOY (95-5 TIN-ANTIMONY) OR TIN AND SILVER.
2. GROOVED JOINTS: AWWA C606 GROOVED TUBE, FITTINGS OF SAME MATERIAL, AND COPPER-TUBE-DIMENSION MECHANICAL COUPLINGS.
3. TEE CONNECTIONS: MECHANICALLY EXTRACTED COLLARS WITH NOTCHED AND DIMPLED BRANCH TUBE.

2.04CONDENSER WATER PIPING, ABOVE GRADE
A. STEEL PIPE: ASTM A53/A53M, SCHEDULE 40, BLACK.
1. WELDED JOINTS: ASTM A234/A234M, WROUGHT STEEL WELDING TYPE FITTINGS WITH FINISH MATCHING PIPING; AWS D1.1/D1.1M WELDED.
2. THREADED JOINTS: ASME B16.3, MALLEABLE IRON FITTINGS WITH FINISH MATCHING PIPING.
3. GROOVED JOINTS: AWWA C606 GROOVED PIPE, FITTINGS OF SAME MATERIAL, AND MECHANICAL COUPLINGS.
B. COPPER TUBE: ASTM B88 (ASTM B88M), TYPE K (A), DRAWN; USING ONE OF THE FOLLOWING JOINT TYPES:
1. SOLDER JOINTS: ASME B16.18 CAST BRASS/BRONZE OR ASME B16.22 SOLDER WROUGHT COPPER FITTINGS.
   a. SOLDER: ASTM B32 LEAD-FREE SOLDER, HB ALLOY (95-5 TIN-ANTIMONY) OR TIN AND SILVER.
2. GROOVED JOINTS: AWWA C606 GROOVED TUBE, FITTINGS OF SAME MATERIAL, AND COPPER-TUBE-DIMENSION MECHANICAL COUPLINGS.
3. TEE CONNECTIONS: MECHANICALLY EXTRACTED COLLARS WITH NOTCHED AND DIMPLED BRANCH TUBE.

2.05EQUIPMENT DRAINS AND OVERFLOWS
A. STEEL PIPE: ASTM A53/A53M, SCHEDULE 40 GALVANIZED; USING ONE OF THE FOLLOWING JOINT TYPES:
B. COPPER TUBE: ASTM B88 (ASTM B88M), TYPE K (A), DRAWN; USING ONE OF THE FOLLOWING JOINT TYPES:
1. SOLDER JOINTS: ASME B16.18 CAST BRASS/BRONZE OR ASME B16.22 SOLDER WROUGHT COPPER FITTINGS; ASTM B32 LEAD-FREE SOLDER, HB ALLOY (95-5 TIN-ANTIMONY) OR TIN AND SILVER.
2. GROOVED JOINTS: AWWA C606 GROOVED PIPE, FITTINGS OF SAME MATERIAL, AND MECHANICAL COUPLINGS.

2.06UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS
A. UNIONS FOR PIPE 2 INCHES (50 MM) AND LESS:
1. FERROUS PIPING: 150 PSIG (1034 KPA) MALLEABLE IRON, THREADED.
2. COPPER PIPE: BRONZE, SOLDERED JOINTS.
B. FLANGES FOR PIPE 2 INCHES (50 MM) AND GREATER:
1. FERROUS PIPING: 150 PSIG (1034 KPA) FORGED STEEL, SLIP-ON.
2. COPPER PIPING: BRONZE.
3. GASKETS: 1/16 INCH (1.6 MM) THICK, PREFORMED NEOPRENE.
C. MECHANICAL COUPLINGS FOR GROOVED AND SHOULDERED JOINTS: TWO OR MORE CURVED HOUSING SEGMENTS WITH CONTINUOUS KEY TO ENGAGE PIPE GROOVE, CIRCULAR C-PROFILE GASKET, AND BOLTS TO SECURE AND COMPRESS GASKET.
1. DIMENSIONS AND TESTING: IN ACCORDANCE WITH AWWA C606.
2. MECHANICAL COUPLINGS: COMPLY WITH ASTM F1476.
3. BOLTS AND NUTS: HOT DIPPED GALVANIZED OR ZINC-ELECTROPLATED STEEL.
4. WHEN PIPE IS FIELD GROOVED, PROVIDE COUPLING MANUFACTURER'S GROOVING TOOLS.
5. MANUFACTURERS:
   a. APOLLO VALVES WWW.APOLLOVALVES.COM
   b. GRINNELL PRODUCTS; WWW.GRINNELL.COM
   c. VICTAULIC COMPANY; WWW.VICTAULIC.COM
D. DIELECTRIC CONNECTIONS:
1. WATERWAYS:
   a. WATER IMPERVIOUS INSULATION BARRIER CAPABLE OF LIMITING GALVANIC CURRENT TO 1 PERCENT OF SHORT CIRCUIT CURRENT IN A CORRESPONDING BIMETALLIC JOINT.
   b. DRY INSULATION BARRIER ABLE TO WITHSTAND 600-VOLT BREAKDOWN TEST.
   c. CONSTRUCT OF GALVANIZED STEEL WITH THREADED END CONNECTIONS TO MATCH CONNECTING PIPING.
   d. SUITABLE FOR THE REQUIRED OPERATING PRESSURES AND TEMPERATURES.
2. FLANGES:
   a. DIELECTRIC FLANGES WITH SAME PRESSURE RATINGS AS STANDARD FLANGES.
   b. WATER IMPERVIOUS INSULATION BARRIER CAPABLE OF LIMITING GALVANIC CURRENT TO 1 PERCENT OF SHORT CIRCUIT CURRENT IN A CORRESPONDING BIMETALLIC JOINT.
   c. DRY INSULATION BARRIER ABLE TO WITHSTAND 600-VOLT BREAKDOWN TEST.
   d. CONSTRUCT OF GALVANIZED STEEL WITH THREADED END CONNECTIONS TO MATCH CONNECTING PIPING.
   e. SUITABLE FOR THE REQUIRED OPERATING PRESSURES AND TEMPERATURES.
3. UNIONS:
   a. 1/2 TO 1 INCHES (15 TO 25 MM): BRASS SOLDER TO GALVANIZED FPT.
   b. 1/2 TO 2 INCHES (15 TO 50 MM): BRASS SOLDER TO GALVANIZED FPT.
   c. 1/2 TO 1 INCHES (15 TO 25 MM): BRASS TO GALVANIZED FPT OR FIP (FEMALE IRON PIPE).
   d. 3/4 TO 1/2 INCH (20 TO 15 MM) REDUCER: BRASS SOLDER TO GALVANIZED FPT.
   e. SERVICE: 250 PSI (1,723.6 KPA), MINUS 20 TO 180 DEG F (MINUS 28.9 TO 82.2 DEG F).

2.07BALL VALVES
A. MANUFACTURERS:
1. APOLLO VALVES.
2. GRINNELL PRODUCTS.
3. VIEGA LLC.
B. UP TO AND INCLUDING 2 INCHES (50 MM):
1. BRONZE ONE PIECE BODY, CHROME PLATED BRASS BALL, TEFLON SEATS AND STUFFING BOX RING, LEVER HANDLE WITH BALANCING STOPS, SOLDER ENDS WITH UNION.
C. OVER 2 INCHES (50 MM):
1. DUCTILE IRON BODY, CHROME PLATED STAINLESS STEEL BALL, TEFLON, VIRGIN TFE SEAT AND STUFFING BOX SEALS, LEVER HANDLE, GEAR OPERATED FLANGED ENDS, RATED TO 800 PSI (5515 KPA).

2.08BUTTERFLY VALVES
A. MANUFACTURERS:
1. APOLLO VALVES.
2. GRINNELL PRODUCTS.
3. VIEGA LLC.
B. BODY: CAST OR DUCTILE IRON WITH RESILIENT REPLACEABLE EPDM SEAT, WAFER, LUG, OR GROOVED ENDS, EXTENDED NECK.
C. DISC: CONSTRUCT OF ALUMINUM BRONZE, CHROME PLATED DUCTILE IRON, STAINLESS STEEL, DUCTILE IRON WITH EPDM ENCAPSULATION, OR BUNA-N ENCAPSULATION.
D. OPERATOR: 10 POSITION LEVER HANDLE.

2.09SWING CHECK VALVES
A. MANUFACTURERS:
1. APOLLO VALVES.
2. GRINNELL PRODUCTS.
3. VIEGA LLC.
B. UP TO AND INCLUDING 2 INCHES (50 MM):
1. BRONZE BODY, BRONZE TRIM, BRONZE ROTATING SWING DISC, WITH COMPOSITION DISC, SOLDER ENDS.
C. OVER 2 INCHES (50 MM):
1. IRON BODY, OR BRONZE TRIM, STAINLESS STEEL, BRONZE, OR BRONZE FACED ROTATING SWING DISC, RENEWABLE DISC AND SEAT, FLANGED, OR GROOVED ENDS.

2.10 SPRING LOADED CHECK VALVES
A. MANUFACTURERS:
1. APOLLO VALVES.
2. GRINNELL PRODUCTS.
3. VIEGA LLC.
B. IRON BODY, BRONZE TRIM, SPLIT PLATE, HINGED WITH STAINLESS STEEL SPRING, RESILIENT SEAL BONDED TO BODY, WAFER, OR THREADED LUG ENDS.

2.11 PRESSURE INDEPENDENT TEMPERATURE CONTROL VALVES AND BALANCING VALVES
A. MANUFACTURERS:
1. DANFOSS; AB-QM VALVE.
2. SCHNEIDER ELECTRIC.
B. CONTROL VALVES: FACTORY-FABRICATED PRESSURE INDEPENDENT WITH INTERNAL DIFFERENTIAL PRESSURE REGULATOR (DPRV), WHICH AUTOMATICALLY ADJUSTS TO NORMAL CHANGES IN SYSTEM PRESSURE AND PROVIDES 100 PERCENT CONTROL VALVE AUTHORITY AT ALL POSITIONS OF THE VALVE.
1. MAINTAIN PROPORTIONAL AND LINEAR FLOW COIL CHARACTERISTICS.
2. PICV TO ACCURATELY CONTROL THE FLOW FROM 0 TO 100 PERCENT FULL RATED FLOW WITH AN OPERATING PRESSURE DIFFERENTIAL RANGE OF 3 TO 60 PSIG (21 TO 414 KPA).
3. PROVIDE CONTROL VALVE TO INCORPORATE CONTROL, BALANCING, AND FLOW LIMITING. HYDRONIC SYSTEM PRESSURE INDEPENDENT CONTROL VALVE BODIES TO COMPLY WITH ASME B16.34 OR ASME B16.15 PRESSURE AND TEMPERATURE CLASS RATINGS BASED ON THE DESIGN OPERATING TEMPERATURE AND 150 PERCENT OF THE SYSTEM DESIGN OPERATING PRESSURE AND HAVE THE FOLLOWING CHARACTERISTICS:
   a. 2 NPS (50 DN) AND SMALLER: CLASS 150 BRONZE OR BRASS BODY WITH UNION CONNECTIONS, STAINLESS STEEL TRIM, STAINLESS STEEL RISING STEM, STAINLESS STEEL DISC OR BALL, AND SCREWED ENDS WITH BACKSEATING CAPACITY REPACKABLE UNDER PRESSURE.
   b. 2-1/2 NPS (65 DN) AND LARGER: CLASS 125 IRON OR DUCTILE IRON BODY, STAINLESS STEEL TRIM, STAINLESS STEEL RISING STEM, STAINLESS STEEL DISC OR BALL, FLANGED ENDS WITH BACKSEATING CAPACITY REPACKABLE UNDER PRESSURE.
   c. PRESSURE CONTROL SEAT: BRASS CONSTRUCTION WITH VULCANIZED EPDM.
   d. SIZING: LINE-SIZE.
   e. FITTINGS AND COMPONENTS: ALL FITTINGS AND COMPONENTS TO MEET ANSI STANDARDS AND BE COMPATIBLE WITH READILY AVAILABLE COMPONENTS. 8-INCH (200 MM) VALVES AND ABOVE TO BE PROVIDED WITH PROPER COMPANION FLANGES.
   f. CLOSE-OFF (DIFFERENTIAL) PRESSURE RATING: COMBINATION OF ACTUATOR, DPRV ACTION, AND TRIM TO PROVIDE A MINIMUM CLOSE-OFF PRESSURE RATING OF 150 PERCENT OF TOTAL SYSTEM (PUMP) HEAD. PROVIDE ACTUATOR FROM THE SAME MANUFACTURER AS THE PRESSURE INDEPENDENT CONTROL VALVE.
C. ELECTRONIC ACTUATORS: DIRECT-MOUNTED, SELF-CALIBRATING TYPE DESIGNED FOR MINIMUM 60,000 FULL-STROKE CYCLES AT RATED FORCE.
D. PROVIDE ACTUATOR WITH VISIBLE POSITION INDICATION. FAIL POSITIONS ON POWER FAILURE TO INCLUDE IN-PLACE, OPEN OR CLOSED AS INDICATED IN THE CONTROLS SPECIFICATIONS.
1. VALVES: SIZED FOR MAXIMUM CIRCUIT FLOW RATE AND NOMINALLY, LINE-SIZED.

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Project No.:	260387
Drawn By:	AJB
Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

MECHANICAL SPECIFICATIONS

M0.02

2. OVERLOAD PROTECTION: ELECTRONIC OVERLOAD OR DIGITAL ROTATION-SENSING CIRCUITRY.
3. FAIL-SAFE OPERATION: MECHANICAL, SPRING-RETURN MECHANISM OR CAPACITANCE RETURN.
4. POWER REQUIREMENTS (TWO-POSITION SPRING RETURN): 24 VAC.
5. POWER REQUIREMENTS (MODULATING): MAXIMUM 10 VA AT 24 VAC OR 8 WATTS AT 24 VDC.
6. PROPORTIONAL SIGNAL: 0 TO 10 VDC OR 2 TO 10 VDC OR 4 TO 20 MA, AND 2 TO 10 VDC POSITION FEEDBACK SIGNAL.
7. PROVIDE PLENUM-RATED ACTUATORS FOR SERVICE ABOVE CEILINGS TO POSSESS UL LISTINGS AND APPROVALS.
8. TEMPERATURE RATING: 40 TO 104 DEGREES F (4.5 TO 40 DEGREES C).

2.12 FLOW CONTROLS

A. MANUFACTURERS:
1. ANVIL INTERNATIONAL.
2. GRISWOLD CONTROLS.
3. HAYS FLUID CONTROLS.
4. ITT BELL & GOSSETT.

B. CONSTRUCTION: CLASS 125, BRASS OR BRONZE BODY WITH UNION ON INLET AND OUTLET, TEMPERATURE AND PRESSURE TEST PLUG ON INLET AND OUTLET, BLOWDOWN/BACKFLUSH DRAIN.

C. CALIBRATION: CONTROL FLOW WITHIN 10 PERCENT OF SELECTED RATING, OVER OPERATING PRESSURE RANGE OF 10 TIMES MINIMUM PRESSURE REQUIRED FOR CONTROL, MINIMUM PRESSURE 2 PSI (13.7 KPA).

PART 3 EXECUTION

3.01 PREPARATION

A. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE.
B. PREPARE PIPE FOR GROOVED MECHANICAL JOINTS AS REQUIRED BY COUPLING MANUFACTURER.
C. REMOVE SCALE AND DIRT ON INSIDE AND OUTSIDE BEFORE ASSEMBLY.
D. PREPARE PIPING CONNECTIONS TO EQUIPMENT USING JOINTING SYSTEM SPECIFIED.
E. KEEP OPEN ENDS OF PIPE FREE FROM SCALE AND DIRT. PROTECT OPEN ENDS WITH TEMPORARY PLUGS OR CAPS.
F. AFTER COMPLETION, FILL, CLEAN, AND TREAT SYSTEMS. SEE SECTION 23 2500 FOR ADDITIONAL REQUIREMENTS.

3.02 INSTALLATION

A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
B. INSTALL HEATING WATER, GLYCOL, CHILLED WATER, CONDENSER WATER, AND ENGINE EXHAUST PIPING TO ASME B31.9 REQUIREMENTS.
C. ROUTE PIPING IN ORDERLY MANNER, PARALLEL TO BUILDING STRUCTURE, AND MAINTAIN GRADIENT.
D. INSTALL PIPING TO CONSERVE BUILDING SPACE AND TO AVOID INTERFERENCE WITH USE OF SPACE.
E. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS.
F. SLEEVE PIPE PASSING THROUGH PARTITIONS, WALLS, AND FLOORS.
G. INSTALL FIRESTOPPING TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS, USING MATERIALS AND METHODS SPECIFIED.
H. SLOPE PIPING AND ARRANGE TO DRAIN AT LOW POINTS.
I. GROOVED JOINTS:
1. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S LATEST PUBLISHED INSTALLATION INSTRUCTIONS.
2. GASKETS TO BE SUITABLE FOR THE INTENDED SERVICE, MOLDED, AND PRODUCED BY THE COUPLING MANUFACTURER.
J. INSERTS:
1. PROVIDE INSERTS FOR PLACEMENT IN CONCRETE FORMWORK.
2. PROVIDE INSERTS FOR SUSPENDING HANGERS FROM REINFORCED CONCRETE SLABS AND SIDES OF REINFORCED CONCRETE BEAMS.
3. PROVIDE HOOKED ROD TO CONCRETE REINFORCEMENT SECTION FOR INSERTS CARRYING PIPE OVER 4 INCHES (100 MM).
4. WHERE CONCRETE SLABS FORM FINISHED CEILING, LOCATE INSERTS FLUSH WITH SLAB SURFACE.
5. WHERE INSERTS ARE OMITTED, DRILL THROUGH CONCRETE SLAB FROM BELOW AND PROVIDE THROUGH-BOLT WITH RECESSED SQUARE STEEL PLATE AND NUT ABOVE SLAB.
K. USE ECCENTRIC REDUCERS TO MAINTAIN TOP OF PIPE LEVEL.
L. WHERE PIPE SUPPORT MEMBERS ARE WELDED TO STRUCTURAL BUILDING FRAMING, SCRAPE, BRUSH CLEAN, AND APPLY ONE COAT OF ZINC-RICH PRIMER TO WELDS.
M. INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.

SECTION 23 2300 - REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. PIPING.
B. REFRIGERANT.
C. MOISTURE AND LIQUID INDICATORS.
D. VALVES.
E. STRAINERS.
F. FLEXIBLE CONNECTIONS.
G. ENGINEERED WALL SEALS AND INSULATION PROTECTION.

1.02 SYSTEM DESCRIPTION

A. WHERE MORE THAN ONE PIPING SYSTEM MATERIAL IS SPECIFIED, ENSURE SYSTEM COMPONENTS ARE COMPATIBLE AND JOINED TO ENSURE THE INTEGRITY OF THE SYSTEM IS NOT JEOPARDIZED. PROVIDE NECESSARY JOINING FITTINGS. ENSURE FLANGES, UNION, AND COUPLINGS FOR SERVICING ARE CONSISTENTLY PROVIDED.
B. PROVIDE PIPE HANGERS AND SUPPORTS IN ACCORDANCE WITH ASME B31.5 UNLESS INDICATED OTHERWISE.
C. LIQUID INDICATORS:
1. USE LINE SIZE LIQUID INDICATORS IN MAIN LIQUID LINE LEAVING CONDENSER.
2. IF RECEIVER IS PROVIDED, INSTALL IN LIQUID LINE LEAVING RECEIVER.
3. USE LINE SIZE ON LEAVING SIDE OF LIQUID SOLENOID VALVES.
D. VALVES:
1. USE SERVICE VALVES ON SUCTION AND DISCHARGE OF COMPRESSORS.
2. USE GAUGE TAPS AT COMPRESSOR INLET AND OUTLET.
3. USE GAUGE TAPS AT HOT GAS BYPASS REGULATORS, INLET AND OUTLET.
4. USE CHECK VALVES ON COMPRESSOR DISCHARGE.
5. USE CHECK VALVES ON CONDENSER LIQUID LINES ON MULTIPLE CONDENSER SYSTEMS.
E. REFRIGERANT CHARGING (PACKED ANGLE) VALVE: USE IN LIQUID LINE BETWEEN RECEIVER SHUT-OFF VALVE AND EXPANSION VALVE.
F. STRAINERS:
1. USE LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE.
2. WHERE MULTIPLE EXPANSION VALVES WITH INTEGRAL STRAINERS ARE USED, USE SINGLE MAIN LIQUID LINE STRAINER.
3. ON STEEL PIPING SYSTEMS, USE STRAINER IN SUCTION LINE.
4. USE SHUT-OFF VALVE ON EACH SIDE OF STRAINER.
G. FLEXIBLE CONNECTORS: UTILIZE AT OR NEAR COMPRESSORS WHERE PIPING CONFIGURATION DOES NOT ABSORB VIBRATION.

1.03 DELIVERY, STORAGE, AND HANDLING

A. DELIVER AND STORE PIPING AND SPECIALTIES IN SHIPPING CONTAINERS WITH LABELING IN PLACE.
B. PROTECT PIPING AND SPECIALTIES FROM ENTRY OF CONTAMINATING MATERIAL BY LEAVING END CAPS AND PLUGS IN PLACE UNTIL INSTALLATION.
C. DEHYDRATE AND CHARGE COMPONENTS SUCH AS PIPING AND RECEIVERS, SEAL PRIOR TO SHIPMENT, UNTIL CONNECTED INTO SYSTEM.

PART 2 PRODUCTS

2.01 PIPING

A. COPPER TUBE: ASTM B280, H58 HARD DRAWN OR O60 SOFT ANNEALED.
1. FITTINGS: ASME B16.22 WROUGHT COPPER.
2. JOINTS: BRAZE, AWS A5.8M/A5.8 BCUP SILVER/PHOSPHORUS/COPPER ALLOY.
3. MECHANICAL PRESS SEALED FITTINGS: DOUBLE PRESSED TYPE COMPLYING WITH UL 207 AND ICC (IMC)-2018.
B. COPPER TUBE TO 7/8 INCH (22 MM) OD: ASTM B88 (ASTM B88M), TYPE K (A), ANNEALED.
1. FITTINGS: ASME B16.26 CAST COPPER.
2. JOINTS: FLARED.
3. MECHANICAL PRESS SEALED FITTINGS: DOUBLE PRESSED TYPE COMPLYING WITH UL 207 AND ICC (IMC)-2018.
C. PIPE SUPPORTS AND ANCHORS:
1. PROVIDE HANGERS AND SUPPORTS THAT COMPLY WITH MSS SP-58.
a. IF TYPE OF HANGER OR SUPPORT FOR A PARTICULAR SITUATION IS NOT INDICATED, SELECT APPROPRIATE TYPE USING MSS SP-58 RECOMMENDATIONS.
2. HANGERS FOR PIPE SIZES 1/2 TO 1-1/2 INCH (13 TO 38 MM): MALLEABLE IRON ADJUSTABLE SWIVEL, SPLIT RING.
3. HANGERS FOR PIPE SIZES 2 INCHES (50 MM) AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.
4. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.
5. WALL SUPPORT FOR PIPE SIZES TO 3 INCHES (75 MM): CAST IRON HOOK.
6. VERTICAL SUPPORT: STEEL RISER CLAMP.
7. COPPER PIPE SUPPORT: CARBON STEEL RING, ADJUSTABLE, COPPER PLATED.
8. HANGER RODS: MILD STEEL THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUS THREADED.
9. INSERTS: MALLEABLE IRON CASE OF GALVANIZED STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT, TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER RODS.

2.02 REFRIGERANT

A. REFRIGERANT: USE ONLY REFRIGERANTS THAT HAVE OZONE DEPLETION POTENTIAL (ODP) OF ZERO AND GLOBAL WARMING POTENTIAL (GWP) OF LESS THAN 50.

2.03 MOISTURE AND LIQUID INDICATORS

A. INDICATORS: SINGLE PORT TYPE, UL LISTED, WITH COPPER OR BRASS BODY, FLARED OR SOLDER ENDS, SIGHT GLASS, COLOR CODED PAPER MOISTURE INDICATOR WITH REMOVABLE ELEMENT CARTRIDGE AND PLASTIC CAP; FOR MAXIMUM TEMPERATURE OF 200 DEGREES F (93 DEGREES C) AND MAXIMUM WORKING PRESSURE OF 500 PSI (3450 KPA).

2.04 VALVES

A. DIAPHRAGM PACKLESS VALVES:
1. UL LISTED, GLOBE OR ANGLE PATTERN, FORGED BRASS BODY AND BONNET, PHOSPHOR BRONZE AND STAINLESS STEEL DIAPHRAGMS, RISING STEM AND HANDWHEEL, STAINLESS STEEL SPRING, NYLON SEAT DISC, SOLDER OR FLARED ENDS, WITH POSITIVE BACKSEATING; FOR MAXIMUM WORKING PRESSURE OF 500 PSI (3450 KPA) AND MAXIMUM TEMPERATURE OF 275 DEGREES F (135 DEGREES C).
B. PACKED ANGLE VALVES:
1. FORGED BRASS OR NICKEL PLATED FORGED STEEL, FORGED BRASS SEAL CAPS WITH COPPER GASKET, RISING STEM AND SEAT WITH BACKSEATING, MOLDED STEM PACKING, SOLDER OR FLARED ENDS; FOR MAXIMUM WORKING PRESSURE OF 500 PSI (3450 KPA) AND MAXIMUM TEMPERATURE OF 275 DEGREES F (135 DEGREES C).
C. BALL VALVES:
1. TWO PIECE BOLTED FORGED BRASS BODY WITH TEFLON BALL SEALS AND COPPER TUBE EXTENSIONS, BRASS BONNET AND SEAL CAP, CHROME PLATED BALL, STEM WITH NEOPRENE RING STEM SEALS; FOR MAXIMUM WORKING PRESSURE OF 500 PSI (3450 KPA) AND MAXIMUM TEMPERATURE OF 300 DEGREES F (149 DEGREES C).
D. SERVICE VALVES:
1. FORGED BRASS BODY WITH COPPER STUBS, BRASS CAPS, REMOVABLE VALVE CORE, INTEGRAL BALL CHECK VALVE, FLARED OR SOLDER ENDS, FOR MAXIMUM PRESSURE OF 500 PSI (3450 KPA).

2.05 STRAINERS

A. STRAIGHT LINE OR ANGLE LINE TYPE:
1. BRASS OR STEEL SHELL, STEEL CAP AND FLANGE, AND REPLACEABLE CARTRIDGE, WITH SCREEN OF STAINLESS STEEL WIRE OR MONEL REINFORCED WITH BRASS; FOR MAXIMUM WORKING PRESSURE OF 430 PSI (2960 KPA).
B. STRAIGHT LINE, NON-CLEANABLE TYPE:
1. STEEL SHELL, COPPER PLATED FITTINGS, STAINLESS STEEL WIRE SCREEN, FOR MAXIMUM WORKING PRESSURE OF [_____] PSI ([_____] KPA).

2.06 CHECK VALVES

A. GLOBE TYPE:
1. CAST BRONZE OR FORGED BRASS BODY, FORGED BRASS CAP WITH NEOPRENE SEAL, BRASS GUIDE AND DISC HOLDER, PHOSPHOR-BRONZE OR STAINLESS STEEL SPRING, TEFLON SEAT DISC; FOR MAXIMUM TEMPERATURE OF 300 DEGREES F (149 DEGREES C) AND MAXIMUM WORKING PRESSURE OF 425 PSI (2930 KPA).
B. STRAIGHT THROUGH TYPE:
1. BRASS BODY AND DISC, PHOSPHOR-BRONZE OR STAINLESS STEEL SPRING, NEOPRENE SEAT; FOR MAXIMUM WORKING PRESSURE OF 500 PSI (3450 KPA) AND MAXIMUM TEMPERATURE OF 200 DEGREES F (93 DEGREES C).

2.07 FLEXIBLE CONNECTORS

A. CORRUGATED STAINLESS STEEL HOSE WITH SINGLE LAYER OF STAINLESS STEEL EXTERIOR BRAIDING, MINIMUM 9 INCHES (230 MM) LONG WITH COPPER TUBE ENDS; FOR MAXIMUM WORKING PRESSURE OF 500 PSI (3450 KPA).

PART 3 EXECUTION

3.01 PREPARATION

A. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE.
B. REMOVE SCALE AND DIRT ON INSIDE AND OUTSIDE BEFORE ASSEMBLY.
C. PREPARE PIPING CONNECTIONS TO EQUIPMENT WITH FLANGES OR UNIONS.

3.02 INSTALLATION

A. INSTALL REFRIGERATION SPECIALTIES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
B. ROUTE PIPING IN ORDERLY MANNER, WITH PLUMBING PARALLEL TO BUILDING STRUCTURE, AND MAINTAIN GRADIENT.
C. INSTALL PIPING TO CONSERVE BUILDING SPACE AND AVOID INTERFERENCE WITH USE OF SPACE.
D. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS AND LOCATIONS. SLOPE PIPING ONE PERCENT IN DIRECTION OF OIL RETURN.
E. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT.
F. PIPE HANGERS AND SUPPORTS:
1. INSTALL IN ACCORDANCE WITH ASME B31.5.
2. SUPPORT HORIZONTAL PIPING AS INDICATED.
3. INSTALL HANGERS TO PROVIDE MINIMUM 1/2 INCH (13 MM) SPACE BETWEEN FINISHED COVERING AND ADJACENT WORK.
4. PLACE HANGERS WITHIN 12 INCHES (300 MM) OF EACH HORIZONTAL ELBOW.
5. SUPPORT VERTICAL PIPING AT EVERY OTHER FLOOR. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING.
6. WHERE SEVERAL PIPES CAN BE INSTALLED IN PARALLEL AND AT SAME ELEVATION, PROVIDE MULTIPLE OR TRAPEZE HANGERS.
7. PROVIDE COPPER PLATED HANGERS AND SUPPORTS FOR COPPER PIPING.
G. ARRANGE PIPING TO RETURN OIL TO COMPRESSOR. PROVIDE TRAPS AND LOOPS IN PIPING, AND PROVIDE DOUBLE RISERS AS REQUIRED. SLOPE HORIZONTAL PIPING 0.40 PERCENT IN DIRECTION OF FLOW.
H. PROVIDE CLEARANCE FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS.
I. FLOOD PIPING SYSTEM WITH NITROGEN WHEN BRAZING.
J. INSULATE PIPING AND EQUIPMENT; REFER TO SECTION AND SECTION 23 0716.
K. FOLLOW ASHRAE STD 15 PROCEDURES FOR CHARGING AND PURGING OF SYSTEMS AND FOR DISPOSAL OF REFRIGERANT.
L. PROVIDE REPLACEABLE CARTRIDGE FILTER-DRIERS, WITH ISOLATION VALVES AND VALVED BYPASS.
M. LOCATE EXPANSION VALVE SENSING BULB IMMEDIATELY DOWNSTREAM OF EVAPORATOR ON SUCTION LINE.
N. PROVIDE EXTERNAL EQUALIZER PIPING ON EXPANSION VALVES WITH REFRIGERANT DISTRIBUTOR CONNECTED TO EVAPORATOR.
O. INSTALL FLEXIBLE CONNECTORS AT RIGHT ANGLES TO AXIAL MOVEMENT OF COMPRESSOR, PARALLEL TO CRANKSHAFT.
P. FULLY CHARGE COMPLETED SYSTEM WITH REFRIGERANT AFTER TESTING.

3.03 FIELD QUALITY CONTROL

A. SEE SECTION 01 4000 - QUALITY REQUIREMENTS, FOR ADDITIONAL REQUIREMENTS.
B. TEST REFRIGERATION SYSTEM IN ACCORDANCE WITH ASME B31.5.
C. PRESSURE TEST SYSTEM WITH DRY NITROGEN TO 200 PSI (1380 KPA). PERFORM FINAL TESTS AT 27 INCHES (92 KPA) VACUUM AND 200 PSI (1380 KPA) USING HALIDE TORCH. TEST TO NO LEAKAGE.

3.04 SCHEDULES

A. HANGER SPACING FOR COPPER TUBING.
1. 1/2 INCH (13 MM), 5/8 INCH (16 MM), AND 7/8 INCH (22 MM) OD: MAXIMUM SPAN, 5 FEET (1500 MM); MINIMUM ROD SIZE, 1/4 INCH (6.3 MM).
2. 1-1/8 INCH (29 MM) OD: MAXIMUM SPAN, 6 FEET (1800 MM); MINIMUM ROD SIZE, 1/4 INCH (6.3 MM).
3. 1-3/8 INCH (35 MM) OD: MAXIMUM SPAN, 7 FEET (2100 MM); MINIMUM ROD SIZE, 3/8 INCH (9.5 MM).
4. 1-5/8 INCH (41 MM) OD: MAXIMUM SPAN, 8 FEET (2400 MM); MINIMUM ROD SIZE, 3/8 INCH (9.5 MM).

SECTION 23 3100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. METAL DUCTWORK.
B. CASINGS AND PLENUMS.
C. DUCT CLEANING.

1.02 FIELD CONDITIONS

A. DO NOT INSTALL DUCT SEALANTS WHEN TEMPERATURES ARE LESS THAN THOSE RECOMMENDED BY SEALANT MANUFACTURERS.
B. MAINTAIN TEMPERATURES WITHIN ACCEPTABLE RANGE DURING AND AFTER INSTALLATION OF DUCT SEALANTS.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. REGULATORY REQUIREMENTS: CONSTRUCT DUCTWORK TO COMPLY WITH NFPA 90A STANDARDS.
B. DUCTS: GALVANIZED STEEL, UNLESS OTHERWISE INDICATED.
C. LOW PRESSURE SUPPLY (HEATING SYSTEMS): 1/2 INCH WG (125 PA) PRESSURE CLASS, GALVANIZED STEEL.
D. LOW PRESSURE SUPPLY (SYSTEM WITH COOLING COILS): 1/2 INCH WG (125 PA) PRESSURE CLASS, GALVANIZED STEEL.
E. RETURN AND RELIEF: 1/2 INCH WG (125 PA) PRESSURE CLASS, GALVANIZED STEEL.
F. GENERAL EXHAUST: 1/2 INCH WG (125 PA) PRESSURE CLASS, GALVANIZED STEEL.
G. OUTSIDE AIR INTAKE: 1/2 INCH WG (125 PA) PRESSURE CLASS, GALVANIZED STEEL.
H. TRANSFER AIR AND SOUND BOOTS: 1/2 INCH WG (125 PA) PRESSURE CLASS, FIBROUS GLASS.

2.02 MATERIALS

A. GALVANIZED STEEL FOR DUCTS: HOT-DIPPED GALVANIZED STEEL SHEET, ASTM A653/A653M FS TYPE B, WITH G60/Z180 COATING.
B. UN-GALVANIZED STEEL FOR DUCTS: ASTM A1008/A1008M DESIGNATION CS (COMMERCIAL STEEL), COLD-ROLLED.
C. ALUMINUM FOR DUCTS: ASTM B209 (ASTM B209M); ALUMINUM SHEET, ALLOY 3003-H14. ALUMINUM CONNECTORS AND BAR STOCK: ALLOY 6061-T651 OR OF EQUIVALENT STRENGTH.
D. STAINLESS STEEL FOR DUCTS: ASTM A666, TYPE 304.
E. JOINT SEALERS AND SEALANTS: NON-HARDENING, WATER RESISTANT, MILDEW AND MOLD RESISTANT.
1. TYPE: HEAVY MASTIC OR LIQUID USED ALONE OR WITH TAPE, SUITABLE FOR JOINT CONFIGURATION AND COMPATIBLE WITH SUBSTRATES, AND RECOMMENDED BY MANUFACTURER FOR PRESSURE CLASS OF DUCTS.
2. VOC CONTENT: NOT MORE THAN 250 G/L, EXCLUDING WATER.
3. SURFACE BURNING CHARACTERISTICS: FLAME SPREAD INDEX OF ZERO AND SMOKE DEVELOPED INDEX OF ZERO, WHEN TESTED IN ACCORDANCE WITH ASTM E84.
F. GASKET TAPE: PROVIDE BUTYL RUBBER GASKET TAPE FOR A FLEXIBLE SEAL BETWEEN TRANSFER DUCT CONNECTOR (TDC), TRANSVERSE DUCT FLANGE (TDF), APPLIED FLANGE CONNECTIONS, AND ANGLE RINGS CONNECTIONS.
G. HANGER ROD: ASTM A36/A36M; STEEL, GALVANIZED; THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUSLY THREADED.
H. HANGER FASTENERS: ATTACH HANGERS TO STRUCTURE USING APPROPRIATE FASTENERS, AS FOLLOWS:
1. CONCRETE WEDGE EXPANSION ANCHORS: COMPLYING WITH ICC-ES AC193.
2. MASONRY WEDGE EXPANSION ANCHORS: COMPLYING WITH ICC-ES AC01.
3. CONCRETE SCREW TYPE ANCHORS: COMPLYING WITH ICC-ES AC193.
4. MASONRY SCREW TYPE ANCHORS: COMPLYING WITH ICC-ES AC106.
5. CONCRETE ADHESIVE TYPE ANCHORS: COMPLYING WITH ICC-ES AC308.

2.03 DUCTWORK FABRICATION

A. FABRICATE AND SUPPORT IN ACCORDANCE WITH SMACNA (DCS) AND AS INDICATED.
B. NO VARIATION OF DUCT CONFIGURATION OR SIZE PERMITTED EXCEPT BY WRITTEN PERMISSION. SIZE ROUND DUCT INSTALLED IN PLACE OF RECTANGULAR DUCTS IN ACCORDANCE WITH ASHRAE (FUND) HANDBOOK - FUNDAMENTALS.
C. DUCT SYSTEMS HAVE BEEN DESIGNED FOR METAL DUCT. AT THE CONTRACTOR'S OPTION, FIBROUS GLASS DUCT MAY BE SUBSTITUTED FOR METAL DUCT.
D. PROVIDE DUCT MATERIAL, GAUGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED.
E. CONSTRUCT T'S, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1-1/2 TIMES WIDTH OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS MUST BE USED, PROVIDE AIR FOIL TURNING VANES OF PERFORATED METAL WITH GLASS FIBER INSULATION.
F. PROVIDE TURNING VANES OF PERFORATED METAL WITH GLASS FIBER INSULATION WHEN ACOUSTICAL LINING IS INDICATED.
G. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.
H. FABRICATE CONTINUOUSLY WELDED ROUND AND OVAL DUCT FITTINGS IN ACCORDANCE WITH SMACNA (DCS).
I. WHERE DUCTS ARE CONNECTED TO EXTERIOR WALL LOUVERS AND DUCT OUTLET IS SMALLER THAN LOUVER FRAME, PROVIDE BLANK-OUT PANELS SEALING LOUVER AREA AROUND DUCT. USE SAME MATERIAL AS DUCT, PAINTED BLACK ON EXTERIOR SIDE; SEAL TO LOUVER FRAME AND DUCT.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. DOUBLE WALL INSULATED ROUND DUCTS: ROUND SPIRAL LOCKSEAM DUCT WITH GALVANIZED STEEL OUTER WALL, PERFORATED GALVANIZED STEEL INNER WALL; FITTING WITH SOLID INNER WALL.
1. MANUFACTURE IN ACCORDANCE WITH SMACNA (DCS).
2. INSULATION:
a. THICKNESS: 1 INCH (25 MM).
b. MATERIAL: AIR.
B. DOUBLE WALL INSULATED RECTANGULAR DUCTS: RECTANGULAR SPIRAL LOCKSEAM DUCT WITH GALVANIZED STEEL OUTER WALL, PERFORATED GALVANIZED STEEL INNER WALL; FITTING WITH SOLID INNER WALL.
1. MANUFACTURE IN ACCORDANCE WITH SMACNA (DCS).
2. INSULATION:
a. THICKNESS: 1 INCH (25 MM).
b. MATERIAL: AIR.
C. SPIRAL DUCTS: ROUND SPIRAL LOCKSEAM DUCT WITH GALVANIZED STEEL OUTER WALL.
1. MANUFACTURE IN ACCORDANCE WITH SMACNA (DCS).
D. ROUND DUCTS: ROUND LOCKSEAM DUCT WITH GALVANIZED STEEL OUTER WALL.
1. MANUFACTURE IN ACCORDANCE WITH SMACNA (DCS).
E. FLEXIBLE DUCTS: TWO PLY VINYL FILM SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE.
1. INSULATION: FIBERGLASS INSULATION WITH POLYETHYLENE VAPOR BARRIER FILM.
2. PRESSURE RATING: 10 INCHES WG (2.50 KPA) POSITIVE AND 1.0 INCHES WG (250 PA) NEGATIVE.
3. MAXIMUM VELOCITY: 4000 FPM (20.3 M/SEC).
4. TEMPERATURE RANGE: MINUS 10 DEGREES F TO 160 DEGREES F (MINUS 23 DEGREES C TO 71 DEGREES C).
F. FLEXIBLE DUCTS: BLACK POLYMER FILM SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE.
1. UL LABELED.
2. INSULATION: FIBERGLASS INSULATION WITH POLYETHYLENE VAPOR BARRIER FILM.
3. PRESSURE RATING: 4 INCHES WG (1000 PA) POSITIVE AND 0.5 INCHES WG (175 PA) NEGATIVE.
4. MAXIMUM VELOCITY: 4000 FPM (20.3 M/SEC).
5. TEMPERATURE RANGE: MINUS 20 DEGREES F TO 175 DEGREES F (MINUS 28 DEGREES C TO 79 DEGREES C).
G. TWO-HOUR, FIRE RATED DUCTS:
1. UL OR ETL LABELED.
2. CONSTRUCT OF 18 GAUGE, 0.0500 INCH (1.27 MM) STAINLESS STEEL.

2.05 CASINGS AND PLENUMS

A. FABRICATE CASINGS IN ACCORDANCE WITH SMACNA (DCS) AND CONSTRUCT FOR OPERATING PRESSURES INDICATED.
B. MOUNT FLOOR MOUNTED CASINGS ON 4 INCH (100 MM) HIGH CONCRETE CURBS. AT FLOOR, RIVET PANELS ON 8 INCH (200 MM) CENTERS TO ANGLES. WHERE FLOORS ARE ACOUSTICALLY INSULATED, PROVIDE LINER OF GALVANIZED 18 GAUGE, 0.0478 INCH (1.21 MM) EXPANDED METAL MESH SUPPORTED AT 12 INCH (300 MM) CENTERS, TURNED UP 12 INCHES (300 MM) AT SIDES WITH SHEET METAL SHIELDS.
C. REINFORCE DOOR FRAMES WITH STEEL ANGLES TIED TO HORIZONTAL AND VERTICAL PLENUM SUPPORTING ANGLES. INSTALL HINGED ACCESS DOORS WHERE INDICATED OR REQUIRED FOR ACCESS TO EQUIPMENT FOR CLEANING AND INSPECTION.
D. FABRICATE ACOUSTIC CASINGS WITH REINFORCING TURNED INWARD. PROVIDE 16 GAUGE, 0.0598 INCH (1.52 MM) SHEET STEEL BACK FACING AND 22 GAUGE, 0.0299 INCH (0.76 MM) PERFORATED SHEET STEEL FRONT FACING WITH 3/32 INCH (2.4 MM) DIAMETER HOLES ON 5/32 INCH (4 MM) CENTERS. CONSTRUCT PANELS 3 INCHES (75 MM) THICK PACKED WITH 4.5 LB/CU FT (72 KG/CU M) MINIMUM GLASS FIBER INSULATION MEDIA, ON INVERTED CHANNELS OF 16 GAUGE, 0.0598 INCH (1.52 MM) SHEET STEEL.

PART 3 EXECUTION

3.01 INSTALLATION

A. INSTALL, SUPPORT, AND SEAL DUCTS IN ACCORDANCE WITH SMACNA (DCS).
B. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
C. DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.
D. FLEXIBLE DUCTS: CONNECT TO METAL DUCTS WITH ADHESIVE.
E. DUCT SIZES INDICATED ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LINING.
F. PROVIDE OPENINGS IN DUCTWORK WHERE REQUIRED TO ACCOMMODATE THERMOMETERS AND CONTROLLERS. PROVIDE PILOT TUBE OPENINGS WHERE REQUIRED FOR TESTING OF SYSTEMS, COMPLETE WITH METAL CAN WITH SPRING DEVICE OR SCREW TO ENSURE AGAINST AIR LEAKAGE. WHERE OPENINGS ARE PROVIDED IN INSULATED DUCTWORK, INSTALL INSULATION MATERIAL INSIDE A METAL RING.
G. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.
H. USE CRIMP JOINTS WITH OR WITHOUT BEAD FOR JOINING ROUND DUCT SIZES 8 INCH (200 MM) AND SMALLER WITH CRIMP IN DIRECTION OF AIR FLOW.
I. USE DOUBLE NUTS AND LOCK WASHERS ON THREADED ROD SUPPORTS.
J. CONNECT TERMINAL UNITS TO SUPPLY DUCTS DIRECTLY OR WITH ONE FOOT (300 MM) MAXIMUM LENGTH OF FLEXIBLE DUCT. DO NOT USE FLEXIBLE DUCT TO CHANGE DIRECTION.
K. CONNECT DIFFUSERS OR LIGHT TROFFER BOOTS TO LOW PRESSURE DUCTS DIRECTLY OR WITH 5 FEET (1.5 M) MAXIMUM LENGTH OF FLEXIBLE DUCT HELD IN PLACE WITH STRAP OR CLAMP.
L. SET PLENUM DOORS 6 TO 12 INCHES (150 TO 300 MM) ABOVE FLOOR. ARRANGE DOOR SWINGS SO THAT FAN STATIC PRESSURE HOLDS DOOR IN CLOSED POSITION.
M. AT EXTERIOR WALL LOUVERS, SEAL DUCT TO LOUVER FRAME AND INSTALL BLANK-OUT PANELS.

3.02 CLEANING

A. CLEAN DUCT SYSTEM AND FORCE AIR AT HIGH VELOCITY THROUGH DUCT TO REMOVE ACCUMULATED DUST. TO OBTAIN SUFFICIENT AIR, CLEAN HALF THE SYSTEM AT A TIME. PROTECT EQUIPMENT THAT COULD BE HARMED BY EXCESSIVE DIRT WITH TEMPORARY FILTERS, OR BYPASS DURING CLEANING.
B. CLEAN DUCT SYSTEMS WITH HIGH POWER VACUUM MACHINES. PROTECT EQUIPMENT THAT COULD BE HARMED BY EXCESSIVE DIRT WITH FILTERS, OR BYPASS DURING CLEANING. PROVIDE ADEQUATE ACCESS INTO DUCTWORK FOR CLEANING PURPOSES.

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. AIR TURNING DEVICES/EXTRACTORS.
B. BACKDRAFT DAMPERS - METAL.
C. COMBINATION FIRE AND SMOKE DAMPERS.
D. DUCT ACCESS DOORS.
E. DUCT TEST HOLES.
F. FIRE DAMPERS.
G. FLEXIBLE DUCT CONNECTORS.
H. SMOKE DAMPERS.
I. VOLUME CONTROL DAMPERS.
J. MISCELLANEOUS PRODUCTS:
1. DAMPER OPERATORS.
2. DAMPER POSITION SWITCH.
3. FIRE-RATED ENCLOSURES.
4. INTERNAL STRUT END PLUGS.
5. DUCT OPENING CLOSURE FILM.

1.02 DELIVERY, STORAGE, AND HANDLING

A. PROTECT DAMPERS FROM DAMAGE TO OPERATING LINKAGES AND BLADES.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. MULTI-BLADE DEVICE WITH RADIUS BLADES ATTACHED TO PIVOTING FRAME AND BRACKET, STEEL CONSTRUCTION, WITH PUSH-PULL OPERATOR STRAP.

2.02 BACKDRAFT DAMPERS - METAL

A. GRAVITY BACKDRAFT DAMPERS, SIZE 18 BY 18 INCHES (450 BY 450 MM) OR SMALLER, FURNISHED WITH AIR MOVING EQUIPMENT: AIR MOVING EQUIPMENT MANUFACTURER'S STANDARD CONSTRUCTION.
B. MULTI-BLADE, PARALLEL ACTION GRAVITY BALANCED BACKDRAFT DAMPERS: GALVANIZED STEEL, WITH CENTER PIVOTED BLADES OF MAXIMUM 6 INCH (150 MM) WIDTH, WITH FELT OR FLEXIBLE VINYL SEALED EDGES, LINKED TOGETHER IN RATTLE-FREE MANNER WITH 90 DEGREE STOP, STEEL BALL BEARINGS, AND PLATED STEEL PIVOT PIN; ADJUSTMENT DEVICE TO PERMIT SETTING FOR VARYING DIFFERENTIAL STATIC PRESSURE.

2.03 COMBINATION FIRE AND SMOKE DAMPERS

A. FABRICATE IN ACCORDANCE WITH NFPA 90A, UL 555, UL 555S, AND AS INDICATED.
B. PROVIDE FACTORY SLEEVE AND COLLAR FOR EACH DAMPER.
C. MULTIPLE BLADE DAMPERS: FABRICATE WITH 16 GAUGE, 0.0598 INCH (1.52 MM) GALVANIZED STEEL FRAME AND BLADES, OIL-IMPREGNATED BRONZE OR STAINLESS STEEL SLEEVE BEARINGS AND PLATED STEEL AXLES, STAINLESS STEEL JAMB SEALS, 1/8 BY 1/2 INCH (3.2 BY 12.7 MM) PLATED STEEL CONCEALED LINKAGE, STAINLESS STEEL CLOSURE SPRING, BLADE STOPS, AND LOCK, AND 1/2 INCH (12.7 MM) ACTUATOR SHAFT.
D. OPERATORS: UL LISTED AND LABELLED SPRING RETURN PNEUMATIC TYPE SUITABLE FOR OPERATION ON 0-20 PSIG (0-140 KPA) INSTRUMENT AIR. PROVIDE END SWITCHES TO INDICATE DAMPER POSITION. LOCATE DAMPER OPERATOR ON INTERIOR OF DUCT AND LINK TO DAMPER OPERATING SHAFT.
E. OPERATORS: UL LISTED AND LABELLED SPRING RETURN ELECTRIC TYPE SUITABLE FOR 120 VOLTS, SINGLE PHASE, 60 HZ. PROVIDE END SWITCHES TO INDICATE DAMPER POSITION. LOCATE DAMPER OPERATOR ON INTERIOR OF DUCT AND LINK TO DAMPER OPERATING SHAFT.
F. NORMALLY CLOSED SMOKE RESPONSIVE FIRE DAMPERS: CURTAIN TYPE, OPENING BY GRAVITY UPON ACTUATION OF ELECTRO THERMAL LINK, FLEXIBLE STAINLESS STEEL BLADE EDGE SEALS TO PROVIDE CONSTANT SEALING PRESSURE.
G. NORMALLY OPEN SMOKE RESPONSIVE FIRE DAMPERS: CURTAIN TYPE, CLOSING UPON ACTUATION OF ELECTRO THERMAL LINK, FLEXIBLE STAINLESS STEEL BLADE EDGE SEALS TO PROVIDE CONSTANT SEALING PRESSURE, STAINLESS STEEL SPRINGS WITH LOCKING DEVICES TO ENSURE POSITIVE CLOSURE FOR UNITS MOUNTED HORIZONTALLY.
H. ELECTRO THERMAL LINK: FUSIBLE LINK MELTING AT 165 DEGREES F (74 DEGREES C); 120 VOLTS, SINGLE PHASE, 60 HZ; UL LISTED AND LABELED.

2.04 DUCT ACCESS DOORS

A. FABRICATE IN ACCORDANCE WITH SMACNA (DCS) AND AS INDICATED.
B. FABRICATION: RIGID AND CLOSE-FITTING OF GALVANIZED STEEL WITH SEALING GASKETS AND QUICK FASTENING LOCKING DEVICES. FOR INSULATED DUCTS, INSTALL MINIMUM 1 INCH (25 MM) THICK INSULATION WITH SHEET METAL COVER.
1. LESS THAN 12 INCHES (300 MM) SQUARE: SECURE WITH SASH LOCKS.
2. UP TO 18 INCHES (450 MM) SQUARE: PROVIDE TWO HINGES AND TWO SASH LOCKS.
3. UP TO 24 BY 48 INCHES (600 BY 1200 MM): THREE HINGES AND TWO COMPRESSION LATCHES WITH OUTSIDE AND INSIDE HANDLES.

2.05 DUCT TEST HOLES

A. TEMPORARY TEST HOLES: CUT OR DRILL IN DUCTS AS REQUIRED. CAP WITH NEAT PATCHES, NEOPRENE PLUGS, THREADED PLUGS, OR THREADED OR TWIST-ON METAL CAPS.
B. PERMANENT TEST HOLES: FACTORY FABRICATED, AIR TIGHT FLANGED FITTINGS WITH SCREW CAP. PROVIDE EXTENDED NECK FITTINGS TO CLEAR INSULATION.

2.06 FIRE DAMPERS

A. FABRICATE IN ACCORDANCE WITH NFPA 90A AND UL 555, AND AS INDICATED.
B. CEILING (RADIATION) DAMPERS: GALVANIZED STEEL, 22 GAUGE, 0.0299 INCH (0.76 MM) FRAME AND 16 GAUGE, 0.0598 INCH (1.52 MM) FLAP, TWO LAYERS 0.125 INCH (3.2 MM) CERAMIC FIBER ON TOP SIDE AND ONE LAYER ON BOTTOM SIDE FOR ROUND FLAPS, WITH LOCKING CLIP.
1. RATED FOR THREE HOUR SERVICE IN COMPLIANCE WITH UL 555C.
C. HORIZONTAL DAMPERS: GALVANIZED STEEL, 22 GAUGE, 0.0299 INCH (0.76 MM) FRAME, STAINLESS STEEL CLOSURE SPRING, AND LIGHTWEIGHT, HEAT RETARDANT NON-ASBESTOS FABRIC BLANKET.
D. CURTAIN TYPE DAMPERS: GALVANIZED STEEL WITH INTERLOCKING BLADES. PROVIDE STAINLESS STEEL CLOSURE SPRINGS AND LATCHES FOR HORIZONTAL INSTALLATIONS. CONFIGURE WITH BLADES OUT OF AIR STREAM EXCEPT FOR 1.0 INCH (250 PA) PRESSURE CLASS DUCTS UP TO 12 INCHES (300 MM) IN HEIGHT.
E. MULTIPLE BLADE DAMPERS: 16 GAUGE, 0.0598 INCH (1.52 MM) GALVANIZED STEEL FRAME AND BLADES, OIL-IMPREGNATED BRONZE OR STAINLESS STEEL SLEEVE BEARINGS AND PLATED STEEL AXLES, 1/8 BY 1/2 INCH (3.2 BY 12.7 MM) PLATED STEEL CONCEALED LINKAGE, STAINLESS STEEL CLOSURE SPRING, BLADE STOPS, AND LOCK.
F. FUSIBLE LINKS: UL 33, SEPARATE AT 160 DEGREES F (71 DEGREES C) WITH ADJUSTABLE LINK STRAPS FOR COMBINATION FIRE/BALANCING DAMPERS.

2.07 FLEXIBLE DUCT CONNECTORS

A. FABRICATE IN ACCORDANCE WITH SMACNA (DCS) AND AS INDICATED.
B. FLEXIBLE DUCT CONNECTIONS: FABRIC CRIMPED INTO METAL EDGING STRIP.
1. FABRIC: UL LISTED FIRE-RETARDANT NEOPRENE COATED WOVEN GLASS FIBER FABRIC TO NFPA 90A, MINIMUM DENSITY 30 OZ PER SQ YD (1.0 KG/SQ M).
2. METAL: 3 INCHES (75 MM) WIDE, 24 GAUGE, 0.0239 INCH (0.61 MM) THICK GALVANIZED STEEL.
C. LEADED VINYL SHEET: MINIMUM 0.55 INCH (14 MM) THICK, 0.87 LBS PER SQ FT (4.2 KG/SQ M), 10 DB ATTENUATION IN 10 TO 10,000 HZ RANGE.

2.08 SMOKE DAMPERS

A. FABRICATE IN ACCORDANCE WITH NFPA 90A AND UL 555S, AND AS INDICATED.
B. DAMPERS: UL CLASS 1 AIRFOIL BLADE TYPE SMOKE DAMPER, NORMALLY OPEN AUTOMATICALLY OPERATED BY PNEUMATIC ACTUATOR.
C. ELECTRO THERMAL LINK: FUSIBLE LINK MELTING AT 165 DEGREES F (74 DEGREES C); 120 VOLTS, SINGLE PHASE, 60 HZ; UL LISTED AND LABELED.

2.09 VOLUME CONTROL DAMPERS

A. FABRICATE IN ACCORDANCE WITH SMACNA (DCS) AND AS INDICATED.
B. SPLITTER DAMPERS:
1. MATERIAL: SAME GAUGE AS DUCT TO 24 INCHES (600 MM) SIZE IN EITHER DIRECTION, AND TWO GAUGES HEAVIER FOR SIZES OVER 24 INCHES (600 MM).
2. BLADE: FABRICATE OF SINGLE THICKNESS SHEET METAL TO STREAMLINE SHAPE, SECURED WITH CONTINUOUS HINGE OR ROD.
3. OPERATOR: MINIMUM 1/4 INCH (6 MM) DIAMETER ROD IN SELF ALIGNING, UNIVERSAL JOINT ACTION, FLANGED BUSHING WITH SET SCREW.
C. SINGLE BLADE DAMPERS:
1. FABRICATE FOR DUCT SIZES UP TO 6 BY 30 INCH (150 BY 760 MM).
2. BLADE: 24 GAUGE, 0.0239 INCH (0.61 MM), MINIMUM.
D. MULTI-BLADE DAMPER: FABRICATE OF OPPOSED BLADE PATTERN WITH MAXIMUM BLADE SIZES 8 BY 72 INCH (200 BY 1825 MM). ASSEMBLE CENTER AND EDGE CRIMPED BLADES IN PRIME COATED OR GALVANIZED CHANNEL FRAME WITH SUITABLE HARDWARE.
1. BLADE: 18 GAUGE, 0.0478 INCH (1.21 MM), MINIMUM.
E. END BEARINGS: EXCEPT IN ROUND DUCTS 12 INCHES (300 MM) AND SMALLER, PROVIDE END BEARINGS. ON MULTIPLE BLADE DAMPERS, PROVIDE OIL-IMPREGNATED NYLON, THERMOPLASTIC ELASTOMER, OR SINTERED BRONZE BEARINGS.
F. QUADRANTS:
1. PROVIDE LOCKING, INDICATING QUADRANT REGULATORS ON SINGLE AND MULTI-BLADE DAMPERS.
2. ON INSULATED DUCTS MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS, BASES, OR ADAPTERS.
3. WHERE ROD LENGTHS EXCEED 30 INCHES (750 MM) PROVIDE REGULATOR AT BOTH ENDS.
G. CONSTANT AIRFLOW REGULATORS:
1. GENERAL REQUIREMENTS:
a. PROVIDE BI-DIRECTIONAL, AIR BALANCING REGULATOR FOR PRESSURE INDEPENDENT AIR VOLUME CONTROL.
b. COMPLIES WITH UL 2043 FOR HEAT AND SMOKE RELEASE.
c. COMPLIES WITH AMCA 500-D FOR THE ALLOWABLE LEAKAGE RATES.
2. CONSTRUCTION:
a. NOMINAL DIAMETER: 4 INCH (104 MM).
b. FRAME: THERMOPLASTIC RESIN IN COMPLIANCE WITH UL 94.
c. BLADE: THERMOPLASTIC RESIN IN COMPLIANCE WITH UL 94.
d. BEARINGS: HYDRAULIC BLADE DAMPENER.
e. OUTER SEAL: REMOVABLE RUBBER GASKET-TYPE AROUND CIRCUMFERENCE OF DAMPER.
f. SPRING: STAINLESS STEEL LEAF-TYPE.
g. TEMPERATURE RANGE: 25 DEGREES F TO 150 DEGREES F (MINUS 4 DEGREES C TO 65 DEGREES C) .
h. OPERATING RANGE: 0.2 INCH W.C. TO 2.0 INCH W.C. (50 PA TO 498 PA).
3. ACCESSORIES:
a. PROVIDE AIRFLOW REGULATORS WITH RECTANGULAR TO ROUND TRANSITIONS.

2.10 MISCELLANEOUS PRODUCTS

A. FIRE-RATED ENCLOSURES:
1. PROVIDE AS REQUIRED TO PRESERVE FIRE RESISTANCE RATING OF BUILDING ELEMENTS.
B. INTERNAL STRUT END PLUGS: COMBINATION END-MOUNTING AND SEALING PLUGS FOR METAL CONDUIT USED AS INTERNAL REINFORCEMENT STRUTS FOR METAL DUCTS; PLUG CRIMPED INSIDE CONDUIT WITH OUTSIDE GASKETED WASHER SEAL.
C. DUCT OPENING CLOSURE FILM: MOLD-RESISTANT, SELF-ADHESIVE FILM TO KEEP DEBRIS OUT OF DUCTS DURING CONSTRUCTION.
1. THICKNESS: 2 MILS (0.6 MM).
2. HIGH TACK WATER BASED ADHESIVE.
3. UV STABLE LIGHT BLUE COLOR.
4. ELONGATION BEFORE BREAK: 325 PERCENT, MINIMUM.

PART 3 EXECUTION

3.01 INSTALLATION

A. INSTALL ACCESSORIES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, NFPA 90A, AND FOLLOW SMACNA (DCS). REFER TO SECTION 23 3100 FOR DUCT CONSTRUCTION AND PRESSURE CLASS.
B. PROVIDE BACKDRAFT DAMPERS ON EXHAUST FANS OR EXHAUST DUCTS NEAREST TO OUTSIDE AND WHERE INDICATED.
C. PROVIDE DUCT ACCESS DOORS FOR INSPECTION AND CLEANING BEFORE AND AFTER FILTERS, COILS, FANS, AUTOMATIC DAMPERS, AT FIRE DAMPERS, COMBINATION FIRE AND SMOKE DAMPERS, AND ELSEWHERE AS INDICATED. PROVIDE MINIMUM 8 BY 8 INCH (200 BY 200 MM) SIZE FOR HAND ACCESS, SIZE FOR SHOULDER ACCESS, AND AS INDICATED. PROVIDE 4 BY 4 INCH (100 BY 100 MM) FOR BALANCING DAMPERS ONLY. REVIEW LOCATIONS PRIOR TO FABRICATION.
D. PROVIDE DUCT TEST HOLES WHERE INDICATED AND REQUIRED FOR TESTING AND BALANCING PURPOSES.
E. PROVIDE FIRE DAMPERS, COMBINATION FIRE AND SMOKE DAMPERS, AND SMOKE DAMPERS AT LOCATIONS INDICATED, WHERE DUCTS AND OUTLETS PASS THROUGH FIRE RATED COMPONENTS, AND WHERE REQUIRED BY AUTHORITIES HAVING JURISDICTION. INSTALL WITH REQUIRED PERIMETER MOUNTING ANGLES, SLEEVES, BREAKAWAY DUCT CONNECTIONS, CORROSION RESISTANT SPRINGS, BEARINGS, BUSHINGS AND HINGES.
F. INSTALL SMOKE DAMPERS AND COMBINATION SMOKE AND FIRE DAMPERS IN ACCORDANCE WITH NFPA 92.
G. DEMONSTRATE RE-SETTING OF FIRE DAMPERS TO OWNER'S REPRESENTATIVE.
H. AT FANS AND MOTORIZED EQUIPMENT ASSOCIATED WITH DUCTS, PROVIDE FLEXIBLE DUCT CONNECTIONS IMMEDIATELY ADJACENT TO THE EQUIPMENT.
I. AT EQUIPMENT SUPPORTED BY VIBRATION ISOLATORS, PROVIDE FLEXIBLE DUCT CONNECTIONS IMMEDIATELY ADJACENT TO THE EQUIPMENT.
J. FOR FANS DEVELOPING STATIC PRESSURES OF 5.0 INCHES (1250 PA) AND OVER, COVER FLEXIBLE CONNECTIONS WITH LEADED VINYL SHEET, HELD IN PLACE WITH METAL STRAPS.
K. PROVIDE BALANCING DAMPERS AT POINTS ON SUPPLY, RETURN, AND EXHAUST SYSTEMS WHERE BRANCHES ARE TAKEN FROM LARGER DUCTS AS REQUIRED FOR AIR BALANCING. INSTALL MINIMUM 2 DUCT WIDTHS FROM DUCT TAKE-OFF.
L. USE SPLITTER DAMPERS ONLY WHERE INDICATED.
M. PROVIDE BALANCING DAMPERS ON HIGH VELOCITY SYSTEMS WHERE INDICATED. REFER TO SECTION 23 3600 - AIR TERMINAL UNITS.
N. PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS, REGARDLESS OF WHETHER DAMPERS ARE SPECIFIED AS PART OF THE DIFFUSER, GRILLE, OR REGISTER ASSEMBLY.

HVAC SEQUENCE OF OPERATIONS

VARIABLE AIR VOLUME SYSTEM:

PROVIDE ALL NECESSARY CONTROLLERS, TEMPERATURE SENSORS, DAMPER ACTUATORS, SPACE TEMPERATURE SENSORS, CONTROL TRANSFORMERS WITH SECONDARY OVERLOAD PROTECTION, CONTROL CABINETS, CONTROLLERS WITH SEVEN DAY PROGRAMMABLE SETBACK/SETUP CAPABILITY, WIRING AND CONDUIT, PLENUM RATED CONTROL WIRING AND OTHER MISCELLANEOUS ACCESSORIES TO ACCOMPLISH FOLLOWING SEQUENCE OF OPERATION FOR VARIABLE AIR VOLUME SYSTEM:

PARALLEL FAN POWERED TERMINAL UNIT SHALL PROVIDE VARIABLE VOLUME, CONSTANT TEMPERATURE AIR IN COOLING MODE AND CONSTANT VOLUME, VARIABLE TEMPERATURE AIR IN HEATING MODE. WHEN SPACE TEMPERATURE IS ABOVE THE DESIGN COOLING SET POINT OF 75°F (ADJUSTABLE), TERMINAL UNIT PRIMARY AIR DAMPER SHALL MODULATE OPEN TO PROVIDE MAXIMUM SCHEDULED AIRFLOW. AS COOLING LOAD DECREASES, TERMINAL UNIT DAMPER SHALL THROTTLE TOWARD MINIMUM SCHEDULED AIRFLOW. A FURTHER DECREASE IN SPACE TEMPERATURE SHALL ENERGIZE UNIT SUPPLY FAN. IF SPACE TEMPERATURE CONTINUES TO DROP, ELECTRIC HEAT SHALL BE ENERGIZED IN STAGES TO MAINTAIN SPACE HEATING SET POINT OF 70°F (ADJUSTABLE). ONCE HEATING SET POINT HAS BEEN REACHED, ELECTRIC HEAT AND FAN SHALL BE DE-ENERGIZED.

FOR UNOCCUPIED HEATING, SHOULD THE SPACE TEMPERATURE DROP BELOW 55°F (ADJUSTABLE), FAN POWERED TERMINAL UNIT FAN SHALL ENERGIZE TO RE-CIRCULATE SPACE AIR AND STAGE THE ELECTRIC HEAT AS NECESSARY TO RAISE THE SPACE TEMPERATURE TO 58°F. WHEN THE UNOCCUPIED SPACE TEMPERATURE IS REACHED, THE TERMINAL UNIT FAN SHALL DE-ENERGIZE.

FIRE ALARM AND SMOKE DETECTION SYSTEM SHALL OVERRIDE CONTROL SYSTEM AND SHUT DOWN FAN POWERED TERMINAL UNITS.

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Project No.:	260387
Drawn By:	AJB
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MECHANICAL SPECIFICATIONS

M0.03

HVAC SYMBOL LEGEND

SYMBOL	DESCRIPTION
	RETURN DUCT SECTION
	SUPPLY DUCT SECTION
	EXHAUST DUCT SECTION
	RETURN AIR GRILLE
	SUPPLY DIFFUSER
	HORIZONTALLY MOUNTED DIFFUSER
	EXHAUST AIR GRILLE
	EXHAUST FAN
	TRANSITION DUCT
	TURNING VANE
	VOLUME DAMPER
MOD	MOTOR OPERATED DAMPER
FD	FIRE DAMPER
FSD	FIRE/SMOKE DAMPER
SD	SMOKE DAMPER
SD	DUCT MOUNTED SMOKE DETECTOR
T	THERMOSTAT/TEMPERATURE SENSOR
TH	TEMPERATURE/HUMIDITY SENSOR
THC	TEMPERATURE/HUMIDITY/CARBON DIOXIDE SENSOR
CO	CARBON MONOXIDE SENSOR
	TEMPERATURE AND PRESSURE GAUGE
	CONNECT TO EXISTING
	BALANCING VALVE
	BACKFLOW PREVENTER
	CHECK VALVE
	CONTROL VALVE (2-WAY)
	CONTROL VALVE (3-WAY)
	PRESSURE REDUCING VALVE
	REMOVE TO POINT AND CAP
	REMOVE TO POINT FOR RECONNECTION
	CLEAN OUT
	SHUT OFF VALVE
	UNION
	WYE STRAINER
	VENT THROUGH ROOF
	EXHAUST THROUGH ROOF
	BLOW DOWN VALVE WITH HOSE CONNECTION
M	MOTORIZED VALVE (2-WAY)
FS	FLOW SWITCH
	AUTOMATIC AIR VENT

HVAC PIPING SYMBOL LEGEND

SYMBOL	DESCRIPTION
CWR	CHILLED WATER RETURN PIPING
CWS	CHILLED WATER SUPPLY PIPING
CD	CONDENSATE DRAIN PIPING
CR	CONDENSER WATER RETURN PIPING
CS	CONDENSER WATER SUPPLY PIPING
D	DRAIN PIPING
HWR	HEATING WATER RETURN PIPING
HWS	HEATING WATER SUPPLY PIPING
HCWR	HEATING & CHILLED WATER RETURN PIPING
HCSR	HEATING & CHILLED WATER SUPPLY PIPING
RL	REFRIGERANT LIQUID PIPING
RS	REFRIGERANT SUCTION PIPING

NOT ALL SYMBOLS AND ABBREVIATIONS ARE UTILIZED

EQUIPMENT TAGGING LEGEND

DESIGNATION	DESCRIPTION
S, R, E	EQUIPMENT DESIGNATION TYPE DUCT CONNECTION SIZE (SEE AIR DEVICE SCHEDULE FOR ADDITIONAL INFORMATION) XX-XX / XXX — CFM
EAV, FPVAV, HAV, RHC, SAV, VAV, RTU, TEF	CFM XXX CFM / XXX-X — DESIGNATED EQUIPMENT NUMBER EQUIPMENT DESIGNATION
VFD	SERVICING EQUIPMENT MARK VFD-XX-XXXX SPECIFIC COMPONENT DESIGNATION

ABBREVIATIONS

ABBREV	DESCRIPTION
AC	AIR CURTAIN
ACU	AIR CONDITIONING UNIT
AHU	AIR HANDLING UNIT
BAL	BALANCE
CC	COOLING COIL
CD	CONDENSATE DRAIN
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CU	CONDENSING UNIT
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
DH	DUCT HEATER
DR	DRAIN
ECON	ECONOMIZER
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EG	EXHAUST GRILLE
FC	FLEXIBLE CONNECTION
FCU	FAN COIL UNIT
FLTR	FILTER
FP	FIRE PROTECTION
FTU	FAN POWERED VARIABLE AIR VOLUME
FSD	FIRE SMOKE DAMPER
MOD	MOTOR OPERATED DAMPER
SD	SUPPLY DIFFUSER
TYP	TYPICAL
VD	VOLUME DAMPER
RG	RETURN GRILLE
TG	TRANSFER GRILLE

ONE CHARACTER STATUS ABBREVIATIONS:

- E EXISTING TO REMAIN
- M ITEM TO BE MOVED
- R RELOCATED ITEM

* REFER ALSO TO ELECTRICAL & PLUMBING

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Project No.:	280387
Drawn By:	AJB

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MECHANICAL SYMBOLS AND ABBREVIATIONS

M0.10

2021 SEATTLE MECHANICAL CODE TABLE 403.3.1.1 VENTILATION SUMMARY

OCCUPANCY CATEGORY	PEOPLE OUTDOOR AIR RATE - (Rp)	AREA OUTDOOR AIR RATE - (Ra)	OCCUPANCY DENSITY	OCCUPANCY CLASSIFICATION	CALCULATED OCCUPANCY DENSITY	ZONE OCCUPANCY OVERRIDE	PEOPLE EXPECTED TO OCCUPY THE ZONE - (Pz)	Rp*Pz	Ra*Az	AREA - (Az)	ZONE AIR DISTRIBUTION EFFECTIVENESS - Ez	BREATHING ZONE OUTDOOR AIRFLOW - (Vbz) Vbz=Rp*Pz+Ra*Az	ZONE OUTDOOR AIRFLOW (Voz) Voz=Vbz/Ez	ZONE PRIMARY AIRFLOW (Vpz)	PRIMARY OUTDOOR AIR FRACTION (Zp) Zp=Voz/Vpz	OCCUPANT DIVERSITY RATIO (D)	UNCORRECTED OUTDOOR AIR INTAKE (Vou) Vou=D*RpPz+RaAz	SYSTEM VENTILATION EFFICIENCY	CORRECTED OUTDOOR AIRFLOW (Vot)	PROVIDED OUTDOOR AIRFLOW
	(CFM/PERSON)	(CFM/SQ.FT.)	P/1,000 SQ.FT.							SQ.FT.		CFM					CFM	Ev	CFM	CFM
FTU-X1																				
Storage	—	0.12	—	RETAIL-Storage Rooms	—	—	—	—	141	1173	0.8	141	176	925	0.19		141		220	
Hall	—	0.06	—	PUBLIC-Corridors	—	—	—	—	23	378	0.8	23	28	270	0.11		23		35	
Storage - Electrical	—	0.12	—	RETAIL-Storage Rooms	—	—	—	—	15	121	0.8	15	18	655	0.03		15		23	
Sales	7.5	0.12	15	RETAIL-Sales	23	—	23	173	185	1541	0.8	358	448	870	0.51		358		560	
				SYSTEM POPULATION INCLUDING DIVERSITY (Ps) =			23							MAX. Zp =	0.51	1.00	536	0.64	838	840
FTU-X2,X3																				
Sales	7.5	0.12	15	RETAIL-Sales	61	—	61	459	489	4078	0.8	948	1185	2530	0.47		948		1185	
				SYSTEM POPULATION INCLUDING DIVERSITY (Ps) =			61							MAX. Zp =	0.47	1.00	948	0.80	1185	1190

S VENTILATION SCHEDULE
SCALE: NONE

GRILLE, REGISTER AND DIFFUSER SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	NECK SIZE	FACE SIZE	FRAME TYPE	FINISH	NOISE CRITERIA LEVEL	ACCESSORIES
				L" X W"	L" X W"				
SD-1	KRUEGER	PLQ	SQUARE PLAQUE DIFFUSER	22"X22"	24"X24"	LAY-IN	PER ARCH	<30	OBD, TRM
SD-X	KRUEGER	EXISTING	SQUARE PLAQUE DIFFUSER	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	--
EG-X	KRUEGER	EXISTING	SINGLE DEFLECTION GRILLE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	--
RG-X	KRUEGER	EXISTING	SINGLE DEFLECTION GRILLE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	--
TG-X	KRUEGER	EXISTING	SINGLE DEFLECTION GRILLE	EXISTING	EXISTING	EXISTING	EXISTING	EXISTING	--

ACCESSORIES
OBD: OPPOSED BLADE DAMPER, STR: SQUARE TO ROUND TRANSITION, TRM: RAPID MOUNT PLASTER FRAME

T AIR DEVICE SCHEDULE
SCALE: NONE

EXISTING FAN TERMINAL UNIT SCHEDULE

IDENTIFICATION					PERFORMANCE			ELECTRIC HEATING COIL			ELECTRICAL			NOTES
MARK	MANUFACTURER	MODEL	SERVICE	INLET SIZE	MAXIMUM PRIMARY AIRFLOW	MINIMUM PRIMARY AIRFLOW	FAN AIRFLOW	INPUT	OUTPUT	STAGES	VOLTS/PH	MCA	MOCP	
FTU-				IN	CFM	CFM	CFM	kW	BTU/HR	QTY		AMPS	AMPS	
X1	CARRIER	45MN3	BACK OF HOUSE	12	2,720	840	1,400	12.0	40,920	2	480V-3PH	21.9	25	1
X2	CARRIER	45MN3	SALES FLOOR	12	1,160	595	900	12.0	40,920	2	480V-3PH	21.9	25	1
X3	CARRIER	45MN3	SALES FLOOR	12	1,370	595	900	12.0	40,920	2	480V-3PH	21.9	25	1

NOTES:
1) EXISTING FAN TERMINAL UNIT TO REMAIN. REBALANCE AIR QUANTITIES AS SHOWN.

V MECHANICAL EQUIPMENT SCHEDULE
SCALE: NONE

Design Parameters:

City Name	Seattle IAP	
Location	Washington	
Latitude	47.5	Deg.
Longitude	122.3	Deg.
Elevation	25.0	ft
Summer Design Dry-Bulb	85.7	°F
Summer Coincident Wet-Bulb	65.1	°F
Summer Daily Range	17.3	°F
Winter Design Dry-Bulb	26.8	°F
Winter Design Wet-Bulb	20.8	°F
Atmospheric Clearness Number	1.05	
Average Ground Reflectance	0.20	
Soil Conductivity	0.800	BTU/(hr·ft·°F)
Local Time Zone (GMT +/- N hours)	8.0	hours
Consider Daylight Savings Time	No	
Simulation Weather Data	N/A	
Current Data is	User Modified	
Design Cooling Months	January to December	

Air System Information

Air System Name	BLOCK	Number of zones	1
Equipment Class	UNDEF	Floor Area	7291.0 ft²
Air System Type	VAV	Location	Seattle IAP, Washington

Sizing Calculation Information

Calculation Months	Jan to Dec	Zone CFM Sizing	Peak zone sensible load
Sizing Data	User-Modified	Space CFM Sizing	Coincident space loads

Central Cooling Coil Sizing Data

Total coil load	8.0 Tons	Load occurs at	Jul 1600
Total coil load	96.2 MBH	OA DB / WB	85.2 / 64.9 °F
Sensible coil load	80.9 MBH	Entering DB / WB	76.5 / 62.9 °F
Coil CFM at Jul 1600	3322 CFM	Leaving DB / WB	53.9 / 52.7 °F
Max block CFM	5250 CFM	Coil ADP	51.4 °F
Sum of peak zone CFM	5250 CFM	Bypass Factor	0.100
Sensible heat ratio	0.840	Resulting RH	55 %
CFM/Ton	414.3	Design supply temp.	55.0 °F
ft²/Ton	909.1	Zone T-stat Check	1 of 1 OK
BTU/(hr·ft²)	13.2	Max zone temperature deviation	0.0 °F
Water flow @ 10.0 °F rise	19.26 gpm		

Preheat Coil Sizing Data

No heating coil loads occurred during this calculation.

Supply Fan Sizing Data

Actual max CFM	5250 CFM	Fan motor BHP	2.16 BHP
Standard CFM	5245 CFM	Fan motor kW	1.71 kW
Actual max CFM/ft²	0.72 CFM/ft²	Fan static	1.50 in wg

Outdoor Ventilation Air Data

Design airflow CFM	1483 CFM	CFM/person	15.76 CFM/person
CFM/ft²	0.20 CFM/ft²		

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1600			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 85.2 °F / 64.9 °F			HEATING OA DB / WB 26.8 °F / 20.8 °F		
ZONE LOADS	Details	Sensible (BTU/hr)	Latent (BTU/hr)	Details	Sensible (BTU/hr)	Latent (BTU/hr)
Window & Skylight Solar Loads	0 ft²	0	-	0 ft²	-	-
Wall Transmission	0 ft²	0	-	0 ft²	0	-
Roof Transmission	0 ft²	0	-	0 ft²	0	-
Window Transmission	0 ft²	0	-	0 ft²	0	-
Skylight Transmission	0 ft²	0	-	0 ft²	0	-
Door Loads	0 ft²	0	-	0 ft²	0	-
Floor Transmission	7291 ft²	0	-	7291 ft²	0	-
Partitions	2418 ft²	4284	-	2418 ft²	18657	-
Ceiling	0 ft²	0	-	0 ft²	0	-
Overhead Lighting	1357 W	2813	-	0	0	-
Task Lighting	2833 W	8390	-	0	0	-
Electric Equipment	8354 W	26826	-	0	0	-
People	94	15727	19286	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	0% / 0%	0	0	25%	4664	0
>> Total Zone Loads	-	58041	19286	-	23321	0
Zone Conditioning	-	63453	19286	-	22552	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	70%	0	-	0	0	-
Plenum Lighting Load	30%	1389	-	0	0	-
Return Fan Load	3322 CFM	0	-	1483 CFM	0	-
Ventilation Load	938 CFM	12243	-3897	419 CFM	19154	0
Supply Fan Load	3322 CFM	3772	-	1483 CFM	-2263	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	80857	15389	-	39443	0
Central Cooling Coil	-	80857	15381	-	-5814	0
Preheat Coil	-	0	-	-	0	-
Terminal Reheat Coils	-	0	-	-	45257	-
>> Total Conditioning	-	80857	15381	-	39443	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

G MECHANICAL LOAD CALCULATIONS
SCALE: NONE

E COMMISSIONING SPECIFICAITONS
SCALE: NONE

COMMISSIONING

A. GENERAL
- A.1. ALL REFERENCES TO THE TERM "OWNER" REFER TO ABERCROMBIE & FITCH, A&F, OR HOLLISTER.
- A.2. ALL REFERENCES TO THE TERM "VENDOR" REFER TO THE OWNER SUPPLIED HVAC & CONTROLS COMMISSIONING VENDOR.
- A.3. ALL REFERENCES TO THE TERM "PROGRAM" REFERS THE HVAC & CONTROLS COMMISSIONING PROGRAM.
- A.4. ALL REFERENCES TO "ALC" REFER TO THE A&F OWNER SUPPLIED ENERGY MANAGEMENT SYSTEM VENDOR, AUTOMATED LOGIC CONTROLS.

B. PURPOSE
- B.1. A&F HAS IMPLEMENTED AN OWNER SUPPLIED HVAC & CONTROLS COMMISSIONING PROGRAM TO GUARANTEE ALL NEW STORES ARE 100% COMMISSIONED AT THE PUBLISHED STORE TURNOVER DATE.

C. EXPECTATIONS
- C.1. THE VENDOR IS EXPECTED TO WORK IN A METHODICAL AND PROFESSIONAL MANNER.
- C.2. THE VENDOR SHALL FOLLOW ALL LOCAL, COUNTRY, LANDLORD, & A&F RULES/REGULATIONS.
- C.3. THE VENDOR IS REQUIRED TO PROVIDE ALL NECESSARY LABOR, MATERIALS, & EQUIPMENT TO COMPLETE THE PROGRAM. THE VENDOR IS RESPONSIBLE FOR COORDINATING ALL SITE VISITS WITH THE GENERAL CONTRACTOR.
- C.4. THE VENDOR IS RESPONSIBLE FOR ALL TRAVEL ARRANGEMENTS.
- C.5. THE VENDOR IS RESPONSIBLE FOR ACCESSING AND DOWNLOADING THE LATEST REVISION OF SHOP DRAWINGS, EQUIPMENT SUBMITTALS, AND CONSTRUCTION DOCUMENTS FOR EACH SITE VISIT.
- C.6. THE VENDOR SHALL MAKE ONE SITE VISIT FOR EACH STORE. THE VISIT SHALL COORDINATE WITH THE A&F CONSTRUCTION SCHEDULE UNLESS OTHERWISE COORDINATED WITH OWNER AND GC.
- C.7. THE VENDOR SHALL REVIEW THE CONSTRUCTION SCHEDULE ON A WEEKLY BASIS TO PLAN AND COORDINATE TRAVEL TO SITES AS REQUIRED.
- C.8. THE VENDOR SHALL CHECK IN & OUT WITH THE GC SITE SUPERINTENDENT EACH DAY OF THE SITE VISIT.
- C.9. THE VENDOR SHALL REVIEW, IN PERSON, ALL DEFICIENCIES WITH THE GC'S SUPERINTENDENT PRIOR TO LEAVING THE SITE EACH DAY.
- C.10. THE VENDOR SHALL COMPLETE AN HVAC & CONTROLS INSPECTION REPORT, FORM DEFINED BY A&F, THAT LISTS ALL DEFICIENCIES WITH PHOTOS OF EACH DEFICIENCY. REVIEW THE REPORT WITH THE GC'S SITE SUPERINTENDENT AND HAVE THEM SIGN THE REPORT. SUBMIT THE REPORT VIA EMAIL TO THE A&F CONSTRUCTION TEAM WITHIN 24 HOURS OF LEAVING THE JOBSITE.
- C.11. THE VENDOR SHALL WORK WITH THE GC, ALC, & HVAC EQUIPMENT MANUFACTURERS TO RESOLVE ALL DEFICIENCIES.

A&F PROJECT MANAGER

D. OWNER MAINTENANCE VENDOR SITE VISIT - MECHANICAL REVIEW
- D.1. AUDIT THE INSTALLED HVAC EQUIPMENT VERSUS THE APPROVED GC SUBMITTALS.
- D.2. AUDIT THE GC FIELD INSTALLATION VERSUS THE CONSTRUCTION DOCUMENTS. THE REVIEW SHALL INCLUDE BUT NOT BE LIMITED TO:
  - D.2.1. HVAC EQUIPMENT (INDOOR & OUTDOOR)
  - D.2.2. ROOF CURBS & PENETRATIONS
  - D.2.3. PIPING (REFRIGERANT, CONDENSER, CONDENSATE, CHILLED WATER, POTABLE WATER, STEAM, NATURAL GAS, ETC.)
  - D.2.4. DUCTWORK
  - D.2.5. SEISMIC HANGARS (IF APPLICABLE)
  - D.2.6. VIBRATION ISOLATORS
  - D.2.7. AIR DEVICES (DIFFUSERS, GRILLES, VCD'S, ETC.)
  - D.2.8. INSULATION (DUCTWORK, PIPING, ETC.)
  - D.2.9. MAINTENANCE ACCESSIBILITY (FILTERS, COILS, MOTORS, ISOLATORS, ETC.)
  - D.2.10. FIRE DAMPER(S)
  - D.2.11. CONTROLS

COMMISSIONING

A&F PROJECT MANAGER

D. OWNER MAINTENANCE VENDOR SITE VISIT - MECHANICAL REVIEW
- D.1. AUDIT THE GC CONTROLS FIELD INSTALLATION VERSUS THE ALC SHOP DRAWINGS. THE REVIEW SHALL INCLUDE BUT NOT BE LIMITED TO:
  - D.1.1. EQUIPMENT INSTALLED (EMS PANEL, SENSORS, ETC.)
  - D.1.2. CONTROLS CABLE PULLED & LABELED
  - D.1.3. NOTIFY A&F IMMEDIATELY IF CABLE IS NOT INSTALLED OR INSTALLED CABLE IS NOT WHAT ALC PROVIDED
- D.2. PRODUCE HVAC & CONTROLS INSPECTION REPORT TO BE SAVED IN JOB'S SITE VISIT FOLDER.

E. PM VISIT #3 - EQUIPMENT START UP AND AIR/WATER.
- E.1. GC TO SAVE A COPY OF THE HVAC EQUIPMENT STARTUP REPORT(S) WITH SIGNATURE OF MANUFACTURER'S REPRESENTATIVE WHO PERFORMED THE STARTUP FROM GC & SAVE TO STORE FOLDER IN NOT COMPLETE UNTIL AFTER PM VISIT #3, PM TO OBTAIN REPORT AS SOON AS STARTUP IS COMPLETE.

COMMISSIONING

COMMISSIONING VENDOR

F. COMMISSIONING SITE VISIT
- F.1. CONTACT ALC'S CUSTOMER SERVICE LINE (PHONE #: (678) 797-5088) AND COMPLETE A POINT-TO-POINT AUDIT OF THE CONTROLS SYSTEM WITH ALC.
- F.2. GC TO HAVE ALL CONTROL CABLE INSTALLED PER E4.00 DRAWINGS PRIOR TO OWNER COMMISSIONING VENDOR ARRIVAL. FAILURE TO DO SO WILL RESULT IN $1,000 BACK CHARGE TO GC.
- F.3 TERMINATE ALL CONTROLS CABLES INTO THE EMS PANEL AND CONTROL DEVICES PER THE ALC SHOP DRAWINGS IF AVAILABLE & HVAC EQUIPMENT SUBMITTALS. THE FOLLOWING IS A LIST ITEMS TO TERMINATE. ITEMS SHALL INCLUDE BUT NOT LIMITED TO:
  - F.3.1. EMS SPACE TEMPERATURE SENSOR(S)
  - F.3.2. EMS RELATIVE HUMIDITY SENSOR(S)
  - F.3.3. EMS SUPPLY AIR TEMPERATURE SENSOR(S)
  - F.3.4. EMS OUTDOOR AIR SENSOR(S)
  - F.3.5. PROGRAMMING EQUIPMENT MANUFACTURER GATEWAY.
  - F.3.6. EMS CHILLED, HOT, AND CONDENSING WATER SENSOR(S)
  - F.3.7. EMS CURRENT OPERATED SWITCH(ES)
  - F.3.8. EMS CONTROLS WIRE AND POWER: FOR ALL NON-DAIKIN HVAC EQUIPMENT. THIS WILL INCLUDE, BUT NOT LIMITED TO, CARRIER, TRANE, YORK, LENNOX, ETC.
  - F.3.9. EMS CONTROLS WIRE: FOR ALL THIRD PARTY EXHAUST, SUPPLY OR CIRCULATION PUMPS.
  - F.3.10. ALL MODBUS CONNECTIONS
- F.4. NOT INCLUDED IN OWNER COMMISSIONING VENDOR SCOPE:
  - F.4.1. ELECTRICAL OR POWER TERMINATIONS TO THE EMS PANEL AND LIGHTING CONTACTORS
  - F.4.2. PROVIDING OR INSTALLING THE COMMUNICATION OR CONTROLS CABLE
  - F.4.3. FIRE PROTECTION OR FIRE ALARM SYSTEMS
- F.5. THE VENDOR IS TO REMAIN ON SITE UNTIL THE STORE HAS BEEN 100% COMMISSIONED. VENDOR SHALL NOT LEAVE THE SITE UNTIL 100% COMMISSIONED UNLESS APPROVED BY A&F'S PROJECT MANAGER.
- F.6. PRODUCE HVAC & CONTROLS INSPECTION REPORT DAILY.

A. GC CHARGE BACK
- A.1. A $2000.00 PER DAY BACK CHARGE WILL BE APPLIED TOWARDS THE GC CONTRACT FOR ALL ADDITIONAL DAYS REQUIRED ON SITE DUE TO GC ISSUES. TO INCLUDE BUT NOT LIMITED TO COSTS TO CHANGE FLIGHT, HOTEL, AND PER DIEM.

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Project # 1912000125

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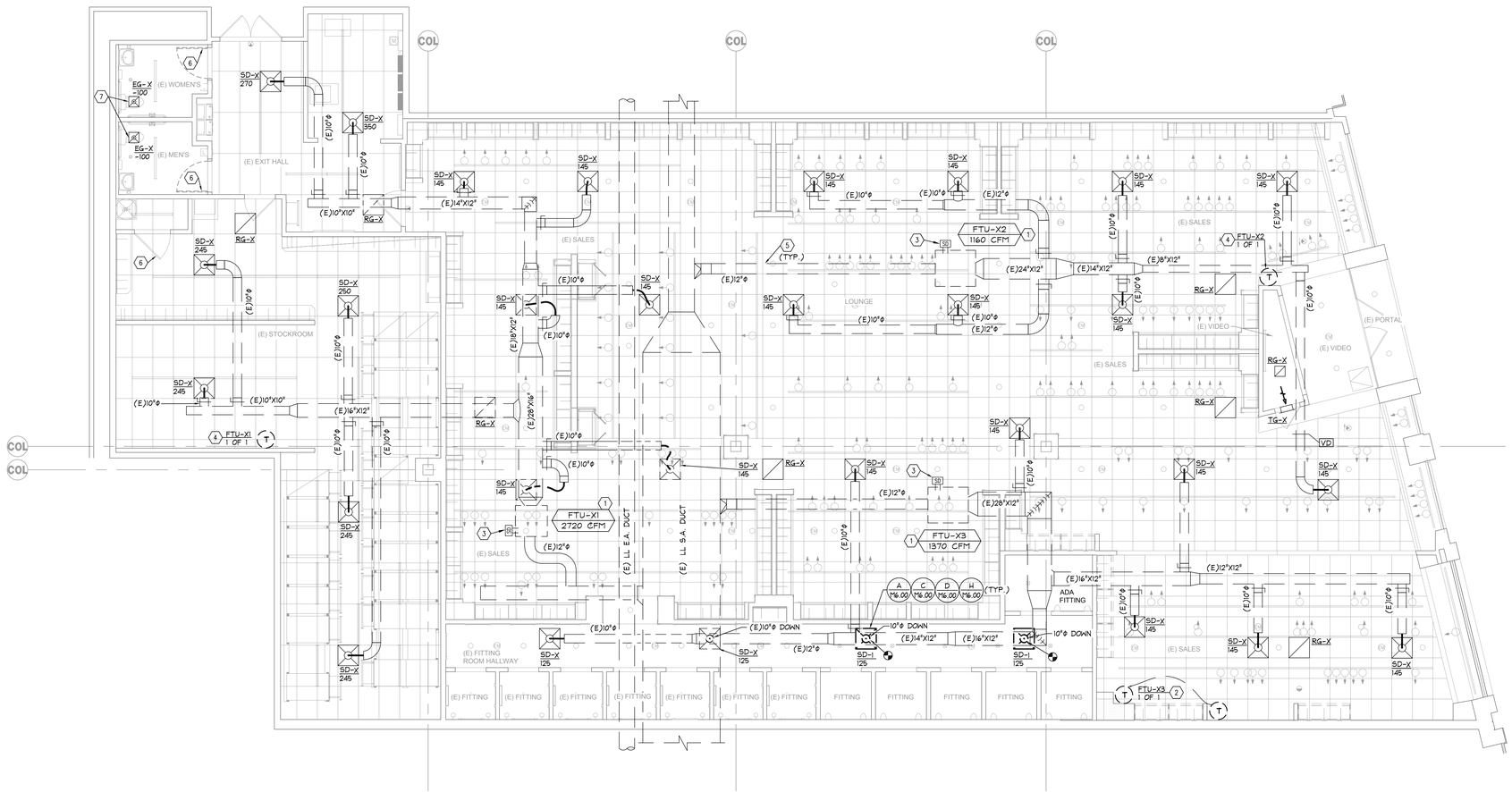
2800 SOUTHCENTER MALL, SPACE 1440
SEATTLE, WA 98188
STORE #31620

Project No:	260387
Drawn By:	AJB

Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

MECHANICAL SCHEDULES AND LOAD CALCULATIONS

M1.00



N

MECHANICAL PLAN

SCALE: 3/16"=1'-0"

EXISTING DUCTWORK NOTES

REUSE AS MUCH OF THE EXISTING DUCTWORK AS POSSIBLE. EXISTING DUCTWORK SHALL BE UTILIZED SUCH THAT RESULTING AIR FLOW THROUGH DUCT DOES NOT EXCEED THE FOLLOWING DESIGN CONDITIONS:

SUPPLY DUCTWORK:
MAXIMUM FRICTION LOSS OF 0.08" PER 100 FEET AND MAXIMUM VELOCITY OF 1,200 FEET PER MINUTE.

RETURN DUCTWORK:
MAXIMUM FRICTION LOSS OF 0.05" PER 100 FEET AND A MAXIMUM VELOCITY OF 1,000 FEET PER MINUTE.

DEMOLITION NOTES

REMOVE ALL EXISTING MECHANICAL EQUIPMENT, DUCTWORK, HANGERS, SUPPORTS, PIPING, AND ACCESSORIES ONLY SERVING THIS SPACE AND NOT UTILIZED IN COMPLETED PROJECT. FIELD VERIFY EXISTING CONDITIONS PRIOR TO BID.

REMODEL NOTES

DRAWING IS BASED ON BEST AVAILABLE INFORMATION AT TIME OF DESIGN AND MAY NOT REFLECT AS-BUILT CONDITIONS. ALL MECHANICAL INSTALLATIONS INDICATED THROUGHOUT DRAWING SET SHALL BE FIELD VERIFIED PRIOR TO BID AND DEMOLITION.

GENERAL PLAN NOTES

A. COORDINATE ROUTE OF DUCTWORK WITH SUPPORTS FOR LIGHTING IN ALL SALES AREA. REFER TO ELECTRICAL LIGHTING PLAN FOR FURTHER INFORMATION.

B. TEMPERATURE SENSORS TO BE MOUNTED 45" AFF UNLESS OTHERWISE NOTED.

C. ALL NON-SALES AREA GRILLES SHALL BE MOUNTED AT 12'-0".

D. ALL MECHANICAL EQUIPMENT SHALL BE LABELED ANF-XXX-# (WHERE XXX IS THE EQUIPMENT DESIGNATION, AHU, CU, EF, ETC.) IN ACCORDANCE WITH THE LABELING REQUIREMENTS IN SPEC BOOK.

E. BRANCH DUCT SIZE TO MATCH DIFFUSER NECK SIZE

F. CONTRACTOR TO CHANGE OUT ALL FILTERS AFTER FINAL STORE CLEAN.

G. CONTRACTORS AND SUB-CONTRACTORS SHALL CAREFULLY REVIEW CONSTRUCTION DOCUMENTS. INFORMATION REGARDING COMPLETE WORK IS DISPERSED THROUGHOUT DOCUMENT SET AND CANNOT BE ACCURATELY DETERMINED WITHOUT REFERENCE TO COMPLETE DOCUMENT SET.

H. COORDINATE WITH WORK OF OTHER SECTIONS, EQUIPMENT FURNISHED BY OTHERS, REQUIREMENTS OF OWNER, AND WITH CONSTRAINTS OF EXISTING CONDITIONS OF PROJECT SITE. PROVIDE DUCT RISES AND DROPS AS REQUIRED FOR FIELD INSTALLATION AND TRADE COORDINATION. NOTIFY ARCHITECT OF DISCREPANCIES BEFORE STARTING WORK.

I. DRAWINGS FOR HVAC WORK ARE DIAGRAMMATIC, SHOWING GENERAL LOCATION, TYPE, LAYOUT, AND EQUIPMENT REQUIRED. DRAWINGS SHALL NOT BE SCALED FOR EXACT MEASUREMENT. REFER TO ARCHITECTURAL DRAWINGS FOR DIMENSIONS. REFER TO MANUFACTURER'S STANDARD INSTALLATION DRAWINGS FOR EQUIPMENT CONNECTIONS AND INSTALLATION REQUIREMENTS. PROVIDE DUCTWORK, CONNECTIONS, ACCESSORIES, OFFSETS, AND MATERIALS NECESSARY FOR A COMPLETE SYSTEM.

J. ALL WORK SHALL COMPLY WITH STATE AND LOCAL CODE REQUIREMENTS AS APPROVED AND AMENDED BY GOVERNING AUTHORITY. PURCHASE ALL PERMITS ASSOCIATED WITH THE WORK. OBTAIN ALL INSPECTIONS REQUIRED BY CODE.

K. INSTALL EQUIPMENT PER MANUFACTURER'S INSTRUCTIONS AND MAINTAIN MANUFACTURER'S RECOMMENDED CLEARANCE.

L. USE OF COMBUSTIBLE MATERIALS IS NOT ALLOWED IN RETURN AIR PLENUMS. MATERIALS USED IN PLENUMS SHALL HAVE FLAME SPREAD RATING NOT TO EXCEED 25, AND SMOKE DEVELOPED RATING NOT TO EXCEED 50 WHEN TESTED IN ACCORDANCE WITH ASTM E 84. ALL EXPOSED WIRING IN PLENUMS SHALL BE PLENUM RATED.

M. REBALANCE ALL DIFFUSERS (NEW AND EXISTING) TO AIRFLOWS INDICATED ON PLAN.

N. PATCH AND SEAL EXISTING DUCTWORK TO MATCH SEAL CLASS "A".

O. EXISTING MALL RETURN AND TRANSFER AIR OPENINGS IN DEMISING WALLS TO REMAIN. VERIFY WITH LANDLORD'S REPRESENTATIVE THAT CURRENT QUANTITY, LOCATIONS AND SIZES ARE ADEQUATE.

MECHANICAL PLAN NOTES

1. EXISTING FAN TERMINAL UNIT TO REMAIN. CLEAN UNIT, GREASE ALL BEARINGS, AND REPLACE FILTERS. RESHEAVE MOTOR AS REQUIRED TO DELIVER SPECIFIED AIR FLOW.
2. RELOCATE EXISTING THERMOSTAT TO LOCATION SHOWN ON PLAN. FIELD VERIFY LOCATION PRIOR TO BID.
3. EXISTING DUCT MOUNTED SMOKE DETECTOR TO REMAIN IN SERVICE IF OPERATIONAL. REMOVE, CLEAN, ADJUST AND REPAIR TO GOOD WORKING CONDITION. PROVIDE BID ALTERNATE TO REPLACE WITH EQUIVALENT NEW SMOKE DETECTOR IF REQUIRED. DETECTION OF SMOKE SHALL INITIATE A SIGNAL FROM FIRE ALARM SYSTEM TO SHUT DOWN UNIT AND SEND SIGNAL TO LANDLORD'S BASE BUILDING SYSTEM.
4. EXISTING THERMOSTAT TO REMAIN. FIELD VERIFY EXISTING LOCATION PRIOR TO BID.
5. EXISTING DUCTWORK TO REMAIN. FIELD VERIFY EXACT LOCATION AND CONDITION. PATCH/REPAIR/SEAL AIR TIGHT. REPLACE AND PROVIDE NEW INSULATION AS REQUIRED. VACUUM CLEAN PER 2021 NADCA, SECTION 4, AFTER CONSTRUCTION AND PRIOR TO OCCUPANCY.
6. ENSURE DOOR IS UNDERCUT 1" FOR TRANSFER AIR.
7. EXISTING CEILING MOUNTED EXHAUST FAN AND DUCTWORK CONNECTING TO EXISTING LANDLORD EXHAUST SYSTEM TO REMAIN. REMOVE FAN, CLEAN, ADJUST AND REPAIR TO GOOD WORKING CONDITION. PROVIDE BID ALTERNATE TO REPLACE WITH EQUIVALENT NEW FAN IF REQUIRED.

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STORE #31620

Project No:	260387
Drawn By:	AJB
Date	Issue
09.18.2026	CHECKSET
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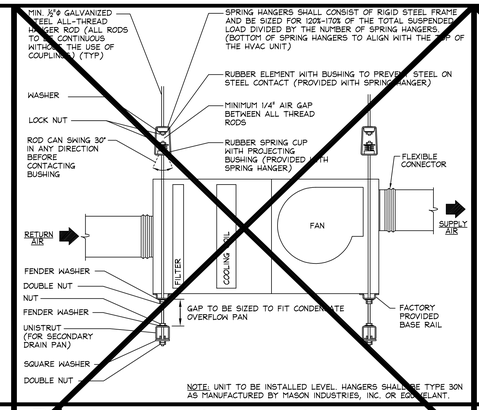
MECHANICAL PLAN

M2.00

\\ATTN_Dialectic_Ic_1TB.dwg
\\ATTN_Dialectic_Ic_2TB.dwg
\\ATTN_Dialectic_Ic_CHASE.dwg
C:\Users\ajbarnhill\Documents\R24_Central_ajbarnhill_Dialectic_Ic_1TB.rvt
Drawn By: Chris Hanke

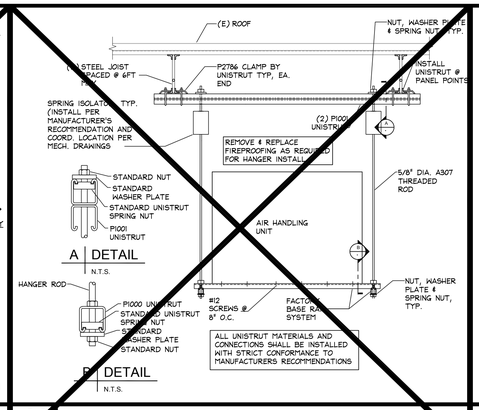
V NOT USED
M2.00 SCALE: NONE

R ACU MOUNTING DETAIL
M2.00 SCALE: NONE

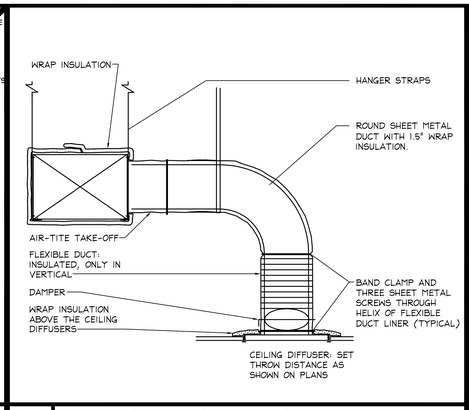


NOTE: UNIT TO BE INSTALLED LEVEL. HANGERS SHALL BE TYPE 30N AS MANUFACTURED BY MASON INDUSTRIES, INC. OR EQUIVALENT.

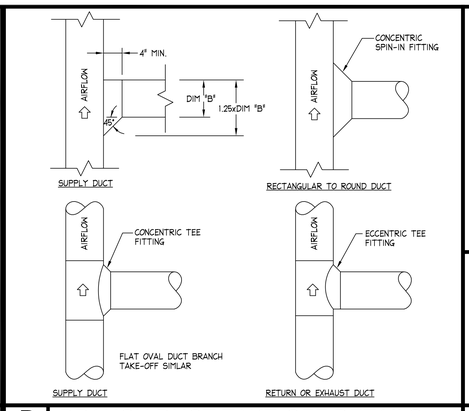
M TYPICAL HANGING DETAIL
M2.10 SCALE: NONE



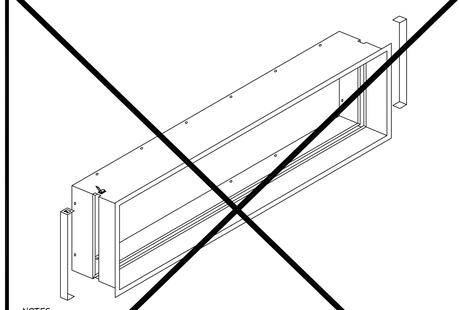
H DIFFUSER MOUNTING
M2.00 SCALE: NONE



D BRANCH DUCT TAKE-OFF DETAILS
M2.00 SCALE: NONE



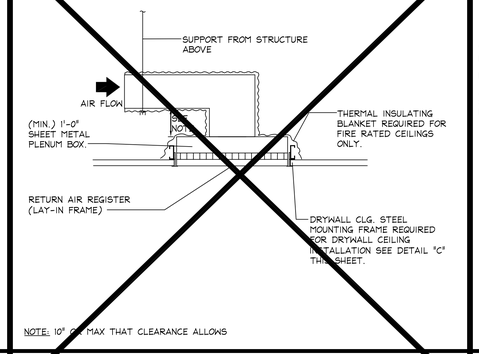
U FILTER RACK
M2.00 SCALE: NONE



NOTES:
1. FILTER RACK TO BE OF STRONG SPOTWELDED M/S SHEET CONSTRUCTION HOT GALVANIZATION DIPPED.
2. FILTER RACK TO BE INTERNALLY LAGGED WITH 1/2"MM CLOSED CELL ELASTOMERIC FOAM.
3. FILTER RACK TO HAVE CHANNEL FOR FILTERS.
4. FILTER RACK TO HAVE REMOVABLE SIDE ACCESS.

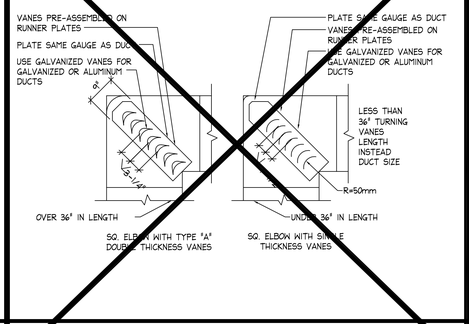
Q NOT USED
M2.00 SCALE: NONE

L TRANSFER GRILLE - RESTROOM
M2.00 SCALE: NONE

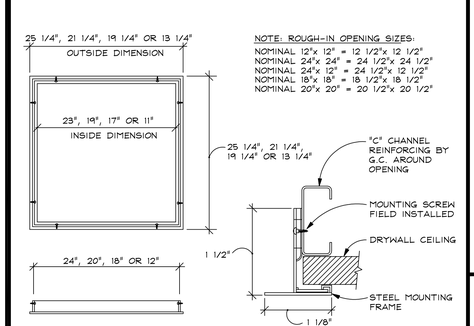


NOTE: 10' O.C. MAX THAT CLEARANCE ALLOWS

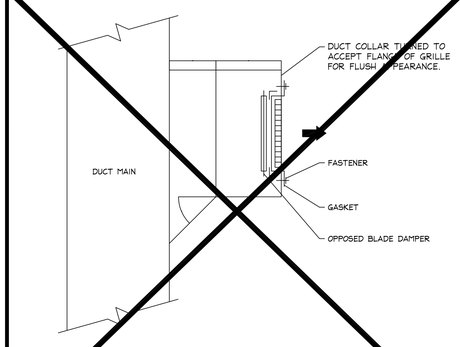
G TURNING VANES DETAIL
M2.00 SCALE: NONE



C DRYWALL MOUNTING FRAME DETAIL
M2.00 SCALE: NONE

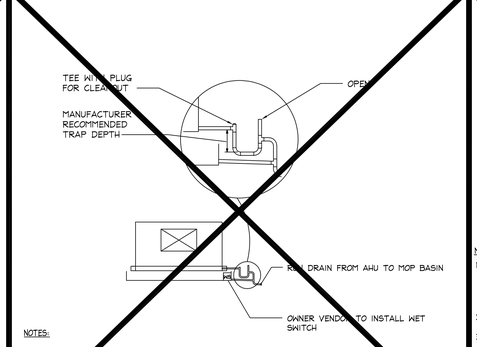


T REGISTER DUCT CONNECTION
M2.10 SCALE: NONE



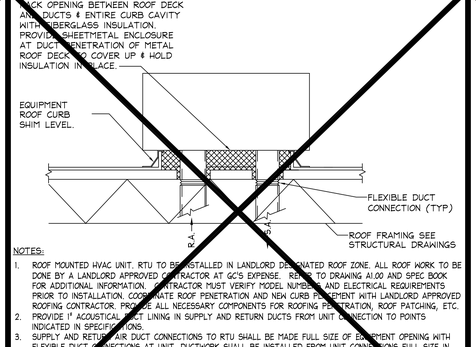
NOTE: GAUGE OF SHEET METAL SHALL BE SUCH THAT DUCT COLLAR IS ABLE TO SUPPORT WEIGHT OF GRILLE & DAMPER AND BE LEVEL.

P ACU SECONDARY DRAIN PAN DETAIL
M2.00 SCALE: NONE



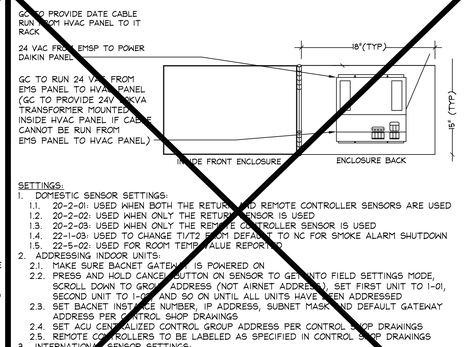
NOTES:
1. ALL CONDENSATE PIPING SHALL BE INSULATED, 1" MINIMUM
2. INSTALL CONDENSATE DRAIN PIPE AT SLOPE OF 1" PER 4' TO NEAREST LL APPROVED RECEPTOR
3. CONDENSATE DRAIN TRAP DEPTH OF 1.5 X UNIT TOTAL STATIC PRESSURE, MINIMUM 6" DEEP

K ROOFTOP UNIT
M2.10 SCALE: NONE



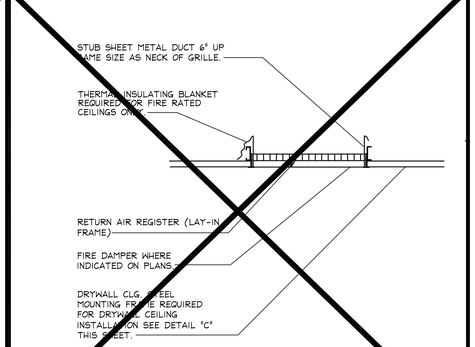
NOTES:
1. ROOF MOUNTED HVAC UNIT. RTU TO BE INSTALLED IN LANDLORD DESIGNATED ROOF ZONE. ALL ROOF WORK TO BE DONE BY A LANDLORD APPROVED CONTRACTOR AT GC'S EXPENSE. REFER TO DRAWING A1.00 AND SPEC BOOK FOR ADDITIONAL INFORMATION. CONTRACTOR MUST VERIFY MODEL NUMBERS AND ELECTRICAL REQUIREMENTS PRIOR TO INSTALLATION. COORDINATE ROOF PENETRATION AND NEW CURB PLACEMENT WITH LANDLORD APPROVED ROOFING CONTRACTOR. PROVIDE ALL NECESSARY COMPONENTS FOR ROOFING PENETRATION, ROOF PATCHING, ETC.
2. PROVIDE 1" ACOUSTICAL DUCT LINING IN SUPPLY AND RETURN DUCTS FROM UNIT CONNECTION TO POINTS INDICATED IN SPECIFICATIONS.
3. SUPPLY AND RETURN AIR DUCT CONNECTIONS TO RTU SHALL BE MADE FULL SIZE OF EQUIPMENT OPENING WITH FLEXIBLE DUCT CONNECTIONS AT UNIT. DUCTWORK SHALL BE INSTALLED FROM UNIT CONNECTIONS FULL SIZE IN THE VERTICAL DROP FROM THE UNIT. TRANSITION TO SIZES SHOWN ON PLANS. ELBOWS SHALL HAVE DOUBLE THICKNESS TURNING VANES INSTALLED.
4. COORDINATE WITH LANDLORD ROOFING CONTRACTOR.

E HVAC PANEL
M2.00 SCALE: NONE

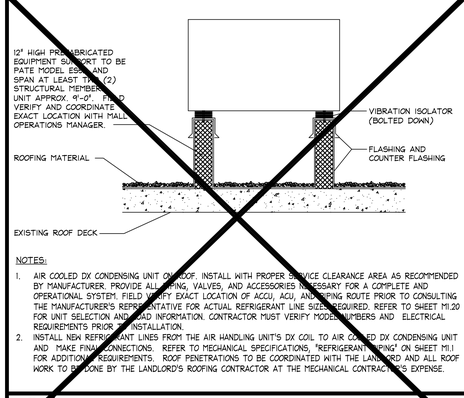


SETTINGS:
1. DOMESTIC SENSOR SETTINGS:
   1.1. 20-2-01: USED WHEN BOTH THE RETURN AND REMOTE CONTROLLER SENSORS ARE USED
   1.2. 20-2-02: USED WHEN ONLY THE RETURN SENSOR IS USED
   1.3. 20-2-03: USED WHEN ONLY THE REMOTE CONTROLLER SENSOR IS USED
   1.4. 22-1-03: USED TO CHANGE T1/T2 FROM DEFAULT TO NC FOR SMOKE ALARM SHUTDOWN
   1.5. 22-5-02: USED FOR ROOM TEMP. VALUE REPORTING
2. ADDRESSING INDOOR UNITS:
   2.1. MAKE SURE BACNET GATEWAY IS POWERED ON
   2.2. PRESS AND HOLD CANCEL BUTTON ON SENSOR TO GET INTO FIELD SETTINGS MODE, SCROLL DOWN TO GROUP ADDRESS (NOT AIRNET ADDRESS), SET FIRST UNIT TO 1-01, SECOND UNIT TO 1-02 AND SO ON UNTIL ALL UNITS HAVE BEEN ADDRESSED
   2.3. SET BACNET INSTANCE NUMBER, IP ADDRESS, SUBNET MASK AND DEFAULT GATEWAY ADDRESS PER CONTROL SHOP DRAWINGS
   2.4. SET ACU CENTRALIZED CONTROL GROUP ADDRESS PER CONTROL SHOP DRAWINGS
   2.5. REMOTE CONTROLLERS TO BE LABELED AS SPECIFIED IN CONTROL SHOP DRAWINGS
3. INTERNATIONAL SENSOR SETTINGS:
   3.1. 20-04-02: USED TO SET TEMPERATURE CONTROL AND CHANGE OVER PARAMETER
   3.2. 23-6-02: USED FOR HIGH STATIC UNITS (DUCTED UNITS)
   3.3. 17-1-02: USED FOR VAM UNITS

B RETURN GRILLE MOUNTING
M2.00 SCALE: NONE

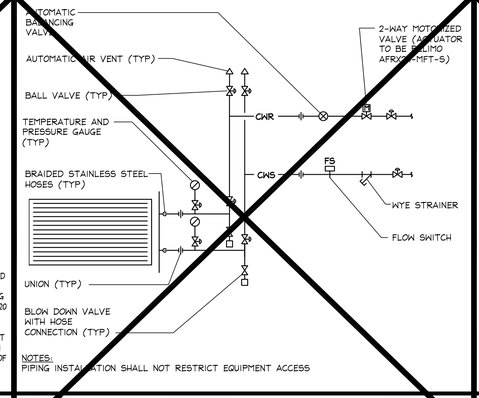


S ROOF MOUNTED EQUIPMENT
M2.10 SCALE: NONE



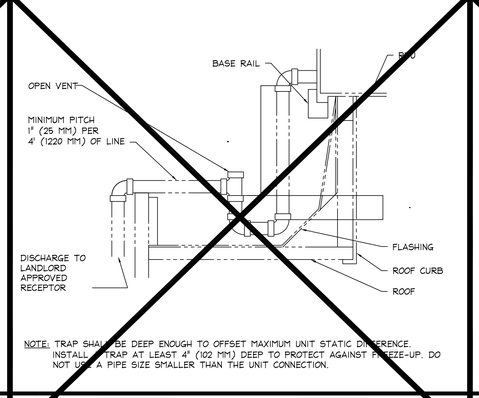
NOTES:
1. AIR COOLED DX CONDENSING UNIT ON ROOF. INSTALL WITH PROPER SERVICE CLEARANCE AREA AS RECOMMENDED BY MANUFACTURER. PROVIDE ALL PIPING, VALVES, AND ACCESSORIES NECESSARY FOR A COMPLETE AND OPERATIONAL SYSTEM. FIELD VERIFY EXACT LOCATION OF ACCU, ACU, AND PIPING ROUTE PRIOR TO CONSULTING THE MANUFACTURER'S REPRESENTATIVE FOR ACTUAL REFRIGERANT LINE SIZES REQUIRED. REFER TO SHEET M1.20 FOR UNIT SELECTION AND LOAD INFORMATION. CONTRACTOR MUST VERIFY MODEL NUMBERS AND ELECTRICAL REQUIREMENTS PRIOR TO INSTALLATION.
2. INSTALL NEW REFRIGERANT LINES FROM THE AIR HANDLING UNIT'S DX COIL TO AIR COOLED DX CONDENSING UNIT AND MAKE FINAL CONNECTIONS. REFER TO MECHANICAL SPECIFICATIONS, "REFRIGERANT PIPING" ON SHEET M1.1 FOR ADDITIONAL REQUIREMENTS. ROOF PENETRATIONS TO BE COORDINATED WITH THE LANDLORD AND ALL ROOF WORK TO BE DONE BY THE LANDLORD'S ROOFING CONTRACTOR AT THE MECHANICAL CONTRACTOR'S EXPENSE.

N HYDRONIC COIL DETAIL
M2.00 SCALE: NONE



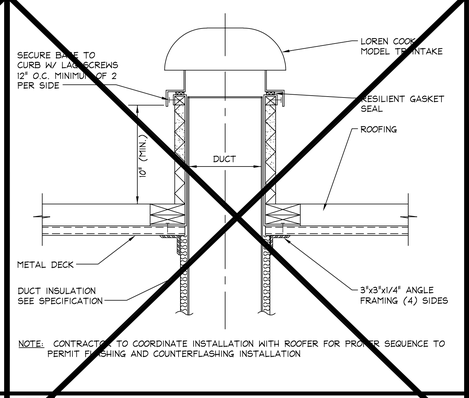
NOTES:
PIPING INSTALLATION SHALL NOT RESTRICT EQUIPMENT ACCESS

J RTU CONDENSATE DRAIN
M2.10 SCALE: NONE



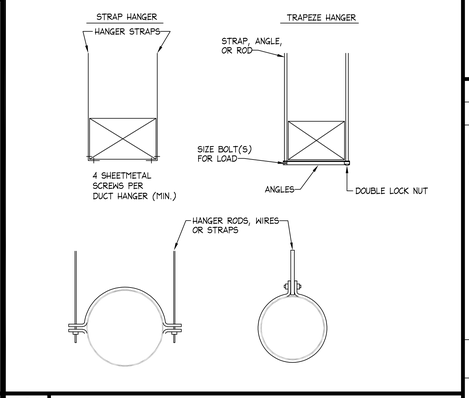
NOTE: TRAP SHALL BE DEEP ENOUGH TO OFFSET MAXIMUM UNIT STATIC DIFFERENCE. INSTALL TRAP AT LEAST 4" (102 MM) DEEP TO PROTECT AGAINST FREEZE-UP. DO NOT USE A PIPE SIZE SMALLER THAN THE UNIT CONNECTION.

E AIR INTAKE/EXHAUST HOOD
M2.10 SCALE: NONE



NOTE: CONTRACTOR TO COORDINATE INSTALLATION WITH ROOFER FOR PROPER SEQUENCE TO PERMIT FLASHING AND COUNTERFLASHING INSTALLATION

A DUCT HANGING DETAIL
M2.00 SCALE: NONE



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614-283-6500

BID SET ONLY. NOT FOR CONSTRUCTION

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STORE #31620

Project No:	260367
Drawn By:	AJB
Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

MECHANICAL DETAILS

M6.00

SECTION 22 0519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Positive displacement meters.

B. Pressure gauges and pressure gauge taps.

C. Thermometers and thermometer wells.

D. Static pressure gauges.

PART 2 PRODUCTS

2.01 POSITIVE DISPLACEMENT METERS (LIQUID)

A. AWWA C700, positive displacement disc type suitable for fluid with bronze case and cast iron frost-proof, breakaway bottom cap, hermetically sealed register, remote reading.

B. Meter: Brass body turbine meter with magnetic drive register.

1. Accuracy: 1-1/2 percent.

2.02PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch (115 mm) diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi and kPa.

2.03DIAL THERMOMETERS

A. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.

1. Size: 5 inch (125 mm) diameter dial.
2. Accuracy: 1 percent.
3. Calibration: Degrees F.

2.04STATIC PRESSURE GAUGES

A. 3-1/2 inch (90 mm) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

D. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

SECTION 22 0523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Applications.

B. General requirements.

C. Angle valves.

D. Ball valves.

E. Butterfly valves.

F. Check valves.

G. Gate valves.

H. Globe valves.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
2. Protect valve parts exposed to piped medium against rust and corrosion.
3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
5. Secure check valves in either the closed position or open position.
6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.
   a. Provide temporary inlet and outlet caps.
   b. Maintain caps in place until installation.
2. Store valves in shipping containers and maintain in place until installation.
   a. Store valves indoors in dry environment.
   b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:

1. Shutoff: Ball, butterfly, gate or plug.
2. Dead-End: Single-flange butterfly (lug) type.
3. Throttling: Provide globe, angle, ball, or butterfly.
4. Swing Check (Pump Outlet):
   a. 2 NPS (50 DN) and Smaller: Bronze swing check valves with disc.
   b. 2-1/2 NPS (65 DN) and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.

B. Domestic, Hot and Cold Water Valves:

1. 2 NPS (50 DN) and Smaller:
   a. Bronze and Brass: Provide with solder-joint or threaded ends.
   b. Bronze Angle: Class 125, bronze disc.
   c. Ball: One piece, full port, brass or bronze with brass trim.
2. 2-1/2 NPS (65 DN) and Larger:
   a. Iron, 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Provide with threaded or flanged ends.
   b. Iron Ball: Class 150.

2.02GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Gear Actuator: Quarter-turn valves 8 NPS (200 DN) and larger.

D. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:

1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 NPS (15 DN) through 24 NPS (600 DN): ASME B16.5.

F. Valve Materials for Potable Water: NSF 61 and NSF 372.

G. Bronze Valves:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03BRONZE ANGLE VALVES

A. Class 125: CWP Rating: 200 psig: (1380 kPa).

1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. Ends: Threaded.
4. Stem: Bronze.
5. Disc: Bronze.
6. Packing: Asbestos free.
7. Handwheel: Bronze or aluminum.

2.04BRASS BALL VALVES

A. Two Piece, Full Port and Regular Port with Brass Trim:

1. Comply with MSS SP-110.
2. SWP Rating: 150 psig (1035 kPa).
3. CWP Rating: 600 psig (4140 kPa).
4. Body: Forged brass.
5. Ends: Threaded.
6. Seats: PTFE.

2.05BRONZE BALL VALVES

2.06 IRON BALL VALVES

A. Class 125, Full Port, Stainless Steel Trim:

1. Comply with MSS SP-72.
2. CWP Rating: 200 psig (1380 kPa).
3. Body: ASTM A536 Grade 65-45-12, ductile iron.
4. Ends: Flanged.
5. Seats: PTFE.
6. Operator: Lever, with locking handle.

2.07BRONZE SWING CHECK VALVES

A. Class 125: CWP Rating: 200 psig (1380 kPa).

1. Comply with MSS SP-80, Type 3.
2. Design: Horizontal flow.
3. Body: Bronze, ASTM B62.
4. Ends: Threaded as indicated.
5. Disc: Bronze.

2.08IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125 with Lever and Spring-Closure Control.

1. Comply with MSS SP-71, Type I.
2. Description:
   a. CWP Rating: 200 psig (1380 kPa).
   b. Design: Clear or full waterway.
   c. Body: ASTM A126, gray iron with bolted bonnet.
   d. Ends: Flanged as indicated.
   e. Trim: Bronze.
   f. Gasket: Asbestos free.
   g. Closer Control: Factory installed, exterior lever, and weight.

SECTION 22 0529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other plumbing work.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems:

1. Channel Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

D. Pipe Supports:

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Liquid Temperatures Up To 122 degrees F (50 degrees C):
   a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
   b. Support From Below: MSS SP-58 Types 35 through 38.
3. Operating Temperatures from 122 to 446 degrees F (50 to 230 degrees C):
   a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.
   b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.
   c. Sliding Support: MSS SP-58 Types 35 through 38.

E. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
3. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

F. Riser Clamps:

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Provide copper plated clamps for copper tubing support.
3. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

G. Strut Clamps: Two-piece pipe clamp.

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

H. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

I. Pipe Hangers: For a given pipe run, use hangers of the same type and material.

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
3. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

J. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

K. Nonpenetrating Rooftop Supports for Low-Slope Roofs:

1. Manufacturers:
   a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
2. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
5. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.

L. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

M. Pipe Installation Accessories:

1. Copper Pipe Supports:
   a. Manufacturers:
      1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.
2. PEX Pipe Supports:
   a. Manufacturers:
      1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.
3. CPVC Pipe Supports:
   a. Manufacturers:
      1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.
4. Overhead Pipe Supports:
   a. Manufacturers:
      1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.
5. Inserts and Clamps:
   a. Manufacturers:
      1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch (100 mm) high concrete pad, 6 inches larger in all directions constructed in accordance with Section 03 3000.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

G. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

SECTION 22 0548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

C. Vibration isolators.

D. Seismic restraint systems.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.

1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing plumbing equipment and/or plumbing connections to vibration-isolated equipment.

B. General Requirements:

1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

C. Equipment and Piping Isolation: As indicated on drawings.

2.02VIBRATION ISOLATORS

A. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
   a. Color code or otherwise identify springs to indicate load capacity.
   b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
   c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
   d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
   e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
   f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
   a. Air Gap: Between 0.125 inches (3 mm) and 0.25 inches (6 mm) unless otherwise indicated.
   b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch (6 mm) thick; capable of being visually inspected for damage and replaced.

B. Vibration Isolators for Nonseismic Applications:

1. Resilient Material Isolator Pads:
   a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
   b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch (6 mm) thickness.
   c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
2. Resilient Material Isolator Mounts, Nonseismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
3. Open (Unhoused) Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
   b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Housed Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
   b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
   c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   d. Furnished with integral leveling device for positioning and securing supported equipment.

C. Vibration Isolators for Seismic Applications:

1. Resilient Material Isolator Mounts, Seismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
2. Restrained Spring Isolators, Seismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
   b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.03SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:
   a. Provide specified minimum clearance beneath base.
2. Spring Isolators:
   a. Position equipment at operating height; provide temporary blocking as required.
   b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
   c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
3. Isolator Hangers:
   a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
   b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Piping: Tags.

B. Pumps: Nameplates.

C. Small-sized Equipment: Tags.

D. Tanks: Nameplates.

E. Valves: Tags and ceiling tacks where located above lay-in ceiling.

F. Water Treatment Devices: Nameplates.

2.02NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.

2.03TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04PIPE MARKERS

A. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

D. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
2. Fire Quenching Fluids: Red with white letters.
3. Toxic and Corrosive Fluids: Orange with black letters.
4. Flammable Fluids: Yellow with black letters.
5. Combustible Fluids: Brown with white letters.
6. Compressed Air: Blue with white letters.

2.05CEILING TACKS

A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

B. Color code as follows:

1. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

SECTION 22 0716 - PLUMBING EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Flexible removable and reusable blanket insulation.

C. Covering.

D. Breeching insulation.

1.02 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.04 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

A. Insulation: ASTM C553 Type V; flexible, noncombustible.

2.03GLASS FIBER, RIGID

A. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.

2.04FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3, in sheet form.

1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

2.05JACKETS

A. PVC Plastic:

1. Jacket: Sheet material, off-white color.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

D. Insulated equipment containing fluids below ambient temperature: Insulate entire system.

E. For hot equipment containing fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions, but bevel and seal ends of insulation.

F. For hot equipment containing fluids over 140 degrees F (60 degrees C), insulate flanges and unions with removable sections and jackets.

G. Inserts and Shields:

1. Shields: Galvanized steel between hangers and inserts.
2. Insert location: Between support shield and equipment and under the finish jacket.

H. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

I. Exterior Applications:

1. Provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement.
2. Cover with aluminum or stainless steel.

J. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

K. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.03SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water Storage Tanks:
   a. Glass Fiber, Rigid Insulation: 2" thick.

SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.03 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02GLASS FIBER

A. Manufacturers:

1. CertainTeed Corporation.
2. Johns Manville Corporation.
3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation.
4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ.
5. Owens Corning Corporation; VaporWick Pipe Insulation.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
2. Maximum Service Temperature: 850 degrees F (454 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.

1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA, Inc; Aerocel Stay-Seal with Protape (SSPT): www.aeroflexusa.com/#sle.
2. Armacell LLC; AP Armaflex: www.armacell.us/#sle.
3. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
2. Maximum Service Temperature: 220 degrees F (104 degrees C).
3. Connection: Waterproof vapor barrier adhesive.

2.04JACKETS

A. PVC Plastic.

1. Manufacturers:
   a. Johns Manville Corporation.
2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
   b. Maximum Service Temperature: 150 degrees F (66 degrees C).
   c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
   d. Thickness: 10 mil (0.25 mm).
   e. Connections: Brush on welding adhesive.
3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:

1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

N. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water Supply:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: 1 1/2 inch and larger.
      2) Thickness: 1 inch.
   b. Glass Fiber Insulation:
      1) Pipe Size Range: 1 1/4 inch and smaller.
      2) Thickness: 1/2 inch.
   c. Cellular Foam Insulation:
      1) Pipe Size Range: 1 1/4 inch and smaller.
      2) Thickness: 1/2 inch.
2. Domestic Hot Water Recirculation:
   a. Glass Fiber Insulation:
      1) Pipe Size Range: All sizes.
      2) Thickness: 1 inch (25 mm).
3. Tempered Domestic Water Supply: 1 inch
4. Tempered Domestic Water Recirculation: 1 inch
5. Domestic Cold Water: 1 inch
6. Roof Drain Bodies: Glass Fiber 1 inch
7. Roof Drainage Above Grade: Glass Fiber 1 inch
8. Roof Drainage Within 10 Feet (3 Meters) of the Exterior: Glass Fiber 1 inch
9. Roof Drainage Run Horizontal at Roof Level:
10. Plumbing Vents Within 10 Feet (3 Meters) of the Exterior: Glass Fiber 1 inch

B. Other Systems:

1. Piping Exposed to Freezing with Heat Tracing:

SECTION 22 1005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.

1. Sanitary sewer.
2. Domestic water.
3. Storm water.
4. Flanges, unions, and couplings.
5. Pipe hangers and supports.
6. Manufactured sleeve-seal systems.
7. Valves.
8. Flow controls.
9. Check.
10. Water pressure reducing valves.
11. Relief valves.
12. Strainers.

1.02 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2729.

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
   a. Manufacturers:
      1) Anvil International.
      2) Apollo Valves.
      3) Grinnell Products.
      4) Viega LLC.

B. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.

1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.

C. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.

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STORE #31620

Project No.:	260387
Drawn By:	ESS
Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

PLUMBING SPECIFICATIONS

P0.01

1. Manufacturers:
   a. SharkBite, a brand of Reliance Worldwide Corporation.
   b. Uponor, Inc.
   c. Viega LLC.
   d. Zurn Industries, LLC.
2. PPI TR-4 Pressure Design Basis:
   a. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
3. Fittings: Brass and engineered polymer (EP) ASTM F1960.
4. Joints: Mechanical compression fittings.

2.05STORM WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.06STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.07NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

2.08NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.09FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
B. Flanges for Pipe Size Over 1 Inch (25 mm):
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or galvanized.
   3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
   4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   5. When pipe is field grooved, provide coupling manufacturer's grooving tools.
   6. Manufacturers:
      a. Anvil International.
      b. Apollo Valves.
      c. Grinnell Products.
D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
      a. Cold and Hot Pipe Sizes 6 Inches (150 mm) and Over: Double hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.
   5. Floor Supports: Concrete pier or steel pedestal with floor flange, fixture attachment.
B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
   4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
   5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
   5. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
   6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
   7. Wall Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
   8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   9. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
   10. Floor Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
   11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

2.11 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Modular/Mechanical Seal:
   1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
   2. Provide watertight seal between pipe and wall/casing opening.
   3. Elastomer element size and material in accordance with manufacturer's recommendations.
   4. Glass reinforced plastic pressure end plates.

2.12 PIPING SPECIALTIES

A. Flow Controls:
   1. Manufacturers:
      a. Anvil International.
      b. ITT Bell & Gossett.
      c. Griswold Controls.
      d. Taco, Inc.
   2. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
   3. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.13 WATER PRESSURE REDUCING VALVES

A. Manufacturers:
   1. Amtrol Inc.
   2. Apollo Valves.
   3. Cash Acme, a brand of Reliance Worldwide Corporation.
   4. Cla-Val Company.
   5. Flomatic Valves.
   6. Watts Regulator Company.
B. Up to 2 Inches (50 mm):
   1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
C. Over 2 Inches (50 mm):
   1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.14 RELIEF VALVES

A. Pressure:
   1. Manufacturers:
      a. Cla-Val Co.
      b. Henry Technologies.
      c. Watts Regulator Company.
   2. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
B. Temperature and Pressure:
   1. Manufacturers:
      a. Cla-Val Co.
      b. Henry Technologies.
      c. Watts Regulator Company.
   2. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

2.15 STRAINERS

A. Manufacturers:
   1. Armstrong International, Inc.
   2. Green Country Filter Manufacturing.
   3. HEAMCO.
B. Size 2 Inches (50 mm) and Under:
   1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
C. Size 1-1/2 Inch (40 mm) to 4 Inches (100 mm):
   1. Class 125, Flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.
D. Size 5 Inch (125 mm) and Larger:
   1. Class 125, Flanged iron body, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.03INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.
G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
H. Provide access where valves and fittings are not exposed.
I. Establish elevations of buried piping outside the building to ensure not less than 4 ft. (1._____ m) of cover.
J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly(_____).
K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
L. Provide support for utility meters in accordance with requirements of utility companies.
M. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
N. Excavate in accordance with Section 31 2316.
O. Backfill in accordance with Section 31 2323.
P. Install bell and spigot pipe with bell end upstream.
Q. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 0523.
R. Install water piping to ASME B31.9.
S. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and Flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
T. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
U. Sleeve pipes passing through partitions, walls, and floors.
V. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
W. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   8. Provide copper plated hangers and supports for copper piping.
   9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
   10. Provide hangers adjacent to motor-driven equipment with vibration isolation; refer to Section 22 0548.
   11. Support cast iron drainage piping at every joint.
X. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a watertight seal.
   6. Install in accordance with manufacturer's recommendations.
Y. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.04APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.
B. Install unions downstream of valves and at equipment or apparatus connections.
C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
E. Install globe valves for throttling, bypass, or manual flow control services.
F. Provide lug and butterfly valves adjacent to equipment when provided to isolate equipment.
G. Provide spring-loaded check valves on discharge of water pumps.
H. Provide flow controls in water recirculating systems where indicated.

3.05DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 0110.58.
B. Prior to starting work, verify system is complete, flushed, and clean.
C. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
D. Maintain disinfectant in system for 24 hours.
E. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

3.06SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
   2. Provide 18 gage, 0.0478-inch (1.21 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing.

3.07SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
      d. Pipe Size: 4 inches (100 mm) to 6 inches (150 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 5/8 inch (15 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Backflow preventers.
D. Water hammer arrestors.
E. Mixing valves.

1.02 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company.
   2. Josam Company.
   3. Zurn Industries, LLC.
B. Roof Drains:
   1. Assembly: ASSE A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Removable polyethylene dome with vandal proof screws.
   4. Accessories: Coordinate with roofing type. (_____)
      a. Membrane flange and membrane clamp with integral gravel stop.
      b. Adjustable under deck clamp.
      c. Roof sump receiver.
      d. Waterproofing flange.
      e. Controlled flow weir.
      f. Leveling frame.
      g. Adjustable extension sleeve for roof insulation.
C. Parapet Drains:
   1. Lacquered cast iron body with aluminum flashing clamp collar and epoxy coated sloping grate.
D. Roof Overflow Drains:
   1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches (1._____ mm) above flood elevation.
E. Downspout Nozzles:
   1. Bronze round with straight bottom section.
F. Area Drains:
   1. Assembly: ASME A112.6.4.
   2. Body: Lacquered cast iron with sump.
   3. Strainer: Round nickel-bronze.
   4. Accessories: Membrane flange and membrane clamp with integral gravel stop, with adjustable under deck clamp.
G. Linear Drains:
   1. Body: Provide PVC, ABS, or stainless-steel with sloped channel to vertical waste pipe.
   2. Clamping Ring: Stainless steel mechanism to clamp waterproof membrane to linear drain body.
   3. Strainer: Removable brushed stainless steel or tile top strainer furnished by manufacturer or others.
   4. Grate: Cross-hatch.
   5. Additional Components: Manufacturer's standard membrane, sealant, fasteners, and anchors.

2.03CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company.
   2. Josam Company.
   3. MIFAB, Inc.
   4. Zurn Industries, LLC.
B. Cleanouts at Exterior Surfaced Areas:
   1. Round cast nickel bronze access frame and non-skid cover.
C. Cleanouts at Exterior Unsurfaced Areas:
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
D. Cleanouts at Interior Finished Floor Areas:
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
E. Cleanouts at Interior Finished Wall Areas (WCO):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.04BACKFLOW PREVENTERS

A. Manufacturers:
   1. MIFAB, Inc.
   2. Watts Regulator Company, a part of Watts Water Technologies.
   3. Zurn Industries, LLC.
B. Reduced Pressure Backflow Preventers:
   1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.05WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company.
   2. Watts Regulator Company, a part of Watts Water Technologies.
   3. Zurn Industries, LLC.
   4. Precision Plumbing Products.
B. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.06MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Manufacturers:
      a. Leonard Valve Company.
      b. Powers, a Watts brand.

2.07FLOOR DRAIN TRAP SEALS

A. Manufacturers:
   1. MIFAB, Inc.
B. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
C. Encase exterior cleanouts in concrete flush with grade.
D. Install Floor cleanouts at elevation to accommodate finished floor.
E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
F. Pipe relief from backflow preventer to nearest drain.
G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or flush valves.

SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water Heaters:
   1. Commercial electric.
   2. Tankless electric.
B. In-line circulator pumps.
C. Cooling condensate removal pumps.

1.02 QUALITY ASSURANCE

A. Certifications:
   1. Water Heaters: NSF approved.
   2. Electric Water Heaters: UL listed and labeled to UL 174.
   3. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.04 WARRANTY

A. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Manufacturers:
   1. A.O. Smith Water Products Co.
   2. Rheem Manufacturing Company.
B. Tankless Electric:
   1. Manufacturers:
      a. Chronomite, Inc.
      b. Navien.
      c. Rinnai.
   2. Type: Automatic, electric.
   3. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F (49 to 77 degrees C), flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
   4. Accessories:
      a. Water Connections: Brass.
      b. Dip Tube: Brass.
      c. Drain valve.
      d. Anode: Magnesium.
      e. Temperature and Pressure Relief Valve: ASME labeled.
C. Commercial Electric:
   1. Type: Factory-assembled and wired, electric, vertical storage.
   2. Tank: Glass lined welded steel; 4 inch (100 mm) diameter inspection port, thermally insulated with minimum 2 inches (50 mm) glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
   3. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F (16 to 82 degrees C), flanged or screw-in nichrome elements, high temperature limit thermostat.
   4. Accessories:
      a. Water Connections: Brass.
      b. Dip Tube: Brass.
      c. Drain valve.
      d. Anode: Magnesium.
      e. Temperature and Pressure Relief Valve: ASME labeled.
   5. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in (11.6 W/sq m).

2.02COOLING CONDENSATE REMOVAL PUMPS

A. Manufacturers:
   1. Franklin Electric Company.
   2. Liberty Pumps Inc.
   3. Little Giant.
B. Construction: Commercial grade, nonferrous pump with stainless steel shaft, integral discharge check valve, integral float switch, safety switch, thermoplastic reservoir, motor assembly, and power cord with ground.
C. Safety: UL 778.

2.03ELECTRICAL WORK

A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.
B. Electrical characteristics to be as specified or indicated.
C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.
D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
C. Pumps:
   1. Ensure shaft length allows sump pumps to be located minimum 24 inches (600 mm) below lowest invert into sump pit and minimum 6 inches (150 mm) clearance from bottom of sump pit.
   2. Provide air cock and drain connection on horizontal pump casings.
   3. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
   4. 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. Provide supports under elbows on pump suction and discharge line sizes 4 inches (100 mm) and over.
   5. Ensure pumps 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.
   6. Align and verify alignment of base mounted pumps prior to start-up
   7. Provide electrical interlocking from cooling condensate pump safety switch to associated HVAC unit(s) furnished under other Sections.

SECTION 22 4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.
B. Urinals.
C. Lavatories.
D. Sinks.
E. Service sinks.
F. Mop sinks.
G. Under-lavatory pipe supply covers.
H. Electric water coolers.
I. Drinking fountains.
J. Showers.
K. Eye and face wash fountains.

1.02 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.
B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
   1. Flush Valve: Exposed (top spud).
   2. Handle Height: 44 inches (1117 mm) or less.
B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
   1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
C. Seats:
   1. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.
D. Water Closet Carriers:
   1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03TANK TYPE WATER CLOSETS

A. Bowl: ASME A112.19.2; wall hung, vitreous china, reverse trap, whirlpool action close-coupled closet combination with regular rim, insulated vitreous china closet tank with fittings and lever flushing valve, chrome plated bolt caps.
B. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 16.5 inches (420 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
C. Bowl: ASME A112.19.2; floor mounted, vitreous china reverse trap, close-coupled closet combination with regular rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps.
D. Seat: Solid white plastic, open front, extended back less cover, complete with self-sustaining hinge.
E. Handle Height: 44 inches (1117 mm) or less.
F. Water Closet Carrier:
   1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.04WALL HUNG URINALS

A. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
   1. Flush Valve: Exposed (top spud).
   2. Trap: Integral.
B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
   1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
C. Carriers:
   1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.05LAVATORIES

A. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
B. Provide lavatory with combination stop and strainer.
C. Accessories:
   1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
   2. Offset waste with perforated open strainer.
   3. Carrier:
      a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

2.06UNDER-LAVATORY PIPE SUPPLY COVERS

A. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.
   1. Fusion Molded Under-Lavatory Insulators (Non-Seun): Plumberex Handy-Shield Maxx.
   2. Slim Fit Under-Lavatory Insulators (Non-Seun): Plumberex Trap Gear.
   3. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.
B. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Adhesives, sewing threads and two ply laminated materials are prohibited.
   3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
   4. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
      a. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
      b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
      c. Comply with ICC A117.1.
      d. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21.
   5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07SHOWERS

A. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

2.08ELECTRIC WATER COOLERS

A. Water Cooler, Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gallons per hour (30.3 liters per hour) at 50 degrees F (10 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.09BI-LEVEL ELECTRIC WATER COOLERS

A. Water Cooler, Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gallons per hour (30.3 liters per hour) at 50 degrees F (10 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.10MOP SINKS

A. Material: Precast terrazzo composed of marble chips cast in Portland cement.
B. Dimensions: As indicated on drawings.
C. Accessories:
   1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

2.11 SERVICE SINKS

A. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covered caps and adjustable threaded wall flanges.
B. Accessories:
   1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
   2. Hose clamp hanger.
   3. Mop hanger.

2.12 EMERGENCY EYE AND FACE WASH

A. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receiver, twin eye wash heads and face spray ring, stainless steel dust cover, copper alloy control valve and fittings.
B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

PART 3 EXECUTION

3.01 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.02INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.
B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
C. Install components level and plumb.

3.03INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.04ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

HOLLISTER
CALIFORNIA

ABERCROMBIE & FITCH CO.
6301 FITCH PATH
NEW ALBANY, OHIO 43054
614-283-6500

BID SET ONLY.
NOT FOR CONSTRUCTION

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Project No.:	260387
Drawn By:	ESS
Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

PLUMBING SPECIFICATIONS

P0.02

PLUMBING SYMBOL LEGEND

DESIGNATION	DESCRIPTION
	BALANCING VALVE
	BACKFLOW PREVENTER
	CHECK VALVE
FCO	CLEANOUT - FLOOR
WCO	CLEANOUT - WALL
	FLOOR DRAIN
	PIPE DROP
	PIPE RISE
	PIPE TEE DROP
	PIPE TEE RISE
	PRESSURE REDUCING VALVE
	REMOVE TO POINT AND CAP
	REMOVE TO POINT FOR RECONNECTION
	ROOF DRAIN/SANITARY VENT
	SHUT OFF VALVE
	UNION
V	VENT THROUGH ROOF
	WATER METER
	WYE STRAINER
CW	COLD WATER PIPING
HW	HOT WATER PIPING
SAN	SANITARY PIPING
V	VENT PIPING
	WATER HEATER

ABBREVIATIONS

ABBREV	DESCRIPTION
EWC	ELECTRIC WATER COOLER
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
DP	DRAIN PUMP
DF	DRINKING FOUNTAIN
LAV	LAVATORY (SINK)
MB	MOP BASIN
TP	TRAP PRIMER
VTR	VENT THROUGH ROOF
WC	WATER CLOSET
WCO	WALL CLEAN OUT
WH	WATER HEATER
WHA	WATER HAMMER ARRESTOR

ONE CHARACTER STATUS ABBREVIATIONS:

E EXISTING TO REMAIN
M ITEM TO BE MOVED
R RELOCATED ITEM

*REFER ALSO TO MECHANICAL AND ELECTRICAL ABBREVIATIONS

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WESTFIELD SOUTHCENTER

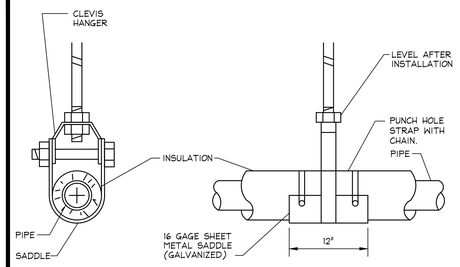
2800 SOUTHCENTER MALL, SPACE 1440
SEATTLE, WA 98188
STORE #31620

Project No.:	260387
Drawn By:	ESS

Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

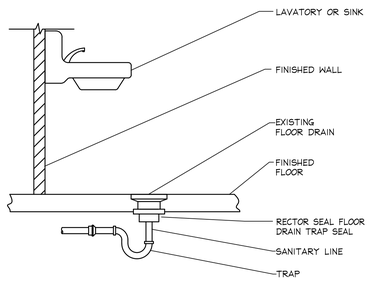
PLUMBING SCHEDULE, SYMBOLS & ABBREVIATIONS

P0.10

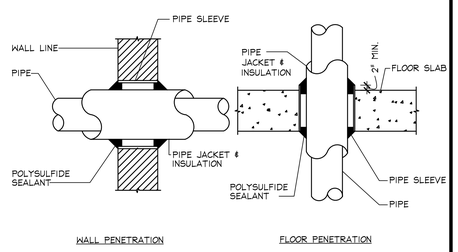


V P2.00 PIPE HANGER
SCALE: NONE

R P2.00 NOT USED
SCALE: NONE



U P2.00 TRAP SEAL
SCALE: NONE



Q P2.00 PIPE PENETRATION
SCALE: NONE

L P2.00 NOT USED
SCALE: NONE

C P2.00 NOT USED
SCALE: NONE

P P2.00 NOT USED
SCALE: NONE

S P2.00 NOT USED
SCALE: NONE

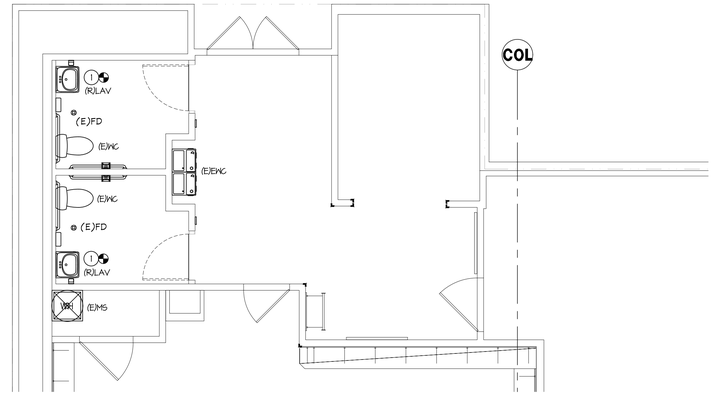
N P2.00 NOT USED
SCALE: NONE

ⓧ PLUMBING PLAN CODED NOTES

1. RELOCATE EXISTING PLUMBING FIXTURE AND MAINTAIN EXISTING ROUGH-INS. CONNECT RELOCATED FIXTURE TO EXISTING ROUGH-INS AT WALL. FIELD VERIFY EXACT LOCATION AND MODIFY ROUGH-INS AS NECESSARY FOR CONNECTION TO FIXTURE.

PLUMBING PLAN GENERAL NOTES

1. PROVIDE METER, SHUT-OFF VALVE, ETC. ALL IN ACCORDANCE WITH LANDLORD'S CRITERIA. OWNER TO INSTALL A PRESSURE REDUCING VALVE WHEN INCOMING WATER PRESSURE IS GREATER THAN 60PSI. ALL INSTALLATIONS AND CONNECTIONS SHALL BE IN ACCORDANCE WITH THE APPLICABLE CODES, LOCAL AUTHORITY'S REQUIREMENTS AND LANDLORD'S CRITERIA.
2. ALL WATER LINES, VENT LINES, DRAIN LINES, SPRINKLER LINES, ETC. SHALL BE OFFSET BELOW SHELF AND CONCEALED IN WALL ABOVE SHELF. DO NOT ROUTE PIPING, ETC. ABOVE ELECTRICAL EQUIPMENT.
3. ALL PLUMBING FIXTURES SHALL BE INSTALLED WITH STOP VALVES TO ISOLATE EACH FIXTURE. REFER TO WATER RISER DIAGRAM AND PLUMBING SPECIFICATIONS FOR FURTHER INFORMATION.
4. ADJUSTABLE FLOOR DRAIN. CONTRACTOR SHALL CLEAR DRAINS 2 DAYS PRIOR TO OPENING.



A P2.00 PLUMBING PLAN
SCALE: 1/4" = 1'-0"

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Drawn By:	ESS

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PLUMBING PLAN, DETAILS AND SCHEDULES

P2.00

ABBREVIATIONS

ABBREV1

NOTE: ABBREVIATIONS MAY OR MAY NOT HAVE PERIODS, BUT SHALL BE READ AS SAME.

A.B.	ANCHOR BOLT
A.B.C.	AGGREGATE BASE COURSE
ACI	AMERICAN CONCRETE INSTITUTE
A/C	AIR CONDITIONER
A.F.F.	ABOVE FINISHED FLOOR
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AITC	AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
ALT.	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APA	AMERICAN PLYWOOD ASSOCIATION
ARCH'L	ARCHITECTURAL
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWS	AMERICAN WELDING SOCIETY
A.W.T.S.	AUTOMATIC WELDED THREADED STUDS
BM	BEAM
B.F.F	BELOW FINISHED FLOOR
BLK	BLOCK
B.O.B.	BOTTOM OF BEAM
B.O.D.	BOTTOM OF DECK
B.O.F.	BOTTOM OF FOOTING
BRG	BEARING
C	CAMBER
C.C.	CENTERLINE TO CENTERLINE
CFS	COLD FORMED STEEL
C.G.	CENTER OF GRAVITY
C.I.P.	CAST IN PLACE
C.L.	CENTERLINE
C.L.B.	CENTERLINE OF BEAM
C.L.C.	CENTERLINE OF COLUMN
C.L.F.	CENTERLINE OF FOOTING
C.L.W.	CENTERLINE OF WALL
CLR	CLEAR
CONC	CONCRETE
CONC C.J.	CONCRETE CONTROL JOINT
CONC S.J.	CONCRETE SAWCUT JOINT
C.M.U.	CONCRETE MASONRY UNIT
CONN	CONNECTION
CONT	CONTINUOUS
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
D.F. (D.F.L.)	DOUGLAS FIR LARCH
DL	DEAD LOAD
DIA	DIAMETER
DN	DOWN
DWG(S)	DRAWING(S)
E.C.	END TO CENTERLINE
E.E.	END TO END
E.O.S.	EDGE OF SLAB
EQ	EQUAL
EQUIP	EQUIPMENT
EXP. BOLT (E.B.)	EXPANSION BOLT
EXP. JT (E.J.)	EXPANSION JOINT
E.W.	EACH WAY
(E)	EXISTING
F.F.	FINISHED FLOOR
F.O.M.	FACE OF MEMBER
F.O.S.	FACE OF STEEL
F.O.W.	FACE OF WALL
GA	GAGE (UNIT OF MEASUREMENT)
GALV	GALVANIZED
G.S.N.	GENERAL STRUCTURAL NOTES
GLB (GLULAM)	GLUED-LAMINATED BEAM
H.F.	HEM FIR
HORIZ	HORIZONTAL REINFORCING
H.S.	HEADED STUDS
IBC	INTERNATIONAL BUILDING CODE
ICC	INTERNATIONAL CODE COUNCIL
ICF	INSULATED CONCRETE FORMS
I.F.W.	INSIDE FACE OF WALL
I.O.D.	INTERPRETATION OF DRAWINGS
JST	JOIST
K(KIP)	1000 POUNDS
KLF	KIPS PER LINEAR FOOT
LBS (#)	POUNDS
LGR	LEDGER
LGS	LIGHT GAGE STEEL
LGSEA	LIGHT GAGE STEEL ENGINEERS ASSOCIATION
L.O.D.	LOCATION OF DETAILS
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
MAS	MASONRY
MAS C.J.	MASONRY CONTROL JOINT
MAX	MAXIMUM
MBMA	METAL BUILDING MANUFACTURERS ASSOCIATION
MECH'L	MECHANICAL
MFR'D	MANUFACTURED
MFR('S)	MANUFACTURER('S)
MIN	MINIMUM
N/A	NOT APPLICABLE
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
O.F.W.	OUTSIDE FACE OF WALL
OPP	OPPOSITE
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
PCI	PRECAST/PRESTRESSED CONCRETE INSTITUTE
P.C.	PRECAST CONCRETE
PCF	POUNDS PER CUBIC FOOT
PLF	POUNDS PER LINEAR FOOT
±	PLUS OR MINUS
PREFAB	PREFABRICATED
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POST-TENSIONED
PTI	POST-TENSIONING INSTITUTE
REINF	REINFORCING
SDI	STEEL DECK INSTITUTE
SLH	SHORT LEG HORIZONTAL
SLV	SHORT LEG VERTICAL
SJI	STEEL JOIST INSTITUTE
SIM	SIMILAR
SQ.	SQUARE
SSMA	STEEL STUD MANUFACTURERS ASSOCIATION
STD	STANDARD
STL	STEEL
TL	TOTAL LOAD
T.O.B.	TOP OF BEAM
T.O.C.T.	TOP OF CONCRETE TOPPING
T.O.D.	TOP OF DECK
T.O.F.	TOP OF FOOTING
T.O.L.	TOP OF LEDGER
T.O.M.	TOP OF MASONRY
T.O.P.	TOP OF PLATE
T.O.P.C.	TOP OF PRECAST CONCRETE
T.O.S.	TOP OF STEEL
T.O.W.	TOP OF WALL
TPI	TRUSS PLATE INSTITUTE
TYP	TYPICAL
T&G	TONGUE AND GROOVE
U.N.O.	UNLESS NOTED OTHERWISE
VERT	VERTICAL REINFORCING
WCLA	WEST COAST LUMBER ASSOCIATION
WCLIB	WEST COAST LUMBER INSPECTION BUREAU
W.W.F.	WELDED WIRE FABRIC
WWPA	WESTERN WOOD PRODUCTS ASSOCIATION
W/C	WATER TO CEMENT RATIO
W/O	WITHOUT

GENERAL STRUCTURAL NOTES

Applies unless noted otherwise on drawings

BUILDING CODE:

2021 EDITION OF THE INTERNATIONAL BUILDING CODE AND STANDARDS REFERENCED THEREIN

LOADS:

LATERAL:

SEISMIC:

RISK CATEGORY, II
MAPPED SHORT PERIOD SPECTRAL ACCELERATION, Ss = 1.465.
MAPPED ONE SECOND SPECTRAL ACCELERATION, S1 = .498.
SOIL SITE CLASS, DEFAULT.
DESIGN SHORT PERIOD SPECTRAL ACCELERATION, Sds = 1.172.
SEISMIC DESIGN CATEGORY, D.

POST-INSTALLED ANCHORS:

GENERAL:

ALL POST-INSTALLED ANCHORS SHALL UTILIZE THE EXACT ANCHORAGE SYSTEM SPECIFIED IN THE STRUCTURAL DETAILS. WHERE ANCHORAGE "PER GSN" IS SPECIFIED, SEE BELOW. ANCHORAGE PRODUCTS MAY NOT BE SWAPPED BETWEEN MANUFACTURERS WITHOUT APPROVAL OF THE ENGINEER OF RECORD. ALL REQUESTS FOR EQUIVALENT ANCHORAGE PRODUCTS MUST BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO BEING INSTALLED IN THE FIELD.

UNLESS NOTED OTHERWISE POST INSTALLED ANCHORS SHALL NOT BE INSTALLED UNTIL CONCRETE OR MASONRY MATERIAL HAVE REACHED DESIGN STRENGTH AND HAVE BEEN FULLY CURED FOR A MINIMUM OF 21 DAYS.

MANUFACTURER'S INSTALLATION TRAINING AND CERTIFICATE ARE REQUIRED FOR ALL INSTALLERS OF POST-INSTALLED ANCHORS. ALL ANCHORS SHALL BE INSTALLED WITH STEEL WASHERS AT SHORT SLOTTED HOLES IN ACCORDANCE WITH THE MANUFACTURERS PRINTED INSTALLATION INSTRUCTIONS (MPII). ALL ANCHORS SHALL TIGHTENED/TORQUED AS REQUIRED PER MANUFACTURERS INSTRUCTIONS AND EVALUATION REPORTS.

POST-INSTALLED ANCHORS IN CONCRETE:

ALL EXPANSION TYPE ANCHORAGE FOR CONCRETE INSTALLATION ONLY SHALL BE PER HILTI "KWIK BOLT-TZ2" EXPANSION ANCHOR PER ICC ESR-4266 OR APPROVED ICC EQUIVALENT.

STRUCTURAL STEEL:

GENERAL:

ALL STEEL CONSTRUCTION SHALL BE PER THE REFERENCED AISC STEEL CONSTRUCTION MANUAL. ALL MISCELLANEOUS STEEL UNLESS NOTED OTHERWISE SHALL BE ASTM A36 (Fy = 36 KSI). UNLESS NOTED OTHERWISE, ALL BOLTS SHALL BE ASTM A307.

COLD FORMED STRUCTURAL STEEL FRAMING:

GENERAL:

ALL COLD FORMED STEEL COMPONENTS INDICATED ON THE STRUCTURAL DRAWINGS SHALL BE PER SSMA. COMPONENTS SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND IN ACCORDANCE WITH THE REFERENCED EDITION OF "SPECIFICATIONS FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS" BY THE AISI AND ICC ESR-3064P OR APPROVED ICC EQUIVALENT. STEEL FOR COLD FORMED MEMBERS SHALL HAVE A MINIMUM YIELD STRENGTH OF 33 KSI FOR 43 MIL THICKNESS AND LESS, AND MINIMUM YIELD STRENGTH OF 50 KSI FOR 54 MIL THICKNESS AND GREATER. STEEL FOR BRIDGING SHALL HAVE A MINIMUM YIELD STRENGTH OF 33 KSI. STEEL SHALL BE GALVANIZED AT LOCATIONS EXPOSED TO WEATHER AND WHEREVER NOTED.

ALL COLD FORMED LIGHT GAGE STEEL HORIZONTAL STRUCTURAL ELEMENTS (I.E.: JOISTS, BOXED BEAMS, HEADERS, ETC) SHALL BE FABRICATED FROM UNPUNCHED COMPONENTS.

WHERE WELDING IS SHOWN ON DRAWINGS IT SHALL BE PERFORMED BY WELDERS CERTIFIED IN LIGHT GAGE STRUCTURAL STEEL FRAMING WORK. DO NOT NOTCH FLANGES OF MEMBERS WITHOUT EXPRESSED APPROVAL OF THE ENGINEER OF RECORD.

SCREWED COLD FORMED TO COLD FORMED CONNECTIONS (I.E.: 97 MIL TO 97 MIL MAX) SHALL BE HILTI SELF-DRILLING AND SELF-PIERCING SCREWS PER ICC ESR-2196, OR APPROVED ICC EQUIVALENT. SCREW SIZE SHALL BE #10 X 3/4" MINIMUM AND MUST PROTRUDE THROUGH AND BEYOND THE CONNECTED STEEL MEMBERS A MINIMUM OF THREE FULL THREADS. SCREWS SHALL BE INSTALLED WITH A MINIMUM EDGE AND END DISTANCE OF THREE SCREW DIAMETERS.

MIL THICKNESS / GAGE NUMBER REFERENCE:

27 MIL ------- 22 GA	54 MIL ------- 16 GA
33 MIL ------- 20 GA	68 MIL ------- 14 GA
43 MIL ------- 18 GA	97 MIL ------- 12 GA

WALLS:

ATTACHMENT OF STUDS TO TRACKS PER TYPICAL DETAILS U.N.O. ALL STUDS SHALL BE SECURELY SEATED FOR FULL END BEARING ON TOP AND BOTTOM TRACK. UNLESS NOTED OTHERWISE, INSTALL DOUBLE STUDS AT ALL JAMBS, CORNERS, INTERSECTIONS AND ISOLATED BEARING POINTS OF FRAMING MEMBERS ABOVE. BRIDGING SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION WITH THE FOLLOWING MINIMUM REQUIREMENTS:

INSTALL BRIDGING AT MID-HEIGHT FOR WALLS LESS THAN OR EQUAL TO 10'-0" HIGH, AND 5'-0" O.C. MAXIMUM FOR WALLS GREATER THAN 10'-0" HIGH.

FOR NON-BEARING PARTITIONS AND SOFFITS, SEE ARCHITECTURAL DRAWINGS.

GENERAL NOTES:

THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. EXCEPT WHERE NOTED, THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER OF RECORD SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS).

WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE REFERENCED EDITION AND/OR ADDENDA. ANY ENGINEERING DESIGN, PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW, SHALL BEAR THE SEAL OF A REGISTERED ENGINEER RECOGNIZED BY THE BUILDING CODE JURISDICTION OF THIS PROJECT.

NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT, AND/OR AS PROVIDED FOR IN THE CONTRACT DOCUMENTS. WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER REQUIREMENTS SHALL GOVERN.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS WITH THE ARCHITECTURAL DRAWINGS AND FIELD CONDITIONS. BUILDING DIMENSIONS AND ELEVATIONS, WHERE SHOWN, WERE PROVIDED BY THE ARCHITECT AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY AND COORDINATE ALL DIMENSIONS PRIOR TO PROCEEDING WITH THE WORK. ANY DISCREPANCIES SHALL BE RESOLVED THROUGH THE ARCHITECT. ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR ARCHITECTURAL, CIVIL, MECHANICAL, PLUMBING AND ELECTRICAL ITEMS WITH THE APPROPRIATE TRADE DRAWINGS AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.

TYPICAL DETAILS MAY NOT NECESSARILY BE CUT ON PLANS, BUT APPLY UNLESS NOTED OTHERWISE.

CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON FRAMED CONSTRUCTION. LOAD SHALL NOT EXCEED THE DESIGN LIVE LOAD PER SQUARE FOOT.

OPTIONS AND SUBSTITUTIONS ARE FOR CONTRACTOR'S CONVENIENCE. IF AN OPTION OR SUBSTITUTION IS CHOSEN, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES, APPROVALS AND THE COORDINATION OF THE WORK WITH ALL RELATED TRADES AND SUPPLIERS.

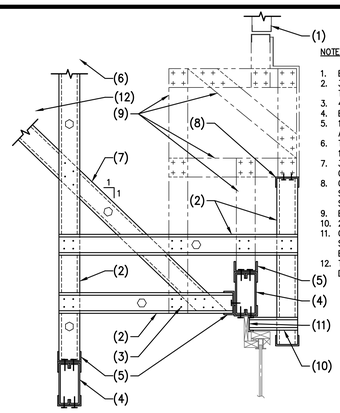
SPECIAL INSPECTION - STRUCTURAL ONLY:

SPECIAL INSPECTION IS TO BE PROVIDED FOR THE ITEMS LISTED BELOW IN ADDITION TO THE INSPECTIONS CONDUCTED BY THE BUILDING JURISDICTION. "SPECIAL STRUCTURAL INSPECTION" SHALL NOT RELIEVE THE OWNER OR THEIR AGENT FROM REQUESTING THE BUILDING JURISDICTION INSPECTIONS REQUIRED BY SECTION 110 OF THE INTERNATIONAL BUILDING CODE. SPECIAL INSPECTION IS REQUIRED PER CHAPTER 17 FOR THE FOLLOWING:

EXPANSION ANCHORS: DURING THE PLACEMENT OF ALL ANCHORS SHOWN ON STRUCTURAL DRAWINGS. ADDITIONAL INSPECTIONS REQUIRED FOR REPAIR DETAILS SHALL BE PERFORMED AT THE CONTRACTOR'S EXPENSE.
A. INSPECTION OF HOLE DIAMETER, HOLE DEPTH AND DRILL BIT CONFORMANCE.
B. INSPECTION OF HOLE CLEANING WITH WIRE BRUSH AND COMPRESSED AIR.
C. INSPECTION OF ANCHOR INSTALLATION USING SPECIFIED PRODUCT AND MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES.
D. INSPECTION OF EXPANSION ANCHORS SHALL INCLUDE THE VERIFICATION OF THE TIGHTENING TORQUE THAT IS SPECIFIED BY THE ANCHOR MANUFACTURER.

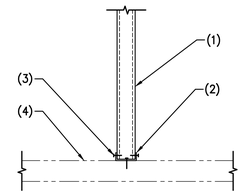
DUTIES AND RESPONSIBILITIES OF THE SPECIAL INSPECTOR:

A. THE SPECIAL INSPECTOR SHALL OBSERVE THE WORK ASSIGNED TO BE CERTAIN IT CONFORMS TO THE APPROVED DESIGN DRAWINGS AND SPECIFICATION.
B. THE SPECIAL INSPECTOR IS NOT AUTHORIZED TO APPROVE DEVIATIONS FROM THE DESIGN DRAWINGS OR SPECIFICATIONS, AND ALL DEVIATIONS MUST BE APPROVED BY THE STRUCTURAL ENGINEER OF RECORD PRIOR TO PROCEEDING WITH THE WORK. ALL REQUESTS FOR DEVIATIONS SHALL BE INITIATED BY THE CONTRACTOR VIA WRITTEN REQUEST FOR INFORMATION (RFI).
C. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE ENGINEER OR ARCHITECT OF RECORD. ALL DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION, THEN, IF UNCORRECTED, TO THE DESIGN AUTHORITY AND THE BUILDING OFFICIAL.
D. THE CONTRACTOR SHALL PROVIDE THE SPECIAL INSPECTOR ACCESS TO ALL ITEMS REQUIRING SPECIAL INSPECTION. ACCESS SHALL BE PROVIDED BY IN-PLACE LADDERS, SCAFFOLDS, LIFTS AND/OR OTHER EQUIPMENT OPERATED BY THE CONTRACTOR'S PERSONNEL AS REQUIRED FOR SAFE OBSERVATION. THE SPECIAL INSPECTOR IS NOT RESPONSIBLE OR AUTHORIZED TO OPERATE CONTRACTOR'S EQUIPMENT.
E. UPON COMPLETION OF THE ASSIGNED WORK THE ENGINEER OR ARCHITECT IN CHARGE OF SPECIAL INSPECTIONS SHALL COMPLETE AND SIGN THE APPROPRIATE FORMS CERTIFYING THAT TO THE BEST OF THEIR KNOWLEDGE THE WORK IS IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS, AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE CODE.



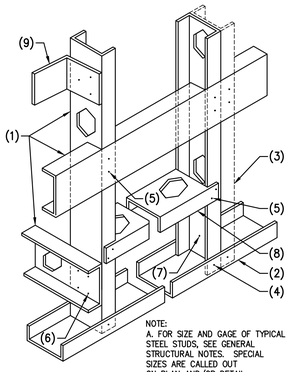
NOTES:
1. EXISTING BULKHEAD TO REMAIN.
2. 362S162-33 AT 16" O.C. - TYP.
3. 4 #10 SCREWS, TYP.
4. BOX BEAM.
5. 18 GA. TRACK WITH #10 SCREWS AT 12" O.C.
6. TOP CONNECTION PER DETAIL 103
7. 362S200-33 BRACE AT 48" O.C.
8. CONT. 20GA TRACK WITH 2 #10 SCREWS AT EACH EXISTING STUD.
9. EXISTING STUDS TO REMAIN.
10. 250S162-33 AT 18" OC.
11. CONT. 20GA TRACK WITH #10 SCREWS AT 12" OC TO BOX BEAM.
12. TOP BRACE CONNECTION PER DETAIL 104.

101 SECTION — 26-1040 — NO SCALE



NOTES:
1. STEEL COLUMN.
2. 18 GAGE CONTINUOUS STEEL TRACK WITH 0.157" DIA. HILTI X-U SHOT PINS WITH 1" EMBEDMENT AT 6" EACH SIDE OF POST OR 3 UNDER POST.
3. #10 SCREW CONNECTION AT EACH STUD.
4. EXISTING CONCRETE SLAB.

04 STEEL STUD COLUMN BASE CONNECTION WITHIN STUD WALL — 13-0210 — NO SCALE

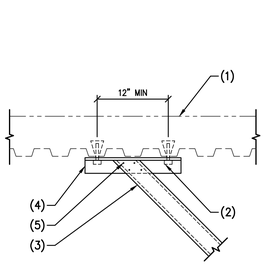


NOTES:
1. STEEL STUD.
2. UNPUNCHED STEEL STUD TRACK.
3. MULTIPLE OR INTERSECTING STUDS WHERE OCCUR. CONNECT WITH 2 ROWS #10 S.M. SCREWS AT 24" O.C. STAGGERED SPACING. AT INTERSECTING STUDS 1 ROW OF SCREWS.
4. #10 S.M. SCREWS EACH SIDE, EACH STUD.
5. 2 #10 S.M. SCREWS.
6. 4 #10 S.M. SCREWS.
7. #10 S.M. SCREWS AT 12" O.C. AT DOUBLE STUDS.
8. STUD BLOCKING.
9. 18 GAGE CLIP ANGLE BY STUD MFR WITH 3 #10 S.M. SCREWS AT EACH STUD WHERE SHOWN IN DETAILS.

NOTE:
A. FOR SIZE AND GAGE OF TYPICAL STEEL STUDS, SEE GENERAL STRUCTURAL NOTES. SPECIAL SIZES ARE CALLED OUT ON PLAN AND/OR DETAIL.

B. INSTALL ALL SCREWS PER STEEL STUD MANUFACTURER'S ASSOC. SPECIFICATIONS.
C. S.M. (SHEET METAL) SCREWS PER G.S.N.

01 TYPICAL STEEL STUD WALL - SCREW CONNECTION — 13-0107M — NO SCALE

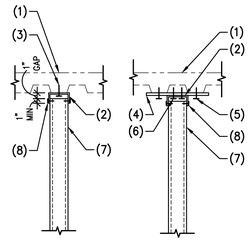


NOTES:
1. BEAM PER PLAN.
2. SIMPSON S/H2.5 CLIP EACH SIDE, FILL ALL HOLES WITH #10 SCREWS.
3. POST PER PLAN.
4. 362T125-43 GA. CONTINUOUS METAL TRACK TOP AND BOTTOM FASTENED WITH #10 SCREWS AT 12" O.C.

102 BEAM TO COLUMN — 13-0222 — NO SCALE

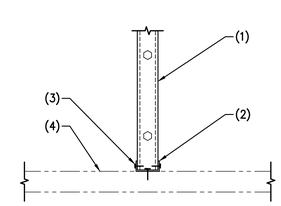
NOTES:
1. #10 SCREWS AT 12" O.C., TYP.
2. BEAM/COLUMN MEMBER PER PLAN.
3. 362T125-43 TRACK AT 3 5/8" WALLS, 600T125-43 TRACK AT 6" WALLS.

02 TYP BOX BEAM/BOX COLUMN — 13-0102 — NO SCALE



NOTES:
1. EXISTING CONCRETE OVER STEEL DECK.
2. CONTINUOUS 20 GAGE SLIP TRACK.
3. 0.157" DIA HILTI X-U SHOT PINS WITH 1" EMBEDMENT AT 32" O.C.
4. STEEL PLATE 16 GA. x 12"x4"x6" AT 32" O.C.
5. 0.157" DIA. HILTI X-U SHOT PINS WITH 1" EMBEDMENT EACH SIDE.
6. 2 #10 SCREWS.
7. STEEL STUDS AT 16" O.C.
8. #10 SCREWS IN SLOTTED HOLES, TYP.

103 STEEL STUD CONNECTION AT TOP - SLIP CONNECTION — 13-0135 — NO SCALE



NOTES:
1. STEEL STUD WALL.
2. CONTINUOUS STEEL TRACK TO MATCH STUD SIZE AND GAGE WITH 0.157" DIA. HILTI X-U SHOT PINS WITH 1" EMBEDMENT AT 16" O.C.
3. #10 SCREW CONNECTION AT EACH STUD EACH SIDE.
4. EXISTING CONCRETE SLAB.

03 STEEL STUD WALL BASE CONNECTION — 13-0110 — NO SCALE

NOTES:
1. EXISTING CONCRETE OVER STEEL DECK.
2. 3/8" DIA EXPANSION ANCHOR PER G.S.N. WITH 2" EMBEDMENT.
3. BRACE.
4. 3"x3"x1/4" STEEL ANGLE x 15" LONG MIN.
5. 4 #10 SCREWS.

NOTE:
SPECIAL INSPECTION IS REQUIRED DURING INSTALLATION OF EXPANSION ANCHOR.

104 BRACE TOP CONNECTION — 13-0155 — NO SCALE

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Project No.:	260387
Drawn By:	

Date	Issue
09.18.2026	CHECKSET
10.09.2026	BID SET

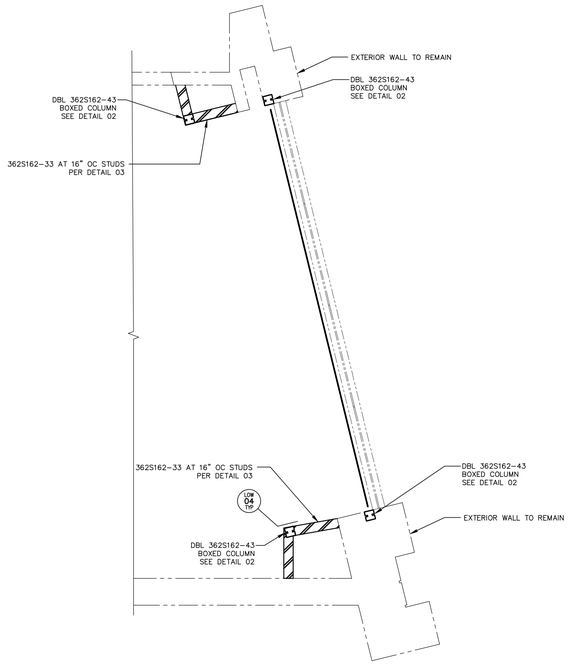
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PROJECT NUMBER	26-1040	PROJECT MANAGER	RAD
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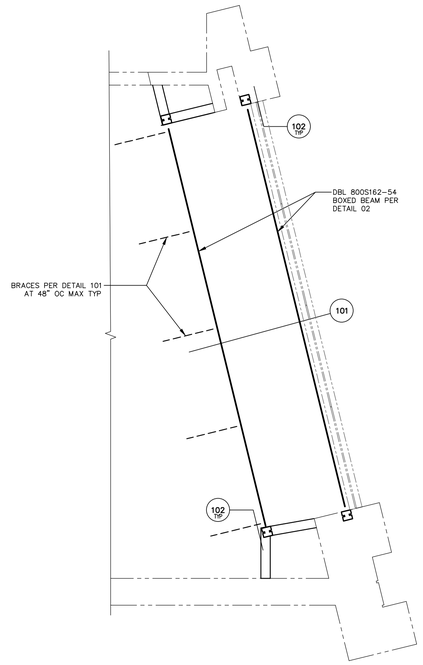
GENERAL STRUCTURAL NOTES AND DETAILS

S1.01



STRUCTURAL FLOOR PLAN

SCALE: 1/2" = 1'-0"



SOFFIT FRAMING PLAN

SCALE: 1/2" = 1'-0"

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Drawn By:	

Date	Issue
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10.09.2026	BID SET

STRUCTURAL FLOOR AND SOFFIT FRAMING PLAN

S2.01

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