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REVISIONS

PLUMBING SPECIFICATIONS

SHEET NUMBER

M1.4

220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- 1.1 COORDINATION
A. COORDINATE INSTALLATION OF IDENTIFYING DEVICES WITH COMPLETION OF COVERING AND PAINTING OF SURFACES WHERE DEVICES ARE TO BE APPLIED.
B. COORDINATE INSTALLATION OF IDENTIFYING DEVICES WITH LOCATIONS OF ACCESS PANELS AND DOORS.
1.2 EQUIPMENT LABELS
A. EQUIPMENT NAMEPLATES: METAL, WITH DATA ENGRAVED OR STAMPED, FOR PERMANENT ATTACHMENT ON EQUIPMENT.
1. DATA:
a. MANUFACTURER, PRODUCT NAME, MODEL NUMBER, AND SERIAL NUMBER.
b. CAPACITY, OPERATING AND POWER CHARACTERISTICS, AND ESSENTIAL DATA.
c. LABELS OF TESTED COMPLIANCES.
2. LOCATION: ACCESSIBLE AND VISIBLE.
B. EQUIPMENT MARKERS: ENGRAVED, COLOR-CODED LAMINATED PLASTIC. INCLUDE CONTACT-TYPE, PERMANENT ADHESIVE.
1. DATA:
a. NAME AND PLAN NUMBER.
b. EQUIPMENT SERVICE.
c. DESIGN CAPACITY.
d. OTHER DESIGN PARAMETERS SUCH AS PRESSURE DROP, ENTERING AND LEAVING CONDITIONS, AND SPEED.
C. EQUIPMENT SIGNS: ASTM D 709, TYPE I, CELLULOSE, PAPER-BASE, PHENOLIC-RESIN-LAMINATE ENGRAVING STOCK; GRADE ES-2, BLACK SURFACE, BLACK LETTERING, COAT WITH WHITE MELAMINE SUBCOAT, UNLESS OTHERWISE INDICATED. FABRICATE IN SIZES REQUIRED FOR MESSAGE. PROVIDE HOLES FOR MECHANICAL FASTENING.
1. DATA: INSTRUCTIONS FOR OPERATION OF EQUIPMENT AND FOR SAFETY PROCEDURES.
D. ACCESS PANEL AND DOOR MARKERS: 1/16-INCH- (1.6-MM-) THICK, ENGRAVED LAMINATED PLASTIC, WITH ABBREVIATED TERMS AND NUMBERS CORRESPONDING TO IDENTIFICATION. PROVIDE 1/8-INCH (3.2-MM) CENTER HOLE FOR ATTACHMENT.
1.3 PIPE LABELS
A. GENERAL REQUIREMENTS FOR MANUFACTURED PIPE LABELS: PREPRINTED, COLOR-CODED, WITH LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION.
B. PIPE LABEL CONTENTS: INCLUDE IDENTIFICATION OF PIPING SERVICE (COLOR-CODED), WITH LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION.
1.4 STENCILS
A. STENCILS: PREPARED WITH LETTER SIZES ACCORDING TO ASME A13.1 FOR PIPING; MINIMUM LETTER HEIGHT OF 3/4 INCH (19 MM) FOR ACCESS PANEL AND DOOR MARKERS, EQUIPMENT MARKERS, EQUIPMENT SIGNS, AND SIMILAR OPERATIONAL INSTRUCTIONS.
1.5 VALVE TAGS
A. VALVE TAGS: STAMPED OR ENGRAVED WITH 1/4-INCH (6.4-MM) LETTERS.
B. PLATE LETTERS (MSS TYPE 57): FOR ATTACHING TO STEEL BEAMS IF FLEXIBILITY AT BEAM IS REQUIRED.
C. HORIZONTAL TRAVELERS (MSS TYPE 58): FOR SUPPORTING PIPING SYSTEMS SUBJECT TO LINEAR HORIZONTAL MOVEMENT WHERE HEADROOM IS LIMITED.
1.6 SADDLES AND SHIELDS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING TYPES:
a. STEEL PIPE-COVERING PROTECTION SADDLES (MSS TYPE 39): TO FILL INTERIOR VOIDS WITH INSULATION THAT MATCHES ADJOINING INSULATION.
b. PROTECTION SHIELDS (MSS TYPE 40): OF LENGTH RECOMMENDED IN WRITING BY MANUFACTURER TO PREVENT CRUSHING INSULATION.
c. THERMAL-HANGER SHIELD INSERTS: FOR SUPPORTING INSULATED PIPE.
11. COMPLY WITH MSS SP-69 FOR TRAPEZE PIPE HANGER SELECTIONS AND APPLICATIONS THAT ARE NOT SPECIFIED IN PIPING SYSTEM SECTIONS.
12. COMPLY WITH MFMA-102 FOR METAL FRAMING SYSTEM SELECTIONS AND APPLICATIONS THAT ARE NOT SPECIFIED IN PIPING SYSTEM SECTIONS.
13. USE POWDER-ACTUATED FASTENERS OR MECHANICAL-EXPANSION ANCHORS INSTEAD OF BUILDING ATTACHMENTS WHERE REQUIRED IN CONCRETE CONSTRUCTION.
14. USE PIPE POSITIONING SYSTEMS IN PIPE SPACES BEHIND PLUMBING FIXTURES TO SUPPORT SUPPLY AND WASTE PIPING FOR PLUMBING FIXTURES.
H. HANGER AND SUPPORT INSTALLATION
1. STEEL PIPE HANGER INSTALLATION: COMPLY WITH MSS SP-69 AND MSS SP-89. INSTALL HANGERS, SUPPORTS, CLAMPS, AND ATTACHMENTS AS REQUIRED TO PROPERLY SUPPORT PIPING FROM BUILDING STRUCTURE.
2. TRAPEZE PIPE HANGER INSTALLATION: COMPLY WITH MSS SP-69 AND MSS SP-89. ARRANGE FOR GROUPING OF PARALLEL RUNS OF HORIZONTAL PIPING AND SUPPORT TOGETHER ON FIELD-FABRICATED TRAPEZE PIPE HANGERS.
3. METAL FRAMING SYSTEM INSTALLATION: ARRANGE FOR GROUPING OF PARALLEL RUNS OF PIPING AND SUPPORT TOGETHER ON FIELD-ASSEMBLED METAL FRAMING SYSTEMS.
4. THERMAL-HANGER SHIELD INSTALLATION: INSTALL IN PIPE HANGER OR SHIELD FOR INSULATED PIPING.
5. INSTALL HANGERS AND SUPPORTS COMPLETE WITH NECESSARY INSERTS, BOLTS, RODS, NUTS, WASHERS, AND OTHER ACCESSORIES.
6. INSTALL BUILDING ATTACHMENTS WITHIN CONCRETE SLABS OR ATTACH TO STRUCTURAL STEEL. INSTALL ADDITIONAL ATTACHMENTS AT CONCENTRATED LOADS, INCLUDING VALVES, FLANGES, AND STRAINERS, NPS 2-1/2 (DN 65) AND LARGER AND AT CHANGES IN DIRECTION OF PIPING. INSTALL CONCRETE INSERTS BEFORE CONCRETE IS PLACED; FASTEN INSERTS TO FORMS AND INSTALL REINFORCING BARS THROUGH OPENINGS AT TOP OF INSERTS.
7. LOAD DISTRIBUTION: INSTALL HANGERS AND SUPPORTS SO PIPING LIVE AND DEAD LOADS AND STRESSES FROM MOVEMENT WILL NOT BE TRANSMITTED TO CONNECTED EQUIPMENT.
8. PIPE SLOPES: INSTALL HANGERS AND SUPPORTS TO PROVIDE INDICATED PIPE SLOPES AND SO MAXIMUM PIPE DEFLECTIONS ALLOWED BY ASME B31.9 (FOR BUILDING SERVICES PIPING) ARE NOT EXCEEDED.
9. INSULATED PIPING: COMPLY WITH THE FOLLOWING:
a. ATTACH CLAMPS AND SPACERS TO PIPING.
b. INSTALL MSS SP-58, TYPE 39, PROTECTION SADDLES IF INSULATION WITHOUT VAPOR BARRIER IS INDICATED. FILL INTERIOR VOIDS WITH INSULATION THAT MATCHES ADJOINING INSULATION.
c. INSTALL MSS SP-58, TYPE 40, PROTECTIVE SHIELDS ON COLD PIPING WITH VAPOR BARRIER. SHIELDS SHALL SPAN AN ARC OF 180 DEGREES.
d. THERMAL-HANGER SHIELDS: INSTALL WITH INSULATION SAME THICKNESS AS PIPING INSULATION.

220700 PLUMBING INSULATION

- A. INSULATION MATERIALS
1. COMPLY WITH REQUIREMENTS IN PART 3 SCHEDULE ARTICLES FOR WHERE INSULATING MATERIALS SHALL BE APPLIED.
2. PRODUCTS SHALL NOT CONTAIN ASBESTOS, LEAD, MERCURY, OR MERCURY COMPOUNDS.
3. MINERAL-FIBER, PREFORMED PIPE INSULATION:
A. ADHESIVES
1. MATERIALS SHALL BE COMPATIBLE WITH INSULATION MATERIALS, JACKETS, AND SUBSTRATES AND FOR BONDING INSULATION TO ITSELF AND TO SURFACES TO BE INSULATED, UNLESS OTHERWISE INDICATED.
2. MINERAL-FIBER ADHESIVE: COMPLY WITH MIL-A-3316C, CLASS 2, GRADE A.
C. FACTORY-APPLIED JACKETS
1. INSULATION SYSTEM SCHEDULES INDICATE FACTORY-APPLIED JACKETS ON VARIOUS APPLICATIONS. WHEN FACTORY-APPLIED JACKETS ARE INDICATED, COMPLY WITH THE FOLLOWING:
D. TAPES
1. ASJ TAPE: WHITE VAPOR-RETARDER TAPE MATCHING FACTORY-APPLIED JACKET WITH ACRYLIC ADHESIVE, COMPLYING WITH ASTM C 1136.
E. EXAMINATION
1. EXAMINE SUBSTRATES AND CONDITIONS FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION AND OTHER CONDITIONS AFFECTING PERFORMANCE OF INSULATION APPLICATION.
F. PREPARATION
1. SURFACE PREPARATION: CLEAN AND DRY SURFACES TO RECEIVE INSULATION. REMOVE MATERIALS THAT WILL ADVERSELY AFFECT INSULATION APPLICATION.
G. GENERAL INSTALLATION REQUIREMENTS
1. INSTALL INSULATION MATERIALS, ACCESSORIES, AND FINISHES WITH SMOOTH, STRAIGHT, AND EVEN SURFACES; FREE OF VOIDS THROUGHOUT THE LENGTH OF EQUIPMENT AND PIPING INCLUDING FITTINGS, VALVES, AND SPECIALTIES.
2. CUT INSULATION IN A MANNER TO AVOID COMPRESSING INSULATION MORE THAN 75 PERCENT OF ITS NOMINAL THICKNESS.
3. FINISH INSTALLATION WITH SYSTEMS AT OPERATING CONDITIONS. REPAIR JOINT SEPARATIONS AND CRACKING DUE TO THERMAL MOVEMENT.

220523 GENERAL-DUTY VALVES FOR PLUMBING PIPING

- A. QUALITY ASSURANCE
1. SOURCE LIMITATIONS FOR VALVES: OBTAIN EACH TYPE OF VALVE FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.
2. NSF COMPLIANCE: NSF 61 FOR VALVE MATERIALS FOR POTABLE-WATER SERVICE.
B. GENERAL REQUIREMENTS FOR VALVES
1. REFER TO VALVE SCHEDULE ARTICLES FOR APPLICATIONS OF VALVES.
2. VALVE PRESSURE AND TEMPERATURE RATINGS: NOT LESS THAN INDICATED AND AS REQUIRED FOR SYSTEM PRESSURES AND TEMPERATURES.
3. VALVE SIZES: SAME AS UPSTREAM PIPING UNLESS OTHERWISE INDICATED.
4. VALVE BYPASS AND DRAIN CONNECTIONS: MSS SP-45.
D. BRONZE ANGLE VALVES
1. CLASS 125, BRONZE ANGLE VALVES WITH NONMETALLIC DISC.
E. BRASS BALL VALVES
1. TWO-PIECE, FULL-PORT, BRASS BALL VALVES WITH BRASS TRIM.
F. BRONZE BALL VALVES
1. TWO-PIECE, FULL-PORT, BRONZE BALL VALVES WITH BRONZE TRIM.
G. BRONZE SWING CHECK VALVES
1. CLASS 125, BRONZE SWING CHECK VALVES WITH BRONZE DISC.
H. BRONZE GATE VALVES
1. CLASS 125, NPS BRONZE GATE VALVES:
I. VALVE INSTALLATION
1. INSTALL VALVES WITH UNIONS OR FLANGES AT EACH PIECE OF EQUIPMENT ARRANGED TO ALLOW SERVICE, MAINTENANCE, AND EQUIPMENT REMOVAL WITHOUT SYSTEM SHUTDOWN.
2. LOCATE VALVES AND OUTLET ELBOW FITTINGS, CORRUGATED-METAL INNER HOSES, AND BRAIDED OUTER SHEATHS.
a. FLEXIBLE-HOSE EXPANSION JOINTS FOR COPPER PIPING: COPPER-ALLOY FITTINGS WITH SOLDER- JOINT END CONNECTIONS.
b. FLEXIBLE-HOSE EXPANSION JOINTS FOR STEEL PIPING: CARBON-STEEL FITTINGS WITH THREADED END CONNECTIONS FOR NPS 2 (DN 50) AND SMALLER AND FLANGED END CONNECTIONS FOR NPS 2-1/2 (DN 65) AND LARGER.
J. GENERAL REQUIREMENTS FOR VALVE APPLICATIONS
1. IF VALVE APPLICATIONS ARE NOT INDICATED, USE THE FOLLOWING:
a. SHUTOFF SERVICE: BALL OR GATE VALVES.
b. THROTTLE SERVICE: BALL VALVES.
c. PUMP-DISCHARGE: CHECK VALVES

220529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

- A. STEEL PIPE HANGERS AND SUPPORTS
1. DESCRIPTION: MSS SP-69, TYPES 1 THROUGH 58, FACTORY-FABRICATED COMPONENTS. REFER TO PART 3 "HANGER AND SUPPORT APPLICATIONS" ARTICLE FOR WHERE TO USE SPECIFIC HANGER AND SUPPORT TYPES.
B. TRAPEZE PIPE HANGERS
1. DESCRIPTION: MSS SP-69, TYPE 89, SHOP- OR FIELD-FABRICATED PIPE-SUPPORT ASSEMBLY MADE FROM STRUCTURAL-STEEL SHAPES WITH MSS SP-58 HANGER RODS, NUTS, SADDLES, AND U-BOLTS.
C. METAL FRAMING SYSTEMS
1. DESCRIPTION: MFMA-3, SHOP- OR FIELD-FABRICATED PIPE-SUPPORT ASSEMBLY MADE OF STEEL CHANNELS AND OTHER COMPONENTS.
D. THERMAL-HANGER SHIELD INSERTS
1. DESCRIPTION: 100-PSIG- (680-KPA-) MINIMUM, COMPRESSIVE-STRENGTH INSULATION INSERT ENCASED IN SHEET METAL SHIELD.
2. INSULATION-INSERT MATERIAL FOR COLD PIPING: WATER-REPELLENT TREATED, ASTM F633, TYPE I CALCIUM SILICATE OR ASTM C 552, TYPE II CELLULAR GLASS WITH VAPOR BARRIER.
3. INSULATION-INSERT MATERIAL FOR HOT PIPING: WATER-REPELLENT TREATED, ASTM F633, TYPE I CALCIUM SILICATE OR ASTM C 552, TYPE II CELLULAR GLASS.
4. FOR TRAPEZE OR CLAMPED SYSTEMS: INSERT AND SHIELD SHALL COVER ENTIRE CIRCUMFERENCE OF PIPE.
5. FOR CLIPS OR BAND HANGERS: INSERT AND SHIELD SHALL COVER LOWER 180 DEGREES OF PIPE.
E. FASTENER SYSTEMS
1. POWDER-ACTUATED FASTENERS: THREADED-STEEL STUD, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE WITH PULL-OUT, TENSION, AND SHEAR CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED.
2. MECHANICAL-EXPANSION ANCHORS: INSERT-WEDGE-TYPE ZINC-COATED STEEL, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE WITH PULL-OUT, TENSION, AND SHEAR CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS WHERE USED.
F. MISCELLANEOUS MATERIALS
1. STRUCTURAL STEEL: ASTM A 36/A 36M, STEEL PLATES, SHAPES, AND BARS; BLACK AND GALVANIZED.
G. HANGER AND SUPPORT APPLICATIONS
1. SPECIFIC HANGER AND SUPPORT REQUIREMENTS ARE SPECIFIED IN SECTIONS SPECIFYING PIPING SYSTEMS AND EQUIPMENT.
2. COMPLY WITH MSS SP-69 FOR PIPE HANGER SELECTIONS AND APPLICATIONS THAT ARE NOT SPECIFIED IN PIPING SYSTEM SECTIONS.
3. USE HANGERS AND SUPPORTS WITH GALVANIZED, METALLIC COATINGS FOR PIPING AND EQUIPMENT THAT WILL NOT HAVE FIELD-APPLIED FINISHES.
4. USE NONMETALLIC COATINGS ON ATTACHMENTS FOR ELECTROLYTIC PROTECTION WHERE ATTACHMENTS ARE IN DIRECT CONTACT WITH COPPER TUBING.
5. USE PADDED HANGERS FOR PIPING THAT IS SUBJECT TO SCRATCHING.
H. HORIZONTAL-PIPING HANGERS AND SUPPORTS: UNLESS OTHERWISE INDICATED AND EXCEPT AS SPECIFIED IN PIPING SYSTEM SECTIONS, INSTALL THE FOLLOWING TYPES:
a. ADJUSTABLE, STEEL CLEVIS HANGERS (MSS TYPE 1): FOR SUSPENSION OF NONINSULATED OR INSULATED STATIONARY PIPES, NPS 1/2 TO NPS 30 (DN 15 TO DN 750).
b. YOKE-TYPE PIPE CLAMPS (MSS TYPE 2): FOR SUSPENSION OF 120 TO 450 DEG F (49 TO 232 DEG C) PIPES, NPS 4 TO NPS 16 (DN 100 TO DN 400), REQUIRING UP TO 4 INCHES (100 MM) OF INSULATION.
c. CARBON- OR ALLOY-STEEL, DOUBLE-BOLT PIPE CLAMPS (MSS TYPE 3): FOR SUSPENSION OF PIPES, NPS 3/4 TO NPS 24 (DN 20 TO DN 600), REQUIRING CLAMP FLEXIBILITY AND UP TO 4 INCHES (100 MM) OF INSULATION.
d. STEEL PIPE CLAMPS (MSS TYPE 4): FOR SUSPENSION OF COLD AND HOT PIPES, NPS 1/2 TO NPS 24 (DN 15 TO DN 600), IF LITTLE OR NO INSULATION IS REQUIRED.
e. PIPE HANGERS (MSS TYPE 5): FOR SUSPENSION OF PIPES, NPS 1/2 TO NPS 4 (DN 15 TO DN 100), TO ALLOW OFF-CENTER CLOSURE FOR HANGER INSTALLATION BEFORE PIPE ERECTION.
f. ADJUSTABLE, SWIVEL SPLIT- OR SOLID-RING HANGERS (MSS TYPE 6): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 3/4 TO NPS 8 (DN 20 TO DN 200).
g. ADJUSTABLE, STEEL BAND HANGERS (MSS TYPE 7): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 1/2 TO NPS 8 (DN 15 TO DN 200).
h. ADJUSTABLE BAND HANGERS (MSS TYPE 9): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 1/2 TO NPS 8 (DN 15 TO DN 200).
i. ADJUSTABLE, SWIVEL-RING BAND HANGERS (MSS TYPE 10): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 1/2 TO NPS 2 (DN 15 TO DN 50).
j. SPLIT PIPE-RING WITH OR WITHOUT TURNBUCKLE-ADJUSTMENT HANGERS (MSS TYPE 11): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 3/8 TO NPS 8 (DN 10 TO DN 200).
k. EXTENSION HINGED OR 2-BOLT SPLIT PIPE CLAMPS (MSS TYPE 12): FOR SUSPENSION OF NONINSULATED STATIONARY PIPES, NPS 3/8 TO NPS 3 (DN 10 TO DN 80).
l. CLIPS (MSS TYPE 26): FOR SUPPORT OF INSULATED PIPES NOT SUBJECT TO EXPANSION OR CONTRACTION.

220516 EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

- A. PERFORMANCE REQUIREMENTS
1. COMPATIBILITY: PRODUCTS SHALL BE SUITABLE FOR PIPING SYSTEM FLUIDS, MATERIALS, WORKING PRESSURES, AND TEMPERATURES.
2. CAPABILITY: PRODUCTS SHALL ABSORB 200 PERCENT OF MAXIMUM AXIAL MOVEMENT BETWEEN ANCHORS.
B. EXPANSION JOINTS
1. METAL-BELLOWS EXPANSION JOINTS: ASTM F 1120, CIRCLAR-CORRUGATED-BELLOWS TYPE WITH EXTERNAL TIE RODS.
a. METAL-BELLOWS EXPANSION JOINTS FOR COPPER PIPING: SINGLE- OR MULTIPLE-PLY PHOSPHOR-BRONZE BELLOWS, COPPER PIPE END CONNECTIONS, AND BRASS SHROUDS.
b. METAL-BELLOWS EXPANSION JOINTS FOR STEEL PIPING: SINGLE- OR MULTIPLE-PLY STAINLESS-STEEL BELLOWS, STEEL PIPE END CONNECTIONS, AND CARBON-STEEL SHROUD.
c. MINIMUM PRESSURE RATING: 175 PSIG (1200 KPA), UNLESS OTHERWISE INDICATED.
d. CONFIGURATION: SINGLE OR DOUBLE-BELLOWS TYPE WITH BASE, UNLESS OTHERWISE INDICATED.
e. END CONNECTIONS: FLANGED OR WELD.
2. RUBBER EXPANSION JOINTS: ASTM F 1123, FABRIC-REINFORCED RUBBER WITH EXTERNAL CONTROL RODS AND COMPLYING WITH FSA'S "TECHNICAL HANDBOOK: NON-METALLIC EXPANSION JOINTS AND FLEXIBLE PIPE CONNECTORS."
a. ARCH TYPE: SINGLE OR MULTIPLE ARCHES.
b. SPHERICAL TYPE: SINGLE OR MULTIPLE SPHERES.
c. MATERIAL: BUTYL RUBBER.
d. END CONNECTIONS: FULL-FACED, INTEGRAL, STEEL FLANGES WITH STEEL RETAINING RINGS.
3. FLEXIBLE-HOSE EXPANSION JOINTS: MANUFACTURED ASSEMBLY WITH TWO FLEXIBLE-METAL-HOSE LEGS JOINED BY LONG-RADIUS, 180-DEGREE RETURN BEND OR CENTER SECTION OF FLEXIBLE HOSE; WITH INLET AND OUTLET ELBOW FITTINGS, CORRUGATED-METAL INNER HOSES, AND BRAIDED OUTER SHEATHS.
a. FLEXIBLE-HOSE EXPANSION JOINTS FOR COPPER PIPING: COPPER-ALLOY FITTINGS WITH SOLDER- JOINT END CONNECTIONS.
b. FLEXIBLE-HOSE EXPANSION JOINTS FOR STEEL PIPING: CARBON-STEEL FITTINGS WITH THREADED END CONNECTIONS FOR NPS 2 (DN 50) AND SMALLER AND FLANGED END CONNECTIONS FOR NPS 2-1/2 (DN 65) AND LARGER.
D. ALIGNMENT GUIDES
1. DESCRIPTION: STEEL FACTORY FABRICATED, WITH BOLTED TWO-SECTION OUTER CYLINDER AND BASE FOR ALIGNMENT OF PIPING AND TWO-SECTION GUIDING SPIDER FOR BOLTING TO PIPE.
E. EXPANSION-JOINT INSTALLATION
1. INSTALL MANUFACTURED, NONMETALLIC EXPANSION JOINTS ACCORDING TO FSA'S "TECHNICAL HANDBOOK: NON-METALLIC EXPANSION JOINTS AND FLEXIBLE PIPE CONNECTORS."
2. INSTALL EXPANSION JOINTS OF SIZES MATCHING SIZE OF PIPING IN WHICH THEY ARE INSTALLED.
3. INSTALL ALIGNMENT GUIDES TO ALLOW EXPANSION AND TO AVOID END-LOADING AND TORSIONAL STRESS.
F. PIPE BEND AND LOOP INSTALLATION
1. INSTALL PIPE BENDS AND LOOPS COLD-SPRING IN TENSION OR COMPRESSION AS REQUIRED TO PARTLY ABSORB TENSION OR COMPRESSION PRODUCED DURING ANTICIPATED CHANGE IN TEMPERATURE.
2. ATTACH PIPE BENDS AND LOOPS TO ANCHORS.
G. ALIGNMENT-GUIDE INSTALLATION
1. INSTALL GUIDES ON PIPING ADJOINING PIPE EXPANSION FITTINGS AND LOOPS.
2. ATTACH GUIDES TO PIPE AND SECURE TO BUILDING STRUCTURE.
H. ANCHOR INSTALLATION
1. INSTALL ANCHORS AT LOCATIONS TO PREVENT STRESSES FROM EXCEEDING THOSE PERMITTED TO ASME B31.9 AND TO PREVENT TRANSFER OF LOADING AND STRESSES TO CONNECTED EQUIPMENT.
2. INSTALL PIPE ANCHORS ACCORDING TO EXPANSION-JOINT MANUFACTURER'S WRITTEN INSTRUCTIONS IF EXPANSION JOINTS ARE INDICATED.

220519 METERS AND GAGES FOR PLUMBING PIPING

- A. METAL-CASE, LIQUID-IN-GLASS THERMOMETERS
1. CASE: DIE-CAST ALUMINUM, 9 INCHES (229 MM) LONG.
2. TUBE: RED OR BLUE READING, MERCURY FILLED, WITH MAGNIFYING LENS.
3. TUBE BACKGROUND: SATIN-FACED, NONREFLECTIVE ALUMINUM WITH PERMANENTLY ETCHED SCALE MARKINGS.
4. WINDOW: GLASS.
5. CONNECTOR: ADJUSTABLE TUBE, 180 DEGREES IN VERTICAL PLANE, 360 DEGREES IN HORIZONTAL PLANE, WITH LOCKING DEVICE.
C. PRESSURE GAGES
1. DIRECT-MOUNTING, DIAL-TYPE PRESSURE GAGES: INDICATING-DIAL TYPE, COMPLYING WITH ASME B40.100.
a. CASE: DRY TYPE, DRAIN STEEL OR CAST ALUMINUM, 4-1/2-INCH (114-MM) DIAMETER.
b. MOVEMENT: MECHANICAL, WITH LINK TO PRESSURE ELEMENT AND CONNECTION TO POINTER.
c. DIAL: SATIN-FACED, NONREFLECTIVE ALUMINUM WITH PERMANENTLY ETCHED SCALE MARKINGS.
d. POINTER: RED METAL.
e. WINDOW: GLASS.
f. RING: METAL.
D. THERMOMETER APPLICATIONS
1. INSTALL LIQUID-IN-GLASS THERMOMETERS IN THE OUTLET OF EACH DOMESTIC, HOT-WATER STORAGE TANK.
2. PROVIDE THE FOLLOWING TEMPERATURE RANGES FOR THERMOMETERS:
a. DOMESTIC HOT WATER: 30 TO 240 DEG F, WITH 2-DEGREE SCALE DIVISIONS (MINUS 1 TO PLUS 115 DEG C, WITH 1-DEGREE SCALE DIVISIONS).
E. INSTALLATIONS
1. INSTALL DIRECT-MOUNTING THERMOMETERS AND ADJUST VERTICAL AND TILTED POSITIONS.
2. INSTALL DIRECT-MOUNTING PRESSURE GAGES IN PIPING TEES WITH PRESSURE GAGE LOCATED ON PIPE AT MOST READABLE POSITION.
3. INSTALL NEEDLE-VALVE AND SNUBBER FITTING IN PIPING FOR EACH PRESSURE GAGE.
4. INSTALL THERMOMETERS AND GAGES ADJACENT TO MACHINES AND EQUIPMENT TO ALLOW SERVICE AND MAINTENANCE FOR THERMOMETERS, GAGES, MACHINES, AND EQUIPMENT.
5. ADJUST FACES OF THERMOMETERS AND GAGES TO PROPER ANGLE FOR BEST VISIBILITY.

220500 COMMON WORK RESULTS FOR PLUMBING

- A. GENERAL REQUIREMENTS
1. INCLUDE ALL LABOR, MATERIAL, EQUIPMENT, TRANSPORTATION AND SERVICES TO FURNISH AND INSTALL COMPLETE PLUMBING SYSTEMS AND ALTERATIONS AS SHOWN ON THE DRAWINGS AND HEREIN SPECIFIED.
2. ALL WORK SHALL BE IN ACCORDANCE WITH ALL LOCAL AND STATE CODES, ALL APPLICABLE BUILDING, MECHANICAL AND PLUMBING CODES, AND ALL AUTHORITIES HAVING JURISDICTION.
3. ALL WORK SHALL BE IN ACCORDANCE WITH ALL LANDLORD REQUIREMENTS.
4. ALL CONNECTION, INSPECTION AND PERMIT FEES SHALL BE AT THE CONTRACTOR'S EXPENSE.
5. CONTRACTOR SHALL CONTACT AUTHORITIES HAVING JURISDICTION FOR INSPECTION OF ALL SYSTEMS IN A TIMELY MANNER BEFORE OCCUPANCY OF THE BUILDING.
B. SUBMITTALS
1. CONTRACTOR SHALL SUBMIT FOR REVIEW SIX COPIES OF SHOP DRAWINGS, LITERATURE, AND EQUIPMENT LISTS PRIOR TO FABRICATION OR DELIVERY.
2. CATALOG SHEETS SHALL BE COMPLETE, AND THE ITEM OR MODEL TO BE USED SHALL BE CLEARLY MARKED.
3. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE THE PRODUCT INDICATED ON DRAWINGS OR A COMPARABLE PRODUCT. ARCHITECT AND/OR ENGINEER APPROVAL IS REQUIRED FOR ALL COMPARABLE PRODUCTS SUBMITTED.
C. PLUMBING DEMOLITION
1. DISCONNECT, DEMOLISH, AND REMOVE PLUMBING SYSTEMS, EQUIPMENT, AND COMPONENTS INDICATED TO BE REMOVED.
a. PIPING TO BE REMOVED: REMOVE PORTION OF PIPING INDICATED TO BE REMOVED AND CAP OR PLUG REMAINING PIPING WITH SAME OR COMPATIBLE PIPING MATERIAL.
b. PIPING TO BE ABANDONED IN PLACE: DRAIN PIPING AND CAP OR PLUG PIPING WITH SAME OR COMPATIBLE PIPING MATERIAL.
c. EQUIPMENT TO BE REMOVED: DISCONNECT AND CAP SERVICES AND REMOVE EQUIPMENT.
d. EQUIPMENT TO BE REMOVED AND REINSTALLED: DISCONNECT AND CAP SERVICES AND REMOVE, CLEAN, AND STORE EQUIPMENT; WHEN APPROPRIATE, REINSTALL, RECONNECT, AND MAKE EQUIPMENT OPERATIONAL.
e. EQUIPMENT TO BE REMOVED AND SALVAGED: DISCONNECT AND CAP SERVICES AND REMOVE EQUIPMENT AND DELIVER TO OWNER.
2. IF PIPE, INSULATION, OR EQUIPMENT TO REMAIN IS DAMAGED IN APPEARANCE OR IS UNSERVICEABLE, REMOVE DAMAGED OR UNSERVICEABLE PORTIONS AND REPLACE WITH NEW PRODUCTS OF EQUAL CAPACITY AND QUALITY.
D. PIPING SYSTEMS - COMMON REQUIREMENTS
1. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS. INDICATED LOCATIONS AND ARRANGEMENTS WERE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, PUMP SIZING, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.
2. INSTALL PIPING IN CONCEALED LOCATIONS, UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.
3. INSTALL PIPING ABOVE ACCESSIBLE CEILINGS TO ALLOW SUFFICIENT SPACE FOR CEILING PANEL REMOVAL.
4. INSTALL PIPING TO PERMIT VALVE SERVICING.
5. INSTALL PIPING AT INDICATED SLOPES.
6. INSTALL PIPING TO ALLOW APPLICATION OF INSULATION.
7. INSTALL ESCUTCHEONS FOR PENETRATIONS OF WALLS, CEILINGS, AND FLOORS.
8. FIRE-BARRIER PENETRATIONS: MAINTAIN INDICATED FIRE RATING OF WALLS, PARTITIONS, CEILINGS, AND FLOORS AT PIPE PENETRATIONS. SEAL PIPE PENETRATIONS WITH FIRESTOP MATERIALS.
9. VERIFY FINAL EQUIPMENT LOCATIONS FOR ROUGHING-IN.
E. PIPING JOINT CONSTRUCTION
1. REAM ENDS OF PIPES AND TUBES AND REMOVE BURRS. BEVEL PLAIN ENDS OF STEEL PIPE.
2. REMOVE SCALE, SLAG, DIRT, AND DEBRIS FROM INSIDE AND OUTSIDE OF PIPE AND FITTINGS BEFORE ASSEMBLY.
3. SOLDERED JOINTS: APPLY ASTM B 813, WATER-FLUSHABLE FLUX, UNLESS OTHERWISE INDICATED, TO TUBE END. CONSTRUCT JOINTS ACCORDING TO ASTM B 828 OR GAGS "COPPER TUBE HANDBOOK," USING LEAD-FREE SOLDER ALLOY COMPLYING WITH ASTM B 32.
4. THREADED JOINTS: THREAD PIPE WITH TAPERED PIPE THREADS ACCORDING TO ASME B1.20.1. CUT THREADS FULL AND CLEAN USING SHARP DIES. REAM THREADED PIPE ENDS TO REMOVE BURRS AND RESTORE FULL ID. JOIN PIPE FITTINGS AND VALVES AS FOLLOWS:
a. APPLY APPROPRIATE TAPE OR THREAD COMPOUND TO EXTERNAL PIPE THREADS UNLESS DRY SEAL THREADING IS SPECIFIED.
b. DAMAGED THREADS: DO NOT USE PIPE OR PIPE FITTINGS WITH THREADS THAT ARE CORRODED OR DAMAGED. DO NOT USE PIPE SECTIONS THAT HAVE CRACKED OR OPEN WELDS.
F. EQUIPMENT INSTALLATION - COMMON REQUIREMENTS
1. INSTALL EQUIPMENT TO ALLOW MAXIMUM POSSIBLE HEADROOM UNLESS SPECIFIC MOUNTING HEIGHTS ARE NOT INDICATED.
2. INSTALL EQUIPMENT LEVEL AND PLUMB, PARALLEL, AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS IN EXPOSED INTERIOR SPACES, UNLESS OTHERWISE INDICATED.
3. INSTALL PLUMBING EQUIPMENT TO FACILITATE SERVICE, MAINTENANCE, AND REPAIR OR REPLACEMENT OF COMPONENTS. CONNECT EQUIPMENT FOR EASE OF DISCONNECTING, WITH MINIMUM INTERFERENCE TO OTHER INSTALLATIONS. EXTEND GREASE FITTINGS TO ACCESSIBLE LOCATIONS.

220500 COMMON WORK RESULTS FOR PLUMBING

- A. GENERAL REQUIREMENTS
1. INCLUDE ALL LABOR, MATERIAL, EQUIPMENT, TRANSPORTATION AND SERVICES TO FURNISH AND INSTALL COMPLETE PLUMBING SYSTEMS AND ALTERATIONS AS SHOWN ON THE DRAWINGS AND HEREIN SPECIFIED.
2. ALL WORK SHALL BE IN ACCORDANCE WITH ALL LOCAL AND STATE CODES, ALL APPLICABLE BUILDING, MECHANICAL AND PLUMBING CODES, AND ALL AUTHORITIES HAVING JURISDICTION.
3. ALL WORK SHALL BE IN ACCORDANCE WITH ALL LANDLORD REQUIREMENTS.
4. ALL CONNECTION, INSPECTION AND PERMIT FEES SHALL BE AT THE CONTRACTOR'S EXPENSE.
5. CONTRACTOR SHALL CONTACT AUTHORITIES HAVING JURISDICTION FOR INSPECTION OF ALL SYSTEMS IN A TIMELY MANNER BEFORE OCCUPANCY OF THE BUILDING.
B. SUBMITTALS
1. CONTRACTOR SHALL SUBMIT FOR REVIEW SIX COPIES OF SHOP DRAWINGS, LITERATURE, AND EQUIPMENT LISTS PRIOR TO FABRICATION OR DELIVERY.
2. CATALOG SHEETS SHALL BE COMPLETE, AND THE ITEM OR MODEL TO BE USED SHALL BE CLEARLY MARKED.
3. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE THE PRODUCT INDICATED ON DRAWINGS OR A COMPARABLE PRODUCT. ARCHITECT AND/OR ENGINEER APPROVAL IS REQUIRED FOR ALL COMPARABLE PRODUCTS SUBMITTED.
C. PLUMBING DEMOLITION
1. DISCONNECT, DEMOLISH, AND REMOVE PLUMBING SYSTEMS, EQUIPMENT, AND COMPONENTS INDICATED TO BE REMOVED.
a. PIPING TO BE REMOVED: REMOVE PORTION OF PIPING INDICATED TO BE REMOVED AND CAP OR PLUG REMAINING PIPING WITH SAME OR COMPATIBLE PIPING MATERIAL.
b. PIPING TO BE ABANDONED IN PLACE: DRAIN PIPING AND CAP OR PLUG PIPING WITH SAME OR COMPATIBLE PIPING MATERIAL.
c. EQUIPMENT TO BE REMOVED: DISCONNECT AND CAP SERVICES AND REMOVE EQUIPMENT.
d. EQUIPMENT TO BE REMOVED AND REINSTALLED: DISCONNECT AND CAP SERVICES AND REMOVE, CLEAN, AND STORE EQUIPMENT; WHEN APPROPRIATE, REINSTALL, RECONNECT, AND MAKE EQUIPMENT OPERATIONAL.
e. EQUIPMENT TO BE REMOVED AND SALVAGED: DISCONNECT AND CAP SERVICES AND REMOVE EQUIPMENT AND DELIVER TO OWNER.
2. IF PIPE, INSULATION, OR EQUIPMENT TO REMAIN IS DAMAGED IN APPEARANCE OR IS UNSERVICEABLE, REMOVE DAMAGED OR UNSERVICEABLE PORTIONS AND REPLACE WITH NEW PRODUCTS OF EQUAL CAPACITY AND QUALITY.
D. PIPING SYSTEMS - COMMON REQUIREMENTS
1. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS. INDICATED LOCATIONS AND ARRANGEMENTS WERE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, PUMP SIZING, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.
2. INSTALL PIPING IN CONCEALED LOCATIONS, UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.
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