SECTION 15000 - GENERAL PLUMBING

GENERAL

1.1.1 WORK INCLUDES ALL LABOR, MATERIALS, AND EQUIPMENT NECESSARY FOR THE INSTALLATION OF FUNCTIONAL PLUMBING SYSTEM AS DESCRIBED IN THESE PLANS AND SPECIFICATIONS.

1.1.2 ALL WORK SHALL CONFORM TO THE CURRENT STATE AND LOCAL CODES AND BE APPROVED BY THE AUTHORITY HAVING JURISDICTION. CONTRACTOR SHALL OBTAIN ALL PERMITS AND PAY ALL FEES FOR THE WORK INCLUDED.

1.1.3 PROJECT SUBMITTALS, IF REQUESTED CONTRACTOR SHALL SUBMIT FOR APPROVAL ON ALL MATERIALS AND METHODS SHOWN IN THESE PLANS.

1.1.4 THESE DRAWINGS ARE IN GENERAL, DIAGRAMMATIC, AND CANNOT SHOW ALL OFFSETS, BENDS, CLEARANCES, OR ISSUES OF GENERAL CONSTRUCTION. LOCATION OF ALL FINISHED WORK SHALL BE VERIFIED IN THE FIELD, COORDINATED WITH THE GENERAL CONTRACTOR AND THE ARCHITECT. IN THE EVENT THERE ARE DISCREPANCIES OR DOUBT AS TO THE INTENT OF THESE PLANS AND SPECIFICATIONS, BEFORE ANY WORK, ORDER OF ANY MATERIALS, OR SELECTION OF ANY METHODS OF CONSTRUCTION, THE CONTRACTOR SHALL CONTACT THE ENGINEER IN WRITING FOR CLARIFICATION.

1.1.5 UTILITIES: THIS IS AN EXISTING BUILDING. CONTRACTOR SHALL VERIFY EXISTING UTILITY LOCATIONS NOT AS SHOWN ON MEP PLANS. CONTRACTOR SHALL COORDINATE FINAL LOCATIONS WITH EXISTING UTILITY CONNECTIONS.

1.1.6 STERILIZE DOMESTIC WATER LINES PER THE LATEST ENVIRONMENTAL HEALTH BULLETINS LOCAL AND STATES CODES.

1.1.7 CONTRACTOR SHALL VERIFY AVAILABLE WATER PRESSURE AND SHALL CONTACT THE ENGINEER IN THE EVENT THE WATER PRESSURE IS LESS THAN 35 PSIG.

1.1.8 CONTRACTOR SHALL PROVIDE WATER PRESSURE REDUCING VALVE 30-85 PSIG DISCHARGE RANGE IF WATER PRESSURE IS OVER 85 PSIG.

1.1.9 FLASH PLUMBING VENTS WITH SHEET LEAD AT LEAST 12" ABOVE ROOD WITH UPPER END TURNED DOWN. VENTS SHALL BE A MINIMUM IF 10 FEET FROM ANY OUTSIDE AIR INTAKE OR OPERABLE WINDOW.

1.1.10 ADEQUATELY SUPPORT ALL PIPING WITH PROPER HANGERS TO PREVENT SAGGING, POCKETING AND SWAYING. INCLUDE SEISMIC BRACING WITH PROPER HANGERS, WHEN REQUIRED BY CODE.

1.1.11 PROVIDE DIELECTRIC ISOLATORS WHERE REQUIRED.

1.1.12 INSTALL ISOLATION VALVES WHERE INDICATED OR REQUIRED FOR ISOLATIONS OF ALL FIXTURES IN AN ACCESSIBLE LOCATION.

1.1.13 PLUMBING CONTRACTOR SHALL PROVIDE HOT AND COLD WATER PIPING. MAKE ALL FINAL CONNECTIONS AND INSTALL BACKFLOW PREVENTION DEVICES AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION.

1.1.14 INSTALL ALL PIPING CONCEALED IN WALLS, PARTITIONS, FURRED OUT SPACES, OR CEILING SPACES. INSTALL SLEEVES FOR ALL PIPES PENETRATING THROUGH WALLS, FLOORS, BEAMS, ETC. AS THEY ARE BEING CONSTRUCTED.

1.1.15 VERIFY THE EXACT NUMBER AND LOCATION OF PLUMBING FIXTURES FROM ARCHITECTURAL DRAWINGS.

1.1.16 PROPER FITTING ESCUTCHEONS SHALL BE PROVIDED ON ALL PENETRATIONS THROUGH FINISHED SURFACES. SILICONE IN PLACE.

1.1.17 ALL PLUMBING FIXTURES SHALL BE NEATLY CAULKED WITH SILICONE COMPOUND WHERE FIXTURE MEETS FLOOR/WALL.

WATER SUPPLY PIPING

2.1 HOT AND COLD WATER PIPING SHALL BE TYPE L HARD DRAWN COPPER WITH WROUGHT COPPER FITTINGS AND 95/5 TIN-ANTIMONY (LEAD FREE) SOLDER.

2.1.2 ROUTE PIPING OVERHEAD.

2.1.3 INSULATE ALL HOT, COLD, AND CONDENSATE WATER PIPING RUN IN TRUSS SPACE AND WALLS.

2.1.4 INSULATE PIPING WITH JOHNS MANVILLE MICRO-LOK FIBERGLASS PIPE INSULATION 0.23 THERMAL CONDUCTIVITY AT 75 DEGREES F MEAN TEMPERATURE, 0.08 WATER VAPOR PERMEATE MAXIMUM, COMPOSITE FHC 25/50 PER ASTM E-84, UL 723 & NFPA 225. JACKETED WITH REINFORCED VAPOR RETARDER FACING AND FACTORY APPLIED LONGITUDINAL ACRYLIC ADHESIVE CLOSURE SYSTEM. MICRO-LOK IS DESIGNED FOR APPLICATION TEMPERATURE OF 0 TO 850 DEGREES F. MICRO-LOK MAY BE PAINTED WITH A LATEX PAINT AFTER INSTALLATION. JACKETING WATER PERMANENCE OF 0.20 PERMS MAX, ASTM E-96-PROCDEURE A. INSTALL PER PER MANUFACTURERS RECOMMENDATIONS.

2.1.5 WHEN REQUIRED INSULATE FITTINGS AND JOINTS AND VALVES UP TO STEM ON ALL PIPING.

2.1.6 COLD WATER PIPE INSULATION SHALL BE CONTINUOUS THROUGH WALLS OF FLOORS.

DWV PIPING

3.1 WASTE VENT AND ROOF DRAIN PIPING SHALL BE PVC, SERVICE WEIGHT AS APPROVED.

3.1.2 MAINTAIN MINIMUM SLOPE OF 1/8 INCH PER FOOT FOR SANITARY SEWER PIPING 4" AND LARGER. MAINTAIN MINIMUM SLOPE OF 1/4 INCH PER FOOT FOR SANITARY SEWER PIPING SMALLER THAN 4".

3.1.3 PROVIDE DEEP SEAL TRAPS FOR ALL FLOOR DRAINS.

TESTING

4.1.1 TEST WASTE, VENT, WATER, AND ALL OTHER PIPING IN ACCORDANCE WITH LOCAL CODES. OBTAIN WRITTEN DOCUMENTATION OF ANY REQUIRED WITNESS OF TEST AND ACCEPTANCE PIPING FOR THE ARCHITECT.

CLOSEOUT:

5.1.1 THE PLUMBING CONTRACTOR SHALL INSTRUCT THE OWNER IN PROPER OPERATION AND MAINTENANCE OF ALL EQUIPMENT. THE CONTRACTOR SHALL PROVIDE TWO BOUND COPIES OF AN OPERATIONS MANUAL UPON COMPLETION. SAID MANUAL SHALL INCLUDE ALL EQUIPMENT OPERATIONS MANUAL, 'CUT' SHEETS OF ALL CONTRACTOR SUPPLIED ITEMS USED ON THE PROJECT AND WARRANTY CERTIFICATES.

GUARANTEE:

6.1.1 PLUMBING CONTRACTOR SHALL GUARANTEE IN WRITING. ALL LABOR AND MATERIALS FURNISHED AND INSTALLED UNDER THIS SECTION FOR A PERIOD OF ONE YEAR. COVERING MATERIALS AND WORKMANSHIP IN FULL. EXCLUDED FROM THIS GUARANTEE IS OWNER SUPPLIED EQUIPMENT.

END OF SECTION 15000

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:
1. PIPES, TUBES, AND FITTINGS.
2. PIPING SPECIALTIES.
3. PIPING AND TUBING JOINING MATERIALS.
4. VALVES.
5. PRESSURE REGULATORS.

1.2 PERFORMANCE REQUIREMENTS

A. MINIMUM OPERATING-PRESSURE RATINGS:
1. PIPING AND VALVES: 100 PSIG MINIMUM UNLESS OTHERWISE INDICATED.
2. SERVICE REGULATORS: 100 PSIG MINIMUM UNLESS OTHERWISE INDICATED.

B. NATURAL-GAS SYSTEM PRESSURE WITHIN BUILDINGS: 0.5 PSIG OR LESS.

C. DELEGATED DESIGN: DESIGN RESTRAINTS AND ANCHORS FOR NATURAL-GAS PIPING AND EQUIPMENT, INCLUDING COMPREHENSIVE ENGINEERING ANALYSIS BY A QUALIFIED PROFESSIONAL ENGINEER, USING PERFORMANCE REQUIREMENTS AND DESIGN CRITERIA INDICATED.

1.3 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.
1. DETAIL FABRICATION AND ASSEMBLY OF SEISMIC RESTRAINTS (WHEN REQUIRED FOR PROJECT).
2. DESIGN CALCULATIONS: CALCULATE REQUIREMENTS FOR SELECTING SEISMIC RESTRAINTS (WHEN REQUIRED FOR PROJECT.

1.4 CLOSEOUT SUBMITTALS

A. OPERATION AND MAINTENANCE DATA.

1.5 QUALITY ASSURANCE

A. STEEL SUPPORT WELDING QUALIFICATIONS: QUALIFY PROCEDURES AND PERSONNEL ACCORDING TO AWS D1.1/D1.1M, 'STRUCTURAL WELDING CODE - STEEL.'

B. PIPE WELDING QUALIFICATIONS: QUALIFY PROCEDURES AND OPERATORS ACCORDING TO ASME BOILER AND PRESSURE VESSEL CODE.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. STEEL PIPE: ASTM A53/A53M, BLACK STEEL, SCHEDULE 40, TYPE E OR S, GRADE B.
1. MALLEABLE-IRON THREADED FITTINGS: ASME B16.3, CLASS 150, STANDARD PATTERN.
2. WROUGHT-STEEL WELDING FITTINGS: ASTM A 234/A 234M FOR BUTT WELDING AND SOCKET WELDING.
3. UNIONS: ASME B16.39, CLASS 150, MALLEABLE IRON WITH BRASS-TO-IRON SEAT, GROUND JOINT, AND THREADED ENDS.
4. PROTECTIVE COATING FOR UNDERGROUND PIPING: FACTORY-APPLIED, THREE-LAYER COATING OF EPOXY, ADHESIVE, AND PE.
a. JOINT COVER KITS: EPOXY PAINT, ADHESIVE, AND HEAT-SHRINK PE SLEEVES.

2.2 PIPING SPECIALTIES

A. APPLIANCE FLEXIBLE CONNECTORS:
1. INDOOR, FIXED-APPLIANCE FLEXIBLE CONNECTORS: COMPLY WITH ANSI Z21.24.
2. INDOOR, MOVABLE-APPLIANCE FLEXIBLE CONNECTORS: COMPLY WITH ANSI Z21.69.
3. OUTDOOR, APPLIANCE FLEXIBLE CONNECTORS: COMPLY WITH ANSI Z21.75.
4. CORRUGATED STAINLESS-STEEL TUBING WITH POLYMER COATING.
5. OPERATING-PRESSURE RATING: 0.5 PSIG.
6. END FITTINGS: ZINC-COATED STEEL.
7. THREADED ENDS: COMPLY WITH ASME B1.20.1.
8. MAXIMUM LENGTH: 24 INCHES.

B. QUICK-DISCONNECT DEVICES: COMPLY WITH ANSI Z21.41.
1. COPPER-ALLOY CONVENIENCE OUTLET AND MATCHING PLUG CONNECTOR.
2. NITRILE SEALS.
3. HAND OPERATED WITH AUTOMATIC SHUTOFF WHEN DISCONNECTED.
4. FOR INDOOR OR OUTDOOR APPLICATIONS.
5. ADJUSTABLE, RETRACTABLE RESTRAINING CABLE.

C. Y-PATTERN STRAINERS:
1. BODY: ASTM A 126, CLASS B, CAST IRON WITH BOLTED COVER AND BOTTOM DRAIN CONNECTION.
2. END CONNECTIONS: THREADED ENDS FOR NPS 2 AND SMALLER.
3. STRAINER SCREEN: 40-MESH STARTUP STRAINER, AND PERFORATED STAINLESS-STEEL BASKET WITH 50 PERCENT FREE AREA.
4. CWP RATING: 125 PSIG.

D. WEATHERPROOF VENT CAP: CAST- OR MALLEABLE-IRON INCREASER FITTING WITH CORROSION-RESISTANT WIRE SCREEN, WITH FREE AREA AT LEAST EQUAL TO CROSS-SECTIONAL AREA OF CONNECTING PIPE AND THREADED-END CONNECTION.

2.3 JOINING MATERIALS

A. JOINT COMPOUND AND TAPE: SUITABLE FOR NATURAL GAS.

B. WELDING FILLER METALS: COMPLY WITH AWS D10.12/D10.12M FOR WELDING MATERIALS APPROPRIATE FOR WALL THICKNESS AND CHEMICAL ANALYSIS OF STEEL PIPE BEING WELDED.

C. BRAZING FILLER METALS: ALLOY WITH MELTING POINT GREATER THAN 1000 DEG F COMPLYING WITH AWS A5.8/A5.8M. BRAZING ALLOYS CONTAINING MORE THAN 0.05 PERCENT PHOSPHORUS ARE PROHIBITED.

2.4 MANUAL GAS SHUTOFF VALVES

A. GENERAL REQUIREMENTS FOR METALLIC VALVES, NPS 2 AND SMALLER: COMPLY WITH ASME B16.33.
1. CWP RATING: 125 PSIG.
2. THREADED ENDS: COMPLY WITH ASME B1.20.1.
3. DRYSEAL THREADS ON FLARE ENDS: COMPLY WITH ASME B1.20.3.
4. TAMPERPROOF FEATURE: LOCKING FEATURE FOR VALVES INDICATED IN 'UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE' AND 'ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE' ARTICLES.
5. LISTING: LISTED AND LABELED BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION FOR VALVES 1 INCH AND SMALLER.
6. SERVICE MARK: VALVES 1-1/4 INCHES TO NPS 2 SHALL HAVE INITIALS 'WOG' PERMANENTLY MARKED ON VALVE BODY.

B. ONE-PIECE, BRONZE BALL VALVE WITH BRONZE TRIM: MSS SP-110.
1. BODY: BRONZE, COMPLYING WITH ASTM B 584.
2. BALL: CHROME-PLATED BRASS.
3. STEM: BRONZE; BLOWOUT PROOF.
4. SEATS: REINFORCED TFE; BLOWOUT PROOF.
5. PACKING: SEPARATE PACKNUT WITH ADJUSTABLE-STEM PACKING THREADED ENDS.
6. ENDS: THREADED, FLARED, OR SOCKET AS INDICATED IN 'UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE' AND 'ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE' ARTICLES.
7. CWP RATING: 600 PSIG.
8. LISTING: VALVES NPS 1 AND SMALLER SHALL BE LISTED AND LABELED BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
9. SERVICE: SUITABLE FOR NATURAL-GAS SERVICE WITH 'WOG' INDICATED ON VALVE BODY.

2.5 EARTHQUAKE VALVES

A. EARTHQUAKE VALVES: COMPLY WITH ASCE 25.
1. LISTING: LISTED AND LABELED BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
2. MAXIMUM OPERATING PRESSURE: 5 PSIG.
3. CAST-ALUMINUM BODY WITH NICKEL-PLATED CHROME STEEL INTERNAL PARTS.
4. NITRILE-RUBBER VALVE WASHER.
5. SIGHT WINDOWS FOR VISUAL INDICATION OF VALVE POSITION.
6. THREADED END CONNECTIONS COMPLYING WITH ASME B1.20.1.
7. WALL MOUNTING BRACKET WITH BUBBLE LEVEL INDICATOR.

2.6 PRESSURE REGULATORS

A. GENERAL REQUIREMENTS:
1. SINGLE STAGE AND SUITABLE FOR NATURAL GAS.
2. STEEL JACKET AND CORROSION-RESISTANT COMPONENTS.
3. ELEVATION COMPENSATOR.
4. END CONNECTIONS: THREADED FOR REGULATORS NPS 2 AND SMALLER.

B. LINE PRESSURE REGULATORS: COMPLY WITH ANSI Z21.80.
1. BODY AND DIAPHRAGM CASE: CAST IRON OR DIE-CAST ALUMINUM.
2. SPRINGS: ZINC-PLATED STEEL; INTERCHANGEABLE.
3. DIAPHRAGM PLATE: ZINC-PLATED STEEL.
4. SEAT DISC: NITRILE RUBBER RESISTANT TO GAS IMPURITIES, ABRASION, AND DEFORMATION AT THE VALVE PORT.
5. ORIFICE: ALUMINUM; INTERCHANGEABLE.
6. SEAL PLUG: ULTRAVIOLET-STABILIZED, MINERAL-FILLED NYLON.
7. SINGLE-PORT, SELF-CONTAINED REGULATOR WITH ORIFICE NO LARGER THAN REQUIRED AT MAXIMUM PRESSURE INLET, AND NO PRESSURE SENSING PIPING EXTERNAL TO THE REGULATOR.
8. PRESSURE REGULATOR SHALL MAINTAIN DISCHARGE PRESSURE SETTING DOWNSTREAM, AND NOT EXCEED 150 PERCENT OF DESIGN DISCHARGE PRESSURE AT SHUTOFF.
9. OVERPRESSURE PROTECTION DEVICE: FACTORY MOUNTED ON PRESSURE REGULATOR.
10. ATMOSPHERIC VENT: FACTORY- OR FIELD-INSTALLED, STAINLESS-STEEL SCREEN IN OPENING IF NOT CONNECTED TO VENT PIPING.
11. MAXIMUM INLET PRESSURE: REFER TO DRAWINGS.

2.7 DIELECTRIC UNIONS

A. DIELECTRIC UNIONS:
1. DESCRIPTION:
a. STANDARD: ASSE 1079.
b. PRESSURE RATING: 125 PSIG MINIMUM AT 180 DEG F.
c. END CONNECTIONS: SOLDER-JOINT COPPER ALLOY AND THREADED FERROUS.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

A. COMPLY WITH NFPA 54 FOR INSTALLATION AND PURGING OF NATURAL-GAS PIPING.

B. INSTALL UNDERGROUND, NATURAL-GAS PIPING BURIED AT LEAST 36 INCHES BELOW FINISHED GRADE. COMPLY WITH REQUIREMENTS IN CIVIL SPECIFICATIONS FOR EXCAVATING, TRENCHING, AND BACKFILLING.
1. IF NATURAL-GAS PIPING IS INSTALLED LESS THAN 36 INCHES BELOW FINISHED GRADE, INSTALL IT IN CONTAINMENT CONDUIT.

C. STEEL PIPING WITH PROTECTIVE COATING:
1. APPLY JOINT COVER KITS TO PIPE AFTER JOINING TO COVER, SEAL, AND PROTECT JOINTS.
2. REPAIR DAMAGE TO PE COATING ON PIPE AS RECOMMENDED IN WRITING BY PROTECTIVE COATING MANUFACTURER.

D. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.

E. INSTALL TEE WITH CAPPED PRESSURE GAGE CONNECTOR DOWNSTREAM FROM EACH SERVICE REGULATOR.

3.2 INDOOR PIPING INSTALLATION

A. COMPLY WITH NFPA 54 FOR INSTALLATION AND PURGING OF NATURAL-GAS PIPING.

B. DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF PIPING SYSTEMS. INDICATED LOCATIONS AND ARRANGEMENTS ARE USED TO SIZE PIPE AND CALCULATE FRICTION LOSS, EXPANSION, AND OTHER DESIGN CONSIDERATIONS. INSTALL PIPING AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED ON COORDINATION DRAWINGS.

C. ARRANGE FOR PIPE SPACES, CHASES, SLOTS, SLEEVES, AND OPENINGS IN BUILDING STRUCTURE DURING PROGRESS OF CONSTRUCTION, TO ALLOW FOR MECHANICAL INSTALLATIONS.

D. INSTALL PIPING IN CONCEALED LOCATIONS UNLESS OTHERWISE INDICATED AND EXCEPT IN EQUIPMENT ROOMS AND SERVICE AREAS.

E. INSTALL PIPING INDICATED TO BE EXPOSED AND PIPING IN EQUIPMENT ROOMS AND SERVICE AREAS AT RIGHT ANGLES OR PARALLEL TO BUILDING WALLS. DIAGONAL RUNS ARE PROHIBITED UNLESS SPECIFICALLY INDICATED OTHERWISE.

F. INSTALL PIPING ABOVE ACCESSIBLE CEILINGS TO ALLOW SUFFICIENT SPACE FOR CEILING PANEL REMOVAL.

G. LOCATE VALVES FOR EASY ACCESS.

H. INSTALL PIPING FREE OF SAGS AND BENDS.

I. INSTALL FITTINGS FOR CHANGES IN DIRECTION AND BRANCH CONNECTIONS.

J. VERIFY FINAL EQUIPMENT LOCATIONS FOR ROUGHING-IN.

K. COMPLY WITH REQUIREMENTS IN SECTIONS SPECIFYING GAS-FIRED APPLIANCES AND EQUIPMENT FOR ROUGHING-IN REQUIREMENTS.

L. DRIPS AND SEDIMENT TRAPS: INSTALL DRIPS AT POINTS WHERE CONDENSATE MAY COLLECT, INCLUDING SERVICE-METER OUTLETS. LOCATE WHERE ACCESSIBLE TO PERMIT CLEANING AND EMPTYING. DO NOT INSTALL WHERE CONDENSATE IS SUBJECT TO FREEZING.
1. CONSTRUCT DRIPS AND SEDIMENT TRAPS USING TEE FITTING WITH BOTTOM OUTLET PLUGGED OR CAPPED. USE NIPPLE A MINIMUM LENGTH OF 3 PIPE DIAMETERS, BUT NOT LESS THAN 3 INCHES LONG AND SAME SIZE AS CONNECTED PIPE. INSTALL WITH SPACE BELOW BOTTOM OF DRIP TO REMOVE PLUG OR CAP.

M. EXTEND RELIEF VENT CONNECTIONS FOR SERVICE REGULATORS, LINE REGULATORS, AND OVERPRESSURE PROTECTION DEVICES TO OUTDOORS AND TERMINATE WITH WEATHERPROOF VENT CAP.

N. CONCEAL PIPE INSTALLATIONS IN WALLS, PIPE SPACES, UTILITY SPACES, ABOVE CEILINGS, BELOW GRADE OR FLOORS, AND IN FLOOR CHANNELS UNLESS INDICATED TO BE EXPOSED TO VIEW.

O. USE ECCENTRIC REDUCER FITTINGS TO MAKE REDUCTIONS IN PIPE SIZES. INSTALL FITTINGS WITH LEVEL SIDE DOWN.

P. CONNECT BRANCH PIPING FROM TOP OR SIDE OF HORIZONTAL PIPING.

Q. INSTALL UNIONS IN PIPES NPS 2 AND SMALLER, ADJACENT TO EACH VALVE, AT FINAL CONNECTION TO EACH PIECE OF EQUIPMENT.

R. DO NOT USE NATURAL-GAS PIPING AS GROUNDING ELECTRODE.

S. WHERE SHOWN ON DRAWINGS, INSTALL STRAINER ON INLET OF EACH LINE-PRESSURE REGULATOR.

T. INSTALL TEE WITH CAPPED PRESSURE GAGE CONNECTION DOWNSTREAM FROM EACH LINE REGULATOR.

U. INSTALL SLEEVES FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS. COMPLY WITH REQUIREMENTS FOR SLEEVES SPECIFIED IN SECTION 220517 'SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING.'

V. INSTALL SLEEVE SEALS FOR PIPING PENETRATIONS OF CONCRETE WALLS AND SLABS. COMPLY WITH REQUIREMENTS FOR SLEEVES SPECIFIED IN SECTION 305 OF THE VIRGINA PLUMBING CODE.

W. INSTALL ESCUTCHEONS FOR PIPING PENETRATIONS OF WALLS, CEILINGS, AND FLOORS. COMPLY WITH REQUIREMENTS FOR ESCUTCHEONS SPECIFIED IN SECTION 220518 'ESCUTCHEONS FOR PLUMBING PIPING.'

3.3 VALVE INSTALLATION

A. INSTALL MANUAL GAS SHUTOFF VALVE FOR EACH GAS APPLIANCE AHEAD OF CORRUGATED STAINLESS-STEEL TUBING OR COPPER CONNECTOR.

B. INSTALL UNDERGROUND VALVES WITH VALVE BOXES.

C. INSTALL REGULATORS AND OVERPRESSURE PROTECTION DEVICES WITH MAINTENANCE ACCESS SPACE ADEQUATE FOR SERVICING AND TESTING.

D. WHEN REQUIRED FOR PROJECT, INSTALL EARTHQUAKE VALVES ABOVEGROUND OUTSIDE BUILDINGS ACCORDING TO LISTING.

3.4 PIPING JOINT CONSTRUCTION

A. REAM ENDS OF PIPES AND TUBES AND REMOVE BURRS.

B. REMOVE SCALE, SLAG, DIRT, AND DEBRIS FROM INSIDE AND OUTSIDE OF PIPE AND FITTINGS BEFORE ASSEMBLY.

C. THREADED JOINTS:
1. THREAD PIPE WITH TAPERED PIPE THREADS COMPLYING WITH ASME B1.20.1.
2. CUT THREADS FULL AND CLEAN USING SHARP DIES.
3. REAM THREADED PIPE ENDS TO REMOVE BURRS AND RESTORE FULL INSIDE DIAMETER OF PIPE.
4. APPLY APPROPRIATE TAPE OR THREAD COMPOUND TO EXTERNAL PIPE THREADS UNLESS DRYSEAL THREADING IS SPECIFIED.
5. 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.

D. WELDED JOINTS:
1. CONSTRUCT JOINTS ACCORDING TO AWS D10.12/D10.12M, USING QUALIFIED PROCESSES AND WELDING OPERATORS.
2. BEVEL PLAIN ENDS OF STEEL PIPE.
3. PATCH FACTORY-APPLIED PROTECTIVE COATING AS RECOMMENDED BY MANUFACTURER AT FIELD WELDS AND WHERE DAMAGE TO COATING OCCURS DURING CONSTRUCTION.

E. BRAZED JOINTS: CONSTRUCT JOINTS ACCORDING TO AWS'S 'BRAZING HANDBOOK,' 'PIPE AND TUBE' CHAPTER.

3.5 HANGER AND SUPPORT INSTALLATION

A. WHERE REQUIRED BY CODE, INSTALL SEISMIC RESTRAINTS ON PIPING. COMPLY WITH REQUIREMENTS FOR SEISMIC-RESTRAINT DEVICES SPECIFIED IN ADOPTED CODES.

B. COMPLY WITH REQUIREMENTS FOR PIPE HANGERS AND SUPPORTS SPECIFIED IN SECTION 308 OF THE VIRGINIA PLUMBING CODE.

C. INSTALL HANGERS FOR HORIZONTAL STEEL PIPING WITH THE FOLLOWING MAXIMUM SPACING AND MINIMUM ROD SIZES:
1. NPS 1 AND SMALLER: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
2. NPS 1-1/4: MAXIMUM SPAN, 108 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
3. NPS 1-1/2 AND NPS 2: MAXIMUM SPAN, 108 INCHES; MINIMUM ROD SIZE, 3/8 INCH.
4. NPS 3/4 AND LARGER: MAXIMUM SPAN, 96 INCHES; MINIMUM ROD SIZE, 3/8 INCH.

3.6 CONNECTIONS

A. INSTALL NATURAL-GAS PIPING ELECTRICALLY CONTINUOUS, AND BONDED TO GAS APPLIANCE EQUIPMENT GROUNDING CONDUCTOR OF THE CIRCUIT POWERING THE APPLIANCE ACCORDING TO NFPA 70.

B. INSTALL PIPING ADJACENT TO APPLIANCES TO ALLOW SERVICE AND MAINTENANCE OF APPLIANCES.

C. CONNECT PIPING TO APPLIANCES USING MANUAL GAS SHUTOFF VALVES AND UNIONS. INSTALL VALVE WITHIN 72 INCHES OF EACH GAS-FIRED APPLIANCE AND EQUIPMENT. INSTALL UNION BETWEEN VALVE AND APPLIANCES OR EQUIPMENT.

D. SEDIMENT TRAPS: INSTALL TEE FITTING WITH CAPPED NIPPLE IN BOTTOM TO FORM DRIP, AS CLOSE AS PRACTICAL TO INLET OF EACH APPLIANCE.

3.7 PAINTING

A. PRIME INTERIOR GAS PIPING BEFORE INSTALLATION. COMPLETE INSTALLATION OF GAS PIPING BEFORE ROOF DECK IS PAINTED. CONFORM TO THE ARCHITECTURAL SPECIFICATIONS FOR PAINTING AND FOR TOUCH-UP ON THE JOB SITE.

B. PRIME AND PAINT EXTERIOR GAS PIPING BEFORE INSTALLATION. CONFORM TO THE ARCHITECTURAL SPECIFICATIONS FOR PAINTING AND FOR TOUCH-UP ON THE JOB SITE.

3.8 LABELING AND IDENTIFYING

A. COMPLY WITH REQUIREMENTS IN SECTION 220553 'IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT' FOR PIPING AND VALVE IDENTIFICATION.

B. INSTALL DETECTABLE WARNING TAPE DIRECTLY ABOVE GAS PIPING, 12 INCHES BELOW FINISHED GRADE, EXCEPT 6 INCHES BELOW SUBGRADE UNDER PAVEMENTS AND SLABS.

3.9 FIELD QUALITY CONTROL

A. TEST, INSPECT, AND PURGE NATURAL GAS ACCORDING TO NFPA 54 AND AUTHORITIES HAVING JURISDICTION.

B. NATURAL-GAS PIPING WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.

C. PREPARE TEST AND INSPECTION REPORTS.

3.10 OUTDOOR PIPING SCHEDULE

A. UNDERGROUND NATURAL-GAS PIPING SHALL BE THE FOLLOWING:
1. STEEL PIPE WITH WROUGHT-STEEL FITTINGS AND WELDED JOINTS. COAT PIPE AND FITTINGS WITH PROTECTIVE COATING FOR STEEL PIPING.

B. ABOVEGROUND NATURAL-GAS PIPING SHALL BE ONE OF THE FOLLOWING:
1. STEEL PIPE WITH MALLEABLE-IRON FITTINGS AND THREADED JOINTS.
2. STEEL PIPE WITH WROUGHT-STEEL FITTINGS AND WELDED JOINTS.

C. CONTAINMENT CONDUIT: STEEL PIPE WITH WROUGHT-STEEL FITTINGS AND WELDED JOINTS. COAT PIPE AND FITTINGS WITH PROTECTIVE COATING FOR STEEL PIPING.

3.11 INDOOR PIPING SCHEDULE

A. ABOVEGROUND, BRANCH PIPING NPS 1 AND SMALLER SHALL BE THE FOLLOWING:
1. STEEL PIPE WITH MALLEABLE-IRON FITTINGS AND THREADED JOINTS.

B. ABOVEGROUND, DISTRIBUTION PIPING SHALL BE ONE OF THE FOLLOWING:
1. STEEL PIPE WITH MALLEABLE-IRON FITTINGS AND THREADED JOINTS.
2. STEEL PIPE WITH WROUGHT-STEEL FITTINGS AND WELDED JOINTS.

C. UNDERGROUND, BELOW BUILDING, PIPING SHALL BE ONE OF THE FOLLOWING:
1. STEEL PIPE WITH MALLEABLE-IRON FITTINGS AND THREADED JOINTS.
2. STEEL PIPE WITH WROUGHT-STEEL FITTINGS AND WELDED JOINTS.

D. CONTAINMENT CONDUIT: STEEL PIPE WITH WROUGHT-STEEL FITTINGS AND WELDED JOINTS. COAT PIPE AND FITTINGS WITH PROTECTIVE COATING FOR STEEL PIPING.

E. CONTAINMENT CONDUIT VENT PIPING: STEEL PIPE WITH MALLEABLE-IRON FITTINGS AND THREADED OR WROUGHT-STEEL FITTINGS WITH WELDED JOINTS. COAT UNDERGROUND PIPE AND FITTINGS WITH PROTECTIVE COATING FOR STEEL PIPING.

END OF SECTION 231123

SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS (ROOFTOP UNITS) WITH THE FOLLOWING COMPONENTS AND ACCESSORIES:
1. DIRECT-EXPANSION COOLING.
2. GAS FURNACE.
3. ECONOMIZER OUTDOOR- AND RETURN-AIR DAMPER SECTION.
4. INTEGRAL, SPACE TEMPERATURE CONTROLS.
5. ROOF CURBS.

1.2 DEFINITIONS

A. OUTDOOR-AIR REFRIGERANT COIL: REFRIGERANT COIL IN THE OUTDOOR-AIR STREAM TO REJECT HEAT DURING COOLING OPERATIONS AND TO ABSORB HEAT DURING HEATING OPERATIONS. 'OUTDOOR AIR' IS DEFINED AS THE AIR OUTSIDE THE BUILDING OR TAKEN FROM OUTDOORS AND NOT PREVIOUSLY CIRCULATED THROUGH THE SYSTEM.

B. OUTDOOR-AIR REFRIGERANT-COIL FAN: THE OUTDOOR-AIR REFRIGERANT-COIL FAN IN RTUS. 'OUTDOOR AIR' IS DEFINED AS THE AIR OUTSIDE THE BUILDING OR TAKEN FROM OUTDOORS AND NOT PREVIOUSLY CIRCULATED THROUGH THE SYSTEM.

C. RTU: ROOFTOP UNIT. AS USED IN THIS SECTION, THIS ABBREVIATION MEANS PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS. THIS ABBREVIATION IS USED REGARDLESS OF WHETHER THE UNIT IS MOUNTED ON THE ROOF OR ON A CONCRETE BASE ON GROUND.

D. SUPPLY-AIR FAN: THE FAN PROVIDING SUPPLY-AIR TO CONDITIONED SPACE. 'SUPPLY AIR' IS DEFINED AS THE AIR ENTERING A SPACE FROM AIR-CONDITIONING, HEATING, OR VENTILATING APPARATUS.

E. SUPPLY-AIR REFRIGERANT COIL: REFRIGERANT COIL IN THE SUPPLY-AIR STREAM TO ABSORB HEAT (PROVIDE COOLING) DURING COOLING OPERATIONS AND TO REJECT HEAT (PROVIDE HEATING) DURING HEATING OPERATIONS. 'SUPPLY AIR' IS DEFINED AS THE AIR ENTERING A SPACE FROM AIR-CONDITIONING, HEATING, OR VENTILATING APPARATUS.

F. VVT: VARIABLE-AIR VOLUME AND TEMPERATURE.

1.3 ACTION SUBMITTALS

A. PRODUCT DATA: INCLUDE MANUFACTURER'S TECHNICAL DATA FOR EACH RTU, INCLUDING RATED CAPACITIES, DIMENSIONS, REQUIRED CLEARANCES, CHARACTERISTICS, FURNISHED SPECIALTIES, AND ACCESSORIES.

B. SHOP DRAWINGS: DETAIL EQUIPMENT ASSEMBLIES AND INDICATE DIMENSIONS, WEIGHTS, LOADS, REQUIRED CLEARANCES, METHOD OF FIELD ASSEMBLY, COMPONENTS, AND LOCATION AND SIZE OF EACH FIELD CONNECTION.
1. WIRING DIAGRAMS: POWER, SIGNAL, AND CONTROL WIRING.

1.4 CLOSEOUT SUBMITTALS

A. OPERATION AND MAINTENANCE DATA.

1.5 QUALITY ASSURANCE

A. ARI COMPLIANCE:
1. COMPLY WITH ARI 203/110 AND ARI 303/110 FOR TESTING AND RATING ENERGY EFFICIENCIES FOR RTUS.
2. COMPLY WITH ARI 270 FOR TESTING AND RATING SOUND PERFORMANCE FOR RTUS.

B. ASHRAE COMPLIANCE:
1. COMPLY WITH ASHRAE 15 FOR REFRIGERANT SYSTEM SAFETY.
2. COMPLY WITH ASHRAE 33 FOR METHODS OF TESTING COOLING AND HEATING COILS.

C. ASHRAE/IESNA 90.1 COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE/IESNA 90.1, SECTION 6 - 'HEATING, VENTILATING, AND AIR-CONDITIONING.'

D. NFPA COMPLIANCE: COMPLY WITH NFPA 90A AND NFPA 90B.

E. UL COMPLIANCE: COMPLY WITH UL 1995.

F. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, ARTICLE 100, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, AND MARKED FOR INTENDED USE.

1.6 WARRANTY

A. SPECIAL WARRANTY: MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPLACE COMPONENTS OF RTUS THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.
1. WARRANTY PERIOD FOR COMPRESSORS: MANUFACTURER'S STANDARD, BUT NOT LESS THAN FIVE YEARS FROM DATE OF SUBSTANTIAL COMPLETION.
2. WARRANTY PERIOD FOR GAS FURNACE HEAT EXCHANGERS: MANUFACTURER'S STANDARD, BUT NOT LESS THAN FIVE YEARS FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. REFER TO DRAWINGS.

2.2 AIR FILTRATION

A. MINIMUM ARRESTANCE ACCORDING TO ASHRAE 52.1, AND A MINIMUM EFFICIENCY REPORTING VALUE (MERV) ACCORDING TO ASHRAE 52.2.
1. PLEATED: MINIMUM 90 PERCENT ARRESTANCE, AND MERV 7.

2.3 CONTROLS

A. CONTROL EQUIPMENT TO BE SPECIFIED BY OWNER FOR BUILDING AUTOMATION & CONTROL SYSTEM (BAS) UNDER A SEPARATE CONTRACT.

2.4 ROOF CURBS

A. MATERIALS: GALVANIZED STEEL WITH CORROSION-PROTECTION COATING, WATERTIGHT GASKETS, AND FACTORY-INSTALLED WOOD NAILER; COMPLYING WITH NRCA STANDARDS.
1. CURB INSULATION AND ADHESIVE: COMPLY WITH NFPA 90A OR NFPA 90B.
a. MATERIALS: ASTM C 1071, TYPE I OR II.
b. THICKNESS: 1 INCH (25 MM).
2. APPLICATION: FACTORY APPLIED WITH ADHESIVE AND MECHANICAL FASTENERS TO THE INTERNAL SURFACE OF CURB.
a. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.
b. MECHANICAL FASTENERS: GALVANIZED STEEL, SUITABLE FOR ADHESIVE ATTACHMENT, MECHANICAL ATTACHMENT, OR WELDING ATTACHMENT TO DUCT WITHOUT DAMAGING LINER WHEN APPLIED AS RECOMMENDED BY MANUFACTURER AND WITHOUT CAUSING LEAKAGE IN CABINET.
c. LINER MATERIALS APPLIED IN THIS LOCATION SHALL HAVE AIR-STREAM SURFACE COATED WITH A TEMPERATURE-RESISTANT COATING OR FACED WITH A PLAIN OR COATED FIBROUS MAT OR FABRIC DEPENDING ON SERVICE AIR VELOCITY.
d. LINER ADHESIVE: COMPLY WITH ASTM C 916, TYPE I.

B. CURB HEIGHT: 18" VERIFY PRIOR TO PURCHASE.

C. WIND AND SEISMIC RESTRAINTS: METAL BRACKETS COMPATIBLE WITH THE CURB AND CASING, PAINTED TO MATCH RTU, USED TO ANCHOR UNIT TO THE CURB, AND DESIGNED FOR LOADS AT PROJECT SITE.

PART 3 - EXECUTION

3.1 INSTALLATION

A. EQUIPMENT MOUNTING:

B. ROOF CURB: INSTALL ON ROOF STRUCTURE OR CONCRETE BASE, LEVEL AND SECURE. INSTALL RTUS ON CURBS AND COORDINATE ROOF PENETRATIONS AND FLASHING WITH ROOF CONSTRUCTION. SECURE RTUS TO UPPER CURB RAIL, AND SECURE CURB BASE TO ROOF FRAMING OR CONCRETE BASE WITH ANCHOR BOLTS.

C. INSTALL CONDENSATE DRAIN, MINIMUM CONNECTION SIZE, WITH TRAP.

D. INSTALL PIPING ADJACENT TO RTUS TO ALLOW SERVICE AND MAINTENANCE.
1. GAS PIPING: CONNECT GAS PIPING TO BURNER, FULL SIZE OF GAS TRAIN INLET, AND CONNECT WITH UNION AND SHUTOFF VALVE WITH SUFFICIENT CLEARANCE FOR BURNER REMOVAL AND SERVICE.

E. DUCT INSTALLATION REQUIREMENTS ARE SPECIFIED IN OTHER HVAC SECTIONS. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF DUCTS. THE FOLLOWING ARE SPECIFIC CONNECTION REQUIREMENTS:
1. INSTALL DUCTS TO TERMINATION AT TOP OF ROOF CURB.
2. REMOVE ROOF DECKING ONLY AS REQUIRED FOR PASSAGE OF DUCTS. DO NOT CUT OUT DECKING UNDER ENTIRE ROOF CURB.
3. CONNECT SUPPLY DUCTS TO RTUS WITH FLEXIBLE DUCT CONNECTORS SPECIFIED IN SECTION 230700 'AIR DUCT ACCESSORIES.'
4. INSTALL RETURN-AIR DUCT CONTINUOUSLY THROUGH ROOF STRUCTURE.

END OF SECTION 237413

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:
1. CENTRIFUGAL ROOF VENTILATORS.

1.2 ACTION SUBMITTALS

A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

1.3 CLOSEOUT SUBMITTALS

A. OPERATION AND MAINTENANCE DATA.

1.4 QUALITY ASSURANCE

A. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.

B. AMCA COMPLIANCE: FANS SHALL HAVE AMCA-CERTIFIED PERFORMANCE RATINGS AND SHALL BEAR THE AMCA-CERTIFIED RATINGS SEAL.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. HOUSING: THE FAN HOUSING SHALL BE CONSTRUCTED OF HEAVY GAUGE ALUMINUM AND SHALL INCLUDE A FULL PERIMETER STORM BAND TO AID IN PROTECTION OF THE ORIFICE FROM BLOWING RAIN AND SNOW.

B. THE SUPPORT BRACKETS SHALL TRANSMIT THE WEIGHT OF THE MOTOR AND IMPELLER DIRECTLY TO THE CURBCAP/CURB TO PREVENT ORIFICE DISTORTION.

C. A CONDUIT POST SHALL BE PROVIDED THROUGH THE CURBCAP TO THE MOTOR COMPARTMENT FOR EASE OF ELECTRICAL WIRING..

D. DIRECT-DRIVE UNITS: MOTOR MOUNTED IN AIRSTREAM, FACTORY WIRED TO DISCONNECT SWITCH LOCATED ON OUTSIDE OF FAN HOUSING WITH WHEEL, INLET CONE, AND MOTOR ON SWING-OUT SERVICE DOOR.

E. FAN WHEELS: THE FAN IMPELLER SHALL HAVE CENTRIFUGAL BACKWARDLY INCLINED HOLLOW AIRFOIL BLADES CONSTRUCTED OF ALUMINUM.
1. THE IMPELLER SHALL BE STATICALLY AND DYNAMICALLY BALANCED TO THE GRADE G6.3 AS DESCRIBED IN ISO 1940/1

D. ACCESSORIES:
1. VARIABLE-SPEED CONTROLLER: SOLID-STATE CONTROL TO REDUCE SPEED FROM 100 TO LESS THAN 50 PERCENT.
2. DISCONNECT SWITCH: NON-FUSIBLE TYPE, WITH THERMAL-OVERLOAD PROTECTION MOUNTED INSIDE OR OUTSIDE (AS REQUIRED BY CODE) FAN HOUSING, FACTORY WIRED THROUGH AN INTERNAL ALUMINUM CONDUIT.
3. BIRD SCREENS: REMOVABLE, 1/2-INCH MESH, ALUMINUM OR BRASS WIRE.
4. DAMPERS: COUNTERBALANCED, PARALLEL-BLADE, BACKDRAFT DAMPERS MOUNTED IN CURB BASE; FACTORY SET TO CLOSE WHEN FAN STOPS.

E. ROOF CURBS: GALVANIZED STEEL; MITERED AND WELDED CORNERS; 1-1/2-INCH- THICK, RIGID, FIBERGLASS INSULATION ADHERED TO INSIDE WALLS; AND 1-1/2-INCH WOOD NAILER. SIZE AS REQUIRED TO SUIT ROOF OPENING AND FAN BASE.

2.2 MOTORS

A. COMPLY WITH NEMA DESIGNATION, TEMPERATURE RATING, SERVICE FACTOR, ENCLOSURE TYPE, AND EFFICIENCY REQUIREMENTS FOR MOTORS SPECIFIED IN SECTION 230513 'COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT.'
1. MOTOR SIZES: MINIMUM SIZE AS INDICATED. IF NOT INDICATED, LARGE ENOUGH SO DRIVEN LOAD WILL NOT REQUIRE MOTOR TO OPERATE IN SERVICE FACTOR RANGE ABOVE 1.0.

B. ENCLOSURE TYPE: TOTALLY ENCLOSED, FAN COOLED.

2.3 SOURCE QUALITY CONTROL

A. CERTIFY SOUND-POWER LEVEL RATINGS ACCORDING TO AMCA 301, 'METHODS FOR CALCULATING FAN SOUND RATINGS FROM LABORATORY TEST DATA.' FACTORY TEST FANS ACCORDING TO AMCA 300, 'REVERBERANT ROOM METHOD FOR SOUND TESTING OF FANS.' LABEL FANS WITH THE AMCA-CERTIFIED RATINGS SEAL.

B. CERTIFY FAN PERFORMANCE RATINGS, INCLUDING FLOW RATE, PRESSURE, POWER, AIR DENSITY, SPEED OF ROTATION, AND EFFICIENCY BY FACTORY TESTS ACCORDING TO AMCA 210, 'LABORATORY METHODS OF TESTING FANS FOR AERODYNAMIC PERFORMANCE RATING.' LABEL FANS WITH THE AMCA-CERTIFIED RATINGS SEAL.

PART 3 - EXECUTION

3.1 INSTALLATION

A. EQUIPMENT MOUNTING:
1. COMPLY WITH REQUIREMENTS FOR VIBRATION ISOLATION AND SEISMIC CONTROL DEVICES AS REQUIRED PER APPLICABLE CODES.

B. SECURE ROOF-MOUNTED FANS TO ROOF CURBS WITH CADMIUM-PLATED HARDWARE. SEE ARCHITECTURAL SPECIFICATIONS FOR INSTALLATION OF ROOF CURBS.

C. CEILING UNITS: SUSPEND UNITS FROM STRUCTURE; USE STEEL WIRE OR METAL STRAPS.

D. SUPPORT SUSPENDED UNITS FROM STRUCTURE USING THREADED STEEL RODS AND ELASTOMERIC HANGERS HAVING A STATIC DEFLECTION OF 1 INCH. INSTALL UNITS WITH CLEARANCES FOR SERVICE AND MAINTENANCE.

E. LABEL UNITS ACCORDING TO REQUIREMENTS SPECIFIED IN SECTION 230553 'IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT.'

3.2 CONNECTIONS

A. DRAWINGS INDICATE GENERAL ARRANGEMENT OF DUCTS AND DUCT ACCESSORIES. MAKE FINAL DUCT CONNECTIONS WITH FLEXIBLE CONNECTORS. FLEXIBLE CONNECTORS ARE SPECIFIED IN SECTION 233300 'AIR DUCT ACCESSORIES.'

B. INSTALL DUCTS ADJACENT TO POWER VENTILATORS TO ALLOW SERVICE AND MAINTENANCE.

3.3 FIELD QUALITY CONTROL

A. PERFORM TESTS AND INSPECTIONS.

B. TESTS AND INSPECTIONS:
1. VERIFY THAT SHIPPING, BLOCKING, AND BRACING ARE REMOVED.
2. VERIFY THAT UNIT IS SECURE ON MOUNTINGS AND SUPPORTING DEVICES AND THAT CONNECTIONS TO DUCTS AND ELECTRICAL COMPONENTS ARE COMPLETE. VERIFY THAT PROPER THERMAL-OVERLOAD PROTECTION IS INSTALLED IN MOTORS, STARTERS, AND DISCONNECT SWITCHES.
3. VERIFY THAT CLEANING AND ADJUSTING ARE COMPLETE.
4. DISCONNECT FAN DRIVE FROM MOTOR, VERIFY PROPER MOTOR ROTATION DIRECTION, AND VERIFY FAN WHEEL FREE ROTATION AND SMOOTH BEARING OPERATION. RECONNECT FAN DRIVE SYSTEM, ALIGN AND ADJUST BELTS, AND INSTALL BELT GUARDS.
5. ADJUST BELT TENSION.
6. ADJUST DAMPER LINKAGES FOR PROPER DAMPER OPERATION.
7. VERIFY LUBRICATION FOR BEARINGS AND OTHER MOVING PARTS.
8. VERIFY THAT MANUAL AND AUTOMATIC VOLUME CONTROL AND FIRE AND SMOKE DAMPERS IN CONNECTED DUCTWORK SYSTEMS ARE IN FULLY OPEN POSITION.
9. DISABLE AUTOMATIC TEMPERATURE-CONTROL OPERATORS, ENERGIZE MOTOR AND ADJUST FAN TO INDICATED RPM, AND MEASURE AND RECORD MOTOR VOLTAGE AND AMPERAGE.
10. SHUT UNIT DOWN AND RECONNECT AUTOMATIC TEMPERATURE-CONTROL OPERATORS.
11. REMOVE AND REPLACE MALFUNCTIONING UNITS AND RETEST AS SPECIFIED ABOVE.

C. TEST AND ADJUST CONTROLS AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.

D. PREPARE TEST AND INSPECTION REPORTS.

3.4 ADJUSTING

A. ADJUST DAMPER LINKAGES FOR PROPER DAMPER OPERATION.

B. ADJUST BELT TENSION.

C. COMPLY WITH REQUIREMENTS IN SECTION 230593 'TESTING, ADJUSTING, AND BALANCING FOR HVAC' FOR TESTING, ADJUSTING, AND BALANCING PROCEDURES.

D. REPLACE FAN AND MOTOR PULLEYS AS REQUIRED TO ACHIEVE DESIGN AIRFLOW.

E. LUBRICATE BEARINGS.

END OF SECTION 233423

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

1.1 SUMMARY

A. SECTION INCLUDES:
1. EQUIPMENT LABELS.
a. LABEL ITEMS WITH MARK VALUES INDICATED ON DRAWINGS. LOCATE LABELS FOR EACH ITEM SO IT CAN BE EASILY READ.
b. SEEK OWNERS APPROVAL BEFORE PURCHASING LABELS.

END OF SECTION 23055.

PLANS ON JOB FOR INSPECTION

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PLUMBING & MECHANICAL SPECIFICATIONS

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