SECTION 22 62 19.74
DENTAL VACUUM AND EVACUATION EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies central piped high volume oral evacuation (HVE) system for dental operatories, including piping, valving, vacuum producers, separators, electric motors, starters, controls and installation and start-up.

1.2 RELATED WORK

A. Sealing around pipe penetrations to maintain the integrity of time rated construction: Section 07 84 00, FIRESTOPPING.

B. Sealing around pipe penetrations through the floor to prevent moisture migration, Section 07 92 00, JOINT SEALANTS.

C. Piping system identification: Section 09 91 00, PAINTING.

D. General requirements and items common to more than one Section of Division 22: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING .

E. Valves (as required for water): Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING.

F. Strainers (as required for water): Section 22 11 00, FACILITY WATER DISTRIBUTION.

G. Electric Motors: Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT.

H. Motor Starters: Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS.

I. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

Requirements for commissioning, systems readiness checklist, and training.

1.3 QUALITY ASSURANCE

A. System: The minimum system demand shall be based on 3.3 L/s (7 scfm) per dental chair and at an operating pressure of 21 to 27 KPa (6 to 8 in Hg). A minimum of vacuum of 21 KPa (6 in – Hg) shall be maintained at

the most distant outlet. System pressure drop shall be a maximum of 3 kPa (1 in – Hg) at the calculated demand flow.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data: Submit the following as one package:

1. Piping

2. Vacuum cleaning inlet

3. Vacuum gage

4. Butterfly valve

5. Directional flow valve

6. Anti-surge valve

C. Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are in the text by the basic designation only.

B. American National Standards Institute (ANSI):

A13.1– 07.....Scheme for the Identification of Piping System

B16.3-06 .....Malleable Iron Threaded Fittings Classes 150 and 300

B16.22-01.....Wrought Copper and Bronze Solder-Joint Pressure Fittings

B40.1-98..... Pressure Gauges and Gauge Attachments

C. American Society for Testing and Materials (ASTM):

A47-99.....Ferritic Malleable Iron Castings

A53M-07 .....Pipe, Steel, Black Hot-Dipped, Zinc-Coated Welded and Seamless

A536-84 (2009) e1.....Ductile Iron Castings

B306- 09.....Copper Drainage Tube (DWV)

D1785 06 .....Poly (Vinyl Chloride) PVC Plastic Pipe Schedule 40, 80, 120

D2564 04.....Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings

D2466 06 .....Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D3311-09.....Drain, Waste, and Vent (DWV) Plastic Fittings

D. National Fire Protection Association

NFPA 99c 2005 Edition.Level 3 Vacuum

PART 2 - PRODUCTS

2.1 PIPING

A. Galvanized Steel: Use only for discharge from vacuum producer, as per manufacturer’s instructions.

1. Pipe: ASTM A53, standard weight.

2. Fittings:

a. Flexible groove type, malleable iron, ASTM A47, or Ductile iron, ASTM A536.

b. Malleable iron screwed, ANSI B16.3.

B. Cleanouts: Same size and material as pipe. Provide accessible and easily removable cleanouts as defined in Section 22 13 00, FACILITY SANITARY SEWERAGE

C. Apply piping identification per ANSI A13.1.

2.2 PIPE ISOLATORS

A. Flexible rubber, couple band, sealed clamps to isolate the turbine from the piping. Size coupling in accordance with the turbine's intake and output connections and provide steel coupling guards.

2.3 BUTTERFLY VALVE

A. Inlet: Built-in or located near the first stage of the turbine to prevent turbine overload through the operational range.

B. Exhaust: Flanged, wafer-style, installed at exhauster output flange for equipment isolation.

2.4 DIRECTIONAL FLOW VALVE

A. Non-restrictive on turbine inlet to prevent back-flow of air.

2.5 ANTI-SURGE VALVE

A. Mechanically or electrically operated valve that will operate automatically throughout the turbine's designed range. Valve shall continually sense the negative pressure within the turbine and maintain a predetermined, operational level of kPa (inches-of-mercury) draw. Equip with a silencer to reduce air noise to below 85 decibels.

2.6 VACUUM GAGE

A. In remote control panel: ANSI B40.1, 40mm (1-1/2 inch) dial with decorative ring.

B. In piping near separator: ANSI B40.1, with metal case, 115mm (4-1/2 inch) dial.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Place vacuum producers on insulating pads furnished with the equipment. Do not bolt or anchor equipment to the floor slab.

B. Cut pipe square, with burrs removed and install with minimum obstructions to air flow. Use DWV (drain-waste-vent) long-radius fittings for turns and wye type for branches.

C. Slope horizontal piping not less than ¼″ per 10 ft (2mm per 1m) toward the separator tanks.

D. All fittings shall be DWV (drain-waste-vent) long-radius bend types for turns and wye types for branching. For small bore piping for which long-radius bends are not available, two 45-degree bends shall be substituted for 90-degree turning.

E. All risers to all HVE inlet locations shall be 40 mm (1.5 -inch) nominal pipe size. Risers shall connect to trunk lines whose nominal pipe sizes shall be determined by head loss calculations that yield a system designed for no more than 1.7 kPa (0.5 inches mercury) worse case head loss. Piping no smaller than 40 mm 1.5 inch shall be used.

F. The cross-sectional area of all trunk lines shall be graduated, increasing toward the vacuum source. The cross-sectional area at any point along the trunk line shall equate to the sum of the riser cross-sectional areas connected prior to that point. Individual trunk lines shall terminate with connection to the manifold of the separators.

G. If backward curve impeller design turbine is installed, terminate the most distant end from the separator of each trunk line with a vacuum relief valve.

H. Install separators level and anchored to the floor slab.

I. Start up shall be by factory representative.

J. Penetrations:

1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal clearances between raceways and openings with the fire stopping material.

2. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.2 TEST

A. Pipe Leakage Test: Test in accordance with NFPA 99c, 2005 Edition, Paragraph 5.3.12.2.4. Exhaust complete piping system to a vacuum of not less than 27 kPa (8-inch mercury gage) after the pipe line is dried out

initially. Vacuum shall not decrease by more than 1.4 kPa (0.4-inch mercury gage) in one hour. If the vacuum does not hold, repair the leaks and retest.

B. Air Volume and Vacuum Tests:

1. Tests shall confirm that the system will meet air volume and vacuum requirements at aspirator tips and that vacuum producer(s) will produce the total capacity required as specified in paragraph 1.3. Perform tests after all oral evacuation equipment is properly installed and piping is cleaned and proved tight.

2. Install HVE (high volume evacuator) tips into the designed number of the facility’s HVE (high volume evacuator) valves. Close all remaining HVE valves.

3. With all UJC hoses fully closed, start the system. Fifteen minutes after start-up, measure the current draw of the motors with ammeter and record the reading of the vacuum gage. Fully open HVE valves with HVE tips in them and record the current and vacuum values again. Amperage measurements shall not exceed the motor full load amperage rating.

4. Check entire system and insure the minimum flow stated in Paragraph 1.3 is achieved.

C. The commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Project Engineer and Commissioning Agent. Provide a minimum of 7 days prior to notice.

3.3 COMMISSIONING

A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.

B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

3.4 DEMONSTRATION AND TRAINING

A. Provide services of manufacturer’s technical representative for four hours to instruct VA Personnel in operation and maintenance of units.

B. Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

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