

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. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.
- I. 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
- 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
 - B16.3-06Malleable 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-07Pipe, Steel, Black Hot-Dipped, Zinc-Coated
Welded and Seamless

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

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

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

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

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

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

B819-00 (R 2006).....Standard Specification for Seamless Copper Tube
for Medical Gas Systems

D. National Fire Protection Association

NFPA 99c 2005 Edition.Level 3 Vacuum

PART 2 - PRODUCTS

2.1 DENTAL ORAL EVACUATION VACUUM PUMPS

A. Dental Oral Vacuum Pumps furnished by Owner. Contractor shall install to provide a complete installation. Contractor shall inventory, prior to bid, VA furnished equipment and provide all necessary interconnecting piping, valves, gauges, isolators, etc. for a complete installation. Coordinate with VA facilities engineering.

2.2 PIPING

A. Poly (Vinyl Chloride) (PVC):

1. PVC Piping: ASTM D1785-06, Type 1 (normal impact), Grade 1 (chemical resistance), Schedule 40 pipe. Provide socket ASTM D2566 fittings and ASTM D2564 PVC solvent cement with PVC primer recommended by manufacturer. Provide DWV (drain-waste-vent). Use long radius fittings for turns and wye fittings for branching, as defined in Section 22 13 00, FACILITY SANITARY SEWERAGE. Minimum pipe size for parts of distributing piping in or below slab is 50 millimeter (2").
- B. 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.
- C. Cleanouts: Same size and material as pipe. Provide accessible and easily removable cleanouts as defined in Section 22 13 00, FACILITY SANITARY SEWERAGE.

2.3 MEDICAL VACUUM PIPING (MEDICAL GAS)

- A. Copper medical gas tube shall be type K or L, seamless, drawn temper meeting ASTM B819 that has been cleaned, purged, and sealed for medical gas service by the pipe manufacturer. Standard color markings "ACR/MED" shall be in green for Type K and in blue for type L tubing.
- B. Copper Water Tube: ASTM B 88, Type M (ASTM B 88M, Type C), seamless, drawn temper [that has been manufacturer cleaned, purged, and sealed for medical gas service or according to CGA G-4.1 for oxygen service].
- C. Wrought copper fittings shall be solder joint, dimensions for brazed joints complying with ASME B16.22.
- D. Brazing filler Metals shall be BCuP series, copper-phosphorus allows for general duty brazing conforming to AWS A5.8. C. Screw Joints shall be made with Degreased polytetrafluoroethylene (teflon) tape.

- E. Piping identification labels shall be applied in accordance with NFPA 99. Supplementary color identification shall be in accordance with CGA pamphlet C-9.
- F. Temperature and pressure ratings of Memory metal couplings shall be not less than that of a brazed joint shall be permitted. The memory metal couplings shall be made of ASTM F 2063, nickel titanium, shape memory alloy, cleaned, purged, and sealed for medical gas service.
- G. All installation shall be performed in strict accordance with NFPA 99 5.1.10. Brazing procedures shall be as detailed in NFPA 99 5.1.10.5. Brazing shall be performed only by brazers qualified under NFPA 99 5.1.10.10.11.

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.
- C. Slope horizontal piping not less than $\frac{1}{4}$ " 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. 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 Resident 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.

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