

SECTION 11370 - BLOWERS, COMPRESSORS, AND VACUUM PUMPS, GENERAL

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing blowers, compressors, and vacuum pumps with drives, motors, speed control equipment (if any) and accessories.
- B. The WORK also requires that one manufacturer accept responsibility for furnishing the WORK as indicated but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibilities shall manufacture the principal elements and components including (but not by way of limitation) the driven equipment.
- D. The WORK also includes coordination of design, assembly, testing and installation.
- E. The WORK of this Section applies to the WORK of the following Sections:
 - 1. Section 11371 Blowers, Positive Displacement
 - 2. Section 11372 Blowers, Centrifugal, Multistage
 - 3. Section 11373 Compressors, Base-Mounted
 - 4. Section 11374 Blowers, Turbine
 - 5. Section 11407 Digester Gas Compressor

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment General Provisions

1.3 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. ANSI/ASME PTC 9 Performance Test Code - Displacement Compressors, Vacuum Pumps and Blowers
 - 2. ANSI/ASME PTC 10 Performance Test Code - Compressors and Exhausters

3. ANSI/IEEE 112 Test Procedure for Polyphase Induction Motors and Generators
4. ANSI/IEEE 115 Test Procedure for Synchronous Machines

1.4 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11000, the following shall be submitted in compliance with Section 01300:
 1. Performance curve (and data) indicating points on the H/Q curves, and the limits recommended for stable operation between which products may be operated without surge and vibration. The stable operating range shall be as wide as possible based on actual tests performed at the factory in accordance with the ANSI/ASME PTC 9 and 10 test codes.
 2. Electrical data including control and wiring diagrams.
 3. Assembly and installation drawings including shaft size, seal, coupling, anchoring details, part nomenclature, material list, outline dimensions and shipping weights.
 4. Certification that the designated single manufacturer accepts responsibility for coordination of design, assembly, testing and installation.

1.5 OWNER'S MANUAL

- A. In addition to the requirements of Section 11000, the following shall be included in the OWNER'S Manual in compliance with Section 01300:
 1. Manufacturer's installation instructions.
 2. List of special tools.
 3. List of spare parts recommended by the manufacturer.
 4. Certification by CONTRACTOR and manufacturer that products comply with the indicated requirements.

1.6 FACTORY INSPECTION AND TESTING

- A. The CONTRACTOR shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for [two] OWNER-designated inspectors for the number of days indicated to complete such inspections or observations, if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. The CONTRACTOR shall not be responsible for salary or salary-related costs of the inspectors. The CONTRACTOR shall comply with the requirements of Section 01400.

B. **Equipment Testing:** The WORK includes equipment testing as follows:

1. General: Tests shall be performed in accordance with the ANSI/ASME PTC 9 and 10 Performance Test Codes. Tests shall be performed on the actual assembled unit from surge condition to 25 percent above the indicated design capacity. Prototype model tests will not be acceptable. All tests performed in the factory shall be certified by the manufacturer and submitted by the CONTRACTOR for approval, prior to shipment.
2. Factory Tests of Blowers and Compressors: Blowers, compressors and vacuum pumps of sizes 10 to 125 hp shall be factory-tested.
3. Factory Tests of Motors: Motors of size 10 hp and larger, shall be assembled, tested, and certified at the factory and the clearances shall be verified to ensure that parts fit properly. The tests shall be conducted in accordance with ANSI/IEEE 112 and ANSI/IEEE 115 standards, including heat run and efficiency tests.
4. Factory Witnessed Tests: Blowers, compressors and vacuum pumps with variable speed drives, and motors, 150 hp and larger, shall be factory-tested as complete assembled units, and shall be witnessed by the CONSTRUCTION MANAGER.

1.7 FIELD TESTING

A. **Field Tests:** Blowers, compressors and vacuum pumps shall be field tested to demonstrate proper operation, without noise, vibration, and overheating of the bearings. The field testing shall be performed in the presence of a factory-trained, experienced field representative of the manufacturer, who shall supervise the following tasks and shall certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation:

1. Start-up, check, and operate the equipment over the entire speed range without exceeding recommended vibration amplitudes.
2. Obtain concurrent readings, showing motor voltage, amperage, and discharge head.
3. Check power leads to the motor for proper current balance.
4. Determine bearing temperatures by a contact-type thermometer. A running time of at least 20 minutes shall be maintained for this test.
5. Test electrical and instrumentation for compliance with Section 13300.
6. The field testings shall be witnessed by the OWNER or its representative. In the event any of the equipment fails to meet the above test requirements, it shall be modified and retested. The CONTRACTOR shall then certify in writing that the equipment has been satisfactorily tested, and that all final adjustments thereto have been made. Certification shall include date of final acceptance test, as well as a listing of all persons present during tests, and resulting test data. The costs of all work performed in this Subsection by factory-trained representatives shall be borne by the CONTRACTOR. The OWNER

will pay for power costs. When available, the OWNER'S operating personnel will provide assistance in the field testing.

1.8 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall be provided in accordance with Section 11000 when listed in specific blowers, compressors and vacuum pumps sections.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. **General:** Products certified as complying with the indicated requirements shall be furnished.
- B. **Products:** Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.
- C. **Quality:** Where 2 or more units of the same type and/or size are indicated, the units shall all be manufactured by the same manufacturer.

2.2 MATERIALS

- A. Materials employed in blowers, compressors, and vacuum pumps shall be designed for the intended purpose and shall be free from defects and imperfections and shall comply with the following:
 1. Cast iron casings shall be of close-grained gray cast iron conforming to ASTM A 48.
 2. Stainless steel shafts shall be of Type 400, Series.
 3. Miscellaneous stainless steel parts shall be of Type 316.
 4. Anchor bolts, nuts and washers shall be hot-dip galvanized except as otherwise indicated.

2.3 APPURTENANCES

- A. **Nameplates:** Blowers, compressors, vacuum pumps, and motors shall be equipped with stainless steel nameplates indicating rated head and capacity, impeller size, speed, and manufacturer's name, serial, and model number. Nameplates for electric motors shall comply with Section 16040.
- B. **Solenoid Valves:** Solenoid valves shall be installed on the water or oil lubrication and cooling lines. Solenoid valve electrical ratings shall be compatible with the motor control voltage and the WORK includes conduit and wiring installation from control panel to solenoid.

- C. **Gauges:** Blowers, compressors, and vacuum pumps shall be equipped with pressure vacuum gauges installed in the discharge lines. Pressure gauges shall be properly located in a location not subject to shock and vibrations. Pressure gauges shall comply with Section 13300. Where shock or vibrations are indicated, the pressure gauges shall be wall-mounted or attached to galvanized channel floor stands and connected by means of flexible connectors.
- D. **Variable Speed Drives:** Variable speed drives, drive motors, speed control equipment, and accessories shall comply with Sections 11030 through 11034.
- E. **Control Panels:** The NEMA rating of local control panels shall be in accordance with the area designations of Section 16050, unless indicated otherwise.
- F. **Flanges:** Suction and discharge flanges shall conform to ANSI B16.1 or B16.5.
- G. **Lubrication:** Blowers, compressors, vacuum pumps, and motors shall be oil- or grease-lubricated as recommended by the manufacturer.
- H. **Drains:** Cooling water drains shall be piped to the nearest floor drain with galvanized steel pipe or copper tube properly supported with brackets.

2.4 TOOLS AND SPARE PARTS

- A. **Tools:** The WORK includes special tools necessary for maintenance and repair; such tools shall be stored in tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags.
- B. **Spare Parts:** Spare parts shall be stored in accordance with the provisions of this paragraph. Spare parts shall be tagged by project equipment number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate). Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping. Spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box with a hinged wooden cover and locking hasp. Hinges shall be strap type. The box shall be painted and identified with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts." A list of the spare parts in the box shall be taped to the underside of the cover.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. **General:** Blowers, compressors, and vacuum pump equipment shall be installed in accordance with the manufacturer's installation instructions, Section 11000, this Section, and the requirements of the individual blowers, compressors and vacuum pumps sections.
- B. **Alignment:** Equipment shall be field tested to verify proper alignment and operation free from binding, scraping, excessive noise, overheating, vibration, shaft-runout, or other defects.

Drive shafts shall be installed without forcing. Equipment shall be secured in place and shall be neat in appearance.

- C. **Piping and Mounting:** Piping shall include sufficient expansion joints, guides, and anchors and shall be supported. Flexible connectors shall be included to isolate the equipment from the piping system. Each unit shall be mounted on a concrete pad capable of supporting the dead weight of the unit by means of restrained vibration isolators or resilient pads of proper design.
- D. **Lubricants:** The WORK includes oil and grease for initial operation and for one year's operation.

3.2 PROTECTIVE COATING

- A. Exposed materials, except corrosion-resistant metals which have not been shop painted, shall be field coated in compliance with Section 09800. Shop coating which has been damaged shall be touched-up.

** END OF SECTION **