

SECTION 11000

MECHANICAL EQUIPMENT - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section contains general information required to install mechanical equipment as shown on the plans and specified on the various individual specifications.
- B. Included shall be all supervision, labor, materials, tools, equipment, and services as required for installation and test operation of equipment, including the services of Manufacturer's service engineers, receiving, unloading, storage, protection, installation, and complete erection of all mechanical equipment required in these Specifications.
- C. Installation shall include, but not be limited to, placing, shimming, anchoring, grouting, cleaning, painting, lubricating, assembling, testing, and adjusting of all mechanical equipment. Installation shall also include providing all required miscellaneous parts.
- D. The Contractor shall coordinate his work with other disciplines to provide a complete, operational installation.

1.2 QUALITY OF EQUIPMENT

- A. Equipment and appurtenances shall be designed for and constructed of materials for the conditions of exposure and of such strength to withstand all stresses which may occur during testing, installation, and all conditions of normal operation.
- B. Machinery parts shall conform exactly to the dimensions shown on the Shop Drawings. The corresponding parts of identical machines shall be made interchangeable. Clearance shall be provided for repairs, inspection and adjustment.
- C. Exposed surfaces shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structure shapes shall be rounded or chamfered for personnel protection.

- D. All machinery and equipment shall comply in all respects with the provisions of the Occupational Safety and Health Act of 1970, and other applicable Federal, State and Local Laws and Regulations.

PART 2 - PRODUCTS

2.1 ANCHORS AND SUPPORTS

- A. The Contractor shall furnish, install, and protect all guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation. Anchors and supports shall be of ample size and strength for the purpose intended and shall be approved by the Engineer.
- B. Anchor bolts shall be furnished and set in concrete foundations where required.
- C. The Contractor shall obtain and use approved Shop Drawings and suitable templates for installation of equipment.

2.2 LUBRICATION

- A. The Contractor shall thoroughly lubricate all equipment in accordance with the equipment and manufacturer's instructions. Lubricating oils and greases shall be of the type and viscosity recommended by the equipment manufacturer.
- B. All lubricants shall be furnished with flushing oils as recommended by the Manufacturer. This includes, but is not limited to, all gearing and bearings, regardless of whether they have been shipped with or without oil soluble protective coatings.
- C. Following flushing, oil lubricating systems shall be filled with "run-in" oil as recommended by the equipment manufacturer. The equipment shall be "run-in" at the no-load condition for a minimum of two (2) hours. Following "run-in" and inspection, the equipment is to be drained and flushed again with flushing oil and refilled with lubricant as recommended by the Manufacturer.
- D. The grease fittings on all mechanical equipment shall be a standard button head type.
- E. Where locally mounted grease fittings would be difficult to service, the fittings shall be extended by adequately sized tubing to a point that shall provide accessibility for normal maintenance. Such points shall be located and installed as directed by the Engineer.

2.3 PROTECTIVE COATINGS AND PAINTING

- A. All equipment and materials shall be shop painted. Particular attentions shall be directed to wetted surfaces and other areas exposed to corrosive, extreme temperature or other hazardous environments. Refer to individual equipment specifications for painting requirements.
- B. All machined surfaces and shafting shall be cleaned and protected from corrosion by the proper type and amount of coating necessary to assure protection until start-up.
- C. Oil lubricated gearing, bearings, and other lubricated components, shall be shipped with an oil soluble protective coating as recommended by the Manufacturer. The coating shall be selected to provide protection until start-up.
- D. Do not paint over any labels or identification plates.
- E. Refinish equipment if it is damaged during construction/installation.

2.4 TOOLS AND ACCESSORIES

The Contractor shall furnish with each type, make, or size of equipment, any special tools, wrenches and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be high-grade, properly labeled, and delivered to the Owner with the equipment.

PART 3 - EXECUTION

3.1 NOISE REQUIREMENTS

All equipment specified to be tested for noise generation shall be tested after installation. When tested, equipment shall include the complete driver and driven equipment. Three (3) certified copies of the test shall be submitted to the Owner for approval prior to final acceptance.

3.2 SHOP INSPECTION AND SHOP TESTING

All equipment shall be inspected at the Manufacturer's shop before shipment. Where shop tests are specified, unless otherwise specified, the tests shall be the Manufacturer's standard test procedures and the Manufacturer shall demonstrate that the equipment meets all the requirements of these tests.

3.3 SHIPPING AND IDENTIFICATION

- A. Each piece of equipment shall be provided with a substantial stainless steel or aluminum nameplate, securely fastened in a conspicuous location and clearly inscribed with the Manufacturer's name, year of manufacture, serial number, principal rating data and equipment item number.
- B. All openings shall be covered with plywood, plastic or wood plugs or shields to prevent debris from entering the assemblies.

3.4 OPERATING AND MAINTENANCE DATA

Operation and Maintenance Data shall be furnished in accordance with Section 01730 before mechanical start-up.

3.5 INSTALLATION OF EQUIPMENT

- A. Before installation of any equipment the Contractor shall furnish the Engineer with one set of detailed installation and operation instructions. This copy shall be in addition to the Contractor's copy or copies available on the job site for his instruction. Equipment shall not be installed until these instructions are available to the Engineer.
- B. The Contractor's work procedure shall conform to the Manufacturer's installation instructions unless expressly directed otherwise by the Engineer.
- C. All equipment shall be installed level and plumb on the foundations and supports at the locations and elevations shown on the plans, unless otherwise directed by the Engineer during installation.
- D. The equipment shall be brought to proper level with wedges and shims or backing nuts. After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to anchor the machine firmly into place against the shims or backing nuts. The entire void between the equipment and its foundation shall be filled with grout. Grout shall be non-metallic, non-shrink grout meeting Corps of Engineers Specifications CRD-C-621 (588) Volume Change per ASTM C-827 0.00% shrinkage compressive strength 5,000 psi seven (7) days.
- E. All equipment shall be installed in such a manner as to provide access for routine maintenance and lubrication.
- F. Equipment of a portable nature which requires no installation shall be delivered to a location designated by the Owner.

3.6 OPERATION AND MAINTENANCE INSTRUCTION

- A. The Contractor shall provide a minimum of 40 hours of instruction time after the equipment has been accepted by the Owner to instruct the Owner's personnel in the proper operation and maintenance of the equipment. The Manufacturer shall provide technical personnel familiar with the operation and maintenance of the equipment in making this presentation. The service shall be coordinated with the Owner.
- B. Training shall consist of on-site operation training, classroom training, operational, safety and emergency drills.
- C. The Manufacturer shall recommend to the Contractor additional number of training days that may be required, if necessary, to properly instruct the Owner's operating personnel in the proper use of the equipment. Such additional instruction time shall be included by the Contractor in the Bid.

3.7 FIELD SERVICE BY MANUFACTURERS

The Contractor shall provide the Manufacturers' qualified field representatives and supporting personnel as required for the equipment furnished and installed under this Contract to perform the following:

- A. If recommended by the Manufacturer, inspection during equipment installation work shall be provided to determine compliance with equipment erection methods and procedures recommended by the Manufacturer.
- B. Provide written approval of the equipment installation to the Owner after satisfactory completion mechanical start-up and "run-in" period of the equipment, but prior to process start-up.
- C. Conduct the process start-up necessary to operate, adjust, calibrate and tune the equipment and systems into operating service in accordance with the design criteria described in each equipment specification and all manufacturer's criteria.
- D. Conduct performance tests to demonstrate compliance with design and manufacturer's criteria and performance guarantees set forth in the specifications.
- E. Provide written approval of performance accompanied by results of all tests. Also provide written certification that the equipment has been adjusted, calibrated and tuned to manufacturer's specifications.

3.8 MECHANICAL START-UP

- A. Once the equipment has been installed, complete with all auxiliary and support systems, and is ready for operation, the Contractor shall mechanically check out the equipment to verify that the equipment functions correctly under "non-process" conditions. The equipment shall be fine-tuned, adjusted, water tested, where applicable, and completely checked out before the equipment and support systems are considered ready for process start-up.
- B. The Contractor will be responsible for coordinating this effort and providing all support services and facilities necessary for this work effort.
- C. The equipment will not be considered ready for process start up until the Engineer is satisfied that the equipment has been satisfactorily checked out and successfully passed a "non-process" test run.

3.9 PROCESS START-UP AND PERFORMANCE TESTS

- A. Once the Engineer considers the equipment ready for process start-up and the support systems can deliver the process material, the Contractor shall start up the equipment under process conditions and conduct performance tests to verify compliance with the Specifications.
- B. The Contractor shall provide the necessary supervision and technical personnel and services required to perform the work. The Contractor shall coordinate this phase of the work with the Owner who shall provide necessary support services and facilities to assist the Contractor in performing the work.
- C. The equipment shall be considered ready for a performance test only after the Contractor has demonstrated to the Engineer that the equipment can operate continuously, without mechanical interruption under process flow conditions for up to three (3) days, or a such lesser time as may be mutually agreeable to the Engineer and Contractor.
- D. After it has been determined that the equipment will operate satisfactorily under process conditions, the performance test shall be made by the Contractor to verify that the equipment can meet the requirements outlined in the specifications. The performance tests shall be based on maintaining the design requirements for up to five (5) consecutive days or such lesser time mutually agreeable to the Engineer and the Contractor.

- E. In the event that the process material does not conform to the design criteria of the specifications to the extent that the equipment cannot meet the specified requirements, then the Owner and Contractor may mutually adjust the design criteria to an equivalent basis in order that equipment performance can be evaluated. Any adjustment in the design criteria and equipment performance specifications will be established by the Engineer and agreed to by both parties in writing.
- F. All equipment installed under this Contract shall be tested for performance according to design criteria. If no design criteria are established in the specifications, the design criteria shall be recommended by the manufacturer and approved by the Engineer prior to testing.
- G. Performance test procedures shall be prepared by the Contractor and approved (in writing) by the Engineer before performance tests are conducted.

3.10 FAILURE OF TESTS

- A. Any defects in the equipment, or deviations from the guarantees or requirements of the specifications, shall be promptly corrected by the Contractor by replacement and/or Manufacturer and Engineer approved repair. If the Contractor fails to correct any defects or deviations, or if the replaced equipment, when tested, shall fail to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacturer of such equipment, may reject that equipment and order the Contractor to remove it from the premises at the Contractor's expense.
- B. If the Owner rejects a particular item of equipment, the Contractor hereby agrees to repay to the Owner all sums of money paid to him for the rejected equipment on progress certificates or otherwise. Upon receipt of such monies the Owner will execute and deliver to the Contractor a bill of sale of all his rights, title, and interest in and to the rejected equipment; provided, however, that the equipment shall not be removed from the premises until the Owner obtains from other sources equipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses, or other conditions arising out of the basic contract. The Contractor hereby agrees to obtain alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or other charge until the alternate equipment is obtained.

- C. The Contractor shall also agree to repay the Owner installation costs for the rejected equipment. The installation costs will be derived by the Owner based on actual costs charged for the installation of the equipment.

3.11 ACCEPTANCE OF EQUIPMENT BY THE OWNER

After all the conditions of the drawings and specifications have been satisfied, the Owner will designate in writing that the equipment is accepted, and at such time the Owner will be responsible for all further maintenance and operation of same.

END OF SECTION 11000.