1. INTRODUCTION AND PURPOSE

1.1. This specification covers the installation, testing and pre-commissioning of mechanical equipment. Work is to be performed in conjunction with the manufacturer's instructions, standard industrial practices, and relevant codes and standards.

1.2. The electrical/instrumentation installation work is identified in a separate document. The mechanical work shall be coordinated with the electrical/instrumentation work to provide a complete and operable system.

1.3. Whenever conflicts exist between the manufacturer's instructions, this Specification, other specifications, the drawings, or codes, the OWNER Construction Manager shall be notified and shall provide the final resolution.

2. CODES AND STANDARDS

All equipment shall be installed in accordance with, but not limited to, the latest editions and applicable provisions of the following codes, laws, regulations, and standards.

2.1. Codes, Laws, and Regulations

2.1.1. Mine Safety and Health Administration (MSHA)

2.1.2. Standard Building Code (SBC)

2.1.3. Standard Fire Prevention Code (SFPC)

2.1.4. Standard Mechanical Code (SMC)

2.1.5. USA Environmental Protection Agency (EPA)

2.1.6. All state and local laws and ordinances.

2.1.7. All other applicable codes, laws, and regulations.

2.2. Standards

2.2.1. American Institute of Steel Construction (AISC)

2.2.2. American Iron and Steel Institute (AISI)

2.2.3. American National Standards Institute (ANSI)

2.2.4. American Society of Mechanical Engineers (ASME)

2.2.5. American Society for Testing and Materials (ASTM)

2.2.6. American Welding Society (AWS)
2.2.7. National Electrical Code (NEC)
2.2.8. Steel Structures Painting Council (SSPC)
2.2.9. All other applicable standards.

3. GENERAL REQUIREMENTS

3.1. The Contractor shall provide supervision, labor, equipment, materials, tools, and supplies unless specifically noted as being provided by others, to perform the work described herein in accordance with this document and the referenced specification, drawings, and related documents. Work not specifically shown on the drawings or enumerated herein but that is reasonably necessary for the proper completion of the contract shall be provided by the Contractor the same as if shown on the drawings or enumerated herein.

3.2. The mechanical equipment shall be installed in accordance with all applicable federal, state and local codes, standards, rules, regulations, and laws including, but not limited to, the codes and standards referenced in Section 2 of this Specification.

3.3. Unload OWNER furnished equipment and materials. Load and transport equipment and materials from the storage area to the installation location.

3.4. Install all the equipment shown on the drawings or as noted in other contract documents.

3.5. Equipment installation shall include the supply and placement of grout for equipment or materials and the supply and installation of anchors and fasteners as required for a complete installation.

3.6. Motor driven equipment placement shall include alignment, assembly of belts, sheaves, couplings, guards, etc. as required for a complete installation.

3.7. The Contractor shall inspect the location for the equipment to be installed prior to beginning installation to insure readiness of area including anchor bolt locations, size, projections and placement of support steel where applicable.

3.8. Work in an area shall be coordinated through the OWNER Construction Manager. No installation of equipment shall be installed without release of the area for such installation.
3.9. All materials and equipment furnished by the Contractor shall be in accordance with the specifications. Substitution of any materials deviating from the specifications and drawings shall be approved in writing by OWNER. A description of Contractor supplied substituted material shall be submitted to the OWNER Construction Manager for approval.

3.10. The Contractor is responsible to alter the drawing dimensions affected by using different approved items where applicable. Any such dimensional changes shall be submitted on “As-Built” drawings.

4. INSTALLATION REQUIREMENTS

4.1. The Contractor shall read and understand the manufacturer’s installation requirements prior to beginning the installation of the equipment.

4.2. Equipment shall only be lifted and handled in accordance with the manufacturer’s instructions and at points and locations designated for such handling.

4.3. Before installation, all parts shall be thoroughly cleaned of all rust, grit and foreign matter. Where accessible without disassembly, all holes and grooves for lubrication shall be examined and cleaned where necessary. Bolts and screws shall be tightened uniformly without over-stressing the threads. Anchor bolts shall be adequately tightened, and all other bolts shall be tightened per manufacturer's instructions.

4.4. During installation of equipment, all small access openings shall be covered with temporary covers made of tape, plywood or sheet metal whenever work is not actually in progress.

4.5. Clearance around all equipment shall be checked prior to installing the equipment. Any interference or lack of access for maintenance that may be evident shall be reported to the OWNER Construction Manager.

4.6. All foundation elevations and bolt locations shall be verified prior to the start of installation of equipment. Bending of bolts to fit equipment base plate holes beyond the limit of the bolt sleeves will not be acceptable.

4.7. Leveling and alignment of all equipment shall be within the tolerance specified in the manufacturer's instructions. Where equipment is received as a shop-assembled unit, alignment shall be checked and adjusted where necessary.
4.8. Leveling plates, dowels, shims, and grout are to be furnished by the Contractor. Grouting material shall be applied in accordance with the printed instruction from the grouting material manufacturer.

4.9. Field alterations to equipment to facilitate installation shall not be made without written approval from OWNER. Subassemblies shall be dismantled only to the extent necessary to verify clearances, equipment condition and lubrication requirements. Total dismantling of the subassemblies, if necessary, shall be carried out only with the written approval from OWNER.

4.10. The Contractor shall maintain alignment and lubrication records on all mechanical equipment and submit them to OWNER for acceptance upon completion of the installation. Such records shall clearly indicate at least the following:

4.10.1. Equipment name and number
4.10.2. Contract number and name
4.10.3. Contractor's name
4.10.4. Contractor's employee name, craft type and employee number.
4.10.5. Date and other pertinent details

4.11. Shaft coupling installation and alignment shall be per manufacturer's instructions. All allowable offsets and angular misalignment shall be per manufacturer's tolerances.

4.12. Safety guards around rotating equipment furnished by the equipment manufacturer, but shipped loose shall be installed by the Contractor in accordance with equipment manufacturer's instructions.

4.13. Welding

4.13.1. All welding for non-ASME code vessel/equipment shall be in accordance with the structural welding code of American Welding Society AWS-D1.1. No welding is allowed on ASME code vessel/equipment.

4.13.2. All welding procedures and welding procedure qualification test records shall be submitted for review and acceptance by OWNER.

4.13.3. Prior to performing welding on any equipment, specific release shall be obtained from OWNER.
4.13.4. Welding shall not be performed in the proximity of bearings. Grounding for welding shall not be through the shaft or bearing.

4.13.5. Welding shall not be carried out while the rigging is attached to the equipment.

4.14. Cleaning, Lubricating and Hydraulics

4.14.1. All equipment shall be lubricated in accordance with the manufacturer’s instructions.

4.14.2. Rotating equipment which has been shipped dismantled for assembly in the field, or shipped without lubricants, shall have the bearings cleaned, inspected and lubricated.

4.14.3. All field-assembled lubrication or hydraulic oil supply and return piping shall be cleaned and pressure tested in accordance with the applicable specification or alternate procedure as approved by OWNER. Factory-assembled lubrication and hydraulic systems do not require flushing unless manufacturer states otherwise or if contamination is suspected.

4.14.4. Grease or other protective coating applied for protection of the equipment in shipping and storage shall be removed using suitable solvents or cleaners which will not damage the finish of the machine.

4.14.5. Contractor shall be responsible to provide all hydraulic oils, lubricating oils and flushing oils for all mechanical equipment in strict accordance with the manufacturer’s recommendation.

5. INSPECTION AND PRE-COMMISSIONING OF MECHANICAL EQUIPMENT

5.1. After the basic system and equipment is installed, the following shall be performed and recorded to assure construction completeness:

5.1.1. Check installation for conformance with the design and specifications using available data (design drawings, vendor’s drawings and manuals, process and instrument diagrams [P&IDs].)
5.1.2. Confirm suitability of mechanical equipment operation by:
  • Checking alignment of all couplings, belts, gears, reducers, and sprockets (complete all records)
  • Checking freedom of shaft rotation
  • Checking tightness of seals, inspecting packing of glands, and stuffing boxes
  • Checking lubrication (complete all records)

5.1.3. Perform and record required tests such as visual inspection, pressure and hydrostatic.

5.1.4. Check that all moving parts have safety guards and if not, Contractor shall provide acceptable field guards.

5.1.5. Check cleanliness of equipment and systems.

5.1.6. The above shall include all checks and tests which can be performed without energizing systems.

5.2. When construction completeness is confirmed, pre-operational tests require energizing all systems. The first operation of the equipment shall be without material, the only exception being pumps which must be run, as applicable, with water or oil. All run-in tests shall consist of continuous operation until all bearing temperatures and equipment vibrations reach a steady state condition. The following tests shall be made:

5.2.1. Check operation of hydraulic and lubrication systems. Oil supply shall be confirmed.

5.2.2. Ensure the motor rotation has been checked before connecting motor driven equipment.

5.3. Make sure that the equipment operates with minimum vibration within limits established by the manufacturer.

5.3.1. Checks shall be made between all moving parts to be sure there is no interference and that clearances are to manufacturer’s tolerances.

5.3.2. Make sure that all instrument devices, limit switches, timing devices, overload trips, alignment switches, emergency stop switches and the like, are operating properly.

5.3.3. Simulate system operation and make other adjustments as required to ensure satisfactory run-in operation.
5.3.4. It will be the Contractor’s responsibility to do touch-up painting on all finished surfaces damaged or abraded during installation or left unpainted for field welding. Contractor shall prepare the surface by removing all oil, dirt, scale, rust, and damaged paint and shall feather edge breaks in existing paint. Contractor shall furnish and apply the materials including primer and paint needed to properly restore the damaged surface coating.

5.3.5. Installation Contractor is to ensure that all chutes, material handling equipment and pipelines and ports are free from any obstruction or contamination.

5.3.6. All piping systems and vessels are to be isolated from contamination at all times, i.e. caps, plugs, covers, etc.

5.3.7. All systems are to be fully cleaned, tested, and inspected prior to first filling, flushing or introduction of processed and handled materials.

5.3.8. All manufacturer representatives required by OWNER are to be coordinated by OWNER.

5.3.9. All installation readings must be documented and accepted by the manufacturer representatives (where applicable) and OWNER prior to pre-commissioning.

5.3.10. All equipment calibration if required, is to be completed and confirmed in writing to OWNER prior to pre-commissioning.

5.3.11. All equipment is to be certified complete and ready for Start-Up. All parties involved in all disciplines are to sign off on each system prior to commissioning. This includes:
- OWNER
- Manufacturer Representative (if applicable)
- Installation Contractor
- Lower Tier Subcontractors (if applicable)

6. **PAINTING**

   Touch-up painting of installed mechanical equipment shall be in accordance with the following:

6.1. Chutes and other fabricated platework per fabricated platework specification.
6.2. Motor driven equipment per manufacturer’s standard paint and color or as approved by Owner.