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## SECTION 23 05 00\_COMMON WORK FOR HVAC SYSTEMS

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Start up
  - 2. Factory Training
  - 3. Quality Control
  - 4. Welding
  - 5. Soldering/Brazing
  - 6. Warranties
  - 7. As Built Documentation
  - 8. Close Out Documents
  - 9. Maintenance & Operation Technician Training

#### 1.2 REFERENCES

- A. All HVAC & Mechanical Standards

#### 1.3 DESIGN REQUIREMENTS

- A. It is not the intent of these design standards to be used as project specifications. Consulting Engineers shall use these design standards to guide them in developing project design drawings and specifications.
- B. It is the responsibility of the consulting engineer to as built all mechanical systems calculations at the end of construction. Consulting Engineer shall use as-built drawings, record submittals and balancing reports to determine final system operating characteristics. Consulting engineer shall revise all equipment schedules to reflect final conditions.
- C. The equipment vendor shall provide final as-built submittals for equipment provided. Final as-built submittals shall be based on the as-built system operating characteristics provided by the consulting engineer.

#### 1.4 WARRANTIES

- A. Unless specifically stated in other standards. All equipment and systems listed below shall have a 2 year parts and labor and 5 year parts only warranty:
  - 1. Rotating Equipment (Fans, Pumps, Compressors...etc)
  - 2. Equipment with on board electronics, controls and automation systems.
  - 3. Equipment in pressurized or energized systems
  - 4. Equipment with onboard heat generation (humidifiers...etc)
  - 5. Metering equipment
  - 6. Steam and Hydronic Controls, Valves and Specialties
  - 7. Air Distribution Controls and Devices

#### 1.5 EXTRA MATERIALS

- A. For all equipment requiring lubricant, provide two (2) containers of lubricant for each equipment requiring lubricant.
- B. If equipment requires a specialty tool, provide one (1) specialty tool for each equipment. This shall include any mechanical device, electrical device or software.
- C. If belt driven equipment is provided, a spare set of belts and sheaves must be provided for each belt driven equipment.
- D. If equipment is supplied with filters, provide one spare (set of) filter(s) per equipment.

#### 1.6 START UP

- B. Verify the equipment is wired correctly.
- C. Verify the systems is completed and energized.
- D. Verify BAS is installed and operating.
- E. Verify that amperage and voltage to powered equipment is within design.
- F. Verify that equipment is rotating in the correct direction.

- G. Verify the equipment, instrument or piping specialty is installed as per manufacturer's installation instructions.
- H. Verify all parts requiring lubrication have been properly lubricated.
- I. Verify systems have been properly flushed and cleaned.
- J. Start up all equipment per manufacturer's procedures.
- K. All equipment startups must be performed by a technician specifically trained by the manufacturer (factory trained) in the starting up of the equipment. Contractor shall provide certification that technician has successfully completed factory training on startup procedures.
- L. Startup technician must complete and submit all factory startup check lists as part of the close out documents. In addition the contractor or equipment vendor must complete and submit a startup report that states that equipment was installed properly and is operating within tolerance.

#### 1.5 CLOSE OUT DOCUMENTS

- A. Equipment vendor or contractor shall submit "as-built" submittals. The as-built submittals shall be revised to reflect final post construction conditions. As built submittals shall be submitted in both PDF format and as a paper copy.
- B. Equipment vendor or contractor shall submit operation and maintenance manuals for each piece of equipment supplied on the project. Operation and Maintenance manuals shall be submitted in both PDF format and as a paper copy.
- C. Equipment vendor or contractor shall complete an equipment data sheet (Excel Spreadsheet Format) for each piece of equipment. Equipment vendor shall submit both electric (Excel Spreadsheet) and paper versions of the data sheets.
- D. Equipment vendor or contractor shall submit a list of replacement parts for each equipment supplied on the job. The replacement parts list shall indicate quantities of parts needed, part number, manufacturer of part and manufacturer's model number for the part.
- E. Contractor shall submit a complete set of as-built drawings for the project. All drawings issued with the bid package (plans, elevations, sections, diagrams and details) shall be as-built. As built drawings shall be submitted in native CAD files, PDF format and paper copy.

- F. For complete close out requirements refer to University of Delaware standard 01 70 00 Execution and Close Out Requirements.

#### 1.6 FACTORY TRAINING & QUALITY CONTROL – SPECIALTY PIPE AND DUCT SYSTEMS

- A. The use of specialty pipe and duct systems shall be approved by the University of Delaware Energy and Engineering Department. (e.g. Aquatherm Piping, Kool Duct/Dual Tech Duct, PEX tubing...etc)
- B. If specialty pipe and duct systems are used, the mechanics and technicians installing the systems shall be factory trained by the manufacturer.
- C. The contractor shall provide certification that mechanics and technicians have successfully completed factory training.
- D. The mechanical contractor shall supply factory inspection of all specialty pipe and duct systems. The manufacturer must certify the specialty pipe or duct system installation conforms to its quality requirements. The manufacturer must submit written certification with the close out documents.

#### 1.7 FACTORY TRAINING – ANCHORING SYSTEMS

- A. For all anchoring systems, the mechanics and technicians installing the anchoring systems shall be factory trained by the manufacturer.
- B. The contractor shall provide certification that mechanics and technicians have successfully completed factory training.
- C. The mechanical contractor shall supply factory inspection of all anchoring systems. The manufacturer must certify the installed anchors conforms to its quality requirements. The manufacturer must submit written certification with the close out documents.

#### 1.8 WELDING

- A. All welders performing work at the University of Delaware must be certified per ASME standards for the type of welding the welder is performing.
- B. Mechanical contractor must submit a copy of the welders' certification prior to start of work.
- C. Mechanical contractor shall X-Ray 10% of the total welds on the project. If any welds fail X-ray examination, contractor shall X-ray 100% of the welds. The contractor is responsible for repairing all welds that failed x-ray examination.

1.9 SOLDERING/BRAZING

- A. All copper pipe greater than 2" diameter shall be brazed. Copper pipe less than 2" diameter can either be brazed or soldered.
- B. All soldering and brazing work must be certified per ASME standards. Mechanical contractor must submit a copy of the certification prior to start of work.

1.10 QUALITY CONTROL

- A. All mechanical contractors performing work on the University of Delaware campuses must have a quality control program.
- B. Mechanical contractor must submit a copy of its quality control procedures prior to start of work.

1.11 MAINTENANCE & OPERATIONS TRAINING

- A. Contractor shall provide factory training on the maintenance, repair and operation of each piece of equipment or control system installed during this project to the maintenance and operations personnel as designated by the Energy and Engineering Group.

**END OF SECTION**