

Standard Operating Procedure Start-Up Procedures & Verification for Chillers	SOP No. 8.039
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- 1 Purpose
 - 1.1 Provide a standard procedure for start-up and commissioning of HVAC equipment.
 - 1.2 Provide a standard procedure for coordinating selection, receiving, check out, and acceptance of new equipment.
- 2 Scope
 - 2.1 This procedure applies to (but is not limited to) the following types of equipment: Water Chillers and Glycol Chillers.
- 3 Responsibility
 - 3.1 Project managers have overall responsibility for new equipment from procurement to start-up. To assure optimum selection of equipment and smooth commissioning, the project manager is responsible for coordinating the following activities:
 - 3.1.1 Review of customer and specific job specifications.
 - 3.1.2 Review of equipment selected with Service prior to ordering. Assure equipment is on approved list.
 - 3.1.3 Review drawings, assure drawing schedules, and equipment details are correct.
 - 3.1.4 Coordinate delivery and commissions schedule with all team members including (but not limited to): Site Foremen, Balance and Service (start-up), Customer, General Contractor, and Safety (as needed).
 - 3.1.4.1 In most cases, Start-up should be scheduled a month in advance.
 - 3.1.4.2 If exact date is known, Service should be notified with estimated time frame.
 - 3.1.4.3 Communicate specific requirements to all team players in writing and verbally.

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3.1.4.4 Provide appropriate job number to team members.

3.2 Therma Service/Start-up has responsibility for the following activities:

- 3.2.1 Therma will provide a qualified service mechanic to perform equipment start-up.
- 3.2.2 The start-up technician will perform the start-up tasks as specified in the commissioning Standard Operating Procedure for that equipment.
- 3.2.3 Service will provide estimated time required to Project Manager (PM) prior to start-up. Service will meet agreed upon schedules to assure customer satisfaction.
- 3.2.4 The start-up technician will fully complete a start-up sheet for each piece of equipment. A copy of this sheet will be provided to the Project Manager with the turnover documents: A second copy will be filed in service by customer name and address.
- 3.2.5 All time will be charged to the appropriate job number as specified by the Project Manager. If requested, Time and Materials sheets shall be completed.

3.3 The Start-up/Commissioning Coordinator has responsibility for the following activities:

- 3.3.1 Provide a communication path between the Project Manager and the Field Foremen.
- 3.3.2 Schedule qualified personnel for start-up, balance, test, and room certification as required.
- 3.3.3 Coordinate punch-list completion with Project Managers.
- 3.3.4 Coordinate start-up, service, balance, and test report documentation.

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4 Procedures

4.1 General: Service Technician is responsible for filling out start-up sheet FN 8.039.1 for Chillers. A start-up sheet will be completed for each piece of equipment. Each sheet requires the following information:

4.1.1 Job identification: The job name, job number, and job address are to be completed by the start-up/commissioning coordination. These will be provided to the service technician.

4.1.2 Section 5 - Equipment Description.

4.1.3 Section 6 - Equipment Pre-Installation Inspection.

4.1.4 Section 7 - Equipment Installation Inspection.

4.1.5 Section 8 - Operational Inspection.

4.1.6 Signature - As each section and page is completed, the Service Technician must print and sign his/her name and record the date. This document should also be signed off by an owner representative when required.

5 Equipment Description

5.1 This section should be completed by the Service Technician. Any design documentation specifying equipment should be recorded in this section. This includes: Specification number, Submittal number, Process and Instrumentation Diagram number, Drawing number. Also, record which area this equipment will be serving.

5.2 Fill in the "design" column, record the following information as specified on the design documents. Unit Tag number (per drawings) Manufacturer (per equipment schedule and/or approved submittals) Model number (per equipment schedule and approved submittals)

6 Equipment Pre-Installation Inspection

6.1 For each of the following items: Check Yes, No or N/A for not applicable. If No is checked, describe the difference in the comment section and notify the Project Manager immediately. Initial and date each item as it is checked.

6.2 Nameplate data matches vendor specifications. When the equipment is delivered, verify it matches specifications. Complete Section 5. In the "actual on site" column, record the actual data as shown on the equipment and verify that it matches the design criteria.

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- 6.3 All parts are received and verify the packing slip(s).
 - 6.4 Inspect for visible signs of damage, leak, or defective parts. Note any discrepancies and notify the Project Manager.
 - 6.5 Verify electrical service for correct voltage, current and thermal overload protection.
 - 6.6 Operational and Maintenance (O&M) manual is available in the field.
 - 6.7 Start up technicians reviewed factory start up procedures in the O&M manual.
 - 6.8 If Therma provided Variable Frequency Drives that are controlling the fans, complete FN 8.029.1 VFD start-up form.
- 7 Installation Inspection
- 7.1 For each of the following items: Check Yes, No or N/A for not applicable. If No is checked, describe the difference in the comment section. Lock Out/Tag Out procedure should be observed before most of the following steps. If there are any discrepancies, notify the Project Manager immediately.
 - 7.2 Unit is installed on flat foundation and level. Check Operation and Maintenance literature: some equipment needs to be level to 1/8" or better to allow proper drainage and or operation.
 - 7.3 Tag number is attached to the unit. Tag should be attached to service disconnect or near unit identification plate, if mounted in a ceiling system tagging should reflect location above or below.
 - 7.4 Service clearance is adequate for maintenance. Service clearance includes access to the equipment through the ceiling systems, over duct work etc. Filter access for removal and replacement are essential.
 - 7.5 Controls are installed and tested. This maybe a separate controls system insure its connection to the Chillers is correct and is applicable to Chiller Operation and Maintenance literature.
 - 7.6 Valves are installed at inlet and outlet of evaporator and condenser water piping. Check Operation and Maintenance literature.
 - 7.7 Flow switches are installed in the chilled water and condenser water piping. Check Operation and Maintenance literature: generally most manufacturers require proof of flow on both chilled water and condenser water barrels.

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- 7.8 Flow switches are set for minimum flow plus 10%. Check Operation and Maintenance literature: the 10% above design flow will protect the chiller from possible flow switch drift or inaccuracies.
- 7.9 Pressure and temperature test ports are installed at inlet and outlet of the evaporator and condenser. Check Operation and Maintenance literature and mechanical drawing details.
- 7.10 Drain valves are installed to the evaporator and condenser. Check Operation and Maintenance literature and mechanical drawing details.
- 7.11 Vent valves are installed on the top of the evaporator and condenser. Check Operation and Maintenance literature and mechanical drawing details.
- 7.12 Water regulating valve is installed. Check Operation and Maintenance literature and mechanical drawing details: may be in another part of the system.
- 7.13 Water treatment is provided. Use start up sheet FN 8.046.1 if by Therma.
- 7.14 Water pressure relief valves are installed in the evaporator and condenser water piping. Check Operation and Maintenance literature and mechanical drawing details.
- 7.15 All condenser fan setscrews are tight.
- 7.16 Electrical connections are secure. Check all terminals, with a reliable meter, from line to line and to ground before checking all electrical connections in all panels, motors, and devices. Check wire, wire nuts, spade connectors, and crimps as well.
- 7.17 All access panels and covers are in place. Including: electrical, fan, filter, damper, return air, economizer section, supply air doors and covers.
- 7.18 Vibration isolators are installed and adjusted. Check Operation and Maintenance literature: internal and external isolation skids and springs need to be set properly. On isolators equipped with rubber damper washers on the seismic restraints these must be "just free" not compressed or removed isolation springs must not be used as leveling devices leveling should be accomplished otherwise.
- 7.19 All compressor shipping braces and compressor rail isolator sleeves are removed. Including: electrical, fan, filter, damper, return air, economizer section, supply air doors and covers.
- 7.20 Coils are clean and fins are straight.

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- 7.21 Crankcase heaters are installed.
- 7.22 Compressor oil level is within manufacturer specifications. Check O&M manuals.
- 7.23 Low ambient control is installed.
- 7.24 Relief valve type, setting, and capacity are correct.
- 7.25 Chilled and condenser water supply outlet is proper size. Check Operation and Maintenance literature and mechanical drawing design.
- 7.26 Chilled and condenser water return inlet is proper size. Check Operation and Maintenance literature and mechanical drawing design.
- 7.27 Make up water supply has proper shut-off and back flow device. Boilers or any other equipment with make-up water generally is fed by (an individual or a industrial water loop) a back flow prevention device to eliminate treated water getting back into potable water.
- 7.28 Temperature and pressure gauges are installed. Check Operation and Maintenance literature and mechanical drawing design.
- 7.29 Make-up water pressure regulator is installed. Check Operation and Maintenance literature and mechanical drawing design.
- 7.30 Expansion tank is installed. Check Operation and Maintenance literature and mechanical drawing design.
- 7.31 Pressure and temperature test ports are provided. Check Operation and Maintenance literature and mechanical drawing design.
- 7.32 Air separation device is properly installed. Check Operation and Maintenance literature and mechanical drawing design.
- 7.33 Pump(s) are installed. Check Operation and Maintenance literature and mechanical drawing design. (Use start-up sheet FN 8.033.1 if by Therma) Air separator generally should be upstream of pumps and downstream of Boiler.
- 7.34 Pot feeder is installed. Check Operation and Maintenance literature and mechanical drawing design.
- 7.35 System has been cleaned and treated. Check Operation and Maintenance literature and mechanical drawing design.

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7.36 Isolation valves are installed. Check Operation and Maintenance literature and mechanical drawing design.

7.37 Water treatment is installed. Check Operation and Maintenance literature and mechanical drawing design.(Use start-up sheet FN 8.046.1 if by Therma)

8 Operational Inspection

8.1 Use Operation and Maintenance literature and follow start up procedures the form FN 8.039.1 is a general out line and is to provide a quality assured start up when used in conjunction with the Operation and Maintenance literature. If there are any discrepancies, notify the Project Manager immediately.

8.2 Unit vibration is acceptable. Check Operation and Maintenance literature for tolerances. Check for vibration at different fan speeds and volumes. Check unit, check around unit and below roof under unit.

8.3 Each fan rotation is correct.

8.4 Cooling components perform per manufacturer's specifications. Check Operation and Maintenance literature: verify all safety controls, operating controls, and refrigeration performance.


8.5 Crankcase heaters are functional. Check Operation and Maintenance literature: verify voltage, wattage, amperage.

8.6 Make sure thermostat is set. Operate (or have operated) temperature controls to ensure all functions and set points.

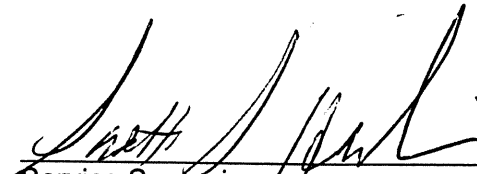
8.7 Record start up operating parameters in the Supplementary Form(s), FN 8.028.2 or FN 8.028.3. Use as many of the supplementary forms as necessary to complete the Chiller start up form FN 8.039.1.

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Document Approval


Service Manager

5-18-99
Date


Service Supervisor

5/19/99
Date


Quality Assurance Manager

5-28-99
Date

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