

Standard Operating Procedure Start-Up Procedures & Verification for Hydronic Piping	SOP No. 8.046
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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: Chilled, Cooling, Hot, Heating, Process and Condenser.
- 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.

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3.1.4.3 Communicate specific requirements to all team players in writing and verbally.

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 Material sheet(s) 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 8.046.1 for Hydronic Piping. 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, and Process and Instrumentation Diagram, and Drawing number. Also, record which area this equipment will be serving.

5.2 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)

5.3 Fill in filter and belt information.

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.

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- 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.
 - 6.3 All parts are received and verify the packing slip(s).
 - 6.4 No visible signs of damage, leak, or defective parts. Note any discrepancies and notify the Project Manager.
 - 6.5 Operation and Maintenance (O&M) manual is available in the field.
 - 6.6 Start up technicians reviewed factory start up procedures in the Operation and Maintenance manual.
- 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 and notify the Project Manager immediately. Lock Out/Tag Out procedure should be observed before most of the following steps:
 - 7.2 Piping is per specifications. Check Operation and Maintenance literature and mechanical drawing details.
 - 7.3 Piping is labeled per specifications. Check Operation and Maintenance literature and mechanical drawing details.
 - 7.4 Piping is installed level or to specifications. Check Operation and Maintenance literature and mechanical drawing details.
 - 7.5 Piping is insulated per specifications. Check Operation and Maintenance literature and mechanical drawing details.
 - 7.6 Piping is supported per specifications. Check Operation and Maintenance literature and mechanical drawing details.
 - 7.7 Piping is seismically restrained per specifications. Check literature and mechanical drawing details.
 - 7.8 Piping materials are per specifications. Check Operation and Maintenance literature and mechanical drawing details.
 - 7.9 Piping of dissimilar materials has dielectric isolation per specifications. Check Operation and Maintenance literature and mechanical drawing details.

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- 7.10 Piping has proper drains per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.11 Piping has proper vents per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.12 Piping has branch isolation valves per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.13 Piping has main isolation valves per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.14 Piping has undergone a hydrostatic pressure test per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.15 Piping has make-up water regulator valve per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.16 Piping has fast fill regulator bypass per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.17 Piping has pressure relief valve per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.18 Pressure relief valve and vents are piped to relieve to an area specified. Check Operation and Maintenance literature and mechanical drawing details.
- 7.19 Piping is full of water. Check Operation and Maintenance literature and mechanical drawing details.
- 7.20 Piping is vented of air. Check Operation and Maintenance literature and mechanical drawing details.
- 7.21 Pressure and temperature gauges are installed per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.22 Piping has chemical pot feeder per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.23 Chemical pot feeder system is installed per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 7.24 Chemical feed system is installed per specifications. Check Operation and Maintenance literature and mechanical drawing details.

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8 Operational Inspection

- 8.1 If there are any discrepancies, notify the Project Manager immediately. Use Operation and Maintenance literature and follow start-up procedures the form FN 8.046.1 is a general out line and is to provide a quality assured start-up when used in conjunction with the Operation and Maintenance literature.
- 8.2 Open all isolation bypass and control valves.
- 8.3 Set make-up water pressure regulator valve to operating pressure setting per specifications. Check Operation and Maintenance literature and mechanical drawing details.
- 8.4 Open fast fill regulator to test pressure relief. Do not exceed piping pressure rating.
- 8.5 Drain pressure to operating pressure setting.
- 8.6 Start-up pumps (use start-up sheet FN 8.033.1) Do not perform this procedure until all the above tests and checks have been completed correctly.
- 8.7 Piping vibration is acceptable. Check Operation and Maintenance literature and mechanical drawing details.
- 8.8 Inspect all piping for leaks and repair as needed.
- 8.9 Restart pumps.
- 8.10 Scrub piping with soap per specifications. This may be required by Therma but performed by a sub-contractor. In either case, do not perform this procedure until all above tests and checks have been completed correctly.
- 8.11 When scrub is complete open drain valve to sanitary drain (be sure make-up regulator or fast fill is open) maintain system pressure while draining. Use total drain and refill procedure or drain and dilute procedure.
- 8.12 Clean all strainers clear all blowdowns.
- 8.13 Check make-up water P.H. and T.D.S. This step provides a base line for checking the piping system in the next step.
- 8.14 Compare make-up water P.H. and T.D.S. readings to pipe system readings. Soap and debris have been eliminated when P.H. is the same and piping system T.D.S. is 0% above make-up water.

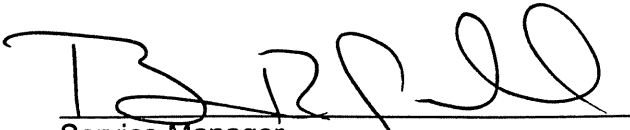
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- 8.15 Add water treatment per specifications. Check Operation and Maintenance literature and mechanical drawing details: pre-treat water then re-check after good circulation has occurred.
- 8.16 Start-up chemical feed system per specifications and manufacturers recommendations. Check Operation and Maintenance literature and mechanical drawing details: chemical treatment levels must be maintained for best performance of system. Make sure levels are correct return after 48 hours to make final adjustments.

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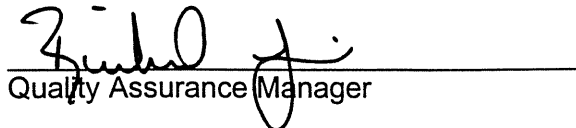
Document Approval


 Service Manager

5-18-99
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