

Standard Operating Procedure <b>Start-Up Procedures &amp; Verification for Cooling Towers</b>	SOP No. 8.045
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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: Cooling Towers and Evaporative Cooling Towers.
- 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 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 the start-up sheet FN 8.045.1 for Cooling Tower. 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, 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)

#### 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 and verify that it matches the design criteria.
- 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 Operation and Maintenance (O&M) manual is available in the field.
- 6.7 Start up technicians reviewed factory start up procedures in the Operation and Maintenance manual.
- 6.8 If Therma provided Variable Frequency Drives (VFDs) that are controlling the fans, complete FN 8.029.1 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 and notify the Project Manager immediately. Lock Out/Tag Out procedure should be observed before most of the following steps:
- 7.2 Unit is installed 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 Inlet air screens, fans, eliminators, heat exchanger sections, and sump strainers are installed and clean. Check Operation and Maintenance literature and mechanical drawing details.
- 7.6 Shipping blocks and materials are removed from fan section. Check Operation and Maintenance literature: remove all temporary shipping blocks and materials including brackets, bolts, covers, etc.

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- 7.7 Water sump is clean.
- 7.8 Water treatment is provided. Use start-up sheet FN 8.046.1 if by Therma.
- 7.9 Sheaves are aligned. Use string or straight edge method.
- 7.10 Multi speed motor is installed. Check Operation and Maintenance literature and mechanical drawing details.
- 7.11 Fan hub, sheaves and bearing setscrews are tight. Check Operation and Maintenance literature: lubricate accordingly to prior use.
- 7.12 Each fan belt tension is correct. Adjust belt tension for optimum performance. Incorrect belt tension causes wear vibration and excess particles.
- 7.13 Motor and blower bearings are lubricated. Check Operation and Maintenance literature: lubricate accordingly to prior use.
- 7.14 Spray nozzles and water level controls are installed. Check Operation and Maintenance literature and mechanical drawing designs.
- 7.15 Fan shaft bearing angular alignment is correct and bolts are tight. Fan shaft is in 90° alignment with shaft bearings.
- 7.16 Vibration isolators are installed and adjusted. Check Operation and Maintenance literature: internal and external isolation skids and springs need to be set properly. 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.
- 7.17 All 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.
- 7.18 All access panels and covers are in place. Including: electrical, fan, filter, damper, return air, economizer section, supply air doors and covers.
- 7.19 Isolation valves are installed. Check Operation and Maintenance literature and mechanical drawing details.


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## 8 Operational Inspection

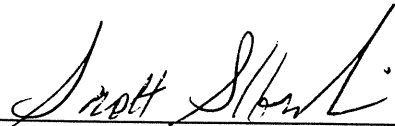
- 8.1 Use Operation and Maintenance literature and follow start up procedures the FN 8.045.1 is a general out line and is to provide a quality assured start up when used in conjunction with the Operation and Maintenance literature. If there are any discrepancies notify the Project Manager.
- 8.2 Unit 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 Each pump rotation is correct. Check Operation and Maintenance literature: some pumps may be damaged even by brief reverse rotation.
- 8.5 Water level make-up valve is operating correctly. Check Operation and Maintenance literature: tower should not take on air at sump discharge in 100% operation and it should not overflow in 0% operation.
- 8.6 Check tower for leaks. Check piping, seals, fill and pans.
- 8.7 Coupling assembly needs alignment. (If yes, proceed with step 8 otherwise go to step 9)
- 8.8 Record final data. Check Operation and Maintenance literature: tolerances of alignment should be completed after pump base is secure.
- 8.9 Add water treatment per specifications. Record chemicals used.
- 8.10 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 form(s) as necessary to complete Cooling Tower start-up form FN 8.045.1.

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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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