<table>
<thead>
<tr>
<th>Hydronic System Control Acceptance Document</th>
<th>MECH-8-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>NJ.10.1 - NJ.10.5</td>
<td>Form 1 of 4</td>
</tr>
</tbody>
</table>

### Intent:
Satisfy HVAC water pumping requirements per Section 144(j).

### Construction Inspection

1. Instrumentation to perform tests include, but not limited to:
   - Differential pressure gauge
   - Portable temperature probe

2. Variable Flow Controls (VFC) and Automatic Isolation Controls (AIC) Inspection
   - □ Valve and piping arrangements were installed per the design drawings to achieve the desired control

3. Supply Water Temperature Reset Controls Inspection
   - □ Supply temperature sensors have been calibrated
     - □ Manufacturer's calibration certificates (attached)
     - □ Site calibration within 2°F of temperature measurement with reference meter
   - □ Sensor locations are adequate to achieve accurate measurements
   - □ Installed sensors comply with specifications

4. Water-loop Heat Pump Controls Inspection
   - □ Valves were installed per the design drawings to achieve equipment isolation requirements
   - □ All sensor locations comply with design drawings

5. Variable Frequency Drive Controls Inspection
   - □ All valves, sensors, and equipment were installed per the design drawings
   - □ Pressure sensors are calibrated
     - □ Manufacturer's calibration certificates (attached)
     - □ Site calibration within 10% of pressure measurement with reference meter

---

**Certification Statement:** I certify that all statements are true on this MECH-8-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: ________________________________

Company: ________________________________

Signature: ________________________________ Date: _____________

:: ☑️
# 2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

## Hydronic System Control Acceptance Document

### NJ.10.1 - NJ.10.5

**Form 2 of 4**

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>DATE</th>
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### System ID

<table>
<thead>
<tr>
<th>A. System Type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chilled water</td>
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<tr>
<td>2. Heating hot water</td>
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<tr>
<td>3. Water-loop heat pump loop</td>
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<td>4. Other (fill in blank):</td>
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<td>5. Other (fill in blank):</td>
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### B. Select Acceptance Test (check all tests completed)

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<tr>
<th>1</th>
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</tbody>
</table>

- □ Variable Flow Control - Alternate 1 (Flow measurement)
- □ Variable Flow Control - Alternate 2 (No flow measurement)
- □ Automatic Isolation Controls
- □ Supply Water Temperature Reset Controls
- □ Water-loop Heat Pump Controls - Alternate 1 (With Flow Meter)
- □ Water-loop Heat Pump Controls - Alternate 2 (Without Flow Meter)
- □ (Pump) Variable Frequency Drive Controls - Alternate 1 (With Flow Meter)
- □ (Pump) Variable Frequency Drive Controls - Alternate 2 (Without Flow Meter)

### C. Equipment Testing Requirements

#### NJ.10.1 Variable Flow Control - Alternate 1

- Step 1: Open all control valves.
  - a. Measured system flow (gpm) GPM =
  - b. Design system flow (gpm) GPM =
  - c. System operation achieves design conditions □ □ □ □ □

- Step 2: Initiate closure of control valves
  - a. Measured system flow (gpm) GPM =
  - b. Design system flow (gpm) GPM =
  - c. Design pump flow control strategy achieves flow reduction requirements □ □ □ □ □
  - d. Ensure all valves operate correctly against the system pressure □ □ □ □ □

- Step 3: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N

#### NJ.10.1 Variable Flow Control - Alternate 2

- Step 1: Drive all valves shut and dead head pump against manual isolation valve
  - a. Measured pressure across the pump (ft. H20) \( \Delta P = \)

- Step 2: Open manual isolation valve and measure pump DP with control valves closed
  - a. Measured pressure across the pump (ft. H20) \( \Delta P = \)
  - b. Both shutoff pressures are within +/- 5% of each other □ □ □ □ □

- Step 3: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N

#### NJ.10.2 Automatic Isolation Controls

- Step 1: Drive all valves shut and dead head pump against manual isolation valve
  - a. Measured pressure across the pump (ft. H20) \( \Delta P = \)

- Step 2: Open manual isolation valve and start/stop each chiller or boiler one at a time
  - a. Verify automatic isolation valve opens fully when respective unit is ON □ □ □ □ □
  - b. Verify automatic isolation valve closes fully when respective unit is OFF □ □ □ □ □

- Step 3: Stop all chillers and boilers on the hydronic loop
  - a. Measured pressure across the pump (ft. H20) \( \Delta P = \)
  - b. Both shutoff pressures (1a and 3a) are within +/- 5% of each other □ □ □ □ □

- Step 4: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N
NJ.10.3 Supply Water Temperature Reset Controls
Step 1: Manually change design control variable to maximum setpoint
   a. Reset temperature setpoint °F =
   b. Measured water temperature °F =
   c. Water temperature setpoint is reset to appropriate value □ □ □ □ □
   d. Actual water supply temperature meets setpoint □ □ □ □ □
Step 2: Manually change design control variable to minimum setpoint
   a. Reset temperature setpoint °F =
   b. Measured water temperature °F =
   c. Water temperature setpoint is reset to appropriate value □ □ □ □ □
   d. Actual water supply temperature meets setpoint □ □ □ □ □
Step 3: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N

NJ.10.4 Water-loop Heat Pump Controls (for circulation pumps > 5 hp) - Alternate 1
Step 1: Open all control valves
   a. Measured system flow (gpm) GPM =
   b. Design system flow (gpm) GPM =
   c. System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.) □ □ □ □ □
Step 2: Initiate shut-down sequence on each individual heat pumps
   a. Isolation valves close automatically upon unit shut-down □ □ □ □ □
   b. Ensure all valves operate correctly at shut-off system pressure conditions □ □ □ □ □
   c. System flow reduced for each individual heat pump shut down □ □ □ □ □
Step 3: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N

NJ.10.4 Water-loop Heat Pump Controls (for circulation pumps > 5 hp) - Alternate 2
Step 1: Drive all valves shut and dead head pump against manual isolation valve
   a. Measured pressure across the pump (ft. H2O) \( \Delta P = \)
Step 2: Open manual isolation valve and measure pump DP with automatic isolation valves closed
   a. Measured pressure across the pump (ft. H2O) \( \Delta P = \)
   b. Both shutoff pressures are within +/- 5% of each other □ □ □ □ □
Step 3: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N

NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 1
Step 1: Open all control valves
   a. Measured system flow (gpm) GPM =
   b. Design system flow (gpm) GPM =
   c. kW =
   d. System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.) □ □ □ □ □
   e. VFD operates near 100% speed at full flow □ □ □ □ □
Step 2: Modulate control valves closed
   a. Ensure all valves operate correctly at system pressure conditions □ □ □ □ □
   b. Witness proper response from VFD (speed decreases as valves close) □ □ □ □ □
   c. Time for system to stabilize Min =
   d. System operation stabilizes within 5 min. after test procedures are initiated □ □ □ □ □
Step 3: Adjust system operation to achieve 50% flow
   a. Measured system flow (gpm) GPM =
   b. Measured pump power at full flow kW =
   c. %Power = part load kW/full load design kW (Step 3.b./Step 1.c.) % =
   d. VFD input power less than 30% of design □ □ □ □ □
Step 4: Adjust to achieve flow rate where VFD is below min speed setpoint
   a. VFD minimum setpoint Hz =
   b. Ensure VFD maintains minimum speed setpoint □ □ □ □ □
Step 5: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N

Design pump power (estimated by motor HP/ motor efficiency x 0.746 kW/HP)
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<tr>
<td>Step 1: Open all control valves</td>
</tr>
<tr>
<td>a. Visually inspect a few valves to verify that they open</td>
</tr>
<tr>
<td>b. Time for system to stabilize Min =</td>
</tr>
<tr>
<td>c. System operation stabilizes within 5 min. after test procedures are initiated</td>
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<tr>
<td>d. VFD operates near 100% speed at full flow</td>
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<tr>
<td>e. Measured pressure at loop pressure sensor control point (psi or ft WC)</td>
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<td>Step 2: Modulate control valves closed</td>
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</tr>
<tr>
<td>f. Measured pressure with valves closed ≤ pressure with valves open</td>
</tr>
<tr>
<td>Step 3: System returned to initial operating conditions Y / N Y / N Y / N Y / N Y / N</td>
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D. PASS / FAIL Evaluation (check one):

- PASS: All applicable Construction Inspection responses are complete and applicable Equipment Testing Requirements check boxes are compete.
- FAIL: Any applicable Construction Inspection responses are incomplete OR there is one or more unchecked box for an applicable test in the Equipment Testing Requirements section. Provide explanation below. Use and attach additional pages if necessary.