

**2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE**

**Hydronic System Control Acceptance Document** **MECH-8-A**

**NJ.10.1 - NJ.10.5** **Form 1 of 4**

PROJECT NAME		DATE
PROJECT ADDRESS		Checked by/Date Enforcement Agency Use
TESTING AUTHORITY	TELEPHONE	
HYDRONIC SYSTEM NAME / DESIGNATION		

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

**Construction Inspection**

- 1 Instrumentation to perform tests include, but not limited to:
    - a. Differential pressure gauge
    - b. Portable temperature probe
  - 2 Variable Flow Controls (VFC) and Automatic Isolation Controls (AIC) Inspection
- VFC AIC
- 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: \_\_\_\_\_

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PROJECT NAME	DATE
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A. System Type		System ID				
		1	2	3	4	5
1	Chilled water					
2	Heating hot water					
3	Water-loop heat pump loop					
4	Other (fill in blank):					
5	Other (fill in blank):					
B. Select Acceptance Test (check all tests completed)		1	2	3	4	5
<input type="checkbox"/>	Variable Flow Control - Alternate 1 (Flow measurement)					
<input type="checkbox"/>	Variable Flow Control - Alternate 2 (No flow measurement)					
<input type="checkbox"/>	Automatic Isolation Controls					
<input type="checkbox"/>	Supply Water Temperature Reset Controls					
<input type="checkbox"/>	Water-loop Heat Pump Controls - Alternate 1 (With Flow Meter)					
<input type="checkbox"/>	Water-loop Heat Pump Controls - Alternate 2 (Without Flow Meter)					
<input type="checkbox"/>	(Pump) Variable Frequency Drive Controls - Alternate 1(With Flow Meter)					
<input type="checkbox"/>	(Pump) Variable Frequency Drive Controls - Alternate 2(Without Flow Meter)					

C. Equipment Testing Requirements		System ID				
Verify and document the following (check applicable tests)		1	2	3	4	5
<b>NJ 10.1 Variable Flow Control - Alternate 1</b>						
Step 1: Open all control valves.						
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	System operation achieves design conditions	<input type="checkbox"/>				
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	<input type="checkbox"/>				
d.	Ensure all valves operate correctly against the system pressure	<input type="checkbox"/>				
Step 3: System returned to initial operating conditions		Y/N	Y/N	Y/N	Y/N	Y/N
<b>NJ.10.1 Variable Flow Control- Alternate 2</b>						
Step 1: Drive all valves shut and dead head pump against manual isolation valve						
a.	Measured pressure across the pump (ft. H2O) ΔP=					
Step 2: Open manual isolation valve and measure pump DP with control valves closed						
a.	Measured pressure across the pump (ft. H2O) ΔP=					
b.	Both shutoff pressures are within +/- 5% of each other	<input type="checkbox"/>				
Step 3: System returned to initial operating conditions		Y/N	Y/N	Y/N	Y/N	Y/N
<b>NJ.10.2 Automatic Isolation Controls</b>						
Step 1: Drive all valves shut and dead head pump against manual isolation valve						
a.	Measured pressure across the pump (ft. H2O) ΔP=					
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	<input type="checkbox"/>				
b.	Verify automatic isolation valve closes fully when respective unit is OFF	<input type="checkbox"/>				
Step 3: Stop all chillers and boilers on the hydronic loop						
a.	Measured pressure across the pump (ft. H2O) ΔP=					
b.	Both shutoff pressures (1a and 3a) are within +/- 5% of each other	<input type="checkbox"/>				
Step 4: System returned to initial operating conditions		Y/N	Y/N	Y/N	Y/N	Y/N

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PROJECT NAME	DATE				
<b>NJ.10.3 Supply Water Temperature Reset Controls</b>					
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		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Actual water supply temperature meets setpoint		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Actual water supply temperature meets setpoint		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N
<b>NJ 10.4 Water-loop Heat Pump Controls (for circulation pumps &gt; 5 hp) - Alternate 1</b>					
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.)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 2: Initiate shut-down sequence on each individual heat pumps					
a. Isolation valves close automatically upon unit shut-down		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Ensure all valves operate correctly at shut-off system pressure conditions		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. System flow reduced for each individual heat pump shut down		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N
<b>NJ.10.4 Water-loop Heat Pump Controls (for circulation pumps &gt; 5 hp) - Alternate 2</b>					
Step 1: Drive all valves shut and dead head pump against manual isolation valve					
a. Measured pressure across the pump (ft. H2O)	ΔP=				
Step 2: Open manual isolation valve and measure pump DP with automatic isolation valves closed					
a. Measured pressure across the pump (ft. H2O)	ΔP=				
b. Both shutoff pressures are within +/- 5% of each other		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N
<b>NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 1</b>					
Step 1: Open all control valves					
a. Measured system flow (gpm)	GPM =				
b. Design system flow (gpm)	GPM =				
c. Design pump power (estimated by motor HP/ motor efficiency x 0.746 kW/HP)	kW =				
d. System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. VFD operates near 100% speed at full flow		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 2: Modulate control valves closed					
a. Ensure all valves operate correctly at system pressure conditions		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Witness proper response from VFD (speed decreases as valves close)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Time for system to stabilize	Min =				
d. System operation stabilizes within 5 min. after test procedures are initiated		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Step 5: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N

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PROJECT NAME		DATE				
<b>NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 2</b>						
Step 1: Open all control valves						
a.	Visually inspect a few valves to verify that they open					
b.	Time for system to stabilize <span style="float: right;">Min =</span>					
c.	System operation stabilizes within 5 min. after test procedures are initiated	<input type="checkbox"/>				
d.	VFD operates near 100% speed at full flow	<input type="checkbox"/>				
e.	Measured pressure at loop pressure sensor control point <span style="float: right;">(psi or ft WC)</span>					
Step 2: Modulate control valves closed						
a.	Visually inspect a few valves to verify that they close	<input type="checkbox"/>				
b.	Witness proper response from VFD (speed decreases as valves close)	<input type="checkbox"/>				
c.	Time for system to stabilize <span style="float: right;">Min =</span>					
d.	System operation stabilizes within 5 min. after test procedures are initiated	<input type="checkbox"/>				
e.	Measured pressure at loop pressure sensor control point <span style="float: right;">(psi or ft WC)</span>					
f.	Measured pressure with valves closed $\leq$ pressure with valves open	<input type="checkbox"/>				
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N

**D. PASS / FAIL Evaluation (check one):**

- PASS: All applicable **Construction Inspection** responses are complete and applicable **Equipment Testing Requirements** check boxes are complete.
- 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.