DOCKETED

Docket Number:	15-BSTD-05
Project Title:	2016 Nonresidential Compliance Manual and Documents
TN #:	205957
Document Title:	Amber Ryman Comments: NRCA Form Suggested Changes
Description:	The form is: State of California, Outdoor Air Acceptance CEC-NRCA-MCH-02-A (Revised 05/15)
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Organization:	Amber Ryman
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Comment Received From: Amber Ryman
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NRCA Comments

Additional submitted attachment is included below.

STATE OF CALIFORNIA

OUTDOOR AIR ACCEPTANCE

CEC-NRCA-MCH-02-A (Revised 05/15) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE		NRCA-MCH-02-A
Outdoor Air Acceptance		(Page 1 of 3)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

Intent:	*Verify measured outside airflow reading is within ± 10% of the total required outside airflow. Required for all newly installed HVAC units. Reference MECH-3C (Column H or Column I) or Mechanical Equipment Schedules.*

A. Construction Inspection

Note: MCH-02-A can be performed in conjunction with MCH-07-A Supply Fan VFD Acceptance (if applicable) since testing activities overlap.

1. Supporting documentation needed to perform test includes:
   a. As-built and/or design documents (for example, Mechanical Equipment Schedules, Equipment Start-Up Sheets or Balancing Reports).
   b. 2013 Building Energy Efficiency Standards Nonresidential Compliance Manual *(NA7.5.1.1 Ventilation Systems: Variable Air Systems At-A-Glance and NA7.5.1.2 Constant Volume Systems Outdoor Air Acceptance At-A-Glance).*
   c. 2013 Building Energy Efficiency Standards.
2. Instrumentation needed to perform test includes:
   a. Watch
   b. Calibrated means to measure airflow (i.e. hot-wire anemometer, velocity pressure probe, etc.).
      i. ~~Method and~~ E equipment used:_____
      ii. Equipment calibration date (must be within one year):_____
3. System type (check either VAV or CAV): ☐ VAV ☐ CAV

If asking about AFMS then add

a. Check if Variable Air Volume (VAV) and complete the following:
   ☐ ~~i.~~ Outside airflow is either factory calibrated or field calibrated. Clarify if this is question is asking if there is an Airflow Monitoring Station?
      ☐ Check if factory calibrated and attach calibration certification.
      ☐ Check if field calibrated and attach calibration results.
   ii. ~~Damper Control (must be checked):~~
      ☑ Dynamic damper control is being used to control outside air. (This is NOT a fixed minimum position).
   ~~iii.~~ One of the following dynamic controls is being utilized to control outside air (check method used)
      ☐ Outdoor Air CFM Compensation
      ☐ Energy Balance Method
      ☐ Demand Control Ventilation
      ☐ Return Fan Tracking
      ☐ Injection Fan Method
      ☐ Dedicated Minimum Ventilation Damper with Pressure Control
      ☐ Other Active Control, Describe: _____
   b. Check if Constant Air Volume (CAV) and verify the following:
      i. ☐ System is designed to provide a fixed minimum OSA when the unit is on.

Tab

~~A.~~ ii. Method of delivering outside air to the unit (check one of the following):
   ☑ Outside air is ducted to the return air plenum. Confirm that outside air is ducted to ~~either~~ within (check one of the following):
      ☐ ~~Within~~ five ft. of the unit.
      ☐ ~~Within~~ 15 ft. of the unit, with the air directed substantially toward the unit.
   ☐ Return air plenum is NOT used to distribute outside air to the unit. I.e. outside air is ducted directly to the unit or outside air is provided independent of the unit. OSA provided via Economizer, forced OSA fan, etc. Need more options/clarifactions.

4. ~~5.~~ Pre-occupancy purge has been programmed for the 1-hour period immediately before the building is normally occupied to provide (one of the following methods must be verified and checked):
   ☐ ~~a.~~ The conditioned floor area times the ventilation rate from the 2013 Building Energy Efficiency Standards TABLE 120.1-A, or 15 cfm per person times the expected number of occupants, whichever is ~~less~~. Greater not less
   ☐ ~~b.~~ 3 complete air changes to the zone served by the air handler.

CERTIFICATE OF ACCEPTANCE		NRCA-MCH-02-A
Outdoor Air Acceptance		(Page 2 of 3)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Remove

B. NA7.5.1.1 Outdoor Air Acceptance Functional Testing		☐ CAV	☐ VAV
Step 1: Disable demand control ventilation (if applicable)	Step 1 & 2 should be written the same way, with check boxes or not.		
Step 2: Verify unit is not in economizer mode during test (economizer disabled).		☐	☐
Note: Shaded boxes do not apply for CAV systems			
Step 3: CAV and VAV testing at full supply airflow			
a.	Adjust supply air to achieve design airflow or maximum airflow at full cooling. Record VFD speed (Hz). Could apply to a CAV unit with a drive installed. May only use drive for setting up but shouldn't it be necessary to note the drive position?		Hz
b.	Measured outdoor airflow reading (cfm)	cfm	cfm
c.	Required outdoor airflow (cfm) *(from MECH-3C, Column I, or Mechanical Equipment Schedules).*	cfm	cfm
d.	Time for outside air damper to stabilize after full supply airflow is achieved (minutes):		min
Step 4: VAV testing at reduced supply airflow		**CAV**	**VAV**
a.	Adjust supply airflow to either the sum of the minimum zone airflows, full heating, or 30% of the total design airflow. Record VFD speed (Hz).		Hz
b.	Measured outdoor airflow reading (cfm)		cfm
c.	Required outdoor airflow (cfm) *(from MECH-3C, Column I, or mechanical equipment schedules).*		cfm
d.	Time for outside air damper to stabilize after reduced supply airflow is achieved (minutes):		min
Step 5: Return to initial conditions (check)		☐	☐

C. Testing Calculations & Results

Determine Percent Outside Air at full supply airflow (%OA_{FA}) for Step ~~2~~ 3			
a.	%OA_{FA} = Measured outdoor airflow reading /Required outdoor airflow (Step ~~2b~~ 3b / Step ~~2c~~ 3c)	%	%
b.	%OA_{FA} is within 10% of design Outside Air. (%OA_{FA} ≤ 110%) Manual states within 10% is it +/- or only <=? Please clarify and have manual/form match.	Y / N	Y / N
c.	Outside air damper position stabilizes within 5 minutes (Step ~~2d~~ 3d < 5 minutes)		Y / N
Determine Percent Outside Air at reduced supply airflow (%OA_{RA}) for Step ~~3~~ 4 (VAV only)			
a.	%OA_{RA} = Measured outdoor airflow reading /Required outdoor airflow reading (Step ~~3b~~ 4b / Step ~~3c~~ 4c)		%
b.	%OA_{RA} is within 10% of design Outside Air. (OA_{RA} ≤ 110%) Same as above note.		Y / N
c.	Outside air damper position stabilizes within 5 minutes (Step ~~3d~~ 4d < 5 minutes)		Y / N

Note: The intent of this test is to ensure that 1) all air handlers provide the minimum amount of OSA and 2) VAV air handlers use dynamic controls to avoid over ventilation. Move to top of form where all other Intents are documented.

D. Evaluation

☐	PASS: All Construction Inspection responses are complete and Testing Calculations & Results responses are positive ~~(Y - yes)~~

Question: On units where VFD's are installed due to T24 requirement based on tonage however unit is set up as a CAV, Do you 1) set Step ~~3a up in the minimum drive position and allow more OSA when in full cooling? 2) set at the Max speed (full cooling) and not get min OSA~~ when unit slows down or 3) are the manufacturers supposed to be able to control to two damper setpoints?

Reason asking is on units that are CAV with drives when in fan mode/no cooling the unit slows down to 60%.

STATE OF CALIFORNIA

CONSTANT VOLUME, SINGLE ZONE, UNITARY (PACKAGED AND SPLIT) AIR CONDITIONER AND HEAT PUMP SYSTEMS

Serving Human Occupancy

CEC-NRCA-MCH-03-A (Revised 05/15) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE Very often we are asked to fill this out for IDF or MDF rooms with either no OSA or no requirement for min OSA because it only serves equipment. This should be clarified.	NRCA-MCH-03-A
Constant Volume, Single Zone, Unitary (Packaged and Split) Air Conditioner and Heat Pump Systems	(Page 1 of ~~4~~)

Project Name:	Enforcement Agency:	Permit Number: 3
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

ADD INTENT

A. Construction Inspection

1. Supporting documentation needed to perform test includes, but not limited to:
   a. 2013 Building Energy Efficiency Standards Nonresidential Compliance Manual *(NA7.5.2 Constant Volume, Single-zone, Unitary Air Conditioner and Heat Pumps Systems Acceptance At-A-Glance).*
   b. 2013 Building Energy Efficiency Standards Manual.
2. Instrumentation to perform test includes, but not limited to:
   ~~a. Temperature Meter~~ These tools are really not applicable in the way this test is written.
   ~~b. Amp Meter~~ No where is it requested to measure temp/ amps or voltage.
3. Installation (check if applies):
   ☐ Thermostat is located within the space-conditioning zone that is served by the HVAC system.
4. Programming (check all those that apply):
   ☐ Thermostat meets the temperature adjustment and dead band requirements of 2013 Building Energy Efficiency Standards Manual section 120.2(b).
   Minimum heating setpoint: _____°F. Maximum cooling setpoint _____°F. Deadband: _____°F.
   ☐ Occupied, unoccupied, and holiday schedules have been programmed per the ~~facility's~~ schedule. provided.
   ☐ Pre-occupancy purge has been programmed to meet the requirements of 2013 Building Energy Efficiency Standards Manual section 120.1(c)2.
   1. Check method used to determine pre-occupancy purge: Only applicable if unit has OSA
      ☐ Greater ~~Lesser~~ of: conditioned floor area times ventilation rate from 2013 Building Energy Efficiency Standards TABLE 120.1-A or 15cfm per person times the expected number of occupants.
      ☐ 3 complete air changes.

Notes: What are the requirements if the unit is on 24/7 for IDF/MDF type room?

CONSTANT VOLUME, SINGLE ZONE, UNITARY (PACKAGED AND SPLIT) AIR CONDITIONER AND HEAT PUMP SYSTEMS

CERTIFICATE OF ACCEPTANCE		NRCA-MCH-03-A
Constant Volume, Single Zone, Unitary (Packaged and Split) Air Conditioner and Heat Pump Systems		(Page ~~1 of 4~~)
Project Name:	Enforcement Agency:	Permit Number: 2 of 3
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

B. Functional Testing Requirements

Operating Modes

Step 1: Disable economizer control and demand-controlled ventilation (if applicable) to prevent unexpected interactions.

Occupied Mode

Step 2: Heating load during occupied condition

Step 3: No-load during occupied condition

Step 4: Cooling load during occupied condition

Unoccupied Mode

Step 5: No-load during unoccupied condition

Step 6: Heating load during unoccupied condition

Step 7: Cooling load during unoccupied condition

Step 8: Manual override

		8	7	6	5	4	3	2
Step 2 – 8: Check and verify the following for each simulation mode required								
a.	Supply fan operates continually							
b.	Supply fan turns off							
c.	Supply fan cycles on and off							
d.	System reverts to "occupied" mode to satisfy any condition							
e.	System turns off when manual override time period expires							
f.	Gas-fired furnace, heat pump, or electric heater stages on			☐	FIX			
g.	No heating is provided by the unit							
h.	No cooling is provided by the unit							
i.	Compressor stages on							
j.	Outside air damper is open to minimum position							
k.	Outside air damper closes completely							
Step 9: System returned to initial operating conditions after all tests have been completed:		Y / N						

If any of these are N/A would a X be put in that square or will it be left blank? For instance if Step 2j there is no OSA then ~~how do you fill in those~~ boxes?

C. Testing Results

	8	7	6	5	4	3	2
Indicate if Passed (P), Failed (F), or fill in appropriate letter							

D. Evaluation

☐ PASS: All **Construction Inspection** responses are complete and all applicable **Testing Results** responses are "Pass" (P)

STATE OF CALIFORNIA

AIR ECONOMIZER CONTROLS ACCEPTANCE

CEC-NRCA-MCH-05-A (Revised 05/15) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE		NRCA-MCH-05-A
Air Economizer Controls Acceptance		(Page 1 of 3)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

ADD INTENT

A. Construction Inspection

1. Supporting documentation needed to perform test includes:
   a. 2013 Building Energy Efficiency Standards Nonresidential Compliance Manual *(NA7.5.4 Air Economizer Controls Acceptance At-A-Glance).*
   b. 2013 Building Energy Efficiency Standards.

2. Instrumentation to perform test includes:
   a. Hand-held temperature probe
      Calibration Date: _____(must be within last year)
   b. ~~Device capable of calculating enthalpy~~ Psychrometer or device capable or reading DB, WB, RH. Enthalpy is plotted after those readings are measured.
      Calibration Date: _____(must be within last year)
   c. ~~1.2 k Ohm~~ Resistor (when specified by the manufacturer)

3. Installation: (**all** of the following boxes should be checked)

   ☐ Economizer high limit shutoff control complies with Table 140.4-B found in the 2013 Building Energy Efficiency Standards Section 140.4(e)3.

   ☐ Economizer reliability features are present per 2013 Building Energy Efficiency Standards Section 140.4(e)4:

   a. 5-year manufacturer warranty of economizer assembly

   b. Provide a product specification sheet proving capability of at least 60,000 actuations

   c. Provide a product specification sheet proving compliance with AMCA Standard 500 damper leakage at 10 cfm/sf at 1.0 in w.g. A product specification sheet showing the manufacturer's results after following the testing procedures of AMCA Standard 500 or AMCA certification by a third party under AMCA Publication 511 can be used to satisfy this requirement (Class 1A, 1, and 2 are acceptable).

   MANUFACTURERS RESPONSIBILTY. Tech doing this test should not be responsible for this section.

   d. If the high limit setpoint is fixed dry-bulb or fixed enthalpy + fixed dry-bulb then the control shall have an adjustable setpoint

   e. Outdoor air, return air, mixed air, and supply air sensors shall be calibrated as follows:

      i. Drybulb and wetbulb temperatures accurate to ±2°F over the range of 40°F to 80°F

      ii. Enthalpy accurate to ±3 Btu/lb over the range of 20 Btu/lb to 36 Btu/lb

      iii. Relative humidity (RH) accurate to ±5% over the range of 20% to 80% RH

   ☐ f. Check that the sensor performance curve(s) is provided by the factory and sensor output values measured during sensor calibration are plotted on the performance curve(s)

   ☐ g. Sensors used for high limit control shall be located to prevent false readings, including but not limited to being properly shielded from direct sunlight.

   ☐ Unitary systems with an economizer have control systems, including two-stage or electronic thermostats, that cycle compressors off when economizers can provide partial cooling

   ☐ System has return fan speed control, relief dampers, or dedicated relief fans to prevent building over pressurization in full economizer mode.

   ☐ For systems with DDC controls, sensor used for economizer lockout has been factory or field calibrated.

   ☐ For systems with non-DDC controls, manufacturer's startup and testing procedures have been applied.

CERTIFICATE OF ACCEPTANCE		NRCA-MCH-05-A
Air Economizer Controls Acceptance		(Page 2 of 3)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

B. Functional Testing		**Results**
Step 1: Disable demand control ventilation systems (if applicable)		
Step 2: Enable the economizer and simulate a cooling demand large enough to drive the economizer fully open. Verify the following:		
a.	Economizer damper modulates 100% open.	Y / N
b.	Return air damper modulates 100% closed.	Y / N
c.	For systems that meet the criteria of 2013 Building Energy Efficiency Standards Section 140.4(e)1, verify that the economizer remains 100% open with the use of mechanical cooling. This occurs when the cooling demand can no longer be met by the economizer alone.	Y / N
d.	All applicable fans and dampers operate as intended to maintain building pressure.	Y / N
e.	The unit heating is disabled (if applicable).	Y / N / NA
Step 3: Disable the economizer and simulate a cooling demand. Verify the following:		
a.	Economizer damper closes to its minimum position.	Y / N
b.	All applicable fans and dampers operate as intended to maintain building pressure.	Y / N
c.	The unit heating is disabled (if applicable).	Y / N / NA
Step 4: If the unit is equipped with heating, simulate a heating demand and enable the economizer. Verify the following:		
a.	Economizer damper closes to its minimum position.	Y / N / NA
b.	Return air damper opens. **Add above**	Y / N / NA
~~**Step 5: Turn off the unit and verify the following:**~~		
a.	Economizer damper closes completely.	Y / N
Step 6: System returned to initial operating conditions		Y / N

C. Testing Results	**PASS**	**FAIL**
Step 2: Simulate cooling load and enable the economizer (all answers are Y).		
Step 3: Simulate cooling load and disable the economizer (all answers are Y).		
Step 4: Simulate heating demand and enable the economizer (all answers are Y).		
Step 5: Turn off the unit (all answers are Y). **Why Pass / Fail or Y/N if only Pass is allowed. Change to checkboxes**		

D. Evaluation
☐ PASS: All **Construction Inspection** responses are complete and all **Testing Results** responses are "Pass"
Notes: **In general this format is not the same as other forms. Should re-write to make it the same with checkboxes instead or Y/N.**

STATE OF CALIFORNIA

DEMAND CONTROL VENTILATION SYSTEMS ACCEPTANCE

CEC-NRCA-MCH-06-A (Revised 05/15) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE	NRCA-MCH-06-A
Demand Control Ventilation Systems Acceptance	(Page 1 of 2)

Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

Intent:	*Verify that systems required to employ demand Controlled ventilation (refer to §121(c)3) can vary outside ventilation flow rates based on maintaining interior carbon dioxide (CO_2) concentration setpoints*

A. Construction Inspection

1 Instrumentation to perform test may include, but not limited to:

a. Calibrated hand-held CO^2 analyzer

b. Manufacturer's calibration kit

c. Calibrated CO^2/air mixtures

2 Installation

☐ The sensor is located in the high density space between 3ft and 6 ft above the floor or at the anticipated level of the occupants' heads.

3 Documentation of all carbon dioxide control sensors includes( ):

a. Calibration method

Move to this line, not applicable to line it is on.

☐ Factory-calibration (certificate calibration cert must be attached)

☐ Field calibrated

b. Sensor accuracy

☐ Certified by manufacturer to be no more than +/- 75 ppm calibration cert must be attached

Add Step 1:

B. Functional Testing	**Results**
a. Disable economizer controls	
b. Outside air CO^2 concentration (~~measured dynamically using CO^2 sensor~~) Remove. Manual gives other options.	_____ ppm
c. Interior CO^2 concentration setpoint (Outside CO^2 concentration + 600 ppm)	_____ ppm
Step ~~1~~ 2: Simulate a signal at or slightly above the CO^2 setpoint or follow manufacturers recommended testing procedures.	
☐ For single zone units, outdoor air damper modulates opens to satisfy the total ventilation air called for in the Certificate of Compliance.	
☐ For multiple zone units, either outdoor air damper or zone damper modulate open to satisfy the zone ventilation requirements.	
Step ~~2~~ 3: Simulate signal well below the CO^2 setpoint or follow manufacturers recommended procedures.	
☐ For single zone units, outdoor air damper modulates to the design minimum value.	☒
☐ For multiple zone units, either outdoor air damper or zone damper modulate to satisfy the reduced zone ventilation requirements.	
Step ~~3~~ 4: System returned to initial operating conditions	~~Y / N~~ ☐

C. Testing Results	**PASS / FAIL**	
☒ Step 1: Simulate a high CO^2 load (check box complete)	☐	☐
☐ Step 2: Simulate a low CO^2 load (check box complete)	☐	☐

D. Evaluation	
☐	PASS: All **Construction Inspection** responses are complete and all **Testing Results** responses are "Pass"

ADD NOTES to stay consistant with other forms. Also, the old forms had a checklist that could be used when testing multiple zones. Add that option for VAV boxes.

SUPPLY FAN VARIABLE FLOW CONTROLS ACCEPTANCE

CERTIFICATE OF ACCEPTANCE	NRCA-MCH-07-A
Supply Fan Variable Flow Controls Acceptance	(Page 1 of 3)

Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

Intent:	*Verify that the supply fan speed in a variable air volume system modulates to meet system airflow demand.*

A. Construction Inspection

Note: MCH-07 can be performed in conjunction with MCH-02 Outdoor Air Acceptance since testing activities overlap.

1. Supporting documentation needed to perform test includes:

   a. As-built and/or Design Documents including Mechanical Equipment Schedules.

   b. 2013 Building Energy Efficiency Standards Nonresidential Compliance Manual *(NA7.5.6 Supply Fan Variable Flow Controls Acceptance At-A-Glance)*.

   c. 2013 Building Energy Efficiency Standards.

2. Instrumentation to perform test includes:

   a. Calibrated differential pressure gauge.

   Date of calibration:_____(*must be within one year*)

   b. Static Pressure Probe

   c. Drill

   d. Rubber Plugs

3. Installation:

   a. The static pressure location, setpoint, and reset control meets the requirements of 2013 Building Energy Efficiency Standards section 140.4(c)2B and 140.4(c)C: (check all the following that apply).

   ☐ If sensor is located downstream of major duct splits, multiple sensors are installed in each major branch with fan capacity controlled to satisfy the sensor furthest below its setpoint. **See note below**

   ☐ Set point is no greater than one-third of the total design fan static pressure. **ADD: NON DDC Units only.**

   Design TSP: _____in. w.c. Setpoint: _____in.w.c.

   ☐ If system has DDC to the zone level it has reset control complying with 2013 Building Energy Efficiency Standards Section 140.4(c) 2C. Reset is based on the zone requiring the most pressure; i.e., the set point is reset lower until one zone damper is nearly wide open. **Unit change out only, no DDC upgrade. This would not apply. Need option.**

   b. Supply fan includes a device for modulating airflow, such as variable speed drive or electrically commutated motor. **This is information only and should be added to 3.a. as info.**

4. Field calibrate all discharge static pressure sensors:

   ☐ Performed field-calibration using calibrated differential pressure gauge and static pressure probe.

   ☐ Calibration complete, all pressure sensors ± 10% of calibrated reference sensor (provide supporting documentation).

Align with line

Notes: **Question: In a 5 story building. There are potentially 5 major duct splits. Where would the sensor be installed to satisfy this requirement? Also, not all control systems look at multiple sensors. Control system would have to be capable of this.**

CERTIFICATE OF ACCEPTANCE	NRCA-MCH-07-A
Supply Fan Variable Flow Controls Acceptance	(Page 2 of 3)

Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

B. Functional Testing		**Results**
Step 1: Drive all VAV boxes to full design airflow.		
a.	Refer to design documents and record system design airflow.	cfm
b.	Supply fan speed modulates to increase capacity.	Y / N
c.	Record fan frequency:	Hz
d.	Supply fan maintains discharge static pressure ± 10% of the current operating set point. If NA, indicate reason in Notes section.	Y / N / NA
	Note: If NOT performing this test in conjunction with MECH-2A, other methods for verifying Variable Flow operation include increasing static pressure setpoint or putting all the VAV boxes into full cooling. Was one of these methods used? *Due to diversity in system design, static pressure setpoint will likely not be achieved when all VAV boxes are in full cooling. If this occurs, verify fan speed is 60 Hz and indicate NA in step 1.d.*	Y / N
e.	Verify that supply fan controls stabilize within a 5 minute period.	Y / N
Notes:		
Step 2: Drive all VAV boxes to reduced or minimum airflow.		
a.	Supply fan speed modulates to decrease capacity.	Y / N
b.	Record fan frequency:	Hz
c.	Current operating static pressure setpoint has decreased (for systems with DDC to the zone level).	Y / N / NA
d.	Supply fan maintains discharge static pressure ± 10% of the current operating setpoint.	Y / N
e.	Supply fan controls stabilize within a 5 minute period.	Y / N
Notes:		
Step 3: System returned to initial operating conditions		~~Y / N~~ ☐

C. Testing Results	**PASS** / **FAIL**	
Step 1: Drive all VAV boxes to achieve full design airflow (Pass if all answers are Yes) **Step 1d may be N/A, need option.**	☐	☐
Step 2: Drive all VAV boxes to minimum flow (Pass if all answers are Yes) **Step 2c may be N/A, need option.**	☐	☐

D. Evaluation
☐ PASS: All **Construction Inspection** responses are complete and all **Testing Results** responses are "Pass"
Notes:

STATE OF CALIFORNIA

VALVE LEAKAGE TEST

CEC-NRCA-MCH-08-A (Revised 05/15)

CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE	NRCA-MCH-08-A
Valve Leakage Test	(Page 1 of 2)

Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.	Enforcement Agency Use: Checked by/Date

withstand - Not the tech's responsiblity to verify they are designed correctly.

Intent:	*Ensure that control valves serving variable flow systems ~~are designed to withstand~~ the pump pressure over the full range of operation.* Add Note: Only applies to newly installed water systems (Entire system). If any part is existing may not have access to do this test.

A. Construction Inspection

1. Instrumentation to perform test includes, but not limited to:
   - a. Calibrated differential pressure gauge
   - b. Pump curve submittals showing the shut-off head

2. Installation
   - a. Valve and piping arrangements were installed per the design drawings — Installer's Responsibility. Covered under NRCI-MCH-01-E

B. Functional Testing

			Results
~~1. Pump Tag (id):~~	Re-word to ask: Pump (ID#) used during this test		
Step 1: Determine pump dead head pressure			
a.	Close pump discharge isolation valve — Note: This is not to be done on all pumps. Verify with manufacturers info prior to shutting any valves.		Y / N
b.	Measure and record the differential pump pressure	Ft. W.C. =	
c.	Record the shut-off head from the submittal	Ft. W.C. =	
d.	The measurement across the pump in step 1b is within 5% of the pump submittal in step 1c		Y / N
e.	Open pump discharge isolation valve		Y / N
Step 2: Automatically close all valves on the systems being tested. If 3-way valves are present, close off the bypass line(s). See note below			
a.	The 2 way valves automatically close		Y / N
b.	Measure and record the differential pump pressure in feet of water column	Ft. W.C. =	
c.	The measurement across the pump in step 2b is within 5% of the measurement in step 1b		Y / N
Step 3: System returned to initial operating conditions			Y / N

C. Testing Results

	PASS	FAIL
Step 1: Pressure measurement is within 5% of submittal data for all pumps	☐	☐
Step 2: Pressure measurements are within 5%	☐	☐

D. Evaluation

☐ PASS: All **Construction Inspection** responses are complete and all **Testing Results** responses are "Pass"

This is not always possible. Need bypass balance and shut off valves installed in order to not take responsibility for work previously done by another contractor. Also, not always are there valves at all on the bypass legs. Cost of project goes up if more devices need to be installed. This test needs to take that into consideration.