

AUTOMATIC FAULT DETECTION AND DIAGNOSTICS FOR AIR HANDLING UNITS AND ZONE TERMINAL UNITS ACCEPTANCE

CEC-NRCA-MCH-13-A (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF ACCEPTANCE		NRCA-MCH-13-A
Automatic Fault Detection and Diagnostics (FDD) for Air Handling Units and Zone Terminal Units Acceptance		(Page 1 of 5)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

<i>Note: Submit one Certificate of Acceptance for each system that must demonstrate compliance.</i>	Enforcement Agency Use: Checked by/Date
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Intent:	Verify that the system detects common faults in air handling units and zone terminal units.
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A. Construction Inspection
1. Instrumentation to perform test includes, but not limited to:
a. No instrumentation is required – changes are implemented at the building automation system control station.
2. Installation:
a. The functional testing verifies proper installation of the controls for FDD for air handling units and zone terminal units. No additional installation checks are required.

B. Functional Testing for Air Handling Units	Results
Testing of each AHU with FDD controls shall include the following tests:	
Step 1: Sensor drift/failure	
a. Disconnect outside air temperature sensor from unit controller.	Y / N
b. Verify that the FDD system reports a fault.	Y / N
c. Connect OAT sensor to the unit controller.	Y / N
d. Verify that FDD indicates normal system operation.	Y / N
Step 2: Damper/actuator fault	
a. From the control system workstation, command the mixing box dampers to full open (100% outdoor air).	Y / N
b. Disconnect power to the actuator and verify that a fault is reported at the control workstation.	Y / N
c. Reconnect power to the actuator and command the mixing box dampers to full open.	Y / N
d. Verify that the control system does not report a fault.	Y / N
e. From the control system workstation, command the mixing box dampers to a full-closed position (0% outdoor air).	Y / N
f. Disconnect power to the actuator and verify that a fault is reported at the control workstation.	Y / N
g. Reconnect power to the actuator and command the dampers closed.	Y / N
h. Verify that the control system does not report a fault during normal operation.	Y / N

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Step 3: Valve/actuator fault	
a. From the control system workstation, command the heating coil valves to full open.	Y / N
b. Disconnect power to the actuator and verify that a fault is reported.	Y / N
c. Reconnect power to the actuator and command the heating coil valve to full open.	Y / N
d. Verify that the control system does not report a fault.	Y / N
e. From the control system workstation, command the cooling coil valve to the full open position.	Y / N
f. Disconnect power to the actuator and verify that a fault is reported.	Y / N
g. Reconnect power to the actuator and command the cooling coil valve to full open.	Y / N
h. Verify that the control system does not report a fault.	Y / N
Step 4: Inappropriate simultaneous heating, mechanical cooling, and/or economizing	
a. From the control system workstation, override the heating coil valve and verify that a fault is reported at the control workstation.	Y / N
b. From the control system workstation, override the cooling coil valve and verify that a fault is reported at the control workstation.	Y / N
c. From the control system workstation, override the mixing box dampers and verify that a fault is reported at the control workstation.	Y / N

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C. Functional Testing for Zone Terminal Units	Results
Testing shall be performed on one of each type of terminal unit (VAV box) in the project. A minimum of 5% of the terminal boxes shall be tested.	
Step 1: Sensor drift/failure	
a. Disconnect the tubing to the differential pressure sensor of the VAV box.	Y / N
b. Verify that control system detects and reports the fault.	Y / N
c. Reconnect the sensor and verify proper sensor operation.	Y / N
d. Verify that the control system does not report a fault.	Y / N
Step 2: Damper/actuator fault – damper stuck open	
a. Command the damper to be fully open.	Y / N
b. Disconnect the actuator to the damper.	Y / N
c. Adjust the cooling setpoint so that the room temperature is below the cooling setpoint to command the damper to the minimum position. Verify that the control system reports a fault.	Y / N
d. Reconnect the actuator and restore to normal operation	Y / N
Step 3: Damper/actuator fault – damper stuck closed	
a. Set the damper to the minimum position.	Y / N
b. Disconnect the actuator to the damper.	Y / N
c. Set the cooling set point below the room temperature to simulate a call for cooling. Verify that the control system reports a fault.	Y / N
d. Reconnect the actuator and restore to normal operation.	Y / N
Step 4: Valve/actuator fault (For systems with hydronic reheat)	
a. Command the reheat coil valve to (full) open.	Y / N
b. Disconnect power to the actuator. Set the heating set point temperature to be lower than the current space temperature, to command the valve closed. Verify that the fault is reported at the control workstation.	Y / N
c. Reconnect the actuator and restore normal operation.	Y / N
Step 5: Feedback loop tuning fault (unstable airflow)	
a. Set the integral coefficient of the box controller to a value 50 times the current value. Lower the space cooling set point to simulate a call for cooling.	
b. The damper cycles continuously and airflow is unstable. Verify that the control system detects and reports the fault.	Y / N
c. Reset the integral coefficient of the controller to the original value to restore normal operation.	Y / N
Step 6: Disconnected inlet duct	
a. From the control system workstation, command the damper to minimum position.	Y / N
b. Disconnect power to the actuator and verify that a fault is reported at the control workstation.	Y / N
c. Reset the space temperature set point back to its original value.	Y / N

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D. Testing Results	PASS / FAIL	
Test passes if all applicable answers are yes under Functional Testing Sections .	<input type="checkbox"/>	<input type="checkbox"/>

E. Evaluation
<input type="checkbox"/> PASS: All Construction Inspection responses are complete and all Testing Results responses are "Pass".

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DOCUMENTATION AUTHOR'S DECLARATION STATEMENT		
1. I certify that this Certificate of Acceptance documentation is accurate and complete.		
Documentation Author Name:	Documentation Author Signature:	
Documentation Author Company Name:	Date Signed:	
Address:	ATT Certification Identification (If applicable):	
City/State/Zip:	Phone:	
FIELD TECHNICIAN'S DECLARATION STATEMENT		
I certify the following under penalty of perjury, under the laws of the State of California:		
<ol style="list-style-type: none"> 1. The information provided on this Certificate of Acceptance is true and correct. 2. I am the person who performed the acceptance verification reported on this Certificate of Acceptance (Field Technician). 3. The construction or installation identified on this Certificate of Acceptance complies with the applicable acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7. 4. I have confirmed that the Certificate(s) of Installation for the construction or installation identified on this Certificate of Acceptance has been completed and signed by the responsible builder/installer and has been posted or made available with the building permit(s) issued for the building. 		
Field Technician Name:	Field Technician Signature:	
Field Technician Company Name:	Position with Company (Title):	
Address:	ATT Certification Identification (if applicable):	
City/State/Zip:	Phone:	Date Signed:
RESPONSIBLE PERSON'S DECLARATION STATEMENT		
I certify the following under penalty of perjury, under the laws of the State of California:		
<ol style="list-style-type: none"> 1. I am the Field Technician, or the Field Technician is acting on my behalf as my employee or my agent and I have reviewed the information provided on this Certificate of Acceptance. 2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Acceptance and attest to the declarations in this statement (responsible acceptance person). 3. The information provided on this Certificate of Acceptance substantiates that the construction or installation identified on this Certificate of Acceptance complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7. 4. I have confirmed that the Certificate(s) of Installation for the construction or installation identified on this Certificate of Acceptance has been completed and is posted or made available with the building permit(s) issued for the building. 5. I will ensure that a completed, signed copy of this Certificate of Acceptance shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Certificate of Acceptance is required to be included with the documentation the builder provides to the building owner at occupancy. 		
Responsible Acceptance Person Name:	Responsible Acceptance Person Signature:	
Responsible Acceptance Person Company Name:	Position with Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone:	Date Signed:

NRCA-MCH-13-A User Instructions**Section A. Construction Inspection**

This pre-test section consists of check boxes and data entry requirements. Complete check boxes and enter data as instructed.

Sections B. Functional Testing for Air Handling Units

This section consists of check boxes and yes or no questions arranged by individual test. Check each box or circle the correct answer for each specific test or line item.

Sections C. Functional Testing for Zone Terminal Units

This section consists of check boxes and yes or no questions arranged by individual test. Check each box or circle the correct answer for each specific test or line item.

Section D. Testing Results

This section consists of check boxes for each test procedure. Complete check boxes as instructed.

Section E. Evaluation

Check the appropriate box as instructed.

Declaration Statements of Acceptance

This section contains fillable fields for three declaration statements: one from the Documentation Author, one from the Field Technician, and one from the Responsible Person. Each area contains a number of data entry requirements, including signature; date; and license number.

The Documentation Author is the person completing the compliance document. The Field Technician is responsible for performing and documenting the results of the acceptance procedures on the Certificate of Acceptance compliance documents. The Field Technician must sign the Certificate of Acceptance to certify that the information he or she provides on the Certificate of Acceptance is true and correct. It is important to note that the Field Technician is not required to have a contractor's, architect's or engineer's license. A Responsible Person is eligible under Division 3 of the Business and Professions code in the applicable classification to take responsibility for the scope of work specified by the Certificate of Acceptance document. The Responsible Person can also perform the field testing and verification work, and if this is the case the Responsible Person must complete and sign both the Field Technician's signature block and the Responsible Person's signature block on the Certificate of Acceptance compliance document. The Responsible Person assumes responsibility for the acceptance testing work performed by the Field Technician agent or employee.