

**HVAC DRY & WET SYSTEM REQUIREMENTS**

CEC-NRCC-MCH-02-E (Revised 01/16)

CALIFORNIA ENERGY COMMISSION



CERTIFICATE OF COMPLIANCE		NRCC-MCH-02-E	
HVAC Dry & Wet System Requirements		(Page 1 of 3)	
Project Name:		Date Prepared:	

**A. Equipment Tags and System Description<sup>1</sup> – Dry Systems**

<b>MANDATORY MEASURES</b>	<b>T-24 Sections</b>	<b>Reference to the Requirements in the Contract Documents<sup>2</sup></b>		
Heating Equipment Efficiency <sup>3</sup>	110.1 or 110.2(a)			
Cooling Equipment Efficiency <sup>3</sup>	110.1 or 110.2(a)			
HVAC or Heat Pump Thermostats	110.2(b), 110.2(c)			
Furnace Standby Loss Control	110.2(d)			
Low Leakage AHUs	110.2(f)			
Ventilation <sup>4</sup>	120.1(b)			
Demand Control Ventilation <sup>5</sup>	120.1(c)4			
Occupant Sensor Ventilation Control <sup>6</sup>	120.1(c)5, 120.2(e)3			
Shutoff and Reset Controls <sup>7</sup>	120.2(e)			
Outdoor Air and Exhaust Damper Control	120.2(f)			
Isolation Zones	120.2(g)			
Automatic Demand Shed Controls	120.2(h)			
Economizer FDD	120.2(i)			
Duct Insulation	120.4			

**PRESCRIPTIVE MEASURES**

Equipment is sized in conformance with 140.4(a & b)	140.4(a & b)	Y/N	Y/N	Y/N
Supply Fan Pressure Control	140.4(c)			
Simultaneous Heat/Cool <sup>8</sup>	140.4(d)			
Economizer	140.4(e)			
Heat and Cool Air Supply Reset	140.4(f)			
Electric Resistance Heating <sup>9</sup>	140.4(g)			
Duct Leakage Sealing and Testing <sup>10</sup>	140.4(l)			

**Notes:**

1. Provide equipment tags (e.g. AHU 1 to 10) and system description (e.g. Single Duct VAV reheat) as appropriate. Multiple units with common requirements can be grouped together.
2. Provide references to plans (i.e. Drawing Sheet Numbers) and/or specifications (including Section name/number and relevant paragraphs) where each requirement is specified. Enter "N/A" if the requirement is not applicable to this system.
3. The referenced plans and specifications must include all of the following information: equipment tag, equipment nominal capacity, Title 24 minimum efficiency requirements, and actual rated equipment efficiencies. Where multiple efficiency requirements are applicable (e.g. full- and part-load) include all. Where appliance standards apply (110.1), identify where equipment is required to be listed per Title 20 1601 et seq.
4. Identify where the ventilation requirements are documented for each central HVAC system. Include references to both central unit schedules and sequences of operation. If one or more spaces is naturally ventilated identify where this is documented in the plans and specifications. Multiple zone central air systems must also provide a MCH-03-E compliance document.
5. If one or more spaces has demand controlled ventilation identify where it is specified including the sensor specifications and the sequence of operation.
6. If one or more space has occupant sensor ventilation control identify where it is specified including the sensor specifications and the sequence of operation
7. If the system is DDC identify the sequences for the system start/stop, optimal start, setback (if required) and setup (if required). For all systems identify the specification for the thermostats and time clocks (if applicable).
8. Identify where the heating, cooling and deadband airflows are scheduled for this system. Include a reference to the specification of the zone controls. Provide a MCH-03-E compliance document.
9. Enter N/A if there is no electric heating. If the system has electric heating indicate which exception to 140.4(g) applies.
10. If duct leakage sealing and testing is required, a MCH-04-A compliance document must be submitted.

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**B. Equipment Tags and System Description<sup>1</sup> – Wet Systems**

<b>MANDATORY MEASURES</b>	<b>T-24 Sections</b>	<b>Reference to the Requirements in the Contract Documents<sup>2</sup></b>		
Heating Hot Water Equipment Efficiency <sup>3</sup>	110.1			
Cooling Chilled and Condenser Water Equipment Efficiency <sup>3</sup>	110.1, 140.4(i)			
Open and Closed Circuit Cooling Towers conductivity or flow-based controls	110.2(e) 1			
Open and Closed Circuit Cooling Towers Maximum Achievable Cycles of Concentration (LSI) <sup>6</sup>	110.2(e) 2			
Open and Closed Circuit Cooling Towers Flow Meter with analog output	110.2(e) 3			
Open and Closed Circuit Cooling Towers Overflow Alarm	110.2(e) 4			
Open and Closed Circuit Cooling Towers Efficient Drift Eliminators	110.2(e) 5			
Pipe Insulation	120.3			
<b>PRESCRIPTIVE MEASURES</b>				
Cooling Tower Fan Controls	140.4(h)2, 140.4(h)5	Y/N	Y/N	Y/N
Cooling Tower Flow Controls	140.4(h)3			
Centrifugal Fan Cooling Towers <sup>4</sup>	140.4(h)4			
Air-Cooled Chiller Limitation <sup>5</sup>	140.4(j)			
Variable Flow System Design	140.4(k)			
Chiller and Boiler Isolation	140.4(k)			
CHW and HHW Reset Controls	140.4(k)			
WLHP Isolation Valves	140.4(k)			
VSD on CHW, CW & WLHP Pumps >5HP	140.4(k)			
DP Sensor Location	140.4(k)			

**Notes:**

1. Provide equipment tags (e.g. CH 1 to 3) or system description (e.g. CHW loop) as appropriate. Multiple units with common requirements can be grouped together.
2. Provide references to plans (i.e. Drawing Sheet Numbers) and/or specifications (including Section name/number and relevant paragraphs) where each requirement is specified. Enter "N/A" if the requirement is not applicable to this system.
3. The referenced plans and specifications must include all of the following information: equipment tag, equipment nominal capacity, Title 24 minimum efficiency requirements, and actual rated equipment efficiencies. Where multiple efficiency requirements are applicable (e.g. full- and part-load) include all. For chillers operating at non-standard efficiencies provide the Kadj values. For chillers also note whether the efficiencies are Path A or Path B.
4. Identify if cooling towers have propeller fans. If towers use centrifugal fans document which exception is used.
5. If air-cooled chillers are used, document which exceptions have been used to comply with 140.4(j) and the total installed design capacity of the air-cooled chillers in the chilled water plant.
6. Identify the existence of a completed MCH-06-E when open or closed circuit cooling towers are specified to be installed, otherwise enter "N/A".

**HVAC SYSTEM REQUIREMENTS**

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**DOCUMENTATION AUTHOR'S DECLARATION STATEMENT**

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name:	Documentation Author Signature:
Company:	Signature Date:
Address:	CEA/ HERS Certification Identification (if applicable):
City/State/Zip:	Phone:

**RESPONSIBLE PERSON'S DECLARATION STATEMENT**

I certify the following under penalty of perjury, under the laws of the State of California:

- The information provided on this Certificate of Compliance is true and correct.
- I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
- The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
- The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
- I will ensure that a completed signed copy of this Certificate of Compliance shall be 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 completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name:	Responsible Designer Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone:

### NRCC-MCH-02-E User Instructions

#### ***Mechanical Mandatory and Prescriptive Measures***

The mandatory measures and prescriptive measures must be incorporated into the construction documents. Left column, NRCC-MCH-02-E (Parts 1, 2, and 3) list the measures and the section numbers in the Standards where the requirements for those measures are specified. The columns labeled *Indicate Page Reference on Plans or Schedule* are for designating the specific sheet on the plans or specification section(s) where the measures used to comply with the Standards are documented. As noted below the table, a reference to specifications must include both a specification section and paragraph number. The remaining cells in this document are organized with a separate column for each system (or groups of similar systems). In each column, the documentation author shall identify where each of the required measures are specified on the plans or in the project specifications. Where a measure is not applicable to the specific system, the letters “NA” (for not applicable) are placed in the cell. Groups of similar systems can be entered in a single column where appropriate.

In the plans or specifications where the specific details of compliance are shown, the designer may use whatever format is most appropriate for specifying the required measures. This will generally take one of several forms:

1. The material is incorporated into an equipment schedule on the mechanical plans. This includes items like equipment efficiencies, capacities (desired equipment size and calculated required capacity) and some features like air-side economizers.
2. The material appears on the plans in a general notes block. Examples of these are the “mandatory measures block” that was used in the project.
3. The material is incorporated into the specifications. For most control measures this will be in the sequences of operations under the controls specification section. For equipment features like tower flow turndown or heat pump thermostats this will typically be in either the equipment schedules or the specification sections for the specific piece of equipment. Where specifications are used, the documentation must be specific enough to point the code official to the page (or specific paragraph) where the feature is specified.

The information on this compliance document may be incorporated into the plans or on a spreadsheet.

#### **Section A. Air System Requirements (Dry)**

##### **Item or System Tags**

At the start of each column identify each air-side unit or groups of similar units using the Items or System Tag(s) from the plans or specifications.

##### **Mandatory Measures**

For each item below, identify the plan or specification section where the required feature is specified.

1. HEATING EQUIPMENT EFFICIENCY – This is the minimum code-mandated heating equipment efficiency found in §110.1 or §110.2(a). Where appropriate, both full- and part-load efficiency must be identified.
2. COOLING EQUIPMENT EFFICIENCY – This is the minimum code-mandated cooling equipment efficiency found in §110.1 or §110.2(a). Note both the full- and part-load efficiencies must be identified.
3. HVAC OR HEAT PUMP THERMOSTAT – Heat pump systems indicate the controls that minimize the use of electric resistance heat as required by §110.2(b), §110.2(c). The electric resistance heat can only be used for defrost and as a second stage of heating.
4. FURNACE STANDBY LOSS CONTROLS – The specified plan sheet must indicate the furnace control requirements of §110.2(d) (IID and power venting or flue damper for furnaces ≥ 225 MBH input rating) and §110.5(a) (ignition by other than a pilot light).
5. NATURAL VENTILATION – The specifications for operable openings, their control (if appropriate) and location found in §120.1(b). Note this will likely cross reference architectural plans.
6. MINIMUM VENTILATION – The specification for minimum OSA at both the central and zone levels in compliance with §120.1(b).
7. DEMAND CONTROL VENTILATION – If demand control ventilation systems are either required or provided per §120.1(c)4, identify the specifications for the CO<sub>2</sub> sensors and controls.
8. OCCUPANT SENSOR VENTILATION CONTROL – Identify the control specifications for preoccupancy purge per §120.1(c)5 and scheduling control per §120.2(e)3 for each system. This item should be in the control sequences or in the specification for a time clock or programmable thermostat.

9. SHUTOFF AND RESET CONTROLS – If shutoff or reset controls are required per §120.2(e), identify the specifications for these off hour controls. This item should be in the control sequences.
10. OUTDOOR AIR AND EXHAUST DAMPER CONTROL – Identify the specifications for automatic or barometric dampers on OSA and exhaust openings as specified in §120.2(f).
11. ISOLATION ZONES – Identify the specifications for isolation zone controls that are required by §120.2(g) for units serving multiple floors or areas in excess of 25,000 ft<sup>2</sup>. This item should be in the control sequences.
12. AUTOMATIC DEMAND SHED CONTROLS – Identify the specifications for automatic demand shed controls that are required by §120.2(h).
13. ECONOMIZER FDD – Identify the specifications for economizer FDD that are required by §120.2(i).
14. DUCT INSULATION – Identify the specifications for duct insulation greater than or equal to the requirements of §120.4.

### Prescriptive Measures

1. CALCULATED COOLING/HEATING CAPACITY – Confirm that the cooling/heating equipment is sized in conformance with §140.4 (a & b).
2. SUPPLY FAN CONTROL – For VAV systems, identify the specifications for fan volume control per §140.4(c). For constant volume systems, enter “NA” in these cells. For VAV fan systems over 10 hp, the modulation must be one of the following: Variable pitch vanes.  
  
Variable frequency drive or variable-speed drive.  
Other; A specification for a device that has a 70% power reduction at 50% airflow with a design pressure setpoint of 1/3 of the fan total static pressure.
3. SIMULTANEOUS HEAT/COOL – Indicate the controls or sequences that stage the heating and cooling, or for VAV systems, reduces the supply before turning on the zone heating. §140.4(d)
4. ECONOMIZER – Indicate the specification for an air or water economizer that meets the requirements of §140.4 (e). The specification must include details of the high limit switch for airside economizers. If an economizer is not required, indicate by entering “NA”.
5. HEAT AND COOL AIR SUPPLY RESET – Indicate the specification for supply temperature reset controls per §140.4(f). This will typically be a sequence of operation. This control is required for systems that reheat, re-cool, or mix conditioned air streams.
6. ELECTRIC RESISTANCE HEATING – Indicate which of the five exceptions to §140.4(g) applies to the project. For more information, see Section 4.6.2.5.
7. DUCT LEAKAGE SEALING AND TESTING – Indicate the specification for duct leakage testing where required by §140.4(l). Note this only applies to small single units with either horizontal discharge or ducts in un-insulated spaces.

### Section B. Water Side System Requirements (Wet)

#### Item or System Tags

At the start of each column identify each chiller, tower, boiler, and hydronic loop (or groups of similar units) using the system tag(s) from the plans or specifications.

#### Mandatory Measures

1. EFFICIENCY – This is the minimum code-mandated heating or cooling equipment efficiency as specified in §110.1. Where appropriate both full- and part-load efficiency must be identified. This is typically identified in the equipment schedules.
2. HEAT REJECTIONS SYSTEM - Applies to heat rejection equipment used in comfort cooling systems such as air cooled condensers, open cooling towers, closed-circuit cooling towers and evaporative condensers. §110.1, §140.4(i).
3. CONDUCTIVITY OR FLOW BASED CONTROLS – Identify the specification for conductivity or flow-based controls that maximize cycles of concentration per §110.2(e)1.
4. MAX CYCLES OF CONCENTRATION – identify the location on the plans that specify the maximum cycles of concentration using the Langelier Saturation Index (LSI) calculator per §110.2(e)2.
5. FLOW METER – Identify control type, either analog or through gateway per §110.2(e)3.
6. OVERFLOW ALARM – Identify the specifications for the audible alarm per §110.2(e)4.
7. DRIFT ELIMINATORS – Identify the specification for drift eliminators per §110.2(e)5.
8. PIPE INSULATION – Identify the specifications for pipe insulation greater than or equal to the requirements of §120.3.

**Prescriptive Measures**

1. COOLING TOWER FAN CONTROLS – For cooling towers identify the specifications for fan volume control per §140.4(h)2, §140.4(h)5. Each fan motor 7.5 hp and larger must have a variable speed drive, pony motor or two-speed motor for no less than 2/3rds of the tower cells.
2. COOLING TOWER FLOW CONTROLS – For cooling towers identify the specifications for tower flow control per §140.4(h)3. Each tower cell must turn down to 50% or the capacity of the smallest pump whichever is larger.
3. CENTRIFUGAL FAN COOLING TOWERS – Identify the specification for centrifugal fan cooling towers per §140.4(h)4.
4. AIR-COOLED CHILLER LIMITATION – Identify the specifications for air-cooled chillers per §140.4(j).
5. VARIABLE FLOW SYSTEM DESIGN – Identify the specifications for two way valves on chilled and hot water systems with more than 3 control valves per §140.4(k). This is often shown on the chilled or hot water piping schematic or riser diagram. It is also sometimes identified in the coil schedules.
6. CHILLER AND BOILER ISOLATION – Identify the specifications for actuated isolation of chiller and boilers in a plant with multiple pieces of equipment and headered pumps per §140.4(k). Note this requirement is inherently met by chillers and boilers with dedicated pumps. This is often shown on the chilled or hot water piping schematic.
7. CHW AND HHW RESET CONTROLS – Indicate the specification for supply water temperature reset controls per §140.4(k). This will typically be a sequence of operation.
8. WLHP ISOLATION VALVES – Indicate the specification for water loop heat pump isolation valves to meet the requirements of §140.4(k).
9. VSD ON CHW, CW & WLHP PUMPS > 5HP – Indicate the specification for variable speed drives on variable flow systems with greater than 5 hp as indicated in §140.4(k).
10. DP SENSOR LOCATION – Indicate the specification for the placement of the pump pressure sensor to meet the requirements of §140.4(k).

**Documentation Author's Declaration Statement**

The CERTIFICATE OF COMPLIANCE is signed by both the Documentation Author and the Principal Designer who is responsible for preparation of the plans of building. This latter person is also responsible for the energy compliance documentation, even if the actual work is delegated to a different person acting as Documentation Author. It is necessary that the compliance documentation be consistent with the plans.

DOCUMENTATION AUTHOR is the person who prepared the energy compliance documentation and who signs the Declaration Statement. The person's telephone number is given to facilitate response to any questions that arise. A Documentation Author may have additional certifications such as a Certified Energy Analyst or a Home Energy Rating System certification number. Enter number in the CEA# or HERS# field provided.

**Declaration Statement of Principle Designer**

The Declaration Statement is signed by the person responsible for preparation of the plans for the building and the documentation author. This principal designer is also responsible for the energy compliance documentation, even if the actual work is delegated to someone else (the Documentation Author as described above). It is necessary that the compliance documentation be consistent with the plans. The Business and Professions Code governs who is qualified to prepare plans and therefore to sign this statement. See Section 2.2.2 Permit Application for applicable text from the Business and Professions Code.