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A. General Information		
Climate Zone:	Building Type:	Conditioned Area (ft^2):
Reviewer's Name:	Reviewer's Agency:	
Note: Design Review for each system/subsystem must be submitted		
Enforcement Agency:	Permit Number:	
Enforcement Agency Use: Checked by	Enforcement Agency Use: Date	

B. Design Review Checklist

Code Section	Measure	Design Reviewer			Designer Response		
		Yes. Complies	Does Not Comply	Consider Better Practice	Complies	Will Include in Next Draft	Not Included - State Reason
COMPLEX MECHANICAL SYSTEMS							
FAN SYSTEMS							
120.1(e)	All variable volume mechanical ventilation and space conditioning systems shall include dynamic controls to maintain measured outside air rates within 10% of required rate at both full and reduced supply airflow conditions.	○	○	○	○	○	○
140.4(c)2 B	SP sensors for VAV fans shall be placed such that the controller set point is no greater than 1/3 the total design fan static pressure, except for systems with zone reset control.	○	○	○	○	○	○
140.4(c)2 C	VAV Systems with DDC of individual zone boxes reporting to the central control panel, static pressure set point shall be reset based on the zone requiring the most pressure.	○	○	○	○	○	○
140.4 (m)	Cooling systems identified in Table 140.4-D have fan controls to vary the indoor fan airflow as a function of load and shall comply with the following: 1. DX and chilled water cooling systems that control capacity based on occupied space temperature have a minimum of 2 stages of control. 2. Systems that control space temperature by modulating airflow to the space have proportional fan control. 3. Systems with air side economizer have a minimum of 2 speeds of fan control during economizer operation.	○	○	○	○	○	○
Best Practice	*Fan cabinet enclosure and internal components are selected to minimize pressure drop, (e.g. face velocity is less than 500 fpm, low pressure drop coils, filters, etc.).*						
Best Practice	*Fan wheel is selected for efficient operation, (e.g. larger diameter rotating at lower speed).*						

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SUPPLY AIR TEMPERATURE (SAT) RESET							
140.4(f)	Systems that serve multiple zones have controls that automatically reset supply air temperature. Zones with high internal loads with near constant airflow are designed for the elevated reset supply air temperature. Reset controls are in response to building loads or to outdoor air temperature and are at least 25% of the difference between supply air and design room air temperature. Control sequences are identified on plans.	○	○	○	○	○	○
Best Practice	SAT reset is established with an aggressive reset schedule of 10°F, (e.g. 55°F during warm weather and 65°F during cool weather).						
Best Practice	*SAT reset off terminal box damper position or thermostat demand does not rely on a lone worst zone, but averaged over a few zones with greatest demand.*						
HEAT REJECTION EQUIPMENT							
110.2(e)	Open and closed circuit cooling towers have conductivity or flow-based controls and are equipped with a Flow Meter, Overflow Alarm and Efficient Drift Eliminators.	○	○	○	○	○	○
140.4(h)2	Tower fans powered by motors greater than 7.5 hp have controls that automatically change fan speed to control the leaving fluid temperature, condensing temperature or pressure of the heat rejection device.	○	○	○	○	○	○
140.4(h)3	Open cooling towers with multiple condenser water pumps are designed so that all cells can run in parallel with the larger of: A) flow this is produced by the smallest pump; or B) 50% of the design flow for the cell.	○	○	○	○	○	○
140.4(h)5	Multiple cell heat rejection equipment with variable speed fan drives shall operate the maximum number of fans and control all operating fans to the same speed.	○	○	○	○	○	○
Best Practice	*A higher condenser water delta-T design is used or was considered. The cooling tower is oversized, accordingly.*						
Best Practice	*For the cooling tower bypass, a 2-way valve should be used in the bypass line rather than a 3-way valve, in order to reduce the pressure drop. The 2-way valve is sized so that no water will go over the tower when in full bypass.*						
Best Practice	*For DX air handlers with water-cooled condensers, the entering condenser water temperature is reset based on outdoor wet bulb or surrogate conditions.*						
Best Practice	*When cool weather cooling loads cannot be met by 100% outside air economizing, a plate and frame heat exchanger is used in parallel with the chiller to chill the water directly from the cooling tower water.*						

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Best Practice	*Cooling towers are specified with low flow accommodating weir dams in the top basin and tower staging sequences call for as much tower(s) to be open to flow as possible within tower limits to take advantage of heat exchange surface area.*						
Best Practice	*Oversized cooling towers are utilized to aid in ensuring lower condenser water temperatures to chillers to save energy.*						
CHILLERS AND BOILERS							
120.9	Boilers meet the requirements of this section, as required: (a) combustion air positive shut-off for boilers with input capacity of 2.5 MMBtu/y and above, (b) combustion air fan motors 10 hp or larger have variable speed drive or controls to limit fan motor demand to no more than 30% of total design wattage at 50% of design air volume, and (c) boilers with input capacity of 5 MMBtu/h and greater maintain excess oxygen concentrations at less than or equal to 5.0%.	○	○	○	○	○	○
140.4(i)	Chilled water plants have no more than 300 tons provided by air-cooled chillers.	○	○	○	○	○	○
140.4(k)2	When a chilled water system includes more than one chiller, flow through any chiller is automatically shut off when that chiller is shut off while still maintaining flow through other operating chiller(s).	○	○	○	○	○	○
140.4(k)3	When a hot water plant includes more than one boiler, provisions shall be made so that flow through any boiler is automatically shut off when that boiler is shut off while still maintaining flow through other operating boiler(s).	○	○	○	○	○	○
140.4(k)4	Systems with a design capacity exceeding 500,000 Btu/hr supplying chilled or heated water shall include controls that automatically reset supply water temperatures as a function of representative building loads or outside air temperature.	○	○	○	○	○	○
Best Practice	*Chillers are sequenced optimally, taking into consideration the current load and part load efficiencies of chillers. This sequence is clear in the sequences of operation.*						
Best Practice	*Total kW/ton efficiency calculation is performed for the most likely outdoor air conditions for low to high chiller loads. Condenser water temperature, chilled water temperature, and which chillers are ON is optimized at each condition and specified in a sequence.*						
Best Practice	*Sequences clearly describe how boiler and chiller short cycling will be avoided at low loads. Minimum flow rates are clearly described in the sequences. Installation of equipment and piping are consistent with the sequence.*						
Best Practice	*Chiller with a variable-speed compressor is used or was considered.*						

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Best Practice	*Heating water systems with condensing boilers utilize low return water temperatures to increase boiler efficiency (and heating water coils are correspondingly "oversized").*						
Best Practice	*Boiler staging control is incorporated to take advantage of boiler part load efficiencies and to optimize total plant efficiency.*						
Best Practice	*A narrative is provided that explains how the continuous turn-down ratio or size of the smallest chiller, or boiler, is in line with the lowest expected heating and cooling load that will occur frequently or be experienced for any significant length of time (assessed by asking the designer for the results of their calculations, and taking into account off-season and off-hours operation and the less than fully occupied condition that may exist for years). Some cycling is expected at the lowest loads, but cycling should be limited to manufacturer recommendations.*						
Best Practice	*Heat recovery chillers are incorporated for domestic hot water or low temperature heating water for space heating or for outdoor air pre-heating and heating coils designed for the lower temperature water.*						
Best Practice	*The cooling central plant equipment is designed to efficiently handle the smallest conceivable load without excessive cycling and without using inefficient techniques like hot gas bypass/reinjection.*						
HYDRONIC SYSTEMS - PUMPING							
140.4(k)1	Chilled and hot water pumping are designed for variable flow and are capable of reducing pump flow rates to no more than the larger of a)50% or less of design flow rate or b) minimum flow required by equipment manufacturer.	○	○	○	○	○	○
140.4(k)6 A	Individual pumps serving variable flow systems with motor horsepower greater than 5 hp have controls or devices that result in pump motor demand of no more than 30% of design wattage at 50% of design water flow. Pumps shall be controlled as a function of required differential pressure.	○	○	○	○	○	○
140.4(k)6 B	For systems without DDC, differential pressure shall be measured at the most remote heat exchanger or at the heat exchanger requiring greatest differential pressure. For systems with DDC, static pressure set point shall be reset based on valve requiring most pressure and the set point shall be no less than 80% open.	○	○	○	○	○	○
Best Practice	*In variable flow systems, there are no 3-way valves. The only exception should be for a valve with an opening limit or a balanced bypass line that is sized for the lowest flow rate at which the pump can operate without overheating. Sequences of operations show that this valve is to be opened only after all coil valves are closed.*						

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Best Practice	*For each hydronic flow meter, the location is shown on the drawings with detail notes indicating length of straight pipe required up, and down, stream of that sensor.*						
Best Practice	*Flow meters used for control in open cooling tower systems utilize magnetic or ultra-sonic meters rather than in-flow paddle meters that are prone to damage and clogging.*						
Best Practice	*There are pump impeller trim requirements for non-VFD controlled motors over 5 hp, if throttling more than 20% is required to meet design. For pumps greater than 20 hp controlled by VFD's, if more than 30% throttling is required at design loads, the pump impellers shall be trimmed.*						
Best Practice	*Pumps are not oversized. The capacity of each pump does not exceed the sum of the coil capacities served. (No additional safety factor is needed, since the normal coil load diversity provides the pump safety factor).*						
Best Practice	*Single line flow diagrams are shown in the drawings for major systems including the chilled water and heating water. These diagrams include the complete path of water through the system with coils, dampers, pumps, valves, flow rates, and sensors shown.*						
Best Practice	*Balancing valves (like triple duty valves) should not be installed on the discharge on variable speed pumps as they are a constant unnecessary pressure drop. The variable speed adjusts for design flow, so the valve is not needed.*						
Best Practice	*In constant flow hydronic loops, hydronic balancing valves are shown at: each non-VFD controlled pump, major zone or floor branch takeoffs, parallel cooling towers and chillers that are not symmetrically piped or are different sizes, and at all coils. Specifications require marking or setting set screws at final valve positions. Requirements should also be found in the specifications.*						
HYDRONIC HEAT PUMP (WLHP)							
140.4(k)7	Hydronic heat pumps connected to a common heat pump water loop with central devices for heat rejection and heat addition shall have controls that are capable of providing a heat pump water supply temperature deadband of at least 20°F between initiation of heat rejection and heat addition by the central devices.	○	○	○	○	○	○
NOTES							

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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:

1. The information provided on this Certificate of Compliance is true and correct.
2. 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).
3. 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.
4. 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.
5. 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 Person Name:	Responsible Person Signature:
Company :	Date Signed:
Address:	License:
City/State/Zip:	Phone: