

Mechanical Requirements List, pg 1 of 32

2021 WSEC Requirements for Commercial Buildings including Group R2, R3 & R4 over 3 stories & all R1 -- Administered by ©2024 NEEA, All rights reserved  
The following information is necessary to check a mechanical permit application for compliance with the mechanical systems and equipment requirements in the Washington State Energy Code, Commercial Provisions.  
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Project:  
Wesley Bradley Park Phase 2 - Care Center - 2021 WSEC  
707 39th Ave. SE  
Puyallup, WA 98374

PRCNC20240424

Date: 2024-12-03

Applies	Code Section	Code Provision	Compliance Information Required In Permit Documentation	Location in Documents	Building Department Notes
SCOPE					
	C103.6.3	Construction documents - General	For a shell & core or tenant space (first build-out) project, indicate if there is no mechanical scope included in the project.		
	C103.1	Construction documents - General	For an alteration project, indicate if there is no mechanical scope included in the project.		
PERFORMANCE CRITERIA & SYSTEM DESIGN					
NA	C403.1	Exempt process equipment	Identify equipment used by manufacturing, industrial or commercial processes that are not for space conditioning or maintaining comfort and amenities for occupants; identify provisions applicable to this equipment per C403.1 exception		
	C403.1.1	HVAC total system performance ratio (TSPR)	For systems serving office (including medical office), retail, library, or education occupancies, or serving R-2 dwelling units or common areas, provide a TSPR report that demonstrates the proposed design ratio is equal to or greater than the standard reference design ratio, or exception applied		
YES	C403.1.2	Calculation of heating and cooling loads	Provide load calculations in accordance with ASHRAE Std 183 or equivalent, using design parameters per C302 and Appendix C; include load adjustments to account for energy recovery		
NA	C403.1.3	Data centers	Provide documentation that demonstrates that data center systems comply with the maximum allowed Design MLC and Annualized MLC per ASHRAE 90.4-2019.		
YES	C403.2.1 C403.4.2.2	Zone isolation	If there are HVAC zones that are intended to be occupied non-simultaneously, identify isolation zone areas on plans; if multiple zones intended to be occupied simultaneously will be combined into a single isolation zone, include on plans that the combined zone area does not exceed 25,000 sf and does not include more than one floor; or exception applied	I-2 dwelling units does not require it on ventilation air.	
YES	C403.2.1 C403.4.2.2	Zone isolation	Indicate locations of associated zone isolation dampers in HVAC and DOAS distribution systems and exhaust systems	I-2 dwelling units does not require it on ventilation air.	
YES	C403.2.1 C403.4.2.2	Zone isolation	Refer to HVAC Controls section in Requirements List for applicable automatic setback and shutdown controls requirements	I-2 dwelling units does not require it on ventilation air.	
EQUIPMENT SELECTION & PERFORMANCE					

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YES	C403.3.2.6	Electric heating / cooling equipment	Verify all packaged and split electric equipment with > 6,000 Btu/h cooling capacity and any amount of heating is a heat pump with reverse-cycle defrost and operates in heat pump mode when outdoor air temperature is > 25 degree F; include in equipment schedules	No elect heat for heat pump units.	
NA	C403.3.2.6	Electric heating / cooling equipment	Verify electric heat in the main supply duct before VAV boxes served by cooling only systems > 6,000 Btu/h is a heat pump with reverse-cycle defrost and operates in heat pump mode when outdoor air temperature is > 25 degree F; include in equipment schedules.		
NO	C401.3 C403.1.4	HVAC Heating Fuel	For all heating equipment, identify whether it qualifies for the C403.1.4 general prescriptive path, a C403.1.4 exception, or for the C401.3 Fossil Fuel Heating path; for equipment qualifying for the C403.1.4 general prescriptive path by exception, document the exception and provide supporting information	Exception 10 and 16	
NO	C401.3 C403.1.4 C406.1	HVAC Heating Fuel	For projects with equipment utilizing the C401.3 Fossil Fuel Heating path, provide an accounting of the total heating capacity and the C401.3 equipment heating capacity for each distinct area utilized in the C406 calculation.		
NA	C403.1.4	HVAC Heating Fuel, exception 2 Dwelling and sleeping units	To qualify for exception 2, provide a list of each separate space in the dwelling or sleeping unit, indicate the number of exterior walls the space has, the presence of fenestration, and the allowed watts; document the heat provided in each space is below the allowed capacity in the space		
NA	C403.1.4	HVAC Heating Fuel, exception 5 Air-to-air heat pumps	To qualify for exception 5, provide documentation that the heat pump is sized to meet the heating load at an outdoor air temperature ≤ 32°F and has a ratio of heating capacity at 47°F to supplemental resistance heat capacity ≥ 2.0 in zone 4 and ≥ 1.0 in zone 5; indicate unit control by either a thermostat designed for heat pump use, a multistage thermostat with an outdoor air temperature thermostat wired to energize supplemental heat only on the last stage or heating and when the outdoor air temperature is ≤ 32°F, or equipment is NAECA rated with integral control		

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NA	C403.1.4	HVAC Heating Fuel, exception 6 Air-to-water heat pumps	To qualify for exception 6, provide documentation that building heating is provided by air-to-water heat pumps with a heating capacity $\geq 75\%$ of the design heating load at 29°F; indicate controls configured to lock out supplemental heat when the outdoor air temperature is $\geq 36^\circ\text{F}$ unless the hot water supply set point has not been maintained for 20 minutes; indicate controls configured to use the compressor as the first stage of heating down to the compressor minimum rated temperature except during start up and defrost		
NA	C403.1.4	HVAC Heating Fuel, exception 7 Ground source heat pumps	To qualify for exception 7, provide documentation building heating provided by ground source heat pumps; ; indicate controls configured to lock out supplemental resistance heat when the source-side entering water temperature is $\geq 42^\circ\text{F}$ unless the hot water supply set point has not been maintained for 20 minutes; indicate controls configured to use the compressor as the first stage of heating; indicate the ground source heat exchanger shall be sized so heat pump annual output is $\geq 70\%$ for the total annual heating output based upon the final year of a 30-year simulation using IGSHPA listed software		
NA	C403.1.4	HVAC Heating Fuel, exception 8 Small systems	To qualify for exception 8, document the capacity or area served for the electric resistance and fossil fuel systems and demonstrate that it is $\leq 5\%$ of the building total heating capacity or area		
NA	C401.3.6	Electrification readiness	For all equipment following the fossil fuel path, indicate on plans that spare electrical branch circuit and service entrance conduit is installed and sized to support future conversion of fossil fuel heaters to heat pumps; indicate on plans additional room in the electric room and transformer rooms and vaults be provided and sized to accommodate future service upgrades for conversion of all fossil fuel equipment to heat pumps.		
YES	C403.3.1	Equipment and system sizing	Indicate that output capacities of heating and cooling equipment and systems are no greater than the smallest available equipment size that exceeds the calculated loads; note exceptions applied		
YES	C403.3.2 C403.9.1	HVAC equipment performance requirements (efficiency)	Provide equipment schedules on plans and in WSEC mechanical equipment compliance reports; indicate equipment type, calculated loads, capacity, rated and WSEC minimum efficiencies for all heating and cooling equipment; include supply and ventilation air cfm and operating hours for all air systems; identify heating and cooling equipment that does not have a corresponding WSEC minimum efficiency (manufacturer rated)		

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YES	C405.8	Electric motor efficiency	List all motors $\geq 1/12$ hp (that are not integral to a rated piece of equipment) in the mechanical or electrical equipment schedules on plans; indicate motor type and applicable efficiency table, hp, rpm, number of poles and rated efficiency, or exception applied		
NA	C403.3.2.1	Gas and oil-fired forced air furnace and unit heaters	For gas and oil fired forced air furnaces with capacity $\geq 225,000$ Btu/h and all unit heaters, indicate in equipment schedule intermittent ignition or IID, flue or draft damper, and rated jacket loss		
NA	C403.3.3	Hot gas bypass limitation for DX cooling equipment	For cooling equipment with hot gas bypass, provide either multiple step unloading or continuous capacity modulation; indicate bypass capacity per Table C403.3.3		
NA	C403.3.2.7	Humidification	For cooling systems with humidification equipment that are also required to have air economizer, indicate humidifier is adiabatic (direct evaporative or fog atomization), or exception applied		
NA	C403.3.2	Hydronic equipment	Refer to Requirements List section Hydronic Systems - Equipment Selection & Performance for selection criteria specific to chillers and boilers		
NA	C403.9	Heat rejection equipment	Refer to Requirements List section Heat Rejection Systems - Equipment Selection & Performance for selection criteria specific to cooling towers, dry coolers and condensers (air-cooled and evaporative)		
NA	C403.13	Dehumidification in spaces for plant growth	Indicate dehumidification equipment serving plant growth spaces and which C403.13 compliance option is met		
<b>EQUIPMENT SELECTION &amp; PERFORMANCE - DEDICATED OUTSIDE AIR SYSTEMS (DOAS)</b>					
YES	C403.3.5.5 C403.7.3	DOAS supplemental heating and cooling	If DOAS has heating capability, indicate heating controlled to limit supply air to $\leq 55^{\circ}\text{F}$ . If heating is used for defrost control, indicate heat is to be locked out when outdoor air temperature is $\leq 35^{\circ}\text{F}$ , modulates to 10% of peak capacity. Provide sizing calculations that show heating capacity sized at design temperatures to prevent damage to unit and heat supply air $\leq 55^{\circ}\text{F}$ .		
YES	C403.3.5.5	DOAS supplemental heating and cooling	If DOAS has cooling capability, indicate cooling coil is used only for dehumidification only, is sized to meet the peak dehumidification requirement at design conditions, and is controlled to maintain supply air or zone relative humidity.		

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YES	C403.3.5 C403.3.5.4	Dedicated outdoor air systems	For buildings with occupancies required to comply with the DOAS provisions per Table C403.3.5, identify on plans all occupancies in the building and indicate which occupied spaces are required to have ventilation air delivered by a DOAS; or exception applied		
NA	C403.3.5 C403.3.5.4	Dedicated outdoor air systems	If natural ventilation exception is applied, identify these spaces on plans; indicate operable window area complies with IMC Section 402; provide documentation describing how required ventilation will be provided during all occupied hours, including during inclement weather		
NA	C403.3.5 C403.3.5.4	Dedicated outdoor air systems	If high efficiency VAV exception is applied, identify these spaces on plans; refer to Single Zone VAV section for Groups A-1, A-2 and A-3 occupancy classifications, or Multiple Zone VAV for other than Groups A-1, A-2 and A-3 (per Table C403.3.5)		
NA	C403.3.5 C403.3.5.6	Dedicated outdoor air systems	If compliance with the DOAS provisions is deemed to be impractical, provide documentation that demonstrates the alternate design strategy applied that achieves a comparable level of energy efficiency, as pre-approved by the AHJ		
NA	C403.3.5	Dedicated outdoor air systems	Refer to Requirements List section after Multiple-Zone Air Systems for High Efficiency Multiple-Zone VAV Systems exception to C403.3.5 DOAS		
NA	C403.3.5	Dedicated outdoor air systems	Refer to Requirements List section after High Efficiency Multiple-Zone Air Systems for High Efficiency Single-Zone VAV Systems exception to C403.3.5 DOAS		
YES	C403.3.5.1	DOAS energy recovery method and effectiveness	For all DOAS systems, indicate exhaust air ER method and basis of rated effectiveness (sensible or latent); indicate $\geq 68\%$ sensible or $\geq 60\%$ enthalpy recovery ratio at design conditions; or exception applied		
YES	C403.3.5.2	DOAS fan power	For DOAS with no fans or fan arrays with input power $\geq 1\text{ kW}$ , indicate total system fan power does not exceed 1 watt per cfm		
YES	C403.3.5.2	DOAS fan power	For DOAS with any fans or fan arrays with input power $\geq 1\text{ kW}$ , indicate total system fan power complies with fan power limitation per Section C403.8.1		
YES	C403.3.5.3	Heating / cooling system fan controls with DOAS	Indicate systems and equipment associated with the delivery of zone level heating and cooling (fans, hydronic pumps, primary air dampers, etc.) are configured to shut off, and central equipment is configured to turn down, when there is no call for heating or cooling in the zone they serve		

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NA	C403.3.5.3	Heating / cooling system fan controls with DOAS	If applying Exception to heating / cooling fans used for air mixing in the space during deadband periods, include fan watts per cfm in equipment schedule		
YES	C403.3.5.4	Decoupled DOAS supply air	Indicate method of delivery of DOAS supply air to the occupied space (directly into space, downstream of terminal heating / cooling coils); or exception applied		
YES	C403.6.5	Multiple zone DOAS	For DOAS serving multiple zones with DDC controls, indicate controls configured to reduce the volume of outdoor air in each zone independently when the zone is unoccupied; or exception applied		

## ADDITIONAL ENERGY EFFICIENCY MEASURE - DEDICATED OUTSIDE AIR SYSTEMS (DOAS)

	C406.2.2.6	High performance DOAS - Energy recovery effectiveness and fan power	For all building occupancies, to comply with this additional efficiency credit, demonstrate compliance with C403.3.5		
	C406.2.2.6	High performance DOAS - Energy recovery effectiveness and fan power	Indicate energy recovery sensible effectiveness of all DOAS is $\geq 80\%$		
	C406.2.2.6	High performance DOAS - Energy recovery effectiveness and fan power	For each system, indicate that total system fan power does not exceed 0.769 watts per cfm or is $\leq 80\%$ of the fan power allowance for a constant volume system calculated per C403.8.1		

## FANS AND FAN CONTROLS

YES	C403.8.1.2	Fan power limitation	For all HVAC fan systems associated with conditioned space and containing 1 or more fans with electrical input $\geq 1$ kW shall provide the total nameplate hp and the fan system electrical input power calculated per C403.8.1.2 in equipment schedules on project plans		
YES	C403.8.1.1	Fan power limitation	For all HVAC and DOAS systems associated with conditioned space with 1 or more fans with electrical input power $\geq 1$ kW, provide fan system electrical input power calculations per Section C403.8.1.2 to verify it complies with fan power budget per Section C403.8.1.1		
YES	C403.8.2	Motor nameplate hp	For HVAC systems with total fan motor nameplate hp $> 5$ hp, indicate fan motors specified are the smallest available motor hp size greater than fan bhp, note exceptions applied		

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YES	C405.8	Fractional hp fan motors	For all fractional hp fan motors (1/12 - < 1 hp), indicate that motors comply with applicable WSEC efficiency tables; if motor type is not listed in an efficiency table, indicate whether fan has an electronically commutated motor, has motor rated efficiency of at least 70%, or exception applied		
NA	C403.8.3	Fan efficiency	For individual fans or fan arrays, indicate in equipment schedule that rated FEI for all applicable fans part of a variable-air volume system is $\geq 0.95$ and $\geq 1.0$ in all other systems, or exception applied; indicate these fans are sized at the design point of operation		
	C403.8.4	Low-capacity ventilation fans	For all ventilation system fans with motors $\leq 1/12$ hp, indicate in equipment schedule the fan flow rate and efficacy (cfm/watt), or exception applied; refer to Table C403.8.4		
YES	C403.2.4	Variable flow capacity - fans	For fan motors $\geq 5$ hp, indicate method of variable flow control (VSD or equivalent method) in equipment schedule, or exception applied		
NA	C403.8.5.1	Fan airflow control	For DX air handling units with cooling capacity $\geq 42,000$ Btu/h and evaporative and chilled water air handling units with fan $\geq 0.25$ hp, indicate whether system is single zone or multiple zone and related control method (cooling capacity controlled in response to space temperature, space temperature is controlled by modulating supply airflow, or both)		
YES	C403.8.5.1	Fan airflow control	For mechanical cooling systems (includes DX and chilled water coils) that control cooling capacity in response to space temperature - Provide a minimum of two stages of fan control; indicate minimum fan speed is $\leq 66\%$ of full speed drawing $\leq 40\%$ of full speed fan power during periods of low cooling or ventilation only		
YES	C403.8.5.1	Fan airflow control	For other mechanical cooling systems (includes DX and chilled water coils) that control space temperature by modulating airflow (in lieu of, or in addition to, controlling capacity in response to space temperature) - Provide fan controls for modulating supply airflow; indicate minimum fan speed is $\leq 50\%$ of full speed drawing $\leq 30\%$ of full speed fan power during periods of low cooling or ventilation only; or exception applied		
NA	C403.8.6	Large-diameter ceiling fans	Where provided, indicate large-diameter ceiling fans to be tested and labeled in accordance with AMCA 230.		

## ADDITIONAL ENERGY EFFICIENCY MEASURE - IMPROVED HVAC TSPR

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	C406.2.2.1	Improved HVAC TSPR	To comply with this additional efficiency credit, indicate systems are required to provide a TSPR report per C403.1.1; demonstrate that the proposed design ratio is at minimum 5% higher than the standard reference design ratio; for projects prorating the credit the TSPR report must show the proposed design exceeds the claimed increase used for proration		
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## ADDITIONAL ENERGY EFFICIENCY MEASURE - MORE EFFICIENT HVAC EQUIPMENT COOLING AND FAN PERFORMANCE

	C406.2.2.2	More efficient cooling and fan performance	To comply with this additional efficiency credit, provide a list of all cooling equipment in the building or credit area and calculations that demonstrate (based on cooling output capacity) that 90% or more of all HVAC cooling equipment serving conditioned floor areas are listed in the tables of Section C403.3.2		
YES	C406.2.2.2 C406.2.2.2.1	More efficient cooling and fan performance	In addition to system selection requirement, demonstrate that 90% or more of all HVAC cooling capacity serving conditioned floor areas in the building or credit area is delivered by equipment at least 5% better than the listed WSEC efficiency, seasonal or annualized where available other wise use full load efficiency		
	C406.2.2.2 C406.2.2.2.1	More efficient cooling and fan performance	For projects prorating the credit in accordance with Equation 4-15 include calculations for equipment representing at least 90% of the cooling capacity in the building or credit area that demonstrate the capacity weighted average better than code efficiency; for equipment with multiple requirements the seasonal or annualized efficiency shall be used		
	C406.2.2.2 C406.2.2.2.3	More efficient cooling and fan performance	In addition to system selection and efficiency requirements, if fan energy is not included in equipment rating or if it is but the fan has been upsized from rated conditions, demonstrate fan power is $\leq 95\%$ of the allowed fan power in Section C403.8.1.		

## ADDITIONAL ENERGY EFFICIENCY MEASURE - MORE EFFICIENT HVAC EQUIPMENT HEATING PERFORMANCE

YES	C406.2.2.3	More efficient HVAC equipment heating performance	To comply with this additional efficiency credit, provide a list of all heating equipment in the building or credit area and calculations that demonstrate that 90% or more of all HVAC heating capacity serving conditioned floor area is delivered by equipment listed in the tables of Section C403.3.2		
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YES	C406.2.2.3 C406.2.2.3.2	More efficient HVAC equipment heating performance	In addition to system selection requirement, demonstrate that 90% or more of all HVAC heating capacity serving the building or credit area is delivered by equipment at least 5% better than the listed WSEC efficiency, seasonal or annualized where available other wise use full load efficiency		
NA	C406.2.2.3 C406.2.2.3.2	More efficient HVAC equipment heating performance	For projects prorating the credit in accordance per Equation 4-16 include calculations for equipment representing at least 90% of the heating capacity serving the building or credit area that demonstrate the capacity weighted average better than code efficiency; for equipment with multiple code requirements the seasonal or annualized efficiency shall be used		
NA	C406.2.2.3 C406.2.2.3.2	More efficient HVAC equipment heating performance	In C402.1.1 low energy and C402.1.1.2 semi-heated spaces demonstrate that 90% of the heating capacity in the building or area is provided by electric infrared or gas-fired radiant equipment for localized heating applications.		

## VENTILATION, EXHAUST & ENERGY RECOVERY

NA	C403.7.1.2	Demand control ventilation design	For each required demand control ventilation system, indicate outdoor air automatically changes in response to a CO2 sensor and utilizes a variable speed fan control to reduce systems flow; or exception applied		
YES	C403.2.2.1	Ventilation	If mechanically delivered, indicate that ventilation systems are configured to provide not more than 150% of, but at least the minimum required volume of outdoor air to each zone per IMC, ASHRAE 62.1 or other applicable code (WAC, OSHA, etc.); or exception applied		
	C403.2.2.1	Ventilation	If delivered via natural ventilation, identify required elements per IMC including: minimum openable area to the outdoors or qualifying adjoining spaces; criteria for ensuring required ventilation is provided during all occupied hours of the year (including during inclement outdoor conditions)		
YES	C403.2.2.2	Exhaust	Indicate that exhaust systems are configured to provide not more than 150% of, but at least the minimum required volume from each zone per IMC, or other applicable code (WAC, OSHA, etc.); or exception applied		
YES	C403.4.2.4	Exhaust system off-hour controls	Refer to Requirements List section HVAC Controls for off-hour controls requirements for exhaust systems		

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	C403.7.6.1	Balanced ventilation for Group R-2 occupancy	For Group R-2 dwelling and sleeping units, indicate that each habitable space is provided with a balanced ventilation system; indicate system is provided with energy recovery with $\geq 60\%$ sensible recovery effectiveness		
NA	C403.7.1.1	Demand control ventilation	Identify spaces with ventilation provided by single zone system with air economizer; for each space indicate controls are configured to provide demand controlled ventilation or provide supporting documentation for applied exception		
NA	C403.7.1.1	Demand control ventilation	Provide list of spaces with IMC ventilation occupant load and the occupant outdoor airflow rate listed; for spaces with occupant load $\geq 15$ people/1,000 sf per IMC or occupant air flow rate $\geq 15$ cfm / person indicate controls are configured to provide demand controlled ventilation or provide supporting documentation for applied exception		
YES	C403.7.2	Occupancy sensors	For gyms, classrooms, auditoriums, conference rooms and other spaces with occupant load $\geq 25$ people/1,000 sf per IMC, that have an area $> 500$ sf, indicate occupancy-based ventilation air control when space is unoccupied and method (closes outdoor air damper or shuts-off equipment); or alternate means provided to automatically reduce ventilation air when space is partially occupied; or exception applied		
YES	C403.7.3	Ventilation air heating control	For ventilation air systems with supplemental heating capacity that operate in conjunction with heating and cooling systems, indicate that ventilation air is tempered (via heating or heat recovery) to no greater than $55^{\circ}$ F when the space conditioning system is in cooling mode		
	C403.7.4.2	Ventilation controls for Group R-1 guestrooms	Indicate method of ventilation and exhaust isolation for each guest room and automatic controls that are configured to turn off ventilation and exhaust airflow when each room is unoccupied		
	C403.8.4	Group R occupancy exhaust fan efficacy	Refer to Requirements List section Fans & Fan Controls		
	C403.7.5 C403.7.5.1	Enclosed loading dock ventilation	For enclosed loading docks, indicate ventilation / exhaust system method of activation (gas detection system for CO and NO <sub>2</sub> , or occupancy sensors), and control method (staged or modulating); if total ventilation system fan motor nameplate horsepower is $> 5$ hp, indicate VSD or equivalent motor drives		

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	C403.7.5 C403.7.5.2	Enclosed parking garage ventilation	For enclosed parking garages, indicate ventilation / exhaust system activated by gas detection system for CO and NO2, and control method (staged or modulating); or exception applied; if total ventilation system fan motor nameplate horsepower is > 5 hp, indicate VSD or equivalent motor drives		
YES	C403.7.6.2	Ventilation / exhaust systems energy recovery	For systems with design ventilation air > 5,000 cfm, or design supply air cfm and % ventilation air exceeding the values in Tables C403.7.6(1) or (2), indicate exhaust air energy recovery method; or exception applied with supporting calculations		
NA	C403.7.6.2	Ventilation / exhaust systems energy recovery	For rooms served by multiple systems with aggregate design ventilation air > 5,000 cfm, or aggregate design supply air cfm and % ventilation air exceeding the values in Tables C403.7.6(1) or (2), indicate exhaust air energy recovery method; or exception applied with supporting calculations		
YES	C403.7.6.2	Ventilation / exhaust systems energy recovery	Indicate energy recovery rated sensible recovery effectiveness $\geq 68\%$ or a enthalpy recovery ratio $\geq 60\%$		
YES	C403.7.7.1.1 C403.7.7.1.2 C403.7.7.1.3	Kitchen exhaust hood system	Indicate on plans the type, duty, UL rating and exhaust airflow rate of each kitchen hood		
YES	C403.7.7.1.1 C403.7.7.1.2 C403.7.7.1.3	Kitchen exhaust hood system	Provide calculations that show a balanced accounting of total kitchen exhaust (include all hoods) with % of: supply air, transfer air from adjacent spaces, and make-up air		
YES	C403.7.7.1.1 C403.7.7.1.2 C403.7.7.1.3	Kitchen exhaust hood system	For hoods with make-up air drawn directly into the exhaust air cavity of each hood, indicate that replacement air does not exceed 10% of hood exhaust airflow rate		
NA	C403.7.7.1.1 C403.7.7.1.2 C403.7.7.1.3	Kitchen exhaust hood system	For kitchens with total hood exhaust exceeding 2,000 cfm, indicate that each hood is UL 710 rated and maximum exhaust airflow rate of each hood is per Table C403.7.7.1.2; or exception applied		
NA	C403.7.7.1.1 C403.7.7.1.2 C403.7.7.1.3	Kitchen exhaust hood system	For kitchens with total hood exhaust exceeding 2,000 cfm, indicate demand control kitchen ventilation configured to a minimum 50% reduction in exhaust and replacement air system flows in response to alliance operation; or exception applied		
	C403.7.7.2	Laboratory exhaust systems energy recovery	For buildings with total lab exhaust > 5,000 cfm, indicate method of energy recovery used to pre-condition laboratory make-up air; energy recovery effectiveness (min 25°F increase in outside air temperature); or alternative method per exception (VAV exhaust, semi-conditioned makeup, or CERM calculation)		

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NA	C403.7.7.3	Transfer air	For spaces where conditioned supply air is utilized as transfer air to balance mechanical exhaust, indicate basis of transfer airflow (supply required to meet loads, health/safety requirement, air that would normally be exhausted); or exception applied		
YES	C403.7.8.1 C403.7.8.3	Shutoff dampers for building isolation	Indicate locations of outdoor air intake, exhaust and relief outlet dampers on plans; indicate whether dampers are Class 1 motorized, or gravity and exception applied (include leakage rating, cfm/sf)		
	C403.7.8.1 C403.7.8.3	Shutoff dampers for stairway and elevator hoistway shaft vents	Indicate location of stairway and elevator hoistway shaft vent dampers on plans; verify dampers are Class 1 motorized; or exception applied		
YES	C403.7.8.2 C403.7.8.3	Shutoff dampers for return air	Indicate locations of return air dampers that are integral to airside economizer operation; verify dampers are motorized; indicate whether dampers are Class 1, or within packaged equipment eligible for leakage rating exception (include leakage rating, cfm/sf)		
YES	C403.7.8.4	Damper actuation	Indicate automatic controls configured to close outdoor air intake, exhaust and relief outlet dampers during unoccupied equipment operation; not including economizer cooling, night flush or IMC required outdoor air / exhaust		
	C403.7.8.4	Damper actuation	Indicate method of activation of stairway and elevator hoistway shaft vent dampers (fire alarm or interruption of power)		
NA	C404.11.4	Exhaust system energy recovery for heated indoor pools and permanent spas	For buildings with pools or spas with water surface area > 200 sf, indicate exhaust air energy recovery method and use of waste heat (preheat ventilation air, pool water or service hot water); or exception applied		
NA	C404.11.4	Exhaust system energy recovery for heated indoor pools and permanent spas	Indicate energy recovery system has the rated effectiveness and is configured to decrease the exhaust air temperature at design conditions by ≥ 36°F		
<b>HVAC CONTROLS</b>					
YES	C403.4.1	Thermostatic controls (thermostats and humidistats)	Indicate locations of thermostatic and humidity control devices and the zones they serve on plans, including perimeter system zones		

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	C403.4.1	Thermostatic controls (thermostats and humidistats)	Where adjacent (neighboring) zones are controlled by separate thermostats (including perimeter systems used to offset heat gain or loss), and are connected by permanent openings > 10% of either zone sf area, indicate controls configured to prevent adjacent zones from operating in conflicting modes (one in heat, other in cool); applies to adjacent perimeter zones, adjacent nonperimeter zones, and adjacent perimeter and nonperimeter zones		
	C403.4.1	Thermostatic controls (thermostats and humidistats)	If applying Exception 2 to interior zones adjacent to perimeter zones, indicate that setpoints and deadband settings in these zones are coordinated so cooling in an interior zone does not occur until the temperature in that zone is 5°F higher than the adjacent perimeter zone temperature in heating		
YES	C403.4.1	Thermostatic controls(thermostats and humidistats)	If applying Exception 3 for DOAS, indicate supply air temperature heating setpoint is ≤ 65°F and cooling setpoint is ≥ 72°F, or method of supply air temperature reset		
NA	C403.4.1.1	Heat pump supplementary heat	Indicate staged heating operation with compression as the first stage of heating and supplemental heating controlled with outdoor lock-out temperature set to 40°F or less, or indicate exception applied and specify equipment meeting the exception requirements	No supplementary heat	
	C403.4.1.2	Deadband	Indicate zone thermostatic controls configured with 5°F minimum deadband for systems that control both heating and cooling		
	C403.4.1.3	Setpoint overlap restriction (thermostats)	If separate heating and cooling thermostatic control devices are used to serve a zone, indicate locations of both thermostatic control devices and the zone they serve on plans		
	C403.4.1.3	Setpoint overlap restriction (thermostats)	Indicate a limit switch, mechanical stop or DDC control with programming to prevent simultaneous heating and cooling		
YES	C403.4.1.4	Heated or cooled vestibules	Indicate thermostatic controls within heating or cooled vestibules with a heating setpoint ≤ 60°F and cooling setpoint ≥ 85°F; indicate controls are configured to turn off heating when outdoor temperature is > 45°F; or note exception applied		
NA	C403.4.1.4	Heated air curtains	Indicate controls are configured to turn off air curtain heating when outdoor temperature is > 45°F		

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YES	C403.4.1.6	Door switches for HVAC system thermostatic control	Doors required to have opening switches for HVAC thermostatic control to the outdoors from a conditioned space and are > 48 sf, indicate automatic controls configured to setback the HVAC system(s) when the door is open for > 5 minutes; indicate method of HVAC system setback control (turns off the HVAC system or resets the heating setpoint to 55°F and cooling setpoint to 85°F), or exception applied (either C402.5.11 or C403.4.1.6)		
YES	C403.4.2 C403.4.2.1 C403.4.2.2	Automatic setback and shutdown	Indicate zone thermostatic controls configured with required automatic setback and manual override functions, setback temperatures, and control method (automatic time clock or 7 day programmable controls); note exceptions applied		
YES	C403.4.2.3	Automatic (optimum) start and stop	Indicate all HVAC systems are provided with automatic start and stop controls; indicate start controls are configured to adjust the equipment start time as required to bring each area served up to design temperature just prior to scheduled occupancy; indicate stop controls are configured to reduce heating setpoint and increase cooling setpoint by at least 2°F prior to scheduled unoccupied periods		
YES	C403.4.2.4	Exhaust system off-hour controls	For exhaust systems serving conditioned spaces in all occupancies other than Group R, indicate method of control and that controls are configured to turn exhaust systems on and off in concert with the ventilation air systems providing their make-up air, or exception applied		
YES	C403.4.2.5	Transfer and destratification fan system off-hour controls	For transfer fan or mixing fan systems serving conditioned spaces in all occupancies other than Group R, indicate method of control and that controls are configured to turn fans on and off in concert with the associated HVAC systems, or exception applied		
YES	C403.4.7	Combustion heating equipment	For combustion heating equipment other than boilers or radiant heaters with output capacity > 225,000 Btu/h, indicate modulating or staged combustion control		
NA	C403.4.7.1	Combustion decorative vented appliance, combustion fireplace and fire pit controls	Indicate controls that are configured to limit operation of combustion appliance, fireplace and fire pit to ≤ 1 hour without override, or that occupancy sensor controls are provided		

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	C403.7.4.1	Temperature setpoint controls for Group R-1 guestrooms	For hotels / motels with over 50 guest rooms, indicate automatic controls for HVAC equipment serving guest rooms are configured to setback (heating) and set-up (cooling) temperature setpoint by at least 4°F when room is rented and unoccupied, and adjust setpoint to 60°F (heating) and 80°F (cooling) when room is unrented / vacated; indicate control method - activated by room entry, occupancy sensor or networked guestroom control system		
	C403.7.4.2	Ventilation controls for Group R-1 guestrooms	Refer to Requirements List section Ventilation, Exhaust & Energy Recovery		
	C403.4.9 C403.4.10	Thermostatic controls for Group R2 / R3 dwelling units and Group R2 sleeping units	For primary space conditioning systems, indicate 5-2 programmable thermostats capable of two setback periods per day; indicate each non-primary system is provided with at minimum an adjustable thermostat, or exception applied. For all thermostats indicate purpose (heating only, cooling only, or both) and required temperature range; indicate thermostats are configured for at minimum a 5°F deadband		
NA	C403.5.1	DX air handler variable cooling control(Located under Integrated Economizer Control)	For DX air handlers with cooling capacity ≥ 65,000 Btu/h, indicate number of cooling stages provided and method (multiple compressors and / or variable speed compressors); indicate minimum displacement (capacity reduction) as % of full load; indicate thermostats are configured with the same number of cooling stages and displacement		
YES	C403.5.1	DX air handler variable cooling control (Located under Integrated Economizer Control)	Indicate control method (cooling capacity controlled in response to space temperature, space temperature controlled by modulating supply airflow, or both)		
YES	C403.4.11.1 C403.4.11.2 C403.4.11.3	DDC system applications, controls and display	Provide central and zone level DDC controls as required based on system application, capacity or size thresholds and other qualification per Table C403.4.11.1		
YES	C403.4.11.1 C403.4.11.2 C403.4.11.3	DDC system applications, controls and display	Identify all DDC system input / output control points in project documents		
YES	C403.4.11.1 C403.4.11.2 C403.4.11.3	DDC system applications, controls and display	Indicate control capability includes monitoring zone and system level demand for fan pressure, pump pressure, heating and cooling; indicate capability to transfer demand information from zones to air / hydronic distribution system controllers, and to central plant systems and equipment controllers		

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YES	C403.4.11.1 C403.4.11.2 C403.4.11.3	DDC system applications, controls and display	Indicate system has the capability and is configured for trending and graphically displaying input / output points		
YES	C403.4.11.4	DDC demand response setpoint adjustment	For buildings with $\geq 780,000$ Btu/h of mechanical cooling, indicate controls are configured to automatically increase the cooling setpoint and decrease the heating setpoint $\geq 2^{\circ}\text{F}$ based upon a binary input to the control system approved by the utility		
YES	C403.4.1.7	Demand responsive controls	Indicate thermostatic controls for heating or cooling systems are provided with demand response controls are capable of increasing the cooling setpoint and decreasing the heating setpoint $\leq 4^{\circ}\text{F}$ ; indicate the controls are capable of receiving and responding automatically to a demand response signal.		
YES	C403.2.3	HVAC System Fault detection and diagnostics	For buildings $\geq 100,000$ square feet, indicate HVAC systems have fault detection and diagnostics with sensors and communications to automatically identify HVAC system faults, provide prioritized recommendations for repair, and communicate faults and recommendations to remotely located authorized personnel.		

## ADDITIONAL ENERGY EFFICIENCY MEASURE - DWELLING UNIT HVAC CONTROLS

YES	C406.2.1	Dwelling unit HVAC controls	To comply with this additional efficiency credit, provide control design for a manual main control or occupancy sensor based controls, or provide control specification and product cut sheets demonstrating compliance with learning thermostat or geographic sensing options.		
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## ADDITIONAL EFFICIENCY CREDIT - FAULT DETECTION AND DIAGNOSTICS

NA	C406.2.2.7	Fault detection and diagnostics	To comply with this additional efficiency credit, demonstrate HVAC controls comply with items 1 through 6 in Section C403.2.3; only buildings not required to comply with Section C403.2.3 or C403.6.10(16) can use this credit		
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## LOAD MANAGEMENT MEASURE - HVAC LOAD MANAGEMENT

YES	C406.3.2	HVAC load management	To comply with this additional efficiency credit, indicate automatic controls connected to central DDC having digital input capable of being activated by external utility signal; where utility real-time demand or pricing program exists indicate system configured to utilize this signal; otherwise indicate building demand monitoring installed and controls configured to utilize demand signals		
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YES	C406.3.2	HVAC load management	Indicate electric cooling controls configured to gradually increase the cooling setpoint by at least 3°F over 3 hours during summer peak periods; , indicate electric heating controls configured to gradually decrease the heating setpoint by at least 3°F over 3 hours during winter peak periods		
<b>DUCTWORK, SHAFTS AND PLENUMS</b>					
YES	C403.10.1.1 C403.10.2	Duct construction	Indicate on plans that all ductwork is constructed and sealed per IMC		
YES	C403.10.1.1 C403.10.2	Duct construction	For outdoor air ductwork, also indicate on plans that ductwork meets air leakage requirements per C402.5 and vapor retarder requirements per the IBC		
NA	C403.10.2.1 C403.10.2.2 C403.10.2.3	Duct pressure classifications	Identify location of low, medium and high pressure ductwork on plans	All low pressure.	
NA	C403.10.2.3	High pressure duct leakage test	Indicate high pressure duct leakage testing requirements on plans; provide test results to jurisdiction when completed		
YES	C403.10.1.1 C403.10.1.2	Duct insulation	For outdoor air ductwork located within conditioned space (upstream or downstream of shutoff damper), identify climate zone, duct airflow, and indicate ductwork insulation R-value per Table C403.10.1.1 on plans; or exception applied		
YES	C403.10.1.1 C403.10.1.2	Duct insulation	For supply and return air ductwork located within unconditioned space or outdoors, identify climate zone and indicate ductwork insulation R-value per Table C403.10.1.2 on plans; or exception applied		
YES	C403.10.1.1 C403.10.1.2	Duct insulation	For supply air ductwork located within conditioned space, identify on plans if design supply air temperature is < 55°F or > 105°F; indicate ductwork insulation R-value per Table C403.10.1.2 on plans; or exception applied		
YES	C403.10.1.1 C403.10.1.2	Duct insulation	For return and exhaust air ductwork located within conditioned space (upstream of the shutoff damper) and downstream of an energy recovery media, indicate ductwork insulation R-value per Table C403.10.1.2; or exception applied		
YES	C403.10.1.1 C403.10.1.2	Duct insulation	For exhaust and relief air ductwork located within conditioned space and downstream of the shutoff damper, indicate ductwork insulation R-value per Table C403.10.1.2; or exception applied		
YES	C403.10.1.1 C402.1.3	Shaft and plenum insulation	For outdoor air shafts and plenums, indicate on plans that the R-value of insulation on these elements complies with Table C402.1.3 for steel-framed walls		

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<b>PIPING</b>					
YES	C403.10.3	Piping insulation	Indicate design temperature range of fluid conveyed in piping and thickness of insulation (in inches) on hydronic piping plans; or exception applied		
YES	C403.10.3.1	Protection of piping insulation	Indicate method of protection of pipe insulation from damage / degradation on hydronic piping plans		
YES	C403.10.4	HVAC refrigerant piping insulation	Indicate refrigerant piping insulation to be installed on all hot gas lines and on some liquid lines per C403.10.4; indicate insulation conductivity $\leq 0.26 \text{ Btu} \times \text{in}/(\text{h} \times \text{ft}^2 \times ^\circ\text{F})$		
<b>ECONOMIZERS</b>					
YES	C403.5	Air economizer required	Identify all cooling systems requiring air economizer controls in equipment schedules on plans and in WSEC mechanical equipment compliance reports		
NA	C403.5	Air economizer exceptions	Indicate all systems utilizing air economizer exceptions in WSEC mechanical equipment compliance report, including those with water-side economizer in lieu of air economizer; indicate on plans and in WSEC mechanical equipment compliance reports all eligible exception(s) taken and measures to comply with exception(s)		
YES	C403.4.1 C403.5.1	Integrated economizer operation - air and water	Indicate air and water-side economizers are configured for partial cooling operation even where additional mechanical cooling is required to meet the load		
YES	C403.4.1 C403.5.1	Integrated economizer operation - air and water	For DX air handlers with single or multiple stages of mechanical cooling; indicate controls are configured with air economizer as the first stage of cooling		
YES	C403.4.1 C403.5.1	Integrated economizer operation - air and water	Refer to Requirements List section HVAC Controls for additional requirements for DX air handlers		
YES	C403.5.2	Economizer heating system impact - air and water	Verify control method of HVAC systems with economizers does not increase building heating energy usage during normal operation		
YES	C403.5.3.1	Air economizer capacity	Indicate modulating outdoor air and return air dampers are configured to provide up to 100% outdoor air for cooling		
YES	C403.5.1 C403.5.3.2	Air economizer controls and integrated operation	Indicate that economizer controls are configured to provide partial economizer cooling when additional mechanical cooling is also required to meet the cooling load		
YES	C403.5.1 C403.5.3.2	Air economizer controls and integrated operation	Indicate that control of economizer dampers is not based only on mixed air temperature; or exception applied for systems with cooling capacity $\leq 65,000 \text{ Btu/h}$		

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YES	C403.5.3.3	Air economizer high limit controls	Indicate high limit shut-off control method and required high limit per Table C403.5.3.3		
NA	C403.5.3.4	Relief of excess outdoor air	Refer to Requirements List section Ventilation, Exhaust & Energy Recovery		
NA	C403.5.3.4	Relief of excess outdoor air	Indicate relief air outlets are sized and configured to relieve excess building air during air economizer operation to prevent building over-pressurization		
NA	C403.5.3.4	Relief of excess outdoor air	Indicate relief air outlet are located to avoid recirculation into the building		
	C403.5.4.1	Water economizer capacity	For eligible systems where water-side economizer may be provided in lieu of air economizer, indicate system is capable of 100% design cooling capacity at 50°F db / 45°F wb outdoor air temperatures; indicate if threshold for 100% design cooling capacity via economizer must be lowered to 45°F db / 40°F wb due to dehumidification requirements		
	C403.5.4.2	Water economizer maximum pressure drop	Indicate that the pressure drop across precooling coils and heat exchangers in water economizer systems do not exceed 15 feet (4572 mm)		
YES	C403.5.5	DX equipment economizer fault detection and diagnostics	For DX air handlers with economizer and cooling capacity $\geq 54,000$ Btu/h, provide a fault detection and diagnostics (FDD) system to monitor economizer system operation and report faults		

## HYDRONIC SYSTEMS - EQUIPMENT SELECTION & PERFORMANCE

	C403.3.2.3	Maximum air cooled chiller capacity	For chilled water plants and buildings with > 500 tons of cooling capacity, indicate air-cooled chiller capacity is $\leq 100$ tons, or exception applied		
	C403.3.2.2	Large capacity cooling systems	For buildings $\geq 300$ tons of cooling capacity, indicate method of multi-stage or variable capacity control (VSD, multiple staged compressors, or max capacity of any single unit		
	C403.3.2.4	Non-standard water-cooled centrifugal chillers	For water-cooled centrifugal chillers not designed for operation at standard conditions, provide calculations documenting maximum full load and part load rated equipment performance requirements		
	C403.3.3	Hot gas bypass limitation for chillers	For cooling equipment with hot gas bypass, provide either multiple step unloading or continuous capacity modulation; indicate bypass capacity per Table C403.3.3		
	C403.4.3 C403.3.4.4	Large capacity boiler systems	For hydronic systems with only a single boiler that has > 500,000 Btu/h input capacity, indicate multi-stage or modulating burner		

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	C403.4.3 C403.3.4.4	Large capacity boiler systems	For boiler system (single or multiple) with > 1,000,000 Btu/h input capacity, indicate turndown ratio per Table C403.3.4.4 and method (multiple single input boilers, modulating boilers, or combination)		
NA	C403.3.4.1	Large capacity boiler systems	For all boiler systems with input capacity ≥ 2,500,000 Btu/h and all systems where one stack serves 2 or more boilers with a combined input capacity ≥ 2,500,000 Btu/h, indicate combustion air positive shut-off is provided to restrict airflow through the combustion chamber during standby (e.g. flue or vent damper).		
NA	C403.3.4.2	Large capacity boiler systems	For boiler systems with combustion air fans ≥ 10 hp, indicate variable speed fan		
NA	C403.3.4.3	Large capacity boiler systems	For boiler systems with input capacity ≥ 5,000,000 and a steady state full-load combustion efficiency <90 percent, indicate combustion air volume to be automatically controlled to limit stack-gas oxygen concentrations specified in Table C403.3.4.3. List exception if it applies.		
NA	C403.3.4.5 C403.3.4.5.1 C403.3.4.5.2	High capacity space heating gas boiler system (new buildings)	For gas hot water space heating systems with ≥ 1,000,000 Btu/h and ≤ 10,000,000 Btu/h capacity, indicate boiler thermal efficiency ≥ 90 percent; coils and heat exchangers sized at design conditions to have a boiler return water temperature ≤ 120°F; valves and controls to ensure under all operating conditions the water temperature entering the boiler is ≤ 120°F or the supply water recirculating directly into the return system is ≤ 20 percent of design flow of the operating boilers.		
NA	C403.2.4	Variable flow capacity - pumps	For pump motors ≥ 5 hp, indicate method of variable flow control (VSD or equivalent method) in equipment schedule, or exception applied		
NA	C403.3.7	Hydronic system flow rate	Indicate chilled water and condenser water flow types and operating hours, and maximum flow rates in less than or equal to Table C403.3.7.		
NA	C403.3.8.1	Chilled-water coil selection	Indicate chilled-water coils sized to provide a 15°F difference between leaving and entering water temperature and a minimum 57°F leaving water temperature at design conditions., or exception applied		
NA	C403.3.8.2	Hot-water coil selection	Indicate hot-water coils sized to provide a 20°F difference between leaving and entering water temperature and a maximum 118°F entering water temperature at design conditions., or exception applied		

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NA	C403.4.12	Pressure independent control valves	For heating and cooling water coils with a design flow $\geq 5$ gpm, indicate modulating pressure independent control valves are provided		
<b>HYDRONIC SYSTEMS - CONTROLS</b>					
	C403.4.3	Boiler sequencing	Indicate automatic controls that sequence operation of multiple boilers		
	C403.4.3.2	Two-pipe changeover systems	Indicate changeover deadband is $\geq 15^{\circ}\text{F}$ outdoor air temperature; indicate controls are configured so that heating / cooling modes are active for at minimum 4 hours before changeover and that the delta between heating / cooling supply temperatures at changeover point is		
	C403.4.1.5	Heating water temperature setback	For hot water boilers that provide building heating via one- or two-pipe systems, indicate controls that provide heating water temperature setback based on outdoor temperature		
	C403.4.4	Hydronic system part load controls and supply-water temperature reset	For heating and chilled water systems with $\geq 300,000$ Btu/h output capacity, indicate system controls are configured to automatically reset supply water temperature based upon demand; or exception applied		
	C403.4.4	Hydronic system part load controls and supply-water temperature reset	Indicate automatic pump flow controls are configured to reduce system flow rate by $\geq 50\%$ , or the maximum allowed by the equipment manufacturer, based upon the heating or cooling loads; or describe why not required		
	C403.4.4	Hydronic system part load controls and supply-water temperature reset	For hydronic systems with output capacity $\geq 300,000$ Btu/h that serve heating water systems, chilled water systems and water-cooled unitary air conditioners, indicate that pumps are provided with a variable speed drive if one of the following conditions apply: 1) System pump motor hp is $\geq 2$ hp and pumps are designed to operate continuously or per time schedule; 2) System pump motor hp is $\geq 7.5$ hp and pumps are controlled by automatic DDC configured to only operate pumps when there is a call for zone heating or cooling		
	C403.4.4	Hydronic system part load controls and supply-water temperature reset	Where variable speed drives are required, indicate system is configured so that pump motor power is $\leq 30\%$ of design wattage at 50% of design flow rate; indicate pump flow is controlled to maintain one control valve nearly wide open, or to maintain a minimum differential pressure; or exception applied		

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NA	C403.4.6	Hydronic system variable pump flow control	For individual pumps required to have variable speed controls, indicate manner of pump speed control (differential pressure, static pressure setpoint, zone heating or cooling demand, or based on the relationship between variable speed controller frequency and power)		
	C403.4.5	Chiller / boiler plant pump isolation	Indicate controls are configured to automatically reduce overall plant flow and shut-off flow through individual chillers and boilers when not in use		
	C403.4.3.3.1	Water loop heat pump - temperature deadband	Indicate method of water loop temperature control (central plant equipment controls are configured to provide $\geq 20^{\circ}\text{F}$ water supply temperature deadband between heat rejection and heat addition modes, or controls are configured for system loop temperature optimization		
	C403.4.3.3.2	Water loop heat pump - heat rejection equipment	Indicate type of cooling tower (open- or closed-circuit) in equipment schedule; indicate whether the cooling tower is used directly in the heat pump loop or in conjunction with a separate heat exchanger; indicate method used to limit system heat loss when heat rejection is not needed		
	C403.4.3.3.3	Water loop heat pump - isolation valves	For hydronic heat pump systems with total system power $> 10$ hp, indicate 2-way isolation valves on each heat pump and variable flow system control		

## HEAT REJECTION SYSTEMS - EQUIPMENT SELECTION & PERFORMANCE

	C403.9.1.3	Centrifugal fan open-circuit cooling towers	For open-circuit centrifugal fan cooling towers with $\geq 1,100$ gpm capacity, indicate cooling towers comply with efficiency requirements for axial fan open circuit cooling towers		
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## HEAT REJECTION & RECOVERY - CONTROLS

	C403.9.1.1 C403.9.1.2	Fan speed control	For each fan powered by an individual motor or array of motors, with total connected fan power $\geq 5$ hp (including motor service factor), indicate method of automatic fan speed control (adjusted based on leaving fluid temperature or condenser temperature / pressure of heat rejection device); verify fan selection provides $\leq 30\%$ design wattage at 50% design airflow		
	C403.9.1.1 C403.9.1.2	Fan speed control	For multiple-cell heat rejection equipment with VSD, indicate controls are configured to ramp all fans in unison (not staged on / off operation)		

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	C403.9.1.4	Cooling tower flow turndown	For open-circuit cooling towers configured with multiple- or variable-speed condenser water pumps, indicate system is designed so all cells can be run in parallel; indicate method of condenser pump turn down control		
	C403.9.2.1	Heat recovery for service water heating	For buildings with 24-hour operation and > 1,500,000 Btu/h of heat rejection capacity and design service hot water load > 250,000 Btu/h, indicate condenser heat recovery to pre-heat service water; or exception applied. Provide calculations showing the amount of recovered heat that is utilized (60% of peak heat rejection load or pre-heat service water to 85°F).		
	C403.9.2.2	Steam condensate systems heat recovery	For buildings with on-site steam heating systems, indicate condensate water heat recovery and use of recovered heat		
	C403.9.2.2	Steam condensate systems heat recovery	For buildings that use off-site generated steam where condensate is not returned to the source, indicate on-site condensate water heat recovery		
	C403.9.2.3	Refrigeration condenser heat recovery	For buildings with food service, meat or deli departments that have ≥ 500,000 Btu/h of remote refrigeration capacity for coolers / freezers, indicate condenser heat recovery and use of captured energy (service water heating, space heating, or dehumidification reheating)		
	C403.9.2.3	Refrigeration condenser heat recovery	For buildings with ≥ 40,000 sf conditioned floor area and ≥ 1,000,000 Btu/h of remote refrigeration capacity, indicate condenser heat recovery to pre-heat service water; indicate remaining recovered heat is applied to space heating or dehumidification reheating		
	C403.9.2.4	Condenser heat recovery for space heating	For buildings that operate > 70 hour per week, that are not served by a DOAS with energy recovery, and have > 1,500,000 Btu/h of heat rejection capacity and ≥ 0.45 cfm per sf of design minimum supply airflow with reheat, indicate condenser heat recovery is provided for space heating that complies with Sections C403.9.2.4.1 or C403.9.2.4.2 or C403.9.2.4.4		
	C403.9.2.4.1 C403.9.2.4.4	Water to water heat recovery	Indicate that 90% or more of the total building space heating and ventilation air design loads are served by heat energy rejected from either a heat recovery chiller or the cooling loop of water to water heat pump equipment		
	C403.9.2.4.2	Exhaust heat recovery	Indicate that waste heat is recovered from least 90% of the total building exhaust airflow such that leaving exhaust air temperature while in heat recovery mode is 55° F dry bulb; note exhaust air systems eligible for exception to this requirement		

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	C403.9.2.4.3	Process heat recovery	In spaces with 5 watts per sf year-round cooling loads from lights and equipment, indicate these spaces are served by water-cooled equipment configured for heat recovery		
	C403.9.2.4.3	Process heat recovery	If these spaces are served by economizer (air or water), indicate automatic controls are configured to disable economizer operation while system is in heat recovery mode		

## ADDITIONAL ENERGY EFFICIENCY MEASURE - IMPROVED LOW CARBON DISTRICT ENERGY SYSTEMS (10%)

NO	C406.2.2.4	Improved low-carbon district energy systems (10 percent better).	Provide calculations showing 90% or more of the annual service water and space heat energy use or 90% or more of the annual service water heat, space heat and space cooling energy use is met by a district energy exchange system complying with C406.2.2.4.1 or a district energy heating and/or cooling system complying with C406.2.2.4.2; provide documentation the system is operational and is in accordance with this section prior to the final inspection.		
NO	C406.2.2.4.1	Improved low-carbon district energy exchange systems (10 percent better)	Provide calculations and documentation that 45% of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources; and no more than 25% of the annual heat input to the system comes from fossil fuel or electric-resistance sources.		
NO	C406.2.2.4.2	Improved low-carbon district energy heating and cooling or heating only systems (10 percent better)	Provide calculations and documentation that distribution losses are less than or equal to 5% of the annual load delivered to buildings served by the system; and that the system complies with one of the following: 1) 45% of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources and no more than 25% of the annual heat input to the system comes from fossil fuel or electric-resistance sources, or, 2) 10% or less of the system annual heat input to the system comes from fossil fuels, electric-resistance sources, or heat pump sources with an annual COP < 3		

## ADDITIONAL ENERGY EFFICIENCY MEASURE - IMPROVED LOW CARBON DISTRICT ENERGY SYSTEMS (20%)



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NO	C406.2.2.5	Improved low-carbon district energy systems (20 percent better).	Provide calculations showing 90% or more of the annual service water and space heat energy use or 90% or more of the annual service water heat, space heat and space cooling energy use is met by a district energy exchange system complying with C406.2.2.4.1 or a district energy heating and/or cooling system complying with C406.2.2.4.2; provide documentation the system is operational and is in accordance with this section prior to the final inspection.		
NO	C406.2.2.5.1	Improved low-carbon district energy exchange systems (20 percent better)	Provide calculations and documentation that 50% of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources; and no more than 10% of the annual heat input to the system comes from fossil fuel or electric-resistance sources.		
NO	C406.2.2.5.2	Improved low-carbon district energy heating and cooling or heating only systems (20 percent better)	Provide calculations and documentation that distribution losses are less than or equal to 5% of the annual load delivered to buildings served by the system; and that the system complies with one of the following: 1) 50% of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources and no more than 25% of the annual heat input to the system comes from fossil fuel or electric-resistance sources, or, 2) 10% or less of the system annual heat input to the system comes from fossil fuels, electric-resistance sources, or heat pump sources with an annual COP < 4		

## LOAD MANAGEMENT MEASURE - COOLING ENERGY STORAGE

NO	C406.3. 5	Cooling energy storage	To comply with this additional efficiency credit, indicate automatic controls connected to central DDC having digital input capable of being activated by external utility signal; where utility real-time demand or pricing program exists indicate system configured to utilize this signal; otherwise indicate building demand monitoring installed and controls configured to utilize demand signals		
NO	C406.3. 5	Cooling energy storage	Provide calculation of ice or chilled water storage capacity with standby loss $\leq 1.5\%$ per day; indicate automatic controls to activate storage to reduce peak period electric demand; provide calculation of storage capacity		

## MULTIPLE ZONE AIR SYSTEMS

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NA	C403.6.1	Air systems serving multiple zones	Identify supply air systems serving multiple zones and the zones they serve on plans; indicate whether system is VAV and method of primary air control; or provide supporting documentation for applied exception to VAV		
NA	C403.6.1	VAV air terminal primary supply airflow	Provide equipment schedules on plans that list all VAV air terminals and types (fan-powered series and parallel air terminals, single duct and dual duct air terminals, etc.)		
NA	C403.6.1	VAV air terminal primary supply airflow	For each air terminal include: maximum primary supply airflow rates during zone peak heating and zone peak cooling; maximum terminal airflow during reheating, recooling or mixing; minimum ventilation airflow rate, and the basis for these values; if IMC or ASHRAE 62.1 multiple zone equation is the basis for minimum flow rates, provide this calculation on plans		
NA	C403.6.2	Single duct VAV terminal units	Indicate single duct terminal units are configured to reduce primary supply air before reheating or recooling		
NA	C403.6.3	Dual duct systems - terminal units	For systems with separate warm air and cool air ducts, indicate terminal units are configured to reduce the flow from one duct to minimum before mixing with air from the other duct		
NA	C403.6.8 C403.6.9	VAV system static - pressure sensors and DDC set points	Indicate locations of duct static pressure sensors on plans; include at least one sensor per major duct branch; verify controller setpoint pressure at each sensor is $\leq 1.2$ inch w.g.		
NA	C403.6.8 C403.6.9	VAV system static - pressure sensors and DDC set points	For systems with zone level DDC, indicate controls are configured to monitor zone damper positions and reset static pressure setpoint based on the zone requiring most pressure; include control logic that automatically detects and generates an alarm if any zone excessively drives reset logic, and allows building operators to exclude zones from reset logic		
NA	C403.6.4	VAV system supply air reset	Indicate controls automatically reset supply air temperature in response to building loads or outdoor air temperature; or exception applied		
NA	C403.6.4	VAV system supply air reset	Indicate zones expected to experience relatively constant loads and that maximum air flow is designed to deliver peak capacity at the fully reset supply air temperature.		
NA	C403.6.5	Multiple-zone VAV system ventilation optimization controls	For systems with zone level DDC controls, indicate controls are configured to automatically reduce outdoor airflow in response to changes in system ventilation efficiency; or exception applied		

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NA	C403.6.6	Parallel fan powered VAV air terminals	Indicate controls automatically activate or shut off the air terminal fan based on call for heating and / or ventilation; indicate controls are configured to activate the terminal fan as the first stage of heating prior to activating the heating coil; indicate control method of primary air during warmup or temperature setback mode		
<b>HIGH EFFICIENCY MULTIPLE-ZONE VAV SYSTEMS - EXCEPTION TO C403.3.5 DOAS, MUST COMPLY WITH ALL 15 PROVISIONS TO BE ELIGIBLE</b>					
	C403.6.10, Item 1	Minimum area served and zoning	Indicate that each high efficiency multiple-zone VAV systems serves an area $\geq 3,000$ sf and includes $\geq 5$ zones		
	C403.6.10, Item 2	Air economizer	Indicate system is configured for 100% air economizer operation and complies with all related economizer requirements per C403.5 (without economizer exceptions)		
	C403.6.10, Item 3	Direct digital controls (DDC)	Provide DDC controls for all components of system per C403.4.11 (regardless of system size); identify all DDC system input / output control points; indicate capability for trending and graphical display		
	C403.6.10, Items 4 and 5	Supply and outdoor airflow measurement and control	For systems with minimum required outdoor air $> 2,500$ cfm, provide an airflow monitoring station that is configured to measure outdoor air intake under all load conditions; indicate control sequence that increases or reduces outdoor air cfm based on VAV terminal feedback of ventilation efficiency (per C403.6.5 without exceptions) or and DCV (per C403.7.1)		
	C403.6.10, Items 4 and 5	Supply and outdoor airflow measurement and control	Provide a supply airflow monitoring station that is configured to measure supply air delivered to VAV terminals under all load conditions		
	C403.6.10, Item 6	Zone isolation and maximum area served	Verify maximum area served by a single VAV system is $\leq 50,000$ sf, or one entire floor, whichever is greater; in addition if a system serves $> 25,000$ sf, that includes areas that are expected to be occupied non-simultaneously, indicate zone isolation controls per C403.2.1		
	C403.6.10, Item 7	Interior / exterior zone design supply air temperature	Verify that VAV terminals serving interior cooling driven loads are sized per a design supply air temperature that is 5°F higher than VAV terminals serving exterior zones while in cooling mode		
	C403.6.10, Item 8	Maximum air terminal inlet velocity	Identify all air terminals with minimum primary airflow setpoints $> 50\%$ of maximum setpoint in mechanical equipment schedule for these air terminals indicate inlet velocity does not exceed 900 fpm		

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	C403.6.10, Item 9	Maximum allowable system brake horsepower	For each fan system serving a multiple-zone VAV HVAC, provide calculations that verify fan system electrical input power is $\leq 90\%$ of the fan power budget in accordance with Section C403.8.1.1		
	C403.6.10, Item 10	Fan-powered terminal unit motor and control	Indicate all series and parallel fan-powered terminals have electronically commutated motors (ECM); indicate DDC control system is configured to vary air terminal fan speed as a function of the load; indicate fan speed during periods of low heating, low cooling, or ventilation-only mode is $\leq 66\%$ of peak design air flow, or provide supporting documentation for applied exception		
	C403.6.10, Item 11	Application of single duct and fan-powered terminal units	Indicate VAV terminal types on plans; verify fan-powered terminal units only serve perimeter zones with envelope loads and interior zones with high occupant density and DCV per C403.7.1; verify all other zones are served by single duct terminal units		
	C403.6.10, Item 12	Fan-powered terminal unit primary air reset	Indicate DDC controls are configured to automatically reset the primary supply air cfm setpoint of all fan-powered terminal units to the minimum required to maintain ventilation during occupied heating or deadband mode, based upon the VAV air handling unit minimum ventilation air fraction		
	C403.6.10, Item 13	Controls for high occupant density spaces	For zones $> 150$ sf with high occupant density ( $\geq 25$ people / 1000 sf), indicate zone is served by a dedicated terminal unit with DCV control that resets terminal unit ventilation setpoint based on measured CO <sub>2</sub> ; also indicate occupancy sensor control that automatically reduces minimum ventilation to zero and sets back room heating and cooling setpoints by $\geq 5^{\circ}\text{F}$ when space is unoccupied		
	C403.6.10, Item 14	Dedicated cooling systems serving data centers and server, electronic equipment and telecom spaces	For data centers and server, electronic equipment, telecom or similar spaces with design cooling loads $> 5$ W/sf, indicate spaces are served by dedicated cooling systems that are independent of the HPVAV systems serving the rest of building		
	C403.6.10, Item 14	Dedicated cooling systems serving data centers and server, electronic equipment and telecom spaces	Indicate dedicated cooling systems are configured for 100% air economizer operation and comply with all related economizer requirements per C403.5 (without economizer exceptions), or heat recovery per C403.5, Exception 9		
	C403.6.10, Item 15	Central plant efficiency	Indicate whether systems are served by a high efficiency heating water plant, or a high efficiency chilled water plant		

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	C403.6.10, Item 15	Central plant efficiency	If complying via high efficiency heating water plant: Indicate all VAV terminals have hydronic heating coils served by a heating water system with either gas-fired boiler(s) with thermal efficiency (Et) $\geq 92\%$ , air-to-water heat pumps, or heat recovery chillers; indicate hydronic heating coils are sized per a maximum 120°F entering water temperature during peak demand		
	C403.6.10, Item 15	Central plant efficiency	If complying via high efficiency chilled water plant: Indicate all VAV air handlers have cooling coils served by chillers with rated IPLV efficiency that exceeds WSEC listed IPLV by at least 25% per Table C403.3.2(7) (note water-cooled IPLV is max, all others are min); indicate smallest chiller or compressor in plant is $\leq 20\%$ of the total plant capacity, or provide thermal storage sized for $\geq 20\%$ of total plant capacity		
	C403.6.10, Item 16	Fault detection and diagnostics	Indicate DDC system includes automatic fault detection and diagnostics (FDD) configured to monitor operation and provide fault reporting of all required parameters for all VAV air handlers and VAV air terminal units in the HPVAV system		

## HIGH EFFICIENCY SINGLE-ZONE VAV SYSTEMS - EXCEPTION TO C403.3.5 DOAS, MUST COMPLY WITH ALL 8 PROVISIONS TO BE ELIGIBLE

	C403.12, Item 1	Air economizer	Indicate system is configured for 100% air economizer operation and complies with all related economizer requirements per C403.5 (without economizer exceptions)		
	C403.12, Item 2	Direct digital controls (DDC)	Provide DDC controls for all components of system per C403.4.11 (regardless of system size); identify all DDC system input / output control points; indicate capability for trending and graphical display		
	C403.12, Item 3	Outdoor airflow measurement and control	For systems with minimum required outdoor air $\geq 1,000$ cfm, provide an airflow monitoring station that is configured to measure outdoor air intake under all load conditions; indicate controls that adjust outdoor air cfm via DCV per C403.7.1		
	C403.12, Item 4	Maximum allowable fan power	For each fan system serving a single-zone VAV system, provide calculations that verify fan system electrical input power is $\leq 90\%$ of the fan power budget in accordance with C403.8.1.1		
	C403.12, Item 5	Supply airflow control	Provide controls that adjust supply airflow based on the heating and cooling loads; indicate control sequence that limits minimum fan speed to 30% of peak design airflow or required ventilation during unoccupied mode, whichever is less		

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	C403.12, Item 6	Controls for high occupant density spaces	For zones > 150 sf with high occupant density (≥ 25 people / 1000 sf), indicate DCV control that resets ventilation setpoint based on measured CO2; also indicate occupancy sensor control that automatically reduces minimum ventilation to zero and sets back room heating and cooling setpoints by ≥ 5°F when space is unoccupied		
	C403.12, Item 7	High efficiency system option	Indicate which system performance option is applied - high efficiency DX cooling and heat pump or high efficiency gas heating; or heating coils served by a high efficiency heating water plant; or cooling coils served by high efficiency chilled water plant		
	C403.12, Item 7	High efficiency system option	If complying via high efficiency DX: Indicate full load and part load rated cooling efficiency exceeds WSEC listed efficiency by at least 15%; if heating is supplied by a gas-fired furnace, indicate thermal efficiency (Et) is ≥ 90%; if system is a heat pump, indicate heating efficiency (HSPF or COP) exceeds WSEC listed efficiency by at least 10%; control of cooling and heating coil output shall be configured with a minimum of 2-stages or modulating		
	C403.12, Item 7	High efficiency system option	If complying via high efficiency heating water plant: Indicate hydronic heating coils are served by a heating water system with either gas-fired boiler(s) with thermal efficiency (Et) ≥ 92%, air-to-water heat pumps, or heat recovery chillers; indicate hydronic heating coils are sized per a maximum 120°F entering water temperature during peak demand		
	C403.12, Item 7	High efficiency system option	If complying via high efficiency chilled water plant: Indicate cooling coils are served by chillers with rated IPLV efficiency that exceeds WSEC listed IPLV by at least 25% per Table C403.3.2(7) (note water-cooled IPLV is max, all others are min); indicate smallest chiller or compressor in plant is ≤ 20% of the total plant capacity, or provide thermal storage sized for ≥ 20% of total plant capacity		
	C403.12, Item 8	Fault detection and diagnostics	Indicate DDC system includes automatic fault detection and diagnostics (FDD) configured to monitor operation and provide fault reporting of all required parameters for all HPVAV single-zone air systems		

## EXTERIOR HEATING SYSTEMS

	C403.11.1	Heating outside a building	Indicate systems providing heating in non-enclosed outdoor occupied spaces are radiant systems		
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	C403.11.1	Heating outside a building	Indicate occupancy sensing or timer switch controls configured to automatically shut off heating system when area served is unoccupied		
	C403.11.2	Snow melt systems	Indicate automatic controls configured to shut off system when pavement temperature exceeds 50°F and no precipitation is falling, and when outdoor air temperature exceeds 40°F		
	C403.11.3	Freeze protection system controls	Indicate automatic controls to shut off system when outdoor temperature exceeds 40°F, or conditions protect fluid from freezing		

## HVAC EQUIPMENT ENERGY USE METERING

	C409.3.1	HVAC equipment energy use metering	For new buildings and building additions > 25,000 sf, verify energy use metering of all equipment used to provide space heating and cooling, dehumidification and ventilation will be provided per C409; indicate equipment eligible for exception		
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## DOCUMENTATION AND SYSTEM SPECIFIC REQUIREMENT TO SUPPORT COMMISSIONING (CX)

	C408.1	Scope of mechanical systems commissioning	For buildings with areas required to comply with C403.3.5 (DOAS) or with $\geq 180,000$ Btu/h total output cooling capacity or $\geq 240,000$ Btu/h total output heating capacity or energy recovery equipment $\geq 300$ cfm, indicate that all mechanical systems regardless of individual capacity are required to be commissioned; or provide building heating / cooling capacity calculation demonstrating eligibility for exception		
	C408.1	Scope of mechanical systems commissioning	Indicate that all systems, equipment and controls for which the WSEC requires control functions and / or configuration to perform specific functions are included in the Cx scope		
	C408.1.1 C408.1.4.1	Commissioning requirements in construction documents	Indicate in plans and specifications that Cx per C408 is required for all applicable mechanical systems		
	C408.1.1 C408.1.4.1	Commissioning requirements in construction documents	Include general summary that includes at minimum: narrative description of activities, responsibilities of the Cx team, schedule of activities including verification of project close out documentation per C103.6, and conflict of interest plan (if required)		
	C408.1.1 C408.1.4.1	Commissioning requirements in construction documents	Include in general summary that a Cx project report or Compliance Checklist (Figure C408.1.4.1) shall be completed by the Certified Cx Professional and provided to the owner prior to the final mechanical inspection.		

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	C408.1.2.2	Functional performance testing criteria	Identify in plans and specifications the intended operation of all equipment and controls during all modes of operation, including interfacing between new and existing-to-remain systems		
	C408.2.2	Air system and hydronic system balancing	Indicate in plans that air and fluid flow rates shall be tested and balanced within the tolerances defined in the specifications; indicate systems shall be balanced in a manner to first minimize throttling losses, then adjusted to meet design flow conditions		
	C408.2.2.1	Air system balancing devices	Indicate devices that provide the capability to balance all supply air outlets, zone terminals and air handling equipment requiring system balancing		
	C408.2.2.2	Hydronic system balancing devices	Indicate devices that provide the capability to isolate, balance and measure flow across all hydronic equipment requiring system balancing including heating and cooling coils and pumps; or exception applied		

**PROJECT CLOSE OUT DOCUMENTATION**

YES	C103.6	Documentation and project close out submittal requirements	Indicate in plans that project close out documentation and training of building operations personnel is required for all mechanical components, equipment and systems governed by this code; indicate close out documentation shall include: record documents, O&M manuals, applicable WSEC mechanical equipment compliance reports and calculations		
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