Mechanical Summary — MECH-SUM

2012 Washington State Energy Code Compliance Forms for Commercial Buildings including R2 & R3 over 3 stories and all R1 — Revised May 2015

Project Info

Project Address:	**5700 100th Street SW, Suite 510**
	Lakewood, WA 98499
Applicant Name:	**Takako Baker**
Applicant Address:	**2007 SE Ash Street, Portland, OR 97213**
Applicant Phone:	**503-234-0548**

Date: 1/1/2015

For Building Dept. Use

Project Description

Briefly describe mechanical systems in the text box provided

☐ Total Bldg Performance

Total Bldg Performance compliance includes all mandatory provisions per C401.2 Option 2. Only MECH-SUM and MECH-CHK forms required.

☐ New Building ☐ Building Addition ☐ System Upgrade ☑ No System Changes

Tenant Improvement work for a new tenant space

Mechanical Systems Summary

Equip ID	Type of System (Note 1)	Space(s) Served	Compliance Path	Heating and Cooling	Fan Flow Controls	Air Economizer (Note 2)	Ventilation (Note 3)	Energy Recovery
RTU	**existing**							
RTU	**existing**							

Note 1 - Provide basic description of system type, for example: unitary rooftop air handler, built-up central air handler; single-packaged, split system or packaged terminal air conditioner or heat pump; unit heater, warm-air furnace, electric resistance heater, 4-pipe fan coil, VRF system, energy recovery air handler, make-up air system, ground or water-source heat pump, etc.

Note 2 - If taking an exception to air economizer, select exception taken from drop down menu and complete MECH-ECONO form. Summary definitions of each exception are listed in MECH-ECONO.

Note 3 - If ventilation "Not applicable" is selected, provide explanation in Project Description box above.

HVAC Hydronic Systems

☐ Hydronic chilled water ☐ Water-loop heat pump ☑ No hydronic systems

☐ Hydronic heating ☐ Geothermal

Service Water Heating Systems

Equipment Type (s)

☑ Hot water heating tank(s) ☐ Instantaneous ☐ No service water systems

☐ Dedicated boiler ☐ Heat exchange from space heat boiler or central hot water/steam

Distribution Type (s)

☑ Circulation System ☐ On-demand

Mechanical Schedules

☑ Mechanical Plans ☐ MECH-EQ Form

Indicate location of equipment compliance information. If provided on plans then MECH-EQ forms are not required, however, include on plans all applicable compliance information listed in MECH-EQ tables.

Design Load Calculations

☐ Load calculation summary ☐ MECH-LOAD-CALC Form ☐ Equipment retrofit or repair

Provide design load calculations for all mechanical systems and equipment serving the building heating, cooling or ventilating needs. If a load calculation summary is provided with the permit documents that includes all applicable compliance information then the MECH-LOAD-CALC form is not required.

Equipment retrofit and repair projects where design loads in space(s) served have not changed from original design conditions are not required to perform load calculations.

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Fan Power

◯ Air system exceeding 5hp ◯ No air system exceeds 5hp ◉

Provide a MECH-FANSYS form for each HVAC system having a total fan system motor nameplate horsepower exceeding 5 horsepower. Refer to Section C403.2.10 and MECH-FANSYS-DOC for requirements and exceptions.

Commissioning Exception Summary

Describe means of eligibilty for commissioning exception (capacity, etc) for all systems noted as taking exception in Mechanical Systems Summary table. Refer to Section C408.2 and C408.4 for exceptions.

☑ Commissioning will be provided for all applicable systems

Commissioning Exceptions:

☐ Mechanical system(s) _____

☐ Service water heating system(s) _____

For systems requiring commissioning, Figure C408.1.2.1 Commissioning Compliance Checklist shall be submitted to the code official upon project completion.

Low Energy and Semi-Heated Spaces (Note 6 and 7)

Space Type	Location in Plan(s)	Space(s) Served	Area Served, square feet	Heating Capacity, Btu/h (Note 4)	Cooling Capacity, Btu/h (Note 5)	Peak Space Conditioning Capacity, Btu/h-sf	Compliance Check	Notes

Note 4 - Provide total installed heating output capacity of systems serving Low Energy or Semi-Heated space(s) in btuh.
Note 5 - Provide total installed cooling capacity of system serving Low Energy space(s) in Btu/h. Not allowed for semi-heated spaces. Enter 0 if no cooling.
Note 6 - Refer to Section C101.5.2 Low Energy Building. Intalled peak space conditioning capacity, heating or cooling, may not exceed 3.4 Btu/h-sf.
Note 7 - Refer to Section C402.1.4 and Semi-Heated Space definition in Chapter 2. Total heating output capacity may not exceed 8 btuh/sf. Only systems without electric resistance heating and no cooling are eligible for the wall insulation exception under semi-heated.

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Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
			GENERAL PROVISIONS		
Equipment Sizing & Performance					
yes	C403.2.1	Load calculations	Load calculations performed per ASHRAE Std 183 or equivalent per Chapter 3		
na	C403.2.2	Equipment and system sizing	Output capacity of heating and cooling equipment and systems do not exceed calculated loads, note exceptions taken		
yes	C403.2.5	Minimum ventilation	Ventilation (natural or mechanical) provided per IMC; indicate mechanical ventilation is capable of being reduced to minimum requirement per IMC	M6.10	
na	C403.2.3 & C403.2.3.2 & C403.2.12.1	Equipment minimum efficiency	Provide equipment schedules or complete MECH-SUM tables with type, capacity, efficiency, test standard (or other efficiency source) for all mechanical equipment		
na	C403.2.13	Electric motor efficiency	Provide equipment schedule with hp, rpm, and efficiency for all motors; note exceptions taken		
na	C403.2.10.1	Fan power limitation	For all applicable systems > 5hp, provide system total nameplate hp in MECH-FANSYS-SUM form		
na	C403.2.10.1	Fan power limitation	For all applicable fan systems > 5hp, verify fan system motor hp or bhp complies with fan power limits per Table C403.2.10.1(1), provide MECH-FANSYS form for each system		
na	C403.2.10.2	Motor nameplate hp	Indicate fan motors specified are the smallest available motor hp size greater than fan bhp, note exceptions taken		
na	C403.2.10.3 & C403.2.13	Fractional hp fan motors	Indicate fan motors 1/12 to 1 hp are ECM type or meet minimum efficiency req.		
na	C403.2.3	Maximum air cooled chiller capacity	Indicate air-cooled chiller capacity does not exceed air-cooled chiller limit		
na	C403.2.3.1	Non-standard water-cooled chillers	Full-load and NPLV values for water-cooled centrifugal chiller adjusted for non-standard operational conditions		
na	C403.2.12.1.2	Centrifugal fan cooling towers	Large capacity cooling towers with centrifugal fan(s) meet efficiency requirements for axial fan open circuit cooling towers		
na	C403.2.3	Forced air furnace and unit heaters	Indicate intermittent ignition or IID, flue/draft damper & jacket loss		
na	C403.2.3.3	Packaged electric heating/cooling equipment	Verify all packaged electric equipment that provides > 20,000 Btu/h cooling capacity and heating is a heat pump, note in equipment schedule		
na	C403.2.3.4	Humidification	Indicate method of humidification (note requirements for systems with economizer)		
HVAC System Controls & Criteria					
yes	C403.2.4.1	Thermostatic controls	Indicate locations of thermostatic control zones on plans, including perimeter systems	M2.10	
no	C403.2.4.1.1	Heat pump supplementary heat	Indicate staged heating (compression/supplemental) and outdoor lock-out temperature is set to 40°F or less		
na	C403.2.4.2	Setpoint overlap (deadband)	Indicate 5°F deadband minimum for systems controlling both heating & cooling		
na	C403.2.4.3	Automatic setback and shutdown	Indicate zone t-stat controls with required automatic setback & manual override		
na	C403.2.4.3.3	Automatic (optimum) start	Indicate system controls that adjust equip start time to match load conditions		
yes	C402.4.5.2 & C403.2.4.4	OSA, exhaust, and relief air dampers	Indicate location of outdoor air supply intake, and exhaust and relief outlet dampers; verify Class 1 leakage rating and control type (motorized or gravity); note exceptions taken	M6.10	
na	C402.4.5.2	Return air dampers	Indicate location of return air dampers; verify motorized control; verify Class 1 leakage rating for all return air dampers not integral to packaged equipment		
na	C402.4.5.1	Stairway and shaft vents	Indicate location of stairway and shaft vents, verify Class 1 leakage rated motorized dampers and method of activation		
na	C403.2.11	Heating outside a building	Indicate radiant heat system and occupancy controls		
na	C403.2.4.5	Snow melt systems	Indicate shut-off controls based on outdoor conditions		
na	C403.2.4.6	Combustion heating equipment	Indicate modulating or staged control		
na	C403.2.4.7	Group R1 hotel/motel systems	Indicate method for guest room temperature automatic setback (heating) & set-up (cooling), confirm adjustment of at least 5°F minimum.		
na	C403.2.4.8 / 9	Group R2/R3 dwelling and sleeping unit systems	Indicate 5-2 programmable thermostats in primary spaces with minimum of two setback periods; note exceptions taken		
yes	C403.2.5.1	Demand controlled ventilation	Indicate high-occupancy spaces and systems requiring DCV	M6.10	
yes	C403.2.5.2	Occupancy sensors	Indicate spaces requiring occupancy-based system control and method; or alternate means provided to automatically reduce OSA when partially occupied	M6.10	

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Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
			GENERAL PROVISIONS, CONTINUED		
			HVAC System Controls & Criteria, Continued		
Na	C403.2.5.3	Enclosed loading dock/parking garage ventilation	Indicate enclosed loading dock and enclosed parking garage ventilation system activation and control method		
NA	C403.2.5.4.1	Kitchen exhaust hoods	Indicate kitchen hoods requiring make-up air; indicate make-up air source and conditioning method		
NA	C403.2.5.4.2	Laboratory exhaust systems	Indicate lab exhaust systems requiring heat recovery, method & efficiency; or alternative method taken (VAV, semi-conditioned makeup, or CERM calculation)		
NA	C403.2.6.1	Energy recovery (ER) - ventilation systems	Indicate ventilation systems requiring ER, method & efficiency; note exceptions		
NA	C403.2.6.2	Energy recovery (ER) - condensate systems	Indicate on-site steam heating systems requiring energy recovery		
NA	C403.2.6.3	Energy recovery (ER) - cooler/freezer condensers	Indicate remote refrig. condensers requiring ER and use of captured energy		
NA	C403.4.6	Energy recovery (ER) - condenser systems	Indicate condenser systems requiring ER to pre-heat service water; indicate ER effectiveness; note exceptions taken		
NA	C403.2.12	Variable flow control - fans/pumps	Indicate fan and pump motors requiring variable flow control and method (VSD or equivalent controls)		
NA	C403.2.12.1	Variable flow control - heat rejection equipment	Indicate heat rejection equipment and cooling tower fans requiring variable flow control and method		
NA	C403.2.12.2	Large volume fan systems	Indicate fan systems requiring airflow reduction based on heating and cooling demand; note exceptions taken		
NA	C403.2.12.2	Single zone AC systems	Indicate method of cooling demand-based fan control for sys. > 110,000 Btu/h		
yes	C403.2.4.10	DDC system capabilities	Identify all DDC system input/output control points and indicate capability for trending and demand response setpoint adjustment	M6.2	
			Ducting Systems		
yes	C403.2.7.1 & C403.2.7.3	Duct construction	Indicate all ductwork constructed and sealed per IMC, C402 leakage requirements and IBC vapor retarder requirements	specs	
yes	C403.2.7.3.1-3	Duct pressure classifications	Identify location of low, medium and high pressure ductwork on plans	specs	
yes	C403.2.7.3.3	High pressure duct leakage test	Indicate high pressure duct leakage testing requirements on plans; provide test results to jurisdiction when completed	specs	
yes	C403.2.7.1 / 2	Duct insulation	Indicate R-value of insulation on ductwork	specs	
			Piping Systems		
yes	C403.2.8	Piping insulation	Indicate R-value of insulation on piping	specs	
na	C403.2.8.1	Piping insulation exposed to weather	Indicate method of protection from damage/degredation		
			SIMPLE SYSTEMS		
			Qualifying Systems		
na	C403.3	Qualifying single zone systems	Verify unitary or packaged equipment does not exceed capacity limits, does not have active humidifcation or simultaneous heating/cooling		
na	C403.3	Qualifying 2-pipe heating systems	Verify 2-pipe heating-only system does not exceed capacity limits		
na	C403.3.2	Hydronic system controls	Refer to Complex Systems Section C403.4.3		
			Simple System Economizers		
yes	C403.3.1	Air economizer required	Indicate cooling systems requiring economizer controls; note in equipment schedule	M6.10	
na	C403.3.1	Air economizer exceptions	Indicate eligible exception(s) taken and provisions to comply with exception(s)		
na	C403.3.1.1.1	Air economizer capacity	Indicate modulating OSA control capability up to 100% OSA; note exceptions taken		
na	C403.3.1.1.2	Integrated air economizer operation	Indicate capability for partial air economizer operation for systems with capacity > 65,000 Btu/h		
na	C403.3.1.1.3	Air economizer high limit controls	Indicate high limit shut-off control method per Table C403.3.1.1.3(2)		

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Applicable (yes,no,na)	Code Section	Code Provision	Information Required - *Must be in permit documents*	Location in Documents	Building Department Notes
			COMPLEX SYSTEMS		
Complex System Economizers					
yes	C403.4.1	Air economizer required	Indicate cooling systems requiring economizer controls; note in equipment schedule	M6.10	
na	C403.4.1	Air economizer exceptions	Indicate eligible exception(s) taken and provisions to comply with exception(s)		
na	C403.4.1.1	Water economizer capacity	For eligible systems where water economizer may be provided in lieu of air economizer, indicate system is capable of 100% cooling capacity at 50°F db/45°F wb OSA		
na	C403.4.1.2	Water economizer maximum pressure drop	Indicate precooling coils and heat exchangers in water economizer system do not exceed pressure drop limit		
na	C403.4.1.3	Integrated economizer operation	Indicate capability for partial economizer operation for air or water economizer systems		
na	C403.4.1.4	Economizer heating system impact	Verify control method of HVAC systems with economizers does not increase building heating energy usage during normal operation		
Specific System Requirements					
na	C403.4.2 & C403.2.12	VAV fan control	Indicate fans requiring variable flow control and method		
na	C403.4.2.1	VAV fan static pressure sensors	Indicate sensor locations on plans; include at least one sensor per major duct branch		
na	C403.4.2.2	VAV fan static pressure setpoint	Indicate fan system static pressure setpoint based on zone requiring most pressure		
na	C403.4.5	VAV systems serving multiple zones	Indicate supply air systems serving multiple zones, method of primary air control, and zones served; Indicate VAV or note exceptions taken		
na	C403.4.5	VAV systems serving multiple zones	For each air system terminal, indicate the maximum air flow rate of primary supply air during zone peak cooling and the maximum air flow rates during zone peak heating.		
na	C403.4.5.4	VAV system supply air reset	Indicate controls that automatically reset supply air temp in response to loads		
na	C403.4	Large capacity cooling systems	Indicate method of multi-stage or variable control for building cooling system capacity > 300 tons		
na	C403.4.7	Hot gas bypass limitation	Indicate cooling equipment unloading or capacity modulation method		
na	C403.4.3	Large capacity boiler systems	Indicate multi-stage or modulating burner for single boilers > 500,000 Btu/h		
na	C403.4.3	Boiler sequencing	Indicate automatic controls that sequence operation of multiple boilers		
na	C403.4.3.5	Chiller / boiler plant pump isolation	Indicate capability to automatically reduce overall plant flow and shut-off flow through chillers & boilers when not in use		
na	C403.4.3.6 & C403.2.12	Variable flow control - pumps	Indicate pumps requiring variable flow control & method		
na	C403.2.12.1 & C403.4.4	Variable flow control - cooling towers	Indicate cooling tower fans requiring variable flow control and method		
na	C403.4.3.4	Hydronic system part load controls	Indicate heating & chilled water systems have the capability to automatically reset supply water temp AND reduce flow by ≥ 50% for systems > 300,000 Btu/h		
na	C403.4.3.2	Two-pipe changeover systems	Indicate deadband, heating/cooling mode scheduling and changeover temperature range		
na	C403.4.3.3.1	Water loop heat pump - deadband	Indicate capability of central equipment to provide min. 20°F water supply temp deadband between heat rejection and heat addition modes		
na	C403.4.3.3.2.1	Water loop heat pump - heat rejection, Zone 4	Indicate method used to limit system heat loss when heat rejections is not needed		
na	C403.4.3.3.2.2	Water loop heat pump - heat rejection, Zone 5	Provide heat exchanger that separates cooling tower and heat pump loop		
na	C403.4.3.3.3	Water loop heat pump - isolation	Indicate 2-way isolation valve on each heat pump and variable flow control for systems with total pump power > 10 hp		
na	C403.5	Walk-in cooler / freezer - anti-sweat heaters	Indicate w/sf & control method for walk-in cooler/freezer door anti-sweat heaters		
na	C403.5 / 6	Cooler / freezer - evaporator and condenser fans	Indicate motor type for evaporator and condenser fans < 1 hp		

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			SERVICE WATER HEATING		
Service Water Systems					
yes	C404.2	Water-heating equip min. efficiency	Provide equipment schedule with type, capacity, efficiency, test standard or other efficiency source	P6.10	
yes	C404.3	Temperature controls	Indicate temperature controls have required setpoint capability	p6.10	
yes	C404.4	Heat traps	Indicate piping connected to equipment have heat traps on supply & discharge	p6.10	
na	C404.5	Insulation under water heater	Indicate R-10 insulation under electric water heater tanks		
yes	C404.6	Service water piping insulation	Indicate R-value of insulation on piping; note exceptions taken	specs	
yes	C404.7 / 8	Circulation systems and heat trace shut-off	Indicate shut-off capability based on occupancy and periods of limited demand	P6.10	
na	C404.9	Group R-2 service hot water meters	Indicate method of usage metering for dwelling units served by a central service hot water system		
Pools & In-Ground Permanently Installed Spas					
na	C404.10.1	Pool heating equip min. efficiency	Provide equipment schedule with type, capacity, efficiency, test standard or other efficiency source		
na	C404.10.1 / 2	Pool heater on / off controls	Indicate automatic on/off control based on scheduling & accessible on/off switch on heater that operates independent of thermostat setting; note exceptions taken		
na	C404.10.3	Pool covers	Indicate vapor retardant cover and insulation rating as required		
na	C404.10.3	Pool assembly insulation	Indicate rating of insulation on sides and bottom of pools heated to > 90°F		
na	C404.10.4	Heat recovery	Indicate method, exhaust air temperature reduction and recovered energy use; note exceptions taken		
			COMMISSIONING		
Specific System Requirements					
yes	C408.2	Mechanical systems commissioning	Indicate all mechanical systems to be commissioned; for those that will not be commissioned, note exception taken	m2.1	
yes	C408.4	Service water heating systems commissioning	Indicate all service water heating systems to be commissioned; for those that will not be commissioned, note exception taken	P2.1	
YES	C408.1.1	Commissioning plan	Provide commissioning plan for all systems requiring commissioning; include in plan all required items per this section	m2.1	
YES	C408.2.2.1 & C408.2.2.2	Air system and hydronic system balancing	Include in commissioning plan that air and hydronic systems shall be balanced in a manner to first minimize throttling losses, then adjust to meet design flow conditions	m2.1	
YES	C408.2.2.1	Air system balancing devices	Indicate devices that provide the capability to balance all supply air outlets, zone terminals and equipment requiring system balancing	m2.1	
YES	C408.2.2.2	Hydronic system balancing devices	Indicate devices that provide the capability to isolate, balance and measure flow for all hydronic equipment requiring system balancing	m2.1	
YES	C408.2.3	Mechanical systems functional performance testing	Provide description of functional performance testing procedures for all applicable systems including: equipment, controls, economizers	m2.1	
YES	C408.4.1	Service water heating functional performance testing	Provide description of functional performance testing procedures for all applicable systems including: equipment, controls, pools and spas	P2.1	
YES	C408.1.4	Systems operation training	Indicate required systems operation training measures to be provided	m2.1	
YES	C408.1.2 & C403.1.3	Documentation	Indicate required documentation including: record documents, manuals, balancing reports, commissioning preliminary and final reports	m2.1	
YES	C408.1.2.1	Acceptance report	Indicate that Commissioning Compliance Checklist (Figure C408.1.2.1) is required upon completion of preliminary commissioning report	m2.1	