

MECHANICAL COMPLIANCE SUMMARY

2018 WSEC Compliance Forms for Commercial Buildings including Group R2, R3 & R4 over 3 stories and all R1 Administered by: ©2023 NEEA, All rights reserved

| | | | | |
|--|-----------------|---|---|--------------------|
| Project & Applicant Information | Project Title | Prologis - 2018 WSEC | For Building Department Use: <div>City of Puyallup Development & Permitting Services ISSUED PERMIT Building Planning Engineering Public Works Fire Traffic</div> <div>City of Puyallup Building ACCEPTED JHmongmay 05/11/2023 1:31:05 PM CITY OF PUYALLUP WASHINGTON STATE</div> | Date: Apr 12, 2023 |
| | Project Address | 1601 Industrial Park 100 Puyallup, WA 98371 | | |
| | Applicant Name | Scott Miller | | |
| | Applicant Phone | 206-920-9240 | | |
| | Applicant Email | scottm@metrixeng.com | | |
| For questions about this report, contact WSEC Commercial Technical Support at 360-539-5300 or via email at com.techsupport@waenergycodes.com | | | | |

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|--------------------------------|---|---|---------------------------------|-----------------------------|---------------------------|-------------------------------|
| General Occupancy | All Commercial | | General Building Use Type | Office, Other | Building Cond. Floor Area | 7,945 |
| General Project Types | Building Addition | New Building or Addition Mechanical Scope | Single Zone Systems & Equipment | Alteration Mechanical Scope | Project Cond. Floor Area | 7,945 |
| | | | | | Floors Above Grade | 1 |
| | | | | | Compliance Method | Compliance Method 1 - General |
| Mechanical Project Description | A re-demise of an existing office space. The scope of work includes the demolition of two (2) existing gas-fired RTU's; and an installation of a new RTU (to provide heating and cooling) and an energy recovery ventilator (to provide ventilation). | | | | | |

| Mechanical Compliance Scope and Method | Project Type | Mechanical Scope | Economizer Exception(s) Applied? | DOAS Ventilation Provided? | Higher Equipment Efficiency Option Applied? | Equipment Efficiency Compliance Verification |
|---|-------------------|---------------------------------|--|----------------------------|---|--|
| | Building Addition | Single Zone Systems & Equipment | Yes | Yes | NA | COMPLIES |
| Additional Efficiency Credits Included (AEC) | | | | | | |
| Does building include occupancy classifications requiring DOAS? | | Yes | Does project include DOAS equipment? | | | Yes |
| Based on project scope do TSPR requirements apply? | | Yes | Do all systems comply with Appendix D standard reference design or qualify for an exception to TSPR? | | | Yes |

| | | | |
|----------------------------|---|-------------------------|----------|
| Scope & Space Conditioning | BUILDING ADDITION - SINGLE ZONE SYSTEMS & EQUIPMENT | Compliance Verification | COMPLIES |
|----------------------------|---|-------------------------|----------|

Single Zone Air Systems Category - Air conditioner, unitary, thru-wall, SDHV

| Air Systems Summary Information | | | | | | | | |
|---------------------------------|-------------------|------------------------|----------------------|---|------------------------|------------------|-----------------------------|--------------------------------|
| System/Equip ID | Quantity of Items | Supply Airflow Control | Ventilation Standard | Ventilation CFM (Total if Multiple Items) | Ventilation Air Source | Paired with DOAS | Ventilation energy recovery | Energy Recovery Efficiency (%) |
| RTU-1 | | Variable air volume | IMC Ventilation | | Separate DOAS | ERV-1 | Not provided, not required | |

| Air Systems & Equipment - Cooling | | | | | | | | | | | |
|-----------------------------------|------------------------------|-------------------|-----------------------------------|---------------------------|--------------------------------------|--|-----------------------------|----------|-------------------------------|----------|------------------------------------|
| System/Equip ID | Cooling System/Equip Type | Specific Type | Cooling Capacity per item (Btu/h) | AEC Efficiency Multiplier | Econo Exception Multiplier (FL & PL) | Combined Efficiency Multiplier (AEC & Econo) | Proposed Cooling Efficiency | CE Units | Proposed Part Load Efficiency | PL Units | Efficiency Compliance Verification |
| RTU-1 | Air conditioner, evap cooled | Single package DX | 102,000 | 1 | 0 | 1 | 12.1 | EER | 16.6 | IEER | COMPLIES |

| Air Systems & Equipment - Heating | | | | | | | |
|-----------------------------------|---------------------------|--------------------------|------------------|----------|-----------------------------|----------|------------------------------------|
| System /Equip ID | Heating System/Equip Type | Specific Type | Heating Capacity | HC Units | Proposed Heating Efficiency | HE Units | Efficiency Compliance Verification |
| RTU-1 | Furnace | Warm air, gas-fired (Et) | 121 | Btu/h | 81.0 | Et | COMPLIES |

| Air Systems & Equipment Details | | | |
|---------------------------------|---|---|--|
| System/Equip ID | Area(s) Served | Location In Project Documents - Plan/Detail # | |
| RTU-1 | Office space | ALL | |
| | Heating Section/Auxiliary Heating Type: Furnace | | Economizer Compliance Method: Air-side economizer provided |

| | | |
|--|---|--|
| | WSEC Equip Efficiency Reference Table - Cooling: Table C403.3.2(1)A - Unitary Air Conditioners & Condensing Units | |
| | WSEC Equip Efficiency Reference Table - Heating: Table C403.3.2(4) Warm Air Furnaces | |

PRCTI20230310

THE APPROVED CONSTRUCTION PLANS,
DOCUMENTS AND ALL ENGINEERING MUST
BE POSTED ON THE JOB AT ALL
INSPECTIONS IN A VISIBLE AND READILY
ACCESSIBLE LOCATION.

FULL SIZED LEDGIBLE COLOR PLANS ARE
REQUIRED TO BE PROVIDED BY THE
PERMITEE ON SITE FOR INSPECTION

Mechanical Requirements List, pg 1 of 25

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Project:
Prologis - 2018 WSEC
1601 Industrial Park
100
Puyallup, WA 98371

PRCTI20230310

Date: 2023-04-12

| Applies | Code Section | Code Provision | Compliance Information Required In Permit Documentation | Location in Documents | Building Department Notes |
|--------------------------------------|------------------------|--|--|-----------------------|---------------------------|
| SCOPE | | | | | |
| | C103.1 | 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 | | |
| NA | C403.1.1 | HVAC total system performance ratio (TSPR) | For systems serving office, retail, library or education occupancies, 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 performed per ASHRAE Std 183 or equivalent, using design parameters per C302 and Appendix C; include load adjustments to account for energy recovery | Separate document | |
| 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 with 2018 WSEC adjustments per climate zone | | |
| NA | 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 | | |
| NA | | | Indicate locations of associated zone isolation dampers in HVAC distribution system | | |
| NA | | | Refer to HVAC Controls section in Requirements List for applicable automatic setback and shutdown controls requirements | | |
| EQUIPMENT SELECTION & PERFORMANCE | | | | | |

Mechanical Requirements List, pg 2 of 25

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| | | | | | |
|-----|----------------------|---|--|-------------------------|---------------|
| 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 | M0.2, Separate document | PRCTI20230310 |
| 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's and operating hours for all air systems; identify heating and cooling equipment that does not have a corresponding WSEC minimum efficiency (manufacturer rated) | M0.2 | |
| NA | 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 | Gas and oil-fired forced air furnace and unit heaters | For 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 | | |
| YES | C403.3.2.4 | Packaged electric heating / cooling equipment | Verify all packaged electric equipment with $> 6,000$ Btu/h cooling capacity and any amount of heating is a heat pump; include in equipment schedules | M0.2 | |
| 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 | C403.3.2.5 | 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 | | |
| | 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) | | |

EQUIPMENT SELECTION & PERFORMANCE - DEDICATED OUTSIDE AIR SYSTEMS (DOAS)

Mechanical Requirements List, pg 3 of 25

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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 | M0.2 | PRCTI20230310 |
| NA | | | 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 | | | 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 | | | 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 | | | Refer to Requirements List section after Multiple-Zone Air Systems for High Efficiency Multiple-Zone VAV Systems exception to C403.3.5 DOAS | | |
| NA | | | 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 $\geq 60\%$ sensible or $\geq 50\%$ enthalpy ER effectiveness based on delta between outdoor air and return air enthalpies at design conditions; or exception applied | M0.2 | |
| NA | | | If applying exception for DCV, identify occupant load in space and airflow control configured to reduce ventilation rate by $\geq 50\%$ when occupancy is less than design occupancy | | |
| YES | C403.3.5.1 | DOAS fan power | For DOAS with total system fan hp < 5 hp, indicate total system fan power does not exceed 1 watt per cfm | M0.2 | |
| NA | | | For DOAS with total system fan hp ≥ 5 hp, indicate total system fan power complies with fan power limitation per Section C403.8.1 | | |

Mechanical Requirements List, pg 4 of 25

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| | | | | | |
|-----|------------|---|--|---------------|--|
| NA | C403.3.5.2 | Heating / cooling system 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 | PRCTI20230310 | |
| NA | | | 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 | C403.3.5.3 | 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 | M1.1 | |
| NA | C403.6.1 | Multiple zone DOAS | For DOAS serving multiple zones, indicate controls configured to reduce the volume of outdoor air in each zone independently when the zone is unoccupied; or exception applied | | |

ADDITIONAL EFFICIENCY CREDITS - DEDICATED OUTSIDE AIR SYSTEMS (DOAS)

| | | | | | |
|--|--------|---|---|--|--|
| | C406.6 | DOAS | For building occupancies not subject to the requirements of Section C403.3.5, to comply with this additional efficiency credit, provide calculations that demonstrate 90% or more of the total floor area of all occupied, conditioned spaces are served by a DOAS per C403.3.5 | | |
| | C406.7 | High performance DOAS - Energy recovery effectiveness and fan power | For all building occupancies, to comply with this additional efficiency credit, demonstrate compliance with C406.6 | | |
| | | | Indicate energy recovery sensible effectiveness of all DOAS is $\geq 80\%$ | | |
| | | | For each system, indicate that total system fan power does not exceed 0.5 watts per cfm | | |

FANS AND FAN CONTROLS

| | | | | | |
|-----|----------|----------------------|---|------|--|
| YES | C403.8.1 | Fan power limitation | For all HVAC fan systems that provide heating and / or cooling and all DOAS, provide system total nameplate hp in equipment schedules on project plans | M0.2 | |
| NA | | | For all applicable HVAC systems with total fan motor nameplate hp > 5hp, verify fan system motor hp or bhp complies with fan power limits per equations in Table C403.8.1(1) | | |
| NA | | | Terminal units installed in conjunction with a DOAS (hydronic heat pumps, VRF heat pumps, chilled/hot water terminal units, variable volume terminal units) shall be treated as independent air-handling units for purposes of fan power calculations | | |

Mechanical Requirements List, pg 5 of 25

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| | | | | | |
|-----|------------|--|--|---------------|--|
| NA | C403.8.2 | Motor nameplate hp | For all applicable HVAC systems with total fan motor nameplate hp > 5hp, indicate fan motors specified are the smallest available motor hp size greater than fan bhp, note exceptions applied | PRCTI20230310 | |
| NA | 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 > 5hp, and multiple fans combined in series or parallel that operate as the functional equivalent of a single fan with a combined total motor hp > 5hp, indicate in equipment schedule that rated FEG for all applicable fans is ≥ 67, or exception applied; indicate these fans are sized so total efficiency is within 15% of the fan maximum total efficiency | | |
| | C403.8.4 | Group R occupancy exhaust fan efficacy | For all exhaust fans ≤ 400 cfm in Group R occupancies, indicate in equipment schedule the fan flow rate and efficacy (cfm/watt), or exception applied; refer to Table C403.8.4 | | |
| NA | C403.2.3 | Variable flow capacity - fans | For fan motors ≥ 7.5 hp, indicate method of variable flow control (VSD or equivalent method) in equipment schedule, or exception applied | | |
| YES | C403.8.5.1 | Fan airflow control | For DX air handling units with cooling capacity ≥ 42,000 Btu/h and evaporative and chilled water air handling units with fan ≥ 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) | M1.1 | |
| YES | | | 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 ≤ 66% of full speed drawing ≤ 40% of full speed fan power during periods of low cooling or ventilation only | M0.2 | |

Mechanical Requirements List, pg 6 of 25

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| | | | | | |
|----|--|--|--|--|---------------|
| NA | | | 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 | | PRCTI20230310 |
|----|--|--|--|--|---------------|

ADDITIONAL EFFICIENCY PACKAGE OPTION, MORE EFFICIENT HVAC EQUIPMENT & FAN PERFORMANCE - MUST COMPLY WITH ALL 3 PROVISIONS TO BE ELIGIBLE

| | | | | | |
|--|----------|------------------------------|--|--|--|
| | C406.2.1 | HVAC system selection | To comply with this additional efficiency credit, provide calculations that demonstrate (based on heating and cooling output capacity) that 90% or more of all HVAC equipment serving conditioned floor areas have a corresponding WSEC listed efficiency; or exception applied | | |
| | C406.2.2 | Minimum equipment efficiency | In addition to system selection requirement, indicate that all associated heating and cooling equipment have a rated efficiency for all equipment performance criteria (heating, cooling, full load, part load) that is at least 15% better than the listed WSEC efficiency; include specific equipment exceptions applied | | |
| | | | For systems required to provide a TSPR report per C403.1.1, demonstrate that the proposed design ratio is at minimum 10% higher than the standard reference design ratio | | |
| | | | For projects complying via weighted average efficiency exception, include calculations that demonstrate the overall average better than code efficiency of all equipment performance criteria for all equipment is $\geq 15\%$; indicate that all equipment has at least 5% better than code efficiency | | |
| | | | For systems serving low energy and semi-heated spaces, indicate that 90% or more of installed heating output capacity is provided by electric infrared or gas-fired radiant equipment for localized heating applications only | | |
| | C406.2.3 | Minimum fan efficiency grade | In addition to system selection and efficiency requirements, indicate rated FEG of all ≥ 1 hp (750 watt) stand alone supply, return and exhaust fans is ≥ 71 ; indicate these fans are sized so the fan efficiency at design conditions is within 10% of the maximum total or static efficiency | | |

VENTILATION, EXHAUST & ENERGY RECOVERY

| | | | | | |
|-----|------------|-------------|---|-------------------------|--|
| YES | C403.2.2.1 | Ventilation | Indicate method of ventilation air delivery (natural or mechanical) for each zone | M1.1, Separate Document | |
|-----|------------|-------------|---|-------------------------|--|

Mechanical Requirements List, pg 7 of 25

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| | | | | | |
|-----|------------|--|---|-------------------|--|
| YES | | | 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 | Separate Document | |
| | | | 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) | | |
| NA | 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 | | |
| NA | C403.4.2.4 | Exhaust system off-hour controls | Refer to Requirements List section HVAC Controls for off-hour controls requirements for exhaust systems | | |
| | C403.3.6 | 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 60% sensible recovery effectiveness | | |
| NA | C403.7.1 | Demand controlled ventilation | Identify spaces > 500 sf with occupant load ≥ 25 people/1,000 sf per IMC; for each space indicate whether it is served by an HVAC system with total design ventilation air > 3,000 cfm, and / or the system has airside economizer or automatic modulating outdoor air damper; indicate controls are configured to provide demand controlled ventilation or provide supporting documentation for applied exception | | |
| NA | C403.7.2 | Occupancy sensors | For gyms, classrooms, auditoriums, conference rooms and other spaces with occupant load ≥ 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 | | |
| NA | C403.7.3 | Ventilation air heating control | For ventilation air systems that operate in conjunction with heating and cooling systems, indicate that ventilation air is tempered (via heating or heat recovery) to no greater than 60F when the space conditioning system is in cooling mode | | |

PRCTI20230310

Mechanical Requirements List, pg 8 of 25

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|-----|--|---|--|---------------|--|
| | C403.7.4.2 | Ventilation controls for Group R-1 guestrooms | Refer to Requirements List section HVAC Controls for Group R-1 temperature setback and set-up controls | PRCTI20230310 | |
| | | | 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 NO2, or occupancy sensors), and control method (staged or modulating) | | |
| | 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 | | |
| NA | C403.7.6 | 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 | | | 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 | | | Indicate energy recovery rated effectiveness that increases outdoor air enthalpy by $\geq 50\%$ based on delta between outdoor air and return air enthalpies at design conditions | M0.2 | |
| | 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 | | |
| | | | 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 | | |
| | | | 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 | | |
| | | | 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 | | |

Mechanical Requirements List, pg 9 of 25

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|-----|--------------------------|---|--|---------------|--|
| | | | For kitchens with total hood exhaust exceeding 2,000 cfm, indicate energy efficiency compliance method (demand ventilation, energy recovery, or transfer air that would otherwise be exhausted); or exception applied | PRCTI20230310 | |
| | 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) | | |
| 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) | M1.1 | |
| | | | Indicate location of stairway and elevator hoistway shaft vent dampers on plans; verify dampers are Class 1 motorized; or exception applied | | |
| | 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 | M0.1 | |
| | | | Indicate method of activation of stairway and elevator hoistway shaft vent dampers (fire alarm or interruption of power) | | |
| | 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 | | |
| | | | Indicate energy recovery system has the rated effectiveness and is configured to decrease the exhaust air temperature at design conditions by ≥ 36°F | | |

Mechanical Requirements List, pg 10 of 25

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| HVAC CONTROLS | | | | | |
|---------------|------------|---|--|------|---------------|
| 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 | M1.1 | PRCTI20230310 |
| | | | 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 | | |
| | | | If applying Exception 2 to nonperimeter zones adjacent to perimeter zones, indicate that setpoints and deadband settings in these zones are coordinated so cooling in a nonperimeter zone does not occur until the temperature in that zone is 5°F higher than the adjacent perimeter zone temperature in heating | | |
| NA | | | 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 | | |
| YES | 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 | M0.2 | |
| | 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 | | |
| | | | Indicate a limit switch, mechanical stop or DDC control with programming to prevent simultaneous heating and cooling | | |
| NA | 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 | | |

Mechanical Requirements List, pg 11 of 25

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| | | | | | |
|-----|--------------------------------------|--|---|------|---------------|
| NA | C403.4.1.6 | Door switches for HVAC system thermostatic control | Where doors open to the outdoors from a conditioned space, 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 | | PRCTI20230310 |
| 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 | M0.1 | |
| 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 | M0.1 | |
| NA | 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 | | |
| NA | 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 | | |
| NA | 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 | | |

Mechanical Requirements List, pg 12 of 25

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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 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 | PRCTI20230310 | |
| | 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 | C403.4.11.1 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 | | |
| NA | | | Identify all DDC system input / output control points in project documents | | |
| NA | | | 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 | | |
| NA | | | Indicate system has the capability for trending and graphically displaying input / output points | | |
| 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 | | |
| NA | | | Indicate control method (cooling capacity controlled in response to space temperature, space temperature controlled by modulating supply airflow, or both) | | |
| DUCTWORK, SHAFTS AND PLENUMS | | | | | |

Mechanical Requirements List, pg 13 of 25

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| | | | | | |
|---------------|---|---------------------------------|--|------|---------------|
| YES | C403.10.1.1 C403.10.2 | Duct construction | Indicate on plans that all ductwork is constructed and sealed per IMC | M0.1 | PRCTI20230310 |
| YES | | | For outdoor air ductwork, also indicate on plans that ductwork meets air leakage requirements per C402.5 and vapor retarder requirements per the IBC | | |
| YES | 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 | M0.1 | |
| 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 | M0.1 | |
| NA | 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 and indicate ductwork insulation R-value per Table C403.10.1.1 on plans; or exception applied | | |
| NA | | | 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 | | | 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 | M0.2 | |
| YES | | | 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 | M0.2 | |
| YES | | | 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 | M0.2 | |
| NA | 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 | | |
| PIPING | | | | | |
| | 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 | | |
| | C403.10.3.1 | Protection of piping insulation | Indicate method of protection of pipe insulation from damage / degradation on hydronic piping plans | | |

Mechanical Requirements List, pg 14 of 25

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| ECONOMIZERS | | | | | |
|-------------|------------------------|--|---|---------------|--|
| | 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 | PRCTI20230310 | |
| | | | 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) | | |
| | 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 | | |
| | | | 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 | | |
| | | | Refer to Requirements List section HVAC Controls for additional requirements for DX air handlers | | |
| | 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 | | |
| | 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 | | |
| | 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 | | |
| | | | Indicate that control of economizer dampers is not based only on mixed air temperature; or exception applied for systems with cooling capacity ≤ 65,000 Btu/h | | |
| | 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 | | |
| | C403.5.3.4 | Relief of excess outdoor air | Refer to Requirements List section Ventilation, Exhaust & Energy Recovery | | |
| NA | | | Indicate relief air outlets are sized and configured to relieve excess building air during air economizer operation to prevent building over-pressurization | | |
| YES | | | Indicate relief air outlet are located to avoid recirculation into the building | M1.2 | |

Mechanical Requirements List, pg 15 of 25

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| | | | | | |
|--|------------|---|---|--|---------------|
| | 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 | | PRCTI20230310 |
| | 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) | | |
| | C403.5.5 | DX equipment economizer fault detection and diagnostics | For DX air handlers with economizer and cooling capacity ≥ 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

| | | | | | |
|--|----------------------|--|---|--|--|
| | C403.3.2.1 | Maximum air cooled chiller capacity | For chilled water plants and buildings with > 500 tons of cooling capacity, indicate air-cooled chiller capacity is ≤ 100 tons, or exception applied | | |
| | C403.6.7 | Large capacity cooling systems | For buildings ≥ 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 | | |
| | C403.3.2.2 | 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 | 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 | | |
| | | | For boiler system (single or multiple) with > 1,000,000 Btu/h input capacity, indicate turndown ratio per Table C403.3.4 and method (multiple single input boilers, modulating boilers, or combination) | | |
| | C403.2.3 | Variable flow capacity - pumps | For pump motors ≥ 7.5 hp, indicate method of variable flow control (VSD or equivalent method) in equipment schedule, or exception applied | | |

HYDRONIC SYSTEMS - CONTROLS

| | | | | | |
|--|----------|-------------------|---|--|--|
| | C403.4.3 | Boiler sequencing | Indicate automatic controls that sequence operation of multiple boilers | | |
|--|----------|-------------------|---|--|--|

Mechanical Requirements List, pg 16 of 25

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| | | | | | |
|--|------------|---|---|---------------|--|
| | 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 | PRCTI20230310 | |
| | C403.4.1.5 | Heating water temperature setback | For 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 | | |
| | | | 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 | | |
| | | | 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 ≥ 2 hp and pumps are designed to operate continuously or per time schedule; 2) System pump motor hp is ≥ 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 | | |
| | | | 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 | | |
| | 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 | | |

Mechanical Requirements List, pg 17 of 25

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| | | | | | |
|--|--------------|---|--|---------------|--|
| | 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) | PRCTI20230310 | |
| | 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 | | |
|--|------------|---|---|--|--|

HEAT REJECTION & RECOVERY - CONTROLS

| | | | | | |
|--|--------------------------|---|---|--|--|
| | C403.9.1.1C 403.9.1.2 | Fan speed control | For each fan powered by an individual motor or array of motors, with total connected fan power ≥ 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 | | |
| | | | For multiple-cell heat rejection equipment with VSD, indicate controls are configured to ramp all fans in unison (not staged on / off operation) | | |
| | 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). | | |

Mechanical Requirements List, pg 18 of 25

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| | | | | | |
|--|------------------------------|--|---|---------------|--|
| | 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 | PRCTI20230310 | |
| | | | 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 $\geq 500,000$ 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) | | |
| | | | For buildings with $\geq 40,000$ sf conditioned floor area and $\geq 1,000,000$ 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 | 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 deg F dry bulb; note exhaust air systems eligible for exception to this requirement | | |
| | 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 | | |
| | | | 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 | | |

MULTIPLE ZONE AIR SYSTEMS

Mechanical Requirements List, pg 19 of 25

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| | | | | | |
|--|------------------|--|---|---------------|--|
| | 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 | PRCTI20230310 | |
| | 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) | | |
| | | | 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 | | |
| | C403.6.2 | Single duct VAV terminal units | Indicate single duct terminal units are configured to reduce primary supply air before reheating or recooling | | |
| | 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 | | |
| | C403.6.8C403.6.9 | 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 ≤ 1.2 inch w.g. | | |
| | | | 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 | | |
| | 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 | | |
| | 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 | | |

Mechanical Requirements List, pg 20 of 25

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| | | | | | |
|--|----------|--|--|--|---------------|
| | 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 | | PRCTI20230310 |
|--|----------|--|--|--|---------------|

HIGH EFFICIENCY MULTIPLE-ZONE VAV SYSTEMS - EXCEPTION TO C403.3.5 DOAS, MUST COMPLY WITH ALL 15 PROVISIONS TO BE ELIGIBLE

| | | | | | |
|--|--------------------------|--|---|--|--|
| | 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 ≥ 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) | | |
| | | | 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 and fan power | 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 | | |

Mechanical Requirements List, pg 21 of 25

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| | | | | | |
|--|--------------------|--|---|---------------|--|
| | C403.6.10, Item 8 | Maximum allowable system brake horsepower | For each multiple-zone VAV system, provide calculations that verify total fan system bhp is $\leq 90\%$ of the total allowable fan system bhp per Option 2 equation in Table C403.8.1.1 | PRCTI20230310 | |
| | C403.6.10, Item 9 | 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 10 | 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 11 | 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 12 | Controls for high occupant density spaces | For zones > 150 sf with high occupant density (≥ 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 ₂ ; 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 13 | 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 | | |
| | | | 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 14 | Central plant efficiency | Indicate whether systems are served by a high efficiency heating water plant, or a high efficiency chilled water plant | | |

Mechanical Requirements List, pg 22 of 25

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|--|--------------------|---------------------------------|---|---------------|--|
| | | | 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) ≥ 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 | PRCTI20230310 | |
| | | | 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 ≤ 20% of the total plant capacity, or provide thermal storage sized for ≥ 20% of total plant capacity | | |
| | C403.6.10, Item 15 | 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 ≥ 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 system brake horsepower | For each single-zone VAV system, provide calculations that verify total fan system bhp is ≤ 90% of the total allowable fan system bhp per Option 2 equation in Table 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 | | |

Mechanical Requirements List, pg 23 of 25

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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 | PRCTI20230310 | |
| | 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 | | |
| | | | 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 | | |
| | | | 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 | | |
| | | | 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 | | |

Mechanical Requirements List, pg 24 of 25

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|--|-----------|-----------------------------------|---|---------------|--|
| | | | Indicate occupancy sensing or timer switch controls configured to automatically shut off heating system when area served is unoccupied | PRCTI20230310 | |
| | 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 > 50,000 sf 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 | | |
|--|----------|------------------------------------|--|--|--|

DOCUMENTATION AND SYSTEM SPECIFIC REQUIREMENT TO SUPPORT COMMISSIONING (CX)

| | | | | | |
|--|------------------------|--|---|--|--|
| | C408.1 | Scope of mechanical systems commissioning | For buildings with ≥ 240,000 Btu/h total output cooling capacity or ≥ 300,000 Btu/h total output heating capacity, 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 | | |
| | | | 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 | | |
| | | | 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) | | |
| | | | 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. | | |

Mechanical Requirements List, pg 25 of 25

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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 | PRCTI20230310 | |
| | 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 | M0.1 | |
|-----|--------|--|--|------|--|