



2021 WSEC Total System Performance Ratio Updates

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Total System Performance Ratio

- Adds multifamily use type to TSPR – already implemented in Seattle
- Clarifies the medical office buildings are included (with some exceptions for specific areas)
- Adds additional exceptions to Section C403.1.1 to clarify space types that are exempt
- Provided additional guidance for core & shell and initial build-out construction
- Added additional system parameters to Table D601.11.2 for credit
- Provides credit for systems that use enhanced filtration
- Miscellaneous clarifications based on user feedback

Total System Performance Ratio

- **Adds multifamily use type to TSPR – already implemented in Seattle**
 - Applies to dwelling units and common areas
 - Sets assumptions for temperature setpoints and equipment power density
 - Establishes baseline system parameters
 - Cycling air source heat pump
 - Minimum heating and cooling efficiency
 - Economizer
 - DOAS with 70% sensible effectiveness ERV
 - Supply fan power 0.528 W/cfm (same as other TSPR systems)

Total System Performance Ratio

- Clarifies the medical office buildings are included (with some exceptions for specific areas)

C403.1.1 HVAC total system performance ratio (*HVAC TSPR*). For systems serving office (including medical office), retail, library, education occupancies and buildings, which are subject to the requirements of Section C403.3.5 without exceptions, and the dwelling units and residential common areas within R-2 multifamily buildings, the *HVAC total system performance ratio (HVAC TSPR)* of the *proposed design* HVAC system shall be more than or equal to the *HVAC TSPR* of the *standard reference design* as calculated according to Appendix D, Calculation of HVAC Total System Performance Ratio.

Exceptions:

11. Buildings or areas of medical office buildings that comply fully with ASHRAE Standard 170, including but not limited to surgical centers, or that are required by other applicable codes or standards to provide 24/7 air handling unit operation

D101 Scope. This appendix establishes criteria for demonstrating compliance using the *HVAC total system performance ratio (HVAC TSPR)* for systems serving office (including medical office), retail, library, and education occupancies and buildings, which are subject to the requirements of Section C403.3.5 without exception and dwelling units and common areas within multifamily buildings. Those HVAC systems shall comply with Section C403 and this appendix as required by Section C403.1.1.

Total System Performance Ratio

- **Adds additional exceptions to Section C403.1.1 to clarify space types that are exempt**
 - **Laboratories**
 - **Surgical suites in MOBs**
 - **Shower rooms**
 - **Commercial kitchens and cafeterias**
 - **Natatoriums**
 - **Areas with high density commercial refrigeration**
 - **Data centers, computer rooms, mechanical rooms**

Total System Performance Ratio

- **Provided additional guidance on how to use Appendix G for core & shell and initial build-out construction**
 - **Zones outside of permitted areas use independent systems are not included –**
 - **example, future TI tenant space with independent packages systems**
 - **Permitted central systems providing services to future TI – those future zonal systems modeled to meet the requirements of C403**
 - **example WLHP central plant and loop assumes future heat pumps meet C403 requirements**
 - **Zone equipment in the permit receives services from existing or future central systems – central systems can be either what is installed or meet C403**
 - **example zone WLHP systems assume central plant and loop are as exists or meet C403**
 - **Complete replacement of existing central plant with remaining zonal equipment – zone equipment meets C403**
 - **example new CW and HW plant serving existing VAV terminal units – zone TU's modeled to meet C403**

Total System Performance Ratio

- Added additional efficiency strategies to Table D601.11.2 for credit
 - Multispeed fans and low speed fan power
 - Multistage dx coils
 - Variable flow DOAS
 - DOAS supply air temperature control strategies for systems with supplemental heating or cooling
 - Control options for supply air temperature reset for VAV systems
 - VAV terminal unit heating airflow
 - Additional CW and HW plant loop configurations

Total System Performance Ratio

- Provides credit for systems that use enhanced filtration
 - COVID 19 recommendations for MERV 13 filtration
 - If MERV 13 or greater filters, baseline fan power allowance is increased (based on additional 1/2" pressure drop)

TABLE D602.11 STANDARD REFERENCE DESIGN HVAC SYSTEMS

Parameter	Building Type				
	Large Office	Small Office and Libraries	Retail	School	<u>Multifamily</u>
Space condition fan power (W/cfm) <u>proposed < MERV13</u>	0.528	0.528	0.522	0.528	<u>0.528</u>
<u>Space condition fan power (W/CFM)</u> <u>proposed ≥ MERV13</u>	0.634	0.634	0.627	0.634	0.634

Total System Performance Ratio

- **Miscellaneous clarifications based on user feedback**
 - No credit for renewable energy (go to C407)
 - Adds site energy use and annual loads to reporting requirements
 - Clarifies how fan power is calculated – “wire-to-wire”
 - Removes unused utility rates
 - Specifies that walls bounding portions of the building not modeled should be adiabatic
 - Specifies area weighted U-factor and SHGC when windows are combined
 - Specifies method for combining windows with different overhangs
 - Moves footnotes to Table D601.11.2 (proposed building system parameters) to section text
 - Specified ventilation system efficiency for VAV systems (ASHRAE 62.1 simplified method)
 - Specifies fan part load curve for VAV fans with SP control
 - Adds displacement ventilation systems to underfloor air distribution systems as exempt from TSPR



Multifamily Code Requirement: Economizer

- Group R occupancies, require either economizer control or 15% higher efficiency than minimum prescriptive requirements

C403.5 Economizers. Air economizers shall be provided on all new cooling systems including those serving computer server rooms, electronic equipment, radio equipment, and telephone switchgear. Economizers shall comply with Sections C403.5.1 through C403.5.5.

Exception: Economizers are not required for the systems listed below:

1. Cooling systems not installed outdoors nor in a mechanical room adjacent to outdoors and installed in conjunction with DOAS complying with Section C403.3.5 and serving only spaces with year-round cooling loads from lights and equipment of less than 5 watts per square foot.
2. Unitary or packaged systems serving one zone with dehumidification that affect other systems so as to increase the overall building energy consumption. New humidification equipment shall comply with Section C403.3.2.5.
3. Unitary or packaged systems serving one zone where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.5.
4. Equipment serving chilled beams and chilled ceiling space cooling systems only which are provided with a water economizer meeting the requirements of Section C403.5.4.
- 4.1.
5. For Group R occupancies, cooling units installed outdoors or in a mechanical room adjacent to outdoors with a total cooling capacity less than 20,000 Btu/h and other cooling units with a total cooling capacity less than 54,000 Btu/h provided that these are high-efficiency cooling equipment with IEER, CEER, SEER, and EER values more than 15 percent higher than minimum efficiencies listed in Tables C403.3.2(1) through (3), in the appropriate size category, using the same test procedures. Equipment shall be listed in the appropriate certification program to qualify for this exception. For split systems, compliance is based on the cooling capacity of individual fan coil units.

Multifamily Code Requirement: Balanced Ventilation

- **Balanced Ventilation and Energy Recovery**

C403.3.6 Ventilation for Group R-2 occupancy. For all Group R-2 dwelling and sleeping units, a balanced ventilation system with heat recovery system with minimum 60 percent sensible recovery effectiveness shall provide outdoor air directly to all habitable space. The ventilation system shall allow for the design flow rates to be tested and verified at each habitable space as part of the commissioning process in accordance with Section C408.2.2.

Thank you

