

New Changes in ASHRAE 90.1-2019 TAG Review Worksheet

Model Code: ASHRAE 90.1-2019

To be completed by Chair									To be completed by TAG members			
90.1-2019 Section	90.1-2016 Section- if different	Related IECC Section	Subject	Current Minnesota Amend	Description of Change	Safety & Health Value	Cost Impact	Recommendation A - Accept R - Reject AM - Amend or Comments	Recommendation A - Accept R - Reject AM - Amend	TAG Group Consensus	Stakeholder Consensus	Comments
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Chapter 3	DEFINITIONS											
			Building Entrance		Consider Amending to Clarify							
			Building Exit		Removed							
			Building Grounds Lighting		Removed							
			Building Service		Added							
			Building Service Equipment		Added							
			Ceiling Fan		Added							
			Coefficient of Performance		Modified							
			Commissioning		Modified							
			Commissioning Provider		Added							
			Computer Room Energy		Deleted							
			Conductance		Deleted							
			Continuous Dimming		Added							
			Cooling Design Wet Bulb Temperature		Deleted							
			Daylight Area Under Skylights in Multi-story spaces		Added							
			Door		Modified- Added Sectional garage door							
			Energy Recovery Ratio, Series (SEER)		Added							
			Energy Recovery, series		Added							
			Equipment		Modified- More specific							
			Fan Array		Added							
			Fan, Embedded		Added							
			Fan Energy Index (FEI)		Added							
			Fan Nameplate Electrical Input Power`		Added							
			Fan system electrical power		Added							
			Fenestration		Modified							
			Fixed		Deleted							
			Floor Area, Gross- Gross Building Envelope Floor Area		Deleted							
			Floor Area, Gross- Gross Semi-Heated Floor Area		Deleted							
			Functional Performance Testing		Added							
			Gross Conditioned Floor Area		Added							

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			Humidistatic Controls		Modified			Term changed from Humidistat				
			Metal Framing		Added							
			Multi-level Occupancy Sensor		Deleted							
			Multiscene control		Deleted							
			Non-metal framing		Added							
			non-renewable energy		Deleted							
			Non-transient		Added							
			Occupied Stand-by mode		Added							
			Off-mode power consumption		Added							
			on-site electricity generation systems		Added							
			PEI _{CL}		Added							
			PEI _{VL}		Added							
			PER _{CL}		Added							
			PER _{STD}		Added							
			PER _{VL}		Added							
			Primary Side-lighted Area		Added							
			Process Application		Added							
			Power Usage Effectiveness (PUE)		Deleted							
			Process Energy		Modified							
			Pump System Power		Deleted							
			Pump		Added							
			Pump- Clean Water Pump		Added							
			Pump- End Suction Closed Coupled (ESCC) pump		Added							
			Pump- End suction frame-mounted/own-bearings (ESFM) pump		Added							
			Pump- inline pump		Added							
			Pump- Radially split, multistage, vertical inline diffuser casing (RSV) pump		Added							
			Pump- Submersible turbine (ST) pump		Added							
			Sensible Cooling Panel		Deleted							
			Service		Deleted							
			Service Equipment		Deleted							
			Simulation Program		Modified							
			Standby Power Mode Consumption		Added							
			Unitary cooling equipment		Deleted							
			Unitary Air Conditioners		Same definition as Unitary Cooling Eq.							
			Verification and Testing Provider		Added							

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			Vertical Fenestration		Modified							
Chapter 4												
4.1.1.2			Additions to Existing Buildings		Modified to include defined terms: Additions, and Existing Buildings							
4.2.1.1			Compliance Paths- New Buildings		Modified to include 4.2.2 through 4.2.5 which is primarily documentation for compliance, verification and commissioning. We might consider amending out the Performance Cost Index Method/ Appendix G.							
4.2.1.2			Compliance Paths- Additions to Existing Buildings		Modified format (not content): We might consider amending out the Performance Cost Index Method/ Appendix G.							
4.2.1.3			Compliance Paths- Alterations to Existing Buildings		Modified format (not content): We might consider amending out the Performance Cost Index Method/ Appendix G.							
4.2.5			Verification, Testing and Commissioning		Modified- Greatly expanded.							
Chapter 5												
5.2.1			Compliance Paths- Requirements for All Compliance Paths		Reformatted with no material change.							
5.4.3			Air Leakage		Charging language added to clarify requirements. No material change.							
5.4.3.1.1	5.4.3.1.3		Whole Building Air Leakage		Reformatted and slightly relocated section. Essentially requires a blower door test for buildings with conditioned and semi-conditioned space to ensure an air leakage rate of 0.40 cfm/ft ² or less. Exception allows an air leakage rate of up to 0.60 0.40 cfm/ft ² with tracing and strategic sealing...no follow up test. Deleted the design option of just providing air resistant materials and not dealing with the connections.							
5.4.3.1.2	5.4.3.1		Continuous Air Barrier Design and Installation		Reformatted with no material change.							
5.4.3.3			Vestibules and Revolving Doors		Reformatted with no material change for our climate zones. Note: The definition of <i>Building Entrance</i> is different than the IECC and results in a more restrictive application than IECC.							
5.4.3.3.2			Vestibule Size		New section introduces size (area) limits and configuration so that doors are not required to be opened at the same time.			Consider amendment so that powered door operators do not allow one of the vestibule membranes to be open while the other is open.				
5.4.3.3.3			Vestibule Envelope		New section requiring both vestibule membranes to comply with air barrier requirements. Multiple new exceptions.							

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5.5.1			Exerior Building Envelope		Modified to include a requirement that the exterior surfaces of a conditioned vestibule shall comply with the building envelope requiriements of a conditioned space.							
5.7			Submittals		Substantially reformatted into requirements for plan review (permit application) and closeout (Completion). Permit application requirements are materially the same. Completion requirements are new.							
5.8.1.2 Exception			Mfg Installation Instr.		Modified to clarify requirements for pre-engineered metal building insulation installation.							
5.8.1.11			Insulation Installation Documentation		New section added to require an affidavit from the installer certifying that the insulation was installed in accordance with its listing.							
5.8.2.5			Exception Added		Exception criteria added for tubular daylighting devices.							
5.8.3			Air Leakage		New section							
5.9.1	5.9.2		Building Envelope Performance Verification		Relocated section							
5.9.2			Commissioning		New: Commissioning of the building envelope now required with report provided.							
6.2.1			Requirements for all compliance paths		Modified for clarity with no material change. Parts of the previous version's section migrated to 6.2.2.							
6.2.2			Additional Requirements to comply with Section 6		Deleted referece to Energy Cost Budget Method in Section 11. Modified to expand on the previous version's section 6.2.1 to provide more clarity.							
			Exception 6.2.2(a)		Added as part of modification ot 6.2.1, no material change.							
			Exception 6.2.2(b)		New exception in this section for HVAC systems serving computer rooms > 10KW of equipment power.							
6.3.2			Simplified Approach Criteria		Item r: added compliance with occupied-standby controls in Section 6.5.3.8.							
6.4.1.1			Mandatory Provisions- Minimum Equipment Efficiencies		Expanded section scoping range from (6.8.1-1 through 6.8.1-16) to (6.8.1-1 through 6.8.1-20)							
			Item h Deleted		Deleted: "Table 6.8.1-8 Heat transfer equipment"							
			Item h Relocated		Relocated from Item J							
			Item I Modified		Added: Applied Heat Pumps to combine Item I with previous Item j.							
			Item j		Moved to Item h.							
			Item j		Previously Item k: Modified to specifically address floor mounted air conditioners.							
			Item K		Relocated to Item J							
			Item K		Previously Item L: Modified with no material change.							
			Item L		Deleted: "Table 6.8.1-12 "commercial refrigerator and freezers minimum efficiency"							

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			Item L		Relocated from Item N- Vapor compression based indoor pool dehumidifiers.							
			Item m		Previous Item m Deleted: "Table 6.8.1-13 Commercial Refrigeration- minimum efficiency requirements"							
			Item m		Relocated from Item O							
			Item n		Relocated to item L							
			Item n		Relocated from item P							
			Item O		Relocated to Item m							
			Item O		New section: Table 6.8.1-15 Electrically Operated Water-source Heat Pumps- minimum efficiency requirements							
			Item P		Relocated to Item n							
			Item P		New Section: Table 6.8.1-16 Heat Pump and Heat Recovery Chiller packages- minimum efficiency requirements							
			Item Q		New section: 6.8.1-17 Ceiling mounted computer room air conditioners- minimum efficiency requirements.							
			Item R		New Section: Table 6.8.1-18 Walk-in Cooler and Freezer Display Door Efficiency Requirements.							
			Item S		New Section: Table 6.8.1-19 Walk-in Cooler and Freezer nondisplay door efficiency requirements							
			Item T		New Section: Table 6.8.1-20 Walk-in Cooler and freezer refrigeration system efficiency requirements.							
6.4.1.3			Ceiling Fans		New Section and subsections providing criteria for large diameter ceiling fans							
6.4.1.5			Verification of Equipment Efficiencies		Deleted verification method f: "Requirements for plate-type liquid-to-liquid heat exchangers are listed in Table 6.8.1-8."							
6.4.3.3.5.1			Guest Room HVAC Set-Point Control		Reformatted. Reset time changed to 20 minutes in lieu of 30 minute. Reformatted for clarity with no other material changes.							
			Exception Added		Cooling for humidity control shall be permitted during rented and unoccupied or unrented and unoccupied periods.							
6.4.3.3.5.2			Guest Room Ventilation Control		Setback period changed from 30 minutes to 20 minutes.							
Table 6.4.3.4.3			Maximum Damper Leakage		Table modified allowing for nonmotorized dampers where the capacity is 300 cfm or less for outdoor air intake for all buildings and for exhaust/relief on buildings three or more stories in height.							
6.4.3.6			Humidification and dehumidification control		Section modified to set the bottom dew point limit for dehumidification at 55F. No other material change.							
6.4.5			Walk-in Coolers & Freezers		Item m added to requirements: Doors shall meet the requirements of Tables 6.8.1-18 and 6.8.1-19. Systems except for walk-in process cooling refrigeration systems as defined in 10 CFR 431.302 shall meet the requirements of Table 6.8.1-20.							

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6.4.7			Liquid-to-liquid Heat Exchangers		Section ADDED. Plate exchangers shall be rated according to AHRI 400.							
6.5.1.1.4			Air Economizer Dampers		Return Air dampers requirement modified to comply with 6.4.3.4.3 without specific reference to requirements for motorized dampers only. Non-motorized dampers will now be allowed to meet those requirements. The result is less restrictive. (Air Damper Leakage)							
6.5.2.1			Exception 1 Zone Controls		Deleted: b. The outdoor airflow rate required to meet the ventilation requirements of ASHRAE Standard 62.1 for the Zone.							
6.5.2.1			Exception 1 Zone Controls		Added: b. For systems with DDC, the minimum primary airflow rate required to meet the Simplified Procedure ventilation requirements of ASHRAE Standard 62.1 for the zone, permitted to be the average airflow rate as allowed by ASHRAE Standard 62.1.							
6.5.2.1			Exception 2 Zone Controls		Exception 2 applies to Zones with DDC that comply with all of the following: Deleted: Under Item a- Subitems (1) and (2) are deleted. (1) Twenty percent of the zone design peak supply rate. (2) The outdoor airflow rate required to meet the ventilation requirements for ASHRAE Standard 62.1 for the zone.							
6.5.2.1			Exception 2 Zone Controls		Exception 2 applies to Zones with DDC that comply with all of the following: Added: Under Item a is new Subitem (1) The minimum primary airflow rate required to meet the Simplified Procedure ventilation requirements of ASHRAE Standard 62.1 for the zone, permitted to be the average airflow rate as allowed by ASHRAE Standard 62.1.							
6.5.3.1.2			Fan Motor Selection		Section modified with no material change to the charging language when considered with the first two exceptions of the previous code. Added new exception 1 "Motors equipped with electronic speed control devices to vary the fan airflow as a function of load." And, exception 4 "Fans with a fan nameplate electrical input power of less than 0.89 kW.							
6.5.3.1.3			Fan Efficiency		Section modified. Need to review/discuss. Scoping and exceptions changed.							
6.5.3.5			Supply Air Temperature Reset Controls		Exceptions 1 through 3 completely rewritten.							
6.5.3.5.1			Dehumidification Control Interaction		New section only applicable to Zones OA through 3A.							
6.5.3.8			Occupied-Standby Controls		New Section for review.							

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6.5.4.8			Buildings with High-Capacity Space-Heating Gas Boiler Systems		New section affecting new buildings with boiler capacities between 1,000,000 Btu/h and 10,000,000 Btu/h. Includes new subsections 6.5.4.8.1 Boiler Efficiency and 6.5.4.8.2 Hot-Water Distribution System Design.							
6.5.6			Exhaust Air Recovery		New Sections inserted							
6.5.6.1.1			Non-transient dwelling units		New section added. Requires energy enthalpy recovery for exhausted heat at efficiencies of 60% or greater.							
6.5.6.1.2			Other than Non-transient Dwelling Units		Modified from previous language found in 6.5.6.1 to include new reference to Table 6.5.6.1.2-1 for ventilation systems operating at more than 8,000 hours per year. (Note: 8760 hours in a year)							
			Exceptions modified		Exceptions 4 and 5 changed "heating energy recovery" and "cooling energy recovery" to Enthalpy Energy Recovery. Exception 9 added for indoor pool dehumidifiers complaint with Section 6.5.6.4							
6.5.6.3			Heat Recovery for Space Conditioning		New Section: Specific to only inpatient hospitals in Climate Zone 6A.							
6.5.6.4			Indoor Pool Dehumidifier Energy Recovery		New section requires enthalpy recovery for swimming pool exhaust where the pool is over 500 square feet unless 60% or more of the space conditioning energy is from on-site renewable resources.							
6.6.1			Alternative Compliance Path- Computer Rooms Systems		Section significantly modified and condensed. Application revised to computer rooms with IT equipment loads exceeding 10 kW							
Old 6.7.2.4			System Commissioning		Section relocated to 6.9 and modified.							
6.9.1			Verification and Testing		Section rewritten to cross reference to other sections. Exception for instructions deleted. Cross reference eliminates the requirement for commissioning for buildings under 10,000 sf. 4.2.5.2 Exception 1							
Table 6.8.1-1			Electrically Operated Unitary Air Conditioners and Condensing Units		Minimum efficiencies generally increased and incrementally increased again as of 1/1/23.							
Table 6.8.1-2			Electrically Operated Air-Cooled Unitary Heat Pumps		Minimum efficiencies generally increased and incrementally increased again as of 1/1/23.							
Table 6.8.1-3			Water Chilling Packages		No Change							
Table 6.8.1-4			Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air Conditioner Heat Pumps.		Table reconfigured. Review.							

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Table 6.8.1-5			Warm-Air Furnaces and Combination Warm Air Furnaces/Air Conditioning Units, Warm Air Duct Furnaces, and Unit Heaters		Minimum efficiencies generally increased and some incrementally increased again as of 1/1/23.							
Table 6.8.1-6			Gas and Oil-Fired Boilers		No Change							
Table 6.8.1-7			Performance Requirements for Heat Rejection Equipment		Propeller or axial fan dry coolers (air-cooled fluid coolers) added. Subcategory or rating condition modified for Propeller or Axial Fan evaporative condensers.							
Old Table 6.8.1-8			Heat Transfer Equipment		Table deleted. Note: Section added to narrative.							
Table 6.8.1-8			Electrically Operated Variable Refrigerant Flow Air Conditioners		No Change							
Table 6.8.1-9			Electrically Operated Variable Refrigerant Flow and Applied Heat Pumps		No Change							
Table 6.8.1-10			Floor Mounted Air Conditioners and Condensing Units Serving Computer Rooms		Table reconfigured. Review.							
Table 6.8.1-11			Commercial Refrigerators and Freezers		Table reconfigured. Review.							
Table 6.8.1-12			Vapor Compression Based Indoor Pool Dehumidifiers		No Change							
Table 6.8.1-13			Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, without Energy Recovery		No Change							
Table 6.8.1-14			Electrically Operated DX-DOAS Units, Single-Package and Remote Condenser, with Energy Recovery		No Change							
Table 6.8.1-15			Electrically operated Water-Source Heat Pumps		New Table							
Table 6.8.1-16			Heat-Pump and Heat Recovery Chiller Packages		New Table							
Table 6.8.1-17			Ceiling Mounted Computer Room Air Conditioners		New Table							
Table 6.8.1-18			Walk-In Cooler and Freezer Display Door		New Table							
Table 6.8.1-19			Walk-in Cooler and Freezer-nondisplay door		New Table							
Table 6.8.1-20			Walk-in Cooler and freezer Refrigeration System		New Table							
Table 6.8.2			Minimum Duct Insulation R-value		No Change							

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Table 6.8.3-1			Minimum Piping Insulation Thickness Heating and hot water systems		No Change							
Table 6.8.3-2			Minimum Piping Insulation Thickness Cooling Systems		No Change							
Chapter 7 Service Water Heating												
7.2			Compliance Paths		Reformatted. Energy Cost Budget Method removed from specific listing. Discuss interpretation of 7.2.1 to verify if others interpret that the Energy Cost Budget Method is still viable under the reading of this section.							
7.7			Submittals		Section largely expanded rather than referring to Section 4.2.2. No material change.							
7.9			Verification, Testing, and Commissioning		New Section.							
Table 7.8			Performance Requirements for Water Heating Equipment		1. Added Electric Instantaneous Water Heaters. 2. Performance requirements modified and metric changed. Need to discuss if this is a material change or not.							
Chapter 8 Power												
8.2.1 Exception			Requirements for all compliance paths		Exception added for power distribution systems and equipment serving only computer rooms with > 10kW IT Loads.							
8.61			Alternative Compliance Path-Computer Rooms		New section added specific to computer rooms with IT power load greater than 10 kW.							
8.9			Verification, Testing, and Commissioning		New section.							
Chapter 9 Lighting												
9.1.4			Interior and Exterior Luminaire Wattage		Add item e regarding DC low voltage lighting systems with flexible cabling. Review.							
9.2			Compliance Paths		Section and subsections rewritten. Modified to include a "Simplified Building Method Compliance Path."							
9.2.3.2			Exterior Lighting Power Allowance		New section added to compliance paths.							
Table 9.2.3.1			Table of Exceptions to Interior Lighting Power and Minimum control requirements		New table corresponding to 9.2.2.3 Exceptions. Added variations to required controls for many of the exceptions.							
9.3			Simplified Building Method Compliance Path		New section added as an option to the other compliance paths. The option of using this table is slightly more restrictive than the Building Area Method.							

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9.4.1.1 e			Mandatory Interior Lighting Controls		Item e Modified characteristics 2 & 3 to require continuous dimming in daylight areas down to 20% and Item 3 now includes requirements for dimming in daylight areas that also have occupancy sensors such that the dimming modulates only to the limits of the unoccupied threshold when the space is unoccupied.							
			Exception 4 added		New exception for primarily side-lighted areas adjacent to vertical fenestration where there are qualifying external projections that function as shading devices to block direct sunlight.							
			Item F:		Significantly modified the requirements for top-lighting daylighting. Similar to side-lighting, dimming shall be down to 20%, Calibration shall be not higher than 11 feet, and the dimming shall be limited by unoccupied thresholds when the space is unoccupied.							
			Item j:		New Item for scheduled off during non-business hours.							
9.4.1.2			Parking Garage Lighting Control		1) Lighting power reduction to 50% within 10 minutes of no activity in lieu of 30% reduction after 20 minutes. 2) Daylighting transition area must go to the general lighting level of the garage from sunset to sunrise in lieu of just a reduced power level for this brighter area, 3) Daylighting controls for the garage lighting come into play at 24 square feet of wall opening in lieu of 40% of the exterior wall area open. Added exceptions to daylighting requirements.							
9.4.1.3			Special Applications Lighting		Reformatted. No material change.							
Table 9.4.2-2			Individual Lighting Power Allowances for Building Exteriors		Loading dock allowance adjusted down to 0.2 W/SF in Zones 2, 3, and 4. Outdoor sales areas not fronting on a street reduced to 0.2 W/SF in zones 3 and 4. Added section for areas not included elsewhere in the table.							
9.4.3			Functional Testing		Deleted							
9.4.3			Dwelling Units		Renumbered section, adding an exception clarifying that hotel/motel guest rooms have requirements in Table 9.6.1 and Section 9.4.1.3(b)							
Table 9.5.1			Lighting Power Density Allowances- Building Area Method		Every allowance changed, most down.							
Table 9.6.1			Lighting Power Density Allowances- Space by Space Method		Nearly every allowance changed, most down.							
9.9			Verification, Testing, and Commissioning		New Section.							
Chapter 10 Other Equipment												
10.4.5			Air Curtains		New Section							

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10.4.7			Pumps		New Section							
10.7			Submittals		New Section							
10.9			Verification, Testing, and Commissioning		New Section							
Table 10.8-6			Maximum Pump Energy Index (PEI)		New Table							