

Quick Reference Guide: For New Construction Projects

This tool is intended to be a quick reference for design, engineering and code review professionals and includes new or challenging requirements in the new Minnesota Commercial Energy Code (2020).

MEASURE	DESCRIPTION	TECHNICAL REQUIREMENTS & CODE SECTION REFERENCES	DETAILS OF WHEN IT APPLIES	BUILDING APPLICABILITY																								
BUILDING ENVELOPE REQUIREMENTS	Roof Insulation R-Value	<p>Provide adequate roof insulation between and/or above roof structure to reduce heat gain and loss.</p> <p>Minimum R-Values</p> <table border="1"> <thead> <tr> <th></th> <th>IECC</th> <th>ASHRAE</th> </tr> </thead> <tbody> <tr> <td>All Above Deck:</td> <td>R-30 ci</td> <td>R-30 ci</td> </tr> <tr> <td>Metal building:</td> <td>R-25 + 11 Ls</td> <td>R-25 + 11 Ls</td> </tr> <tr> <td>Attic & Other:</td> <td>R-49</td> <td>R-49</td> </tr> </tbody> </table> <p>Ls = Top-most layer draped above and between purlins IECC References: 1323.0100, Subpart 3; C303, C402.2.1 & Table C404.1.3 ASHRAE References: Table 5.5-6, Sections 5.5.3.1, 5.8.1 & A2.3.2.4</p>		IECC	ASHRAE	All Above Deck:	R-30 ci	R-30 ci	Metal building:	R-25 + 11 Ls	R-25 + 11 Ls	Attic & Other:	R-49	R-49	<p>IECC: Required for ALL new roofs. Required for replacement roofs when all existing insulation is above the deck and the slope is < 2 inches per foot, and for unfilled cavities that are exposed.</p> <p>ASHRAE: Required for ALL new and replacement roofs (except where existing cavities are already filled).</p>	Applies to all buildings.												
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Above Grade Wall Insulation	<p>Provide adequate wall insulation between and/or outside of wall structural elements to reduce heat gain and loss.</p> <p>Min R- OR Max U-</p> <table border="1"> <thead> <tr> <th></th> <th>IECC</th> <th>ASHRAE</th> <th>IECC</th> <th>ASHRAE</th> </tr> </thead> <tbody> <tr> <td>Mass wall:</td> <td>13.3ci*</td> <td>13.3ci*</td> <td>0.080*</td> <td>0.080*</td> </tr> <tr> <td>Metal building:</td> <td>13 + 13ci</td> <td>0 + 19ci</td> <td>0.052</td> <td>0.050</td> </tr> <tr> <td>Steel-framed:</td> <td>13 + 7.5ci</td> <td>13 + 12.5ci</td> <td>0.064</td> <td>0.049</td> </tr> <tr> <td>Wood-framed/other:</td> <td>13 + 7.5ci or R-20 + 3.8ci</td> <td>13 + 7.5ci or R-19 + 5ci</td> <td>0.051</td> <td>0.051</td> </tr> </tbody> </table> <p>*Group R bldgs: mass wall R-15.2 ci(U-0.71). IECC References: Sections C303 & C402.2.2; Tables C402.1.3 & C402.1.4 ASHRAE References: Table 5.5-6, Sections 3.2, 5.5.3.2 & 5.8.1</p>		IECC	ASHRAE	IECC	ASHRAE	Mass wall:	13.3ci*	13.3ci*	0.080*	0.080*	Metal building:	13 + 13ci	0 + 19ci	0.052	0.050	Steel-framed:	13 + 7.5ci	13 + 12.5ci	0.064	0.049	Wood-framed/other:	13 + 7.5ci or R-20 + 3.8ci	13 + 7.5ci or R-19 + 5ci	0.051	0.051	<p>IECC: Exterior walls that are more than 15% above grade.</p> <p>ASHRAE: Exterior walls that are at least partially above grade. For partially below-grade walls: 1) If insulation is within the structural wall or outside of it, then these R-values only apply to the above-grade part of the wall. OR 2) If the insulation is inside of the supporting structure, then these R-values apply to the whole wall.</p>	Applies to all buildings.
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Slab Edge Insulation	<p>Provide adequate insulation around the perimeter of floors on grade or below. This eliminates a potentially overlooked heat loss path.</p> <p>IECC ASHRAE</p> <table border="1"> <thead> <tr> <th></th> <th>IECC</th> <th>ASHRAE</th> </tr> </thead> <tbody> <tr> <td>Commercial (typical):</td> <td>R-10 for 24"</td> <td>R-20 for 24"</td> </tr> <tr> <td>" w/in-floor heat:</td> <td>R-15 for 36"</td> <td>R-20 for 48"</td> </tr> <tr> <td>Residential (typical):</td> <td>R-15 for 24"</td> <td>R-20 for 48"</td> </tr> <tr> <td>" w/in-floor heat:</td> <td>R-20 for 48"+ R-5 under</td> <td>R-25 for 48"</td> </tr> </tbody> </table> <p>IECC References: Section 402.2.4 & Tables C402.1.3 and C402.1.4 ASHRAE References: Table 5.5-6 and Sections 5.5.3.5 & 3.2 (Slab-on-grade floor)</p>		IECC	ASHRAE	Commercial (typical):	R-10 for 24"	R-20 for 24"	" w/in-floor heat:	R-15 for 36"	R-20 for 48"	Residential (typical):	R-15 for 24"	R-20 for 48"	" w/in-floor heat:	R-20 for 48"+ R-5 under	R-25 for 48"	<p>IECC & ASHRAE: For floor slabs in contact with the ground that aren't more than 2 feet below grade.</p>	Applies to buildings with slab on grade floors.										
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Window U-Factor & SHGC	<p>Limits the U-value of windows, which saves energy by reducing the rate of conductive heat gain or loss through windows. Limits SHGC, which saves energy by reducing solar heat gain.</p> <p>Max Values</p> <table border="1"> <thead> <tr> <th></th> <th>IECC</th> <th>ASHRAE</th> </tr> </thead> <tbody> <tr> <td>Fixed windows U-</td> <td>U-0.36 all</td> <td>Non-metal U-0.30; Metal U-0.36</td> </tr> <tr> <td>Operable windows U-</td> <td>U-0.43 all</td> <td>Non-metal U-0.30; Metal U-0.45</td> </tr> <tr> <td>SHGC*</td> <td>0.40 if facing S,E or W; 0.53 north-facing</td> <td>0.40 all</td> </tr> </tbody> </table> <p>*Higher SHGC allowed if permanent shading. Skylights IECC & ASHRAE: U-0.50 and SHGC-0.40; if daylight responsive controls U-0.75 and SHGC 0.60/IECC or NR/ASHRAE IECC References: Table C402.4, Sections C303.3.1.3 & C402.4.3 ASHRAE References: Table 5.5-6, Sections 5.5.4.3, 5.5.4.4 & 5.8.2</p>		IECC	ASHRAE	Fixed windows U-	U-0.36 all	Non-metal U-0.30; Metal U-0.36	Operable windows U-	U-0.43 all	Non-metal U-0.30; Metal U-0.45	SHGC*	0.40 if facing S,E or W; 0.53 north-facing	0.40 all	<p>IECC & ASHRAE: Applies to ALL exterior windows and skylights</p>	Applies to all buildings.													
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Window Area & Orientation	<p>Window area is limited to reduce heat gain and loss, which is much higher through windows than through opaque walls. East and west facing window area is limited to minimum solar heat gain.</p> <p>IECC: Window area must be <30% of the wall area. Up to 40% is allowed if at least 50% of the floor area is daylight (25% if >3 stories) AND visible transmittance is >1.1 times SHGC. ASHRAE: (1) Window area must be <40% of the wall area, (2) Window area on east side < 25% of total window area, and (3) Window area on west side < 25% of total window area.* *This can be increased above 25% with aggressive permanent shading and/or lower SHGC. IECC References: 402.4.1 ASHRAE References: 5.5.4.2, 5.5.4.5 (and 5.5.4.4.1 [esp. exception 3])</p>	<p>IECC: Applies to all buildings. ASHRAE: Street-side street-level wall/windows can be ignored (for area & orientation requirements) if it has permanent exterior shading (PF=0.5) and its window area is <75% of its wall area.</p>	Applies to all buildings.																									
LIGHTING REQUIREMENTS	Automatic Off Lighting Controls	<p>Install controls to automatically turn lights off when spaces are unoccupied.</p> <p>IECC & ASHRAE: Occupancy sensors (ASHRAE only—or timer switch) must be used in certain spaces prone to intermittent occupancy to turn off lights within 20 minutes of when everyone leaves the space. A choice of occupancy sensor or automatic time-off control can be used in other spaces. Automatic time-off controls shall have a temporary manual override that will run lights for no more than 2 hours at a time. Automatic on controls (IECC—occupancy sensors only) must bring the lights on at <50% power. For most spaces. IECC References: C405.2.1 & C405.2.2.1 ASHRAE References: 9.4.1.1 (h) (i) & Table 9.6.1</p>	<p>IECC & ASHRAE: All spaces except egress stairways/corridors, sleeping/dwelling units, patient care areas, security areas, emergency areas or other areas that need 24/7 lighting. Occupancy sensors (ASHRAE—or timer than shuts off lighting within 30 minutes of everyone leaving) required in any classrooms, private offices, break rooms, meeting rooms, restrooms, storage rooms, and janitor closets plus (IECC—any other room <300 sf; ASHRAE—copy, dressing locker and fitting rooms).</p>	Doesn't apply to dwelling units—only common spaces that don't need 24/7 operation. Applies to nearly all building spaces that don't require 24/7 operation																								
	*Daylight Responsive Control_{LA}	<p>Controls that reduce the power needed to light areas close to daylight sources.</p> <p>IECC & ASHRAE: Daylit areas within larger spaces shall have separate lighting controls. If automatic control, it must have at least one step with <35% power and at least one step from 50% to 70% power with the setpoint and calibration readily accessible. (IECC—Each daylighting control cannot serve more than 100 sf of daylight zones lit by windows facing more than two adjacent directions.) IECC References: C405.2 ASHRAE References: (j) & 3.2 (def. Daylight Area & Primary Sidelighted Area)</p>	<p>IECC: Required in daylit zones with >2 light fixtures. Daylit zones are the rectangle extending 2 feet beyond each end of a window and 15 feet into the building. For skylights, it is the rectangle extending beyond each side of the skylight by 1/2 of the floor to ceiling height. Required in spaces with >250 sf lit by window(s) [or >900 sf lit by skylight(s)] except in retail spaces or where a structure blocks the daylight. Daylit area is defined as the rectangle extending 2 feet beyond each end of a window and as far into the building as the top of the window is above the floor. For skylights, it is the rectangular area extending beyond each side of the skylight by 70% of the floor to ceiling height.</p> <p>ASHRAE: Spaces with windows (or skylights) that have 2 or more light fixtures. ASHRAE: Spaces >250 sf with windows (or >900 sf with skylights)</p>	Doesn't apply to dwelling units. See below for other spaces. IECC: Spaces with windows (or skylights) that have 2 or more light fixtures. ASHRAE: Spaces >250 sf with windows (or >900 sf with skylights)																								
	*Light-reduction/Bilevel control_{LA}	<p>Each space must have a lighting control that provides at least one step between on and off.</p> <p>IECC: Each space must have a manual control that reduces lighting power to 1/2 of full power (or less) while providing uniform lighting, except for areas that have automatic daylighting control. ASHRAE: Each space must have a lighting control with at least one step that has power draw between 30% and 70% of full on. IECC References: C405.2.2.2 References: 9.4.1.1 (d) ASHRAE</p>	<p>IECC & ASHRAE: Each area with more than one fixture (or one fixture >100W) that is not a stairway, corridor, equipment room, storeroom, restroom, public lobby, parking area, audience seating, electrical or mechanical room.</p> <p>IECC Only: Not required for spaces with occupancy sensors, lighting power density < 0.6 wsf, or sleeping rooms.</p>	Doesn't apply to dwelling units—common spaces only. Applies to most spaces within buildings.																								
	Interior Lighting Power Density	<p>The total connected lighting power is limited based on the building (or space) size and type of use (e.g. office vs retail).</p> <p>IECC & ASHRAE: Specify and install lighting fixtures whose total power draw is less than allowed for the building. Total allowance may be calculated using building area type (building area method), or by using the sum of multiple space types and their respective areas (space by space method). The space by space method gives extra allowances for merchandise lighting (ASHRAE) and for specific lighting controls in certain situations. IECC References: C405.3 ASHRAE References: 9.5 or 9.6</p>	<p>IECC & ASHRAE: Applies to all spaces except dwelling units.</p>	Doesn't apply to dwelling units—common spaces only. Applies to all spaces within buildings.																								
	*Exterior Lighting Control_{LA}	<p>Install controls to automatically turn lights off or reduce the power when spaces are unoccupied.</p> <p>IECC & ASHRAE: All exterior lights needs to be auto off when daylight is sufficient. The facade and landscape lights needs to be auto off either based on business hour or from 12-6am. The rest of the lights needs to be at least 30% (IECC) / 50% (ASHRAE) off either based on the same schedule OR at anytime when unoccupied. IECC References: C405.2.6 References: 9.4.1.4 ASHRAE</p>	<p>IECC & ASHRAE: All except lighting for covered vehicle entrances and exits that required for eye adaptation</p> <p>IECC: Lighting controls from within dwelling units are exempted ASHRAE: Light controls in signage are exempted</p>	Applies to all buildings.																								
	*Automatic Outlet Shutoff_{LA}	<p>Turn off power supply to at least half of outlets when spaces are unoccupied.</p> <p>ASHRAE Only: At least half of receptacles must be automatically turned off by one of the following: 1) a time of day control serving no more than one floor nor more than 25,000 sf, 2), an occupancy sensor control with an off delay of no more than 30 minutes, or 2) another control or alarm signal that indicates that a space is unoccupied. IECC References: None ASHRAE References: 8.4.2</p>	<p>IECC: No requirement</p> <p>ASHRAE: Office and computer classroom spaces. Applies to 125 volt 15 and 20 amp receptacles, except those specifically designed for equipment requiring 24 hour operation or where safety or security would be endangered.</p>	ASHRAE Only: Applies to office & computer classroom spaces only. ASHRAE Only: Applies to office & computer classroom spaces only.																								
Lighting System Functional Testing_{LA}	<p>Testing ensures that lighting system controls are installed and calibrated properly and according to construction documents and manufacturer's standards.</p> <p>IECC & ASHRAE: Testing shall confirm proper control and sensor placement AND that controls are programmed for lights off AND that daylighting controls reduce electric light use by >1%. *ASHRAE requires that this testing be performed by a third party (and a code official to require third party testing). IECC References: C408.3 ASHRAE References: 9.4.3</p>	<p>IECC & ASHRAE: Where automatic lighting controls are used.</p>	Doesn't apply to dwelling units—common spaces only. Applies wherever automatic lighting controls are used.																									

MEASURE	DESCRIPTION	TECHNICAL REQUIREMENTS & CODE SECTION REFERENCES	DETAILS OF WHEN IT APPLIES	BUILDING APPLICABILITY												
*Economizer Fault Detection and Diagnostics_A & Air-Side Economizers	Automated fault detection and diagnostics (FDD) is required for any air-side economizer to ensure energy savings. An economizer uses cool outside air to help meet air conditioning needs (when possible).	IECC & ASHRAE: (1) Specify and install air-side economizer system capable of providing up to 100% of design supply air as outdoor air for cooling, along with staged compressor cooling that keeps the economizer on until the appropriate high-limit outdoor condition is reached [dry-bulb control only >70°F or return air temperature; or enthalpy control w/field dry-bulb: 28 Btu/lb, return enthalpy, or 75°F dry-bulb] (2) All air-side economizers must have automated fault detection and diagnostics. <i>IECC References: C403.5</i> <i>ASHRAE References: 6.5.1 & 6.4.3.12 (FDD)</i>	BOTH: Air-side economizer required when a fan cooling unit has a capacity ≥24,000 Btu/hr (≥4.5 tons) & all air-side economizers must have FDD. IECC: The building's total capacity of non-economized fan cooling systems is limited to the larger of 300,000 Btu/hr or 20% of the total fan cooling capacity. For Group R occupancy buildings, the thresholds are: ≥270,000 Btu/hr (≥22.5 tons) for individual systems; and 1,500,000 Btu/hr for the whole building. Not Required if: < 20 hours of operation per week, open refrigerated cases in the space, BOTH: or etc...	Economizer applies to most systems serving floor areas larger than 1,800 sf, and smaller areas with high cooling loads. Seldom applies to dwelling units (IECC or any system in Group R Buildings). Automated FDD applies to all economizers.												
*Demand Control Ventilation (DCV)_A	A control that automatically reduces the amount of fresh outside air being brought in through the ventilation system when few or no people are in a space. This reduces the energy use for heating and cooling outside air.	IECC & ASHRAE: Specify and install a demand control ventilation system (or exhaust air energy recovery ventilation) for high occupancy spaces (Occupant Density is based on the MN 2015 Mechanical Code, Table 403.3 Minimum Ventilation Rates.) <i>IECC References: IMC Table 403.1.1; Section C403.7.1 (& C403.7.4)</i> <i>ASHRAE References: Section 6.4.3.8 (& 6.5.6.1)</i>	IECC & ASHRAE: When design occupancy is ≥25 people/1,000 sf for a space >500 sf ASHRAE: AND there is an economizer, automatic modulating outdoor air damper control, OR outdoor airflow is >3,000 cfm AND the hvac system has (IECC ≥1,200; ASHRAE ≥750) cfm of outdoor air AND the hvac system is NOT a multizone system without DDC controls AND the hvac system does NOT have exhaust air ventilation recovery with an enthalpy recovery ratio of at least 50%	Often applies to meeting rooms, reception areas, gathering spaces. Does NOT apply to correctional cells, daycare sickrooms, science labs, barbers, beauty and nail salons, and bowling alley seating.												
Energy Recovery Ventilation (ERV)	Equipment that uses the air being exhausted to preheat (and precool) fresh outdoor air that is brought into the building for ventilation. This reduces the heating and cooling loads for conditioning outdoor ventilation air.	IECC & ASHRAE: Specify and install ERV that reduces the design outdoor air heating or cooling load by at least 50% (aka 50% enthalpy recovery ratio). Must have bypass if economizer required. <i>IECC References: C403.7.4</i> <i>ASHRAE References: 6.5.6.1</i>	Any hvac system that runs at least 20 hours a week at % outdoor air listed below with design supply flows at or above the CFM values listed: OA → 10-19% 20-29% 30-39% 40-49% 50-59% 60-69% 70-79% 80%+ IECC NR NR 5,500 4,500 3,500 2,000 1,000 0 ASHRAE 26,000 16,000 5,500 4,500 3,500 2,000 1,000 120 Unless: (1) Problematic exhaust air (laboratory, grease hood, etc.), (2) less than 75% of the system's exhaust and relief is not in one place (ASHRAE within 20 feet of each other), (3) Required humidity control is via reclaimed heat, OR (4) ≥60% of heating is from renewables or recovered heat.	IECC: Uncommon except for hvac systems that serve high occupancy spaces (e.g. dining room or theater). ASHRAE: Common—Large systems, high outdoor air fraction systems, and anything that runs continuously.												
HVAC Temperature Controls (Heating/Cooling, Setback & Optimum Start)_A	Deadband creates a 5°F range between heating and cooling setpoints. Setback changes temperature setpoints when unoccupied. Optimum start adjusts the pre-heat and pre-cool start times.	IECC ASHRAE Deadband Configured to have 25°F between the heating and cooling setpoints. Heating setback Capable of 55°F Configured to at least 10°F > occupied Cooling setback Capable of 28°F Configured to at least 5°F > occupied Optimum Start: IECC: bring to setpoint immediately prior to occupancy. ASHRAE: Must consider space temperature, setpoint, and outdoor temperature. <i>IECC References: C403.4.1.2 & C403.4.2</i> <i>ASHRAE References: 6.4.3.1.1 & 6.4.3.3</i>	IECC & ASHRAE: Deadband applies whenever the same zone thermostatic control controls both heating and cooling. ASHRAE: Setback applies to any system that will not be operated continuously with a capacity ≥ (IECC 8,800; ASHRAE 15,000) Btu/hr. Optimum Start: applies wherever setback applies (except ASHRAE doesn't require if there is not DDC control).	Dead band doesn't apply when tight temperature requirements (e.g. retirement homes, process, etc.). Setback doesn't apply where continuous operation. ASHRAE—optimum start only applies if DDC control.												
*Duct Sealing & Testing_A	All ductwork connections shall be sealed, and high pressure ductwork shall be tested. Savings is realized through reduced fan power and heating/cooling loads.	IECC & ASHRAE: Low-pressure ducts need to be sealed to Seal Class A using mastics, tapes, gaskets, and welds. This includes all longitudinal and transverse joints, seams, and connections. (ASHRAE only allows tape if per UL-181A or UL-181B certification and IECC does not require sealing of longitudinal joints that are continuously welded and locking at pressures below 2 inches water column.) Sealing of high pressure ducts (>3 inches water column) shall be verified by testing. <i>IECC References: C403.11.2</i> <i>ASHRAE References: 6.4.4.2</i>	IECC & ASHRAE: Sealing to class A applies to all ducts and plenums with a pressure class rating. ASHRAE: Leakage testing is required in systems with static pressures above 3 inches water column (750 Pa).	Sealing applies to all buildings. Testing seldom applies—only if high pressure ductwork.												
Supply-Air Temperature Reset for Multizone VAV Systems	Control that raises the cooling supply air temperature when cooling loads are low. This saves energy by reducing the overcooling and reheating in VAV systems.	IECC & ASHRAE: HVAC systems controls should be specified and installed to automatically reset the supply air temperature by at least 25% of the difference between design supply and design room temperatures. Zones with relatively constant heat loads (e.g. server room) must be sized based on the maximum reset temperature (i.e. 25%+ higher cfm). <i>IECC References: C403.6.5</i> <i>ASHRAE References: 6.5.5.5</i>	IECC & ASHRAE: This applies to multizone HVAC systems. Is not required if no reheat or reheat is via site exhaust: recovered heat or site solar. IECC: (Design for fully reset supply temperature?) not required for zones designed for 300 cfm or less.	Applies to multizone/VAV systems with reheat.												
*Fan Speed Control Beyond Multizone VAV	Fan speed control greatly reduces the fan energy usage during low load periods.	IECC & ASHRAE: HVAC Units. During low load and ventilation-only operation, the HVAC unit fan speed goes down to 66% or lower with a power draw of 40% or less of the design value. Minimum speed may be increased as needed to meet ventilation requirements. Heat Rejection Equipment: Fan speed is reduced to 50% or less (with power draw 30% or less of design) before staging any fans. <i>IECC References: C403.8.5, C403.9, C403.9.1 & C403.10.4.1</i> <i>ASHRAE References: 6.5.3.2.1, 6.5.5.1, 6.5.5.2 & 6.5.11.1</i>	IECC & ASHRAE: DX cooling units ≥65,000 Btu/hr (5.4 tons) and chilled water units with fan motors ≥1/4 hp. (Multizone systems have separate, stricter requirements.) *Not required if the unit doesn't provide ventilation air and the fan cycles with cooling demand. Heat Rejection Equipment: All refrigeration air-cooled condenser, evaporative condensers, cooling towers and fluid coolers. Also for the same comfort cooling HR equipment with total fan size of 5 hp or more.	Applies to many small to mid-sized hvac units and to most condensers and cooling towers.												
*Shutoff of SHW Recirculation Pump When No Load_A	Letting distribution pipes cool down when hot water is not needed reduces piping heat loss.	IECC: Start recirculation pump based on identification of a demand and stop pump when temperature reaches setpoint and demand stops. Turn off heat trace automatically when there is not a demand for hot water. ASHRAE: Recirculation pumps and heat tracing shall have automatic time switches or other controls to switch off during extended periods when hot water is not needed. <i>IECC References: C404.6.1 & C404.6.2</i> <i>ASHRAE References: 7.4.4.2</i>	IECC & ASHRAE: Service hot water system with recirculation loop or electric heat tracing to maintain hot ASHRAE: water temperature in distribution piping.	Multifamily buildings, hotels, motels, schools, and other buildings with long service hot water piping runs.												
*Pool Cover_A	Provide a pool cover for the surface of any pool.	IECC & ASHRAE: Specify and install a vapor retardant pool cover. For pools heated above 90°F, the cover shall have a minimum R-12 insulating value. <i>IECC References: C404.9.3</i> <i>ASHRAE References: 7.4.5.2</i>	IECC & ASHRAE: Required for all heated pools.	When there is a heated pool.												
*Low Leakage Intake & Exhaust Dampers_A	Provide dampers meeting specific low leakage testing requirements, with motorized dampers required in many cases.	IECC & ASHRAE: Leakage Rates Based on AMCA 5000 @ 1 inch wg 1) Motorized Dampers: ≤4 cfm/sf (≤6 cfm/sf @ 4 in wg is better); 2) Gravity Dampers ≥2 ft in both directions: ≤20 cfm/sf; 3) Gravity Dampers < 2 ft in one direction: ≤40 cfm/sf. <i>IECC References: C402.5.5 & C403.7.7</i> <i>ASHRAE References: 6.4.3.4.2 & 6.4.3.4.3</i>	IECC & ASHRAE: Low Leakage Motorized Dampers—System outdoor air intakes >300 cfm; system exhausts >300 cfm in buildings over 2 stories. ASHRAE: Low Leakage Gravity Dampers—Other outdoor air intakes & exhausts. Only IECC Allows: Gravity Exhaust Dampers < 8 inch diameter—Must be spring-loaded with a weather hood (no testing requirement).	Virtually all outdoor air intakes and exhausts.												
Fan Power Limitation for VAV Systems	Set high-limit to the fan power to prevent unnecessary energy usage of oversized fan	IECC & ASHRAE: Each HVAC system fan shall not exceed the allowable fan system motor nameplate hp or fan system bhp calculated based on supply cfm and fan type (constant vs VAV), (Hospital, vivarium and lab that controls flow to maintain pressure are considered VAV.) <table border="0"> <tr> <td colspan="2">Constant Volume</td> <td colspan="2">Variable Volume</td> </tr> <tr> <td>HP</td> <td>hp ≤ CFMS × 0.0011</td> <td>hp</td> <td>hp ≤ CFMS × 0.0015</td> </tr> <tr> <td>BHP</td> <td>bhp ≤ CFMS × 0.00094 + A*</td> <td>bhp</td> <td>bhp ≤ CFMS × 0.0013 + A*</td> </tr> </table> *A = Sum of adjustments for special circumstances (e.g. special filtration, energy recovery, etc.) <i>IECC References: C403.8.1</i> <i>ASHRAE References: 6.5.3.1</i>	Constant Volume		Variable Volume		HP	hp ≤ CFMS × 0.0011	hp	hp ≤ CFMS × 0.0015	BHP	bhp ≤ CFMS × 0.00094 + A*	bhp	bhp ≤ CFMS × 0.0013 + A*	IECC & ASHRAE: Apply to HVAC system fans when the total fan motor nameplate horsepower for an HVAC system (including exhaust fans) is >5 hp (Individual exhaust fan ≤ 1hp are exempt from 5hp allowance calc)	Typically applies to systems serving >4,500 sf
Constant Volume		Variable Volume														
HP	hp ≤ CFMS × 0.0011	hp	hp ≤ CFMS × 0.0015													
BHP	bhp ≤ CFMS × 0.00094 + A*	bhp	bhp ≤ CFMS × 0.0013 + A*													
HVAC Commissioning & Documentation_A	Verification that equipment and controls are installed, balanced, adjusted and functioning properly, and mechanical system documentation.	IECC & ASHRAE: 1) Detailed instructions for commissioning must be in the construction documents. 2) Provide O&M manuals and permanently record all initial setpoints; 3) HVAC systems are to be balanced to first reduce throttling losses, and then reduce fan/pump speed; and 4) Controls shall be tested to ensure they are calibrated, adjusted and working properly <i>IECC References: C408.2</i> <i>ASHRAE References: 6.7.2</i>	IECC: Buildings with cooling capacity ≥480,000 Btu/hr (40 tons) OR heating capacity ≥600,000 Btu/hr, except for systems serving dwelling or sleeping units. All hvac systems need balancing and controls testing; ASHRAE: Written balancing report is only needed for systems serving >5,000 sf; Commissioning instructions only needed in design documents for buildings >50,000 sf.	IECC: NOT required for dwelling/sleeping units NOT required for projects <12,000 sf (unless high heating or cooling loads) ASHRAE: Commissioning required for buildings >50,000 sf -Other requirements for all systems												

MEASURE	DESCRIPTION	TECHNICAL REQUIREMENTS & CODE SECTION REFERENCES	DETAILS OF WHEN IT APPLIES	BUILDING APPLICABILITY
* All new construction	building projects shall comply with at least one of the following requirements. Tenant spaces should comply with C406.2 or C406.3, unless the entire building meets C406.4.			
Efficient HVAC Performance	Increase heating and cooling efficiencies above the base energy code requirements. This save significantly on heating energy, and moderately on cooling energy.	Gas-fired heating equipment (except steam boilers) must be condensing with efficiencies at least: - Furnaces: < 235 MBH 92% / > 235 MBH 90% - Hot water boilers: 92% - Unit heaters & duct furnaces: 90% Air conditioning efficiency must be at least: - ≤ 5 tons: 14 SEER - 5.5 to 19.5 tons: 11.3 SEER & 11.8 IEER - > 20 tons: 10.2 SEER & IEER	IECC: All building types have the option of choosing this (Efficient HVAC Performance) or Efficient Lighting Power or On-Site Renewables for it's additional efficiency package.	IECC Only: 1 of 3 options. This has medium to large impact if base hvac system design doesn't lend itself to high efficiency condensing heating equipment. Small impact for many buildings.
Efficient Lighting Power	Reduce the total connected lighting power to levels below	Connected interior lighting must be at or below a lower whole building method value (space method is not an option). The percentage power reductions are much larger for retail than for office building Area Method Only with the required values being: Multifamily 0.6 wsf Office 0.85 wsf	IECC: All building types have the option of choosing this (Efficient Lighting Power) or either Efficient HVAC Performance or On-Site Renewables for it's additional efficiency package.	IECC Only: 1 of 3 options. NOT in dwelling units. Medium energy impact. IECC Only: 1 of 3 options. Small energy impact
On-Site Renewables	Reduce energy impacts through on-site renewables.	On-site renewable production must be at least one of the following: 1) 1-75 Btu/sf peak rate 2) 0.50 Watts/sf peak rate 3) 3% of the sum of energy for hvac, service hot water and lighting <i>IECC References: C406.4</i>	IECC: 1 of 3 options. Small energy impact	IECC Only: 1 of 3 options. Small energy impact

IMPORTANT: All measures require that design compliance is documented in construction documents and/or in submitted specifications so that compliance can be reviewed and documented at Plan Review stage.

*These measures are completely new 2020 commercial energy code requirements within the State of Minnesota or dramatically tighter than previously.

₁ and/or _A indicates measures that are required under both prescriptive and performance options for the IECC 2018 path (1 and/or₂) and/or ASHRAE 90.1-2016 path (A).

ci = Continuous Insulation, without any structural members in the plane of the insulation.