CHAPTER 7670
DEPARTMENT OF PUBLIC SERVICE
ENERGY DIVISION
MINNESOTA ENERGY CODE

7670.0100 AUTHORITY; SCOPE; APPLICABILITY.

Subpart 1. **Authority.** This chapter is adopted pursuant to Minnesota Statutes, section 216C.19, subdivision 8.

Subp. 2. **Scope.** Under Minnesota Statutes, section 216C.19, subdivision 8, this chapter is a part of the State Building Code, adopted according to Minnesota Statutes, sections 16B.59 to 16B.73.

Subp. 3. **Applicability.** Buildings covered by this chapter must comply with the Model Energy Code as amended by parts 7670.0260 to 7670.1000. This chapter also applies to driveways, walkways, entrances, parking lots, and grounds.

EXCEPTION: Relocated residential buildings need not comply with this chapter, except that, where available, an energy audit must be conducted on the relocated building.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9,10 subd 1; 15 SR 2407; 16 SR 2687*

7670.0110 [Repealed, 15 SR 2407]

7670.0120 [Repealed, 15 SR 2407]

7670.0125 LEGISLATIVE MANDATES CONCERNING MINNESOTA ENERGY CODE.

An enclosed structure or portion of an enclosed structure constructed after January 1, 1978, and used primarily as a commercial parking facility for three or more motor vehicles may not be heated. Incidental heating resulting from building exhaust air passing through a parking facility is not prohibited if substantially all useful heat previously has been removed from the air.

EXCEPTION: Parking facilities that are appurtenant to dwelling unit occupancies.

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407*

7670.0130 INCORPORATIONS BY REFERENCE.

Subpart 1. **Incorporated items.** The following standards and references are incorporated by reference:

A. The Model Energy Code, 1989 Edition, as published by the Council of American Building Officials (Falls Church, Virginia), as amended by parts 7670.0260 to 7670.1000.

B. Code of Federal Regulations, title 10, part 435, Energy Conservation Voluntary Performance Standards for New Commercial and Multi–Family High Rise Residential Buildings; Mandatory for New Federal Buildings.

C. Code of Federal Regulations, title 10, part 430, National Appliance Energy Conservation Act of 1987.

D. LTGSTD, lighting prescriptive and system performance compliance calculation program, a computer program developed by Battelle Pacific Northwest Laboratories.

E. ANSI/ASHRAE Standard 119–1988, Air Leakage Performance for Detached Single–Family Residential Buildings.

F. AAMA Standard 1503.1–88, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

G. ASTM C 236–87, Standard Test Method for Steady State Thermal Performance of Building Assemblies by means of a Guarded Hot Box.

H. ASTM C 976–82, Standard Test Method for Thermal Performance of Building Assemblies by means of a Calibrated Hot Box.

I. NFRC 100–91: Procedure for Determining Fenestration Product Thermal Properties (Currently Limited to U–values).

Subp. 2. **Availability.** All standards and documents incorporated by reference are available for public inspection at the Minnesota State Law Library and through the Minitex interlibrary loan system. In addition:

A. ASHRAE and ANSI/ASHRAE documents and standards are available from the American Society of Heating, Refrigerating and Air–Conditioning Engineers – Publication Sales, 1791 Tullie Circle NE, Atlanta, GA 30329;

B. AAMA standards are available from the American Architectural Manufacturers Association, 2700 River Road, Des Planes, IL 60018;

C. ASTM standards are available from ASTM, 1916 Race Street, Philadelphia, PA 19103; and

D. The WINDOW computer program is available from Bostik Construction Products, 1740 County Line, Huntington Valley, PA 19006.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

7670.0200 [Repealed, 15 SR 2407]

7670.0210 [Repealed, 15 SR 2407]

7670.0220 [Repealed, 15 SR 2407]

7670.0260 MATERIALS AND EQUIPMENT.

Section 102 of the Model Energy Code is amended by adding a paragraph to read:

102.3 Thermal Insulation. Thermal insulation used in residential buildings three stories or less in height must conform to chapter 7640, Minnesota Thermal Insulation Standards, adopted by the Department of Public Service. All thermal insulation must achieve stated performance at 75 degrees Fahrenheit mean temperature and no less than stated performance at winter design conditions.

EXCEPTION: Thermal insulation designed to reduce summer cooling load only is not required to achieve stated performance at winter design conditions.

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407; 16 SR 2687*

7670.0300 [Repealed, 15 SR 2407]

7670.0310 [Repealed, 15 SR 2407]

7670.0320 [Repealed, 15 SR 2407]

7670.0325 AMENDMENTS TO SECTION 201: DEFINITIONS.

Subpart 1. **Thermal transmittance (U).** In section 201 of the Model Energy Code, the definition of "Thermal transmittance (U)" is amended to read:

THERMAL TRANSMITTANCE (U). The coefficient of heat transmission (air to air). It is the time rate of heat flow per unit area and unit temperature differential between the warm side and cold side air films (Btu/h ft^2 F).

Thermal transmittance of opaque wall components (U_w) and roof/ceiling components (U_r) calculation methods are defined in the references indicated:

(1) Parallel heat flow method: Model Energy Code, chapter 5, equations 1 and 2, substituting the framing and insulated cavity components of the opaque wall or roof/ceiling for the elements designated by subscripts in these equations.

(2) Series–parallel method: Page 20.8 of Standard RS–1 listed in chapter 7.

(3) Parallel path correction factor method: Standard RS–24 listed in chapter 7.

(4) Thermal bridges in sheet metal construction method: Standard RS–25 listed in chapter 7.

(5) Zone method: Pages 22.10 and 22.11 of Standard RS–1 listed in chapter 7.

Subp. 2. **Vapor retarder.** Section 201 of the Model Energy Code is amended by adding a new definition to read:

VAPOR RETARDER. A material to retard air and water vapor passage designed to meet a maximum perm rating of 1.0 grain per hour per ft^2 per inch Hg pressure differential. Polyethylene material that is not cross laminated which is used to meet the requirements of this paragraph must be designed to have a minimum thickness of four mills.

Subp. 3. **Wind wash.** Section 201 of the Model Energy Code is amended by adding a new definition to read:

WIND WASH. Wind wash is the passage of unconditioned air through thermal insulation of the building envelope.

Subp. 4. **Window area.** Section 201 of the Model Energy Code is amended by adding a new definition to read:

WINDOW AREA. Window area, or glazing area, is equal to the rough opening less installation clearances.

Subp. 5. **Advanced framing.** Section 201 of the Model Energy Code is amended by adding a new definition to read:

ADVANCED FRAMING. Advanced area framing means framing techniques used to minimize the amount of uninsulated area that is required for proper structural support consistent with requirements of the Uniform Building Code, including section 2517. Advanced wall framing means 2 x 6 stud spacing of 24" on center, insulated headers, two–stud corners using approved backing for the attachment of facing materials, full insulation wherever possible between partition wall intersections with exterior walls, and, when foam insulated sheathing is used, replacement of cripples with hangers whenever possible. Advanced ceiling framing means achieving full insulating value to the outside of exterior walls.

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407; 16 SR 2687*

7670.0330 [Repealed, 15 SR 2407]

7670.0340 [Repealed, 15 SR 2407]

7670.0400 AMENDMENT TO SECTION 302: DESIGN CONDITIONS.

Footnote 1 of section 302.1 of the Model Energy Code is amended to read:

[1]The exterior design temperature must be selected from the "Design Conditions" columns shown in Table 302.1.

EXCEPTION: Where necessary to assure the prevention of damage to the building or to material and equipment within the building, the values listed in Table 302.1 under "extreme conditions" may be used.

TABLE 302.1 Exterior Design Temperatures

CITY	DESIGN CONDITIONS SUMMER DB/WB	WINTER DB	EXTREME CONDITIONS SUMMER DB/WB	WINTER DB
Albert Lea	87/72	–17	90/74	
Alexandria	88/72	–22	90/72	–28.0
Bemidji	85/69	–31	88/69	–36.9
Brainerd	87/71	–20	90/73	
Duluth	82/68	–21	85/70	–27.4
Faribault	88/72	–17	91/74	–24.3
Fergus Falls	88/72	–21	91/72	–27.8
International Falls	83/68	–29	85/68	–36.5
Mankato	88/72	–17	91/72	
Minneapolis	89/73	–16	92/75	–22.0
Rochester	87/72	–17	90/74	
St. Cloud	88/72	–15	91/74	
St. Paul	89/73	–16	92/75	–22.0
Virginia	83/68	–25	85/69	–33.0
Willmar	88/72	–15	91/74	–24.3
Winona	88/73	–14	91/75	

"DB" = dry bulb temperature, degrees Fahrenheit

"WB" = wet bulb temperature, degrees Fahrenheit

Heating degree days must be selected from Standard RS–23 listed in chapter 7. Adjustments may be made as determined by the building official to reflect local climates which differ from the tabulated temperatures or local weather experience.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407*

7670.0450 AMENDMENT TO SECTION 303: VENTILATION.

Section 303.1 of the Model Energy Code is amended to read:

303.1 Ventilation. Ventilation systems must be designed to conform with Standard RS–3 listed in chapter 7.

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407*

BUILDING ENVELOPE

7670.0470 AMENDMENTS TO SECTION 502: ENVELOPE THERMAL TRANSMITTANCE.

Subpart 1. Section 502.1 of the Model Energy Code is amended by adding a paragraph to read:

502.1.4 Thermal transmittance of opaque wall components and roof/ceiling components. Thermal transmittance of opaque wall components (U_w) and roof/ceiling components (U_r) must be calculated using the following methods:

(1) Wood frame: Parallel heat flow method.

(2) Masonry blocks with insulation inserts or filled cores and other envelope assemblies containing nonmetal framing: Series–parallel method.

(3) Metal framing bonded on one or both sides to a metal skin or covering: Thermal bridges in sheet metal construction method.

(4) Nonmetal surface with metal framing:

(a) For elements identified in Standard RS–24 listed in chapter 7, the parallel path correction factor method.

(b) For elements not identified in Standard RS–24 listed in chapter 7, the zone method.

Subp. 2. Section 502.1 of the Model Energy Code is amended by adding a paragraph to read:

502.1.5 Thermal transmittance of window area and skylight elements. Thermal transmittance of window area (U_g) and skylight elements (U_s) must be determined in accordance with one of the following methods:

(1) Representative U–values for fenestration products, pages 27.16 to 27.18 of Standard RS–1 listed in chapter 7;

(2) Standard RS–26 listed in chapter 7;

(3) Standard RS–27 or RS–28 listed in chapter 7 using design conditions specified in footnote (a) of table 13, chapter 27 of Standard RS–1; or

(4) Standard RS–20 listed in chapter 7.

Subp. 3. **Alternative compliance.** Section 502.2.1 of the Model Energy Code is amended by adding a new section to read:

502.2.1.7 Alternative compliance. Alternative methods of compliance with sections 502.2.1.1, 502.2.1.2, and 502.2.1.3 for one– and two–family residential buildings.

Minimum performance for components of Type A–1 (one– and two–family) buildings:

Minimum thermal resistance of the insulation in the roof/ceilings: R–38.

Minimum thermal resistance of the insulation in floors not over conditioned space: R–21.

Minimum thermal resistance of the insulation in rim joists: R–19.

Maximum window and door area as a percentage of overall exposed wall area with the combination of framing technique, R–value of insulation within the insulated cavity, sheathing, R–value, insulation on exposed foundation wall, and window overall U–value as indicated below:

MAXIMUM WINDOW AND DOOR AREA AS A PERCENT OF OVERALL EXPOSED WALL

R–5 Foundation Wall Insulation

Framing	Cavity Insulation	Sheathing	Window U–Value 0.49	0.36	0.31	0.27
STANDARD	R–15	≥R–5	11.2%	15.7%	18.6%	21.9%
STANDARD	R–21	<R–5	11.1%	15.5%	18.4%	21.7%
STANDARD	R–21	≥R–5	12.9%	17.8%	21.1%	24.7%
ADVANCED	R–21	<R–5	12.0%	16.7%	19.7%	23.2%
ADVANCED	R–21	≥R–5	13.4%	18.5%	21.8%	25.5%

R–10 Foundation Wall Insulation

			Window U–Value 0.49	0.36	0.31	0.27
STANDARD	R–15	≥R–5	12.5%	17.6%	20.9%	24.6%
STANDARD	R–21	<R–5	12.4%	17.4%	20.6%	24.3%
STANDARD	R–21	≥R–5	14.1%	19.7%	23.2%	27.2%
ADVANCED	R–21	<R–5	13.3%	18.5%	21.9%	25.8%
ADVANCED	R–21	≥R–5	14.7%	20.3%	24.0%	28.0%

Notes:

1) Maximum of 12 inches foundation wall exposed, excluding window wells.

2) Foundation windows must be insulated glass, 1/2–inch between panes and wood or vinyl frame, or equivalent.

3) Standard framing is wall framing that is not advanced as defined in section 201 of the Model Energy Code.

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407; 16 SR 2687*

7670.0480 AMENDMENT TO SECTION 502: EFFECTIVENESS OF REQUIRED THERMAL INSULATION.

Section 502.1 of the Model Energy Code is amended by adding paragraphs to read:

502.1.6 Cold weather vapor condensation. Building assemblies are required to maintain the thermal performance of required insulation and the integrity of building materials against cold weather water vapor condensation.

502.1.6.1 Vapor retarder. A vapor retarder must be installed between the interior surface and the winter design condition dew point location within each building envelope surface. Joints in the vapor retarder must be sealed between solid blocking.

EXCEPTION: A vapor barrier need not be installed on the rim joist insulation.

502.1.6.2 Air leakage barrier. A barrier against air leakage must be installed to prevent the leakage of moisture–laden air from the conditioned space into the building envelope. An air barrier must be continuous at all plumbing and heating penetrations of interior surface of the building exterior envelope. If a tub or shower is located on an exterior wall, an air barrier must be provided at the interior surface of the building exterior envelope behind the tub or shower.

502.1.7 Preventing wind wash. A barrier must be provided at the following locations to mitigate wind wash:

(1) the exterior edge of attic insulation; and

(2) cantilevered floors and bay windows, including corners with adjoining vertical walls above and below.

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407; 16 SR 2687*

7670.0500 AMENDMENT TO SECTION 502: SLAB ON GRADE FLOORS.

Section 502.2.1.4 of the Model Energy Code is amended to read:

502.2.1.4 Slab on grade floors. For slab on grade floors, the thermal resistance of the insulation around the perimeter of the floor must be not less than the value given in Table No. 502.2.1. The insulation must extend downward from the top of the slab to the design frost line or downward to the bottom of the slab then horizontally beneath the slab for an equivalent distance, and must be an approved type.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407*

7670.0510 AMENDMENT TO SECTION 502: FOUNDATION WALLS.

Section 502.2.1.6 of the Model Energy Code is combined with section 502.2.1.5 and is amended to read:

502.2.1.5 Foundation walls. Foundation walls enclosing heated or conditioned spaces must be insulated.

Either the thermal resistance (R) of the insulation on the entire opaque foundation wall must be not less than R–5, or the thermal resistance (R) of the insulation on the opaque foundation wall must be not less than R–10 from the top of the wall down to the design frost line. If the top of the footing is at or above the design frost line, the thermal resistance (R) of the insulation on the wall must not be less than R–5 from the top of the wall to the top of the footing.

All insulation used in or on foundation walls must be approved for the intended use. The insulation must be installed in accordance with the approved manufacturer's specifications.

If the foundation wall insulation is on the exterior, the portion from the top of the foundation wall to six inches below grade must be covered by an approved protective coating finish to protect the insulation from deterioration due to sunlight and physical abuse.

Statutory Authority: *MS s 216C.10; 216C.19*

History: *8 SR 1229; 10 SR 1687; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

7670.0520 [Repealed, 15 SR 2407]

7670.0530 AMENDMENT TO SECTION 502: SLAB ON GRADE FLOORS.

Section 502.3.1.4 of the Model Energy Code is amended to read:

502.3.1.4 Slab on grade floors. For slab on grade floors, the thermal resistance of the insulation around the perimeter of the floor may not be less than the value given in Table No. 502.3.1. The insulation must extend downward from the top of the slab to the design frost line or downward to the bottom of the slab then horizontally beneath the slab for an equivalent distance, and must be of an approved type.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 16 SR 2687*

7670.0540 [Repealed, 15 SR 2407]

7670.0550 AMENDMENTS TO SECTION 502: AIR LEAKAGE.

Subpart 1. **Alternative.** Section 502.4.3 of the Model Energy Code is amended by adding an exception as follows:

EXCEPTION: As an alternative to the prescriptive requirements of section 502.4.3 for detached single–family residential buildings, air tightness must comply with air leakage class A, B, C, or D of Standard RS–30 listed in chapter 7. In addition, this alternative requires that the ventilation system must provide a ventilation rate of not less than 0.35 air changes per hour (determined in accordance with Standard RS–3, Table 2.3) or 15 cfm per person, whichever is greater. This ventilation rate must be verified by measurement. If this alternative is not chosen, this ventilation rate requirement applies only if required by Standard RS–3.

Subp. 2. **Fire stops.** Section 502 is amended by adding a section as follows:

502.4.4 Fire stops. Fire stops must be installed in accordance with the State Building Code. When mineral fiber or glass fiber materials are used as fire stop construction at ceilings and wall cavities separating conditioned and nonconditioned spaces, the fire stop must be installed to block air movement.

EXCEPTIONS: A fire stop need not block air movement if its installation would conflict with any other part of the State Building Code.

Subp. 3. **Air sealing.** Section 502 of the Model Energy Code is amended by adding paragraphs to read:

502.4.5 Air sealing of rim joists. Rim joists, band joists, and where floor joists or trusses meet the building envelope must be sealed in an approved manner to prevent air leakage.

502.4.6 Air sealing of interior partition walls. The top of interior partition walls that join insulated ceilings must be sealed in an approved manner to block air leakage.

Statutory Authority: *MS s 216C.10; 216C.19*

History: *10 SR 1687; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

BUILDING MECHANICAL SYSTEMS

7670.0600 [Repealed, 15 SR 2407]

7670.0610 AMENDMENTS TO SECTION 503: BUILDING MECHANICAL SYSTEMS.

Subpart 1. **Calculation procedures.** Section 503.2.1 of the Model Energy code is amended to read:

503.2.1 Calculation procedures. Heating and cooling system design loads for the purpose of sizing systems and equipment must be determined in accordance with the procedures described in Standard RS–1 listed in chapter 7.

503.2.1.1 Safety factor. Design loads may at the designer's option be increased by as much as ten percent to account for unexpected loads or changes in space usage.

503.2.1.2 Pick–up loads. Transient loads such as warm–up or cool–down loads that occur after off–hour setback or shutoff may be calculated from principles based on the heat capacity of the building and its contents, the degree of setback, and desired recovery time; or may be assumed to be up to 30 percent for heating and ten percent for cooling of the steady–state design loads. The steady–state load may include a safety factor in accordance with section 503.2.1.1.

Subp. 2. **System and equipment sizing.** Section 503.2 of the Model Energy Code is amended by adding a paragraph to read:

503.2.3 System and equipment sizing. HVAC systems and equipment must be sized to provide no more than the space and system loads calculated in accordance with 503.2.1.

Exceptions:

(a) Equipment capacity may exceed the design load if the equipment selected is the smallest size needed to meet the load within available options of the desired equipment line.

(b) Equipment whose capacity exceeds the design load may be specified if oversizing the equipment can be shown to not increase the overall annual energy costs.

(c) Stand–by equipment may be installed if controls and devices are provided that allow stand–by equipment to operate automatically only when the primary equipment is not operating.

(d) Multiple units of the same equipment type, such as multiple chillers and boilers, with combined capacities exceeding the design load may be specified to operate concurrently only if controls are provided that sequence or otherwise optimally control the operation of each unit based on load.

(e) For a single piece of equipment that has both heating and cooling capability, only one function, either the heating or the cooling, need meet the requirements of this section. Capacity for the other function must be, within available equipment options, the smallest size necessary to meet the load.

Subp. 3. **Air–systems.** Section 503.5.1 of the Model Energy Code is amended to read:

503.5.1 Air–systems. The power required by motors of constant air volume fan systems must not exceed 0.8 W/cfm of supply air at design conditions.

The power required by motors of variable air volume fan systems must not exceed 1.25 W/cfm of supply air at design conditions.

Subp. 4. **Pumping system design criteria.** Section 503.5.2 of the Model Energy Code is amended to read:

503.5.2 Piping friction loss. Piping systems must be designed at a friction pressure loss rate of no more than 4.0 ft. of water per 100 equivalent ft. of pipe where a "C–factor" of 125 is used.

Subp. 5. **Variable flow pumping.** Section 503.5 of the Model Energy Code is amended by adding a paragraph to read:

503.5.3 Variable flow pumping. Pumping systems serving control valves designed to modulate or step open and closed as a function of load must be designed for variable fluid flow. The system must be capable of reducing system flow to 50 percent of design flow or less.

EXCEPTIONS: Pumping loops where a minimum flow greater than 50 percent of the design flow is required for the proper operation of equipment served by the system, such as chiller loops and systems that serve no more than one control valve.

Subp. 6. **Balancing.** Section 503.6 of the Model Energy Code is amended to read:

503.6 Balancing. Means must be provided to balance air and water systems in accordance with this section.

503.6.1 Air system balancing. Air systems must be balanced. Fan speed must be adjusted to meet design air system flow.

EXCEPTION: Speed adjustment is not required for air system balancing with fan motors of 1 hp or less.

503.6.2 Hydronic system balancing. Hydronic systems must be balanced. Pump impellers must be trimmed or pump speed must be adjusted to meet design system flow.

EXCEPTION: Impeller trimming or speed adjustment is not required for hydronic system balancing with pump motors of 5 hp or less.

503.6.3 Systems balancing reports. Systems balancing reports must be submitted to the building official upon request.

Subp. 7. **Controls.** Section 503.8 of the Model Energy Code is amended by adding paragraphs to read:

503.8.4 Variable air volume (VAV) fan controls. VAV fans with motors 75 hp and larger must provide controls for the fan motor to demand no more than 50 percent of design wattage at 50 percent of design air volume, based on manufacturer's test data.

503.8.6 HVAC control system testing. HVAC control systems must be tested to assure that control elements are calibrated, adjusted, and in proper working condition.

Subp. 8. **Air–handling duct system insulation.** Section 503.9.1 of the Model Energy Code is amended by modifying the definition of delta t to read:

Where delta t = the design temperature differential between the air in the duct and the ambient temperature outside of the duct.

Subp. 9. **Duct construction.** Section 503.10 of the Model Energy Code is amended to read:

503.10 Duct construction. Ductwork must be constructed and erected in accordance with chapter 1346.

503.10.1 Duct leakage test. Ductwork designed to operate at static pressure in excess of 3 in. wc. must be leak tested and classified in a duct leakage class equal to or less than leakage Class 6 according to Standard RS–18 listed in chapter 7.

503.10.2 Additional sealing. Where supply air ducts and plenums that are designed to operate at static pressures from 0.25 in. to 3 in. wc. inclusive are located outside of conditioned space or in return plenums, joints must be sealed in accordance with Seal Class B as defined in Standards RS–17, RS–18, and RS–19 listed in chapter 7. All other ducts and plenums operating from 0.25 in. to 3 in. wc. inclusive must be sealed in accordance with Seal Class C. Pressure sensitive tape must not be used as the primary sealant where ducts are designed to operate at static pressure of 1 in. wc. or greater.

Subp. 10. **Operation and maintenance manual.** Section 503 of the Model Energy Code is amended by adding a paragraph to read:

503.12 Operation and maintenance manual. An operation and maintenance manual must be provided. The manual must include basic data relating to the operation and maintenance of HVAC systems and equipment. Required routine maintenance actions must be clearly identified. Where applicable, HVAC controls information such as diagrams, schematics, control sequence descriptions, and maintenance and calibration information must be included.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

7670.0620 [Repealed, 15 SR 2407]

7670.0630 [Repealed, 15 SR 2407]

7670.0640 [Repealed, 15 SR 2407]

7670.0650 [Repealed, 15 SR 2407]

7670.0660 AMENDMENT TO SECTION 503: EQUIPMENT EFFICIENCY.

Subpart 1. **HVAC equipment efficiency.** Section 503.4 of the Model Energy Code, with the exception of sections 503.4.2.3 and 503.4.4, is amended to read:

503.4 HVAC equipment performance requirements. HVAC equipment must meet minimum efficiency requirements specified in Standard RS–10 listed in chapter 7 with the following exceptions:

(1) Table 8.3–6 is amended to cite the reference standard for air conditioners, air cooled as ARI 360–86; to cite the reference standard for air conditioners, water/evaporatively cooled as ARI 360–86; and efficiency requirements added as follows:

Air Conditioners (air cooled)	≤760,000 Btu/h 8.5 EER	>760,000 Btu/h 8.2 EER
Heat Pumps (cooling) (air cooled)	<760,000 Btu/h 8.5 EER	≥760,000 Btu/h 8.7 EER

(2) Table 8.3–7 is amended to read:

WATER COOLED	CFC	NON–CFC
Centrifugal	0.63 KW/Ton	0.73 KW/Ton
Helical–rotary (screw)	0.75 KW/Ton	0.80 KW/Ton
Reciprocating or Scroll	0.93 KW/Ton	
AIR COOLED (any type)		
≥150 Ton	1.41 KW/Ton	
<150 Ton	1.30 KW/Ton	

503.4.1 Heat–operated water chilling packages. Double–effect, heat–operated water chilling packages must be used in lieu of single–effect equipment, except where the energy input is from low temperature waste–heat or renewable energy sources.

Subp. 2. [Repealed, 16 SR 2687]

Subp. 3. **Efficiency requirements.** HVAC system heating and cooling equipment regulated by the National Appliance Energy Conservation Act of 1987 must conform to the efficiency requirements of Standard RS–5 listed in chapter 7.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

7670.0670 [Repealed, 16 SR 2687]

7670.0700 [Repealed, 15 SR 2407]

7670.0710 AMENDMENTS TO SECTION 504: SERVICE WATER HEATING.

Subpart 1. **Efficiency requirements.** Section 504.2 of the Model Energy Code is amended to read:

504.2 Efficiency requirements. Service water heating equipment must meet the minimum efficiency requirements listed in RS–6 with the following exceptions:

Fuel Type	Input Rating	Input to Volume Ratio (Btuh/gal)	Efficiency	Standby Loss (%/hour)
Electric	>12 KW			0.30 + 27 ÷ Vt
Gas/Oil	≤155,000 Btuh	>4,000	80 percent	1.3 + 114 ÷ Vt
Gas/Oil	>155,000 Btuh	>4,000	80 percent	1.3 + 95 ÷ Vt
Gas/Oil	All	≥4,000	80 percent	2.3 + 67 ÷ Vt

Where: Vt is the measured storage volume in gallons.

Test procedures for electric, gas, and oil water heaters not regulated by the National Appliance Energy Conservation Act (NAECA) of 1987 must follow procedures prescribed in ANSI Z21.10.3–1990.

Subp. 2. **Time clocks.** Section 504.5 of the Model Energy Code is amended by deleting section 504.5.3.

Subp. 3. **Pipe insulation.** Section 504.7 of the Model Energy Code is amended by deleting the exception and by adding a paragraph to read:

504.7.1 Nonrecirculating systems. Either the first eight feet of both inlet and outlet pipe from the storage tank must be insulated in accordance with Table No. 504.7, or heat traps must be installed on both inlet and outlet pipes with pipe insulation between the storage tank and heat traps installed in accordance with Table No. 504.7.

Subp. 4. **Devices to limit temperature.** Section 504.8.2 of the Model Energy Code is amended by deleting section 504.8.2.2.

Subp. 5. **Efficiency requirements.** Service water heating equipment regulated by the National Appliance Energy Conservation Act of 1987 must conform to the efficiency requirements of Standard RS–5 listed in chapter 7.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

7670.0720 [Repealed, 15 SR 2407]

7670.0730 [Repealed, 15 SR 2407]

ELECTRICAL POWER AND LIGHTING

7670.0800 AMENDMENTS TO SECTION 505: ELECTRIC POWER AND LIGHTING.

Subpart 1. **Electric energy determination.** Section 505.2 of the Model Energy Code is amended to read:

505.2 Electrical energy consumption. In multifamily dwellings, provision must be made to determine the electrical energy consumed by each tenant by separately metering individual dwelling units.

EXCEPTION: Motels, hotels, college dormitories, other transient facilities, and buildings intended for occupancy primarily by persons who are 62 years of age or older or handicapped, or which contain a majority of units not equipped with complete kitchen facilities.

505.2.1 Electrical distribution monitoring. In electrical panels of buildings other than residential buildings three stories or less in height, all feeder wiring and the panel feeder must be capable of accepting a clamp–on ampmeter.

Subp. 2. **Lighting power budget.** The lighting requirements of sections 505.3 and 505.4 of the Model Energy Code are amended to read:

The lighting power budget must be the upper limit of the power to provide the lighting needs in accordance with the 1993 criteria and calculation procedure specified in Standard RS–29 listed in chapter 7 with the following exceptions:

(1) at each occurrence, the words "sections 11 and 12" are amended to read "Chapter 4 of the Model Energy Code";

(2) each time the word "shall" is used in reference to an inanimate object, "shall" is changed to "must";

(3) all recommendations identified by "may" or "should" are deleted;

(4) section 3.1.6.2 is amended to reference equation 3.4–1;

(5) section 3.2 is deleted;

(6) section 3.3.1.2:2 is amended to read:

3.3.1.2.2 Equivalent number of controls. A reduction in the minimum number of controls is permitted by using an equivalent number of controls from Table 3.3–1 where control types used in Table 3.3–1 are used. However, the minimum number of controls must not be less than one for each 20 ampere circuit;

(7) section 3.3.1.2.3(a) is amended to read:

3.3.1.2.3(a) Lighting for spaces that must be used as a whole, such as public lobbies of office buildings, hotels, and hospitals; retail and department stores; and warehouses, storerooms, and service corridors under centralized supervision may be controlled by a lesser number of controls, but not less than one for each 20 ampere circuit or a total of three controls, whichever is greater;

(8) sections 3.3.2.1 and 3.3.2.2 are amended to read:

Fluorescent lamp ballasts must comply with Standard RS–5 listed in chapter 7 of the Model Energy Code;

(9) section 3.5.5 is amended by changing the units of Interior Power Allowance in equation 3.5–3 to Watts;

(10) section 3.5.5 is amended to calculate "unlisted space" by subtracting the Listed Space Area (LSA) from the Gross Lighting Area (GLA);

(11) Table 3.5–2 is amended to read:

Table 3.5–2

Automatic Control Device(s)	Power Adjustment Factor
Daylight Sensing Controls (DS), continuous dimming	0.30
DS, multiple step dimming	0.20
DS, ON/OFF	0.10
DS, continuous dimming and programmable timing	0.35
DS, multiple step dimming and programmable timing	0.25
DS, ON/OFF and programmable timing	0.15
DS, continuous dimming, programmable timing, and lumen maintenance	0.40
DS, multiple step dimming, programmable timing, and lumen maintenance	0.30
DS, ON/OFF, programmable timing, and lumen maintenance	0.20
Lumen maintenance	0.10
Lumen maintenance and programmable timing control	0.15
Programmable timing control	0.15
Occupancy sensor	0.30
Occupancy sensor DS, continuous dimming	0.40
Occupancy sensor DS, multiple step dimming	0.35
Occupancy sensor DS, ON/OFF	0.35
Occupancy sensor, DS, continuous dimming, and lumen maintenance	0.45
Occupancy sensor, DS, multiple step dimming, and lumen maintenance	0.40
Occupancy sensor, DS, ON/OFF, and lumen maintenance	0.35
Occupancy sensor and lumen maintenance	0.35
Occupancy sensor and programmable timing control	0.35

Standard RS–31 listed in chapter 7 is an acceptable method for determining compliance of the lighting system design with this subpart.

EXCEPTION: One– and two–family detached dwellings and the dwelling portion of multifamily buildings.

Subp. 3. **Internally illuminated exit signs.** Internally illuminated exit signs must be in accordance with the lighting requirements specified in Minnesota Statutes, section 16B.61, subdivision 3.

Subp. 4. **Electric motor efficiencies.** All permanently wired, single–speed, Design A and B, polyphase induction motors of 1 hp or more must have National Electrical Manufacturers Association nominal efficiencies not less than those listed in the table below.

	OPEN				ENCLOSED			
HORSE POWER	3600 RPM	1800 RPM	1200 RPM	900 RPM	3600 RPM	1800 RPM	1200 RPM	900 RPM
1 to 4	82.5%	82.5%	80.0%	74.0%	82.5%	82.5%	80.0%	74.0%
5 to 9	85.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	85.5%
10 to 19	88.5%	89.5%	90.2%	89.5%	89.5%	89.5%	89.5%	88.5%
20 to 49	90.2%	91.0%	91.0%	90.2%	90.2%	91.0%	90.2%	89.5%
50 to 99	92.4%	93.0%	93.0%	91.7%	92.4%	93.0%	93.0%	91.7%
100 to 124	93.0%	94.1%	94.1%	93.6%	93.6%	94.5%	94.1%	93.0%
125 and greater	93.6%	94.5%	94.1%	93.6%	94.5%	94.5%	94.1%	93.6%

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

BUILDING DESIGN BY ACCEPTABLE PRACTICE

7670.0850 AMENDMENT TO SECTION 600: DESIGN BY ACCEPTABLE PRACTICE.

Section 601.1 of the Model Energy Code is amended by adding a paragraph to read:

Buildings constructed in accordance with this section must also comply with parts 7670.0470 to 7670.0800 as indicated below:

Model Energy Code	Minnesota Rules Part
602.2	7670.0470, 7670.0480
602.2.4	7670.0500, 7670.0530
602.2.5, 602.2.6	7670.0510
602.3	7670.0550
603	7670.0610, 7670.0660
604	7670.0710
605	7670.0800

Statutory Authority: *MS s 216C.19*

History: *15 SR 2407; 16 SR 2687*

7670.0900 [Repealed, 15 SR 2407]

7670.0910 [Repealed, 15 SR 2407]

7670.0920 [Repealed, 15 SR 2407]

7670.0930 [Repealed, 15 SR 2407]

7670.0940 [Repealed, 15 SR 2407]

7670.0950 [Repealed, 15 SR 2407]

7670.0960 [Repealed, 15 SR 2407]

7670.0970 [Repealed, 15 SR 2407]

REFERENCE STANDARDS

7670.1000 AMENDMENTS TO SECTION 701: STANDARDS.

Section 701.1 of the Model Energy Code is amended by replacing and adding the following code standard numbers to read:

A. RS–1, 1989 ASHRAE Handbook of Fundamentals.

B. RS–3, ASHRAE Standard 62–1989, Ventilation for Acceptable Indoor Air Quality.

C. RS–4, ASHRAE Standard 55–1981 Thermal Environment Conditions for Human Occupancy.

D. RS–5, Code of Federal Regulations, title 10, part 430.32, Energy Conservation Standards for Consumer Products.

E. RS–6, Code of Federal Regulations, title 10, part 435.109, Table 9.3.1, Standard Rating Conditions and Minimum Performance of Water Heating Equipment.

F. RS–10, Code of Federal Regulations, title 10, part 435.108, HVAC Equipment.

G. RS–11, 1991 ASHRAE HVAC Applications.

H. RS–17, SMACNA HVAC Duct Construction Standards: Metal and Flexible, First Edition, 1985.

I. RS–18, SMACNA HVAC Duct Leakage Test Manual, First Edition, 1985.

J. RS–20, NFRC 100–91: Procedure for Determining Fenestration Product Thermal Properties (Currently Limited to U–values).

K. RS–23, Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1951–80 Minnesota. National Oceanic and Atmospheric Administration September 1982.

L. RS–24, Code of Federal Regulations, title 10, part 435.105, section 5.3.3.2.1(b), Calculation procedures for parallel path correction factor method.

M. RS–25, Code of Federal Regulations, title 10, part 435.105, section 5.3.3.2.1(d), Calculation procedures for thermal bridges in Sheet Metal Construction.

N. RS–26, AAMA Standard 1503.1–88, Voluntary Test Method for Thermal Transmittance and Condensation of Windows, Doors and Glazed Wall Sections.

O. RS–27, ASTM C 236–87, Standard Test Method for Steady State Performance of Building Assemblies by means of a Guarded Hot Box.

P. RS–28, ASTM C 976–82, Standard Test Method for Steady State Performance of Building Assemblies by means of a Calibrated Hot Box.

Q. RS–29, Code of Federal Regulations, title 10, part 435.103, lighting.

R. RS–30, ASHRAE Standard 119–1988, Air Leakage Performance for Detached Single–Family Residential Buildings.

S. RS–31, LTGSTD, lighting prescriptive and system performance compliance calculation program.

Statutory Authority: *MS s 216C.19*

History: *8 SR 1229; L 1987 c 312 art 1 s 9; 15 SR 2407; 16 SR 2687*

7670.1010 [Repealed, 15 SR 2407]

7670.1020 [Repealed, 15 SR 2407]

7670.1030 [Repealed, 15 SR 2407]

7670.1100 [Repealed, 15 SR 2407]

7670.1110 [Repealed, 15 SR 2407]

EFFECTIVE DATES

7670.1115 EFFECTIVE DATES.

The effective date of amendments to this chapter is September 7, 1992.

Exception: The effective date of part 7670.0550, subpart 3, is January 1, 1993.

Statutory Authority: *MS s 216C.19*

History: *16 SR 2687*

NOTE: This part has been renumbered editorially. It was originally numbered 7670.1100 at the time of its adoption.