CHAPTER 7674
DEPARTMENT OF COMMERCE
ENERGY CODE; SMALL, MULTISTORY RESIDENCES

NOTE: This chapter was adopted at 23 SR 145 on July 20, 1998. It became effective on April 15, 2000, as an alternative to chapter 7670. Laws 2000, chapter 407, section 1.

MULTISTORY RESIDENTIAL BUILDINGS THREE STORIES OR LESS IN HEIGHT

7674.0100 AUTHORITY AND PURPOSE.

This chapter is adopted pursuant to Minnesota Statutes, section 216C.19, subdivision 8. The purpose of this chapter is to establish the minimum energy code criteria necessary to construct new and remodeled elements of multifamily residential buildings of three stories or less in height, as well as to provide alternatives for demonstrating compliance with those minimum criteria.

Statutory Authority: *MS s 216C.19*
History: *23 SR 145*

7674.0200 APPLICATION.

Subpart 1. **General.** This chapter is a part of the Minnesota State State Building Code, adopted according to Minnesota Statutes, sections 16B.59 to 16B.73. Enforcement of this chapter must not abridge safety, health, or environmental requirements under other applicable codes or ordinances.

Subp. 2. **New and remodeled buildings.** This chapter applies to all new and remodeled elements of multifamily residential buildings of three stories or less in height.

Subp. 3. **Existing residences.** Additions, alterations, and repairs to existing multifamily residential buildings of three stories or less in height must comply with part 7674.1100.

Subp. 4. **Mixed occupancy.** If a building houses more than one occupancy, each portion of the building must conform to the requirements for the occupancy housed in that portion. If minor accessory uses occupy no more than ten percent of the area of any floor of a building, the major use is considered the building occupancy.

Subp. 5. **Historic buildings.** Alterations to historic buildings and changes of occupancy are regulated by the Minnesota State Building Code, part 1305.0010.

Subp. 6. **Exempt buildings.** This chapter does not cover buildings, structures, or portions of buildings or structures whose peak design rate of energy usage is less than 3.4 Btu's per hour per square foot or 1.0 watt per square foot of floor area for all purposes.

Statutory Authority: *MS s 216C.19*
History: *23 SR 145*

7674.0300 MATERIALS AND EQUIPMENT.

Subpart 1. **Identification.** Materials and equipment must be identified in order to show compliance with this chapter.

Subp. 2. **Plans and specifications.** Plans, specifications, and either calculations or compliance forms must demonstrate compliance with all requirements of this chapter. Energy details must show all pertinent data and features of the building, equipment, and systems including:

A. exterior envelope component materials;

B. U-values of windows, doors, and skylights;

C. R-values of insulating materials;

D. location of interior air barrier, vapor retarder, and wind wash barrier;

E. air sealing requirements;

F. size and type of equipment;

G. equipment controls; and

H. other data needed to indicate conformance with this chapter.

Subp. 3. **Maintenance information.** Required regular maintenance actions must be clearly stated and incorporated on a readily accessible label. The label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product. Maintenance instructions must be furnished for equipment that requires preventive maintenance for efficient operation.

Subp. 4. **Thermal insulation.** Thermal insulation used in residential buildings of three stories or less in height must conform to chapter 7640, Minnesota Thermal Insulation Standards, adopted by the Department of Commerce. 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: *23 SR 145; L 2001 1Sp4 art 6 s 1*

7674.0400 INCORPORATIONS BY REFERENCE.

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

A. ASHRAE, 1997 Handbook of Fundamentals, chapter 27;

B. ASHRAE Standard 84-1991, Method of Testing Air-to-Air Heat Exchangers;

C. ASTM E1677-95 Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls;

D. Children, Families, and Learning Worst Case Draft Test, as published in the State of Minnesota Plan for Weatherization Assistance for Low-Income Persons, March 10, 1997;

E. Manual J: Load Calculation for Residential Winter and Summer Air Conditioning, 7th ed., Air Conditioning Contractors of America;

F. MNcheck, residential energy code compliance personal computer program published by the Minnesota Department of Commerce; and

G. The Model Energy Code, chapter 4, 1995 Edition, as published by the Council of American Building Officials (Falls Church, Virginia).

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.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145; L 2001 1Sp4 art 6 s 1*

7674.0500 DEFINITIONS.

Subpart 1. **Definitions.** The definitions in this part apply to this chapter.

Subp. 2. **Accessible.** "Accessible" means having access to but which first may require the removal of an access panel, door, or similar obstruction covering the item described.

Subp. 3. **Attic bypass.** "Attic bypass" means a passageway where air may pass from a conditioned space to the unconditioned side of a roof or attic. Attic bypasses include utility penetrations, interior soffits, openings in top plates, fan penetrations, and light fixture penetrations.

Subp. 4. **Building envelope.** "Building envelope" means the elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or semiconditioned spaces.

Subp. 5. **Enclosed space.** "Enclosed space" means an area defined by ceiling height partitions when less than half the area of the common wall with the surrounding space is open or if the area of the opening is 25 square feet or less.

Subp. 6. **Energy.** "Energy" means the capacity for doing work, taking a number of forms which may be transformed from one into another such as thermal (heat), mechanical (work), electrical, and chemical, in customary units measured in kilowatt-hours (kWh's) or British thermal units (Btu's).

Subp. 7. **Fenestration (window, door, or skylight) area.** "Fenestration (window, door, or skylight) area" means the area of a window, door, or skylight equal to the rough opening of the window, door, or skylight, respectively, less installation clearances.

Subp. 8. **Gross wall area.** "Gross wall area" means the building envelope wall area bounding interior space from grade to the roof/ceiling assembly enclosing conditioned or semiconditioned space, including opaque wall, window, and door area.

For basement walls with an average below-grade area less than 50 percent of the total wall area, including openings, all walls, including the below-grade portion, are included as part of the gross wall area. Windows and doors in basement walls are also included in the gross wall area.

Subp. 9. **Heat trap.** "Heat trap" means a device for preventing convection in supply and return pipes serving service water heaters and tanks. It includes pipe loop configurations to prevent convection. For water heaters, it does not include mechanical heat traps that are not included as part of the manufacturer's testing and performance rating of the appliance.

Subp. 10. **Heated slab.** "Heated slab" means slab-on-grade construction in which the heating elements or hot air distribution system is in contact with or placed within the slab or below the slab.

Subp. 11. **HVAC.** "HVAC" means heating, ventilating, and air conditioning.

Subp. 12. **HVAC system.** "HVAC system" means a system that provides either collectively or individually the processes of comfort heating, ventilating, or air conditioning within or associated with a building.

Subp. 13. **Infiltration.** "Infiltration" means the uncontrolled air leakage through cracks and interstices in any building element and around windows and doors of a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density.

Subp. 14. **Interior air barrier.** "Interior air barrier" means a material or combination of materials which are durable and installed at the warm side of the building envelope to resist the passage of air and airborne moisture from a conditioned or semiconditioned space into the building envelope. Acceptable air barrier materials include supported four mil polyethylene, gypsum board, wood products, rigid insulation, plastic, metal, sealed concrete products, and any air impermeable material that qualifies as a draft stop, fire stop, or fire block.

Subp. 15. **Manual.** "Manual" means capable of being operated by personal intervention.

Subp. 16. **Readily accessible.** "Readily accessible" means capable of being reached safely and quickly for operation, repair, or inspection, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to the use of portable access equipment.

Subp. 17. **Renewable energy sources.** "Renewable energy sources" means sources of energy, excluding minerals, derived from incoming solar radiation, including natural daylighting and photosynthetic processes, including biomass, from resulting phenomena including wind, waves and tides, and lake or pond thermal differences, and energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

Subp. 18. **Roof/ceiling assembly.** "Roof/ceiling assembly" means all components of the roof/ceiling envelope through which heat flows, thus creating a building transmission heat loss or gain, where such assembly is exposed to outdoor air and encloses a conditioned or semiconditioned space.

The gross area of a roof/ceiling assembly consists of the total interior surface of the assembly, including skylights exposed to the conditioned or semiconditioned space.

Subp. 19. **Seal.** "Seal" means to secure at all edges, joints, openings, and penetrations of barrier materials in a permanent manner to resist the passage of air and airborne moisture.

Subp. 20. **Service water heating.** "Service water heating" means the supply of hot water for domestic or commercial purposes other than space heating.

Subp. 21. **Thermal resistance or R.** "Thermal resistance" or "R" means the reciprocal of thermal conductance (h ft^2 ° F/Btu).

Subp. 22. **Thermal transmittance, overall or U_o.** "Thermal transmittance, overall" or "U_o" means the overall thermal transmittance of an exterior building envelope component, such as a wall, floor, or roof/ceiling. The value of U_o is calculated by the parallel path heat flow method using the areas and thermal transmittance values of the various elements, such as windows, doors, and opaque surfaces that comprise the gross area of the building component.

Subp. 23. **UL181 or equivalent.** "UL181 or equivalent" means a duct sealing product that meets standards UL181A, Ul181B, or the UL standard for metal duct sealant. It also means a duct tape with metal foil backing and acrylic or silicone adhesive. It does not mean cloth-backed tape with rubber adhesive.

Subp. 24. **Unconditioned space.** "Unconditioned space" means space within a building which is neither conditioned nor semiconditioned, including outdoor space and spaces within a building with uncontrolled ventilation to outdoors.

Subp. 25. **Vapor retarder.** "Vapor retarder" means a material or assembly to impede water vapor passage designed to meet a maximum permeability rating of 1.0 grain per hour per square foot per inch Hg pressure differential. Polyethylene material which is used to meet the requirements of this subpart must either be designed to have a minimum thickness of four mils, be cross laminated, or be shown to have the strength and puncture resistance of not less than cross laminated polyethylene.

Subp. 26. **Warm side.** "Warm side" means the location within a building envelope element between the interior surface and the winter design condition dew point.

Subp. 27. **Wind wash barrier.** "Wind wash barrier" means a material or combination of materials, rigid or flexible, to resist the passage of unconditioned air into the building envelope. Wind wash barrier materials must be suitable for exterior conditions. Flexible wind wash barrier materials must meet ASTM E1677.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145*

7674.0600 MINIMUM ENVELOPE CRITERIA.

Subpart 1. **General.**

A. Buildings that are heated or mechanically cooled and heated slabs must be constructed so as to provide the required thermal performance for components identified in this part.

B. Buildings must be designed and constructed to permit continuity of air barriers and thermal insulation as required in this part.

C. The minimum criteria specified in this part must be met for new buildings in all cases, and shall not be made less stringent by a trade off.

D. Where sealed materials are required, sealants must be compatible with substrate and other materials being sealed. Consideration must be given to the installation conditions, temperature, moisture, gap width, and permanence of the seal required when selecting appropriate material for sealing.

Subp. 2. **Foundation walls and slabs on grade.**

A. Foundation walls enclosing conditioned or semiconditioned spaces must be insulated, including exposed edges of slabs on grade. The insulation must be continuous except where the insulation must be interrupted for purposes such as penetrations or structural requirements, provided that the insulation is sealed or tightly abutted at the penetration or structural member.

B. Foundation wall insulation must be not less than R-5 from the top of the wall down to the top of the footing, or top of the floor if insulation is on the interior.

C. Slabs on grade, including heated aprons located outside of a building, must be insulated around the perimeter. The insulation must extend from the top of the slab downward to either the design frost line or to the top of the footing, whichever is less. The thermal insulation must be not less than R-5.

D. If 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.

Subp. 3. **Framed components.**

A. Insulated ceilings must have a vertical clearance of not less than six inches from the outside edge of the exterior wall top plate to the roof sheathing, and not less than R-19 insulation at the inside edge of the top plate.

B. Exterior corners must be framed so that insulation can be installed after the exterior sheathing is installed.

C. Intersections of interior partition walls with exterior walls must be framed so that insulation can be installed between the partition wall and exterior sheathing after the exterior sheathing is installed.

D. Gaps between framing which are less than one-half inch in width must be either eliminated by securing the framing members together, or must be insulated at the time of assembly.

E. Fire stops, fire blocks, and draft stops separating conditioned and unconditioned spaces must be sealed. This requirement applies to dropped ceilings, soffits, fire or draft stops, fireplace framing, and similar elements.

F. Prior to installing a tub, shower, or spa located at an exterior wall, a continuously sealed interior air barrier must be installed on the exterior wall to allow continuity with adjacent interior air barrier materials. The interior air barrier must be covered to protect against physical abuse.

G. Walls exposed to attic areas and skylight shafts must be constructed to meet the same requirements as exterior walls, including wind wash barrier, insulation, vapor retarder, and interior air barrier requirements. If sheathing is not installed, the wind wash barrier must be supported between solid blocking.

Subp. 4. **Interior air barrier.** An interior air barrier must be installed on the warm side of the building envelope to resist air leakage and movement of moisture in accordance with subpart 3, items E and F.

Subp. 5. **Interior air barrier penetrations.**

A. All penetrations installed through an interior air barrier material which are required to be sealed must be sealed so that a continuous interior air barrier is maintained. All penetrations made prior to framing inspection must be sealed prior to framing inspection, and no work may be covered or made inaccessible without sealing all penetrations.

B. Penetrations that must be sealed are piping and ducts, wires and equipment, and flue and chimney penetrations.

C. Sealing for wires and equipment must include the service entrance, wires, conduit, cables, panels, recessed light fixtures, electronic equipment, and heating appliances. Recessed light fixtures must be sealed in an approved manner.

EXCEPTION: Electrical boxes and fan housings.

D. Penetration openings must be of appropriate dimensions to facilitate the sealing method. Penetrations in a flexible interior air barrier must be supported by rigid material or approved method to facilitate permanent air sealing.

Subp. 6. **Vapor retarder requirements.** A vapor retarder must be installed on the warm side of all walls, ceilings, and earth floors of unvented crawl spaces.

Subp. 7. **Exterior wind wash barrier.** A barrier must be provided at the locations identified in this subpart to resist wind wash.

A. A rigid wind wash barrier must be tightly installed at the exterior edge of the exterior wall top plate, extending vertically to the underside of the truss top chord, or for nontruss wood framing to within 3-1/2 inches of the roof deck, or to the top of the required ceiling insulation.

B. A sealed wind wash barrier must be installed at cantilevered floors, bay windows, and overhangs separating conditioned spaces from unconditioned spaces.

C. A sealed wind wash barrier must be installed between an attached garage and interior conditioned spaces.

D. Party walls constructed with an interior air space must have a sealed wind wash barrier at the intersection with the exterior wall.

Subp. 8. **Fenestration products; installation requirements.** Minimum clearance between rough opening framing and fenestration product frame must be maintained in accordance with the manufacturer's instructions to facilitate insulation. If the manufacturer's installation instructions require insulation between the rough opening and the frame, the portion of the rough opening which is located to the exterior side of the glazing must be insulated. The required insulation must be installed by the installer at the time of the fenestration product installation. The installer must also provide a durable exterior side infiltration and weather seal around the perimeter of the product frame. Windows must be labeled with their rated infiltration and overall assembly U-value. Window labels must not be removed until after inspection of installation.

Subp. 9. **Floors over unconditioned spaces.** Floors over unconditioned spaces must have a maximum overall thermal transmittance as required for the building types identified in this chapter. While the U-value may be increased or decreased by trade off calculations, in all cases it must have a maximum overall thermal transmittance of 0.033. Floor rim joist framing must have a sealed wind wash barrier according to subpart 7, item B.

Subp. 10. **Thermal insulation placement and support.**

A. Thermal insulation must be installed in ceilings and walls in a permanent manner and in substantial contact with the interior air barrier.

B. When framing or equipment is installed that will restrict access to building cavities requiring insulation, those cavities must be insulated prior to restricting access.

C. All insulation in floors and walls must be supported and protected on the unconditioned side by sheathing or other approved materials to resist insulation movement and wind wash.

D. In buildings having eave ventilation and loose fill attic insulation, a barrier must be installed to prevent the insulation from entering the eave. Loose fill insulation

must be installed after eave protection is installed, unless prior loose fill insulation is required to prevent cold weather freezing of interior applied building materials.

E. Where building designs and code requirements allow, thermal insulation must be continuous and uninterrupted by ducts, pipes, wiring, bracing, and other elements which are capable of being installed to the interior or exterior side of the insulation.

Subp. 11. **Performance and identification of loose fill insulation.**

A. Loose fill insulation installed to meet the requirements of this chapter must provide the required performance at 75 degrees Fahrenheit mean temperature and no less than the required performance at winter design conditions.

B. Insulation must be installed in accordance with the bag count on the manufacturer's coverage chart.

C. Identification must be placed in accessible attics of all buildings with loose fill insulation.

(1) A means must be provided to verify the claimed insulation level by installing insulation thickness markers labeled with a minimum of one-inch increments at approximately ten-foot spacing throughout the attic.

(2) A completed insulation receipt attic card must be attached to the framing near the access opening in a clearly visible place. The attic card must identify the type of insulation installed, the manufacturer, the installer, the R-value, the design settled thickness, the square footage of attic coverage area, and the number of bags installed, and must be signed and dated by the installer.

(3) Notification must be posted near the building inspection card indicating the installed attic R-value and date of installation.

D. Attic access panels must be installed to a minimum of R-38 for ceiling panels and R-19 for wall panels, and must be weatherstripped.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145*

7674.0700 METHODS FOR COMPLIANCE.

Subpart 1. **Scope.** Multifamily residential buildings three stories or less in height must comply with the requirements of subpart 3 and subpart 5, 6, or 7.

Subp. 2. **Calculations.** Calculation of overall thermal transmittance values (U_o-values) must be according to chapter 7678.

Subp. 3. **Minimum R-values, maximum U-values, and other minimum requirements.** The minimum criteria specified in this subpart must be met for new buildings in all cases, and must not be made less stringent by a trade off.

A. Fenestration products (windows, doors, and skylights) must have air infiltration rates not exceeding those listed in part 7678.0600. The average U-values for fenestration products as determined by part 7678.0600 used in the building must not exceed:

(1) U-0.37 for windows and glass doors (except foundation windows 5.6 square feet and less);

(2) U-0.55 for skylights;

(3) U-0.51 for foundation windows 5.6 square feet and less.

B. Foundation wall insulation must be not less than R-5.

C. Slab on grade insulation must not be less than R-5.

D. Floors over unconditioned spaces must have a maximum U_o-value of 0.033.

E. All other minimum criteria specified in part 7674.0600 must be met.

Subp. 4. **Total heat gain or loss for entire building.** The value of U_o for any assembly such as roof/ceiling, wall, or floor may be increased and traded off by decreasing the value of U_o for other components, provided that the total heat gain or

loss for the entire building envelope does not exceed the total resulting from conformance to the values of U_o specified in this part.

Subp. 5. **Building component performance method.**

A. For buildings located in Minnesota climate zones as defined in part 1305.5400 of the Minnesota State Building Code, the gross exterior wall area must have an above-grade U_o-value not exceeding the values in this item.

(1) Zone I (northern Minnesota), maximum U_o-value is 0.129;

(2) Zone II (southern Minnesota), maximum U_o-value is 0.131.

B. For roof/ceilings, U_o-value must not exceed 0.026 Btu/°F h ft^2.

Subp. 6. **MNcheck performance method.** A building is deemed to comply with this part if the thermal envelope passes using the MNcheck computer program.

Subp. 7. **Building design by systems analysis method.**

A. This subpart establishes design criteria in terms of total energy use by a residential building, including all of its systems. The intent of this item is to allow flexibility in the design process while ensuring that the annual energy or energy cost of the proposed design is no more than is allowed under the prescriptive path.

B. Building design by systems analysis must comply with chapter 4 of the Model Energy Code, 1995 edition. Chapter 4 of the Model Energy Code is amended by:

(1) replacing references to chapter 5 or 6 with Minnesota Rules, parts 7674.0600 to 7674.1100;

(2) changing the air changes per hour for the standard design to be 0.10, for calculation purposes only; and

(3) adding a requirement that if the proposed building uses an air or water source heat pump for heating or cooling, the standard design building must also use a heat pump with the same energy source for the comparative analysis.

Subp. 8. **Enclosed three-season porches method.**

A. This subpart may be applied to an enclosed three-season porch when heating and cooling systems for the space are either separate or separately zoned from other conditioned spaces and have separate controls capable of complete and independent shut-off of heating and cooling systems.

B. Minimum requirements for the porch and wall separating the porch from conditioned spaces are contained in subitems (1) to (3).

(1) Building components separating conditioned areas of the building from the porch as well as the porch from unconditioned spaces must meet the minimum criteria of part 7674.0600 for separating, including interior air barrier and vapor retarder requirements.

(2) The thermal performance of the porch roofs, floors over unconditioned spaces, and fenestration products must be not less than required in subpart 3, 4, 5, or 6.

(3) The U_o-values of the walls separating other conditioned areas of the building from the porch and the porch from unconditioned spaces must not exceed the values identified in this subitem, or a U_o-value not greater than 0.11 for the combined thermal resistance of both walls in series.

Porch wall	Separation wall
0.14	0.15
0.18	0.14
0.22	0.13
0.26	0.13
0.30	0.13
0.34	0.12

Statutory Authority: *MS s 216C.19*
History: *23 SR 145*

7674.0800 BUILDING MECHANICAL SYSTEMS.

Subpart 1. **General.** Multifamily residential buildings of three stories or less with a self-contained HVAC system must comply with this part. Multifamily residential buildings of three stories or less with a central heating system must comply with part 7676.1000, Building Mechanical Systems.

Subp. 2. **Equipment sizing.**

A. HVAC equipment must be sized according to the ASHRAE Handbook of Fundamentals or ACCA Manual J.

B. Design conditions must be determined according to the outdoor design conditions table. Design condition adjustments may be made as determined by the building official to reflect local climates that differ from the tabulated temperatures or local weather experience.

DESIGN CONDITIONS

City	Summer Db/Wb	Winter Db
Albert Lea	87/72	-17
Alexandria	88/72	-22
Bemidji	85/69	-31
Brainerd	87/71	-20
Duluth	82/68	-21
Faribault	88/72	-17
Fergus Falls	88/72	-21
International Falls	83/68	-29
Mankato	88/72	-17
Minneapolis	89/73	-16
Rochester	87/72	-17
St. Cloud	88/72	-15
St. Paul	89/73	-16
Virginia	83/68	-25
Willmar	88/72	-15
Winona	88/73	-14

Db = dry bulb temperature, degrees Fahrenheit
Wb = wet bulb temperature, degrees Fahrenheit

C. Indoor design temperature must be 72 degrees Fahrenheit for heating and 74 degrees Fahrenheit for cooling.

Subp. 3. **Controls.**

A. A thermostat must provide a readily accessible manual or automatic means for controlling the temperature. When used to control both heating and cooling, the thermostat must be capable of being set from 55 to 85 degrees Fahrenheit, and must be capable of operating the system heating and cooling in sequence.

B. Heat pumps must be provided with a control to prevent supplementary heater operation when the operating load can be met by the heat pump alone. Supplementary heater operation is permitted during transient periods of no more than 15 minutes, such as start-ups, following room thermostat set-point advance, and during defrost. A two-stage thermostat, which controls the supplementary heat on its second stage, is acceptable for meeting this requirement.

Subp. 4. **Duct construction.** Ductwork installation requirements are provided in the Minnesota State Mechanical Code, chapter 1346. Ducts outside of the interior air barrier must be sealed with a product meeting UL181 or equivalent.

Subp. 5. **Duct insulation.**

A. Ducts in wall and floor cavities of the thermal envelope must be a minimum of R-8 between the duct and unconditioned or semiconditioned space.

B. Ducts running outside the thermal envelope, including ducts in attics and ceilings, must be a minimum of R-8 between the duct and unconditioned space.

C. Ducts within concrete or in contact with the ground must be insulated to R-5.

Subp. 6. **Pipe insulation.** HVAC pipe insulation must be in accordance with part 7676.1100, subpart 17.

Subp. 7. **Testing.** All controls must be tested to ensure that control elements are calibrated, adjusted, and in proper working condition.

Subp. 8. **Equipment efficiency.** HVAC equipment must meet the requirements of part 7678.0700.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145*

7674.0900 SERVICE WATER HEATING.

Subpart 1. **Ice-making water supply.** Water supplies to ice-making machines and residential refrigerators must be taken from a cold water line of the water distribution system.

Subp. 2. **Efficiency requirements.** Service water heating equipment must meet the minimum efficiency requirements of chapter 7678.

Subp. 3. **Automatic controls.** Service water heating systems must be equipped with automatic temperature controls capable of adjustment from the lowest to the highest temperature settings for the intended use.

Subp. 4. **Shutdown.** A separate switch must be provided to permit turning off the energy supplied to electric service water heating systems. A separate valve must be provided to permit turning off the energy supplied to the main burners of all other types of service water heating systems.

Subp. 5. **Swimming pools and spas.**

A. All swimming pool and spa heaters must be equipped with a readily accessible ON/OFF switch to allow shutting off the operation of the heater without adjusting the thermostat setting and to allow restarting without relighting the pilot light.

B. Indoor swimming pool and spa area ventilating systems must be controlled with a humidistat. Additionally, heated indoor swimming pools and spas must provide for energy conservation by at least one of the following methods:

(1) the pool or spa must be equipped with a cover according to part 4717.1575, the Minnesota Department of Health pool cover safety standard;

(2) the ventilating system serving the pool or spa area must provide a heat recovery of 70 percent as calculated by ASHRAE Standard 84 at winter design conditions; or

(3) renewable energy sources must be capable of providing at least 50 percent of the heating energy required for the pool or spa over an operating season.

C. Heated outdoor swimming pools and spas must either be provided with a cover according to part 4717.1575 or the heating system must use renewable energy sources to provide at least 70 percent of the heating energy required over an operating season.

Subp. 6. **Pump operation.** Circulating hot water systems must be equipped with automatic time switches or other controls so that the circulation pumps can be conveniently turned off when the use of hot water is not required.

Subp. 7. **Pipe insulation.**

A. Minimum pipe insulation for domestic and service water heating systems must comply with this subpart. Pipe insulation is assumed to have a k-value of 0.27. If the k-value of a product is less than 0.22, then the thickness must be adjusted to have an equivalent R-value.

(1) Pipes in conditioned and semiconditioned spaces must have a one-half inch minimum of insulation.

(2) Pipes in unconditioned space must have 1-1/2 inch minimum of insulation.

(3) Pipes in contact with high conductivity material, including concrete and earth, must have a one inch minimum of insulation.

(4) Pipe insulation is not required at support brackets. For water heaters with a draft diverter, pipe insulation is not required to be closer to the draft diverter than is recommended by the manufacturer or safety codes. Pipe insulation is not required for nonrecirculating systems where the water heater is equipped with heat traps on both the supply and return.

B. For recirculating systems, the entire pipe must be insulated.

C. For nonrecirculating systems with unfired storage tank, the first eight feet of both inlet and outlet pipes from the storage tank must be insulated. Pipes between the water heater and storage tank must be insulated.

D. For nonrecirculating systems with a water heater, both supply and return piping for water heaters must be insulated for a distance of three feet from the water heater.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145*

7674.1000 ELECTRICAL POWER AND LIGHTING.

Subpart 1. **Multifamily electrical metering.** In new multifamily dwellings, the electrical energy consumed by each individual dwelling unit must be separately metered with individual metering readily accessible to the individual occupants.

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.

Subp. 2. **Lighting power budget.**

A. Lighting systems in the following areas and spaces must meet the requirements of this item:

(1) interior spaces of buildings which are not dwelling units;

(2) building exteriors and exterior areas, such as entrances, exits, and loading docks; and

(3) roads, grounds, parking, and other exterior areas where lighting is energized through the building's electrical service.

EXCEPTIONS: High risk security areas or any area identified by local ordinances or regulations or by security or safety personnel as requiring additional lighting are exempt from these requirements.

B. A building must be considered in compliance with this subpart if the following conditions are met:

(1) the minimum requirements for controls and fluorescent ballasts in subparts 3 and 4 are met;

(2) the exterior lighting power to be installed is not greater than the exterior lighting power allowance required in subpart 5; and

(3) the interior connected lighting power to be installed is not greater than the interior lighting power allowance.

C. For connected lighting power calculations, ballast and luminaire wattage must be determined according to this item.

(1) The ballast wattage must be as listed in the Northern States Power Company (NSP) Lighting Efficiency Program Input Wattage Guide, or if the ballast is not listed in the NSP Lighting Efficiency Program Input Wattage Guide, then ballast wattage must be the American National Standards Institute (ANSI) value published by the manufacturer.

(2) The connected lighting power includes permanently installed lighting plus supplemental or task-related lighting provided by movable or plug-in luminaires.

(3) The connected lighting power for luminaires with incandescent medium base sockets is the higher of the following two wattages: the total lamp wattage proposed for the luminaire; or 50 percent of the listed lighting power capacity of the luminaire in watts.

(4) The connected lighting power for track lights is the higher of the total lamp wattage proposed for the track or 50 percent of the total listed power capacity of the elements proposed for the track.

D. Trade offs between interior lighting power allowance and exterior lighting power allowance are not allowed. Trade offs of the interior lighting power budgets among interior spaces are allowed.

Subp. 3. **Controls.**

A. All lighting controls must be readily accessible to personnel occupying or using the space.

EXCEPTIONS: Automatic controls, programmable controls, lighting for safety hazards and security, controls requiring trained operators, controls for spaces that must be used as a whole, and controls for spaces intended for 24-hour per day use.

B. Exterior lighting must be automatically controlled by a timer, a photocell, or a combination of a timer and photocell. Timers must be of the automatic type capable of adjustment for seven days and for seasonal daylight schedule variations. All time controllers must be equipped with back-up mechanisms to keep time during a four-hour power outage.

C. If the building is served by an energy management system, programmable controls, shared tenant services that affect interior environments, or intelligent building systems, provisions must be made to incorporate lighting controls into the system if a separate automatically controlled lighting system is not provided.

Subp. 4. **Fluorescent lamp ballasts.**

A. Fluorescent lamp ballasts must comply with Code of Federal Regulations, title 10, part 435, 103, section 3.3.2, Fluorescent Lamp Ballast Standards.

EXCEPTIONS: Ballasts specifically designed for use with dimming controls.

B. Single-lamp ballasts are prohibited. Tandem wiring must be used to replace single-lamp ballasts with multiple-lamp ballasts.

EXCEPTION: Single-lamp ballasts may be used where luminaire spacing or obstructions cause whip length to exceed ten feet, and odd units at the end of arrays.

C. Fluorescent lamp ballasts must have a power factor equal to or greater than 90 percent.

EXCEPTION: Ballasts for circline lamps and compact fluorescent lamps.

Subp. 5. **Exterior lighting power allowance.**

A. Building exteriors, exterior areas, roads, grounds, and parking must comply with this subpart.

EXCEPTION: Outdoor security lighting may be exempt when approved by the building official, provided the lamp efficacy is not less than 55 lumens per watt.

B. The exterior lighting power density must be determined according to the exterior lighting power density table and must not exceed the exterior lighting power

allowance (ELPA). The ELPA is the sum of the allowances for each area of the building.

Exterior Lighting Unit Power Density

Area Description	Unit Power Density
Exit (with or without canopy)	25 W/Lin.ft. of door opening
Entrance (without canopy)	30 W/Lin.ft. of door opening
Entrance (with canopy)	
High traffic (retail, hotel, airport, theater, etc.)	10 W/ft^2 of canopied area
Light traffic (hospital, office, school, etc.)	4 W/ft^2 of canopied area
Loading area	0.40 W/ft^2
Loading door	20 W/Lin.ft. of door opening
Building exterior surfaces/facades	0.25 W/ft^2 of surface area to be illuminated
Storage and nonmanufacturing work areas	0.20 W/ft^2
Other activity areas for casual use such as picnic grounds, gardens, parks, and other landscaped areas	0.10 W/ft^2
Private driveways/walkways	0.10 W/ft^2
Public driveways/walkways	0.15 W/ft^2
Private parking lots	0.12 W/ft^2
Public parking lots	0.18 W/ft^2

Subp. 6. **Interior lighting.** The total adjusted lighting power in a building must not exceed the sum of the interior lighting power allowances.

A. The lighting power budget of each interior space must be determined by:

$LPB = A_{wp} \times UPD_b \times AF$

Where:

A_{wp} = Area of the room at the horizontal lighted working plane

UPD_b = Base UPD

B. The area factor must be determined by the equation or table in this unit based on the floor area and ceiling height of the room. Rooms with identical ceiling

height and activities, and with similar size, may be treated as a group. The area factor of such a group of rooms must be determined from the average area of the rooms.

The equation for area factor (AF) is as follows:

$AF = 0.2 + 0.8 EXP - [[[10.21 \times (CH - 2.5)]/SQRT (A_r) - 1] \times Ln (0.9)]$

Where:

CH = Ceiling height, feet

A_r = Floor area of room, square feet calculated from the inside dimensions of the room

If AF < 1.0 then AF = 1.0

If AF > 1.8 then AF = 1.8

C. The base unit power density must be selected from the table in this item. For applications to areas or activities other than those given, select values for similar areas or activities.

Performance Procedure Unit Power Density

Common Activity Areas	UPD	Note or Area Factor (AF) Required
Corridor	0.8	AF = 1.0
Food Service		
Fast Food/Cafeteria	0.8	
Leisure Dining	1.4	(1)
Bar/Lounge	1.3	(1)
Kitchen	1.4	
Recreation/Lounge	0.5	
Stairs		
Active Traffic	0.6	
Emergency Exit	0.4	
Toilet and Washroom	0.5	
Garage		
Auto/Pedestrian Circulation	0.25	(2)
Parking Area	0.2	(2)
Lobby (General)		
Reception and Waiting	0.55	
Elevator Lobbies	0.4	
Atrium (Multistory)		
First Three Floors	0.4	
Each Additional Floor	0.15	
Conference/Meeting Room	1.3	(3)
Storage and Warehouse		
Inactive Storage	0.2	
Active Storage, Bulky	0.3	
Laundry		
Washing	0.6	

Ironing and Sorting	1.3

(1) Base UPD includes lighting power required for cleanup purpose.

(2) Outdoor security lighting may be exempted, provided the lamp efficacy is not less than 55 lumens per watt.

(3) A 1.5 adjustment factor is applicable for multifunctional spaces.

D. Lighting for special places and activities must comply with this item.

(1) For rooms serving multifunctions, such as hotel banquet or meeting rooms and office conference or presentation rooms, an adjustment factor of 1.5 times the base UPD may be used if a supplementary lighting system is actually installed to serve the secondary function of the room and the design meets the following conditions:

(a) the installed power for the supplementary system must not be greater than 33 percent of the adjusted lighting power budget calculated for that room; and

(b) independent controls must be installed for the supplementary lighting system.

(2) Indoor sports and recreation areas must comply with part 7676.1300.

Subp. 7. **Internally illuminated exit signs.** New internally illuminated exit signs must not exceed five watts per side.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145*

7674.1100 ADDITIONS, ALTERATIONS, AND REPAIRS TO EXISTING BUILDINGS.

Subpart 1. **General.** Additions, alterations, and repairs to existing buildings must comply with the requirements of this part only.

Subp. 2. **Affecting air leakage.** If an addition or alteration affects the air leakage characteristics or capacity of a building, and vented appliances are present that are not sealed or power vented and are without combustion air supply, then a combustion air supply must be provided according to the Minnesota State Mechanical Code, chapter 1346. Alterations that will likely affect the air leakage characteristics or capacity of a building include attic insulation, wall insulation, applying siding underlayment, or the replacement of a majority of window or door units.

EXCEPTION: A combustion air supply need not be provided where a worst case draft test is performed according to Children, Families, and Learning Worst Case Draft Test and documentation is provided that the vented appliances continue to draft within established parameters of the worst case draft test procedure.

Subp. 3. **Additions.** Compliance for an addition may be demonstrated in one of three ways:

A. the addition alone must comply with this chapter;

B. the addition, together with the entire existing building, must comply with this chapter; or

C. when taken together with the energy improvements of remodeling other components of the building as part of the same permit, the addition meets the requirements of this chapter.

Subp. 4. **Conversions.** A change in the occupancy or use of an existing building or structure constructed under this chapter which would require an increase in demand for either fossil fuel or electrical energy supply shall not be permitted unless the building or structure is made to comply with the requirements of either this chapter or chapter 7672 or 7676 as appropriate for the converted building.

Subp. 5. **Penetrations.** All penetrations resulting as part of an alteration must be sealed according to part 7674.0600, subpart 3. This includes penetrations for telecom-

munication wires and equipment, electrical wires and equipment, electronic wires and equipment, fire sprinklers, plumbing and ducts, and penetrations in exterior walls and ceilings.

Subp. 6. **Roof/ceilings.**

A. Ventilation requirements for alterations to roof/ceilings are given in the Minnesota State Building Code, chapter 1305.

B. Attic insulation must not be installed unless accessible attic bypasses have been sealed.

C. A ceiling vapor retarder may be omitted if the interior ceiling finish is not removed.

D. When an uninsulated attic space is finished, the insulation of the sloped ceiling cavity must be no less than R-18.

E. Alterations comprising removal of at least 50 percent of existing membrane or built-up roof covering must comply with this item.

Alterations and repairs to a built-up or membrane roof covering of a residential building of three stories or less in height must provide for a maximum U-value of 0.033 or an R-value of R-30 or greater.

Subp. 7. **Walls.**

A. Storm windows may be installed over existing glazing without meeting the additional requirements of this chapter.

B. Reglazing and repairs to existing windows are not required to meet the additional requirements of this chapter. Replaced windows must conform to parts 7674.0600, subpart 8, and 7674.0700, subpart 3.

C. Interior wall finish may not be replaced unless wall cavities have been insulated to full depth. This item shall apply whenever plaster is removed, even though lath may not have been removed.

EXCEPTIONS: Walls that are back-plastered, walls that are more than 50 percent filled with insulation, and walls without framing cavities. Also excepted are small openings for purposes including installing, altering, or repairing plumbing, electrical, and mechanical systems.

D. A vapor retarder is not required if the interior wall finish is not removed.

Subp. 8. **Heating, ventilation, and air conditioning; service water heating; and electrical power equipment and controls.** All new equipment or control devices installed in conjunction with the alteration must comply with the specific requirements of this part and parts 7674.0800, subpart 8, and 7674.1000 applicable to that equipment or control device.

Subp. 9. **Lighting.** An enclosed space must comply with the applicable requirements of this chapter if either 50 percent of the luminaires in the enclosed space are replaced, or if the occupancy classification is changed. For alterations to a portion of an enclosed space lighting system, such as moving luminaires or installing control devices, the requirements of this part need not be met, provided that the connected lighting load within the enclosed space is not increased.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145*

7674.1200 EFFECTIVE DATE.

This chapter is effective April 15, 2000.

Statutory Authority: *MS s 216C.19*

History: *23 SR 145; L 1999 c 135 s 9*