

1 Department of Energy, Planning and Economic Development

2 Energy Division

3 Adopted Amendments to the State Building Code

4

5 Rules as Adopted

6 2 MCAR S 1.16007 Authority; purpose; definitions; effective date.

7 A. Authority; scope. Rules 2 MCAR SS 1.16007-1.16008 are

8 adopted pursuant to Minnesota Statutes, section 116J.19,

9 subdivision 8 and constitute amendments to the State Building

10 Code. In cases of conflict with the State Building Code, 2 MCAR

11 SS 1.16007-1.16008 govern in all cases not affecting safety and

12 health requirements.

13 Additionally, 2 MCAR SS 1.16007-1.16008 are intended to

14 serve as standards for conducting maxi-audits of existing

15 buildings owned by the state, the University of Minnesota,

16 cities, counties, and school districts as specified in Minnesota

17 Statutes, section 116J.20.

18 B. Definitions. As used in 2 MCAR SS 1.16007-1.16008,

19 "State Building Code" means 2 MCAR SS 1.10101-1.18901 and rules

20 SBC 7101-8505, and "this code" or "the code" means the Model

21 Energy Code incorporated by reference in 2 MCAR S 1.16008 A.

22 C. Effective date. The effective date of 2 MCAR SS

23 1.16007-1.16008 and the repeal of 2 MCAR SS 1.16001-1.16006 is

24 January 1, 1984.

25 2 MCAR S 1.16008 Adoption of the Model Energy Code with

26 amendments.

27 A. Incorporation by reference. The Model Energy Code, 1983

28 Edition, as published by the Council of American Building

29 Officials (Falls Church, Virginia), is incorporated by reference

30 and made a part of the State Building Code, subject to the

31 amendments in B.-PP NN.

32 B. Amendment to 101.3. On page 1 of the code, 101.3 is

33 amended to read:

34 101.3 Scope.

35 This code sets forth minimum requirements for the design

10-31-83

1 and evaluation of new buildings, additions, and remodeled
2 elements of buildings and standards for certain existing public
3 buildings by regulating their exterior envelopes and the
4 selection of their HVAC, service water heating, electrical
5 distribution, and illuminating systems and equipment for
6 effective use of energy. Buildings which must comply with this
7 code are the same as those which must comply with the State
8 Building Code.

9 Buildings must be designed to comply with the requirements
10 of chapter 4, 5, or 6 of this code.

11 C. Amendment to 101.3.2. On page 2 of the code, 101.3.2 is
12 amended by adding a paragraph to read:

13 101.3.2.4 Remodeled elements of buildings. The
14 requirements of 2 MCAR S 1.10111 apply in determining how
15 remodeled elements of buildings are required to comply with this
16 code.

17 D. Amendment to 105.1. On page 3 of the code, 105.1 is
18 amended to read:

19 105.1 General.

20 Construction of work for which a permit is required is
21 subject to inspection by the building official. Inspections
22 shall be as required by 2 MCAR S 1.10111.

23 E. Amendment to section 201. On page 4 of the code, section
24 201 is amended by adding a new definition to read:

25 BUILDING. "Building" means a new building at the time of
26 application for a building permit, an addition or remodeled
27 element of a building, a moved building, and an existing
28 building heated by oil, gas, or electric units which is owned by
29 the state, the University of Minnesota, a city, a county, or a
30 school district.

31 F. Amendment to section 201. On page 5 of the code, section
32 201 is amended by adding a new definition to read:

33 COMMERCIAL PARKING FACILITY. Any enclosed parking facility
34 except one which is appurtenant to or a part of a residential
35 building, whether the individual dwelling units are rented or
36 owned by the occupants, and which is used primarily by the

1 occupants and their guests.

2 G. Amendment to section 201. On page 6 of the code, section
3 201 the definition of "Heated Space" is amended to read:

4 HEATED SPACE. Space within a building which is provided
5 with a positive heat supply to maintain air temperature of 50
6 degrees Fahrenheit (10 degrees Celsius) or higher. This
7 ~~definition-is-not-to-be-construed-to-require-the-insulation-of~~
8 ~~floor-assemblies-above-basements-or-crawl-spaces-in-Type-R~~
9 buildings.

10 H. Amendment to section 201. On page 7 of the code, section
11 201 the definition of "Nondepletable Energy Sources" is amended
12 to read:

13 RENEWABLE ENERGY SOURCES. Sources of energy which are
14 replaced within a matter of days, months, or years (but no more
15 than 50 years) by new or additional supplies of the energy
16 source. Renewable energy sources include forestry products and
17 forest harvest residues, agricultural wastes, solar radiation,
18 including natural daylighting, phenomena resulting from solar
19 radiation and celestial movements, including wind, waves, tides,
20 and lake or pond thermal differences, and nocturnal thermal
21 exchanges.

22 All references to "Nondepletable Energy Sources" in this
23 code mean "Renewable Energy Sources."

24 I. Amendment to section 201. On page 10 of the code,
25 section 201 is amended by adding a new definition to read:

26 VAPOR BARRIER. A material resistant to retard air and
27 water vapor passage with a maximum perm rating of 0.1 grain per
28 hour per ft² per inch Hg pressure differential.

29 J. Amendment to 302.1. On page 12 of the code, footnote 1
30 to 302.1 is amended to read:

31 ¹The outdoor design temperature shall be selected from the
32 columns of 99 percent values for winter and one percent values
33 for summer from tables in Standard RS-1. Degree days heating
34 shall be selected from Standard RS-22. Adjustments may be made
35 to reflect local climates which differ from the tabulated
36 temperatures or local weather experience as determined by the

1 building official.

2 ~~K. Amendment to 303.1. On page 13 of the code, 303.1 is~~
 3 ~~amended to read:~~

4 ~~303.1-Ventilation~~

5 ~~Ventilation air must conform to Standard RS-3.~~

6 ~~EXCEPTION:--If outdoor air quantities other than those~~
 7 ~~specified in Standard RS-3 are used or required because of~~
 8 ~~special occupancy or process requirements, source control of air~~
 9 ~~contamination, health and safety, or other standards, the~~
 10 ~~required outdoor air quantities shall be used as the basis for~~
 11 ~~calculating the heating and cooling design loads.~~

12 B. K. Amendment to 502.2.1.4. On page 19 of the code,
 13 502.2.1.4 is amended to read:

14 502.2.1.4 Slab-on-grade floors. For slab-on-grade floors,
 15 the thermal resistance of the insulation around the perimeter of
 16 the floor must be not less than the value given in Table No.
 17 5-1. The insulation must extend downward from the top of the
 18 slab to the design frost line or downward to the bottom of the
 19 slab then horizontally beneath the slab for an equivalent
 20 distance, and must be an approved type.

21 M. L. Amendment to 502.2.1. On page 19 of the code, 502.2.1
 22 is amended by adding a paragraph to read:

23 502.2.1.6 Foundation walls. If floors are not insulated as
 24 required in Section 502, basement or crawl space walls must be
 25 insulated. Either the thermal resistance (R) of the insulation
 26 on the entire wall must be not less than R-5, or the thermal
 27 resistance (R) of the insulation on the wall must be not less
 28 than R-10 down to the design frost line.

29 ~~Note:--Foundation walls insulated as required in this~~
 30 ~~section should be designed to prevent damage due to frost action.~~

31 N. M. Amendment to 502.2.1. On page 19 of the code, 502.2.1
 32 is amended by adding a paragraph to read:

33 502.2.1.7 Vapor barriers. The design of buildings for
 34 energy conservation may not create conditions of accelerated
 35 deterioration from moisture condensation. A vapor barrier must
 36 be installed between the interior surface and the winter design

1 condition dew point location within each building envelope
 2 surface. The vapor barrier must be continuous with all joints
 3 overlapped and made over framing members or blocking. The vapor
 4 barrier must be continuous and uninterrupted by framing at
 5 dropped ceiling areas of bath and kitchen soffits. Rips and
 6 punctures in the vapor barrier must be patched with vapor
 7 barrier materials and sealed.

8 EXCEPTION EXCEPTIONS: The vapor barrier at the rim joist
 9 need not be continuous. The vapor barrier need not be sealed
 10 around electrical junction boxes.

11 Note: An air-vapor barrier may create conditions of low
 12 natural infiltration. Installation of a heat recovery
 13 ventilation system should or an efficient ventilation system
 14 must be considered to avoid excessive humidity and other air
 15 contaminants.

16 Ø. N. Amendment to 502.3.1.4. On page 19 of the code,
 17 502.3.1.4 is amended to read:

18 502.3.1.4 Slab-on-grade floors. For slab-on-grade floors,
 19 the thermal resistance of the insulation around the perimeter of
 20 the floor may not be less than the value given in Table No.
 21 5-2. The insulation must extend downward from the top of the
 22 slab to the design frost line or downward to the bottom of the
 23 slab then horizontally beneath the slab for an equivalent
 24 distance, and must be of an approved type.

25 P. O. Amendment to Table No. 5-1. On page 20 of the code,
 26 Table No. 5-1 is amended to read:

27 TABLE NO. 5-1

Element	Mode	Type A-1 Buildings	Type A-2 Buildings
		U_o	U_o^1
Walls	Heating or cooling	0.11	
Roof/ceiling	Heating or cooling	0.026	
Floors over unheated spaces	Heating or cooling	0.05	

1 2 3 Heated slab 4 on grade	5 6 Heating	7 R Value ¹	8 R Value ¹
9 Unheated slab 10 on grade	11 Heating	12 R Value ¹	13 R Value ¹

14 ¹Values shall be determined by using the graphs (Figures Nos. 1,
15 2, 3, and 6) contained in Chapter 7 (based on Standard RS-9)
16 using heating degree days as specified in Section 302.

17 Q. P. Amendment to 503.1. On page 24 of the code, 503.1 is
18 amended by adding a paragraph to read:

19 503.1.1 Heated parking garages. An enclosed structure or
20 portion of an enclosed structure constructed after January 1,
21 1978, and used primarily as a commercial parking facility for
22 three or more motor vehicles may not be heated. Incidental
23 heating resulting from building exhaust air passing through a
24 parking facility is not prohibited if substantially all useful
25 heat has previously been removed from the air.

26 R. Q. Amendment to 503.2. On page 24 of the code, 503.2 is
27 amended by adding a paragraph to read:

28 503.2.3 System design heating and cooling capacity. The
29 rated capacity of the heating and cooling system at design
30 conditions may not be greater than 115 percent for heating, 100
31 percent for cooling at design output load calculated in
32 accordance with 503.2, whenever appropriate equipment is
33 available.

- 34 EXCEPTIONS:
- 35 1. Equipment designed for standby purposes.
 - 36 2. Cooling capacity of heat pumps.
 - 37 3. Systems designed for pick-up after automatic
38 temperature set-back when a registered
39 professional engineer shows that the
40 extra system design heating and cooling
41 capacity is needed for pick-up.

42 S. R. Amendment to Table No. 5-4. On page 26 of the code,
43 Table No. 5-4 is amended to read:

44 TABLE NO. 5-4 -- MINIMUM COP FOR HEAT PUMPS, HEATING MODE¹

45 SOURCE AND OUTDOOR TEMPERATURE (F)	46 MINIMUM COP
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Air Source - 47DB/43WB	2.7
Air Source - 17DB/15WB	1.8
Water Source - 60 Entering	3.0

¹When tested at the standard rating specified in Table 5-10A.
F. S. Amendment to Table No. 5-5. On page 28 of the code,
 Table No. 5-5 is amended to read:

TABLE NO. 5-5
 HVAC SYSTEM HEATING EQUIPMENT --
 GAS- AND OIL-FIRED
 MINIMUM STEADY STATE COMBUSTION EFFICIENCY

Types of equipment	ALL OTHER COMMERCIAL/ INDUSTRIAL FURNACES AND BOILERS	
	Percent ¹	Percent ²
FURNACES OF CAPACITIES OF 225,000 BTU/H AND LESS BOILERS OF CAPACITIES OF 300,000 BTU/H AND LESS		
Forced-air furnaces and low-pressure steam or hot-water boilers	74	80
Gravity central furnaces	69	--
All other vented heating equipment	69	--

¹Combustion efficiency for furnaces of capacities of 225,000 Btu/h and less and boilers of capacities of 300,000 Btu/h and less shall be tested in accordance with the applicable U.S. Department of Energy furnace test procedures.

²Combustion efficiency of commercial/industrial furnaces and boilers is defined as 100 percent minus stack losses in percent of heat input. Stack losses are:

- Loss due to sensible heat in dry flue gas.
- Loss due to incomplete combustion.
- Loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.

U. T. Amendment to Table No. 5-6. On page 28 of the code,
 Table No. 5-6 is amended to read:

TABLE NO. 5-6 -- MINIMUM EER AND COP FOR ELECTRICALLY
 DRIVEN HVAC-SYSTEM EQUIPMENT -- COOLING^{1 2}

Air-cooled	Evaporator or Water cooled
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STANDARD RATING CAPACITY	EER	COP	EER	COP
Under 65,000 Btu/h (19,050 watts)	7.8	2.28	8.8	2.58
65,000 Btu/h (19,050 watts) and over	8.2 ³	2.40 ³	9.2	2.69

¹When tested at the standard rating conditions specified in Table No. 5-10B.

²The Department of Energy has established required test procedures for single-phase air-cooled residential central air conditioners under 19 kW (65,000 Btu/h) in capacity, which have been incorporated into ARI Standard 210-79. EER and COP values in Table No. 5-6 are based on Test A of the DOE Test Procedures.

³Applies when return-air fans are not included under the manufacturer's model No. When return-air fans are included, the required minimum values are 2.34 (8.0).

V. U. Amendment to Table No. 5-7. On page 29 of the code, Table No. 5-7 is amended to read:

TABLE NO. 5-7 -- MINIMUM EER AND COP FOR ELECTRICALLY DRIVEN HVAC-SYSTEM COMPONENTS¹

COMPONENT	TYPE OF COMPRESSOR	CONDENSING MEANS					
		AIR		WATER		EVAPORATIVE	
		EER	COP	EER	COP	EER	COP
Self-contained water chillers	Centrifugal	8.00	2.34	13.80	4.04		
	Positive displacement	8.40	2.46	12.00	3.51		
Condenserless water chillers	Positive displacement	9.90	2.9	12.00	3.51		
Compressor and condenser units 65,000 Btu/h (19,050 watts) and over ²	Positive displacement	9.50	2.78	12.50	3.66	12.50	3.66
Water Source Hydronic Heat Pump	Size	under 19 kW (65,000 Btu/h)			19 kW (65,000 Btu/h) and over		
		EER	COP	EER	COP		
	Centrifugal	9.0	2.64	9.4	2.75		

1 ¹When tested at the standard rating conditions specified in
2 Table No. 5-10C.

3 ²Ratings in accordance with Standard RS-14 as applicable. COP
4 based on condensing unit standard rating capacity and energy
5 input to the unit, all at sea level.

6 ~~W~~ V. Amendment to 503.10.2. On page 33 of the code,
7 503.10.2 is amended to read:

8 503.10.2. For low-pressure supply and return air ducts
9 located outside of the conditioned space, all transverse joints
10 must be sealed using mastic, tape, or mastic plus tape. For
11 fibrous glass ductwork, pressure-sensitive tape may be used.

12 ~~X~~ W. Amendment to 504.5.2. On page 38 of the code, 504.5.2
13 is amended to read:

14 504.5.2 Pool covers. Heated outdoor swimming pools must be
15 equipped with pool covers.

16 ~~Y~~ X. Deletion of 504.5.3. On page 38 of the code, 504.5.3
17 is deleted.

18 ~~Z~~ Y. Amendment to 504.7. On page 38 of the code, 504.7 is
19 amended by deleting the exception.

20 ~~AA~~ Z. Deletion of 504.8.2.2. On page 39 of the code,
21 504.8.2.2 is deleted.

22 ~~BB~~ AA. Amendment of 505.2. On page 39 of the code, 505.2
23 is amended to read:

24 505.2 Electric energy determination.

25 In any multi-tenant residential building, provisions shall
26 be made to separately determine the electric energy consumed by
27 each tenant. Electrical service to individual dwelling units in
28 buildings containing two or more units shall be separately
29 metered, with individual metering readily accessible to the
30 individual occupants.

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

36 ~~CC~~ BB. Amendment to 602.2. On page 44 of the code, 602.2
37 is amended to read:

38 602.2 Criteria - Heating and Cooling.

1 For type A-1 buildings, criteria for ceiling, wall, and
 2 floor sections listed in Table No. 6-11 may be used in lieu of
 3 the criteria specified in sections 602.2.1, 602.2.2, and 602.2.3.
 4 Appropriate U_o values may be determined by using Appendix Table
 5 No. 6-1, 6-2, or 6-3 and Chart 6-A or 6-B.

6 ~~BB~~: CC. Amendment to 602.2.4. On page 44 of the code,
 7 602.2.4 is amended to read:

8 602.2.4 Slab-on-grade floors. For slab-on-grade floors,
 9 thermal resistance (R) of the insulation around the perimeter of
 10 the floor must be at least the value given in Table No. 5-1 or
 11 5-2 as appropriate for the building type.

12 The insulation shall extend downward from the top of the
 13 slab to the design frost line or downward to the bottom of the
 14 slab then horizontally beneath the slab for an equivalent
 15 distance.

16 ~~EE~~: DD. Amendment to 602.2. On page 45 of the code, 602.2
 17 is amended by adding a paragraph to read:

18 602.2.6 Foundation walls. If floors of Group R buildings
 19 are not insulated as required in Section 602.2, basement or
 20 crawl space walls must be insulated as required in Section
 21 502.2.1.7.

22 ~~FF~~: EE. Amendment to 602.2. On page 45 of the code, 602.2
 23 is amended by adding a paragraph to read:

24 602.2.7 Vapor barriers. A vapor barrier must be installed
 25 in all Group R buildings as required in Section 502.2.1.7.

26 ~~GG~~: FF. Addition of Table No. 6-11. On page 50 of the code,
 27 insert Table No. 6-11 to read as follows:

28 TABLE NO. 6-11

29 Minimum R Values for Ceiling, Wall, and Floor Sections of
 30 Type A-1 Buildings

31	32	33	34	35	36	37	38
Ceilings	Walls	Floors	Windows	Sliding Glass	Doors	Doors	
(1)	(2)	(3)	(4) See	(5)	See	See	
			Note 4		Note 5	Note 6	
38	20	20	2700	±45			

36 Notes to Table 6-11:

37 (1) Ceilings which meet one of the following criteria satisfy
 38 this requirement:

39 A. R-38 throughout the entire ceiling.

1 B. If a portion of the ceiling is less than R-38, the
 2 insulation in the remainder of the ceiling must be increased to
 3 yield an overall average thermal resistance of not less than
 4 R-38 using the following equation.

$$5 \quad R_r = (A_o - A_1) / (A_o/38 - A_1/R_1)$$

6 where:

7 R_r = R value of the insulation in the remainder
 8 of the ceiling.

9 A_o = total area of the ceiling, ft².

10 A_1 = area of the ceiling with less than R-38.

11 R_1 = R value of the ceiling which is less than
 12 R-38.

13 C. Where the roof at the perimeter of the ceiling prevents
 14 installation of insulation to full depth, the insulation in the
 15 remainder of the ceiling must be increased to reduce the overall
 16 ceiling heat loss to no more than if R-38 had been installed
 17 throughout the entire ceiling.

18 (2) For the insulated cavity of opaque wall and rim joists, but
 19 not foundation walls.

20 (3) For the insulated cavity of floors of heated spaces over
 21 unheated spaces.

22 (4) Maximum glass area may not exceed 12 percent of the gross
 23 area of exterior walls ~~when the average R-value of all glass is~~
 24 ~~not less than the value listed~~ not including foundation walls.
 25 All windows shall be double glazed or have storm windows.

26 (5) Maximum glass area may not exceed ten percent of the gross
 27 area of exterior walls, not including foundation walls, when a
 28 sliding glass door is installed with a minimum R-value as
 29 listed, and. ~~All other glass is not less than the R-value~~
 30 ~~listed under windows~~ shall be double glazed or have storm
 31 windows.

32 (6) A 1-3/4 inch metal faced door system with an insulated core -
 33 ~~and durable weatherstripping~~ providing a an R value equal to or
 34 greater than three 3.0 or a conventional door and storm door.
 35 All primary doors must have durable weatherstripping.

36 ~~HH-~~ GG. Amendment to 604.1.2.3. On page 49 of the code,
 37 604.1.2.3 is amended to read:

38 604.1.2.3 Swimming pools.

39 Pool heaters must be equipped with an ON-OFF switch mounted
 40 for easy access to allow shutting off the operation of the
 41 heater without adjusting the thermostat setting and to allow
 42 restarting without relighting the pilot light.

43 Active solar heating systems should be used to supply a
 44 portion of the pool heating requirements when conditions permit
 45 their cost-effective installation.

46 Heated outdoor swimming pools must be equipped with a pool

1 cover.

2 ~~HH.~~ HH. Amendment to 604.3. On page 49 of the code, 604.3
3 is amended by deleting the exception.

4 ~~JJ.--Amendment-to-701.1.--On-page-54-of-the-code,701.1,Code
5 Standard-No.-RS-3,--is-amended-to-read:~~

6 ~~RS-3-----ASHRAE-Standard-62-1981-Ventilation-for
7 Acceptable-Indoor-Air-Quality.~~

8 KK. II. Amendment to 701.1. On page 54 of the code, 701.1,
9 Code Standard No. RS-4, is amended to read:

10 RS-4 ASHRAE Standard 55-1981 Thermal Environment
11 Conditions for Human Occupancy.

12 ~~LL.~~ JJ. Amendment to 701.1. On page 54 of the code, 701.1,
13 Code Standard No. RS-8, is amended to read:

14 RS-8 IES Lighting Handbook, 1981 Application
15 Volume and 1981 Reference Volume, Illuminating
16 Engineering Society.

17 ~~MM.~~ KK. Amendment to 701.1. On page 55 of the code, 701.1
18 is amended by adding a Code Standard No. RS-22 to read:

19 RS-22 Monthly Normals of Temperature, Precipitation, and
20 Heating and Cooling Degree Days 1951-80 Minnesota.
21 National Oceanic and Atmospheric Administration
22 September, 1982.

23 ~~NN.~~ LL. Amendment to list of accredited authoritative
24 agencies. On page 56 of the code, the references to ASHRAE and
25 NWMA are amended to read:

26 ASHRAE refers to the American Society of Heating,
27 Refrigerating and Air Conditioning Engineers, Inc., 1791 Tellie
28 Circle N.E., Atlanta, GA 30329.

29 NWMA refers to the National Woodwork Manufacturers
30 Association, Inc., 205 W. Touhy Ave., Park Ridge, IL 60068.

31 ~~OO.~~ MM. Amendment to Figure No. 1. On page 57 of the code,
32 Figure No. 1 is amended by deleting the line marked A1 and by
33 amending the title to read:

34 "U₀ WALLS - TYPE A₂ BUILDINGS - HEATING"

35 ~~PP.~~ NN. Amendment to Figure No. 2. On page 58 of the code,
36 Figure No. 2 is amended by amending the title to read:

37 "ROOF/CEILINGS TYPE A₂ BUILDINGS"

38
39 Repealer. Rules 2 MCAR SS 1.16001, 1.16002, 1.16003, 1.16004,
40 1.16005, and 1.16006 are repealed.