

Figure 63.1015-4
Alternate Component Package
ACP Table C

Part C1: Maximum Window Area / Gross Exterior Wall Area						
Exterior Wall U_o	Shading Coefficient Range SC_x	U_{or} Range				
		0.60 to 0.56	0.55 to 0.51	0.50 to 0.46	0.45 to 0.41	≤ 0.40
≤ 0.06	0.80 - 0.71	0.20	0.21	0.22	0.22	0.23
	0.70 - 0.61	0.22	0.23	0.24	0.25	0.26
	0.60 - 0.51	0.23	0.25	0.26	0.27	0.29
	0.50 - 0.41	0.25	0.27	0.29	0.30	0.32
	≤ 0.40	0.27	0.29	0.32	0.34	0.37
0.061 to 0.070	0.80 - 0.71	0.19	0.20	0.21	0.22	0.23
	0.70 - 0.61	0.21	0.22	0.23	0.24	0.25
	0.60 - 0.51	0.22	0.24	0.25	0.26	0.28
	0.50 - 0.41	0.24	0.26	0.27	0.29	0.31
	≤ 0.40	0.26	0.28	0.30	0.33	0.35
0.071 to 0.080	0.80 - 0.71	0.18	0.19	0.20	0.21	0.22
	0.70 - 0.61	0.20	0.21	0.22	0.23	0.24
	0.60 - 0.51	0.21	0.23	0.25	0.26	0.27
	0.50 - 0.41	0.23	0.25	0.26	0.28	0.30
	≤ 0.40	0.25	0.27	0.29	0.31	0.34
0.081 to 0.090	0.80 - 0.71	0.17	0.18	0.19	0.20	0.21
	0.70 - 0.61	0.19	0.20	0.21	0.22	0.23
	0.60 - 0.51	0.20	0.22	0.23	0.24	0.26
	0.50 - 0.41	0.22	0.23	0.25	0.27	0.29
	≤ 0.40	0.24	0.26	0.28	0.30	0.33

Part C2: Other Criteria
Roof Max $U_o = 0.049$
Wall and Ceiling Adjacent to Unconditioned Space Max $U_o = 0.11$
Floor Over Unconditioned Space Max $U_o = 0.040$
Wall Below Grade Min R-Value = 11

Part C3: Unheated Slab-On-Grade			
Minimum R-Value			
Insulation Orientation	Length of Insulation		
	24"	36"	48"
Horizontal	R=18	R=15	R=11
Vertical	R=8	R=6	R=4

Comm 63.1016 System standards option. To comply with the system standards for building envelope thermal performance, the building shall comply with section 8.6 of ASHRAE standard 90.1 or with the system analysis design specified in IECC section 806 applied to the thermal envelope alone. Building site climate data shall be determined using Wisconsin division of state energy statistics or other source acceptable to the department.

Note: Section 8.6 of ASHRAE 90.1 Standard requires use of the latest version of the ENVSTD computer program, which is the computer program included in the ASHRAE 90.1 Standard to evaluate an envelope trade-off.

Note: ComCheck-EZ is a computer program that may be used only for determining building envelope compliance. The ComCheck-EZ computer program may be downloaded at: http://www.eren.doe.gov/buildings/codes_standards/buildings/com_download.html. The federal Department of Energy has issued a computer package called ComCheck-Plus, which establishes trade-offs between the building envelope, lighting, and HVAC equipment; however, this program has not been approved for use in Wisconsin since Wisconsin's lighting allowances are not the same as those included in the program.

Comm 63.1017 Design criteria. (1) THERMAL PERFORMANCE. (a) Except as provided in par. (b), the thermal performance values for the exterior envelope of buildings or areas of buildings that are warehouses that meet the criteria of s. Comm 63.1014 (3), or that are factories shall not exceed the values in Table 63.1017-1. The calculation procedures of s. Comm 63.1019 shall be used to show compliance.

**Table 63.1017-1
Thermal Performance Values**

Number of Stories	Thermal Performance Values*
1-2	12
3-4	13
5-7	16
8-12	18
13-20	20
Over 20	21

*Expressed in Btu/hour/square foot of above-grade exterior envelope. See s. Comm 63.1023 (2) and (3) for design conditions.

(b) The thermal performance values specified in par. (a) may be increased or decreased provided the U-value for other components is decreased or increased so the total heat gain or loss for the entire building envelope and floor area does not exceed the total heat gain or loss resulting from conformance to the values specified in this section.

(2) FLOORS OVER UNCONDITIONED SPACES. The overall heat transmission coefficient (U-value) for floors of heated or mechanically cooled spaces over unconditioned spaces shall not exceed 0.08 Btu/h-ft²-°F.

(3) **SLAB-ON-GRADE PERIMETER INSULATION.** For slab-on-grade floors with or without a grade beam, a foundation bearing wall or a foundation frost wall, the thermal resistance of the insulation around the perimeter of the floor shall not be less than the values shown in Table 63.1017-2. The insulation shall extend 48 inches in the vertical or horizontal direction or combination thereof with a total dimension of 48 inches. Slab-on grade perimeter insulation shall be moisture resistant.

**Table 63.1017-2
Perimeter Insulation Requirements¹**

Slab-on-grade Perimeter Insulation		Zone 1	Zone 2	Zone 3	Zone 4
R = $\frac{^{\circ}\text{F}\cdot\text{ft}^2\cdot\text{Hour}}{\text{Btu}}$	Unheated Slabs	6.7	6.2	5.9	5.2
	Heated Slabs ²	9.3	9.0	8.6	8.2

¹ See Fig. 63.1023 for zone definitions.

² Heated slabs have piping, duct work or other heat distribution system components embedded in or under them.

Comm 63.1018 Material properties. (1) ASHRAE FUNDAMENTAL DATA. Except as specified in sub. (2), when available, information on thermal properties, performance of building envelope sections, and components and heat transfer shall be obtained from ASHRAE *Handbook of Fundamentals*.

(2) **EXCEPTIONS. (a) Laboratory or field test measurements.** When the information is not available from ASHRAE *Handbook of Fundamentals*, the data may be obtained from laboratory or field-test measurements. If laboratory or field test measurements are used for envelope heat transmission, they shall be obtained using one of the following test methods:

1. ASTM C177, Test method by guarded hot plate apparatus.
2. ASTM C518, Test method by means of the heat flow meter apparatus.
3. ASTM C236, Standard test method by means of a guarded hot box.
4. ASTM C976, Standard test method by means of a calibrated hot box.
5. ASTM C335, Test method of horizontal pipe insulation.

(b) **Foam plastic insulation.** For foam plastic insulations that use a gas other than air as the insulating medium, laboratory or field tests shall be conducted on representative samples that have been aged for the equivalent of 5 years or until the R-Value has stabilized. The tests shall be conducted by an independent third party and shall be submitted for department product review and approval in accordance with ch. Comm 61.

(c) *Masonry or concrete units.* 1. Integrally insulated concrete masonry systems within the scope of the National Concrete Masonry Association (NCMA) shall be evaluated for the thermal performance of the masonry or concrete units in accordance with one of the following:

a. Use the NCMA Evaluation Procedures for the Integrally-Insulated Concrete Masonry Walls.

b. Use of default values as approved by the department may be used. No extrapolations or interpolations are allowed.

2. All other concrete or masonry units not within the scope of the NCMA Evaluation Procedures shall comply with one of the following methods for determining the thermal performance of the assembly or system:

a. Use default values as approved by the department. No extrapolations or interpolations are allowed.

b. Verify thermal performance through a laboratory or field test measurements specified in par (a).

c. Use the department material approval process as specified in ch. Comm 61 to determine the U-factor.

Comm 63.1019 Required calculation procedures. (1) GENERAL. The following procedures shall be used to calculate the thermal performance of above- and below-grade envelope sections of any building that is heated or mechanically cooled.

(2) OVERALL THERMAL TRANSMITTANCE (U_o). The overall thermal transmittance of the building envelope assembly shall be calculated in accordance with the following equation:

$$U_o = \sum U_i A_i / A_o = (U_1 A_1 + U_2 A_2 + \dots + U_n A_n) / A_o$$

where:

U_o = The area-weighted average thermal transmittance of the gross area of an envelope assembly; that is the exterior wall assembly including fenestration and doors, the roof and ceiling assembly, and the floor assembly, Btu/h·ft²·°F.

A_o = The gross area of the envelope assembly, ft².

U_i = The thermal transmittance of each individual path of the envelope assembly, for example, the opaque portion of the wall assembly, Btu/h·ft²·°F. U_i also equals $1/R_i$ where R_i is the total resistance to heat flow of an individual path through an envelope assembly.

A_i = The area of each individual element of the envelope assembly, ft².

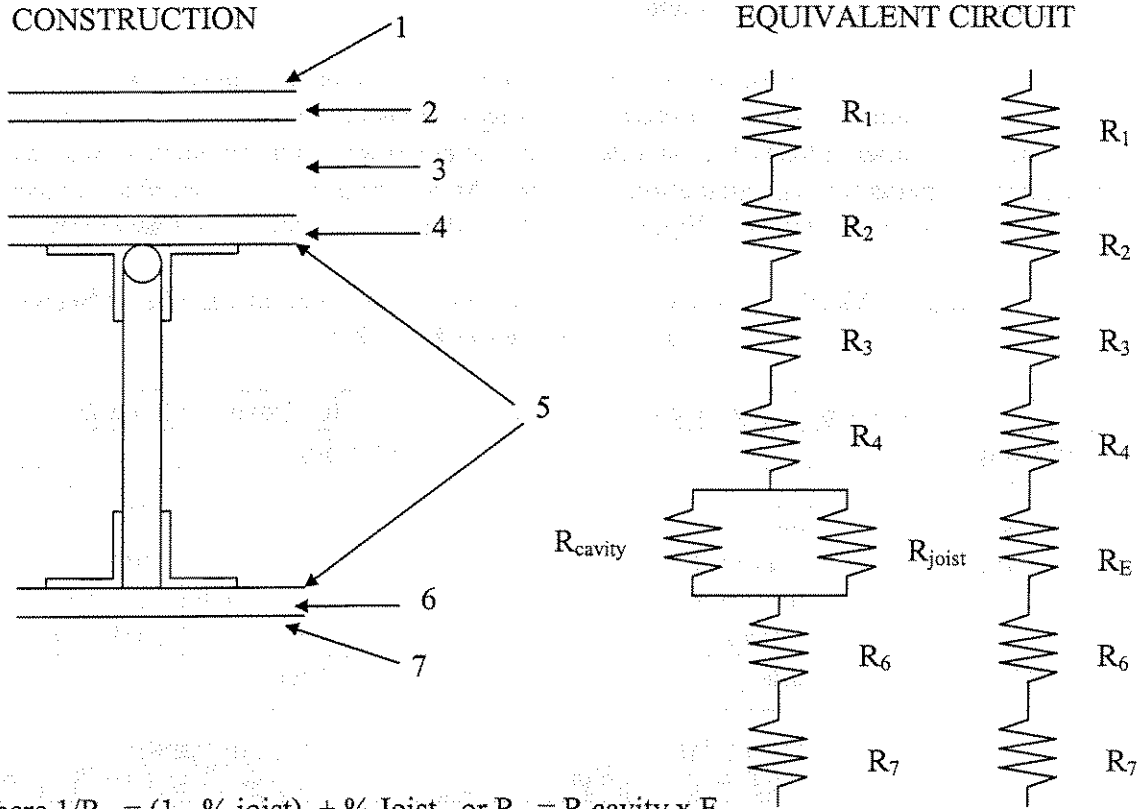
(3) THERMAL TRANSMITTANCE (U_i) OF AN INDIVIDUAL PATH THROUGH AN ENVELOPE ASSEMBLY. The thermal transmittance of each envelope shall be determined with consideration of all major series and parallel heat flow paths through the elements of the assembly and film coefficients. Compression of insulation shall be considered in determining the thermal resistance.

(a) *Thermal transmittance of opaque elements.* The thermal transmittance of opaque elements of assemblies shall be determined using a series path procedure with correction for the presence of parallel paths within an element of the envelope assembly such as wall cavities with parallel paths through insulation and studs. An acceptable procedure shall be used, as specified in Figure 63.1019-1. Figure 63.1019-2 illustrates a typical roof assembly.

Figure 63.1019-1 Calculation Procedures for Evaluating Major Series and Parallel Heat Flow Paths

Acceptable Procedures for Determining U_i for Opaque Elements		
Sheathing	Framing	
	Metal	Nonmetal
Metal on One or Both Sides	Tests - s. Comm 63.1019 (2)(a) 1.a. Thermal Bridges - s. Comm 63.1019 (2)(a) 1.c.	Tests - s. Comm 63.1019 (2)(a) 1.a. Series or Parallel Path - s. Comm 63.1019 (2)(a) 2.
Nonmetal on Both Sides	Tests - s. Comm 63.1019 (2)(a) 1.a. Parallel Path Correction Factor - s. Comm 63.1019 (2)(a) 1.b. Zone Method - s. Comm 63.1019 (2)(a) 1.d.	Tests - s. Comm 63.1019 (2)(a) 1.a. Series or Parallel Path - s. Comm 63.1019 (2)(a) 2.

Figure 63.1019-2 Calculation Procedure for Thermal Resistance of a Typical Roof Assembly



Where $1/R_e = \frac{(1 - \% \text{ joist})}{R_{\text{cavity}}} + \frac{\% \text{ Joist}}{R_{\text{joist}}}$ or $R_e = R_{\text{cavity}} \times F_c$

R_e is the equivalent resistance of the element contacting the parallel path. F_c is the parallel path correction factor.

1. For envelope assemblies containing metal framing, the U_i shall be determined by using one of the following methods:

a. Using results from laboratory or field-test measurements where one of the procedures specified in s. Comm 63.1018 is used.

b. Using the thermal resistance of those roof and wall assemblies listed in Tables 63.1019-1 and 63.1019-2 shall be corrected using the following parallel path correction factor procedure:

Considering the total resistance of the series path:

$$U_i = 1/R_t$$

$$R_t = R_i + R_e$$

where:

R_t = The total resistance of the envelope assembly.

R_i = The resistance of the series elements (for $i = 1$ to n) excluding the parallel path element(s)

R_e = The equivalent resistance of the element containing the parallel path, the value of R_e is:

$R_e = R\text{-value of insulation} \times F_c$

The Parallel Path Correction Factors (F_c) may be obtained from tests conducted using procedures listed in s. Comm 63.1018. Parallel Path Correction Factors for some envelope assemblies are listed in Tables 63.1019-1 and 63.1019-2.

c. For elements with internal metallic structures bonded on one or both sides to a metal skin or covering, the calculation procedure specified in the *ASHRAE Handbook of Fundamentals*, or specified in ASHRAE standard 90.1, or other procedure acceptable to the department shall be used to include the effects of thermal bridges in metal construction.

d. For elements other than those covered above, the zone method described in the *ASHRAE Handbook of Fundamentals* shall be used for calculation.

Table 63.1019-1

Roofs
Parallel Path Correction Factors^a

Bridged R-Value	0	5	10	15	20	25	30	35	40	45	50	55
Correction Factor	1.0	0.96	0.92	0.88	0.85	0.81	0.79	0.76	0.73	0.71	0.69	0.67

^a Table values are based upon metal trusses with 4-foot spacing that penetrate the insulation, and 0.66-inch diameter cross members every 1 foot.

Table 63.1019-2

**Wall Sections With Metal Studs
Parallel Path Correction Factors**

Size of Members	Gauge of Stud ^a	Spacing of Framing, in.	Cavity Insulation R-Value	Correction Factor	Effective Framing/Cavity R-Values
2 x 4	18-16	16 o.c.	R-11	0.50	R-5.5
			R-13	0.46	R-6.0
			R-15	0.43	R-6.4
2 x 4	18-16	24 o.c.	R-11	0.60	R-6.6
			R-13	0.55	R-7.2
			R-15	0.52	R-7.8
2 x 6	18-16	16 o.c.	R-19	0.37	R-7.1
			R-21	0.35	R-7.4
2 x 6	18-16	24 o.c.	R-19	0.45	R-8.6
			R-21	0.43	R-9.0
2 x 8	18-16	16 o.c.	R-25	0.31	R-7.8
2 x 8	18-16	24 o.c.	R-25	0.38	R-9.6

^a These factors can be applied to metal studs of this gauge or thinner.

2. For assemblies containing nonmetal framing, the U_i shall be determined from one of the laboratory or field test measurements specified in s. Comm 63.1018 or from the ASHRAE series-parallel method. Formulas in the ASHRAE *Handbook of Fundamentals*, shall be used for these calculations.

3. The opaque portions of doors shall be considered to be a part of the opaque wall assembly in the calculation of the average thermal transmittance. The thermal transmittance of the entire opaque door assembly including the frame shall be included in the calculation.

(b) *Thermal transmittance of fenestration.* Values of U_{of} shall be determined using one of the following methods:

1. The National Fenestration Rating Council (NFRC) 100 Procedure for Determining Fenestration Product U-Factors. The thermal performance values shall be certified through the NFRC Fenestration Thermal Performance Rating Certification and Labeling Program as described in the NFRC Product Certification Program LAP 1, PCP 1, and CAP 1.

2. The values for the appropriate product type given in IECC Table 102.5.2 (1) may be used.

Note: In order to use the component standards option of s. Comm 63.1015, the U-value of fenestration must be 0.60 or less.

(4) **GROSS AREA OF ENVELOPE COMPONENTS.** (a) *Roof assembly.* The gross area of a roof assembly consists of the total surface of the roof assembly exposed to outside air or unconditioned spaces. The roof assembly shall be considered to include all roof or ceiling components through which heat may flow between indoor and outdoor environments including skylight surfaces but excluding service openings. For thermal transmittance purposes when return air ceiling plenums are employed, the roof or ceiling assembly shall not include the resistance of the ceiling or the plenum space as part of the total resistance of the assembly.

(b) *Floor assembly.* The gross area of a floor assembly over outside or unconditioned spaces consists of the total surface of the floor assembly exposed to outside air or unconditioned space. The floor assembly shall include all floor components through which heat may flow between indoor and outdoor or unconditioned space environments.

(c) *Exterior walls.* The gross area of exterior walls enclosing a heated or cooled space is measured on the exterior and consists of the opaque wall including between floor spandrels, peripheral edges of flooring, window areas including sash, and door areas, but excluding vents, grilles, and pipes.

(5) **SHADING COEFFICIENTS.** The shading coefficient (SC_x) for fenestration shall be obtained from the ASHRAE *Handbook of Fundamentals* or from manufacturer's test data or from IECC section 102.5.2. SC_x is the shading coefficient of the fenestration including permanently installed internal and external shading devices but excluding the effect of external shading projections, which is calculated separately. The shading coefficient used for louvered shade screens shall be determined using a profile angle of 30° as found in the ASHRAE *Handbook of Fundamentals*.

Part 4 Equipment and Systems

Comm 63.1020 Minimum equipment efficiencies. (1) Space heating or cooling equipment that is not covered by 10 CFR Part 430, Energy Conservation Program for Consumer Products, shall have a minimum efficiency at the specified rating conditions not less than the values given in ASHRAE 90.1, section 10.4.1.

(2) Equipment ratings shall be certified under a nationally recognized certification program or rating procedure or by data furnished by the equipment manufacturer to show compliance with the minimum efficiency requirements.

Note: The following certification programs are accepted by the department: Gas Appliance and Manufacturers Association (GAMA) and Air-Conditioning and Refrigeration Institute (ARI).

(3) Compliance with minimum efficiency requirements specified for HVAC equipment shall include compliance with part-load requirements where indicated as well as standards for full-load requirements. The part-load efficiency shall be determined as specified in ASHRAE 90.1.

(4) Space heating or cooling equipment used to provide additional functions, such as water heating for plumbing, as part of a combination or integrated system shall comply with

minimum performance requirements for the appropriate space heating or cooling equipment category.

(5) Equipment providing water heating for plumbing that is used to provide additional functions, such as space heating, as part of a combination or integrated system shall comply with minimum performance requirements for water heating equipment as specified in s. Comm 84.20 (5) (n).

(6) Combination space and plumbing water heating equipment shall comply with IECC section 504.2.2 and s. Comm 63.0504 (1).

Note: See ch. Comm 64 for additional requirements for combined systems.

(7) Equipment that is not used for comfort cooling or comfort heating is exempt from the energy efficiency requirements of this chapter.

Note: Omission of minimum performance requirements for certain classes of HVAC equipment does not preclude use of that equipment.

Comm 63.1021 Field-assembled equipment and components. When components, such as indoor or outdoor coils, from more than one manufacturer are used as parts of air-conditioning or heating equipment, component efficiencies shall be specified based on data provided by the component manufacturers.

Comm 63.1022 Heat pump equipment controls. Controls for heat pumps equipped with supplementary heaters that are installed in residential buildings shall comply with IECC section 503.3.2.3, and controls for equipment installed in commercial buildings shall comply with IECC sections 803.3.3.1.1.

Comm 63.1023 Load calculations for sizing. (1) CALCULATION PROCEDURES. Heating and cooling system design loads for the purpose of sizing systems and equipment shall be determined in accordance with the procedures described in the *ASHRAE Handbook of Fundamentals*, or a similar computation procedure approved by the department. For those design parameters addressed in subs. (2) to (6), the values specified shall be used.

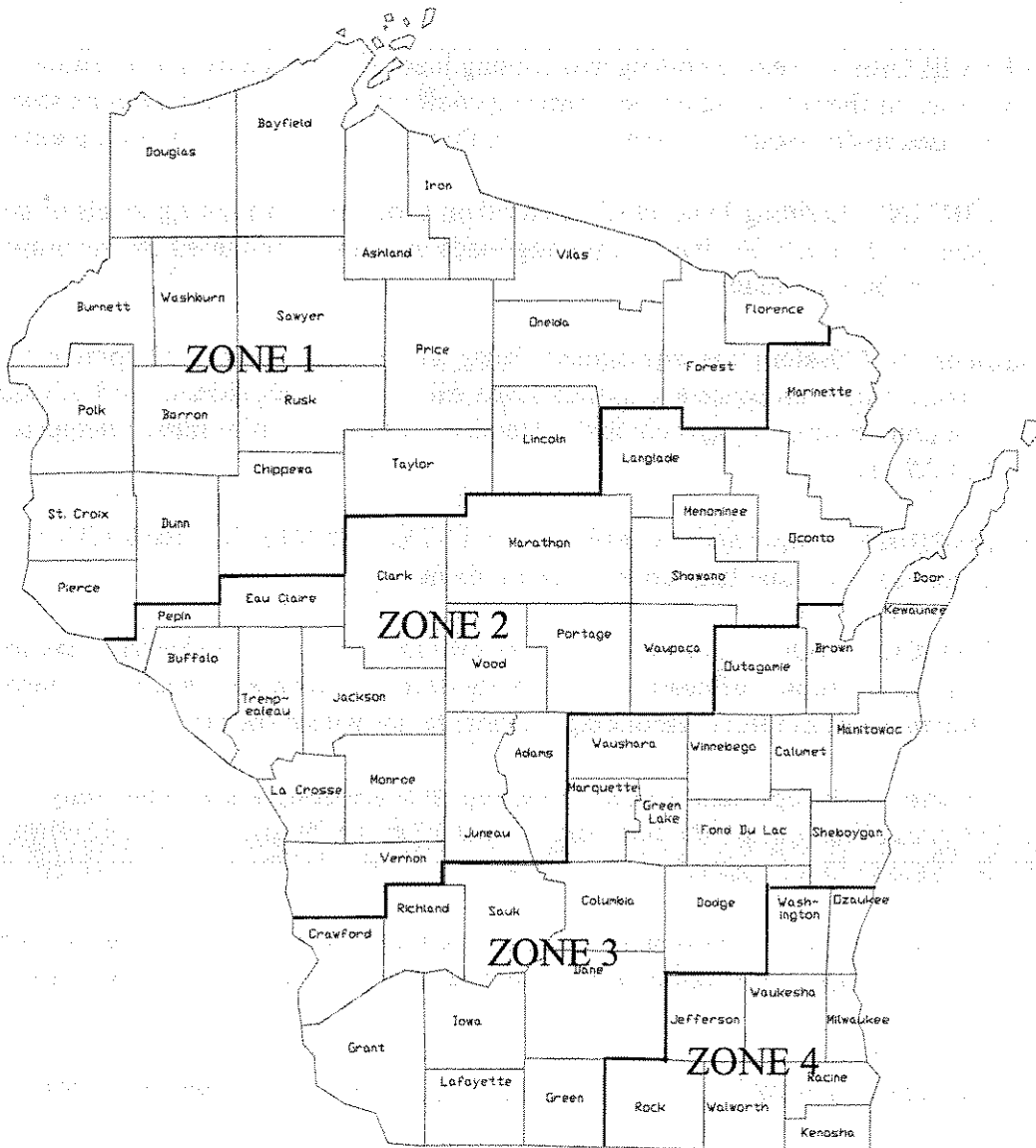
Note: This section does not require the installation of cooling equipment.

(2) **INDOOR DESIGN CONDITIONS.** The winter indoor design temperature is specified in Table 64.0403. When air conditioning is provided in accordance with ch. Comm 64, the summer indoor design temperature is 78°F or lower.

(3) **OUTDOOR DESIGN CONDITIONS.** Winter maximum and summer minimum for outdoor design temperatures shall be taken from Figure 63.1023.

Note: Systems may be designed for colder winter temperatures or for warmer summer temperatures.

**Figure 63.1023
Outdoor Design Conditions**



Zone	Winter	Summer	
	Design Temp. (°F)	Dry Bulb (°F)	Wet Bulb (°F)
1	-25	86	75*
2	-20	87	75
3	-15	87	75
4	-10	89	77

*Exception: For Douglas, Bayfield, Ashland and Iron Counties, use 70°F summer wet bulb design temperature.

(4) VENTILATION. Outdoor air ventilation loads shall be based on ventilation rates specified in ch. Comm 64.

(5) ENVELOPE. Envelope heating and cooling loads shall be based on envelope characteristics such as thermal conductance, shading coefficient, and air leakage consistent with the values used to demonstrate compliance with this subchapter, Part 3, building envelope.

(6) LIGHTING. Lighting loads shall be based on actual design lighting levels or power budgets consistent with subch. III, Part 5. Lighting loads may not be included for the purpose of calculating design heating loads.

Comm 63.1024 System and equipment sizing. HVAC systems and equipment shall be sized to provide the minimum space and system loads calculated in accordance with s. Comm 63.1023. Heating and cooling equipment and systems shall meet the minimum efficiencies in IECC Table 803.2.2 (1).

Comm 63.1026 Temperature controls. (1) SYSTEM CONTROL. Each HVAC system shall include at least one temperature control device.

(2) ZONE CONTROLS. (a) *Individual thermostatic controls.* 1. 'General.' Except as provided in subd. 2., the supply of heating and cooling energy to each zone shall be controlled by individual thermostatic controls responding to temperature within the zone.

2. 'Exceptions.' Independent perimeter systems that are designed to offset only envelope heat losses or gains, or both, may serve one or more zones also served by an interior system with the following limitations:

a. The perimeter system shall include at least one thermostatic control zone for each building exposure having exterior walls facing only one orientation for 50 contiguous feet or more; and

b. The perimeter system heating and cooling supply shall be controlled by thermostats located within the zones served by the system.

(b) *Zone controls for comfort heating.* Where used to control comfort heating, zone thermostatic controls shall be capable of being set locally or remotely by adjustment or selection of sensors down to 50°F or lower.

(c) *Zone controls for comfort cooling.* Where used to control comfort cooling, zone thermostatic controls shall be capable of being set locally or remotely by adjustment or selection of sensors up to 85°F or higher.

(d) *Zone controls for both heating and cooling.* 1. 'General.' Except as provided in subd. 2., zone thermostatic controls used to control both comfort heating and cooling shall be capable of providing a temperature range, or deadband, of at least 5°F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum.

2. 'Exceptions.' a. Deadbands are not required for special occupancy, special usage, or required systems where deadband controls are not appropriate.

b. Deadbands are not required for buildings complying with the ASHRAE energy cost budget method under subch. III, Part 5, if, in the proposed building energy analysis, heating and cooling thermostat set-points are set to the same value between 70°F and 75°F inclusive and assumed to be constant throughout the year.

c. Deadbands may be omitted for thermostats that have manual changeover between heating and cooling modes.

Comm 63.1027 Zone controls. (1) THERMOSTATIC AND HUMIDISTATIC CONTROLS. Except as provided in sub. (2), zone thermostatic and humidistatic controls shall be capable of operating in sequence to supply heating and cooling energy to the zone. Such controls shall prevent any of the following:

(a) Reheating.

(b) Recooling.

(c) Mixing or simultaneous supply of air that has been previously mechanically heated and air that has been previously cooled, either by mechanical refrigeration or by economizer systems.

(d) Other simultaneous operation of heating and cooling systems to the same zone.

(2) EXCEPTIONS. All of the following systems and zones are exempt from this section:

(a) Variable air volume (VAV) systems which, during periods of occupancy, are designed to reduce the air supply to each zone to a minimum before reheating, recooling, or mixing takes place. This minimum volume shall be no greater than the largest of the following:

1. 30% of the peak supply volume.

2. The minimum required to meet ventilation requirements of ch. Comm 64.

3. 0.4 cfm/square foot of zone conditioned floor area.

(b) Zones where special pressurization relationships or cross-contamination requirements are such that VAV systems are impractical, such as isolation rooms, operating areas of hospitals, and laboratories.

(c) Where at least 75% of the energy for reheating or for providing warm air in mixing systems is provided from a site-recovered or site-solar energy source.

(d) Zones where specified humidity levels are required to satisfy process needs, such as computer rooms and museums.

(e) Zones with a peak supply air quantity of 150 cfm or less.

(f) Multiple reheat systems serving multiple zones, other than those employing variable air volume for temperature control, that are provided with controls that will automatically reset the system cold air supply to the highest temperature level that will satisfy the zone requiring the coolest air. In the case of direct expansion cooling systems, cooling may be cycled based on the zone requiring the coolest air or average room temperature for all zones.

(g) Dual duct and multizone systems that are provided with controls that will automatically reset all of the following:

1. The cold duct air supply to the highest temperature that will satisfy the zone requiring the coolest air.

2. The hot duct air supply to the lowest temperature that will satisfy the zone requiring the warmest air.

(h) Systems in which heated air is recooled, directly or indirectly, to maintain space temperature that are provided with controls that will automatically reset the temperature to which the supply air is heated to the lowest level that will satisfy the zone requiring the warmest air.

(i) A multiple zone heating, ventilating and air-conditioning system that employs reheating or recooling for control of not more than 5,000 cfm or 20% of the total supply air of the system, whichever is less.

(3) OFF-HOUR CONTROLS. Except as provided in pars. (a) to (c), mechanical HVAC systems shall be equipped with automatic controls capable of accomplishing a reduction of energy use through control setback or equipment shutdown during periods of nonuse or alternate use of the zones served by the system. The following systems are exempt from this subsection:

(a) Systems serving areas expected to operate continuously.

(b) Where it can be shown that setback or shutdown will not result in a decrease in overall building energy costs.

(c) Equipment with full load demands of 2 kW or 6826 Btu/h or less that is controlled by readily accessible manual off-hour controls.

Comm 63.1028 Humidity control. If a system is equipped with a means for adding moisture to maintain specific humidity levels in a zone or zones, a humidistat shall be provided in accordance with IECC section 503.3.2.4 for residential buildings and IECC section 803.2.3.2 for commercial buildings.

Comm 63.1029 Insulation, materials and construction. (1) GENERAL. Insulation required by subs. (2) and (3) shall be suitably protected from damage. Insulation shall be installed in accordance with practices acceptable to the department. The department accepts MICA Commercial and Industrial Insulation Standards as an insulation installation practice.

(2) PIPING INSULATION. Except as provided in pars. (a) to (c), recirculating plumbing system piping, plumbing piping in the first 8 feet from storage tanks for noncirculating systems, any piping served by a self-regulating electric heating cable, HVAC system piping, and related HVAC fluid conveying conduit, such as heat exchanger bodies, shall be thermally insulated in accordance with Table 63.1029 or equivalent. The following piping or conduit is exempted from this subsection:

(a) Factory-installed piping or conduit within HVAC equipment tested and rated in accordance with s. Comm 63.1020;

(b) Piping or conduit for which no insulation is specified in Table 63.1029.

(c) Where it can be shown that the heat gain or heat loss to or from piping or conduit without insulation will not increase building energy use.

**Table 63.1029
Plumbing and HVAC Piping Minimum Insulation [in. ^a (R-value)]**

Fluid Design Operating Temp. Range, °F	Insulation Conductivity ^a		Nominal Pipe Diameter [in. (R-value)]					
	Conductivity Range Btu in./- (h ft ² °F)	Mean Rating Temp. °F	Runouts ^b up to 2	1 and less	1-1/4 to 2	2-1/2 to 4	5 & 6	8 & up
Heating systems (Steam, Steam Condensate, and Hot Water)								
Above 350	0.32-0.34	250	1.5(R-4.4)	1.5(R-4.4)	2.5(R-7.4)	3.0(R-8.8)	3.5(R-10.3)	3.5(R-10.3)
251-350	0.29-0.31	200	1.5(R-4.8)	1.5(R-4.8)	2.5(R-8.1)	2.5(R-8.1)	3.5(R-11.3)	3.5(R-11.3)
201-250	0.27-0.30	150	1.0(R-3.3)	1.0(R-3.3)	1.5(R-5.0)	2.0(R-6.7)	2.0(R-6.7)	3.5(R-11.7)
141-200	0.25-0.29	125	0.5(R-1.8)	0.5(R-1.8)	1.5(R-5.2)	1.5(R-5.2)	1.5(R-5.2)	1.5(R-5.2)
105-140	0.24-0.28	100	0.5(R-1.8)	0.5(R-1.8)	1.0(R-3.6)	1.0(R-3.6)	1.0(R-3.6)	1.5(R-5.4)
Domestic and Service Hot Water systems^c								
105 and greater	0.24-0.28	100	0.5(R-1.8)	1.0(R-3.6)	1.0(R-3.6)	1.5(R-5.4)	1.5(R-5.4)	1.5(R-5.4)

Cooling systems (Chilled water, brine, and refrigerant)^d

40-55	0.23-0.27	75	0.5(R-1.9)	0.5(R-1.9)	0.75(R-2.8)	1.0(R-3.7)	1.0(R-3.7)	1.0(R-3.7)
Below 40	0.23-0.27	75	1.0(R-3.7)	1.0(R-3.7)	1.5(R-5.6)	1.5(R-5.6)	1.5(R-5.6)	1.5(R-5.6)

^a For insulation outside the state conductivity range, the minimum thickness (T) shall be determined as follows: $T=PR [(1+t/PR)^{K/k}-1]$, where T = minimum insulation thickness for material with conductivity K, in.; PR = actual outside radius of pipe, in.; t = insulation thickness, in.; K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature; and k = the lower value of the conductivity range listed for the applicable fluid temperature.

^b Runouts to individual terminal units not exceeding 12 ft. in length.

^c Applies to recirculating sections of service or domestic hot water systems and first 8 ft. from storage tank for nonrecirculating systems.

^d The required minimum thickness does not consider water vapor transmission and condensation.

(3) AIR-HANDLING SYSTEM INSULATION. All air-handling ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated in accordance with s. Comm 63.0803 (2) (f).

(4) ADDITIONAL DUCT SEALING. Where supply ductwork and plenums that are designed to operate at static pressures from 0.25 inches to 3 inches water column inclusive are located outside of the conditioned space or in return plenums, joints shall be sealed in accordance with Seal class C as defined in the SMACNA HVAC Duct Leakage Test Manual. Pressure sensitive tape shall not be used as the primary sealant where such ducts are designed to operate at static pressures of 1 inch water column or greater.

Comm 63.1030 Hydronic system controls. Hydronic system controls shall comply with IECC section 803.3.3.7.

Comm 63.1031 Economizer controls. (1) FAN SYSTEM. Except as provided in sub. (2), each fan system shall be designed and capable of being controlled to take advantage of favorable weather conditions to reduce mechanical cooling requirements. The system shall include either of the following:

(a) A temperature or enthalpy air economizer system which is capable of automatically modulating outside air and return air dampers to provide 100% of the design supply air quantity as outside air for cooling;

(b) A water economizer system, which is capable of cooling supply air by direct evaporation, indirect evaporation, or both. Such a system shall be designed and capable of being controlled to provide 100% of the expected system cooling load at outside air temperatures of 50°F dry-bulb/40°F wet-bulb and below.

(2) EXCEPTIONS. All of the following systems are exempt from this subsection:

(a) Individual fan-cooling units with a supply capacity of less than 2,000 cfm or a total system cooling capacity of less than 62,000 Btu/hour for split systems or less than 36,000 Btu/hour for all other types. The total capacity of all such units complying by use of this exception shall not exceed 600,000 Btu/hour per building or 10% of the total installed cooling capacity, whichever is larger;

(b) Systems with air or evaporatively cooled condensers for which it can be shown that the use of outdoor air cooling affects the operation of other systems, such as humidification, dehumidification, or supermarket refrigeration systems, so as to increase overall building energy costs;

Note: Other areas that may use controlled humidification or dehumidification are computer rooms, museums, library stacks and drafting rooms.

(c) Where the overall building energy use resulting from alternative designs, such as internal to external zone heat recovery systems, can be shown to be less than those resulting from an economizer system.

Comm 63.1032 Electrical motors. (1) PERMANENTLY WIRED MOTORS. Any permanently wired motor that meets all of the criteria specified in pars. (a) through (g) shall meet the efficiency requirements specified in Table 63.1032 and the requirements of this section:

- (a) The motor is used in a HVAC fan or pumping system.
- (b) The motor is polyphase.
- (c) The motor is one horsepower or more.
- (d) The motor is a design A or B squirrel-cage, foot-mounted, T-frame induction motor that has synchronous speeds of 3600, 1800, 1200, and 900 rpm.
- (e) The motor is expected to operate more than 1000 hours per year.
- (f) The motor is not a multispeed motor used in a system designed to use more than one speed.
- (g) The motor is not a component of equipment that meets the efficiency requirements of s. Comm 63.1020 where motor input is included in the determination of the equipment efficiency.

(2) MOTOR NAMEPLATE. The motor nameplate shall list the minimum nominal full-load motor efficiency.

Note: Motors that are classified as "energy efficient" under the National Electric Manufacturer's Association Standard MG 12.55, dated 3-14-91, are acceptable to the department as meeting the efficiency requirements of this section.

Table 63.1032
Minimum Acceptable Nominal Full-Load Motor Efficiency
For Single-Speed Polyphase Squirrel-Cage Induction Motors
Having Synchronous Speeds of 3600, 1800, 1200 and 900 rpm

Full-Load Efficiencies—Open Motors								
HP	2-Pole		4-Pole		6-Pole		8-Pole	
	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1.0	--	--	82.5	81.5	80.0	78.5	74.0	72.0
1.5	82.5	81.5	84.0	82.5	84.0	82.5	75.5	74.0
2.0	84.0	82.5	84.0	82.5	85.5	84.0	85.5	84.0
3.0	84.0	82.5	86.5	85.5	86.5	85.5	86.5	85.5
5.0	85.5	84.0	87.5	86.5	87.5	86.5	87.5	86.0
7.5	87.5	86.5	88.5	87.5	88.5	87.5	88.5	87.5
10.0	88.5	87.5	89.5	88.5	90.2	89.5	89.5	88.5
15.0	89.5	88.5	91.0	90.2	90.2	89.5	89.5	88.5
20.0	90.5	89.5	91.0	90.2	91.0	90.2	90.2	89.5
25.0	91.0	90.2	91.7	91.0	91.7	91.0	90.2	89.5
30.0	91.0	90.2	92.4	91.7	92.4	91.7	91.0	90.2
40.0	91.7	91.0	93.0	92.4	93.0	92.4	91.0	90.2
50.0	92.4	91.7	93.0	92.4	93.0	92.4	91.7	91.0
60.0	93.0	92.4	93.6	93.0	93.6	93.0	92.4	91.7
75.0	93.0	92.4	94.1	93.6	93.6	93.0	93.6	93.0
100.0	93.0	92.4	94.1	93.6	94.1	93.6	93.6	93.0
125.0	93.6	93.0	94.5	94.1	94.1	93.6	93.6	93.0
150.0	93.6	93.0	95.0	94.5	94.5	94.1	93.6	93.0
200.0	94.5	94.1	95.0	94.5	94.5	94.1	93.6	93.0
Full-Load Efficiencies—Enclosed Motors								
HP	2-Pole		4-Pole		6-Pole		8-Pole	
	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1.0	75.5	74.0	82.5	81.5	80.0	78.5	74.0	72.0
1.5	82.5	81.5	84.0	82.5	85.5	84.0	77.0	75.5
2.0	84.0	82.5	84.0	82.5	86.5	85.5	82.5	81.5
3.0	85.5	84.0	87.5	86.5	87.5	86.5	84.0	82.5
5.0	87.5	86.5	87.5	86.5	87.5	86.5	85.5	84.0
7.5	88.5	87.5	89.5	88.5	89.5	88.5	85.5	84.0
10.0	89.5	88.5	89.5	88.5	89.5	88.5	88.5	87.5
15.0	90.2	89.5	91.0	90.2	90.2	89.5	88.5	87.5
20.0	90.2	89.5	91.0	90.2	90.2	89.5	89.5	88.5
25.0	91.0	90.2	92.4	91.7	91.7	91.0	89.5	88.5
30.0	91.0	90.2	92.4	91.7	91.7	91.0	91.0	90.2
40.0	91.7	91.0	93.0	92.4	93.0	92.4	91.0	90.2
50.0	92.4	91.7	93.0	92.4	93.0	92.4	91.7	91.0
60.0	93.0	92.4	93.6	93.0	93.6	93.0	91.7	91.0
75.0	93.0	92.4	94.1	93.6	93.6	93.0	93.0	92.4
100.0	93.6	93.0	94.5	94.1	94.1	93.6	93.0	92.4
125.0	94.5	94.1	94.5	94.1	94.1	93.6	93.6	93.0
150.0	94.5	94.1	95.0	94.5	95.0	94.5	93.6	93.0
200.0	95.0	94.5	95.0	94.5	95.0	94.5	94.1	93.6

Part 5-Lighting Power

Comm 63.1040 Scope. (1) GENERAL. Except as specified in sub. (2), sections Comm 63.1041 to 63.1051 shall apply to all of the following rooms, spaces and areas:

- (a) Interior spaces of buildings.
- (b) Building exteriors and exterior areas such as entrances, exits, and loading docks.
- (c) Roads, grounds, parking, and other exterior areas where lighting is energized through the building electrical service.

(2) EXCEPTIONS. Lighting that is specifically designated as required by a health or life safety regulation is exempt.

Comm 63.1041 Exterior lighting power requirement. The exterior lighting power of a building or a group of buildings in a multibuilding facility calculated in accordance with s. Comm 63.1042 shall be no greater than the lighting power allowance calculated in accordance with s. Comm 63.1043.

Comm 63.1042 Calculation of exterior lighting power. The calculated exterior lighting power is the sum of the power for all exterior luminaires that are included in s. Comm 63.1040, minus the power for exempted exterior lighting as specified in subs. (1) to (5).

- (1) Task lighting for outdoor activities such as manufacturing and processing facilities.
- (2) Lighting power for theatrical productions.
- (3) Lighting for outdoor sporting facilities, including playing and seating areas.
- (4) Lighting for dwelling units that is controlled within the dwelling unit.
- (5) Exit way or egress lighting required by s. Comm 73.21 that has switching regulated by Article 700 of the National Electrical Code.

Comm 63.1043 Exterior lighting power allowance. (1) CALCULATION METHOD. The exterior lighting power allowance for a building or a multibuilding facility is the sum of all the allowed lighting powers for all exterior areas. The lighting power for each area is calculated by multiplying the unit power allowance from Table 63.1043 by the applicable length or area.

(2) APPLICABLE AREAS AND LENGTHS. The applicable areas and lengths used with Table 63.1043 to calculate the exterior lighting power allowance are described in pars. (a) to (d).

(a) Horizontal areas of grounds, driveways, lots, gardens or parks may be calculated as if they were flat, or the actual area of the surfaces of contours may be used.

(b) Canopied areas are the area of the horizontal surface under the canopy. A canopy includes an exterior awning, soffit or ornamental or functional structure signifying a main entrance to a building.

(c) The linear length of door openings is measured in plan view and includes the door opening only. Sidelights and other portions of the door, which do not open, are not included.

(d) The applicable area of the building facade includes all vertical and horizontal areas that are intended to be illuminated.

Table 63.1043

Exterior Lighting Unit Power Allowances

Area Description	Allowances
Canopies (not associated with an entrance)	4 W/ft ²
Commerce or merchandizing areas	4 W/ft ²
Exit (with or without canopy)	16 W/lin ft of door opening
Entrance (without canopy)	20 W/lin ft of door opening
Entrance (with canopy)	
High traffic (retail, hotel, airport, theater, etc.)	6.6 W/ft ² of canopied area
Light traffic (hospital, office, school, etc.)	2.6 W/ft ² of canopied area
Loading area	0.26 W/ft ²
Loading door	13 W/lin ft of door opening
Building exterior surfaces/facades	0.16 W/ft ² of surface area to be illuminated
Storage and nonmanufacturing work areas	0.13 W/ft ²
Other activity areas for casual use such as picnic Grounds, gardens, parks and other landscaped Areas.	0.06 W/ft ²
Private driveways/walkways	0.06 W/ft ²
Public driveways/walkways	0.10 W/ft ²
Private parking lots	0.08 W/ft ²
Public parking lots	0.12 W/ft ²
Pump island canopies	4 W/ft ²

Comm 63.1044 Interior lighting power requirement. The interior lighting power of a building calculated in accordance with s. Comm 63.1045 shall be no greater than the interior lighting power allowance calculated in accordance with s. Comm 63.1046.

Comm 63.1045 Calculation of interior lighting power. The calculated interior lighting power of a building is the total watts of all interior luminaires including, but not limited to, track and flexible lighting systems, lighting that is integral with modular furniture, movable

displays and cabinets, and internally illuminated case work for task or display purposes, minus any adjustments allowed under subs. (1) through (4).

(1) **MULTIPLE INTERLOCKED LIGHTING SYSTEMS SERVING A SPACE.** When multiple interlocked lighting systems serve a space, the watts of all systems except the system with the highest wattage may be excluded from the calculated lighting power if:

(a) The lighting systems are interlocked to prevent simultaneous operation; or

(b) The lighting systems are controlled by a preset dimming system or other device that prevents simultaneous operation of more than one lighting system, except under the direct control of authorized personnel.

(2) **REDUCTION OF WATTAGE THROUGH CONTROLS.** The watts of any luminaire that is controlled may be reduced by the number of watts times the applicable power adjustment factor from Table 63.1045 if all of the following are met:

(a) The control complies with s. Comm 63.1051.

(b) At least 50% of the light output of the luminaire is within the applicable space listed in Table 63.1045.

(c) Except as noted in Table 63.1045, only one power adjustment factor is used for the luminaire.

(d) For daylighting control credits, the luminaire is controlled by the daylighting control, and the luminaire is located within the daylit area.

(e) For automatic time switch control devices, a timed manual override is provided at each switch location required by s. Comm 63.1050. The override device shall control only the lights in the surrounding area enclosed by ceiling-height partitions.

**Table 63.1045
Lighting Power Adjustment Factors**

<u>Type of Control</u>	<u>Type of Space</u>	<u>Factor</u>
Automatic daylighting controls	Daylit areas	
Continuous dimming		0.30
Multiple step dimming		0.20
On/off		0.10
Automatic time switch control device in conjunction with automatic daylighting controls	Daylit areas ≤ 250 square feet	

<u>Type of Control</u>	<u>Type of Space</u>	<u>Factor</u>
Continuous dimming		0.35
Multiple step dimming		0.25
On/off		0.15
Automatic time switch control device in conjunction with lumen maintenance and automatic daylighting controls	Daylit areas \leq 250 square feet	
Continuous dimming		0.40
Multiple step dimming		0.30
On/off		0.20
Lumen maintenance	Any space	0.10
Lumen maintenance in conjunction with an automatic time switch control device	Space \leq 250 square feet	0.15
Automatic time switch control device	Spaces \leq 250 square feet	0.15
Occupant-sensing device with a separate sensor for each space	Spaces \leq 250 square feet enclosed by opaque floor-to-ceiling partitions; any size classroom, corridor, conference or waiting room	0.30*
Occupant-sensing device with separate sensor for each space	Rooms of any size that are used exclusively for storage	0.60*
Occupant-sensing device with separate sensor for each space	Spaces $>$ 250 square feet	0.10*
Occupant-sensing device with a separate sensor for each space used in conjunction with daylighting controls and separate sensor for each space	Spaces \leq 250 square feet within a daylit area and enclosed by opaque floor-to-ceiling partitions	
Continuous dimming		0.40*
Multiple step dimming		0.35*
On/off		0.35*
Occupant-sensing device with a separate sensor for each space used in conjunction with daylighting controls and separate sensor for each space and lumen maintenance	Spaces \leq 250 square feet within a daylit area and enclosed by opaque floor-to-ceiling partitions	0.35*

<u>Type of Control</u>	<u>Type of Space</u>	<u>Factor</u>
Continuous dimming		0.45*
Multiple step dimming		0.40*
On/off		0.35*
Occupant-sensing device with a separate sensor for each space used with lumen maintenance	Spaces \leq 250 square feet and enclosed by opaque floor-to-ceiling partitions	0.35*
Occupant-sensing device with a separate sensor for each space used in conjunction with an automatic time switch control device	Spaces \leq 250 square feet enclosed by opaque floor to ceiling partitions	0.35*
Manual dimming system	Hotels, motels, restaurants, auditoriums, theaters	0.10
Multiscene programmable dimming system	Hotels, motels, restaurants, auditoriums, theaters	0.20
Occupant-sensing device with programmable multiscene dimming system	Hotels, motels, restaurants, auditoriums, theaters	0.35

*Note to Table 63.1045: Adjustment factors for occupant-sensing devices are for devices with on-off operation. If devices are used that turn lights down, rather than off, the adjustment factor shall be multiplied by the percent of energy savings that occur while the lights are turned down.

(3) LIGHTING WATTAGE EXCLUDED. The watts of the following lighting applications may be excluded from the calculated interior lighting power of the building.

(a) Lighting for theatrical productions and other live performances, television broadcasting, audio-visual presentations, and those portions of entertainment facilities such as stage areas in hotel ballrooms, night clubs, dance floors, churches, and casinos where lighting is an essential technical element for the function performed, if the lighting is an addition to a general lighting system, and if the lighting is separately controlled and accessible only to authorized operators.

(b) Lighting for television, video and film production.

(c) Lighting for photographic processes.

(d) Lighting for the amusement and attraction areas in theme parks.

(e) Lighting for exhibits in areas such as exhibit, convention, and hotel function areas, if the lighting is an addition to a general lighting system, and if the lighting is separately controlled and accessible only to authorized operators.

(f) Specialized local lighting installed in nonlighting process equipment by its manufacturer used to illuminate process related tasks only.

(g) In buildings for medical and clinical care, examination and surgical lights, low-level night lights, and lighting integral to medical equipment.

(h) Lighting fixtures that are an integral part of refrigeration equipment.

(i) Nonretail display lighting required for art exhibits or displays in galleries, museums and monuments.

(j) Special lighting needed for research.

(k) Task lighting for plant growth or maintenance, if it is equipped with an automatic 24-hour time switch that has program back-up capabilities that prevent the loss of the switch's program and time setting for at least 10 hours if power is interrupted.

(l) Exit way or egress illumination that is normally off.

(m) Task lighting specifically designed for primary use by visually impaired, for lip reading, and by senior citizens.

(n) Lighting for informational signs and exit signs, but excluding commercial displays.

Note: See s. Comm 63.1005 (38) for definition of informational sign and s. Comm 63.1052 for exit sign requirements.

(o) Display window lighting in retail facilities provided the display area is separated from the store sales area by opaque ceiling-height partitions.

(p) Lighting in dwelling units that provides complete independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking, and sanitation.

(q) In restaurant buildings and areas, lighting for food warming or integral to food preparation equipment.

(r) Lighting equipment that is for sale.

(s) Lighting demonstration equipment in lighting education facilities.

(4) LIGHTING FIXTURES THAT ALLOW SUBSTITUTION OF SOURCES. The watts of track and other lighting fixtures that allow the substitution of low efficacy sources for high efficacy sources without altering the wiring of the fixture shall be determined by this subsection or other method approved by the department.

(a) *Track and busway line-voltage lighting.* The wattage of line-voltage lighting track and plug-in busway that allow the addition and relocation, or both, of luminaries without altering the wiring of the system shall be the specified wattage of the luminaries included in the system with a minimum of 30 W/lin ft.

(b) *Low-voltage lighting systems.* The wattage of low-voltage lighting track, cable conductor, rail conductor, and other flexible lighting systems that allow the addition or relocation, or both, without altering the wiring of the system shall be the specified wattage of the transformer supplying the system.

(c) *Incandescent medium base sockets.* The wattage for medium base fixtures shall be the listed lighting power capacity, in watts, of the fixture.

Comm 63.1046 Calculation of interior lighting power allowance. The interior lighting power allowance shall be calculated using one of the methods in s. Comm 63.1047, 63.1048, or 63.1049 as applicable.

Comm 63.1047 Complete building method. The complete building method may be used only on projects involving entire buildings where at least 80 percent of the areas of the building are the same type of use. Under this approach, the interior lighting power allowance is the lighting power density value in Table 63.1047 times the floor area of the entire building. Hotel, motel and residential buildings shall not use this method. Building uses that are not listed in Table 63.1047 shall be assigned the allowed lighting power density given under "All Others."

Table 63.1047
Complete Building Method
Lighting Power Density Values (Watts/ft²)

<u>Type of Use</u>	<u>Allowed Lighting Power Density</u>
Banks and Financial Institutions	1.7
Correctional Housing.....	1.4
General Commercial and Industrial Work Buildings	1.2
Grocery Store.....	1.8
Industrial and Commercial Storage Buildings	0.8
Medical Buildings and Clinics	1.5
Office Building	1.5
Religious Worship, Auditorium, and Convention Centers....	2.0
Restaurants	1.5
Retail and Wholesale Store	2.6
Schools	1.8
Theaters	1.5
All Others	0.8

Comm 63.1048 Area category method. Under the area category method, the interior lighting power allowance for the building is the sum of all allowed lighting powers for all areas in the building. The allowed lighting power for an area is the lighting power density in Table 63.1048 times the area. For purposes of the Area Category Method, an "Area" means all contiguous spaces that accommodate or are associated with a single one of the primary functions listed in Table 63.1048. Buildings with primary functions not listed in Table 63.1048 shall not use this method. Where areas are bounded or separated by interior partitions, the floor space occupied by those interior partitions shall not be included in any area. The area shall not include enclosed retail display windows with exempted lighting as described in s. Comm 63.1045 (3) (o). When the Area Category Method is used to calculate the interior lighting power allowance for an entire building, main entry lobbies, corridors, rest rooms, and support functions shall be treated as separate areas.

**Table 63.1048
Area Category Method - Lighting Power
Density Values (Watts/ft²)**

<u>Primary Function</u>	<u>Allowed Lighting Power Density</u>
Auditorium	2.0
Auto Repair	2.0
Bank/Financial Institution	1.8
Classrooms	2.0
Convention, Conference and Meeting Centers.....	1.6
Corridors, Rest Rooms and Support Areas.....	0.8
Detention Facilities.....	1.6
Dining.....	1.2
Exhibit	2.3
Storage Garage.....	0.2
General Commercial and Industrial Work.....	1.3
Grocery.....	2.0
Guest Room or Dorm Room.....	1.4
Hotel Function.....	2.3*
Industrial and Commercial Storage.....	0.6
Kitchen	2.2
Laboratory	3.3
Lobbies:	
Hotel Lobby.....	2.3*
Main Entry Lobby.....	1.6*
Malls, Arcades, and Atria.....	1.2*
Medical and Clinical Care.....	1.8
Office.....	1.6
Precision Commercial and/or Industrial Work.....	2.0
Religious Worship.....	2.2*
Retail Sales, Wholesale Showrooms.....	2.8
Theaters	

Motion Picture.....	1.0
Performance.....	1.5*

* Note to Table 63.1048: The smallest of the following values may be added to the allowed lighting power listed in Table 63.1048 for ornamental chandeliers and sconces that are switched or dimmed on circuits different from the circuits for general lighting:

- a. 1 watt per square foot times the area of the space in which the chandelier or sconce is used; or
- b. The actual design wattage of the chandelier or sconce.

Comm 63.1049 Activity method. Under the activity method, the interior lighting power allowance for a building is determined by calculating a lighting power budget for each space in accordance with subs. (1) to (4) and summing them in accordance with sub. (5).

(1) The lighting power budget of each interior space shall be determined in accordance with the following equation:

$$LPB = A \times UPD \times AF$$

Where:

LPB = lighting power budget of the space, W

A = area of the space, ft²

UPD = unit power density, W/ft² [Table 63.1049]

AF = area factor of the room [Figure 63.1049]

(a) The UPD shall be selected from Table 63.1049. For applications to areas or activities other than those given, select values for the most similar areas or activities. The UPD for a multifunctional space shall be based on the lowest UPD of any of the activities of the space.

(b) The area factor (AF) shall be determined from Figure 63.1049 based on the room area (A_r) and ceiling height. The room area shall be calculated from the inside dimensions of the room. Rooms of identical ceiling height and activities may be evaluated as a group. The AF of a group of rooms shall be determined from the average area of these rooms.

The following equation gives the formula used in developing Fig. 63.1049.

$$AF = 0.2 + 0.8(1/0.9^n)$$

Where:

$$n = \left[\frac{10.21(CH - 2.5)}{\sqrt{A_r}} \right] - 1$$

AF = Area factor

CH = Average ceiling height, ft.

A_r = Room area, ft²

If AF < 1.0, then AF = 1.0

If AF > 1.8, then AF = 1.8

(2) For rooms serving multiple functions such as hotel banquet or meeting rooms and office conference or presentation rooms; an adjustment factor of 1.5 times the UPD may be used if a supplementary system is actually installed and meets all of the following conditions:

(a) The installed power for the supplementary system shall not be greater than 33 percent of the adjusted lighting power budget calculated for that space.

(b) Independent controls shall be installed for the supplementary system.

(3) In rooms containing multiple simultaneous activities, such as a large general office having separate accounting and drafting areas within the same room, the lighting power budget for the rooms shall be the weighted average of the activities in proportion to the areas being served.

(4) The activity of indoor sports areas shall be considered as an area 10 feet beyond the playing boundaries of the sport, not to exceed the total floor area of the indoor sports space less the spectator seating area.

(5) The interior lighting power allowance shall be calculated in accordance with the following equation. The interior lighting power allowance shall include a 0.20 W/ft² allowance for unlisted spaces.

$$\text{ILPA} = (\text{LPB}_1 + \text{LPB}_2 + \dots + \text{LPB}_n) \\ + (0.20 \text{ W/ft}^2 \times \text{unlisted space area})$$

Where:

- ILPA = interior lighting power allowance, W
- Unlisted space area = $\text{GLA} - \Sigma(\text{LS})$, ft²
- GLA = gross lighted area, ft²
- LPB = lighting power budget, W
- LS = listed space

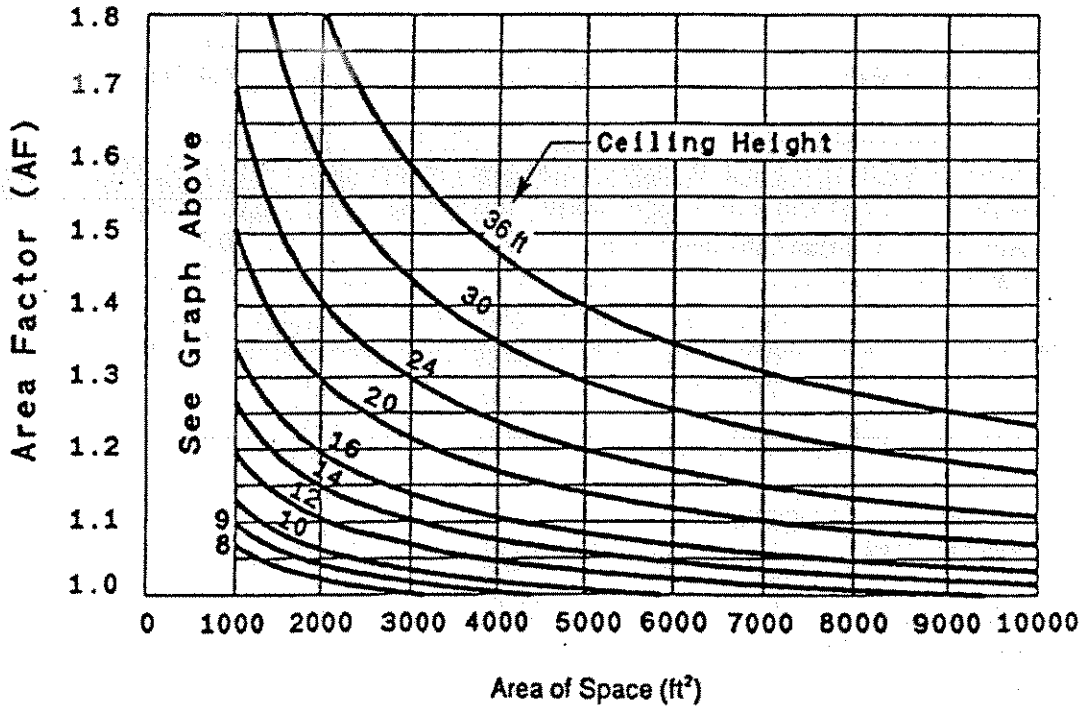
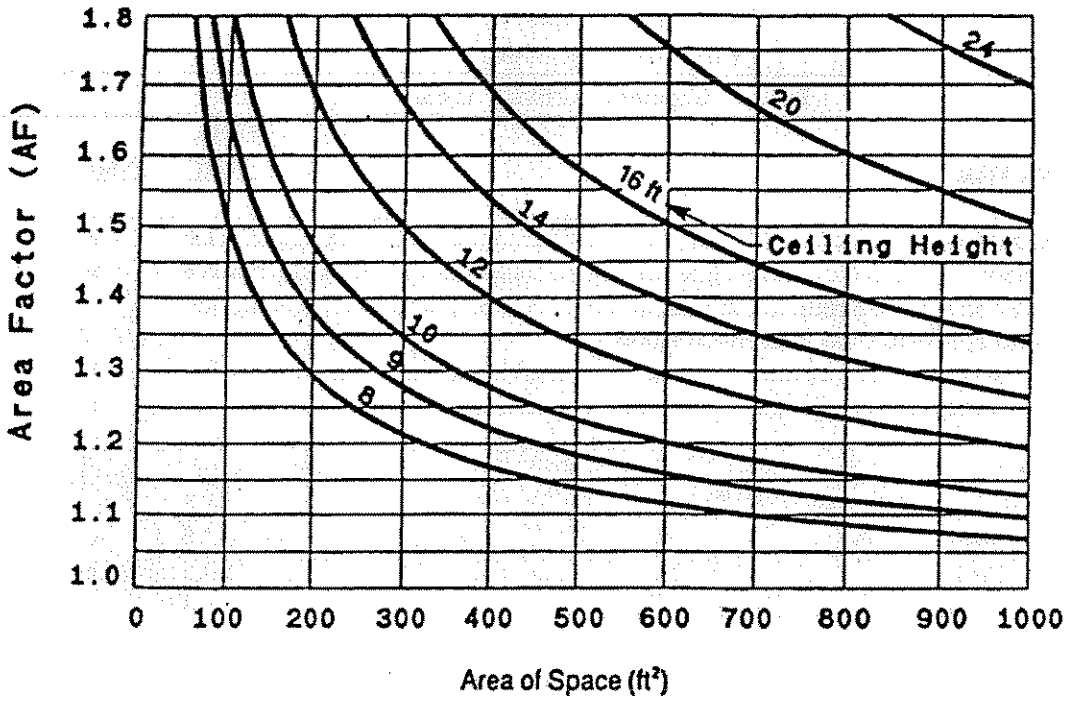


Figure 63.1049 Area Factor

**Table 63.1049
Unit Power Densities**

Part a - Common Activity Areas		
<u>Activity/Area</u>	<u>UPD W/ft²</u>	<u>Note</u>
Auditorium.....	1.6	a
Corridor.....	0.8	b
Classroom/Lecture Hall.....	2.0	
Electrical/Mechanical Equipment Room		
General.....	0.7	b
Control Rooms.....	1.5	b
Food Service		
Fast Food/Cafeteria.....	1.3	
Leisure Dining.....	2.5	c
Bar Lounge.....	2.5	c
Kitchen.....	1.4	
Recreation/Lounge.....	0.7	
Stair		
Active Traffic.....	0.6	
Emergency Exit.....	0.4	
Toilet and Washroom.....	0.8	
Garage		
Auto and Pedestrian Circulation Area.....	0.3	
Parking Area.....	0.2	
Laboratory.....	3.0	
Library		
Audio/Visual.....	1.1	
Stack Area.....	1.5	
Card File and Cataloging.....	1.6	
Reading Area.....	1.9	
Lobby (General)		
Reception and Waiting.....	1.0	
Elevator Lobbies.....	0.8	
Atrium (Multistory)		
First Three Floors.....	0.7	
Each Additional Floor.....	0.2	

**Table 63.1049
Unit Power Densities**

Part a - Common Activity Areas (Continued)

<u>Activity/Area</u>	<u>UPD</u> <u>W/ft²</u>	<u>Note</u>
Locker Room and Shower.....	0.8	
Office Category 1		
Enclosed offices, all open plan offices without partitions or with partitions* lower than 4.5 feet below the ceiling		
Reading, Typing and Filing.....	1.8	d
Drafting	2.6	d
Accounting	2.1	d
Office Category 2		
Open plan offices 900 square feet or larger with partitions* 3.5 to 4.5 feet below the ceiling Offices less than 900 square feet shall use Category 1		
Reading, Typing and Filing.....	1.9	b
Drafting	2.9	b
Accounting	2.4	b
Office Category 3		
Open plan offices 900 square feet or larger with partitions* higher than 3.5 feet below the ceiling Offices less than 900 square feet shall use Category 1		
Reading, Typing and Filing.....	2.2	b
Drafting	3.4	b
Accounting	2.7	b
Common Activity Areas		
Conference Meeting Room.....	1.8	a
Computer Office Equipment	2.1	
Filing, Inactive.....	1.0	
Mail Room.....	1.8	
Shop		
Machinery.....	2.5	
Electrical/Electronic	2.5	
Painting.....	1.6	
Carpentry.....	2.3	
Welding	1.2	

**Table 63.1049
Unit Power Densities**

Part a - Common Activity Areas (Continued)

<u>Activity/Area</u>	<u>UPD W/ft²</u>	<u>Note</u>
Storage and Warehouse		
Inactive Storage	0.3	
Active Storage, Bulky	0.3	
Active Storage, Fine	1.0	
Material Handling	1.0	
Unlisted Space	0.2	

* Not less than 90 percent of all work stations shall be individually enclosed with partitions of at least the height described.

Part b - Specific Buildings

<u>Activity/Area</u>	<u>UPD W/ft²</u>	<u>Note</u>
Airport, Bus and Rail Station		
Baggage Area	1.0	
Concourse/Main Thruway	0.9	
Ticket Counter	2.5	
Waiting and Lounge Area	1.2	
Bank		
Customer Area	1.1	
Banking Activity Area	2.8	
Barber and Beauty Parlor	2.0	
Church, Synagogue, Chapel		
Worship/Congregational	2.5	
Preaching and Sermon/	2.7	
Dormitory		
Bedroom	1.1	
Bedroom With Study	1.4	
Study Hall	1.8	
Fire and Police Department		
Fire Engine Room	0.7	
Detention Dayroom	1.5	
Jail Cell	1.2	

**Table 63.1049
Unit Power Densities**

Part b - Specific Buildings (Continued)

<u>Activity/Area</u>	<u>UPD W/ft²</u>	<u>Note</u>
Hospital/Nursing Home		
Corridor.....	1.3	b
Dental Suite/Examination/Treatment.....	1.6	
Emergency.....	2.3	
Laboratory.....	3.0	
Lounge/Waiting Room.....	0.9	
Medical Supplies.....	2.4	
Nursery.....	2.0	
Nurse Station.....	2.1	
Occupational Therapy/Physical Therapy.....	1.6	
Patient Room.....	1.4	
Pharmacy.....	1.7	
Radiology.....	2.1	
Surgical and O.B. Suites		
General Area.....	2.1	
Operating Room.....	7.0	
Recovery.....	2.3	
Hotel/Conference Center		
Banquet Room/Multipurpose.....	2.4	a
Bathroom/Powder Room.....	1.2	
Guest Room.....	1.4	
Public Area.....	1.2	
Exhibition Hall.....	2.6	
Conference/Meeting.....	1.8	a
Lobby.....	1.9	
Reception Desk.....	2.4	
Laundry		
Washing.....	0.9	
Ironing and Sorting.....	1.3	
Museum and Gallery		
General Exhibition.....	1.9	
Inspection/Restoration.....	3.9	
Storage (Artifacts)		
Inactive.....	0.6	
Active.....	0.7	
Post Office		
Lobby.....	1.1	
Sorting and Mailing.....	2.1	

**Table 63.1049
Unit Power Densities**

Part b - Specific Buildings (Continued)

<u>Activity/Area</u>	<u>UPD W/ft²</u>	<u>Note</u>
Service Station/Auto Repair.....	1.0	
Theater		
Performance Arts.....	1.5	
Motion Picture.....	1.0	
Lobby.....	1.5	
Retail Establishments		
Merchandising and Circulation Area - Applicable to all lighting, including accent and display lighting, installed in merchandising and circulation areas.....	2.2	g.
Mall Concourse	1.4	
Retail Support Areas		
Tailoring	2.1	
Dressing/Fitting Rooms.....	1.4	

Part c - Indoor Athletic Areas^{e,f}

<u>Activity/Area</u>	<u>UPD W/ft²</u>
Seating Area, All Sports.....	0.4
Badminton	
Club	0.5
Tournament.	0.8
Basketball/Volleyball	
Intramural.	0.8
College	1.3
Professional	1.9
Bowling	
Approach Area	0.5
Lanes.	1.1

**Table 63.1049
Unit Power Densities**

Part c - Indoor Athletic Areas^{e,f} (Continued)

<u>Activity/Area</u>	<u>UPD W/ft²</u>
Boxing or Wrestling (platform)	
Amateur	2.4
Professional	4.8
Gymnasium	
General Exercising and Recreation Only	1.0
Handball/Raquetball/Squash	
Club	1.3
Tournament	2.6
Hockey, Ice	
Amateur	1.3
College or Professional	2.6
Skating Rink	
Recreational	0.9
Exhibition/Professional	2.6
Swimming	
Recreational	0.9
Exhibition	1.5
Under Water	1.0
Tennis	
Recreational (Class III)	1.3
Club/College (Class II)	1.9
Professional (Class I)	2.6
Tennis, Table	
Club	1.0
Tournament	1.6

Notes for Table 63.1049

- a. A 1.5 power adjustment factor is applicable for multifunctional spaces.
- b. Area factor of 1.0 shall be used for these spaces.
- c. UPD includes lighting power required for clean-up purpose.
- d. Area factor shall not exceed 1.55.
- e. Area factor of 1.0 shall be used for all indoor athletic spaces.
- f. Facilities that are used for more than one level of play shall have appropriate switching between the different levels specified in Table 63.1049. Dimming shall not be used to accomplish the reduction in illumination. The illumination at all levels shall be uniform.

g. Where lighting equipment is specified to be installed to highlight specific merchandise in addition to lighting equipment specified for general lighting and is switched or dimmed on circuits different from the circuits for general lighting, the smaller of the actual wattage of the lighting equipment installed specifically for merchandise, or 0.8 W/ft² times the floor area of the display area shall be added to the interior lighting power determined in accordance with this line item.

Comm 63.1050 Lighting controls that must be installed. (1) AREA CONTROLS. (a) Except as provided in pars. (c) and (d), each interior area enclosed by ceiling-height partitions shall have an independent switching or control device. This switching or control device shall comply with all of the following:

1. Be readily accessible.
2. Located so that a person using the device can see the lights or area controlled by that switch, or so that the area being lit is annunciated.
3. Be manually operated, or automatically controlled by an occupant-sensing device that meets the requirements of s. Comm 63.1051 (4).

(b) Other devices may be installed in conjunction with the switching or control device required by par. (a) provided that they:

1. Permit the required switching or control device to override the action of the other devices; and
2. Reset the mode of any automatic system to normal operation without further action.

(c) Up to one-half watt per square foot of lighting in any area within a building that must be continuously illuminated for reasons of building security or emergency egress are exempt from par. (a) if:

1. The area is designated a security or emergency egress area on the plans and specifications submitted to the department; and
2. The area is controlled by switches accessible only to authorized personnel.

(d) Public areas with switches that are accessible only to authorized personnel are exempt from the area control requirements of par. (a).

(2) CONTROLS TO REDUCE LIGHTING. (a) Except as provided in par. (b), the general lighting of any enclosed interior space 100 square feet or larger in which the connected lighting load exceeds 1.2 watts per square foot for the space as a whole, and that has more than one light source or luminaire, shall be controlled so that the load for the lights may be reduced by at least one-half while maintaining a reasonably uniform level of illuminance throughout the area. A reasonably uniform reduction of illuminance shall be achieved by one of the following:

1. Controlling all lamps or luminaires with dimmers.
2. Dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps.
3. Switching the middle lamps of three lamp luminaires independently of the outer lamps.
4. Switching each luminaire or each lamp.
5. Other methods approved by the department.

(b) The requirements of par. (a) do not apply to any of the following:

1. Lights in areas that are controlled by an occupant-sensing device that meets the requirements of s. Comm 63.1051 (4).
2. Lights in corridors.
3. Lights in areas that are controlled by an automatic time switch control device that has a timed manual override available at each switch location required by sub. (1), and that controls only the lights in that area enclosed by ceiling height partitions.

(3) DAYLIT AREAS. (a) Except as provided in par. (b), daylit areas in any interior enclosed space greater than 250 square feet and a lighting density more than 1.2 W/ft² shall meet the requirements of subds. 1. and 2.

1. Such areas shall have at least one control that complies with all of the following:
 - a. Controls only luminaires in the daylit area.
 - b. Controls at least 50% of the lamps or luminaires in the daylit area, in a manner described in sub. (2)(a) 1. to 5., independently of all other lamps or luminaires in the enclosed space. The other luminaires in the enclosed space may be controlled in any manner allowed by sub. (2)(a) 1. to 5.

2. Such areas shall have controls that control the luminaires in each vertically daylit area separately from the luminaires in each horizontally daylit area.

(b) The requirements of this subsection do not apply to any of the following:

1. Daylit areas where the effective aperture of glazing is equal or less than 0.1 for vertical glazing and 0.01 for horizontal glazing.

2. Daylit areas where existing adjacent structures or natural objects obstruct daylight to the extent that effective use of daylighting is not feasible.

(4) SHUT-OFF CONTROLS. (a) Except as provided in par. (b), for every floor or metered space, all interior lighting systems shall be equipped with at least one separate automatic control to shut off the lighting. This automatic control shall meet the requirements of s. Comm 63.1051 and may be an occupancy sensor, automatic time switch, or other device capable of automatically shutting off the lighting.

(b) The requirements of par. (a) do not apply to any of the following:

1. Buildings or separately metered spaces of less than 5,000 square feet of space.
2. Where the system is serving an area that must be continuously lit, or where the use of the space prohibits the use of a preestablished lighting program.

Note: Service equipment rooms as specified in NEC 110-26 (3) (d) are covered by this exception.

3. In residential buildings, hotels and motels, lighting of corridors, guest rooms, and lodging quarters.

4. Up to one-half watt per square foot of lighting in any area within a building that must be continuously illuminated for reasons of building security or emergency egress, if:

a. The area is designated a security or emergency egress area on the plans and specifications submitted to the department; or

b. The area is controlled by switches accessible only to authorized personnel.

(c) If an automatic time switch control device is installed to comply with par. (a), it shall incorporate an override switching device that complies with all of the following:

1. Is readily accessible.
2. Is located so that a person using the device can see the lights or the area controlled by that switch, or so that the area being lit is annunciated.
3. Is manually operated.
4. Allows the lighting to remain on for no more than two hours when an override is initiated.
5. Controls an area not exceeding 20,000 square feet in malls, auditoriums, gymnasiums, single tenant retail spaces, factories, warehouses and arenas, and not exceeding 5,000 square feet for other uses.

6. Two overrides may be provided for a maximum of 10,000 square feet if the lighting is dual level controlled in accordance with sub. (2) (a) 2. or 3.

(5) **DISPLAY LIGHTING CONTROLS.** Display lighting shall be separately switched on circuits that are 20 amps or less.

(6) **EXTERIOR LIGHTING CONTROLS.** Except in lighting in parking garages, tunnels, and large covered areas that require illumination during daylight hours, exterior lighting shall be controlled by a directional photocell or astronomical time switch that automatically turns off the exterior lighting when daylight is available. Time switches shall be equipped with back-up provisions to keep time during a power outage of 10 hours or more.

(7) **HOTEL AND MOTEL GUEST ROOM CONTROLS.** Hotel and motel guest rooms or suites excluding bathrooms shall have one or more master switches at the main entry door or at the entry door of each room that turn off all permanently wired lighting fixtures and switched receptacles in the room or suite.

Comm 63.1051 Requirements for lighting control devices. Automatic time switch control devices, occupant-sensing devices, automatic daylighting control devices, lumen maintenance control devices, or interior photocell sensor devices that are used to justify a wattage reduction factor in the calculation of the actual internal lighting power in s. Comm 63.1045 (2) shall be approved for compliance with all of the applicable requirements of subs. (1) to (7) and shall be installed in compliance with sub. (8). Approval of devices shall be obtained via the material approval program in accordance with ch. Comm 61 or via manufacturer certification to the California Energy Commission.

Note: Information on California Energy Commission Certification may be obtained from the California Energy Commission, Energy Efficiency and Demand Analysis Division, 1516 9th Street, MS-25, Sacramento, CA 95814, (916) 654-4080. A list of approved control devices is available on the internet at <ftp://38.144.192.166/pub/efftech/appliance/>.

(1) **ALL DEVICES: INSTRUCTIONS FOR INSTALLATION AND CALIBRATION.** The manufacturer shall provide step-by-step instructions for installation and start-up calibration of the device.

(2) **ALL DEVICES: STATUS SIGNAL.** The device shall have an indicator that visibly or audibly informs the device operator that it is operating properly, or that it has failed or malfunctioned, except for photocell sensors or other devices where a status signal is infeasible because of inadequate power.

(3) **AUTOMATIC TIME SWITCH CONTROL DEVICES.** Automatic time switch control devices shall comply with all of the following:

(a) Be capable of programming different schedules for weekdays and weekends.

(b) Incorporate an automatic "holiday shut-off" feature that turns off all loads for at least 24 hours, then resumes the normally scheduled operation.

(c) Have program backup capabilities that prevent the loss of the device's program and time setting for at least 10 hours if power is interrupted.

(4) OCCUPANT-SENSING DEVICES. Occupant-sensing devices shall be capable of automatically controlling all the lights in an area no more than 30 minutes after the area has been vacated. In addition, ultrasonic and microwave devices shall have a built-in mechanism that allows calibration of the sensitivity of the device to room movement in order to reduce the false sensing of occupants and shall comply with either par. (a) or (b), as applicable:

(a) If the device emits ultrasonic radiation as a signal for sensing occupants within an area, the device shall comply with all of the following:

1. Have had an Initial Report submitted to the Bureau of Radiological Health, Federal Food and Drug Administration, under 21 CFR 1002.10.

2. Emit no audible sound.

3. Not emit ultrasound in excess of the decibel (dB) values given in Table 63.1051 measured no more than 5 feet from the source on axis.

Table 63.1051
Maximum Ultrasound Emissions

Midfrequency of Sound Pressure Third-Octave Bank (in kHz)	Maximum dB Level within Third-Octave Band (in dB reference 20 micropascals)
less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

(b) If the device emits microwave radiation as a signal for sensing occupants within area, the device shall comply with all of the following:

1. Comply with all applicable provisions in 47 CFR Part 5, and have an approved Federal Communications Commission identification number that appears on all units of the device and that has been submitted to the department.

2. Not emit radiation in excess of 1 milliwatt per square centimeter measured at no more than 5 centimeters from the emission surface of the device.

3. Have permanently affixed to it installation instructions recommending that it be installed at least 12 inches from any area normally used by room occupants.

(5) AUTOMATIC DAYLIGHTING CONTROL DEVICES. Automatic daylighting control devices shall comply with all of the following:

(a) Be capable of reducing the light output of the general lighting of the controlled area by at least one-half while maintaining a uniform level of illuminance throughout the area.

(b) If the device is a dimmer, provide electrical outputs to lamps for reduced flicker operation through the dimming range and without causing premature lamp failure.

(c) If the device is a stepped dimming system, incorporate time delay circuits to prevent cycling of light level changes of less than three minutes.

(d) If the device uses step switching with separate "on" and "off" settings for the steps, have sufficient separation or deadband of "on" and "off" points to prevent cycling.

(e) Have provided by the manufacturer step-by-step instructions for installation and start-up calibration to design foot-candle levels.

(6) LUMEN MAINTENANCE CONTROL DEVICES. Lumen maintenance control devices shall comply with all of the following:

(a) Be capable of reducing the light output of the general lighting of the controlled area by at least 30% while maintaining a uniform illuminance throughout the area.

(b) Provide electrical outputs to lamps for reduced flicker operation through the dimming range and without causing premature lamp failure.

(c) Incorporate an alarm, either audible or visible, to announce when a specified setpoint of lumens or watts has been reached.

(d) Have provided by the manufacturer step-by-step instructions for installation and start up calibration to design foot-candle levels.

(7) INTERIOR PHOTOCCELL SENSOR DEVICES. Interior photocell sensors shall not have a mechanical slide cover or other device that permits easy unauthorized disabling of the control, and shall not be incorporated into a wall-mounted occupant-sensing device.

(8) INSTALLATION IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. If an automatic time switch control device, occupant-sensing device, automatic daylighting control device, lumen maintenance control device, or interior photocell sensor device is installed, it shall comply with both pars. (a) and (b).

(a) The device shall be installed in accordance with the manufacturer's instructions.

(b) Automatic daylighting control devices and lumen maintenance control devices shall:

1. Be installed so that automatic daylighting control devices control only luminaries within the daylit area; and

2. Have photocell sensors that are either ceiling mounted or located so that they are accessible only to authorized personnel, and that are located so that they maintain adequate illumination in the area according to the designer's or manufacturer's instructions.

Comm 63.1052 Exit signs. Exit signs shall have an installed wattage of 20 watts or less.

Comm 63.1053 Reduction of single lamp ballasts. The following luminaries located within the same room shall be tandem wired or provided with three-lamp ballasts:

(1) One-lamp or three-lamp fluorescent luminaries recess-mounted within 10 feet center-to-center of each other.

(2) One-lamp or three-lamp fluorescent luminaries pendant- or surface-mounted within one foot edge-to-edge of each other.

Part 6 Nondepletable Energy Source

Comm 63.1060 Buildings utilizing solar, geothermal, wind or other nondepletable energy source. Any building, or portion thereof, utilizing any nondepletable energy source shall meet all the requirements in IECC section 806.

Part 7 System Analysis Design

Comm 63.1070 System analysis design. A building designed using system analysis design shall comply with IECC section 806.

File Reference: IBC/Comm 63C 1r

Chapter Comm 64
Heating, Ventilating and Air Conditioning

Subchapter I — Purpose, Scope, Application and Compliance

Comm 64.0001 Purpose and scope. (1) **PURPOSE.** (a) The purpose of this chapter is to regulate the design, installation, operation and maintenance of heating, ventilating and air conditioning systems in buildings and structures as specified in ch. Comm 61.

(b) The installation of fuel gas distribution piping and equipment, fuel gas-fired appliances and fuel gas-fired appliance venting systems shall be regulated by ch. Comm 65.

(c) Fixed electric space heating equipment shall comply with ch. Comm 16.

(2) **SCOPE.** The scope of this chapter is as specified in s. Comm 61.02.

Comm 64.0002 Application. (1) **GENERAL.** The application of this chapter is as specified in s. Comm 61.03 and as modified in this section.

(2) **APPLICABILITY.** All heating, ventilating and air conditioning systems shall be designed, installed, maintained and operated so as to provide the service and results required within the provisions of this chapter. The minimum requirements established in each part of this chapter shall be complied with as they apply to the structures and facilities covered in the IBC.

Note: The administrative rules pertaining to energy conservation, ch. Comm 63, may be applied retroactively to existing buildings and structures.

(3) **EXISTING SYSTEMS.** The provisions for existing systems shall be as specified in pars. (a) and (b).

(a) *Additions.* 1. The provisions of this chapter shall apply to all additions to existing buildings and structures as specified in s. Comm 61.03.

2. Except when an existing heating, ventilation and air conditioning system is extended to serve an addition, existing system components are not required to be replaced if the provisions in this chapter are met within the addition.

(b) *Alterations*. 1. The provisions of this chapter shall apply to all alterations in any building or structure which affect the replacement of major equipment as specified in s. Comm 61.03.

2. When an existing heating, ventilating and air conditioning system serves a remodeled or altered space that has not undergone a change in occupancy classification, the existing system components are not required to be replaced if the provisions in this chapter that applied to the original construction of the space are met.

Note: "Occupancy classification" refers to the entries in Table 64.0403.

Note: Compliance with this chapter shall not constitute assurance of proper installation or operation of the heating, ventilating and air conditioning system. This chapter is not to be used as a design manual, but it is established as a minimum standard for safety, health and general welfare of the public.

Note: Maintenance and repair to existing equipment when there is no change to the building or occupancy, is considered an alteration.

(4) **RETROACTIVITY.** Retroactivity shall apply as specified in s. Comm 61.03.

(5) **CONFLICTS.** Conflicts between rules and other requirements shall apply as specified in s. Comm 61.03.

Comm 64.0003 Compliance. All buildings and structures shall comply with the IMC and the changes, additions or omissions under subch. II.

Comm 64.0004 Approval of drawings and specifications. All drawings and specifications shall be submitted to the department in accordance with the provisions of subch. III, ch. Comm 61.

Subchapter II — Changes, Additions or Omissions to the International Mechanical Code (IMC)

Comm 64.0100 Changes, additions or omission to the International Mechanical Code® (IMC). Changes, additions or omission to the international mechanical code are specified in this subchapter and are rules of the department and are not requirements of the IMC.

Note: This code subchapter is numbered to correspond to the numbering used within the model code; i.e., s. Comm 64.0102 refers to section IMC 102.

Comm 64.0101 General. (1) **ADMINISTRATION.** (a) The requirements in IMC section 101 are not included as part of this chapter.

(b) The requirements in IMC sections 102.1, 102.2, 102.4 to 102.7 and 102.9 are not included as part of this chapter.

(2) SCOPE. The requirements of IMC sections 103 to 107, 108.1 to 108.6 and 109 are not included as part of this chapter.

Comm 64.0102 Applicability. This is a department rule in addition to the requirements in IMC section 102.3:

(1) The designer or installer shall provide the owner with written instructions for the operation and maintenance of the system and equipment. An operating and maintenance manual shall be provided to the building owner or operator. The manual shall include basic data relating to the operation and maintenance of HVAC systems and equipment.

(2) Required routine maintenance actions shall be clearly identified. Where applicable, HVAC controls information such as diagrams, schematics, control sequence descriptions, and maintenance and calibration information shall be included.

Comm 64.0202 Definitions. (1) ADDITIONS. These are department definitions in addition to the definitions in IMC section 202:

(a) "Air change" means the introduction of new, cleaned, or recirculated air to a space.

(b) "Air change rate" means airflow in volume units per hour divided by the building space volume in identical volume units.

(c) "DHFS" means the department of health and family services.

(d) "Spot heating" means to provide heat to raise the air temperature to the required minimum in the immediate area of the occupants.

(2) SUBSTITUTIONS. Substitute the following meanings for the corresponding definitions in IMC section 202:

(a) "Approved" means acceptable to the department.

(b) "Approval agency" means the department or its authorized representative.

(c) "Unusually tight construction" has the meaning given in s. Comm 65.0201.

Note: Section Comm 65.0201 reads: "Unusually tight construction" means the total area of outdoor openings is less than 3% of the floor area of the space in which equipment is located.

Comm 64.0301 General regulations. (1) ENERGY UTILIZATION. This is a department informational note to be used under IMC section 301.2:

Note: See ch. Comm 63 for additional requirements.

(2) LISTED AND LABELED. Substitute the following wording for the requirements in IMC section 301.4:

(a) *General.* All appliances regulated by this chapter shall be listed and labeled as specified in this chapter, unless otherwise approved by the department in accordance with par. (b).

(b) *Unlisted equipment.* If the equipment is unlisted, the one of the following provisions shall be taken:

1. A statement from the equipment manufacturer shall be provided indicating the national standard with which the equipment complies. A test by a Wisconsin registered engineer shall be conducted on the output and safety controls, in accordance with the national standard used by the manufacturer. A statement regarding the test of the rating and safety controls shall be furnished for each installation unless an approval for the equipment is obtained from the department.

Note: The purpose of the statement is to show that the equipment is in complete compliance with the national standard by which the equipment is designed, constructed and tested.

2. Approvals for unlisted equipment and products regulated by this chapter shall be as specified in ch. Comm 61.

(3) ELECTRICAL. Substitute the following wording for the requirements in IMC section 301.7: Electrical wiring, controls and connections to equipment and appliances regulated by this chapter shall be in accordance with ch. Comm 16.

(4) PLUMBING CONNECTIONS. Substitute the following wording for the requirements in IMC section 301.8: Potable water supply and building drainage system connections to equipment and appliances regulated by this chapter shall be in accordance with chs. Comm 81-87.

Comm 64.0304 Installation. This is a department informational note to be used under IMC section 304.2:

Note: See s. Comm 61.03 (2) for clarification on the application of different requirements and where the most restrictive requirements apply.

Comm 64.0306 Access and service space. This is a department exception to the requirements in IMC section 306.6: These provisions do not apply when the installation consists of fans only.

Comm 64.0309 Temperature control. Substitute the following wording for the requirements and exception in IMC section 309:

(1) **HEATING SYSTEM DESIGN.** Except as provided in subds. (2) or (3), the heating system shall be designed to maintain a temperature of not less than that shown in Table 64.0403 at 3 feet above the floor within the occupied space.

(2) **SPOT HEATING.** Spot heating may be used to heat individual fixed work stations in industrial buildings in lieu of heating the entire space as specified in sub. (1), provided the inside design temperature at the fixed work station is at least 60°F.

(3) **SEASONAL OCCUPANCIES.** When approved by the department, heating requirements may be waived, but not ventilation required by this chapter, during the period of May 15 through September 15 for the following or similar occupancies: drive-in eating places, club houses, outdoor toilets, camp lodge buildings, canning factories and migrant labor camps.

Comm 64.0312 Heating and cooling load calculations. This is a department informational note to be used under IMC section 312:

Note: For design parameters in the IECC refer to ch. Comm 63 or IECC section 803.

Comm 64.0313 Other requirements. These are department rules in addition to the requirements in IMC chapter 3:

(1) **BALANCING, FINAL TEST REQUIRED.** Every heating, ventilating and air conditioning system shall be balanced upon installation. The person or agency responsible for balancing of the ventilating system shall document in writing the amount of outdoor air being provided and distributed for the building occupants and any other specialty ventilation. The document shall be retained at the site and shall be made available to the department upon request.

(a) Air systems shall be balanced in a manner to minimize losses from damper throttling by first adjusting fan speed then adjusting dampers to meet design flow conditions. Balancing procedures shall be acceptable to the department. Damper throttling alone may be used for air system balancing with fan motors of 1 hp or less, or if throttling results in no greater than 1/3 hp fan horsepower draw above that required if the fan speed were adjusted.

(b) Either of the following test methods shall be used:

1. Hydronic systems shall be balanced in a manner to minimize valve throttling losses by first trimming the pump impeller or adjusting the pump speed then adjusting the valves to meet design flow conditions.

2. Valve throttling alone may be used for hydronic system balancing under any of the following conditions as specified in subds. 3.a. to d.

a. Pumps with pump motors of 10 hp or less.

b. If throttling results in no greater than 3 hp pump horsepower draw for pumps of 60 hp or less, or no greater than 5% of pump horsepower draw for pumps greater than 60 hp, above that required if the impeller were trimmed.

c. To reserve additional pump pressure capability in open circuit piping systems subject to fouling. Valve throttling pressure drop shall not exceed that expected for future fouling.

d. Where it can be shown that throttling will not increase overall building energy costs.

Note: National Environmental Balancing Bureau (NEBB) Procedural Standards, the Associated Air Balance Council (AABC) National Standards, the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), or equivalent balancing procedures are acceptable to the department.

(2) **BALANCING, PROPER WORKING CONDITION.** HVAC control systems shall be tested to assure that control elements are calibrated, adjusted and in proper working condition.

(3) **BALANCING, OPERATING AND MAINTENANCE MANUAL.** An operating and maintenance manual shall be provided to the building owner or operator. The manual shall include basic data relating to the operation and maintenance of HVAC systems and equipment. Required routine maintenance actions shall be clearly identified. Where applicable, HVAC controls information such as diagrams, schematics, control sequence descriptions, and maintenance and calibration information shall be included.

Comm 64.0401 Ventilation. (1) **VENTILATION REQUIRED.** Substitute the following wording for the requirements in IMC section 401.2: Every occupied space shall be ventilated by natural means in accordance with IMC section 402 or by mechanical means in accordance with IMC section 403 and as specified in Table 64.0403.

(2) **WHEN REQUIRED.** Substitute the following wording for the requirements in IMC section 401.3:

(a) *Outside air.* Mechanical ventilation systems shall be operated to provide a continuous source of outside air to all areas while people are present.

(b) *Operation.* 1. Except as provided in subd. 2., the required building exhaust ventilating systems shall operate continuously when people are in the building to provide the amount of exhaust specified in Table 64.0403.

Note: Chapter Comm 32 may require continuous operation of some exhaust systems, such as purging systems, chloride storage exhaust or industrial exhaust.

2. Subdivision I. does not apply to all of the following:

a. Toilet rooms with 2 or fewer total water closets or urinals, if the required ventilation is provided when the room is occupied.

b. Shower rooms with 2 or fewer showerheads if the required ventilation is provided when the room is occupied.

c. Common residential laundry rooms with a total of 4 or fewer washers and dryers if the required ventilation is provided when the room is occupied.

d. Mechanical exhaust systems for natatoriums even when the building is not occupied.

(3) EXITS. Substitute the following wording for the requirements in IMC section 401.4: Vestibule ventilation for smokeproof enclosures shall be in accordance with the IBC.

(4) INTAKE OPENINGS. (a) These are department rules in addition to the requirements in IMC section 401.5.1:

1. Mechanical and required gravity outside air intake openings shall be located a minimum of 10 feet from any hazardous or noxious contaminant such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this chapter. Where a source of contaminant is located within 10 feet of an intake opening, such opening shall be located a minimum of 2 feet below the contaminant source.

2. The lowest side of outside air intake required openings shall be located at least 12 inches vertically from the adjoining grade level, above adjoining roof surfaces, or above the bottom of an areaway.

3. Outside air intakes located in areaways shall be provided the minimum horizontal cross section of the areaway is equal to the free area of the opening.

(b) These are department exceptions in addition to the requirements in IMC section 401.5.1:

1. The setback distances as specified in IMC section 401.5.1 shall not apply to the combustion air intake of a direct vent appliance.

2. Unless a greater distance is specified by the manufacturer, exhaust openings of 100 cfm or less shall be located at least 12 inches, measured in any direction, from doors or openable windows.

3. The 10-foot minimum separation does not apply to the intake and exhaust of a factory-packaged rooftop unit or other listed outdoor appliance provided nothing restricts air flow around the unit. The exhaust and intake of the unit shall be located to minimize contamination of outside air.

4. Unless a greater distance is specified by the manufacturer, product of combustion outlets of direct vent appliance vents shall terminate at least 12 inches measured in any direction from doors or openable windows.

Note: See ch. Comm 82 for plumbing vent setbacks. That rule requires plumbing vents to be 10 feet from air intakes and 10 feet horizontally from or 2 feet above roof scuttles, doors or openable windows.

Note: See NFPA standard 45, Fire Protection for Laboratories Using Chemicals, adopted under ch. Comm 10, for chemical fume hood exhaust location. Health care and related facilities may have additional requirements.

(5) EXHAUST OPENINGS. These are department rules in addition to the requirements in IMC section 401.5.2:

(a) *Gravity ventilation ducts.* Gravity ventilation ducts shall extend not less than 2 feet above the highest portion of the building within a 10-foot radius of the duct and shall be provided with a siphon roof ventilator.

(b) *Barometric relief vents.* Where barometric relief vents are installed on the roof, the discharge openings shall be no less than 2 feet above the roof surface where the vent pierces the roof.

Comm 64.0402 Natural ventilation. This is a department rule in addition to the requirements in IMC section 402: Natural ventilation shall be permitted only in areas specified in Table 64.0403.

Comm 64.0403 Mechanical ventilation. (1) VENTILATION SYSTEMS. Substitute the following wording for the requirements in IMC section 403.1:

(a) Mechanical ventilation shall be provided by a method of supply air and exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The system shall not be prohibited from producing negative or positive pressure. The system to convey ventilation air shall be designed and installed in accordance with IMC chapter 6.

(b) Ventilation supply systems shall be designed to deliver the required rate of supply air into the occupied zone within an occupied space.

(2) OUTDOOR AIR REQUIRED. (a) This is a department exception to the requirements in IMC section 403.2: Where it can be demonstrated that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding the maximum obtainable by providing the rate of outdoor air ventilation determined in accordance with IMC section 403.3, the minimum required rate of outdoor air may be reduced in accordance with such engineered system design.