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Chapter Ind 63

ENERGY CONSERVATION

PART I—SCOPE AND PURPOSE

Ind 63.001 Scope. (1) GENERAL. The provisions of this chapter shall apply to all public buildings and places of employment. These provisions are not retroactive unless specifically stated in the administrative rule. Where different sections of this chapter specify different requirements, the most restrictive requirement shall govern.

(2) EXEMPT BUILDINGS AND STRUCTURES. Buildings and structures, or portions thereof, without space heating or cooling, service water heating, or illumination are exempt from the requirements of this chapter.

(3) APPLICATIONS TO EXISTING BUILDINGS. (a) Additions to existing buildings or structures may be made without making the entire building or structure comply, but the addition shall comply with the requirements of this chapter.

(b) Any change of occupancy or use of any existing building or structure within the scope of this chapter which would increase the energy consumption shall not be permitted unless such building or structure is made to comply with the requirements of this chapter.

Note: It is the intent of the department to have every new building or addition and every change of occupancy meet the energy conservation requirements of this chapter. It is not the intent to prevent a previously built building from installing air conditioning, nor to cause equipment with several years of remaining service to be discarded due to not being able to meet the required efficiences of this chapter. However, occupancy changes such as building a

warehouse and later remodeling it into an office space will not be permitted unless all the requirements of this chapter are met.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78, am. (2) and (3) (b), Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.002 Purpose. The purpose of this chapter is to provide design requirements which will promote efficient utilization of energy in public buildings and places of employment.

(1) GENERAL. The intent of this chapter is to provide minimum requirements for construction and equipment to conserve energy.

(2) FLEXIBILITY IN USE. It is intended that this chapter be flexible and permit the use of innovative approaches and techniques to achieve effective utilization of energy.

(3) CONFLICT WITH OTHER RULES. This chapter is not intended to conflict with any safety or health requirements. Where such conflict occurs, the safety and health requirements shall govern.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.01 Plans and specifications. (1) ARCHITECTURAL AND MECHANICAL. Architectural and mechanical plans and specifications shall be submitted in accordance with the requirements outlined in sections Ind 50.07 and Ind 50.12 and shall contain details and data to demonstrate compliance with the requirements of this chapter. Such information shall include, but is not limited to: design criteria, exterior envelope component materials, resistance values of insulating materials, and the thermal performance value of the building envelope. Size and type of equipment, system and equipment controls and equipment efficiencies shall be submitted with the mechanical plans.

Note: The resistance values for insulating materials are expressed in Fahrenheit degrees per Btu/(hour) (square foot).

(2) ELECTRICAL ENERGY DATA AND ILLUMINATION. Illumination, power factor, switching and control plans and specifications shall be submitted in accordance with the requirements outlined in sections Ind 50.07 and Ind 50.12 and shall contain details and data to demonstrate compliance with the requirements of this chapter. Such information shall include, but is not limited to: lighting wattages and budget calculations, lighting fixture schedules, and information on switching, equipment, power factors and controls. Four copies of the illumination budget calculation form (DILHR-SBD-5315) may be used in lieu of 3 sets of plans on smaller projects for which plan layouts are not typically used. All information listed above shall still be provided.

Note: The review of electrical energy data will be for the sole purpose of determining compliance with the applicable energy conservation rules of this chapter. The review will not include determination of compliance with the Wisconsin state electrical code, Volume 2.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. (1), Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. (2), Register, January, 1980, No. 289, eff. 2-1-80.

PART II—DEFINITIONS

Ind 63.02 Definitions. (1) COEFFICIENT OF PERFORMANCE (COP). Coefficient of performance is the ratio of the rate of net heat removal for

cooling or net heat output for heating to the rate of total energy input, expressed in consistent units and under standard rating conditions.

(2) COOLING LOAD. Cooling load is the rate at which heat must be removed from the space to maintain a selected indoor air temperature.

(3) ENERGY. Energy is the capacity for doing work; taking a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical, and chemical; in customary units, measured in kilowatt hours (kwh) or British thermal units (Btu).

(4) ENERGY EFFICIENCY RATIO (EER). The energy efficiency ratio is the ratio of net cooling capacity in Btu per hour to total rate of electric input in watts under designated operating conditions.

(5) NONDEPLETABLE ENERGY SOURCES. Nondepletable energy sources are sources of energy (excluding minerals) derived from incoming solar radiation, including photosynthetic processes; from phenomena resulting therefrom, including wind, waves and tides, lake or pond thermal differences; and energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

(6) RECOVERED ENERGY. Recovered energy is the energy utilized which would otherwise be wasted from an energy utilization system.

(7) SERVICE WATER HEATING. Service water heating is the supply of hot water for domestic or commercial purposes other than comfort heating and processing.

(8) THERMAL PERFORMANCE. Thermal performance is the design heat loss, excluding infiltration and ventilation, through above-grade gross walls and roofs facing heated interiors.

(9) ZONE. A zone is a space or group of spaces within a building with heating or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device. As a minimum, each floor of a building shall be considered as a separate zone.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. (2), Register, January, 1980, No. 289, eff. 2-1-80.

PART III—DESIGN CONDITIONS

Ind 63.10 Scope. The criteria of this part establish the minimum requirements for the thermal design of the exterior envelope of buildings and establish criteria for the design of the heating, ventilating and air-conditioning systems and their parts.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.11 General requirements. (1) BUILDING USE. When a building houses more than one use, each portion of the building shall conform to the requirements for the use housed therein.

(2) MOISTURE CONDENSATION. The design of buildings for energy conservation shall not create conditions of accelerated deterioration from moisture condensation.

Note: The designer should consider the use of vapor barriers and ventilation to control condensation.

(3) INFILTRATION. *All exterior windows and doors.* All exterior windows and doors shall be designed to limit air leakage into or from the building and shall be caulked, gasketed, weatherstripped or otherwise sealed.

(b) *Factory manufactured exterior windows and doors.* Factory manufactured exterior windows and doors shall be designed and manufactured to have a rate of infiltration equal to or less than the rates specified in Table 63.11-A.

TABLE 63.11-A

AIR INFILTRATION RATES FOR FACTORY MANUFACTURED EXTERIOR WINDOWS AND DOORS

Component	Infiltration Rate (Expressed in CFM/lineal foot of perimeter crack of operable sash, unless otherwise specified)	
Operable windows, prime		
Residential*	.30	
All other occupancies	.15	
Prehung, swing-type doors	.50	
Glazed, sliding (patio type) doors	.50	CFM/square foot of door area

*Residential occupancies include apartments, row houses, town houses, condominiums, convents and monasteries.

1. Compliance with the air infiltration rates specified in Table 63.11-A shall be certified by an independent testing laboratory or a Wisconsin registered architect or professional engineer using the criteria for air leakage specified in ASTM E-283, "Standard Method of Test for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Door" (Ind 51.25 (55)) at a pressure differential of 1.567 pounds per square foot (equivalent to effect of 25 miles per hour wind).

Note: The term "factory manufactured" does not apply to units constructed or fabricated in the field or to units assembled from individual components at a lumber yard or building material center.

(4) DESIGN TEMPERATURE DIFFERENTIALS. (a) *Winter.* The winter design temperature differential shall be determined using the indoor design temperature as given in Table 1 of chapter Ind 64 and the outdoor design temperature as given in the following Figure 1.

(b) *Summer.* The summer design temperature differential shall be determined using an indoor design temperature of 78° F and the outdoor design temperature as given in the following Figure 1.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; r. and recr. (3), Register, May, 1980, No. 293, 6-1-80.

Ind 63.12 Design criteria. (1) THERMAL PERFORMANCE. (a) The thermal performance values for the exterior envelope of buildings, other than residential buildings (i.e., apartments, row houses, town houses, condominiums, convents and monasteries) of 2 stories or less in height, shall not exceed the values specified in Table 63.12-A.

TABLE 63.12-A

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.

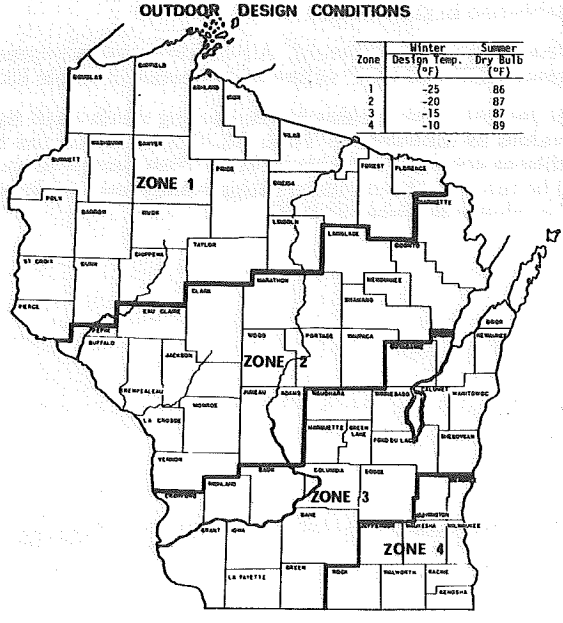
(b) The thermal performance values for the exterior envelope of residential buildings (i.e., apartments, row houses, town houses, condominiums, convents and monasteries) of 2 stories or less in height shall not exceed 9 Btu/hour/square foot of above-grade exterior envelope.

(c) *Exception.* The thermal performance values specified in (a) or (b) may be increased provided the U-value for floors over unheated spaces is decreased so that 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 (1) and (2) of this section.

Note: To determine the thermal performance value of a building, the designer may use a static or dynamic method of calculation provided such calculation method is acceptable to the department.

FIGURE 1

OUTDOOR DESIGN CONDITIONS



(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, the thermal resistance of the insulation around the perimeter of the floor shall not be less than the values shown in Table 63.12-B. The insulation shall extend downward from the top of the slab for a minimum distance of 24 inches, or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of 24 inches.

TABLE 63.12-B

PERIMETER INSULATION REQUIREMENTS

Slab-on-grade Perimeter Insulation	Zone 1	Zone 2	Zone 3	Zone 4
R = °F Ft² Hour / Btu	6.7	6.2	5.9	5.2

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. (1) (intro.), Register, January, 1980, No. 289, eff. 2-1-80; r. and recr. (1), Register, May, 1980, No. 293, eff. 6-1-80.

PART IV—HEATING AND AIR-CONDITIONING EQUIPMENT AND SYSTEMS

Ind 63.20 Equipment efficiencies. (1) ELECTRICAL EQUIPMENT. All electrical heating and cooling equipment shall comply with the minimum coefficients of performance (COP) or energy efficiency ratios (EER) established in this section.

(a) *Air-conditioning equipment.* Air-conditioning equipment shall have minimum EER and COP values as indicated in Table 63.20-A.

(b) *Heat pumps.* Heat pumps in the cooling mode shall have EER and COP values as indicated in Table 63.20-A based on the standard rating conditions specified in Table 63.20-B. Heat pumps in the heating mode shall be rated at the standard rating conditions and have a minimum COP as shown in Table 63.20-C.

TABLE 63.20-A

MINIMUM EER AND COP FOR ELECTRIC HEATING, VENTILATING AND AIR-CONDITIONING SYSTEM EQUIPMENT, COOLING MODE†

Standard Rating Capacity	EER	COP
Under 65,000 Btu/hour (19,050 watts)	6.8	2.0
65,000 Btu/hour (19,050 watts) and over	7.5	2.2

†Adapted from Table 6.2, ASHRAE Standard 90-75, Energy Conservation in New Building Design (The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 345 East 47th St., New York, NY 10017).

TABLE 63.20-B

HVAC SYSTEM EQUIPMENT STANDARD RATING CONDITIONS†— COOLING††

Item	Temperatures			
	Dry Bulb	Wet Bulb	Inlet	Outlet
Air Entering Equipment °F (°C)	80 (26.7)	67 (19.4)	—	—
Condenser Ambient (Air Cooled) °F (°C)	95 (35.0)	75 (23.9)	—	—
Condenser Water (Water Cooled) °F (°C)	—	—	85 (29.4)	95 (35.0)

†Standard ratings are at sea level.

††Reproduced with permission from ASHRAE Standard 90-75, Energy Conservation in New Building Design (The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 345 East 47th St., New York, NY 10017).

TABLE 63.20-C

MINIMUM COP FOR HEAT PUMPS, HEATING MODE†

Source and Outdoor Temperature °F	Minimum COP
Air Source (return air 70° F) 47 db/43 wb	2.5
Air Source (return air 70° F) 17 db/15 wb	1.5
Water Source 60° Entering (return air 70°F)	2.5

†Adapted from Tables 6.7 and 6.8 ASHRAE Standard 90-75, Energy Conservation in New Building Design (The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 345 East 47th St., New York, NY 10017).

(2) COMBUSTION HEATING EQUIPMENT. All gas-fired and oil-fired heating equipment shall have a minimum combustion efficiency of 75% at maximum rated output.

(3) HEAT-OPERATED EQUIPMENT, COOLING MODE. Heat-operated cooling equipment shall have a COP cooling not less than the values shown in Table 63.20-D when tested at standard rating conditions. These requirements apply to, but are not limited to, absorption equipment, engine-driven equipment and turbine-driven equipment.

(4) ELECTRICALLY OPERATED SYSTEMS COMPONENTS, COOLING MODE. Components of heating, ventilating and air-conditioning systems having

entirely electric energy input shall have a COP cooling not less than the values shown in Table 63.20-E when tested at the standard conditions shown in Table 63.20-F.

TABLE 63.20-D

MINIMUM COP FOR HEATING, VENTILATING AND AIR-CONDITIONING SYSTEMS, HEAT-OPERATED COOLING EQUIPMENT†

Heat Source	Minimum COP
Direct-fired (gas, oil)	0.48
Indirect-fired (steam, hot water)	0.68

†Adapted from Table 6.6 ASHRAE Standard 90-75, Energy Conservation in New Building Design (The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 345 East 47th St., New York, NY 10017).

TABLE 63.20-E

MINIMUM COP FOR ELECTRICALLY DRIVEN HEATING, VENTILATING AND AIR-CONDITIONING SYSTEM COMPONENTS†

Component	Condensing Means	Air		Water		Evaporative	
		EER	COP	EER	COP	EER	COP
Self-Contained Water Chillers	Centrifugal	7.8	2.3	13.6	4.0	—	—
	Positive Displacement	7.5	2.2	11.6	3.4	—	—
Condenserless Water Chillers	Positive Displacement	9.5	2.8	11.6	3.4	—	—
Compressor and Condenser Units 65,000 Btu/hour (19,050 watts and over)	Positive Displacement	8.5	2.5	11.9	3.5	11.9	3.5

†Adapted from Tables 6.4 and 6.5 ASHRAE Standard 90-75, Energy Conservation in New Building Design (The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 345 East 47th St., New York, NY 10017).

TABLE 63.20-F

APPLIED HVAC SYSTEM COMPONENTS
STANDARD RATING CONDITIONS†—COOLING††

Item			Centrifugal or Self-Contained Reciprocating Water Chiller	Condenserless Reciprocating Water Chiller
Leaving Chilled Water Temp		°F	44	44
Entering Chilled Water Temp		°F	54	54
Leaving Condenser Water Temp		°F	95	—
Entering Condenser Water Temp		°F	85	—
Fouling Factor, Water				
Nonferrous Tubes		*	0.0005	0.0005
Steel Tubes		*	0.0010	0.0010
Fouling Factor, Refrigerant		*	0.0000	0.0000
Condenser Ambient (Air or Evap. Cooled)		°F	95 db/75 wb	—
Compressor Saturated Discharge Temp	Water Cooled (or Evap. Cooled)	°F	—	105
	Air Cooled	°F	—	120

†Standard ratings are at sea level.

*H-Ft²-F°/Btu.

††Adapted from Table 6.3, ASHRAE Standard 90-75, Energy Conservation in New Building Design (The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., 345 East 47th St., New York, NY 10017).

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. tables A, C, D and E, Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.21 Controls. (1) ZONE HEATING AND COOLING. Simultaneous heating and cooling by reheating or recooling supply air or by concurrent operation of independent heating and cooling systems serving a common zone shall be in accordance with the following:

(a) *Reheat systems:* Single zone reheat systems shall be controlled to sequence reheat and cooling. Multiple reheat systems serving multiple zones, other than those employing variable air volume for temperature control, shall be 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.

(b) *Dual duct and multi-zone systems.* These systems shall be provided with control(s) that will automatically reset:

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

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

(c) *Recooling systems:* Systems in which heated air is recooled, directly or indirectly, to maintain space temperature shall be 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.

1. *Exception.* 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, shall be exempt from the supply air temperature reset requirements of Ind 63.21 (1) (a), (b) and (c).

(d) Heat pump supplemental heater. The heat pump shall be installed with a control to prevent simultaneous operation of a supplemental heater when the heating load can be met by the heat pump alone. A two-stage thermostat, which controls the supplementary heat on its second stage, will be accepted as meeting this requirement. The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat.

Note: Supplemental heater operation is permitted during transient periods, such as start-ups, following room thermostat set point advance, and during defrost.

(2) CONCURRENT OPERATION. Concurrent operation of independent heating and cooling systems serving common spaces and requiring the use of new energy for heating or cooling shall be minimized by one or both of the following:

(a) Providing sequential temperature control of both heating and cooling capacity in each zone;

(b) Limiting the heating energy input through automatic reset control of the heating medium temperature (or energy input rate) to only that necessary to offset heat loss due to transmission and infiltration and, where applicable, to heat the ventilation air supply to the space.

(3) THERMOSTAT. At least one thermostat for regulation of space temperature shall be provided for:

(a) Each separate heating, ventilating and air-conditioning system;

(b) Each separate zone. A readily accessible manual or automatic means shall be provided to partially restrict or shut off the input of the heating, cooling, or both, to each floor.

Note: On multi-story buildings where the perimeter system offsets only the transmission losses of the exterior wall, an entire side of the uniform exposure may be zoned separately.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; r. (1) (intro.) and am. (1) (d), Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.22 Insulation. (1) AIR-HANDLING DUCT INSULATION. All ducts, plenums and similar enclosures serving buildings shall be insulated as follows:

(a) All duct systems, or portions thereof, shall be insulated to provide a thermal resistance, excluding film resistances, of:

$$R = \frac{\Delta T}{15} \quad H\text{-}Ft^2\text{-}F°/Btu$$

Where ΔT = the design temperature differential between the air in the duct, plenum or similar enclosure and the surrounding air in °F.

(b) *Exceptions.* Duct insulation is not required:

1. Where ΔT is 25° F or less;

2. When the heat gain or loss of the ducts, plenums and similar enclosures, without insulation, will not increase the energy consumption of the building.

(2) PIPE INSULATION. All piping within buildings shall be thermally insulated to achieve at least the equivalent insulation values of Table 63.22. Minimum insulation thickness shall be increased for materials with thermal resistance less than 4.0 H-Ft²-F°/Btu/inch or may be reduced for materials with thermal resistance greater than 4.6 H-Ft²-F°/Btu/inch.

Note: See section Ind 63.33 (2) for service water piping insulation.

(a) *Exception.* Piping insulation shall not be required where the fluid temperature is between 55°F and 120°F.

TABLE 63.22

MINIMUM PIPE INSULATION

(The thicknesses specified in this table are based on insulation having thermal resistance in the range of 4.0 H-Ft²- F°/Btu to 4.6 H-Ft²-F°/Btu per inch of thickness on a flat surface at a mean temperature of 75°F)

Piping System Types	Fluid Temperature Range °F	Insulation Thickness in Inches for Pipe Sizes					
		Run-Outs† up to 2″	1″ and less	1¼ to 2″	2½ to 4″	5″ to 6″	8″ and larger
Heating Systems:							
Steam and Hot Water							
High Pressure/Temp	306-450	1½	1½	2	2½	3½	3½
Med. Pressure/Temp	251-305	1½	1½	2	2½	3	3
Low Pressure/Temp	201-250	1	1	1½	1½	2	2
Low Temperature	120-200	½	¾	1	1	1	1½
Steam Condensate (for feed water)	Any	1	1	1	1½	1½	2
Cooling Systems:							
Chilled Water	40-55	¾	¾	1	1	1½	1½
Refrigerant	Below 40	1	1	1½	1½	1½	1½

† Run-outs not exceeding 12 feet in length to individual terminal units.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.23 Cooling with outdoor air in conjunction with mechanical cooling systems (economizer cycle) (1) OUTDOOR AIR. Each fan system shall be designed to use up to and including 100% of the fan system capacity for cooling with outdoor air automatically whenever its use will result in lower usage of new energy. Activation of economizer cycle shall be controlled by sensing outdoor air enthalpy and dry bulb temperature jointly, or outdoor air dry bulb temperature alone.

(a) *Exception.* Cooling with outdoor air is not required when the cooling capacity of the fan system is less than 60,000 Btu per hour.

Note: It is the intent of this section to require cooling with outdoor air for nominal 5-ton units or larger.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. (1) (a), Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.24 Maintenance. Equipment shall be labeled to clearly state the required regular maintenance. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product. Maintenance instructions shall be furnished for any equipment which requires preventive maintenance for efficient operation.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

PART V—WATER HEATING

Ind 63.30 Purpose. The purpose of this part is to provide energy conservation criteria for the design and equipment selection for service water heating.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.31 Water heaters, storage tanks and boilers. (1) COMBINATION SERVICE WATER HEATING/SPACE HEATING BOILERS. Space heating boilers shall not be used for service water heating from May 1 to September 30 unless the service water heating load equals or exceeds 30% of the net boiler load.

(2) TEMPERATURE CONTROLS. Service water heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use.

Note: The department recognizes the values specified in Table 1, ASHRAE Handbook and Product Directory, Systems Volume, Chapter 37.

(3) SHUT DOWN. A separate means shall be provided to permit turning off the energy supplied to service water heating systems.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.32 Conservation of hot water. (1) SHOWERS. Showers shall be equipped to limit the flow of water to not more than 3 gallons per minute per shower head.

(2) LAVATORIES. Lavatories (washbasins) in toilet rooms of nonresidential public buildings shall be equipped to limit the flow of water through the faucet, after the handle is released, to not more than one gallon. Lavatories in toilet rooms of private living units shall be equipped to limit the flow to not more than 3 gallons per minute.

Note: The requirements of subs. (1) and (2) of this section will be enforced by the department of health and social services as they relate to plumbing fixtures and materials. The same rules will be included in Wis. Adm. Code chapter H 62—Design, Construction, Installation, Supervision and Inspection of Plumbing.

(3) HEATED SWIMMING POOLS. Heated swimming pools shall comply with the following:

(a) Heated swimming pools shall be equipped with controls to limit heating water temperatures to no more than 80° F, except for pools used for therapeutic purposes.

(b) Unenclosed heated pools shall be controlled so that the electric resistance or fossil-fueled pool water heating systems are inoperative from September 15 to May 15.

Note: The requirements of (3) of this section will be enforced by the department of health and social services. The same rules will be included in Wis. Adm. Code chapter H 72—Users of Indoor or Outdoor Artificial Swimming Pools.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; am. (1) and (2), Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.33 Insulation. (1) STORAGE TANKS. Heat loss from unfired hot water storage tanks shall be limited to 15 Btu per hour per square foot of external tank surface area. The design ambient temperature shall be no higher than 65° F.

(2) PIPING. Piping heat loss for recirculation systems shall be limited to a maximum of 25 Btu per hour per square foot of external pipe surface for above-ground piping and a maximum of 35 Btu per hour per square foot of external pipe surface for underground piping. Maximum heat loss shall be determined at a $\triangle T$ equal to the maximum water temperature minus a design ambient temperature no higher than 65° F.

(a) *Exception.* Conformance to the minimum pipe insulation requirements specified in Table 63.22 shall be deemed as complying with the requirements of this section.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78; cr. (2) (a), Register, May, 1980, No. 293, eff. 6-1-80.

PART VI—ILLUMINATION AND ELECTRICAL SYSTEMS

Ind 63.40 Distribution. (1) POWER FACTOR. Building service utilization equipment rated greater than 1,000 watts and lighting equipment greater than 30 watts, with an inductive reactance load component, shall have a power factor of not less than 85% under rated load conditions. Building service utilization equipment with a power factor of less than 85% shall be corrected to at least 90% under rated load conditions.

(2) LIGHTING SWITCHING. Switching shall be provided for each lighting circuit, or for portions of each circuit, so that the partial lighting required for custodial or for effective complementary use with natural lighting may be operated selectively.

Note: For purposes of energy conservation, the department recommends separate metering for energy usage for each tenant in any multi-tenant residential building. Where local codes and regulatory agencies permit, tenants should be financially responsible for the energy they use. This recommendation does not include college dormitories, hotels and other transient facilities.

History: Cr. Register, May, 1978, No. 269, 7-1-78; am. (1), Register, January, 1980, No. 289, eff. 2-1-80.

Ind 63.41 Lighting. The building lighting shall be designed in accordance with one of the following methods:

(1) LIGHTING POWER BUDGET. For purposes of establishing a budget, the power allowed for the lighting load shall not exceed the value for the

space use as indicated in Table 63.41. Each area of space shall be multiplied by its maximum lighting load respective value as indicated in Table 63.41. This calculation shall be made for all areas of the building and these values shall be summed to yield a total allowable lighting wattage. This total allowable lighting wattage is the maximum amount of lighting power for the building, which may then be allocated as desired provided this value is not exceeded.

(a) *Exception.* The following areas or classes of lighting equipment may be exempt from the criteria of (1) of this section:

1. Local task lighting fixtures applied to an individual location with switching under the user's immediate control, such as, but not limited to, a portable desk lamp, a work light on a machine, or a hospital examination light.

2. Lighting for special applications where the lighting is an essential technical element for the function performed, such as theatrical performances and spectator sports.

(2) ILLUMINATION BUDGET. If the total allowable lighting wattage value determined by the calculations outlined in (1) above is exceeded, then the illumination shall be determined by a method acceptable to the department.

Note #1: The department will accept calculations in accordance with chapter 9 of the ASHRAE 90-75 standard.

Note #2: The material in this section is not intended to be used as a lighting design procedure. The purpose of this section is solely to outline a procedure for determining the maximum power limit for the lighting. It is recommended that lamps of the highest efficacy be used, except where areas or tasks require good to high color rendition.

TABLE 63.41

LIGHTING POWER VALUES

Area/Use	Maximum Connected Lighting Load
Offices	3.0 watts/sq. ft.
Factories, mercantile buildings, classrooms, day care centers and other chapter 54 and 56 occupancies not listed elsewhere in this table	2.5 watts/sq. ft.
Conference rooms, toilet rooms, theaters and other places of assembly (i.e., entertainment, recreation, worship, or dining areas)	2.0 watts/sq. ft.
Corridors, bulk manufacturing buildings, places of abode or detention, lobby areas, and other chapter 57 and 61 occupancies	1.0 watt/sq. ft.
Dead storage areas	0.5 watts/sq. ft.
Indoor parking structures and other hazardous occupancies	0.25 watts/sq. ft.
Outdoor parking areas	0.05 watts/sq. ft.
Building perimeter, facade	5.0 watts/lin. ft.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.42 Controls. Circuiting and switching or dimming shall be provided so that lighting can be turned off when a space is empty and

not used or so that lighting can be reduced or turned off (manually or automatically) where daylight is adequate and can be used effectively.

Note: The department recommends that switching, circuiting or dimming be provided for lighting in task areas larger than 150 square feet to reduce the lighting level by at least one-half when the task is not being performed or is relocated.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

PART VII—NONDEPLETABLE ENERGY SOURCE

Ind 63.50 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 of this chapter. An energy credit will be given to the building envelope in the amount of the net nondepletable energy collected. The nondepletable energy must be derived from a specific collection, storage and distribution system, which may include active and passive systems.

Note: An energy credit to the building envelope in the amount of the net recovered energy will be given to the use of recovery systems which will conserve energy, provided the amount expended is less than the amount recovered when the energy transfer potential and the operating hours are considered.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.51 Documentation. Proposed alternative designs, submitted as variations to the standard design criteria, shall be accompanied by an energy analysis. This department will accept alternative systems designed according to the requirements of nationally recognized agencies.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

PART VIII—SYSTEM ANALYSIS DESIGN

Ind 63.60 Annual energy consumption. A building designed in accordance with this part will be deemed as complying with this chapter if the calculated annual energy consumption is not greater than a similar building with enclosure elements and energy consuming systems designed in accordance with parts I through VI of this chapter. If the proposed alternative design results in an increase in consumption of one energy source and a decrease in another energy source, the difference in each energy source shall be converted to equivalent energy units for purposes of comparing the total energy used.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.61 Simulation. The calculation procedure used to simulate the operation of the building and its service systems through a full year operating period shall be detailed to permit the evaluation of the effect of system design, climatic factors, operational characteristics, and mechanical equipment on annual energy usage. Manufacturer's data or comparable field test data shall be used when available in the simulation of all systems and equipment. The calculation procedure shall be based upon 8,760 hours of operation of the building and its service systems and shall utilize the following input:

(1) CLIMATIC DATA: Coincident hourly data for temperatures, solar radiation, wind and humidity of typical days in the year representing seasonal variation.

(2) BUILDING DATA: Orientation, size, shape, thermal mass, air moisture and heat transfer characteristics.

(3) OPERATIONAL CHARACTERISTICS: Temperature, humidity, ventilation, illumination, control mode for occupied and unoccupied hours.

(4) MECHANICAL EQUIPMENT: Design capacity, partial load profile.

(5) BUILDING LOADS: Internal heat generation, lighting, equipment, number of people during occupied and unoccupied periods.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.

Ind 63.62 Documentation. Proposed alternative designs, submitted as requests for exception to the standard design criteria, shall be accompanied by an energy analysis comparison report. The report shall provide technical detail on the building and system design and on the data used.

History: Cr. Register, May, 1978, No. 269, eff. 7-1-78.