

(9) **IMBEDDED MATERIAL.** No pipes, wires, cables, ducts or other service equipment shall be imbedded lengthwise in the required fire-resistive protection of any structural member except as allowed in approved fire rated assemblies.

(10) **EXPOSED EXTERIOR STRUCTURAL COLUMNS AND FRAMING.** The required fire-resistive hourly rating may be omitted on noncombustible columns and framing when the building does not exceed 2 stories and the fire separation to the center of a street, or to the property line or buildings on the same property, is greater than 30 feet.

(11) **PROTECTION OF VERTICAL OPENINGS.** (a) Except as specified in ss. Ind 54.08 and 57.08 and in par. (b), stairways, elevator shafts and other vertical openings, which serve 2 or more floor levels, shall be enclosed with fire-resistive rated construction equal to or better than the hourly ratings specified in Table 51.03-A. Stairways serving as required means of egress shall comply with the requirements specified in s. Ind 51.18.

(b) *Exceptions.* Vertical openings need not be enclosed under the following conditions:

1. Serving and contained within individual living units;
2. Serving raised or depressed areas, open mezzanines or open balconies contained within a single story;
3. Serving 2 floor levels and the opening is not a required means of egress provided the opening is separated from any corridor or stairway serving other floors by fire-resistive rated construction having at least the hourly rating specified for fire-rated enclosures as specified in line 20 of Table 51.03-A; or
4. As permitted by chs. Ind 54 through 62.

(c) Openings in required exit enclosures shall be limited to exit doors serving public passageways and corridors or serving floors occupied by a single tenant.

(12) **PARAPET WALLS.** (a) Parapet walls shall be provided on exterior walls closer than 10 feet to a property line or to other buildings on the same property except as exempted under subd. 4. Parapet walls shall satisfy the following requirements:

1. Parapets shall not be less than 2 feet in height;
2. The minimum thickness of masonry parapets shall be 8 inches;
3. Parapets shall have fire-resistive ratings as specified for exterior walls in Table 51.03-A; and
4. Parapets are not required on exterior walls which front streets and alleys or where exterior walls connect with roofs of noncombustible construction.

(b) All parapet walls shall be properly coped with noncombustible weatherproof material.

(13) FIRE DIVISION WALLS. (a) Fire division walls shall have not less than a 4-hour fire-resistive rating as specified in s. Ind 51.04 and shall comply with one of the following conditions:

1. The wall shall extend 3 feet above the roof;
2. The wall shall connect and make tight contact with roof decks of at least 2-hour fire-resistive noncombustible construction on both sides of the wall; or
3. The wall shall connect and make tight contact with roofs of noncombustible construction on both sides of the walls, and the roofs shall be noncontinuous at the wall.

Note: Built-up roofs, including those having class A rating, are considered combustible and do not meet the requirements of this section.

(b) Structural members shall not continue through or over the fire wall.

(14) DETERMINATION OF NUMBER OF STORIES.\* For purposes of establishing the maximum allowable stories in the various classes of construction stated in s. Ind 51.03, the number of stories shall be determined on the following basis:

(a) The first floor shall be determined first and this level shall satisfy the following conditions:

1. Is the lowest floor having one or more required exits for that floor and for any floor above or below; and

a. If condition stated in subd. 1. is not satisfied, the highest floor level shall be considered the first floor.

2. The elevation of the first floor and the sills of all required exit discharges from the first floor shall be at or not more than 3 feet above an exit discharge grade.

(b) An interior balcony or mezzanine floor which exceeds 25,000 square feet or one third ( $\frac{1}{3}$ ), whichever is least, of the net area enclosed within exterior walls and/or fire division walls shall be counted as a story.

(c) Penthouse with a total area that exceeds 50% of the total roof area shall be counted as a story.

(d) Construction according to sub. (4) (b) 1. b. shall also be counted as a story.

(e) Total number of stories shall include the first floor plus all stories above and those stories determined by sub. (14) (b), (c) and (d).

1. Floor levels satisfying the definition of basement, ground floor, attic, interior balcony and mezzanine floor, unless otherwise stated, shall not be counted as a story.

(15) DECORATIVE COMBUSTIBLE MATERIALS. Decorative combustible materials may be applied to all required noncombustible exterior sur-

\*See Appendix A for further explanatory material.

faces of "0" hourly rated construction or better, up to a limit of 10% of the surface area within any 100 lineal feet of the building.

(a) *Exception.* Fire-retardant treated wood may be applied to all required noncombustible exterior surfaces of "0" hourly rated construction without limit.

(18) **ACCESS TO ATTIC AND ROOF.** (a) *Attic.* Every attic compartment shall be provided with access from the floor level immediately below it. The access opening shall be at least 20 by 30 inches and shall be located above the stair landing or in an accessible location.

*Note:* A single access point to the attic from the floor level immediately below will be acceptable if all the attic compartments are interconnected with access openings of at least 20 by 30 inches.

(b) *Roof.* All buildings more than 2 stories, or 25 feet in height, where the slope of the roof is less than 3 in 12, shall be provided with a means of access to the main roof from the floor level immediately below. The roof opening shall be at least 20 by 30 inches and shall be provided with a permanent ladder or stairway.

1. *Exception.* Roof access shall not be required in the sloped ceiling (cathedral ceiling) portions of buildings.

(19) **ATTIC COMPARTMENTALIZATION.** Except as provided in par. (b), attics of combustible construction shall be divided into areas not greater than 3,200 square feet by firestopping as specified in s. Ind 53.63 (1) (d).

1. Compartmentalization shall extend into the eave and soffit areas to provide a complete separation between compartments.

2. Panels for access openings in compartment walls shall be equipped with self-closing devices and shall normally be kept closed.

(b) Attic compartmentalization need not be provided in buildings completely protected, including the attic space, by an automatic fire sprinkler system.

(20) **CLASS OF CONSTRUCTION SEPARATION.** Portions of buildings of different classes of construction, as specified in s. Ind 51.03, shall be separated by fire division walls as specified in s. Ind 51.02 (13) or the building classification will be reduced to the lowest class of construction utilized.

*History:* Cr. Register, June, 1972, No. 198, eff. 1-1-73; r. (9) and (10), renum. (3) to be (4), (4), (5), (6), (7), (8) to be (6), (7), (8), (9), (10), am. (2) (a) cr. (3), (5), (11), (12), (13) and (14), Register, September, 1973, No. 213, eff. 10-1-73; am. (14) (d), Register, February, 1974, No. 218, eff. 3-1-74; r. and recr. (12) (a); am. (13) (c), Register, May, 1974, No. 221, eff. 6-1-74; cr. (11) (c) and (15), Register, July, 1974, No. 223, eff. 8-1-74; cr. (16) and (17), Register, December, 1974, No. 228, eff. 1-1-75; am. (5) (a) 1 and (14) (e) 1, cr. (18), Register, December, 1975, No. 240, eff. 1-1-76; am. (16) (b), Register, July, 1976, No. 247, eff. 8-1-76; cr. (2) (c), Register, December, 1976, No. 252, eff. 1-1-77; am. (15) and cr. (19), Register, December, 1977, No. 264, eff. 1-1-78; r. (16) and (17), Register, May, 1978, No. 269, eff. 7-1-78; am. (4) (a), (18) and (19), cr. (15) (a) and (20), Register, December, 1978, No. 276, eff. 1-1-79; am. (11) (a) and (c) (intro.), (13) and (19), r. and recr. (6) (b), Register, January, 1980, No. 289, eff. 2-1-80; r. and recr. (11), am. (14) (a) 2., r. (14) (a) 3., Register, December, 1981, No. 312, eff. 1-1-82; reprinted to correct error in (14) (a) 2., Register, February, 1982, No. 314; am. (11) (a) and (19), Register, October, 1982, No. 322, eff. 11-1-82.

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**Ind 51.03 Classes of construction standards. (1) FIRE RESISTIVE TYPE A (NO. 1).** (a) A building is of fire-resistive construction if all the walls, partitions, piers, columns, floors, ceilings, roof and stairs are built of noncombustible material, with a fire-resistive rating as specified in Table 51.03-A.

1. Concealed draft openings in columns, walls and partitions shall be firestopped with noncombustible material at each floor level.

(b) All buildings of this classification shall not be restricted in height.

(c) Stairs and stair platforms shall be constructed of noncombustible material.

(d) Doors and windows may be of wood except as otherwise specified in s. Ind 51.02 (5), Table 51.03-B, ss. Ind 51.17, 51.18, 51.19 and 51.20, or in the occupancy chapters of this code.

1. Doors leading into main public corridors other than rated exit corridors shall be noncombustible or 20-minute fire door assemblies, as specified in s. Ind 51.047 or equivalent, unless otherwise specified above.

**Note:** Public corridors are intended to include principal corridors serving a floor and leading directly to building exits, but do not include communicating passageways within a given use area.

(e) Bays, oriels, and similar exterior projections from the walls shall be constructed of material with fire-resistive ratings as required for exterior walls.

(f) Mansards shall be constructed of noncombustible material or fire-retardant treated wood.

ing elements are as set forth in Table 51.03-A unless otherwise exempted.

(b) All buildings of this classification shall not exceed a height of 75 feet, in which height there shall be not more than 4 stories.

(c) Columns. 1. Wood columns shall be not less than 8 inches, nominal, in any dimension when supporting floor loads and not less than 6 inches, nominal, in least dimension and not less than 8 inches, nominal, in other dimension when supporting roof loads only.

2. All wood columns in the structural frame shall be superimposed, end to end, one above the other, and joined by metal or wood connectors.

Note: See structural ch. Ind 53 for design requirements.

(d) Floor framing. 1. Beams and girders of wood shall be not less than 6 inches, nominal, in any dimension and not less than 45 square inches in actual cross-sectional area.

2. Wood arches which support floor loads shall be not less than 8 inches, nominal, in any dimension.

3. Framed timber trusses supporting floor loads shall have members of not less than 8 inches, nominal, in any dimension.

4. Floor framing and structural framing of material other than wood shall have a fire-resistive protection of not less than one hour.

(e) Roof framing. 1. Beams and girders of wood shall be not less than 6 inches, nominal, in any dimension and not less than 45 square inches in actual cross-sectional area.

2. Wood arches, timber trusses, purlins and rafters for roof construction shall have members not less than 4 inches, nominal, in width and not less than 6 inches, nominal, in depth. Spaced members may be composed of 2 or more pieces not less than 3 inches, nominal, in thickness when blocked solidly throughout their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate of not less than 2 inches, nominal, in thickness, secured to the underside of the members. Splice plates shall be not less than 3 inches, nominal, in thickness.

(f) Floors. 1. Wood floor construction shall be tongued and grooved, or splined lumber not less than 3 inches nominal thickness, or of solid lumber placed on edge and securely fastened together to make a floor not less than 4 inches, nominal, in thickness. A top layer of flooring of one inch nominal thickness shall be placed over all such floor construction.

(g) Stair construction may be of wood in buildings not exceeding 3 stories in height. In 4-story buildings, all stairs, platforms and stair construction shall be constructed of noncombustible material.

(h) Roofs. Roof decks shall be:

1. Matched or splined wood roof decking of not less than 2 inches in nominal thickness;

2. Solid lumber not less than 3 inches in nominal thickness, set on edge securely fastened together;

3. Approved 1½ inch thick plywood with exterior glue, tongue and groove with all end joints staggered and butting on centers of beams spaced not over 4 feet apart; or

4. Other forms of roof decks, if of noncombustible material.

(5) \* EXTERIOR MASONRY, PROTECTED AND UNPROTECTED (Nos. 5A AND 5B). (a) A building is of protected or unprotected exterior masonry construction if all exterior walls are constructed of masonry or reinforced concrete or of other materials in combination with a minimum 6 inch nominal masonry wall and all building elements are as set forth in Table 51.03-A unless otherwise exempted.

(b) All buildings of Type 5A classification shall not exceed a height of 50 feet, in which height there shall be not more than 4 stories and all buildings of Type 5B classification shall not exceed a height of 40 feet, in which height there shall be not more than 3 stories.

(c) The interior structural framing shall be metal, reinforced concrete, masonry or wood. Fire protection of metal or wood structural members shall be as specified in Table 51.03-A.

(d) In walls where fire protection is required, the bottom of lower flange of steel lintels supporting load-bearing masonry shall be protected for openings exceeding 12-foot spans.

(e) Floors, roofs, partitions and stairs may be of wood but no joist, rafter, stud or stringer shall be less than 2 inches in nominal thickness.

(f) Bays, oriels and similar exterior projections from the walls shall be constructed of material with fire-resistive ratings as required for exterior walls.

(g) A mansard shall be constructed entirely of noncombustible material or fire-retardant treated wood if it is subject to one of the following conditions:

1. If the mansard is closer than 20 feet to the adjoining property line or other building on the same property; or

2. If the vertical projected area of the mansard exceeds 30% of the area of the wall surface to which it is attached.

(h) Light-transmitting panels of combustible materials may be used in exterior walls requiring NC-O hour rating up to a limit of 10% of the surface area within any 100 linear feet of the building. The bottom of the panels shall be at least 12 feet above grade. Such panels will be included in the decorative trim allowance permitted by s. Ind 51.02 (15).

(6) METAL FRAME—UNPROTECTED (NO. 6). (a) A building is of metal frame unprotected construction if the enclosing walls are of unprotected metal or unprotected metal in combination with other noncombustible materials and all building elements are as set forth in Table 51.03-A unless otherwise exempted.

\* See Appendix A for further explanatory material.

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1. Heavy timber may be used for interior columns and floor framing.

2. Interior mezzanines and balconies within the first story may be constructed of one-hour fire-resistive construction.

3. Light panels of combustible materials may be used in exterior walls requiring NC-0 hour rating up to a limit of 10% of the surface area within any 100 lineal feet of the building. The bottom of the panels shall be at least 12 feet above grade. Such panels will be included in the decorative trim allowance permitted by s. Ind 51.02 (15).

(b) A pole building is considered type No. 6, metal frame unprotected construction, provided the following conditions are satisfied:

1. The poles supporting the roof only shall be at least 6 inches by 8 inches nominal in dimension. Poles supporting floors shall be 8 inches by 8 inches nominal in dimension. Poles may be built up from individual 2-inch nominal lumber if the pieces are bolted or glued and nailed together;

2. The girts shall be of noncombustible, fire-retardant treated wood or heavy timber construction;

3. The enclosing wall skin shall be of noncombustible materials. A non-structural 2" x 6" nominal wood skirt is permitted if it is in contact with the ground or foundation;

4. The roof cover shall have a class B rating or better; and

5. All other requirements of this section and Table 51.03-A are satisfied.

(c) All buildings of this classification shall not exceed a height of 50 feet, in which height there shall be not more than 3 stories.

(d) Stairs and stair platforms may be of wood with stringers not less than 2 inches in nominal thickness.

(e) Bays, oriels and similar exterior projections from the walls shall be constructed of material with fire-resistive ratings not less than that specified for exterior walls in Table 51.03-A.

(7) WOOD FRAME—PROTECTED (NO. 7). (a) A building is of wood frame protected construction if the structural parts and enclosing walls are of protected wood, or protected wood in combination with other materials, with fire-resistive ratings at least equal to or better than those set forth in Table 51.03-A. Except as specified in s. Ind 51.03 (5) (a), if such enclosing walls are veneered, encased or faced with stone, brick, tile, concrete, plaster or metal, the building is also termed a wood frame protected building.

(b) All buildings of this classification shall not exceed a height of 40 feet, in which height there shall be not more than 3 stories.

(c) Floors, roofs, partitions and stairs may be of wood but no joist, rafter, stud or stringer shall be less than 2 inches in nominal thickness.

(d) The structural members supporting the finished ceiling in the topmost story shall be protected on the underside by fire-resistive

material acceptable in systems approved for one-hour fire-resistive ratings as covered in s. Ind 51.04.

(e) Buildings of wood frame protected construction may be located less than 10 feet from a property line provided any wall closer than 10 feet from a property line is a 4-hour fire division wall, without openings, as specified in s. Ind 51.02 (13).

(f) Buildings 3 stories in height of wood frame protected construction may be located between 10 feet and 30 feet from a property line or other building on the same property provided any wall within 10 feet to 30 feet from a property line or other building on the same property is a 4-hour fire division wall, without openings, as specified in s. Ind 51.02 (13).

(8) **WOOD FRAME—UNPROTECTED (NO. 8).** (a) A building is of wood frame unprotected construction if the structural parts and enclosing walls are of unprotected wood, or unprotected wood in combination with other materials as set forth in table 51.03-A. If such enclosing walls are veneered, encased or faced with stone, brick, tile, concrete, plaster or metal, the building is also termed a wood frame unprotected building.

(b) All buildings of this classification shall not exceed a height of 35 feet, in which height there shall be not more than 2 stories.

(c) Floors, roofs, partitions and stairs may be of wood but no joist, rafter, stud or stringer shall be less than 2 inches in nominal thickness.

(d) Buildings of wood frame unprotected construction may be located less than 10 feet from a property line provided any wall closer than 10 feet from a property line is a 4-hour fire division wall, without openings, as specified in s. Ind 51.02 (13).

**History:** Cr. Register, June, 1972, No. 198, eff. 1-1-73; am. (1) (d), renum. (1) (e) 1. to be (f), (1) (f) 1. a. to be (1) (f) 1., (1) (f) (g) (h) (i) to be (1) (g) (h) (i) (j), (2) (f) 1. to be (2) (g), (2) (g) 1. a. to be (2) (g) 1., (2) (g) (h) (i) to be (2) (h) (i) (j), (3) (d) 1. to be (e), (3) (e) 1. a. to (3) (e) 1., (7) (b) to be (c), (7) (c) to be (b), am. (2) (e), r. (4) (e) 3., r. and recr. (6) (a), cr. (7) (d), Register, September, 1973, No. 213, eff. 10-1-73; r. and recr. (6) (a), Register, May, 1974, No. 221, eff. 6-1-74; cr. (5) (a) 1. and 2.; am. (5) (f) and r. and recr. (5) (g), Register, July, 1974, No. 228, eff. 8-1-74; am. (1) (d) 1. and (2) (e) 1., Register, December, 1974, No. 228, eff. 1-1-75; cr. (6) (a) 3, Register, December, 1977, No. 264, eff. 1-1-78; renum. (6) (b) to (d) to be (6) (c) to (e), cr. (6) (b), (7) (e) and (8) (d), am. (1) (f) (intro.), (h), (i), (2) (g) (intro.), (i), (j), (3) (e) (intro.), (4) (a), (5) (a) (intro.) and (8) (a), Register, December, 1978, No. 276, eff. 1-1-79; am. (1) (d) 1., (2) (e) 1., (5) (g) (intro.) and (6) (a) 3., cr. (5) (a) 3., Register, January, 1980, No. 289, eff. 2-1-80; am. (5), (7) (a), (b) and (e), (8) (d), cr. (9) (f), Register, December, 1981, No. 312, eff. 1-1-82; am. (5) (a) and (7) (f), Register, October, 1982, No. 322, eff. 11-1-82.

#### Fire-Resistive Standards for Materials of Construction

**Ind 51.04 Scope.** This section shall include standards applicable to various types of fire-resistive construction. Requirements established herein are considered minimum safety standards and will not necessarily result in the most advantageous insurance rates.

**History:** Cr. Register, February, 1971, No. 182, eff. 7-1-71; r. eff. 8-1-71 and recr. eff. 1-1-72, Register, July, 1971, No. 187.

**Ind 51.042 General requirements.** (1) Construction details and quality of material used for these systems must be those used by the testing laboratory for the test, and/or those dictated by good construction practice.

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**TABLE 51.07**  
**MINIMUM INTERIOR FINISH REQUIREMENTS**

Occupancy	Required Exit Enclosures <sup>1</sup>		Exit Access <sup>1,2</sup>		Rooms or Enclosed Spaces <sup>1,2</sup>	
	Walls & Ceilings <sup>4</sup>	Floor <sup>5</sup>	Walls & Ceilings <sup>4</sup>	Floor <sup>5,6</sup>	Walls & Ceilings <sup>4</sup>	Floor <sup>3,5</sup>
Ch. Ind 54 Occupancies Other than Storage and Warehouses	A	II	A or B	II	A, B or C	DOC FE-1 <sup>6</sup>
Ch. Ind 54 Storage and Warehouse Occupancies	A or B	DOC FF-1 <sup>6</sup>	A or B	DOC FF-1 <sup>6</sup>	A, B or C	DOC FF-1 <sup>6</sup>
Ch. Ind 55 Places of Assembly	A	I	A	II	A or B <sup>7</sup>	DOC FF-1 <sup>6</sup>
Ch. Ind 56 Places of Instruction	A	I	A or B	II	A, B or C	DOC FF-1 <sup>6</sup>
Ch. Ind 57 Residential Occupancies	A	II	A or B	II	A, B or C	DOC FF-1 <sup>6</sup>
Ch. Ind 58 Health Care and Places of Detention	SEE CHAPTER IND 58 FOR SPECIFIC REQUIREMENTS					
Ch. Ind 59 Hazardous Occupancies	A	DOC FF-1 <sup>6</sup>	A or B	DOC FF-1 <sup>6</sup>	A, B or C	DOC FF-1 <sup>6</sup>
Ch. Ind 60 Day Care Centers (20 Children or Less)	A or B	DOC FF-1 <sup>6</sup>	A or B	DOC FF-1 <sup>6</sup>	A, B or C	DOC FF-1 <sup>6</sup>
Ch. Ind 60 Day Care Centers (More than 20 Children)	A	II	A or B	II	A, B or C	DOC FF-1 <sup>6</sup>
Ch. Ind 62 Specialty Occupancies	A, B or C	DOC FF-1 <sup>6</sup>	A, B or C	DOC FF-1 <sup>6</sup>	A, B or C	DOC FF-1 <sup>6</sup>

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## Notes to Table 51.07

<sup>1</sup> Exposed portions of structural members of Type No. 4-Heavy Timber Construction are not subject to the requirements of this table.

<sup>2</sup> Where a complete automatic sprinkler system is installed, materials with an interior finish of Class B or C may be used in places where Class A or B materials, respectively, are required and floor finish materials with an interior finish of Class II or materials complying with the DOC FF-1-70 "pill test" may be used in places where Class I or II materials, respectively, are required.

<sup>3</sup> Requirements for rooms or enclosed spaces are based upon the spaces being separated from exit access corridors and exits by partitions extending from the floor to the ceiling. Where partitions do not satisfy this criteria, the room or space is considered part of the exit access or the exit.

<sup>4</sup> Materials having napped, tufted, looped or similar surfaces, such as carpet, when applied on walls or ceilings shall meet the requirements for Class A interior finish.

<sup>5</sup> Wood, vinyl, hhooleum, terrazzo, resilient and other approved finished floors or floor covering materials are exempt from the provisions of this table.

<sup>6</sup> All carpet manufactured for sale in the U.S. is required by federal regulations to comply with the DOC FF-1-70 "pill test" (16 CFR Para 1630). If a material other than carpet is used, the material should be shown to be resistant to flame propagation as a material which passes the DOC FF-1-70 test (minimum critical radiant flux of 0.04 watts/cm<sup>2</sup>).

<sup>7</sup> Class C interior finish materials may be used in places of assembly with a capacity of 400 persons or less.

Note: See s. Ind 51.01 (75a) for further explanatory information.

Class A Interior Finish — flame spread 0-25, smoke developed 0-450.

Class B Interior Finish — flame spread 26-75, smoke developed 0-450.

Class C Interior Finish — flame spread 76-200, smoke developed 0-450.

Class I Interior Floor Finish — critical radiant flux — .45 watts/cm<sup>2</sup>.

Class II Interior Floor Finish — critical radiant flux — .22 watts/cm<sup>2</sup>.

History: Cr. Register, December, 1981, No. 312, eff. 1-1-82; am. table, Register, October, 1982, No. 322, eff. 11-1-82.

**Ind 51.08 Occupancy separations.** (1) When a building is used for more than one occupancy purpose, each part of the building comprising a distinct occupancy division shall be separated from any other occupancy division as provided for under the occupancy requirements of this code.

(2) Occupancy separations shall be classified as absolute, special and ordinary and shall apply to both horizontal and vertical separations.

(a) An absolute occupancy separation shall consist of walls or floors or both of not less than 4-hour fire-resistive construction as specified in ss. Ind 51.04 to 51.049. All openings in walls forming such a separation shall be protected by self-closing fire-resistive door assemblies as specified in s. Ind 51.047. The total width of all openings in any such separating wall in any one story shall not exceed 25% of the length of the wall in that story and no single opening shall have an area greater than 120 square feet. Floor openings shall be protected by 4-hour rated shaft enclosures or fire curtain doors as specified in s. Ind 64.42.

1. All openings in floors forming an absolute occupancy separation shall be protected by vertical enclosures extending above and below such openings.

2. The walls of such vertical enclosures shall be of not less than 3-hour fire-resistive construction as specified in ss. Ind 51.04 to 51.049, and all

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openings shall be protected by self-closing fire-resistive door assemblies as specified in s. Ind 51.047.

(b) A special occupancy separation shall consist of walls or floors, or both, of not less than 3-hour fire-resistive construction as specified in ss. Ind 51.04 to 51.049. All openings in walls forming such separation shall be protected by self-closing fire-resistive door assemblies as specified in s. Ind 51.047. The total width of all openings in any such separating wall in any one story shall not exceed 25% of the length of the wall in that story and no single opening shall have an area greater than 120 square feet. Floor openings shall be protected by 3-hour rated shaft enclosures or fire curtain doors as specified in s. Ind 64.42.

1. All openings in floors forming a special occupancy separation shall be protected by vertical enclosures extending above and below such openings.

2. The walls of such vertical enclosures shall be of not less than 2-hour fire-resistive construction as specified in ss. Ind 51.04 to 51.049, and all openings shall be protected by self-closing fire-resistive door assemblies as specified in s. Ind 51.047.

(c) An ordinary occupancy shall have walls or floors, or both, of not less than 1-hour fire-resistive construction as specified in ss. Ind 51.04 to 51.049. All openings in such separations shall be protected by self-closing fire-resistive door assemblies as specified in s. Ind 51.047.

**History:** 1-2-56; r. and recr. (2) (c), Register, October, 1967, No. 142, eff. 11-1-67; am. (2) (a), (b) and (c), Register, February, 1971, No. 182, eff. 7-1-71; r. and recr. (2) (a), (b) and (c) eff. 8-1-71 and expiring 1-1-72 and cr. (2) (a), (b) and (c) eff. 1-1-72, Register, July, 1971, No. 187; am. (2) (b) 1., Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. (2), Register, December, 1981, No. 312, eff. 1-1-82; am. (2) (a) and (b) (Intro.), Register, October, 1982, No. 322, eff. 11-1-82.

**Ind 51.14 Safety glazing.** (1) **SCOPE.** This section applies to fixed or operating glazed flat panels adjacent to doors; fire window assemblies; display cases within 7 feet of the floor in schools; mirrors; framed, glazed pictures or similar decorative objects; skylights; sloped glazing and any other glazing materials used in hazardous impact areas which are not included within the scope of the federal consumer product safety commission (CPSC) standard for architectural glazing materials, 16 CFR, para. 1201. FP

**Note:** The CPSC standard for architectural glazing materials pre-empts state and local regulations for framed or unframed interior or exterior glazed doors, exterior doors with glazed lights, sliding doors and the adjacent glazed fixed or operating panel, storm doors, shower doors, walk-in mirror closet doors and tub enclosures.

(2) **APPLICATION.** All glazing material used in hazardous impact locations shall be safety glazing material. All replacements of glazing material in hazardous impact locations made after November 30, 1976, shall be safety glazing, except that the replacement of glazing shall be as specified in sub. (3).

(a) **Location.** Hazardous impact locations shall include all glazed elements such as framed or unframed interior or exterior glass doors, the first fixed or operating flat panel within 2 feet of nearest vertical edge of an entrance or exit door, exterior doors with glass lights, or any other glazed elements which may be mistaken for a means of egress or ingress to a room or building. Other hazardous impact locations shall include

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sliding doors and the adjacent glazed fixed or operating panel, storm doors, shower doors, tub enclosures and display cases within 7 feet of the floor in schools except as follows:

1. A fixed or operating flat panel immediately adjacent to an entrance or exit door is exempt from the requirements of this paragraph if the lower horizontal edge of the panel is 2 feet or more above the floor; or

2. Any mirror, framed glazed picture or similar decorative object which is attached to a door or wall in a hazardous impact location and which does not in whole or in part conceal any opening in such door or wall is exempt from the requirements of this paragraph.

(b) *Material.* Safety glazing shall include any glazing material including but not limited to tempered glass, laminated glass, wired glass, safety plastic, or safety insulating units which meet the test requirements of the American National Standards Institute (ANSI) standard Z97.1-1975, and which are constructed, treated or combined with other materials so as to minimize the likelihood of cutting and piercing injuries resulting from human impact with the glazing material.

(c) *Labeling.* Safety glazing material shall be labeled with a permanent label by such means as etching, sand blasting, firing of ceramic material, or hot die stamping. The label shall be legible and visible after installation. Labels identifying safety glazing materials may be omitted provided that a notarized affidavit or invoice is submitted to the department or owner upon request certifying the installation of safety glazing material. The label or affidavit shall identify the seller, manufacturer, fabricator, or installer, the nominal thickness and type of safety glazing material, and the fact that the material meets the test requirements of the American National Standards Institute (ANSI) standards Z97.1-1975.

(3) **GUARDING OF GLAZING.** All interior and exterior glazed panels, subject to human impact not in a hazardous impact location, shall be guarded or provided with safety glazing, except that glazed panels with a sill height of 2 feet or more, or glazed panels less than 12 inches in width, are not required to be safety glazed or guarded.

(a) Guarding shall consist of a horizontal bar, rail, mullion, grille or screen at least 1-½ inches wide and located within 3 feet 6 inches to 4 feet 6 inches above the floor. The guard assembly shall be capable of withstanding a lateral force of 100 pounds applied at any point and installed to avoid contact with the glazing when the force is applied.

(b) Safety glazing materials shall be as specified in sub. (2) (b).

(c) For replacement of glazing in buildings contracted for or existing prior to November 30, 1976, the installation of a horizontal bar, rail, mullion, grille or screen as a protective device may be provided in lieu of safety glazing material in hazardous impact locations where safety glazing would be impractical because of the size of the light required.

(4) **INTERIOR DOORS WITH GLASS LIGHTS.** (a) All interior doors with glass lights greater than 8 inches in the least dimension shall be provided with safety glazing material.

(b) All interior doors with glass lights less than 8 inches in the least dimension shall be provided with ¼-inch glazing material.

(c) Safety glazing materials shall be as specified in sub. (2) (b).

(5) **SKYLIGHTS AND SLOPED GLAZING.** (a) *Skylights.* All glazing in skylights shall be safety glazing material and shall comply with the requirements specified in s. Ind 51.02 (6).

(b) *Sloped glazing.* All glazing installed more than 15° with the vertical shall be safety glazing material. This paragraph does not apply to greenhouses.

(6) **FIRE WINDOW ASSEMBLIES.** All glazing in fire window assemblies shall be designed and installed as specified in s. Ind 51.048.

(7) **STRUCTURAL REQUIREMENT.** Glazing material shall be designed and installed to safely withstand the loads specified in ch. Ind 53.

Note: Section 101.125, Stats., requires safety glazing in all hazardous locations.

History: Cr. Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.15 Standard exit.** (1) Every door which serves as a required exit from a public passageway, stairway or building shall be a standard exit door unless exempted by the occupancy requirements of this code.

Note: For required exits see ss. Ind 54.06, 55.10, 56.08 and 57.09.

(2) Every standard exit door shall swing outward or toward the natural means of egress. It shall be level with the floor, and shall be so hung that, when open, it will not block any part of the required width of any other doorway, passageway, stairway or fire escape. No revolving door, overhead door or sliding door shall be considered as a standard exit. FP

(3) A standard exit door shall have such fastenings or hardware that it can be opened from the inside by pushing against a single bar or plate or turning a single knob or handle. FP

(a) The installation of hardware requiring use of a key for opening an exit door from the inside, except on doors serving individual living units, shall be prohibited. This paragraph shall apply to all buildings in existence and to any building built after the effective date of this rule.

1. *Exception:* Upon written request by the owner, key-locking, or securing, of exits may be approved in fire-resistive buildings, or parts of fire-resistive buildings, accommodating occupants who must be detained in order to protect the occupants or the public from physical harm.

Note #1: Section Ind 51.15 (3) (a) 1. is intended to apply only to jails, prisons, mental institutions, asylums, nursing homes with senile patients, and similar type occupancies.

Note #2: The owner's request should include the following considerations: accessibility of keys to the fire department and staff personnel for the locked areas; electrical devices which release the locks; and 24-hour supervision of the locked areas by personnel who carry keys for the locked areas while on duty. Electrical devices which release the locks upon power failure or upon activation of the fire alarm or sprinkler system or the product of combustion detectors should be considered for securing of exits in nursing homes.

Note #3: Written approval to lock exits must also be obtained from the department of health and social services in accordance with the rules of that department.

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(b) The door shall not be barred, bolted or chained at any time.

1. Exception. When authorized persons (employees, frequenters, patrons and other such occupants) are not present, the exit door may be secured by the use of a single bar or bolt. A sign or label shall be posted on the door near the single bar or bolt. The sign or label shall bear the following: "This bolt or bar shall be kept open during periods of occupancy."

Note: The intent of (3) (b) is to prohibit padlocks or use of a key to open a door or lock at any time. The bar and bolt exception is to give added security against intruders from the outside while protecting persons in the building from being trapped.

(4) A standard exit doorway shall not be less than 6 feet 4 inches high by 3 feet 0 inches wide, except where especially provided under occupancy classifications and in s. Ind 51.20. Where double doors are provided with or without mullions, the width of each single door may be reduced to 2 feet 6 inches, except double doors utilized to provide accessibility in accordance with s. Ind 52.04 shall have the width of at least one single door increased to 2 feet 8 inches.

(5) All exit doors, unless otherwise exempted by the occupancy requirements of this code, shall be plainly marked by a red illuminated translucent exit sign bearing the word EXIT or OUT in plain letters not less than 5 inches in height and in such other places as may be necessary to direct the occupants to exit doorways.

(6) \* REQUIRED AGGREGATE WIDTH. (a) The required aggregate width of exits from a level shall be determined by using the full occupant load of that level, plus the percentage effects of the occupant loads of adjacent levels (above and below) which exit through it as follows:

1. 50% of the occupant load of each first-adjacent level; and
2. 25% of the occupant load of each second-adjacent level.

(b) The width shall be based upon the following ratios:

1. Types No. 1 through No. 4 construction unsprinklered, 40 inches per 100 persons;
2. Types No. 5 through No. 8 construction unsprinklered, 50 inches per 100 persons;
3. Types No. 1 through No. 4 construction sprinklered, 30 inches per 100 persons; or
4. Types No. 5 through No. 8 construction sprinklered, 40 inches per 100 persons.

Note: The determination of exit width for health care facilities is specified in Ind 58.12 (2) and (3) and takes precedence over this section.

(c) The required aggregate width of exits from assembly seating facilities shall comply with the requirements of s. Ind 62.75 (4).

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; am. (5) and cr. (7), Register, November, 1963, No. 95, eff. 12-1-63; r. and recr., Register, October, 1967, No. 142, eff. 11-1-67; am. (?) (j), Register, May, 1968, No. 149, eff. 6-1-68; r. and recr. (7), Register,

\* See Appendix A for further explanatory material.

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December, 1970, No. 180, eff. 1-1-71; r. and recr. (3), Register, February, 1971, No. 182, eff. 3-1-71; am. (7) (a) 1., Register, September, 1973, No. 213, eff. 10-1-73; r. (7), r. and recr. (6), Register, December, 1974, No. 228, eff. 1-1-75; emerg. cr. (3) (b) 1., eff. 6-20-75; cr. (3) (a) 1. and (3) (b) 1., Register, November, 1975, No. 239, eff. 12-1-75; am. (4), Register, December, 1977, No. 264, eff. 1-1-78; am. (2) and (3) (b) 1., Register, December, 1978, No. 276, eff. 1-1-79; am. (4), Register, January, 1980, No. 289, eff. 2-1-80; am. (2), r. and recr. (3) (a), (intro.), cr. (6) (c), Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.16 Stairways.** (1) **DEFINITION.** A stairway is one or more flights of steps, and the necessary platforms or landings connecting them, to form a continuous passage from one elevation to another, including exterior porches, platforms and steps providing means of ingress or egress.

(2) **REQUIRED AGGREGATE WIDTH.** (a) The required aggregate width of stairway exits from any level shall be as determined in accordance with the requirements of s. Ind 51.15 (6).

(b) In no case shall the minimum width of an exit stair be less than that specified in sub. (3).

(c) Under no circumstances shall stairways decrease in width in the line of travel toward the exit.

(3) **MINIMUM WIDTH.** (a) Every required exit stairway shall be not less than 3 feet 8 inches wide, except as provided in the occupancy chapters, of which not more than 4 inches on each side may be occupied by a handrail. The clear dimension between handrails, or stringers, shall not be less than 3 feet 0 inches.

(b) Nonrequired stairways need not conform to the width requirements of this code.

(4) **RISERS AND TREADS.** Risers and treads shall be designed and provided in accordance with the following:

(a) All stairways and steps shall have a rise of not more than 7¾ inches and a tread not less than 9½ inches, measured from tread to tread and from riser to riser. Treads and risers shall be uniform in any one flight. Winders shall not be used;

**Note #1:** The department recommends that steps be proportioned so the sum of 2 risers and a tread, exclusive of its nosing or projection, should be not less than 24 inches or more than 26 inches.

**Note #2:** The department may accept nonstandard exit stairways serving unoccupied areas, such as equipment mezzanines or platforms, and similar areas, if approved in writing.

**Note #3:** Round or smooth nosings are recommended as they are not difficult to negotiate for individuals with restrictions in the knee, ankle or hip, or with artificial legs or long leg braces.

(b) The edges of all treads and the edges of all stairway landings shall be finished with a nonslippery surface not less than 3 inches in width;

(c) Where an exit door leads to an outside platform or sidewalk, the level of the platform or sidewalk shall not be more than 7¾ inches below the doorsill;

(d) Every stairway flight shall have at least 3 risers (unless additional safety is provided which meets the approval of the department); and

(e) There shall be no more than 22 risers in any one flight.

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(5) **STAIRWAY LANDINGS AND PLATFORMS.** (a) If a door is provided at the head and/or foot of a stairway, a landing or platform shall be placed between the door and the stairway regardless of the direction of swing of the door.

(b) Every landing or platform shall be at least as wide as the stairway, measured at right angles to the direction of travel. Every landing or platform must have a length of at least 3 feet, measured in the direction of travel.

(6) **CURVED STAIRS.** Interior or exterior curved stairs used as required exits shall meet all the requirements for stairways. Curved stairs shall have a radius of at least 25 feet at the interior edge of the tread.

(7) **SPIRAL STAIRS.** Spiral stairways may be permitted as specifically allowed by the occupancy chapters of this code. Such spiral stairs shall provide a clear walking area measuring at least 22 inches from the outer edge of the supporting column to the inner edge of the handrail and shall have treads at least 7 inches in width at a point one foot from the narrow end of the tread, and a uniform riser height of not more than 8 inches.

**History:** 1-2-56; am. (2); (2) (a); (2) (b); Register, June, 1956, No. 6, eff. 7-1-56; r. and recr. Register, September, 1959, No. 46, eff. 10-1-59; r. (4) (b), renum. (c) to be (b), and cr. (5), Register, February, 1971, No. 182, eff. 3-1-71; am. (2) (a), Register, September, 1973, No. 213, eff. 10-1-73; r. and recr. Register, December, 1974, No. 228, eff. 1-1-76; am. (4) (a) and cr. (10), Register, December, 1977, No. 264, eff. 1-1-78; cr. (7) (a), Register, December, 1978, No. 276, eff. 1-1-79; r. (5) to (7), renum. (8) to (10) to be (5) to (7) and am. (7), Register, January, 1980, No. 289, eff. 2-1-80.

**FP Ind 51.161 Handrails.** (1) **WHERE REQUIRED.** Handrails shall be provided in all of the following conditions unless otherwise specified in the occupancy chapters of this code.

(a) On the left side, as one mounts the stairs, on all interior stairways of more than 3 risers.

(b) On the open side of any stairway with more than 3 risers.

(c) On both sides of interior stairways 5 feet or more in width.

(d) To divide interior stairways more than 8 feet wide into widths at least 3 feet 8 inches but less than 8 feet.

(e) On both sides of exterior stairways with more than 3 risers, which are an integral part of the building.

(f) To divide exterior stairways which are an integral part of the building and more than 25 feet wide into approximately equal widths not less than 3 feet 8 inches but not greater than 25 feet.

(g) On interior and exterior ramps having a slope greater than one foot of rise in 20 feet of run in accordance with the requirements specified in pars. (a) through (f).

1. Exception. For ramps used to provide barrier-free access, see s. Ind 52.04 (7) (c).

(h) On fire escapes as specified in s. Ind 51.20 (8).

(2) **LOADING.** All handrails shall be designed and constructed to withstand a load of 200 pounds applied in any direction at any point.

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(3) **HEIGHT.** Handrails, except those serving fire escapes, shall be not less than 30 inches nor more than 34 inches above the nosing of the treads on stairways or above the surface of ramps.

**Note:** See Ind 51.20. (8) for handrail requirements for fire escapes.

(4) **CONTINUITY AND EXTENSIONS.** (a) Except as provided in par. (b), handrails shall be continuous for the full length of the stairway or ramp and one handrail shall extend at least 12 inches beyond the top and bottom riser or ramp end and shall not constitute a projecting hazard.

(b) Handrails not required for barrier-free design construction on assembly seating facilities need not comply with the 12 inch extension requirement.

(5) **CLEARANCE.** Handrails shall provide a clearance of at least 1½ inches between the handrail and the wall to which it is fastened.

(6) **OPENINGS BELOW TOP RAIL.** (a) Handrails protecting the open sides of stairways and ramps subject to use by children shall have intermediate rails or an ornamental pattern designed to prevent the passage of an object with a diameter larger than 9 inches.

(b) Handrails protecting the open sides of stairways and ramps not subject to use by children (i.e., waste water treatment plants, foundries, tanneries and other industrial occupancies) shall be provided with an intermediate rail at mid height or equivalent.

**History:** Cr. Register, January, 1980, No. 289, eff. 2-1-80; am. (4), Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.162 Guardrails.** (1) **WHERE REQUIRED.** Guardrails shall be provided in all of the following conditions unless otherwise specified in the occupancy chapters of this code: **FP**

(a) On the open side of elevated platforms, landings, walks, balconies and mezzanines which are more than 24 inches in height;

(b) On assembly seating facilities as specified in s. Ind 62.77;

(c) On open parking structures as specified in s. Ind 62.28 and as indicated in sub. (5); and

(d) On openings through floors and roofs.

(2) **EXEMPT LOCATIONS.** Guardrails need not be provided on the loading side of loading docks.

(3) **LOADING.** (a) Except as provided in par. (b), all guardrails shall be designed and constructed to withstand a load of at least 200 pounds applied in any direction at any point.

(b) All guardrails on assembly seating facilities shall be designed and constructed to withstand a vertical and horizontal load of 50 pounds per linear foot. Loads need not be applied simultaneously.

(4) **HEIGHT.** Guardrails shall not be less than 3 feet 6 inches in height.

(a) **Exception.** Guardrails within individual living units may be 36 inches in height.

(b) *Exception.* Guardrails on a balcony immediately in front of the first row of fixed seating and which are not at the end of an aisle may be 30 inches in height.

(5) **OPENINGS BELOW TOP RAIL.** (a) Guardrails in areas subject to use by children shall have intermediate rails or an ornamental pattern designed to prevent the passage of an object with a diameter larger than 9 inches.

(b) Guardrails in areas not subject to use by children shall be provided with an intermediate rail at mid height or equivalent.

*History:* Cr. Register, January, 1980, No. 289, eff. 2-1-80; am. (1) (b), (3) and (4) (b), Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.163 Toeboards.** *History:* Cr. Register, January, 1980, No. 289, eff. 2-1-80; r. Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.164 Headroom.** (1) Every means of egress shall be provided with a headroom clearance of not less than 6 feet 8 inches. In stairways, the clearance shall be 7 feet 0 inches established by measuring vertically from the edge of the tread nosing to the ceiling or soffit above the tread nosing.

(a) *Exception.* The headroom clearance for stairways in apartments, row houses and townhouses may be reduced to not less than 6 feet 8 inches.

*History:* Cr. Register, January, 1980, No. 289, eff. 2-1-80.

**FP Ind 51.165 Stairway identification.** All stairways serving 4 or more stories shall have each floor level or story identified on the stair side as to its name or number with a permanent sign having letters or characters at least 2 inches in height.

*History:* Cr. Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.166 Stairway discharge.** Where a stairway from the level below the exit discharge and a stairway from an upper floor terminate at the same exit discharge level, an approved barrier shall be provided to prevent persons from continuing down one or more full floor levels below the exit discharge level unless the exit discharge level has a vision panel to the outside or is otherwise made readily apparent.

*History:* Cr. Register, December, 1981, No. 312, eff. 1-1-82; am. Register, October, 1982, No. 322, eff. 11-1-82.

**Ind 51.167 Exiting through areas of hazard.** (1) **GENERAL.** Except as provided in subs. (2) and (3), exit access shall be so arranged that it will not be necessary to travel through any area of hazard in order to reach the exit.

*Note:* See ss. Ind 54.14, 55.29, 56.15, 57.14, 58.24, 58.62, 59.21, 60.25, 60.37, 62.32 for additional requirements.

(2) **GARAGES.** (a) Occupancies within the scope of ch. Ind 54 may exit through storage garages.

(b) Occupancies within the scope of ch. Ind 54 may not exit through repair garages.

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(c) Occupancies within the scope of chs. Ind 55-62 may not exit through a storage or repair garage.

(3) KITCHENS. (a) Exiting through a kitchen within an individual living unit is permitted.

(b) Exiting through kitchens equipped with residential-type appliances in areas such as but not limited to employe lounges, activity rooms and similar areas is permitted provided the kitchen is not used for commercial purposes.

(c) Exiting through kitchens of restaurants and similar commercial operations or kitchens equipped with commercial-type appliances is prohibited.

**History:** Cr. Register, December, 1981, No. 312, eff. 1-1-82; am. Register, October, 1982, No. 322, eff. 11-1-82.

**Ind 51.17 Smokeproof stair tower.** (1) A smokeproof stair tower shall be an enclosed stairway which is entirely cut off from the building and which is reached by means of open balconies or platforms. The stairways, landings, platforms and balconies shall be of noncombustible material throughout. The enclosing walls shall be of not less than 4-hour

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**Ind 51.24 Fire alarm systems.** Interior fire alarm systems required under ss. Ind 54.17, 56.19 and 57.17 shall be designed and constructed in conformity with the following requirements:

(1) All such alarm systems shall consist of operating stations on each floor of the building, including the basement, with bells, horns, or other approved sounding devices which are effective throughout the building. The system shall be so arranged that the operation of any one station will actuate all alarm devices connected to the system except in the case of a presignal system. Fire alarms shall be readily distinguishable from any other signalling devices used in the building. A system designed for fire alarm and paging service may be used if the design is such that fire alarm signals will have precedence over all others;

(a) In all buildings where a fire alarm system and a complete automatic sprinkler system are required, a water flow detecting device shall be provided to actuate the fire alarm system.

(2) Every fire alarm system shall be electrically operated or activated by non-combustible, nontoxic gas. Electrically operated systems shall be operated on closed circuit current under constant electrical supervision, so arranged that upon a circuit opening and remaining open or in case of a ground or short circuit in the undergrounded conductor, audible trouble signals will be given instantly. Gas-activated systems shall be mechanically supervised and under constant gas pressure, so arranged that in case of a pressure drop an audible trouble signal will be given instantly. Means shall be provided for testing purposes;

(3) (a) Except as provided in par. (b), coded fire alarm systems shall be provided in buildings more than 3 stories in height and the systems shall be so arranged that the code transmitted shall indicate the location and story of the structure in which the signal originated;

(b) The department shall approve noncoded continuous sounding fire alarm systems under constant electric or gas activated supervision in apartment buildings.

(4) Operating stations shall be prominently located in an accessible position at all required exit doors and required exit stairways. Operating stations shall be of an approved type and shall be conspicuously identified. All such operating stations shall be of a type, which after being operated, will indicate that an alarm has been sent therefrom until reset by an authorized means. (Operating stations having a "Break Glass" panel will be acceptable. On coded systems having a device to permanently record the transmission of an alarm, "Open Door" type stations may be used). The fire alarm operating stations shall be mounted not less than 3 feet nor more than 4 feet above the finished floor as measured from the floor to the center of the box;

(5) All such alarm systems shall be tested at least once a week and a record of such tests shall be kept; **FP**

(6) Existing fire alarm systems that are effective in operation will be accepted if approved by the department;

(7) The gas for operation of non-combustible, non-toxic gas activated fire alarm systems shall be supplied from approved pressure cylinders

on the premises. The cylinders shall have sufficient capacity and pressure to properly operate all sounding devices connected to the system for a period of not less than 10 minutes. Cylinders shall be removed for recharging immediately after use and shall be replaced by fully charged cylinders;

(8) Spare cylinders shall be kept on the premises at all times for immediate replacement and separate cylinders for testing shall be incorporated in the system;

(9) Tubing in connection with non-combustible, non-toxic gas activated fire alarm systems shall be installed in rigid metal conduit, flexible metal conduit, or surface metal raceways where subject to mechanical injury. Non-corrosive metallic tubing not less than 3/16" in diameter which will withstand a bursting pressure of not less than 500 pounds per square inch shall be used. The maximum length of 3/16" tubing shall not exceed 300 feet between charged cylinders. All tubing and other component parts shall be installed by skilled workers in accordance with the provisions of this code; and

Note: See Wisconsin State Electrical Code, Volume 2, ch. ILHR 16, Wis. Adm. Code.

(10) MAINTENANCE. All fire alarm systems, whether required by this code or not, shall be maintained in an operable condition.

History: 1-2-56; am. (4) (a), Register, November, 1963, No. 95, eff. 12-1-63; am. Register, August, 1964, No. 104, eff. 9-1-64; r. (10), (11) and (12), Register, December, 1975, No. 240, eff. 1-1-76; cr. (1) (a) and am. intro. and (2), Register, December, 1976, No. 252, eff. 1-1-77; am. (intro.) and (4), r. (3) (a), Register, January, 1980, No. 289, eff. 2-1-80; am. (3) and (6), cr. (10), Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.245 Smoke detectors.** (1) GENERAL REQUIREMENTS. All required smoke detectors shall be approved by the department and shall comply with the provisions of NFPA No. 72E-1978 — Standard on Automatic Fire Detectors or NFPA No. 74-1980 — Household Fire Warning Equipment.

**FP** (2) INSTALLATION. (a) Smoke detectors and smoke detector systems shall be installed in accordance with the provisions of NFPA No. 72E-1978 — Standard on Automatic Fire Detectors or NFPA No. 74-1980 — Household Fire Warning Equipment and in accordance with the manufacturer's directions and specifications.

(b) Except as provided in s. Ind 57.16 (2) (b), all smoke detectors interconnected with each other or with the manual fire alarm system shall be installed in accordance with the provisions of NFPA No. 72A-1979 — Standard for the Installation, Maintenance and Use of Local Protective Signaling Systems for Guard's Tour, Fire Alarm and Supervisory Service. Where smoke detectors are interconnected with the manual fire alarm system, the smoke detectors shall be wired in accordance with the provisions specified in s. ILHR 16.34, Wis. Adm. Code.

**FP** (3) MAINTENANCE. (a) The owner shall be responsible for maintaining the smoke detectors and the smoke detection system in good working order.

(b) Tenants shall be responsible for informing the owner, in writing, of any smoke detector malfunction, including the need for a new battery.

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(c) The owner shall have 5 days upon receipt of written notice from the tenant to repair or replace the smoke detector or replace the battery. The owner shall check batteries at the beginning of a new lease and shall replace the battery at least annually.

(d) The owner shall furnish to the tenant written notice of the responsibilities of the tenant and the obligations of the owner regarding smoke detector maintenance.

History: Cr. Register, December, 1981, No. 312, eff. 1-1-82; am. (2) and (3) (c), Register, October, 1982, No. 322, eff. 11-1-82.

**Ind 51.25 Adoption of ASTM standards.** Pursuant to s. 227.025, Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of the following standards of the American Society of Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103. Copies of the standards in reference are on file in the offices of the department, the secretary of state, and the revisor of statutes.

(1) GENERAL REQUIREMENTS FOR ROLLED STEEL PLATES, SHAPES, SHEET PILING AND BARS FOR STRUCTURAL USE. Part 4 ASTM Designation A6-80a.

(2) STRUCTURAL STEEL. Part 4 ASTM Designation A36-77a.

(3) COLD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A82-79.

(4) ZINC-COATED (GALVANIZED) IRON OR STEEL FARM-FIELD AND RAILROAD RIGHT-OF-WAY WIRE FENCING. Part 3 ASTM Designation A116-73 (1978).

(5) ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE. Part 3 ASTM Designation A153-80.

(6) DEFORMED AND PLAIN BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A615-81.

(7) RAIL-STEEL DEFORMED AND PLAIN BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A616-79.

(8) AXLE-STEEL DEFORMED AND PLAIN BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A617-79.

(9) GYPSUM. Part 13 ASTM Designation C22-77.

(10) CHEMICAL ANALYSIS OF LIMESTONE, QUICKLIME, AND HYDRATED LIME. Part 13 ASTM Designation C25-79.

(11) STRUCTURAL CLAY LOAD-BEARING WALL TILE. Part 16 ASTM Designation C34-62 (1975).

(12) COMPRESSIVE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS. Part 14 ASTM Designation C39-72 (1979).

- (13) OBTAINING AND TESTING DRILLED CORES AND SAWED BEAMS OF CONCRETE. Part 14 ASTM Designation C42-77.
- (14) SAMPLING, INSPECTION, PACKING, AND MARKING OF LIME AND LIMESTONE PRODUCTS. Part 13 ASTM Designation C50-78.
- (15) GYPSUM PARTITION TILE OR BLOCK. Part 13 ASTM Designation C52-54 (1977).
- (16) CONCRETE BUILDING BRICK. Part 16 ASTM Designation C55-75.
- (17) STRUCTURAL CLAY NON-LOAD-BEARING TILE. Part 16 ASTM Designation C56-71 (1976).
- (18) STRUCTURAL CLAY FLOOR TILE. Part 16 ASTM Designation C57-57 (1978).
- (19) BUILDING BRICK (SOLID MASONRY UNITS MADE FROM CLAY OR SHALE). Part 16 ASTM Designation C62-75a.
- (19a) REFRACTORIES FOR INCINERATORS AND BOILERS. Part 17 ASTM Designation C64-72 (1977).
- (20) SAMPLING AND TESTING BRICK AND STRUCTURAL CLAY TILE. Part 16 ASTM Designation C67-78.
- (21) HOLLOW LOAD-BEARING CONCRETE MASONRY UNITS. Part 16 ASTM Designation C90-75.
- (22) MASONRY CEMENT. Part 13 ASTM Designation C91-78.
- (23) ABSORPTION AND BULK SPECIFIC GRAVITY OF NATURAL BUILDING STONE. Part 19 ASTM Designation C97-47 (1977).
- (24) MODULUS OF RUPTURE OF NATURAL BUILDING STONE. Part 19 ASTM Designation C99-52 (1976).
- (24a) GROUND FIRE CLAY AS A REFRACTORY MORTAR FOR LAYING-UP FIRECLAY BRICK. Part 17 ASTM Designation C105-47 (1976).
- (25) PHYSICAL TESTING OF QUICKLIME, HYDRATED LIME, AND LIMESTONE. Part 13 ASTM Designation C110-76a.
- (28) SAMPLING AND TESTING CONCRETE MASONRY UNITS. Part 16 ASTM Designation C140-75.
- (29) AGGREGATE FOR MASONRY MORTAR. Part 16 ASTM Designation C144-76.
- (30) SOLID LOAD-BEARING CONCRETE MASONRY UNITS. Part 16 ASTM Designation C145-75.
- (31) PORTLAND CEMENT. Part 14 ASTM Designation C150-80.
- (32) COMPRESSIVE STRENGTH OF NATURAL BUILDING STONE. Part 19 ASTM Designation C 170-50 (1976).



- (33) HYDRATED LIME FOR MASONRY PURPOSES. Part 13 ASTM Designation C207-79.
- (34) MORTAR FOR UNIT MASONRY. Part 16 ASTM Designation C270-80a.
- (35) GYPSUM CONCRETE. Part 13 ASTM Designation C317-76.
- (36) MICROSCOPICAL DETERMINATION OF AIR-VOID CONTENT AND PARAMETERS OF THE AIR-VOID SYSTEM IN HARDENED CONCRETE. Part 14 ASTM Designation C457-71.
- (37) CHEMICAL ANALYSIS OF GYPSUM AND GYPSUM PRODUCTS. Part 13 ASTM Designation C471-76.
- (38) PHYSICAL TESTING OF GYPSUM PLASTERS AND GYPSUM CONCRETE. Part 13 ASTM Designation C472-79.
- (39) PHYSICAL TESTING OF GYPSUM BOARD PRODUCTS, GYPSUM LATH, GYPSUM PARTITION TILE OR BLOCK, AND PRECAST REINFORCED GYPSUM SLABS. Part 13 ASTM Designation C473-76a.
- (40) MORTAR AND GROUT FOR REINFORCED MASONRY. Part 16 ASTM Designation C476-71 (1976).
- (41) HOLLOW BRICK (HOLLOW MASONRY UNITS MADE FROM CLAY OR SHALE). Part 16 ASTM Designation C652-77.
- (42) TEST FOR RESISTANCE OF CONCRETE TO RAPID FREEZING AND THAWING. Part 14 ASTM Designation C666-80.
- (43) ESTABLISHING STRUCTURAL GRADES AND RELATED ALLOWABLE PROPERTIES FOR VISUALLY GRADED LUMBER. Part 22 ASTM Designation D245-74.
- (44) EVALUATING THE PROPERTIES OF WOOD-BASE FIBER AND PARTICLE PANEL MATERIALS. Part 22 ASTM Designation D1037-78.
- (45) TESTING PILES UNDER AXIAL COMPRESSIVE LOAD. Part 19 ASTM Designation D1143-81.
- (46) CONDUCTING STRENGTH TESTS OF PANELS FOR BUILDING CONSTRUCTION. Part 18 ASTM Designation E72-77.
- (47) TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS. Part 18 ASTM Designation E84-80.
- (48) FIRE TESTS OF ROOF COVERINGS. Part 18 ASTM Designation E108-80a.
- (49) FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS. Part 18 ASTM Designation E119-80.
- (50) TEST FOR BEHAVIOR OF MATERIALS IN A VERTICAL TUBE FURNACE AT 750° C. Part 18 ASTM Designation E136-79.
- (51) TEST FOR BOND STRENGTH OF MORTAR TO MASONRY UNITS. Part 18 ASTM Designation E149-76.

(52) FIRE TESTS OF DOOR ASSEMBLIES. Part 18 ASTM Designation E152-80.

(53) FIRE TESTS OF WINDOW ASSEMBLIES. Part 18 ASTM Designation E163-80.

(53a) TEST FOR RATE OF AIR LEAKAGE THROUGH EXTERIOR WINDOWS, CURTAIN WALLS AND DOORS. Part 18 ASTM Designation E283-73.

(54) TESTS FOR COMPRESSIVE STRENGTH OF MASONRY PRISMS. Part 18 ASTM Designation E447-74.

(55) TEST FOR CRITICAL RADIANT FLUX OF FLOOR COVERING SYSTEMS USING A RADIANT HEAT SOURCE. Part 18 ASTM Designation E648-78.

**History:** Cr. Register, October, 1967, No. 142, eff. 11-1-67; cr. (88) to (93), Register, February, 1971, No. 182, eff. 7-1-71; r. (88) to (93) eff. 8-1-71 and recr. (88) to (93) eff. 1-1-72, Register, July, 1971, No. 187; r. and recr., Register, July, 1974, No. 223, eff. 1-1-76; am. (43), Register, December, 1978, No. 276, eff. 1-1-79; cr. (55), Register, May, 1980, No. 293, eff. 6-1-80; am. Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.26 Adoption of ACI Standards.** Pursuant to s. 227.025, Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of the following standards of the American Concrete Institute (ACI), P. O. Box 19150, Detroit, Michigan 48219. Copies of the standards in reference are on file in the offices of the department, the secretary of state, and the revisor of statutes.

(1) BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE. ACI 318-77.

**History:** Cr. Register, October, 1967, No. 142, eff. 11-1-67; r. and recr., Register, July, 1974, No. 223, eff. 1-1-75; am. (intro.) and (1), Register, January, 1980, No. 289, eff. 2-1-80; r. (2) and (3), Register, December, 1981, No. 312, eff. 1-1-82.

**Ind 51.27 Adoption of miscellaneous standards.** Pursuant to s. 227.025, Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of the following standards. Copies of the standards in reference are on file in the offices of the department, the secretary of state, and the revisor of statutes.

(1) Aluminum Association, 818 Connecticut Avenue, N.W., Washington, DC 20006. SPECIFICATIONS FOR ALUMINUM STRUCTURES, Aluminum Construction Manual, Section 1, third edition, April, 1976.

(2) American Institute of Steel Construction, 400 North Michigan Ave., Chicago, Illinois 60611, SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS, November 1, 1978; and COMMENTARY ON THE SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS, November 1, 1978.

(3) American Institute of Timber Construction, 333 West Hampden Ave., Englewood, Colorado 80110, STANDARD SPECIFICATIONS FOR STRUCTURAL GLUED LAMINATED TIMBER OF SOFTWOOD SPECIES, AITC 117-79 — DESIGN; STANDARD

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**SPECIFICATIONS FOR HARDWOOD GLUED LAMINATED  
TIMBER, AITC 119-76.**

(4) American Iron and Steel Institute, 1000 16th St., NW, Washington, DC 20036, SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS, September 3, 1980, edition; STAINLESS STEEL COLD-FORMED STRUCTURAL DESIGN MANUAL 1974 edition; MANUAL FOR STRUCTURAL APPLICATIONS OF STEEL CABLES FOR BUILDINGS, 1973 edition.

(5) American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018, SPECIFICATION FOR REINFORCED GYPSUM CONCRETE, ANSI A59.1-1968 (R-1972); SPECIFICATION FOR VERMICULITE CONCRETE ROOFS AND SLABS ON GRADE, ANSI A122.1-1965; PERFORMANCE SPECIFICATIONS AND METHODS OF TESTING FOR SAFETY GLAZING MATERIALS USED IN BUILDINGS, ANSI Z97.1-1975.

(6) American Welding Society, 2501 NW 7th Street, Miami, Florida 33126, STRUCTURAL WELDING CODE, AWS D1.1-81; SPECIFICATION FOR WELDING SHEET STEEL IN STRUCTURES, AWS D1.3-78.

(6a) American Wood Preservers Bureau, 2772 S. Randolph St., P.O. Box 6085, Arlington, Virginia 22206, STANDARD FOR SOFTWOOD LUMBER, TIMBER AND PLYWOOD PRESSURE TREATED WITH WATER-BORNE PRESERVATIVES FOR ABOVE GROUND USE, AWPB standard LP-2, 1980; STANDARD FOR SOFTWOOD LUMBER, TIMBER AND PLYWOOD PRESSURE TREATED WITH WATER-BORNE PRESERVATIVES FOR GROUND CONTACT USE, AWPB standard LP-22, 1980; QUALITY CONTROL PROGRAM FOR SOFTWOOD LUMBER, TIMBER AND PLYWOOD PRESSURE TREATED WITH WATER-BORNE PRESERVATIVES FOR GROUND CONTACT USE IN RESIDENTIAL AND LIGHT COMMERCIAL FOUNDATIONS, AWPB standard FDN, 1980.

(7a) National Fire Protection Association, Batterymarch Park, Quincy, Mass. 02269; STANDARD FOR PORTABLE FIRE EXTINGUISHERS, NFPA No. 10-1978; STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS, NFPA No. 13-1980; STANDARD FOR THE CARE AND MAINTENANCE OF SPRINKLER SYSTEMS, NFPA No. 13A-1978; STANDARD FOR THE INSTALLATION OF CENTRIFUGAL FIRE PUMPS, NFPA No. 20-1980; STANDARD FOR WATER TANKS FOR PRIVATE FIRE PROTECTION, NFPA No. 22-1978; STANDARD FOR OUTSIDE PROTECTION, NFPA No. 24-1977; STANDARD FOR THE INSTALLATION OF OIL-BURNING EQUIPMENT, NFPA No. 31-1978; NATIONAL FUEL GAS CODE, NFPA No. 54-1974; STANDARD FOR CENTRAL STATION PROTECTIVE SIGNALING SYSTEMS, NFPA No. 71-1977; STANDARD FOR THE INSTALLATION, MAINTENANCE AND USE OF LOCAL PROTECTIVE SIGNALING SYSTEMS FOR GUARD'S TOUR, FIRE ALARM AND SUPERVISORY SERVICE, NFPA No. 72A-1979; STANDARD FOR AUXILIARY PROTECTIVE SIGNALING

SYSTEMS, NFPA No. 72B-1979; STANDARD FOR REMOTE STATION PROTECTIVE SIGNALING SYSTEMS, NFPA No. 72C-1975; STANDARD FOR PROPRIETARY PROTECTIVE SIGNALING SYSTEMS, NFPA No. 72D-1979; STANDARD ON AUTOMATIC FIRE DETECTORS, NFPA No. 72E-1978; STANDARD FOR HOUSEHOLD FIRE WARNING EQUIPMENT, NFPA No. 74-1980; MANUAL ON CLEARANCES FOR HEAT PRODUCING APPLIANCES, NFPA No. 89M-1976; STANDARD FOR THE INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS, NFPA No. 90A-1981; STANDARD FOR CHIMNEYS, FIREPLACES AND VENTS, NFPA No. 211-1980.

(8) National Forest Products Association, 1619 Massachusetts Ave. NW, Washington, D.C. 20036, NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, 1977 edition, with amendments to sections 2.2.5.3, 4.1.7 and 4.2.2, including DESIGN VALUES FOR WOOD CONSTRUCTION, a July, 1981 supplement to the 1977 edition of National Design Specification for Wood Construction; THE ALL-WEATHER WOOD FOUNDATION SYSTEM, BASIC REQUIREMENTS, Technical Report No. 7, Revised 1976, with amendments to section 6.7, including Supplement to Technical Report No. 7, dated June 1, 1977, with amendments to Article 3.3.1 of section 3.3.

(9) Steel Joist Institute, 1703 Parnum Blvd., Suite 204, Richmond, Virginia 23229, STANDARD SPECIFICATIONS, LOAD TABLES AND WEIGHT TABLES FOR STEEL JOISTS AND JOIST GIRDERS, 1981.

(10) Truss Plate Institute, Inc., 2400 East Devon Street, Des Plaines, Illinois 60018, DESIGN SPECIFICATION FOR METAL PLATE CONNECTED WOOD TRUSSES, TPI-78.

(11) American Plywood Association, 7011 South 19th Street, Tacoma, Washington 98460, U.S. PRODUCT STANDARD FOR CONSTRUCTION AND INDUSTRIAL PLYWOOD, PS 1-74.

(12) Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, MINIMUM REQUIREMENTS OF CONSTRUCTION AND EQUIPMENT FOR HOSPITALS AND MEDICAL FACILITIES, DHEW PUBLICATION No. (HRA) 79-14500, Revised, August, 1979.

(13) Air Conditioning and Refrigeration Institute, 1815 North Ft. Meyer Drive, Arlington, Virginia 22209, STANDARD FOR AIR FILTER EQUIPMENT, ARI STANDARD 680-80.

(14) American Society of Heating, Refrigerating and Air Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, Georgia 30329, HANDBOOK OF FUNDAMENTALS, 1977; METHODS OF TESTING AIR-CLEANING DEVICES USED IN GENERAL VENTILATION FOR REMOVING PARTICULATE MATTER, ASHRAE STANDARD No. 52-76.

(15) Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, Illinois 60062, FACTORY MADE AIR DUCT

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MATERIAL AND AIR DUCT CONNECTORS, UL STANDARD No.  
181-1981, sixth edition including revisions dated September 16, 1981.

**History:** Cr. Register, July, 1974, No. 223, eff. 1-1-75, am. (6) and (10), cr. (7a), Register, December, 1974, No. 228, eff. 1-1-75; am. (2) and r. (7), Register, December, 1976, No. 252, eff. 1-1-77; cr. (6a) and am. (8), Register, December, 1978, No. 276, eff. 1-1-79; am. (10), Register, February, 1979, No. 278, eff. 3-1-79; am. (2), (6), (7a), (9) and (10), Register, January, 1980, No. 289, eff. 2-1-80; am. (1) and (3) to (10), r. and recr. (11), cr. (12) to (15), Register, December, 1981, No. 312, eff. 1-1-82; cr. (12) to (16), Register, February, 1982, No. 314, eff. 3-1-82; am. (7a), Register, October, 1982, No. 322, eff. 11-1-82.

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