

DEPT. OF INDUSTRY, LABOR & HUMAN RELATIONS 17
Definitions and standards

exceed an area greater than 20% of the roof area except as permitted under occupancy sections.

1. No individual dome or group of domes or skylights shall exceed 100 square feet.

a. Domes or groups of domes or skylights shall be separated from each other by at least 8 feet laterally and 10 feet along the slope of the roof.

(7) Building locations:

(a) When the distance between buildings located on the same property is less than 10 feet, the following shall apply:

1. Where the combined gross area for these buildings is less than that allowable for one building the exterior wall shall satisfy minimum requirements listed for class of construction in table 51.03-A.

a. Buildings classified as wood frame under subsections Ind 51.03 (7) or (8) shall have exterior walls with a fire-resistive rating of not less than that required for these buildings when satisfying the 10 feet to 30 feet distance to property line shown in table 51.03-A.

2. Where the combined gross area for these buildings is greater than that allowable for one building, one of the opposing walls shall be not less than a 4-hour fire-resistive rated fire division wall or building division wall, whichever applies. Where buildings are of different classes of construction, the lesser allowable gross area shall apply.

(8) Interior balcony or mezzanine. Interior balconies or mezzanine floors shall have fire-resistive ratings as required for the story in which it is located.

(9) 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) Stairways, elevators and vertical shafts which serve 3 or more floor levels shall be enclosed with fire-resistive rated construction equal to or better than requirements specified in Table 51.03-A, except as exempted below:

(a) In buildings with 3 floor levels, the stairways in the upper 2 levels may be left open provided all stairways leading to the lowest level are separated from the upper levels with fire-resistive rated construction as specified in Table 51.03-A or better.

(b) Conditions specified in subsections Ind 55.09 (1) (a) and (b) as applied to a place of worship are acceptable.

(12) (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 Ind 51.02 (12) (a) 4, Wis. Adm. Code. 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.

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. Fire division walls shall have not less than a 4-hour fire-resistive rating as specified in section Ind 51.04 and shall comply with one of the following conditions:

(a) The wall shall extend 3 feet above the roof.

(b) 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.

(c) 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.

(14) DETERMINATION OF NUMBER OF STORIES.* For purposes of establishing the maximum allowable stories in the various classes of construction stated in section 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(s) above or below.

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

2. The elevation of the first floor shall be at or not more than 6 feet above an exit discharge grade.

3. The door sill of all required exit discharges from the first floor shall be at or not more than 3 feet above 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(s) with a total area that exceeds 50% of the total roof area shall be counted as a story(ies).

(d) Construction according to subsection Ind 51.02 (4) (b) 1. b. shall also be counted as a story(ies).


(e) Total number of stories shall include the first floor plus all stories above and those stories determined by subsections Ind 51.02 (14) (b), (c) and (d).

1. Floor levels satisfying the definition of basement(s), ground floor(s), attic, interior balcony(ies) and/or mezzanine floor(s), unless otherwise stated, shall not be counted as a story(ies). For exception, see Appendix A-51.02 (14), Illustration No. 4. *Cr (15) July Reg No*

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.

* See Appendix A for further explanatory material.

CLASSES OF CONSTRUCTION TABLE 51.03-A FIRE RESISTIVE RATINGS IN HOURS (OR FRACTIONS THEREOF)

BUILDING ELEMENT 	MODIFYING CONDITIONS			TYPES OF CONSTRUCTION								APPLICABLE NOTES
	NUMBER OF STORIES	SEE NOTES ①②	BEARING OR NON-BEARING	FIRE RESISTIVE TYPE A	FIRE RESISTIVE TYPE B	METAL FRAME PROTECTED	HEAVY TIMBER	EXTERIOR MASONRY	METAL FRAME UNPROTECTED	WOOD FRAME PROTECTED	WOOD FRAME UNPROTECTED	
		BLDG. SETBACK DIS. TO P/L OR TO OTHER BLDG ON SAME PROP.		NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	
1. INTERIOR SUPPORTS (COLUMNS, PIERS, FRAME LEGS, POSTS)	OVER 8 STORIES OR MORE THAN 85' IN HEIGHT			NC-4	NP	NP	NP	NP	NP	NP	NP	①④
2. FLOOR FRAMING (BEAMS, GIRDERS, JOISTS, SLABS, DECK)	8 STORIES OR 85' IN HEIGHT OR LESS			NC-3	NC-2	SEE IND. 51.03(3) NC-1	SEE IND. 51.03(4) H.T. OR I	SEE IND. 51.03(5) 0	SEE IND. 51.03(6) NC-0	SEE IND. 51.03(7) 3/4	SEE IND. 51.03(8) 0	①④⑥
3. ROOF FRAMING	MORE THAN 2 STORIES			NC-3	NC-2	SEE IND. 51.03(3) NC-1	SEE IND. 51.03(4) H.T. OR I	SEE IND. 51.03(5) 0	SEE IND. 51.03(6) NC-0	NP	NP	①
4. (TRUSSES, BEAMS, GIRDERS, JOISTS, FRAME RAFTERS, PURLINS, DECK)	2 STORIES OR LESS			NC-2	NC-1	NC-1	SEE IND. 51.03(4) H.T. OR I	0	SEE IND. 51.03(6) NC-0	3/4	0	①⑥
5. INTERIOR WALLS & COURT WALLS	OVER 8 STORIES OR MORE THAN 85' IN HEIGHT			NC-2	NP	NP	NP	NP	NP	NP	NP	①
6. EXTERIOR WALLS & COURT WALLS	3 TO 8 STORIES OR 85' IN HEIGHT OR LESS			NC-2	NC-1 1/2	SEE IND. 51.03(3) NC-1	SEE IND. 51.03(4) H.T. OR I	SEE IND. 51.03(5) 0	SEE IND. 51.03(6) NC-0	NP	NP	①
7. INTERIOR WALLS & COURT WALLS	2 STORIES OR UNDER 35' IN HEIGHT			NC-1	NC-1	NC-1	SEE IND. 51.03(4) H.T. OR I	SEE IND. 51.03(5) 0	NC-0	SEE IND. 51.03(7) 3/4	0	①⑥
8. EXTERIOR WALLS & COURT WALLS	1 STORY - ROOF FRAMING MORE THAN 20' ABOVE FL.			NC-0	SEE IND. 51.03(2) NC-0	NC-0	SEE IND. 51.03(4) H.T. OR I	0	0	0	0	①
9. EXTERIOR WALLS & COURT WALLS	1 STORY - ROOF FRAMING 20' OR LESS ABOVE FL.			NC-1	NC-1	NC-1	SEE IND. 51.03(4) H.T. OR I	0	0	SEE IND. 51.03(7) 3/4	0	①⑥
10. INTERIOR WALLS & COURT WALLS	OVER 8 STORIES OR MORE THAN 85' IN HEIGHT			CLASS A	NP	NP	NP	NP	NP	NP	NP	①
11. EXTERIOR WALLS & COURT WALLS	8 STORIES OR 85' IN HEIGHT OR LESS			CLASS A	CLASS A	CLASS A	CLASS B	CLASS B	CLASS C	CLASS C	CLASS C	①
12. INTERIOR WALLS & COURT WALLS		LESS THAN 10 FT.	BEARING	NC-4	NC-3	NC-2	NC-2	NC-2	NC-2	NP	NP	①④⑥⑦
13. INTERIOR WALLS & COURT WALLS		10 FT. TO 30 FT. INCLUSIVE	BEARING	NC-3	NC-2	NC-3/4	I	NC-1	NC-0	3/4	0	①④⑥⑦⑧⑨
14. INTERIOR WALLS & COURT WALLS (NOT INCLUDING INTERIOR FURRING ATTACHED TO INSIDE SURFACE OF WALL)		OVER 30 FT.	BEARING	NC-2	NC-1	NC-0	I	NC-1	NC-0	3/4	0	①④⑥⑦⑧⑨
15. INTERIOR WALLS & COURT WALLS		LESS THAN 10 FT.	NON-BEARING	NC-2	NC-2	NC-1	NC-1	NC-1	NC-1	NP	NP	①④⑥⑦
16. INTERIOR WALLS & COURT WALLS		10 FT. TO 30 FT. INCLUSIVE	NON-BEARING	NC-1	NC-1	NC-0	I	NC-1	NC-0	3/4	0	①④⑥⑦⑧⑨
17. INTERIOR WALLS & COURT WALLS		OVER 30 FT.	NON-BEARING	NC-0	NC-0	NC-0	3/4	NC-0	NC-0	3/4	0	①④⑥⑦⑧⑨
18. INTERIOR WALLS BEARING				NC-3	NC-2	NC-1	I	I	NC-0	3/4	0	①⑥⑦
19. PARTITIONS				NC-0	NC-0	NC-0	0	0	0	0	0	①
20. REQUIRED EXIT CORRIDOR ENCLOS.				NC-2	NC-2	NC-1	I	I	I	3/4	3/4	①⑥
21. FIRE ENCLOSURE (STAIRWAYS, ELEVATORS, VERTICAL SHAFTS)	3 STORIES OR MORE			NC-2	NC-2	NC-1	I	I	I	NP	NP	①⑦
	3 OR MORE FLOOR LEVELS									3/4	3/4	
22. PENTHOUSE WALLS				NC-0	NC-0	NC-0	0	NC-0	0	0	0	①
23. PENTHOUSE ROOF				NC-0	NC-0	NC-0	0	0	0	0	0	①⑥

KEY TO ABBREVIATIONS :

NC - NON COMBUSTIBLE
 NP - NOT PERMITTED
 H.T. - HEAVY TIMBER

- ① - SEE OCCUPANCY SECTIONS OF THE CODE FOR OTHER BASIC REQUIREMENTS AND MORE RESTRICTIVE LIMITATIONS.
- ② - ROOF COVERING SAME AS FOR MAIN BUILDING.
- ③ - WALLS OF SOLID WOOD 4" IN THICKNESS ARE ACCEPTABLE AS EQUAL TO ONE HOUR FIRE-RESISTIVE RATING.
- ④ - FIRE RESISTIVE REQUIREMENTS ALSO APPLY FOR THOSE BRACING MEMBERS REQUIRED FOR GRAVITY LOADING.
- ⑤ - REFER TO TABLE 51.03-B FOR ALLOWABLE AREAS FOR WINDOWS AND OTHER OPENINGS IN EXTERIOR WALLS.
- ⑥ - FOR EXCEPTIONS REFER TO IND. 51.03.

am July Reg. No. 223

**TABLE 51.03-B
MAXIMUM TOTAL ALLOWABLE AREA OF WINDOWS OR OTHER WALL OPENINGS
WITHOUT FIRE PROTECTION IN PERCENT OF TOTAL EXPOSED EXTERIOR WALL SURFACE**

Setback from Property Line, or Other Walls on Same Property*	Class of Construction				
	1. Fire-Resistive "A" 2. Fire-Resistive "B" 3. Metal Frame Protected 4. Heavy Timber 5. Exterior Masonry		6. Metal Frame Unprotected	7. Wood Frame Protected	8. Wood Frame Unprotected
Less than 5' -----	Bearing Wall	Nonbearing Wall			
	No Openings	No Openings	No Openings	Not Permitted	Not Permitted
5' to less than 10' -----	20%—Fire window reqd.†	30%—Fire window reqd.†	30%	Not Permitted	Not Permitted
10' to less than 30' -----	30%	40%	40%	40%	40%
30' or over -----	40%	No Limit	No Limit	No Limit	No Limit
Openings with approved automatic-closing, 3-hour fire door or shutter assemblies—No Limit.					
Tabulated percentage of openings shall be applied to each 100 lineal feet of wall.					

*Does not apply to property lines along streets.

†Fire windows shall be as required for moderate fire exposure—see Ind 51.047.

This tabulation will not allow wing walls or high parapets, etc., to be used to increase exposed wall areas and thereby increase allowable total area of openings.

History: Cr. Register, June, 1972, No. 198, eff. 1-1-73; am table A,
Register, September, 1973, No. 213, eff. 10-1-73.

* See Appendix A for further explanatory material.

Ind 51.03 Frame construction. History: 1-2-56; cr. (2), Register, February, 1971, No. 182, eff. 7-1-71; r. (2), eff. 8-1-71; cr. (2) eff. 1-1-72, Register, July, 1971, No. 187; r. and recr. Register, June, 1972, No. 198, eff. 1-1-73.

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 section Ind 51.02 (5), Table 51.03-B, sections 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 shall be noncombustible or quality certified glued solid wood core flush doors 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 of noncombustible construction.

1. The wall construction behind mansard shall extend to underside of roof deck and shall have a fire-resistive rating of not less than that specified for exterior walls in table 51.03-A.

(g) Penthouses and other roof structures shall have enclosing walls of noncombustible construction and roof framing and coverings shall be equal to that specified in table 51.03-A. Wood cooling towers are permitted.

(h) Wood may be used for finished floors, trim and wall paneling if open spaces behind the material are completely firestopped with noncombustible materials unless prohibited under the occupancy requirements of this code.

(i) Acoustical materials may be used on ceilings and walls provided they are noncombustible and the open spaces between furring on walls are completely firestopped with noncombustible material.

(j) In required fire-resistive floor and roof assemblies one electric outlet box, not exceeding 16 square inches in area, may be installed in such ceilings in each 90 square feet of ceiling area. Recessed electric fixtures shall have protection boxes built above the fixture, constructed of approved fire-resistant material of rating equal to that of the ceiling, to cover the opening in case fixture is displaced. Duct openings in ceilings shall be protected by fire dampers.

* See Appendix A for further explanatory material.

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(2) FIRE-RESISTIVE TYPE B (NO. 2):

(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.

(b) All buildings of this classification shall not exceed a height of 85 feet, in which height there shall be not more than 8 stories.

(c) Roofs. Where roof framing is greater than 20 feet above the floor, or highest level of any balcony, roof decks may be:

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

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

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.

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

(e) Doors and windows may be of wood except as otherwise specified in section Ind 51.02 (5), Table 51.03-B, sections 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 shall be noncombustible or quality certified glued solid wood core flush doors 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.

(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) Mansards shall be of noncombustible construction.

1. The wall construction behind mansard shall extend to underside of roof deck and shall have a fire-resistive rating of not less than that specified for exterior walls in table 51.03-A.

(h) Penthouse and other roof structures shall have enclosing walls of noncombustible construction and roof framing and coverings shall be equal to that specified in table 51.03-A. Wood cooling towers are permitted.

(i) Wood may be used for finished floors, trim and wall paneling if open spaces behind the material are completely firestopped with noncombustible materials unless prohibited under the occupancy requirements of this code.

(j) Acoustical materials may be used on ceilings and walls provided they are noncombustible and the open spaces between furring strips on walls are completely firestopped with noncombustible material.

(3) METAL FRAME—PROTECTED (NO. 3):

(a) A building is of metal frame protected construction if the structural parts and enclosing walls are of metal, or metal in combi-

* See Appendix A for further explanatory material.

nation with other noncombustible materials, with time resistance ratings as set forth in table 51.03-A.

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

(d) 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.

(e) Mansards shall be of noncombustible construction.

1. The wall construction behind mansard shall extend to underside of roof deck and shall have a fire-resistive rating of not less than that specified for exterior walls in table 51.03-A.

(4) HEAVY TIMBER (NO. 4):

(a) A building is of heavy timber construction if the structural frame consists of heavy timber or heavy timber in combination with metal, reinforced concrete or masonry. The structural and enclosing wall shall be as set forth in table 51.03-A.

(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 chapter 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

* See Appendix A for further explanatory material.

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; or

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

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 (NO. 5):

(a) A building is of exterior masonry construction if all enclosing walls are constructed of masonry or reinforced concrete with fire-resistive ratings as set forth in table 51.03-A. *Or 1, + 2. July Re*

(b) All buildings of this classification shall not exceed a height of 50 feet, in which height there shall be not more than 4 stories. *W!*

(c) The interior structural framing shall be metal, reinforced concrete, masonry or wood. Fire protection of metal or wood structural members may be omitted except that all such members supporting load-bearing masonry in all parts of buildings of more than one story shall be of metal, reinforced concrete or masonry with not less than one-hour fire-resistive protection of supporting metal.

(d) In walls where fire protection is required, the bottom of lower flange of 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 or approved fire-retardant treated wood satisfying the definition for "noncombustible" [Ind 51.01 (86) (c)].

(g) Where exterior overhangs are closer than 20 feet to the adjoining property line or other building on the same property, exterior wood siding, trim and shingles of projecting canopies, cornices, roof overhangs, dormers and mansard roofs may be used if the construction complies with the following:

1. All exposed material shall be noncombustible material or fire-retardant treated wood satisfying the definition for "noncombustible" [Ind 51.01 (86) (c)].

* See Appendix A for further explanatory material.

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2. Exterior masonry walls shall extend to the underside of roof rafters or joists or bearing points of beams and trusses.

3. Spaces between rafters, joists, beams or trusses shall be fire-stopped with nominal 2-inch wood blocking or rigid noncombustible material to the underside of the roof decking.

(h) Penthouses and other roof structures shall have enclosing walls of noncombustible construction and roof framing and coverings shall be equal to that specified in table 51.03-A.

(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.

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.

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

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

(d) 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 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 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 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) 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 section Ind 51.04.

(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. 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.

* See Appendix A for further explanatory material.

(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.

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) (1) 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.

Ind 51.04 History: 1-2-56; r. Register, February, 1971, No. 182, eff. 7-1-71; cr. Register, July, 1971, No. 187, eff. 8-1-71 and expiring 1-1-72.

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 51.041 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; r. Register, June, 1972, No. 198, eff. 1-1-73.

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.

(2) Connection of structural members. (a) The minimum fire-resistive protection of a connection shall be equal to the maximum required for the members to which it is attached.

(3) For structural components with a fire-resistive rating obtained by test with restrained ends, the supporting structure shall be designed to provide for this restraint.

(4) ASTM standard methods of test. (a) All products manufactured and tested according to ASTM standard methods prior to effective dates of standards specified in "Fire-Resistive Standards for Materials of Construction" shall be accepted unless the ASTM standard method used in the test is judged to be inadequate in comparison with the currently adopted standard method.

(5)* The heat transmission requirements of ASTM E-119 (25b), with the exception of high hazard areas, penal and health care facilities and warehouses for combustible materials, may be reduced to one-half (1/2) of the hourly rating required by this code, but not less than one hour.

NOTE: For ASTM E-119 Standard adopted see Ind 51.25 (90).

(a) The fire-resistive rating for structural integrity required by this code shall be maintained where the heat transmission criteria has been reduced.

* See Appendix A for further explanatory material.

(6) The use of fire-resistive protection implies consent by owner to maintain material in a serviceable condition. Where this protection is concealed, provisions shall be made for periodic visual inspection of the structural insulating material at each story.

NOTE: Definition of owner—see 101.01 (13), Wis. Stats.

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 51.043 Approved rating methods. (1) Ratings of fire-resistive assemblies shall be determined by one of the following methods:

(a) Test by approved testing laboratories (see Ind 51.044).

(b) Typical examples as listed in this code in lieu of approved test (see Ind 51.045).

(c) Approved method of calculation in lieu of approved test (see Ind 51.046).

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 51.044 Approved testing laboratories. (1) Fire rating tests conducted according to table 1 listed ASTM standards shall be acceptable if conducted by the recognized testing laboratory for referenced test.

NOTE: Other testing laboratories will be recognized as an approved agency if accepted in writing by the department.

TABLE 1

Name of Recognized Laboratories	ASTM Standard Tests					
	E-84	E-108	E-119	E-136	E-162	E-163
Forest Prod. Lab., Madison, Wis.*	-----	-----	X	-----	X	-----
Nat'l. Bureau of St'd., Washington, D.C.	-----	-----	X	X	-----	-----
Ohio State Univ., Columbus, Ohio	-----	-----	X	X	X	X
Portland Cement Assoc., Skokie, Ill.	-----	-----	X	-----	-----	-----
Southwest Research Inst., San Antonio, Tex.	X	-----	-----	-----	-----	-----
Underwriters' Lab., Inc., Chicago, Ill.	X	X	X	-----	X	X
Underwriters' Lab., Inc., Scarborough, Ont., Canada	X	X	X	X	X	X
Univ. of Calif., Berkeley, Calif.	-----	X	X	-----	-----	X

*NOTE: Reference based on research and development data. Facility is not available for conducting routine rating tests.

NOTE: For column identification and specific standards adopted, see subsections Ind 51.25 (88) thru (93).

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 51.045 Typical examples of Fire-Resistive Structural Components. (1) Basic design and construction for specified fire-resistive protection of structural components listed in table 2, including references (a) through (p), shall be acceptable.

NOTE: The following table is based on performance, interpretation of various test data and/or data from ASTM E-119 test (see table 2).

* See Appendix A for further explanatory material.

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having not less than 4 longitudinal rails, and vertical lattice bars not more than 8 inches apart, and proper stiffening braces or brackets.

(9) **LADDER TO ROOF.** Every fire escape which extends higher than the second floor shall be provided with a ladder leading from the upper platform to the roof, unless the fire escape stairway leads to the roof. The ladder shall have stringers not less than 1½ inch pipe, or not less than 2 x ¾ inch flat bars, at least 17 inches apart in the clear. The rungs shall be not less than ½ inch square or ⅝ inch round bars, 14 inches center to center. The stringers shall be securely tied together at intervals no greater than every fifth rung. The stringers of each ladder shall extend not less than 4 feet above the roof coping and return to within 2 feet of the roof, with the top rung of the ladder level with the coping.

(10) **OTHER TYPES OF FIRE ESCAPES.** Sliding or chute fire escapes may be used, upon the approval of the department of industry, labor and human relations, in place of "A" or "B" fire escapes. Every sliding fire escape shall be provided with a ladder constructed as in subsection Ind 51.20 (9), extending from 5 feet above grade, to 4 feet above the roof coping.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; am. (1) (a), Register, February, 1971, No. 182, eff. 7-1-71; am. (7), Register, February, 1971, No. 182, eff. 3-1-71; r. and recr. 51.20 (1) (a) eff. 8-1-71 and exp. 1-1-72 and cr. (1) (a) eff. 1-1-72, Register, July, 1971, No. 187; am. (1) (a), Register, June, 1972, No. 198, eff. 7-1-72.

Ind 51.21 Standpipes. (1) **CLASSES OF SERVICE.** Standpipe systems are designed for 2 classes of service: (a) for use by fire departments or others trained in handling heavy streams from 2½ inch hose, and (b) for use by occupants of a building on incipient fires. These are referred to in these sections as fire departments, and first aid standpipes, respectively. The features of each system may be combined in a single equipment, if served by an automatic water supply conforming to subsection (2) (g) or (h). All threads on hose and hose connections shall be interchangeable with those of the public fire department.

(2) **FIRE DEPARTMENT STANDPIPES.** (a) Standpipes shall be provided for all buildings exceeding 60 feet in height. Required standpipes shall be installed as construction progresses, to make them available to the fire department in the topmost floor constructed.

(b) Standpipes shall be sufficient in number so that any part of every floor area can be reached within 30 feet by a nozzle attached to 100 feet of hose connected to the standpipe. When 2 or more standpipes are required, they shall be cross connected at the bottom, and equipped with individual controlling valves located not higher than the first story.

(c) Standpipes shall be protected against mechanical and fire damage, with outlets in stairway enclosures; where stairways are not enclosed, outlets shall be at inside or outside of outside walls, within one foot of a fire tower, interior stairway or fire escape. Dry standpipes shall be accessible for inspection and not concealed.

(d) No required standpipe shall be less than 4 inches in diameter, and not less than 6 inches in diameter for buildings exceeding 75

* See Appendix A for further explanatory material.

feet in height. Material shall be steel or wrought iron pipe with approved fittings, designed for a working pressure of 100 pounds in excess of the static pressure due to elevation. An approved 2½ inch hose valve shall be located at each story, not over 5 feet above the floor level. An approved pressure reducing device shall be installed at hose valves where the pressure would otherwise be in excess of 50 pounds. Where a standpipe is not normally under pressure, hose valves shall be equipped with a tight fitting cap on a chain and having lugs for a spanner wrench.

(e) An approved siamese connection with a check valve in each inlet shall be installed on a 4 inch pipe connecting with each standpipe system and shall be marked "To Standpipe". The elevation of the connection shall be not over 3 feet above the sidewalk or ground. An automatic drip valve shall be installed where necessary to prevent freezing. In buildings with several standpipes, more than one siamese connection may be required.

(f) Fire department standpipes need not be equipped with attached hose.

(g) Automatic water supplies will not ordinarily be required, except as provided in subsection (2) (h), or where judged necessary by reason of the high combustibility or potential hazard of the occupancy. When required, they shall be designed to provide not less than 40 pounds flowing pressure at the top outlet, with volume for two fire streams. Any of the following supplies will be acceptable:

1. Connection to city water works system when providing required minimum volume and pressure.
2. Gravity tank of not less than 3,500 gallons capacity, elevated 50 feet above the top story.
3. Pressure tank of 5,250 gallons gross capacity (3,500 gallons water capacity).
4. Automatic pump or pumps, with combined effective capacity of 500 gallons per minute.

(h) An automatic water supply from an approved fire pump shall be provided in buildings over 150 feet high, or in buildings over 10,000 square feet in area per floor and requiring a standpipe. The capacity of the pump shall be not less than 500 gallons per minute for a 4 inch standpipe, 750 gallons per minute for 2 interconnected 4 inch or single 6 inch standpipes, and 1,000 gallons per minute for larger systems.

(3) **FIRST AID STANDPIPES.** (a) Standpipes shall be provided as required in sections Ind 54.14, 55.33, and 57.21.

(b) Standpipes shall be sufficient in number so that any part of every floor area can be reached within 20 feet by a nozzle attached to not more than 75 feet of hose connected to a standpipe.

Note: Standpipe outlets should be located in occupied areas, and usually at interior columns in large area buildings. Asylums and places of detention may require special arrangements. It should be possible in all cases to direct the stream into all important enclosures, such as closets, etc.

(c) No required standpipe shall be less than 2 inches in diameter, and not less than 2½ inches in diameter for buildings 5 stories or more in height. Material shall be wrought iron or steel and pipe and fittings shall be of suitable weight for the pressure used. An ap-

* See Appendix A for further explanatory material.

proved 1½ inch hose valve shall be located in each story, not more than 5 feet above the floor level; valves of the gate type shall be equipped with a suitable open drip connection. An approved pressure-reducing device shall be installed at hose valves where pressure would otherwise be over 50 pounds.

(d) Not more than 75 feet of hose shall be attached to each outlet. Hose shall be of unlined linen construction, 1½ inches in diameter, with a ½ inch nozzle attached, and shall be located in approved cabinets or racks.

(e) Water supply shall be automatic, and be designed for 70 gallons per minute for 30 minutes with 25 pounds flowing pressure at the top outlet. Such supply may be from city connection, gravity tank, pressure tank or pump.

Note: Data on the design of standpipe systems can be found in the Standards of the National Board of Fire Underwriters for the Installation of Standpipe and Hose Systems. The department of industry, labor and human relations will ordinarily approve any installation which is approved by the Underwriters.

Ind 51.22 Fire extinguishers. (1) Where fire extinguishers are required, they shall be of a type approved by the department of industry, labor and human relations. All fire extinguishers shall be charged in accordance with the instructions of the manufacturer.

(2) Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung on hangers or set on brackets or shelves so that the top of the extinguisher is not more than 5 feet above the floor.

Note: The department of industry, labor and human relations will ordinarily approve any extinguisher which bears the Underwriters' label and which is of the size, and suitable, for the hazard for which it is intended. Consult the department of industry, labor and human relations for lists of approved extinguishers.

Ind 51.23 Automatic sprinklers. (1) Required automatic sprinkler systems shall be designed and constructed in conformity with good established practice. Only materials and devices approved by the department of industry, labor and human relations may be used. Reinstallation of used sprinkler heads is prohibited, and other second-hand devices may be installed by special permission only.

(2) Where an automatic sprinkler system is required throughout a building, supply shall be from a city water main, or from a gravity or pressure tank. If the city water supply is inadequate in either pressure or volume, a tank of not less than 5,000 gallons capacity shall be provided. The bottom of a gravity tank shall be not less than 35 feet above the under side of the roof.

(3) Where automatic sprinklers are required in a basement only, the supply shall be from a city water main. Where there is no city water supply, such basement sprinklers need not be installed; but at such time as a city supply becomes available, such required basement sprinklers shall be installed.

(4) Every basement sprinkler system shall also include sprinklers in all shafts (except elevator shafts) leading to the story above.

* See Appendix A for further explanatory material.

(5) Every sprinkler system shall have a suitable audible alarm and an approved siamese connection marked "To Automatic Sprinklers", and otherwise conforming to section Ind 51.21 (2) (e).

Note: It will be the policy of the department of industry, labor and human relations to approve equipment conforming to standards of the National Board of Fire Underwriters for Sprinkler Equipment, also materials and devices currently listed by the Underwriters' Laboratories. The commission reserves the right to order a sprinkler system in any building, regardless of height or number of persons, if the occupancy is especially hazardous.

Ind 51.24 Fire alarm systems. Interior fire alarm systems required under Wis. Adm. Code sections Ind 54.16, 56.19 and 57.22 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.

(2) Every fire alarm system shall be electrically operated or activated by non-combustible, non-toxic gas except as provided in section Ind 56.19. 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) In buildings more than 3 stories in height, coded fire alarm systems shall be provided, and the systems shall be so arranged that the code transmitted shall indicate the location and the story of the structure in which the signal originated.

Exception: (a) In apartment buildings, non-coded continuous sounding fire alarm systems under constant electrical or gas activated supervision will be approved.

(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 4 feet nor more than 5 feet above the finished floor as measured from the floor to the center of the box.

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

(6) Existing fire alarm systems that are effective in operation will be accepted if approved by the department of industry, labor and human relations.

(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 workmen in accordance with the provisions of this code.

Note: The following sections are taken from the Wisconsin Administrative Electrical Code.

(10) The energy for the operation of electrical fire alarm systems shall be taken from sources suited to the design of the system. Batteries on systems of less than 110 volts shall not be used.

(11) A 3-wire 120-240 volt or 120-208 volt (3 phase 4 wire) service will be accepted for supervised systems provided the operating current is secured from one ungrounded conductor and the neutral, or ungrounded conductor, and the current for operating trouble signal or signals is secured from the other ungrounded conductor and the neutral or grounded conductor.

(12) Electrical wiring in connection with fire alarm systems shall be installed in rigid metal conduit, flexible metal conduit, electrical metallic tubing or surface metal raceways. Armored cable (metal) may be used where it can be fished in hollow spaces of walls or partitions in apartments or rooming houses not over 3 stories in height. Where the wiring is subject to excessive moisture or severe mechanical injury, rigid metal conduit shall be used. The smallest size conductor to be used in any fire alarm system in a building over 3 stories in height shall be No. 14 AWG or No. 16 AWG for buildings not over 3 stories in height. The wires shall be provided with insulation suitable for use on circuits not exceeding 600 volts. Fire alarm systems shall be connected to the line inside of the main service switch or to the emergency feeder through 2 single pole breakers or switches used for no other purpose and arranged so they can be locked in the "on" position, and under the supervision of a qualified person.

* See Appendix A for further explanatory material.

The breaker or switches shall be identified by a red color. Two pole breakers shall not be used.

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.

Ind 51.25 Specifications cited in this code. The specifications of the American Society for Testing and Materials referred to in this code are listed below.

- (1) CLAY BUILDING BRICK. (Solid masonry units made from clay or shale.) Part 12 ASTM Designation C 62-66.
- (2) SAND-LIME BUILDING BRICK. Part 12 ASTM Designation C 73-51 (1965).
- (3) CONCRETE BUILDING BRICK. Part 12 ASTM Designation C 55-66T.
- (4) SAMPLING AND TESTING BRICK. Part 12 ASTM Designation C 67-66.
- (5) STRUCTURAL CLAY LOAD-BEARING WALL TILE. Part 12 ASTM C 34-62.
- (6) SAMPLING AND TESTING STRUCTURAL CLAY TILE. Part 12 ASTM C 112-60.
- (7) SAMPLING AND TESTING CONCRETE MASONRY UNITS. Part 12 ASTM Designation C 140-65T.
- (8) STRUCTURAL CLAY NON-LOAD-BEARING TILE. Part 12 ASTM Designation C 56-62.
- (9) STRUCTURAL CLAY FLOOR TILE. Part 12 ASTM Designation C 57-57 (1965).
- (10) PORTLAND CEMENT. Part 10 ASTM Designation C 150-66.
- (11) AIR-ENTRAINING PORTLAND CEMENT. Part 10 ASTM Designation C 175-66.
- (12) PORTLAND BLAST-FURNACE SLAG CEMENT. Part 10 ASTM Designation C 205-64T.
- (13) MASONRY CEMENT. Part 9 ASTM Designation C 91-66.
- (14) QUICKLIME FOR STRUCTURAL PURPOSES. Part 9 ASTM Designation C 5-59.
- (15) HYDRATED LIME FOR MASONRY PURPOSES. Part 9 ASTM Designation C 207-49 (1961).
- (16) AGGREGATE FOR MASONRY MORTAR. Part 10 ASTM Designation C 144-66T.
- (17) AGGREGATES FOR MASONRY GROUT. Part 10 ASTM Designation C 404-61.
- (18) PORTLAND-POZZOLAN CEMENT. Part 9 ASTM Designation C 340-66T.
- (19) CONCRETE AGGREGATES. Part 10 ASTM Designation C 33-66.
- (20) LIGHTWEIGHT AGGREGATES FOR STRUCTURAL CONCRETE. Part 10 ASTM Designation C 330-64T.

* See Appendix A for further explanatory material.

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- (21) BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A15-66.
- (22) RAIL-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 16-66.
- (23) DEFORMED RAIL STEEL BARS FOR CONCRETE REINFORCEMENT WITH 60,000 P.S.I. MINIMUM YIELD STRENGTH. Part 4 ASTM Designation A 61-66.
- (24) AXLE-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 160-66.
- (25) SPECIAL LARGE SIZE DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 408-66.
- (26) HIGH-STRENGTH DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT WITH 75,000 P.S.I. MINIMUM YIELD STRENGTH. Part 4 ASTM Designation A 431-66.
- (27) MINIMUM REQUIREMENTS FOR THE DEFORMATIONS OF DEFORMED STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 305-65.
- (28) BLEEDING OF CONCRETE. Part 10 ASTM Designation C 232-58 (1966).
- (29) FABRICATED STEEL BAR OR ROD MATS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 184-65.
- (30) COLD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 32-66.
- (31) WELDED STEEL WIRE FABRIC FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 185-64.
- (32) UNCOATED SEVEN-WIRE STRESS-RELIEVED STRAND FOR PRESTRESSED CONCRETE. Part 4 ASTM Designation A 416-64.
- (33) UNCOATED STRESS-RELIEVED WIRE FOR PRESTRESSED CONCRETE. Part 4 ASTM Designation A 421-65.
- (34) STEEL FOR BRIDGES AND BUILDINGS. Part 4 ASTM Designation A 7-66.
- (35) STRUCTURAL STEEL. Part 4 ASTM Designation A 36-66.
- (36) FLEXURAL STRENGTH OF CONCRETE (using simple beam with third-point loading). Part 10 ASTM Designation C 78-64.
- (37) WELDED AND SEAMLESS STEEL PIPE. Part 1 ASTM Designation A 53-65.
- (38) CAST IRON AND DUCTILE IRON PRESSURE PIPE. Part 2 ASTM Designation A 377-66.
- (39) AIR-ENTRAINING ADMIXTURES FOR CONCRETE. Part 10 ASTM Designation C 260-66T.
- (40) CHEMICAL ADMIXTURES FOR CONCRETE. Part 10 ASTM Designation C 494-65T.
- (41) FLY ASH FOR USE AS AN ADMIXTURE IN PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 350-65T.

* See Appendix A for further explanatory material.

- (42) RAW OR CALCINED NATURAL POZZOLANS FOR USE AS ADMIXTURES IN PORTLAND CEMENT CONCRETE, Part 10 ASTM Designation C 402-65T.
- (43) METHODS AND DEFINITIONS FOR MECHANICAL TESTING OF STEEL PRODUCTS, Part 4 ASTM Designation A 370-65.
- (44) DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT WITH 60,000 P.S.I. MINIMUM YIELD STRENGTH, Part 4 ASTM Designation A 432-66.
- (45) MAKING AND CURING CONCRETE COMPRESSION AND FLEXURE TEST SPECIMENS IN THE FIELD, Part 10 ASTM Designation C 31-66.
- (46) COMPRESSIVE STRENGTH OF MOLDED CONCRETE CYLINDERS, Part 10 ASTM Designation C 39-66.
- (47) OBTAINING AND TESTING DRILLED CORES AND SAWED BEAMS OF CONCRETE, Part 10 ASTM Designation C 42-64.
- (48) READY-MIXED CONCRETE, Part 10 ASTM Designation C 94-65.
- (49) SAMPLING FRESH CONCRETE, Part 10 ASTM Designation C 172-54.
- (50) MAKING AND CURING CONCRETE COMPRESSION AND FLEXURE TEST SPECIMENS IN THE LABORATORY, Part 10 ASTM Designation C 192-66.
- (51) SPLITTING TENSILE STRENGTH OF MOLDED CONCRETE CYLINDERS, Part 10 ASTM Designation C 496-66.
- (52) METHODS OF MECHANICAL TESTINGS, Part 31 ASTM Designation E 6-66.
- (53) MILD STEEL COVERED ARC-WELDING ELECTRODES, Part 4 ASTM Designation A 233-64T.
- (54) RECOMMENDED PRACTICE FOR PROBABILITY SAMPLING OF MATERIALS, Part 30 ASTM Designation E 105-58.
- (55) CALCIUM CHLORIDE, Part 10 ASTM Designation D 98-59.
- (56) CHEMICAL ANALYSIS OF HYDRAULIC CEMENT, Part 9 ASTM Designation C 114-67.
- (57) FINENESS OF PORTLAND CEMENT BY THE TURBIDIMETER, Part 9 ASTM Designation C 115-58.
- (58) FINENESS OF PORTLAND CEMENT BY AIR PERMEABILITY APPARATUS, Part 9 ASTM Designation C 204-55.
- (59) COMPRESSIVE STRENGTH OF HYDRAULIC CEMENT MORTARS (using 2-in. cube specimens), Part 9 ASTM Designation C 109-64.
- (60) AUTOCLAVE EXPANSION OF PORTLAND CEMENT, Part 9 ASTM Designation C 151-66.
- (61) SPECIFIC GRAVITY OF HYDRAULIC CEMENT, Part 9 ASTM Designation C 188-44 (1958).
- (62) RESISTANCE TO ABRASION OF SMALL SIZE COARSE AGGREGATE BY USE OF THE LOS ANGELES MACHINE, Part 10 ASTM Designation C 131-66.

* See Appendix A for further explanatory material.

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(63) MATERIALS FINER THAN NO. 200 SIEVE IN MINERAL AGGREGATES BY WASHING. Part 10 ASTM Designation C 117-66.

(64) FRIABLE PARTICLES IN AGGREGATES. Part 10 ASTM Designation C 142-66T.

(65) LIGHTWEIGHT PIECES IN AGGREGATES. Part 10 ASTM Designation C 123-66.

(66) ORGANIC IMPURITIES IN SANDS FOR CONCRETE. Part 10 ASTM Designation C 40-66.

(67) SIEVE OR SCREEN ANALYSIS OF FINE AND COARSE AGGREGATES. Part 10 ASTM Designation C 136-63.

(68) SOUNDNESS OF AGGREGATES BY USE OF SODIUM SULFATE OR MAGNESIUM SULFATE. Part 10 ASTM Designation C 83-63.

(69) SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE. Part 10 ASTM Designation C 127-59.

(70) SPECIFIC GRAVITY AND ABSORPTION OF FINE AGGREGATE. Part 10 ASTM Designation C 128-59.

(71) SURFACE MOISTURE IN FINE AGGREGATE. Part 10 ASTM Designation C 70-66.

(72) UNIT WEIGHT OF AGGREGATE. Part 10 ASTM Designation C 29-60.

(73) VOIDS IN AGGREGATE FOR CONCRETE. Part 10 ASTM Designation C 30-37 (1964).

(74) EFFECT OF ORGANIC IMPURITIES IN FINE AGGREGATE ON STRENGTH OF MORTAR. Part 10 ASTM Designation C 87-63T.

(75) PETROGRAPHIC EXAMINATION OF AGGREGATES FOR CONCRETE. Part 10 ASTM Designation C 295-65.

(76) POTENTIAL REACTIVITY OF AGGREGATES (CHEMICAL METHOD). Part 10 ASTM Designation C 239-66.

(77) POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS (MORTAR BAR METHOD). Part 10 ASTM Designation C 227-65.

(78) TERMS RELATING TO CONCRETE AND CONCRETE AGGREGATES. Part 10 ASTM Designation C 125-66.

(79) WEIGHT PER CUBIC FOOT, YIELD, AND AIR CONTENT (GRAVIMETRIC) OF CONCRETE. Part 10 ASTM Designation C 138-63.

(80) AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE VOLUMETRIC METHOD. Part 10 ASTM Designation C 173-66.

(81) AIR CONTENT OF FRESHLY MIXED CONCRETE BY PRESSURE METHOD. Part 10 ASTM Designation C 231-62.

(82) SLUMP OF PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 143-66.

(83) FLOW OF PORTLAND CEMENT CONCRETE BY USE OF THE FLOW TABLE. Part 10 ASTM Designation C 124-39 (1966).

(84) COMPRESSIVE STRENGTH OF CONCRETE USING PORTIONS OF BEAMS BROKEN IN FLEXURE. Part 10 ASTM Designation C 116-65T.

* See Appendix A for further explanatory material.

(85) FUNDAMENTAL TRANSVERSE, LONGITUDINAL, AND TORSIONAL FREQUENCIES OF CONCRETE SPECIMENS. Part 10 ASTM Designation C 215-60.

(86) CEMENT CONTENT OF HARDENED PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 85-66.

(87) LENGTH CHANGE OF CEMENT MORTAR AND CONCRETE. Part 10 ASTM Designation C 157-64T.

(88) SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS. Part 14 ASTM Designation E 84-68.

(89) FIRE TESTS OF ROOF COVERINGS. Part 14 ASTM Designation E 108-70.

(90) FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS. Part 14 ASTM Designation E 119-69.

(91) NONCOMBUSTIBILITY OF ELEMENTARY MATERIALS. Part 14 ASTM Designation E 136-65.

(92) FIRE TESTS OF DOOR ASSEMBLIES. Part 14 ASTM Designation E 152-66.

(93) FIRE TEST OF WINDOW ASSEMBLIES. Part 14 ASTM Designation E 163-65.

Note: The above standards may be obtained for personal use from American Society of Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103. They are available for inspection in the office of the department, the secretary of state and the revisor of statutes.

History: Cr. Register, October, 1967, No. 142, eff. 11-1-67; cr. (88), (89), (90), (91), (92), and (93), Register, February, 1971, No. 182, eff. 7-1-71; r. (88), (89), (90), (91), (92) and (93) eff. 8-1-71 and recr. (88), (89), (90), (91), (92) and (93) eff. 1-1-72, Register, July, 1971, No. 187.

Ind 51.26 Specifications cited in this code. The specifications of the American Concrete Institute referred to in this code are listed below.

(1) Building code requirements for reinforced concrete ACI 318-63.

(2) Minimum standard requirements for precast concrete floor and roof units ACI 512-67.

(3) Minimum requirements for thin-section precast concrete construction ACI 525-63.

Note: The above standards may be obtained for personal use from American Concrete Institute, 7400 Second Boulevard, Detroit, Michigan. They are available for inspection in the office of the department, the secretary of state and the revisor of statutes.

History: Cr. Register, October, 1967, No. 142, eff. 11-1-67.

* See Appendix A for further explanatory material.