

Chapter Ind 51

DEFINITIONS AND STANDARDS

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Ind 51.001 Fire resistive construction. History: 1-2-56; am. (2); (2) (a); (3); (3) (a); Register, June, 1956, No. 6, eff. 7-1-56; am. (2) intro. par., (3) (a), (4), (7) and (8), Register, February, 1971, No. 182, eff. 7-1-71; r. and recr. (2) intro. par., (3) (a), (4), (7) and (8), eff. 8-1-71 and expiring 1-1-72; cr. (2) intro. par., (3) (a), (4), (7) and (8) eff. 1-1-72, Register, July, 1971, No. 187; r. and recr. (3), eff. 7-1-72; repeal and recreate Ind 51.001, renum. 51.015, eff. 1-1-73, Register, June, 1972, No. 198.

Ind 51.01 Mill construction. History: 1-2-56; am. (2); (2) (a); Register, June, 1956, No. 6 eff. 7-1-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59; am. (2) intro. par., (7) and (8), Register, February, 1971, No. 182 eff. 7-1-71; r. and recr. (2) intro. par., (7) and (8) eff. 8-1-71 and exp. 1-1-72; and cr. (2) intro. par., (7) and (8) eff. 1-1-72, Register, July, 1971, No. 187; r. and recr.; Register, June, 1972, No. 198, eff. 1-1-73.

Ind 51.01 Definitions. (1) **ACCESSORY ROOM.** Any room or enclosed floor space used for eating, cooking, bathrooms, water closet compartments, laundries, pantries, foyers, hallways, and other similar floor spaces. Rooms designated as recreation, study, den, family room, office, etc., in addition to habitable rooms, are considered accessory rooms.

(1a) **AIR CONDITIONING.** The process of treating air to control simultaneously its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space.

(2) **ALLEY.** Any legally established public thoroughfare less than 30 feet in width but not less than 10 feet in width whether designated by name or number.

(3) **APPROVED.** Approval granted by the department under the regulations stated in this code.

(4) **AREA (GROSS).** The maximum horizontal projected area within the perimeter of the outside surface of walls or supports of the building or structure. Exterior cantilever open balconies are not included.

(5) **AREA (NET).** The occupied or usable floor area in a building but

* See Appendix A for further explanatory material.

not including space occupied by columns, walls, partitions, mechanical shafts or ducts.

(5a) **AREAWAY.** Exterior area whose grade is below the grade (at building) and having at least one side consisting of the exterior wall of a building.

(6) **ATTIC.** The space not used for human occupancy located between the ceiling of uppermost story and the roof.

(7) **AUTOMATIC.** Automatic as applied to a fire protective device, is one which functions without human intervention and is actuated as a result of the predetermined temperature rise, rate of rise of temperature, combustion products or smoke density such as an automatic sprinkler system, automatic fire door, automatic fire shutter, or automatic fire vent.

(8) **BALCONY (EXTERIOR).** An elevated platform attached to a building and enclosed on one or more sides by railings.

(9) **BALCONY (INTERIOR).** An open intermediate level or stepped floor. Also see "Stories, Number of."

(10) **BASEMENT.** A basement floor is that level below the first or ground floor level with its entire floor below exit discharge grade.

(11) **BEARING WALL.** See "Wall (bearing)."

(12) **BUILDING.*** A structure for support, shelter or enclosure of persons or property.

(13) **BUILDING HEIGHT.** See "Height (building)."

(14) **BUTTRESS.** A structural projection which is an integral part of a wall, primarily to provide resistance to lateral forces.

(15) **CAVITY WALL.** See "Wall (cavity)."

(16) **CEILING PROTECTION.** The fire protection membrane suspended beneath the floor or ceiling construction which, when included with the construction, develops the fire-resistive rating for the overall assembly.

(17) **CLOSING DEVICE (FIRE DOOR).** A closing device is one which will close the door and be adequate to latch and/or hold hinged or sliding door in a closed position.

(a) *Automatic.* An automatic closing device is one which functions without human intervention and is actuated as a result of the predetermined temperature rise, rate of rise of temperature, combustion products or smoke density.

(b) *Self-closing.* A self-closing device is one which will maintain the door in a closed position.

(18) **COMBUSTIBLE CONSTRUCTION.** An assembly such as a wall, floor or roof having components of combustible material.

(19) **COMBUSTIBLE MATERIAL.** All materials not classified as "non-combustible" are considered combustible. This property of a material does not relate to its ability to structurally perform under fire exposure. The degree of combustibility is not defined by standard fire test procedures.

* See Appendix A for further explanatory material.

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(20) CONCRETE. See "Types of Concrete," section Ind 51.045 (1) (a).

(21) CONSTRUCTION. Includes all labor and materials used in the framing or assembling of component parts in the erection, installation, enlargement, alteration, repair, moving, conversion, razing, demolition or removal of any appliance, device, building, structure or equipment.

(22) CORRIDOR. An enclosed passageway in a building for public ingress and egress to and from dwelling units, rooms or other areas and leading to a lobby, foyer or exit discharge.

(22a) CORRIDOR (REQUIRED EXIT). A fire-rated enclosure beginning at the end point of maximum allowable exit distance and continuing to the exit discharge door.

Note: See line 20 of Table 51.03-A.

(23) COURT (EXIT). An exterior court providing a pathway for public egress from an exit to a public thoroughfare.

(24) COURT (INNER). An open air shaft or court surrounded on all sides by walls.

(25) COURT (INNER LOT LINE). A court bounded on 3 sides by walls and on the remaining side by a lot line or property line.

(26) COURT (OUTER). A court bounded on 3 sides with walls and on the remaining side by a street, alley or other open space not less than 15 feet wide.

(27) COURT (OUTER LOT LINE). A court with one side on a lot line or property line and opening to a street or open space not less than 15 feet wide.

(28) CURTAIN WALL. See "Wall (curtain)."

(29) DEPARTMENT. Means the department of industry, labor and human relations.

(30) DIVISION WALL. See "Wall (division)."

(31) DUCT. Any pipe, flue, or tunnel used to convey air, gases and entrained materials. An underground duct is any part of a duct that is below the surface of the ground.

(32) DUCT FURNACE. See "Furnace (duct)."

(33) ELEVATOR. See Wis. Adm. Code, chapter Ind 4.

(34) EQUIPMENT. Self-contained systems and apparatus attached to or built into the building and used for mechanical or electrical processing, comfort, safety, sanitation, communication or transportation within a building.

(35) EXHAUST VENTILATING SYSTEM. See "Ventilating System (exhaust)."

(36) EXISTING. A building, structure, or equipment completed or in the course of construction or use or occupied prior to the effective date of applicable rules of this code.

(37) EXIT COURT. See "Court (exit)."

* See Appendix A for further explanatory material.

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(38) EXIT DISCHARGE GRADE. See "Grade (exit discharge)."

(39) EXIT (VERTICAL). See "Vertical Exit."

(40) EXTERIOR BALCONY. See "Balcony (exterior)."

(41) EXTERIOR WALL. See "Wall (exterior)."

(42) FAMILY.* Means 2 or more individuals who are related to each other by blood, marriage, adoption or legal guardianship. For purposes of this code a group of not more than 4 persons not necessarily related by blood or marriage, living together in a single living unit will be considered equivalent to a single family.

(43) FIRE DOOR. A door so constructed as to give protection against the passage of fire.

(44) FIRE DOOR ASSEMBLY. The assembly of fire door and its accessories, including all hardware, frames, closing devices and their anchors, so constructed as to give protection against the passage of fire.

(45) FIRE DOOR CLOSING DEVICE. See "Closing Device (fire door)."

(46) FIRE RESISTANCE AND FIRE-RESISTIVE MATERIAL. Having the property to withstand fire or give protection from it. As applied to elements of building, it is characterized by the ability to confine a fire or to continue to perform a given structural function, or both.

(47) FIRE-RESISTIVE CLASSIFICATION. Fire-resistive classification is the time in hours during which a material or assembly continues to exhibit fire resistance under conditions of tests and performance as specified in ASTM E-119, ASTM E-152 and ASTM E-163.

(48) FIRE-RESISTIVE PROTECTION. An insulating material applied directly, attached to, or suspended from a structural assembly, to maintain the structural integrity of a member or system for the specified time rating.

(49) FIRE-RESISTIVE PROTECTION, DIRECTLY APPLIED. A coating material applied directly to the structural element for the purpose of fire protection.

(50) FIRE-RESISTIVE RATING. Refer to fire-resistive classification.

(51) FIRE-RETARDANT ROOF COVERINGS. Roof coverings shall be classified on the basis of protection provided against fire originating outside the building or structure on which they have been installed.

(a) Class A roof coverings are those which are effective against severe fire exposures (meeting the 3 methods for fire tests of class A roof coverings [ASTM Standard E-108]) and possess no flying brand hazard.

(b) Class B roof coverings are those which are effective against moderate fire exposures (meeting the 3 methods for fire tests of class B roof coverings [ASTM Standard E-108]) and possess no flying brand hazard.

(c) Class C roof coverings are those which are effective against light fire exposures (meeting the 3 methods for fire tests of class C roof coverings [ASTM Standard E-108]) and possess no flying brand hazard.

* See Appendix A for further explanatory material.

(52) **FIRE RETARDANT—TREATED WOOD.** Fire-retardant wood includes lumber or plywood that has been treated with a fire-retardant chemical to provide classifications (flame-spread [FSC] and fuel contributed [FCC]) of 25 or less by ASTM method E-84, shows no progressive combustion during 30 minutes of fire exposure by this method, and is so labeled. Fire-retardant wood for decorative and interior finish purposes provides reduced flame-spread classification (FSC) by ASTM method E-84 as specified by the code for materials used in the particular applications.

(53) **FIRE WINDOW ASSEMBLY.** A fire window includes glass, frame, hardware and anchors constructed and glazed to give protection against the passage of flame.

(54) **FIRST FLOOR.** The first floor is the primary floor used in determining the number of stories of a building.

(55) **FLAME-SPREAD CLASSIFICATION.** Flame-spread classification (FSC) is a comparative rating of the measure of flame-spread on a surface of a material or assembly as determined under conditions of tests and performance as specified in ASTM E-84.

(56) **FLAME-SPREAD RATING.** Refer to flame-spread classification.

(56a) **FLOOR.** The bottom or lower part of an enclosed space including any portions raised or depressed by not more than 3 feet from the designated principal level where the raised or depressed portion is treated architecturally as a part of the same principal level.

(57) **FLOOR AREA.** See "Area (net)."

(57a) **FLOOR LEVEL.** The upper surface of a floor treated architecturally as the designated principal floor at a given elevation.

(58) **FOYER.** An enclosed space and passageway into which aisles, corridors, stairways, or elevators may exit and from which the public has access to exits.

(59) **FRONT YARD.** See "Yard (front)."

(60) **FUEL CONTRIBUTED CLASSIFICATION.** Fuel contributed classification (FCC) is a comparative measure of the fuel contribution of a material or an assembly in the flame-spread test per ASTM E-84.

(61) **FURNACE.** A completely self-contained direct-fired, automatically controlled, vented appliance for heating air by transfer of heat of combustion through metal to the air and designed to supply heated air through ducts to spaces remote from the appliance location.

(62) **FURNACE (DUCT).** A suspended direct-fired heating appliance normally installed in air ducts. Air circulation is provided by a blower not furnished as part of the appliance.

(63) **GRADE (AT BUILDING).** Elevation of surface of paved or unpaved ground adjacent to wall of a building.

(64) **GRADE (EXIT DISCHARGE).** The elevation of finished exterior surface of paved or unpaved ground at any exit discharge doorsill.

(65) **GRAVITY EXHAUST VENTILATION.** See "Ventilation (gravity exhaust)."

* See Appendix A for further explanatory material.

(66) GROSS AREA. See "Area (gross)."

(67) GROUND FLOOR. A ground floor is that level of a building on a sloping or multilevel site which has its floor line at or not more than 3 feet above exit discharge grade for at least one-half of the required exit discharges.

(67a) HABITABLE ROOM.* Any room or enclosed floor space arranged for living and/or sleeping purposes.

(68) HAZARDOUS PIPING. See "Piping (hazardous)."

(69) HEATING SYSTEM. Any combination of building construction, machinery, devices or equipment, so proportioned, arranged, installed, operated, and maintained as to produce and deliver in place the required amount and character of heating service.

(70) HEIGHT (BUILDING). Height of a building is measured from the average of the exit discharge grade elevation of all required first story exits to the top of a level roof or to a point $\frac{1}{2}$ of the distance between the intersection of the exterior wall surface (extended) with the roof surface, and the highest part of the roof but not to include penthouses.

NOTE: For exceptions to penthouses see definition "Stories, Number of."

(71) HOLLOW BONDED WALL. See "Wall (hollow bonded)."

(72) INNER COURT. See "Court (inner)."

(73) INNER LOT LINE COURT. See "Court (inner lot line)."

(74) INTAKE (OUTSIDE AIR). See "Outside Air Intake."

(75) INTERIOR BALCONY. See "Balcony (interior)."

(76) JACKETED STOVE. See "Stove (jacketed)."

(76a) LIVING UNIT. Any enclosed floor space consisting of one or more habitable rooms (with or without accessory rooms) used by a person(s) or family.

(77) LOBBY. An enclosed space into which aisles, corridors, stairways, elevators or foyer may exit and provides access to exits.

(78) LOT LINE. A legally established line dividing one lot, plot of land or parcel of land from an adjoining lot or plot of land or parcel of land.

(79) MAJOR APPARATUS. Central air-handling equipment supplying more than one occupancy or rooms and heat-producing equipment generating heat for the heating and ventilating system.

(80) MASONRY. A construction composed of separate units such as brick, block, hollow tile, stone or approved similar units or a combination thereof, laid up or built unit by unit and bonded by approved manner.

(81) MECHANICAL VENTILATION. See "Ventilation (mechanical)."

(82) MEZZANINE OR MEZZANINE FLOOR. An intermediate floor, either open or enclosed. Also see "Stories, Number of."

* See Appendix A for further explanatory material.

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(83) NET AREA. See "Area (net)."

(84) NONBEARING WALL. Refer to "Wall (exterior)" or "Partition."

(85) NONCOMBUSTIBLE CONSTRUCTION. An assembly such as a wall, floor or roof having components of noncombustible material.

(86) NONCOMBUSTIBLE MATERIAL. A noncombustible material is one which, in the form in which it is used, meets one of the requirements (a), (b) or (c) listed below. Materials used adjacent to or in contact with heat-producing appliances, warm air ducts, plenums and chimneys shall be classified as noncombustible only on the basis of requirement (a). Non-combustible does not apply to the flame-spread characteristics of interior finish or trim materials. No material shall be classed as noncombustible building construction material which is subject to increase in combustibility or flame-spread classification (FSC) beyond the limits herein established through the effects of age, moisture or other atmospheric conditions.

(a) Materials which pass the test procedure of ASTM E-136 for defining noncombustibility of elementary materials when exposed to a furnace temperature of 1,382 degrees F. for a minimum period of 5 minutes, and do not cause a temperature rise of the surface or interior thermocouples in excess of 54 degrees F. above the furnace air temperature at the beginning of the test and which do not flame after an exposure of 30 seconds.

(b) Materials having a structural base of noncombustible material as defined in paragraph (a), with a surfacing not more than 1/8 inch thick which has a flame-spread classification (FSC) not greater than 50 when tested in accordance with the method of test for surface burning characteristics of building materials (ASTM E-84).

(c) Materials other than defined in paragraphs (a) and (b), having a flame-spread classification (FSC) not greater than 25 without evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material in any way would not have a flame-spread classification (FSC) greater than 25 when tested in accordance with the method of test for surface burning characteristics of building materials (ASTM E-84).

(87) OCCUPANCY OR USE. The purpose for which a building, structure, equipment, materials, or premises, or part thereof, is used or intended to be used as regulated in this code.

(88) OCCUPIED. Refers to any room or enclosure used by one or more persons for other than incidental maintenance.

(89) OPEN SPACES. Front (setback), rear and side yards, exit courts, outer courts, and outer lot line courts on the same property with a building as regulated by this code.

(90) OUTDOOR OPENINGS. May be doors, windows or skylights located in outside walls or roof and can be opened to provide natural ventilation to the occupied space.

(91) OUTER COURT. See "Court (outer)."

(92) OUTER LOT LINE COURT. See "Court (outer lot line)."

* See Appendix A for further explanatory material.

(93) **OUTLET (SUPPLY OPENING)**. An opening, the sole purpose of which is to deliver air into any space to provide heating, ventilating or air conditioning.

(94) **OUTSIDE AIR**. Air that is taken from outside the building and is free from contamination of any kind in proportions detrimental to the health or comfort of the persons exposed to it.

(95) **OUTSIDE AIR INTAKE**. Includes the ducts and outdoor openings through which outside air is admitted to a ventilating, air conditioning or heating system.

(96) **PANEL WALL**. See "Wall (panel)."

(97) **PARTITION**. An interior nonbearing vertical element serving to enclose or divide an area, room or space.

(98) **PARTY WALL**. See "Wall (party)."

(99) **PENTHOUSE**. An enclosed or partially enclosed structure extending above the main roof of a building or structure and/or enclosing a stairway, tank, elevator, machinery, mechanical equipment or other apparatus and not used for human occupancy.

(100) **PIER**. An isolated column of masonry or concrete. A section of bearing wall not bonded on the sides into adjoining masonry shall be considered to be a pier when its horizontal dimension measured at right angles to the thickness does not exceed 4 times the thickness.

(101) **PILASTER**. A projection of masonry for the purpose of bearing concentrated loads, or to compensate for reduction of wall section by chases, openings or recesses, or for the purpose of stiffening the wall against lateral forces. (See also "Buttress.")

(102) **PIPING (HAZARDOUS)**. Any service piping conveying oxygen, flammable liquids, flammable gases or toxic gases.

(103) **PORCH**. An unenclosed exterior structure at or near grade attached or adjacent to the exterior wall of any building, and having a roof and floor. (See also "Terrace" and "Balcony.")

(104) **PROPERTY LINE**. A legally established line dividing one lot, plot of land or parcel of land under one ownership from an adjoining lot or plot of land or parcel of land under another ownership.

(105) **PUBLIC THOROUGHFARE**. Any legally established street or alley as defined herein.

(106) **REQUIRED**. A term for mandatory use under the provisions of this code.

(106a) **REQUIRED EXIT CORRIDOR**. See "Corridor (Required Exit)."

(107) **RESTRAINED SUPPORT**. A flexural member where the supports and/or the adjacent construction provides complete or partial restraint against rotation of the ends of the member and/or partial restraint against horizontal displacement when subject to a gravity load and/or temperature change.

(108) **RETAINING WALL**. See "Wall (retaining)."

(109) **RETURN (OR EXHAUST OPENING)**. Any opening, the sole pur-

* See Appendix A for further explanatory material.

pose of which is to remove air from any space being heated, ventilated or air conditioned.

(110) **ROADWAY.** That portion of a public thoroughfare devoted to vehicular traffic, or that part included between curbs.

(111) **ROOF.** The structural cover of a building with a slope range bearing from horizontal to a maximum of 60 degrees to the horizontal.

(112) **ROOF COVERING.** Refers to the covering applied over the roof construction for the purpose of weather or fire resistance.

(113) **ROOF COVERINGS (FIRE-RETARDANT).** See "Fire-Retardant Roof Coverings."

(114) **ROOM.** A space within a building completely enclosed with walls, partitions, floor and ceiling, except for openings for light, ventilation, ingress and egress.

(115) **SETBACK.*** Refers to the open space between the property line or public thoroughfare and the nearest part of the building. Unenclosed terraces, slabs, or stoops without roofs or walls may project into this open space or setback.

(116) **SHAFT.** A vertical opening in a building extending through one or more stories and/or roof, other than an inner court.

(117) **SHALL.** A term for mandatory use under the provisions of this code.

(118) **SIGNS.** A structure that is intended, designed, or used for advertising, display, identification, announcements, or related purposes; this includes signs, screens, billboards, and other advertising devices of any type.

(119) **SIMPLE SUPPORT.** A flexural member where the supports and/or the adjacent construction allows free rotation of the ends of the member and horizontal displacement when subject to a gravity load and/or a temperature change.

(120) **SPACE HEATER (GRAVITY OR CIRCULATING TYPE).** A vented, self-contained free standing or wall recessed heating appliance using liquid or gas fuels. (Also see definition for "Stove (jacketed).")

(121) **STORIES, NUMBER OF.*** The number of stories of a multistory building includes all stories except the basement(s), ground floor(s), attic or interior balcony(ies) and/or mezzanine floor(s). Also see Ind 51.02 (14).

(122) **STORY.** The space in a building between the surfaces of any floor and the floor next above or below, or roof next above, or any space not defined as basement, ground floor, mezzanine, balcony, penthouse or attic. (Also see "Stories, Number of.")

(123) **STOVE (JACKETED).** A vented, self-contained free standing, non-recessed heating appliance using solid, liquid or gas fuels. The effective heating is dependent on a gravity flow of air circulation over the heat exchanger. (Also see definition for "Space Heater.")

(124) **STREET.** Any legally established public thoroughfare 30 feet or more in width whether designated or not by name or number such

* See Appendix A for further explanatory material.

as avenue, boulevard, circle, court, drive, lane, place, road or way. All-weather hard-surfaced areas 30 feet or more in width and extending at least 50% of the length of that side of building and accessible to fire-fighting equipment will be acceptable in lieu of streets.

(125) **STRUCTURE.** An assembly of materials forming a construction for occupancy or use (including, among others, buildings, stadiums, gospel or circus tents, reviewing stands, platforms, stagings, observation towers, radio and television towers, water tanks, trestles, piers, wharves, open sheds, coal bins, shelters, fences, and display signs).

(126) **SUPPORT (RESTRAINED).** See "Restrained Support."

(127) **SUPPORT (SIMPLE).** See "Simple Support."

(128) **TEMPERED AIR.** Air transferred from heated area of building.

(129) **TEMPERED OUTSIDE AIR.** Outside air heated before distribution.

(130) **TERRACE.** An unenclosed exterior structure at or near grade having a paved, floored, or planted platform area adjacent to an entrance or to the exterior walls for a building or structure and having no roof.

(131) **TREATED WOOD (FIRE-RETARDANT).** See "Fire Retardant—Treated Wood."

(132) **UNIT HEATER (HIGH STATIC PRESSURE TYPE).** A direct-fired suspended or floor standing, self-contained, automatically controlled and vented, heating appliance having an integral means for circulation of air against 0.2 inch or greater static pressure.

(133) **UNIT HEATER (LOW STATIC TYPE).** A direct-fired suspended, self-contained automatically controlled, vented heating appliance, having integral means for circulation of air by means of a propellor fan or fans.

(134) **VENEERED WALL.** See "Wall (veneered)."

(135) **VENTILATING SYSTEM (EXHAUST).** Any combination of building construction, machinery, devices or equipment, designed and operated to remove harmful gases, dusts, fumes or vitiated air, from the breathing zone of employes and frequenters.

(136) **VENTILATION.** The process of supplying or removing air by natural or mechanical means, to or from any space.

(137) **VENTILATION (GRAVITY EXHAUST).** A process of removing air by natural means, the effectiveness depending on atmospheric condition, such as difference in relative density, difference in temperature or wind motion.

(138) **VENTILATION (MECHANICAL).** The process of supplying or removing air by power-driven fans or blowers.

(139) **VERTICAL EXIT.** A means of egress used for ascension or descension between 2 or more floors, or other levels, and shall include approved exterior stairways, automatic (moving) stairways, fire escapes, ramps, stairways, and smokeproof stair towers.

(140) **WALL.** A structural element which is vertical or within 30 degrees of vertical, serving to enclose space, form a division, or support superimposed weight.

(141) **WALL (BEARING).** Any wall which supports a load in addition to its own weight.

* See Appendix A for further explanatory material.

(142) **WALL (CAVITY)**. A wall built of masonry units or of plain concrete, or a combination of these materials, so arranged to provide an air space within the wall, and in which the facing and backing (inner and outer parts) of the wall are tied together with metal ties.

(143) **WALL (CURTAIN)**. An exterior nonbearing wall.

(144) **WALL (DIVISION)**.*

(a) *Building division*. A wall used for separation between 2 buildings on the same property identical in construction to a party wall.

(b) *Fire division*. A wall extending from the lowest floor level to or through the roof to restrict the spread of fire.

(145) **WALL (EXTERIOR)**. Any outer enclosing wall of a building or structure.

(146) **WALL (FRAMING)**. Wall framing shall include columns, studs, beams, girders, lintels and girts.

(147) **WALL (HOLLOW BONDED)**. Wall built of masonry units with or without any air space within the wall, and in which the facing and backing of the wall are bonded together with masonry units.

(148) **WALL (NONBEARING EXTERIOR)**. Wall which supports no vertical load other than its own weight.

(148a) **WALL (NONBEARING INTERIOR)**. See "Partition."

(149) **WALL (PANEL)**. An exterior nonbearing wall in skeleton construction.

(150) **WALL (PARAPET)**. That part of a wall entirely above the roof line.

(151) **WALL (PARTY)**.* Walls used for separation between 2 buildings on the property line between adjoining properties.

(152) **WALL (RETAINING)**. Wall used to resist laterally imposed pressures.

(153) **WALL (VENEERED)**. Wall having facing which is attached to the backing but not so bonded as to exert common action under load.

(154) **YARD (FRONT)**. An open, unoccupied space unobstructed to the sky, extending across the full width of a lot, or plot of land between the street line and the base of a front building wall. Unenclosed terraces, slabs or stoops without roofs or walls may project into this open space.

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Standards for Classes of Construction

Ind 51.015 Scope. This section covers minimum standards for common types of building designs currently being constructed. This section does not specifically include classification for uncommon building designs such as shells, domes, space frames, inflatable and similar types of designs. The standards contained herein shall be used as a guide for such uncommon building designs to achieve the degree of safety intended by these standards.

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Ind 51.02 Ordinary construction. History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59; am. (1), (3) and (5), and cr. (6), Register, February, 1971, No. 132, eff. 7-1-71; r. (6) and r. and recr. (1) (3) and (5) eff. 8-1-71 and expiring 1-1-72, and cr. (1), (3), (5) and (6) eff. 1-1-72, Register, July, 1971, No. 187; r. and recr. Register, June, 1972, No. 198, eff. 1-1-73.

Ind 51.02 General requirements. (1) The fire-resistive ratings shown in "Classes of Construction" table 51.03-A are to satisfy the structural integrity end point for the time specified. For heat transmission end point requirements see subsection Ind 51.042 (5).

(2) Substitution of a building element fire-resistive rating will be permitted in any class of construction providing it is equal to or better than the required fire-resistive rating as specified in table 51.03-A.

(a) Construction requiring the use of noncombustible material shall not be replaced by combustible construction regardless of fire-resistive rating unless mentioned specifically under classes of construction standards.

(b) Noncombustible construction may be substituted for combustible construction provided the fire-resistive rating indicated in table 51.03-A is equal to or better than that noted for combustible construction.

(3) **FLOOR FRAMING.** (a) All floor framing shall satisfy the requirements of Table 51.03-A, whether floor system is considered part of a story or not, unless more restrictive requirements are noted under the occupancy chapters of this code.

(4) **Exterior wall construction:**

(a) All exterior walls which are in contact with the soil shall be of masonry or concrete.

(b) Exposed exterior walls between the first floor structural system and grade shall be of masonry or concrete except as follows:

1. Walls may be constructed of material other than masonry or concrete providing the following conditions are satisfied:

a. The construction shall meet the requirements of table 51.03-A for specified class of construction.

b. Any portion of exposed wall above grade and below the first floor structural system, when other than masonry or concrete, shall be counted as a story, and is also considered when determining height of wall.

(5) **INTERIOR WALL CONSTRUCTION.** (a) Openings in partitions and interior bearing walls shall be protected if such walls serve as required building division, fire division or fire separation walls.

1. Openings shall be protected by approved fire door or fire window assemblies as specified in section Ind 51.047, or fire damper or fire door assemblies as specified in section Ind 59.69.

Note: Openings in walls other than those specified above need not be protected except to satisfy structural integrity end point for the time specified.

(6) **Roof coverings, skylights and skydomes:**

(a) There shall be no restriction in use of glass or other non-combustible material when satisfying minimum requirements for roof coverings.

(b) Where combustible plastic is used in roof openings it shall not

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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) PARAPET WALLS: (a) Parapet walls not less than 8 inches in thickness and 2 feet in height shall be provided on all exterior walls of masonry or concrete, where such walls connect with roofs other than roofs that are of noncombustible construction throughout; but this section shall not apply to:

1. Buildings where type No. 7 and No. 8 construction would be permitted under the provisions of this code;

* See Appendix A for further explanatory material.

2. Walls which face streets or alleys;
3. Walls where not less than 10 feet of vacant space is maintained between the wall and the property line;
4. Walls which are not less than 10 feet from other buildings on the same property.

(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 wall and 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 (3) (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.

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.

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

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

KEY TO ABBREVIATIONS :

NC - NON COMBUSTIBLE
 NP - NOT PERMITTED
 H.T. - HEAVY TIMBER
 P/L - PROPERTY LINE

- ④ - SEE OCCUPANCY SECTIONS OF THE CODE FOR OTHER BASIC REQUIREMENTS AND MORE RESTRICTIVE LIMITATIONS.
- ⑤ - ROOF COVERING SAME AS FOR MAIN BUILDING.
- ⑥ - WALLS OF SOLID WOOD 4" IN THICKNESS ARE ACCEPTABLE AS EQUAL TO ONE HOUR FIRE-RESISTIVE RATING.
- ⑦ - FIRE RESISTIVE REQUIREMENTS ALSO APPLY FOR THOSE BRACING MEMBERS REQUIRED FOR GRAVITY LOADING.
- ⑧ - REFER TO TABLE 51.03-B FOR ALLOWABLE AREAS FOR WINDOWS AND OTHER OPENINGS IN EXTERIOR WALLS.
- ① - FOR EXCEPTIONS REFER TO IND. 51.02
- ② - SETBACKS AND DISTANCES TO P/L OR OTHER BLDG ON SAME PROPERTY

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
	Bearing Wall	Nonbearing Wall			
Less than 5'-----	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.

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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.

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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.

(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.

(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.

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 the other 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.

(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) (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.

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 ($\frac{1}{2}$) 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.

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(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-152	E-168
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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TYPICAL EXAMPLES OF FIRE RESISTIVE STRUCTURAL COMPONENTS, TABLE 2

TYPE OF CONSTRUCTION	ROW NO.	STRUCTURAL COMPONENTS	SKETCHES	INSULATING MATERIAL	DESCRIP-TION	MINIMUM REQUIREMENTS												
						4 HR.			3 HR.			2 HR.			1 HR.			
						I	II	III	I	II	III	I	II	III	I	II	III	
COMPONENTS WITHOUT APPLIED PROTECTION	CONCRETE CAST IN PLACE AND PRECAST	1. COLUMNS		CONCRETE TYPE I II & III ⓐ ⓑ	REINF. COVER MIN. DIM. & AREA-SQ. IN.	2	2	2	2	2	2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	
		2. GIRDERS AND BEAMS		CONCRETE TYPE I II & III ⓐ ⓑ ⓓ	REINF. COVER WIDTH (w)	2	2	2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1	1	1	
		3. JOISTS & WAFFLES WITHOUT FILLERS OR PARTIAL FILLERS OF TYPE I OR II MASONRY OR CLAY TILE		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ ⓑ ⓓ ⓔ ⓖ ⓗ ⓙ	REINF. COVER WIDTH WEB (w) TH. TOP SLAB (t)	1	1	1	1	1	1	3/4	3/4	3/4	3/4	3/4	3/4	
		4. SLABS OR JOISTS & WAFFLES WITH TYPE I OR II MASONRY OR CLAY TILE FILLER		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ ⓑ ⓓ ⓔ ⓖ ⓗ ⓙ	REINF. COVER TOP SLAB (t)	1	1	1	1	1	1	3/4	3/4	3/4	3/4	3/4	3/4	
		5. WALLS AND PARTITIONS BR'G. & NON-BR'G.		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ	REINF. COVER THICKNESS (t)	1	1	1	1	1	1	3/4	3/4	3/4	3/4	3/4	3/4	
	CONCRETE PRECAST CAST IN PLACE POST-TENSIONED OR PRETENSIONED SIMPLE SPAN	6. GIRDERS AND BEAMS		CONCRETE TYPE I II & III ⓐ ⓑ ⓓ	AVE. COVER (w)	I & II 3 1/2	III 3	I & II 3 3/4	III 3	I & II 2 1/2	III 2 3/4	I & II 2 1/2	III 2 3/4	I & II 1 3/4	III 1 3/4			
		7. JOISTS AND WAFFLES		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ ⓑ ⓓ ⓔ ⓖ ⓗ ⓙ	AVE. COVER AVE. WEB TH. (w) SLAB TH. (t)	3 1/2	3	11	10	3	2 3/4	9 1/2	8	2 1/2	2	1 3/4	1 3/4	
		8. SINGLE TEE		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ ⓑ ⓓ ⓔ ⓖ ⓗ ⓙ	AVE. COVER AVE. WED TH. (w) TOP THICK'S (t)	2 3/4	2 3/4	8	8	1 3/4	1 3/4	6 1/2	4 3/4	1 3/4	1 3/4	1 3/4	1 3/4	
		9. MULTI-TEE UNITS		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ ⓑ ⓓ ⓔ ⓖ ⓗ ⓙ	AVE. COVER AVE. WEB TH. (w) TOP THICK'S (t)	BY TEST OR LISTING BY APPROVED TESTING LAB.	2	4	4	4	1 3/4	1 3/4	4 3/4	3 3/4	1 3/4	1 3/4	1 3/4	1 3/4
		10. SOLID & CORED SLABS		CONCRETE TYPE I II & III ⓐ ⓑ ⓐ ⓑ ⓓ ⓔ ⓖ ⓗ ⓙ	t ₁ OR t ₂ AVE. COVER	6 3/4	7	5 1/2	5 1/2	6	4	2	1 3/4	4 3/4	5 3/4	3 1/4	1	
	MASONRY BEARING AND NON BEARING	11. UNREINFORCED CONCRETE WALLS & PARTITIONS		CONCRETE TYPE I II & III ⓐ ⓓ	WALL TH. (t)	6	6 1/2	5	5	5 1/2	4 1/2	4	4 1/2	4	3	3	3	
		12. HOLLOW MASONRY WALLS & PARTITIONS...BLOCK TILE CORED BRICKS CAVITY WALLS		MASONRY TYPE I MASONRY TYPE II ⓕ ⓖ ⓓ	EQUIV. THICK'S. EQUIV. THICK'S.	6.7	5.7	4.5	3.0	2.6								
		13. SOLID MASONRY BRICK BLOCK...CLAY TILE WITH LESS THAN 25% VOIDS OR WITH THE CORES FILLED		MASONRY TYPE I & II CLAY, SHALE, CONCRETE, SAND OR LIME ⓓ	WALL TH. (t)	8"	8"	8"	4"									
	COMPONENTS WITH DIRECT APPLIED PROTECTION	STEEL	14. COLUMNS		CONCRETE TYPE I II & III ⓐ ⓑ	THICKNESS OF (t) PROTECTION	2	2 1/2	3 3/4	1 1/2	2	2 1/4	1	1 1/2	2 1/4	1	1	1 1/4
			15. GIRDERS...BEAMS...TRUSSES		CONCRETE TYPE I II & III ⓐ ⓑ	THICKNESS OF (t) PROTECTION	2	2 1/2	3 3/4	1 1/2	2	2 1/4	1	1 1/2	2 1/4	1	1	1 1/4
		COLUMNS...BEAMS...GIRDERS... TRUSSES...JOISTS & STEEL FLOOR UNITS		SPRAYED FIBER...CEMENTITIOUS MIXTURE... INTUMESCENT	BY TESTS...OR LISTING BY													

TYPICAL EXAMPLES OF FIRE RESISTIVE STRUCTURAL COMPONENTS, TABLE 2 (CON'T.)

TYPE OF CONSTRUCTION	R _{OW} NO.	STRUCTURAL COMPONENTS	SKETCHES	INSULATING MATERIAL	DESCRIPTION	MINIMUM REQUIREMENTS				
						4 HR.	3 HR.	2 HR.	1 HR.	
COMPONENTS WITH SUSPENDED OR ATTACHED PROTECTION	CONC.	CONCRETE JOISTS OR WAFFLE		ⓐ ⓑ Ⓓ CONCRETE TYPE I, II OR III 3/4" COVER	1/2" THICK OF SLAB	3"	2"			
				VERMICULITE... GYPSUM... OR PERLITE GYPSUM ON METAL LATH	1/2" THICK OF INSULATION	1"	3/4"			
	STEEL FRAMING	18.	STEEL COLUMNS		TYPE I & II MASONRY ⓑ 1 1/2" AIR SPACE ⓑ	THICK OF INSULATION	4" SOLID			
		19.	STEEL GIRDERS... BEAMS... TRUSSES... JOISTS, COLUMNS INDIVIDUALLY PROTECTED		SPRAYED FIBRE... CEMENTITIOUS MIXTURE... LATH & PLASTER		BY TESTS... OR APPROVED TESTING LAB.	LISTING	BY	
		20.	STEEL BEAMS, GIRDERS, TRUSSES & JOISTS... W/CEILING PROTECTION & MINIMUM 2 1/2" TH. TYPE I, II OR III CONCRETE SLAB ⓐ ⓑ Ⓓ		SPRAYED FIBRE... CEMENTITIOUS MIXTURE... LATH & PLASTER ACOUSTICAL TILE		BY TESTS... OR APPROVED TESTING LAB.	LISTING	BY	
		21.	STEEL STUD PARTITION NON BEARING		GYPSUM... PERLITE PLASTER ON PERFORATED GYP. LATH... 2 1/2" STUD GYPSUM WALL BOARD... 3 5/8" STUD	1/2" PLASTER 1/2" LATH NO. LAYERS THICK, EACH		3/4" / 3/8"	1/2" / 3/8"	
	COMBUSTIBLE CONSTRUCTION	22.	WOOD JOISTS MIN. 2" X 10", WOOD FLOOR ATTACHED CEILING		GYPSUM WALL BOARD... 2-2" X 10" S-4'-0" 1/8" PLYWOOD FLOORING GYP. WALL BOARD... 2" X 10" S 16" 1/2" PLYWOOD OR 1" X 6" T. & G. SUB-FLRG	1/2" INSUL. 1/2" INSUL. 1/2" FLOORING				5/8" 5/8" 5/8" PLYWOOD OR 1" X 3" T. & G.
		23.	WOOD JOISTS MIN. 2" X 10", WOOD FLOOR SUSPENDED CEILING		NON COMBUSTIBLE 2" X 10" 16" 1/2" ACOUSTICAL TILE W/ 5/8" PLYWOOD OR 1" X 4" T. & G. SUB FLOORING	1/2" INSUL. 1/2" FLOORING				5/8" 1/2" PLYWD OR 1" X 6" T. & G.
		24.	WOOD STUD PARTITION MIN. 2" X 4" STUD		GYPSUM WALLBOARD GYPSUM PERLITE PLASTER ON 3/8" GYPSUM LATH GYPSUM & SAND PLASTER ON U.L. LISTED WIRE LATH GYPSUM & VERMICULITE PLASTER ON METAL LATH	NO. LAYERS / TH. OF EACH 1/2" 1/2" 1/2"				TWO 5/8" 1/2" PLASTER W/ 1/2" HEX. MESH 9/16" 3/4" 3/4"
	ⓐ HEAVY TIMBER CONSTRUCTION TABLE									
HEAVY TIMBER SOLID OR LAMINATED	25.	COLUMNS		WOOD ALL SPECIES	FLOOR... WIDTH X DEPTH MIN. NOM. ROOF... WIDTH X DEPTH MIN. NOM.				8" X 8" 6" X 8"	
	26.	GIRDERS & BEAMS		WOOD ALL SPECIES	MIN. WIDTH X DEPTH (NOM.)				6" X 10"	
	27.	ARCH & TRUSS FOR ROOF ONLY		WOOD ALL SPECIES	MIN. WIDTH X DEPTH EACH MEMBER				4" X 6"	
	28.	FLOOR & ROOF DECK		WOOD ALL SPECIES	ROOF FLOOR				2" T & G. OR 3" SOLID 3" T & G. + 1" T & G. OR 4" SOLID	

(a) Types of concrete.

1. Type I—normal weight concrete with limestone, calcareous gravel and air-cooled slag aggregate.

2. Type II—normal weight concrete with siliceous gravel, granite or quartz aggregate containing more than 40% quartz, chert or flint. Values given for type I apply except where values are tabulated for type II.

3. Type III—lightweight aggregate with expanded slag, shale or clay aggregate. Includes sanded—lightweight concretes not over 115 lbs. per cu. ft. oven-dried density.

(b) Cover on reinforcing steel is for sides and bottoms. Where tensile reinforcing elements have different cover, the tabulated cover is the average of the minimum values of the individual elements. The cover of an individual element shall not be less than $\frac{1}{2}$ the tabulated value. Top cover to be a minimum of $\frac{3}{4}$ inch.

(c) For the heat transmission requirements of floor and roof construction, the thickness of the top slab may be reduced if non-combustible insulation is directly applied to either side of the slab and provided the U-factor is equaled or reduced.

(d) The thickness of top slab is in accordance with ASTM E-119 heat transmission requirements. For variations in thickness of top slab see section Ind 51.042 (5).

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

(e) Longitudinal joints between individual precast floor or roof units, or individual wall units shall be installed as tested or shall be grouted solid for the thickness required by the fire-resistive rating. Noncombustible insulation may be substituted for the grout if the U-factor is equaled or reduced providing the integrity of insulation remains as installed. The topping used in floor or roof units may be included.

(f) Type I Hollow Masonry is a masonry with calcareous or siliceous aggregate having an oven-dried density exceeding 115 pounds per cubic foot. Type II Hollow Masonry is a masonry with expanded slag, clay, shale or pumice aggregate having an oven-dried density of 115 pounds or less per cubic foot.

(g) Equivalent thickness = $\frac{\text{Total volume minus volume of voids}}{\text{length times height}}$

(h) t_a -equivalent thickness = $\frac{\text{Total conc. area minus area of void}}{\text{width}}$

(i) Clay, shale, concrete or sand lime—with less than 25% voids or with all spaces filled.

(j) $1\frac{1}{2}$ inch space between column and masonry unit—no fill required.

(k) For restrained conditions, thickness of fire protection may be reduced if substantiated by test data or calculation method.

(l) Elements with this minimum size are recognized for heavy timber construction, acceptable for certain buildings in lieu of one hour noncombustible construction.

(m) Where combustible members are framed into a wall, the wall shall be of such thickness or be so constructed that the fire

* See Appendix A for further explanatory material.

barrier between the member and the opposite face of the wall, or between adjacent members set in from opposite sides will be 93% of the equivalent thickness shown in table 2.

(n) Cover thickness on reinforcing steel as indicated is based on continuity of system. For simple span conditions increase cover thickness by 50%.

(p) Wire mesh reinforced and with a minimum area of 0.015 inches square per foot of length or equivalent.

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; am. (1) (f), Register, March, 1972, No. 195, eff. 4-1-72.

Ind 51.046 Calculation method. (1) The rational design of structural members for fire resistance shall be submitted to the department and shall be based on the type of span (simple or restrained), the magnitude of longitudinal restraint, accepted structural engineering principals and methods.

(a) Appropriate research data and design criteria to substantiate the method, interpreting between known information, shall accompany the above material and shall include:

1. Time—temperature relationship ASTM E-119.
2. The temperature—strength characteristics of the structural components.
3. The time—temperature characteristics of the insulating material, at temperature range designated by ASTM E-119.
4. The expansion characteristics of the materials comprising the member, at the temperature range designated by ASTM E-119.

NOTE: 1. For ASTM E-119 standard adopted see Ind 51.25 (90).

2. The department will accept published research data from Portland Cement Association, American Iron & Steel Institute, and American Institute of Steel Construction, Inc.

5. The safety factor of not less than 1.0 shall be maintained at the end of the time requirement for the full design live and dead load.

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 51.047 Openings in fire rated construction. (1) Openings in fire-rated construction, where permitted by other sections of the code, shall satisfy the following appropriate requirements unless otherwise exempted.

(a) *Fire door assemblies.* 1. Openings. a. All openings in 3- and 4-hour fire-resistive walls shall be protected with not less than 3-hour rated doors.

b. All openings in 2-hour fire-resistive walls shall be protected with not less than 1½-hour rated doors.

c. All openings in one-hour fire-resistive walls, including openings to exterior fire escapes, shall be protected with not less than ¾-hour rated doors.

d. All openings in ¾-hour fire-resistive walls shall be protected with not less than ¾-hour rated doors.

Note: Door assemblies with glued solid wood core flush doors, 1¾-inches thick, quality certified as meeting National Woodwork Manufacturers Association industry standard IS-1-69, and in addition possessing no core voids, may be used with one-hour fire-resistive walls where the occupancy chapters of this code permit.

* See Appendix A for further explanatory material.

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2. The door assemblies shall be installed with frame, hinges, latches, closing devices and counterweights in accordance with methods and standards approved by the department.

3. Methods of securing door frame to adjacent construction shall be illustrated on the plans submitted to the department for approval.

NOTE: The department will accept recommended practices for installation covered in "Standard for Fire Door and Windows" N.F.P.A. No. 80.

4. The maximum swinging door clearances to frame shall be $\frac{1}{8}$ inch on sides and top and $\frac{3}{4}$ inch at bottom between sill or floor.

5. All labeled fire doors where required shall be equipped with an approved closing device.

a. Doors with self-closing device shall remain in a closed position except when in use.

NOTE: The intent was to accept normal usage of door but not permit doors with this device to be blocked open at any time.

b. Where a pilot weight is used, it shall be suspended from a chain or wire cable and shall be installed in a protective housing.

NOTE: For type of closing device permitted please refer to chapters for classes of construction and/or occupancy.

6. Adequate clearance shall be maintained to permit free operation of fire doors.

Note: 1. See section Ind 51.15 for exit door requirements.

2. Transoms, vision panels and/or louvers may be incorporated if tested in accordance with ASTM E-152 standard method.

(b) *Fire window assemblies.** 1. Openings. Where openings are permitted in fire rated walls protected with fire window assemblies they shall be time rated as $\frac{3}{4}$ hour by an approved laboratory and tested in accordance with ASTM E-163 standard method.

NOTE: For ASTM E-163 standard adopted see section Ind 51.25 (93).

2. *Size.* The fire window assembly size shall not exceed size tested. Windows combined in multiple assemblies shall be separated by approved nonbearing metal mullions.

3. *Wired Glass.* Labeled wired glass $\frac{1}{4}$ inch thick shall be installed in a fire window assembly.

***NOTE:** Fire windows have been classified for either moderate or light fire exposure. For moderate fire exposure the individual glass size is limited to 720 sq. inches. (Size limitation either 48 inch max. width or 54 inch max. height.) For light fire exposure the individual glass size is limited to 1,296 sq. inches. (Size limitation either 54 inch max. width or 54 inch max. height.) Please refer to chapters for classes of construction and/or occupancy for fire window classifications.

4. *Installation.** a. Frames shall be securely fastened to the construction and be capable of resisting all wind stresses and other stresses to which they are likely to be subjected.

b. The wired glass shall be well bedded in approved glazing compound and all exposed joints between the metal shall be struck and pointed. The clearance between the edges of the glass and metal framing shall not exceed $\frac{1}{8}$ inch.

***NOTE:** The department will accept recommended practices for installation covered in "Standard for Fire Doors and Windows" N.F.P.A. No. 80.

(c) *Glass block.* 1. *Openings.* Where openings are permitted in fire rated walls protected with glass block they shall be time rated as $\frac{3}{4}$ hour by an approved laboratory and tested in accordance with ASTM E-163 standard method.

NOTE: For ASTM E-163 standard adopted see section Ind 51.25 (93).

* See Appendix A for further explanatory material.

2. *Size of opening.* Glass blocks are suitable for openings not exceeding 120 square feet in area, with neither the width nor height exceeding 12 feet.

3. *Installation.*

NOTE: The department will accept recommended practices for installation covered in "Standard for Fire Doors and Windows" N.F.P.A. No. 80.

(d) *Labels.* 1. The label shall identify the time rating for fire door assemblies and class of fire window assemblies and glass block.

2. The label shall identify the testing laboratory, listing agency and manufacturer.

3. The label shall be securely attached and located to permit visual inspection after installation.

(e) *Miscellaneous openings.* 1. Openings around ducts, pipes, conduit or other service installations penetrating required fire-resistive rated floor, wall and roof assemblies shall be filled solidly with material of fire-resistive rating equal to the required rating of assembly penetrated.

2. Duct openings in required fire-resistive rated floor and wall assemblies shall be protected as specified under section Ind 59.69 (13).

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; am. (1) (intro.), r. and recr. (1) (a) 1., Register, September, 1973, No. 213, eff. 10-1-73.

Ind 51.048 Roof coverings. (1) Roof coverings of class A, B, C or unclassified shall be provided as specified under "Classes of Construction" or under the specific occupancy requirements.

NOTE: Brick, concrete, tile, slate, ferrous and cupreous metals and their alloys will be accepted as "Class A" roof coverings.

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 51.05 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.

Ind 51.06 History: 1-2-56; r. Register, February, 1971, No. 182, eff. 7-1-71; cr. Register, July, 1971, No. 187, eff. 8-1-71, expiring 1-1-72.

Ind 51.07 History: 1-2-56; r. Register, February, 1971, No. 182, eff. 7-1-71; cr. Register, July, 1971, No. 187, eff. 8-1-71, expiring 1-1-72.

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 classed as "Absolute", "Special" and "Ordinary" and shall apply to both horizontal and vertical separations.

(a) An absolute occupancy separation shall have no openings therein and shall have walls and floors of not less than 4-hour fire-resistive construction as specified in section Ind 51.04.

(b) A special occupancy separation shall have walls and floors of not less than 3-hour fire-resistive construction as specified in section Ind 51.04. All openings in walls forming such separation shall be protected on each side thereof by self-closing fire-resistive

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doors as specified in section Ind 51.047, and such doors shall be kept normally closed. 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.

1. All openings in floors forming this type of separation shall be protected by vertical enclosures extending above and below such openings. The walls of such vertical enclosures shall be of not less than 2-hour fire-resistive construction as specified in section Ind 51.04 and all openings therein shall be protected on one side thereof by self-closing 1-hour fire-resistive doors as specified in section Ind 51.047 and such doors shall be kept normally closed.

(c) An ordinary occupancy separation shall have walls and floors of not less than 1-hour fire-resistive construction as specified in section Ind 51.04. All openings in such separations shall be protected by self-closing fire-resistive doors as specified in section Ind 51.047 and such doors shall be kept normally closed.

History: 1-2-56; r. and recr. (2) (c), Register, October, 1967, No. 142, eff. 1-1-67; 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.

Ind 51.09 History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59; am. Register, December, 1962, No. 84, eff. 1-1-63; am. (2) Register, December, 1967, No. 144, eff. 1-1-68; r. Register, February, 1971, No. 182, eff. 7-1-71; cr. eff. 8-1-71 and expiring 1-1-72, Register, July, 1971, No. 187.

Ind 51.10 History: 1-2-56; r. Register, February, 1971, No. 182, eff. 7-1-71; cr. eff. 8-1-71 and expiring 1-1-72, Register, July, 1971, No. 187.

Ind 51.11 History: 1-2-56; r. Register, February, 1971, No. 182, eff. 7-1-71; cr. eff. 8-1-71 and expiring 1-1-72, Register, July, 1971, No. 187.

Ind 51.12 History: 1-2-56; r. Register, June, 1972, No. 198, eff. 1-1-73.

Ind 51.13 History: 1-2-56; r. and recr. Register, February, 1971, No. 182, eff. 3-1-71; r. Register, June, 1972, No. 198, eff. 1-1-73.

Ind 51.14 History: 1-2-56; r. Register, June, 1972, No. 198, eff. 1-1-73.

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 Wis. Adm. Code sections 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 (except as below). 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, and no sliding door except where it opens onto a stairway enclosure or serves as a horizontal exit, shall be considered as a standard exit door.

(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.

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- (a) The use of a key for opening door from the inside is prohibited.
- (b) The door shall not be barred, bolted or chained at any time.
- (4) A standard exit doorway shall not be less than 6 feet 4 inches high by 3 feet 4 inches wide, except where especially provided under occupancy classifications and in Wis. Adm. Code section 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.
- (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) Doors, windows or other openings which are not exits but which give the appearance of exits shall be effectively guarded.
- (a) *Glass doors.* All glass doors shall be provided with a push bar or plate inside and outside. The push bar or plate shall be within 32 inches to 44 inches above the floor.
- (b) *Glass walls panels.* Glass wall panels having a curb or sill less than 24 inches in height shall be protected by a horizontal bar or rail at least 1½ inches wide and located within 3 feet 6 inches to 4 feet 6 inches above the floor. The bar or rail assembly shall be capable of withstanding a lateral force of 100 pounds applied at any point.
- (7) Safeguards for physically handicapped persons:
- (a) Any place of employment or public building, the initial construction of which is commenced after July 1, 1970, shall be so designed and constructed as to provide reasonable means of ingress and egress by the physically handicapped with the exception of:
1. Apartment houses with less than 20 living units, row houses and rooming houses;
 2. Convents and monasteries;
 3. Jails or other places of detention;
 4. Garages, hangars and boathouses;
 5. All buildings classified as hazardous occupancies;
 6. Warehouses, and
 7. State buildings specifically built for field service purposes such as but not limited to conservation fire towers, fish hatcheries, tree nursery buildings.
 8. University residence halls at universities which have at least three residence halls for men and three residence halls for women so constructed as to allow physically handicapped persons reasonable means of ingress and egress to such buildings.
- (b) The requirements of section Ind 51.15 (7) (a) may be accomplished by at least one ground or street level entrance and exit without steps.
- The entrance and exit shall be by:
1. Ramps with slopes not more than one foot of rise in 12 feet coated with a nonskid surface, or
 2. By elevator or such other arrangements as may be reasonably appropriate under the circumstances and which meets with the ap-

* See Appendix A for further explanatory material.

proval of the department of industry, labor and human relations or in lieu thereof with the approval of the municipality wherein the building is located.

3. Doors having a clear opening of at least 40 inches in width and shall otherwise conform to the department of industry, labor and human relations building code.

(c) If any ground or street level entrance or exit is not so designed or constructed a sign shall be placed at such entrance or exit indicating the location of the entrance or exit available for wheel chair service.

(d) Where requirements of section Ind 51.15 (7) (a) apply, there shall be reasonable means of access from a parking lot, if any, ancillary to such buildings and reasonable means of ingress and egress to at least one floor on which the primary business of such building is located.

(e) The ramp shall be at least 4 feet in width of which not more than 4 inches on each side may be occupied by a handrail.

(f) All ramps shall have a handrail on each side.

1. Handrail shall be not less than 2 feet 6 inches in height with an intermediate rail at mid height.

(g) The floor on the inside and outside of each ramp doorway shall be level for a distance of 6 feet from the door.

(h) Every ramp shall have at least 6 feet of level clearance at the bottom.

(i) All ramps shall have a level platform at 30 feet intervals and shall have a level platform at least 6 feet in length wherever they turn.

(j) The requirements of section Ind 51.15 (7) (a) through (i) shall apply to buildings presently exempt or existing should there be a change in occupancy of such building to that of a place of employment or public building not otherwise exempt after July 1, 1970.

Note: See section Ind 52.59 for further requirements.

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. (7) (J), Register, May, 1968, No. 149, eff. 6-1-68; r. and recr. (7), Register, 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.

Ind 51.16 Stairways and elevated platforms. (1) DEFINITION. By a stairway is meant one or more flights of steps and the necessary platforms connecting them to form a continuous passage from one level to another within a building or structure, except as provided in subsection (3) (b).

(2) **WIDTH.** Every required exit stairway, whether enclosed or not, shall be not less than 3 feet 8 inches wide of which not more than 4 inches on each side may be occupied by a handrail. Every platform shall be at least as wide as the stairway, measuring at right angles to the direction of travel. Every straight run platform shall measure at least 3 feet in the direction of travel. Wherever a door opens onto a stairway, a platform shall be provided extending at least the full width of the door in the direction of travel. *Exception:*

(a) In apartment buildings not more than 2 stories in height and

* See Appendix A for further explanatory material.

having not more than 2 living units on a floor, and in rooming houses, hospitals, hotels and similar buildings not more than 2 stories in height and having not more than 6 habitable rooms on a floor, such stairways shall not be less than 3 feet wide.

(b) If other stairways are provided in addition to those required by this code, such additional stairways need not conform to the width requirements of this code.

(3) **HANDRAILS.** All stairways and steps of more than 3 risers shall have at least one handrail. Stairways and steps 5 feet or more in width, or open on both sides, shall have a handrail on each side. Stairways and steps which are less than 5 feet in width shall have a handrail on the left hand side as one mounts the stairs and on the open side, if any.

(a) Stairways which are more than 8 feet wide shall be divided by center rails into widths not more than 8 feet nor less than 3 feet 8 inches. Rails shall be not less than 2 feet 6 inches above the nose of the treads or 3 feet 6 inches above the platform except as specified in Wis. Adm. Code section Ind 51.20. Railings on the open sides of stairways and platforms shall be provided with an intermediate member at midheight or with vertical members having a maximum spacing of 11 inches, or its equivalent in safety.

(b) Stairways on the outside of buildings and an integral part thereof, having more than 3 risers, shall have a handrail at each side, and if the stairway is more than 50 feet wide, one or more intermediate handrails shall be provided.

(c) Where an exit door leads to an outside stairway, platform or sidewalk, the level of the platform or sidewalk shall not be more than 7¼ inches below the door sill except as provided in section Ind 51.20 (4) (g).

(4) **RISERS AND TREADS.** All stairways and steps required as exits by this code shall have a uniform rise of not more than 7¼ inches and a uniform tread of not less than 9½ inches, measuring from tread to tread, and from riser to riser. No winders shall be used. There shall not be more than 18, nor less than 3 risers between platforms or between floor and platform and not more than 22 risers from floor to floor with no platform.

(a) Stairways and steps not required as exits by this code shall have a uniform rise of not more than 8 inches and a uniform tread of not less than 9 inches. If winders are used, the tread shall be at least 7 inches wide at a point one foot from the narrow end.

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

(5) **ELEVATED PLATFORMS.** Elevated platforms, walks and runways not otherwise mentioned, which are an integral part of a building or structure, shall have railings as required by this section.

(a) For stairways to elevated platforms, walks and runways in places of employment see Wis. Adm. Code, chapter 1, Safety.

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. 45, 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.

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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 non-combustible material throughout. The enclosing walls shall be of not less than 4-hour fire-resistive construction, and the floors and ceilings of not less than 2-hour fire-resistive construction as specified in section Ind 51.04.

(2) The doors leading from the buildings to the balconies and from the balconies to the stairways shall be fire-resistive doors, and all openings within 10 feet of any building shall be protected with fire-resistive windows for moderate fire exposure, or fire-resistive doors as specified in section Ind 51.047.

(3) Each balcony shall be open on at least one side, with a railing not less than 3'6" high on all open sides.

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

Ind 51.18 Interior enclosed stairway. (1) An interior enclosed stairway shall be completely enclosed as specified in table 51.03-A, and all doors opening into such enclosure shall be as specified in section Ind 51.047.

(2) The enclosure shall include at each floor level a portion of such floor which will be at least as wide as the stairway; and such enclosure shall also include the passageway of the first floor level (if any) leading from the stairway to an outside door, so as to afford uninterrupted passage from the uppermost floor to such outside door without leaving the enclosure.

(3) If windows are placed in any such enclosure they shall be fixed fire-resistive windows as specified in section Ind 51.047 except in outside walls.

History: 1-2-56; am. (1) and (3), Register, February, 1971, No. 182, eff. 7-1-71; r. and recr. (1) and (3), eff. 8-1-71 and exp. 1-1-72, and cr. (1) and (3), eff. 1-1-72, Register, July, 1971, No. 187; r. and recr. (1), Register, June, 1972, No. 198, eff. 1-1-73

Ind 51.19 Horizontal exit. (1) A horizontal exit shall consist of one or more openings through or around an exterior wall or occupancy separation, or of one or more bridges or balconies connecting 2 buildings or parts of buildings entirely separated by occupancy separations as described in section Ind 51.08.

(2) Openings used in connection with horizontal exits shall be protected by fire-resistive doors as specified in section Ind 51.047. If swinging doors are installed in pairs, they shall be arranged to swing in opposite directions; with direction of travel indicated by signs, except that where the travel is in one direction only, both doors shall swing in that direction. Such doors shall be kept continuously unlocked whenever the building is occupied and be normally closed or be self-closing and equipped with fusible links.

(3) Floors in horizontal exits shall have a slope of not more than one foot in 6.

* See Appendix A for further explanatory material.

(4) All doors and windows within 10 feet of any balcony or bridge shall be fire-resistive windows for moderate fire exposure or fire-resistive doors as specified in section Ind 51.047, except that if such windows or doors are in the same plane, this requirement shall apply only to those within 5 feet of the balcony or bridge.

(5) The floor on each side of a horizontal exit and all passageways leading thereto shall be kept clear and unobstructed at all times.

History: 1-2-56; am. (2) and (4), Register, February, 1971, No. 182, eff. 7-1-71; r. and recr. (2) and (4) eff. 8-1-71 and exp. 1-1-72, and cr. (2) and (4) eff. 1-1-72, Register, July, 1971, No. 187; am. (4) Register, June, 1972, No. 198, eff. 7-1-72

Ind 51.20 Fire escapes. (1) **LOCATION.** Every fire escape shall be so located as to lead directly to a street, alley, or open court connected with a street.

(a) Every fire escape shall be placed against a blank wall if possible. If such a location is not possible then every wall opening which is less than 6 feet distant horizontally from any tread or platform of the fire escape shall be protected by a fire-resistive window for moderate fire exposure or by a fire-resistive door as specified in section Ind 51.047.

(2) **EXITS TO FIRE ESCAPES.** Every fire escape shall be accessible from a public passageway or shall be directly accessible from each occupied room. Exits to fire escapes shall be standard exit doors as specified in section Ind 51.15, except that doors to "A" fire escapes may be not less than 2 feet 6 inches wide.

(3) **DESIGN AND FABRICATION.** Each part of every fire escape (except counterweights for balanced stairways) shall be designed and constructed to carry a live load of 100 pounds per square foot of horizontal area over the entire fire escape. Each part of every fire escape shall be designed and constructed in accordance with the requirements of section Ind 53.16, except that the unit stresses therein specified shall be reduced by one-fourth. The minimum sections and sizes specified below shall be increased whenever necessary so that under full load the allowable unit stresses will not be exceeded.

(a) No other material than wrought iron, soft steel or medium steel shall be used for any part of a fire escape, except for weights, separators and ornaments. No bar material less than $\frac{1}{4}$ inch thick shall be used in the construction of any fire escape, except for separators, ornaments, structural shapes over 3 inches and rigidly built up treads and platforms of approved design. In the fabrication of a fire escape, all connections or joints shall be made by riveting, bolting or welding in an approved manner. All bolts or rivets, except for ornamental work, shall be not less than $\frac{3}{8}$ inch in diameter.

(4) **PLATFORMS.** Each platform on an "A" fire escape shall be at least 28 inches wide; each platform on a "B" fire escape shall be at least 3 feet 4 inches wide. Such widths shall be the clear distance between stringers, measuring at the narrowest point. Each platform shall extend at least 4 inches beyond the jambs of exit opening. The above minimum widths and lengths shall be increased, wherever necessary, so that no exit door or window will, when open, block any part of the required width of the fire escape. Every platform shall consist of either,

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(a) Flat bars on edge, not less than 1 x ¼ inch, but not less than 1¼ x ¼ inch where bolts and separators are used except that platforms and treads constructed of flat bars on edge may be made of material ⅜ inch in thickness provided the material is galvanized after fabrication. Bars shall not be spaced more than 1¼ inches, center to center.

(b) ½ inch or ⅝ inch square bars with sharp edge up, not more than 1½ inches, center to center.

(c) ⅝ inch round bars, not more than 1½ inches, center to center.

(d) Platform and treads may be solid if covered by a roof.

(e) The platform frame shall consist of not less than 2 x ⅝ inch flat bars on edge or equivalent, provided the brackets are not more than 4 feet apart. If brackets are more than 4 feet apart, the frame shall be correspondingly stronger and stiffer. Every platform wider than 30 inches, if made of square or round bars, shall have a third frame bar through the center; if made of flat bars, the platform shall have separators and bolts through the center. Frame bars shall not project more than ¼ inch above platform bars, except around the outside of platform.

(f) There shall be a platform at each story above the first, and intermediate platforms if floors are more than 18 feet apart vertically.

(g) Platforms shall not be more than 8 inches below the door sill.

(5) BRACKETS. Brackets for a 28 inch or 30 inch platform, when spaced not more than 4 feet apart, shall be made of not less than ⅝ inch square bars or 1½ x 1½ x ¼ inch angles; such bars or angles shall be larger if the platform is wider or if the brackets are farther apart. Each bracket shall be fastened at the top to the wall by a through bolt (at least ⅝ inch diameter), nut, and washer (at least 4 inch diameter). The slope of the lower bracket bar shall be not less than 30 degrees with the horizontal. The lower bar shall have a washer or shoulder to give sufficient bearing against the wall.

(a) The strength of the wall to which brackets are to be attached shall be carefully considered in determining the spacing, shape and inside connection of brackets, so that under full load the wall will not be unduly strained. Where it is necessary to install brackets adjacent to wall openings they shall be located at a suitable distance therefrom, or the wall shall be properly reinforced.

(6) STAIRWAYS. (a) Each stairway of an "A" fire escape shall be at least 24 inches wide between stringers; such stairway shall have a uniform rise of not more than 8 inches and a uniform run of not less than 8 inches.

(b) Each stairway of a "B" fire escape shall be at least 3 feet 4 inches wide between stringers; such stairway shall have a uniform rise of not more than 8 inches, and a uniform run of not less than 9 inches.

1. The rise is the vertical distance from the extreme edge of any step to the corresponding extreme edge of the next step. The run is the horizontal distance between the same points.

(c) Stairway stringers shall consist of either:

1. A 5 inch channel or larger.

* See Appendix A for further explanatory material.

2. Two angles 2 x 2 x $\frac{1}{4}$ inch or larger.
3. Two flat bars 2 x $\frac{3}{8}$ inch or larger.
4. One flat bar 6 x $\frac{1}{4}$ inch or larger.
5. If 2 angles or 2 flat bars are used, they shall be properly tied together by lattice bars, vertical as well as horizontal. If flat bars are used, every stairway of more than 10 risers shall have lateral bracing. The connection of stringers to platform, at top and bottom, shall be at least equal in strength to the stringers and shall safely carry the full live and dead loads. If stringers are carried by intermediate brackets, the stringers shall have a horizontal bearing on the brackets and shall be properly and securely connected thereto.
6. Treads shall consist of either flat or square bars, (not round), of the size and spacing specified for platforms. An "A" tread shall consist of at least 6 square bars, or 7 flat bars. A "B" tread shall consist of at least 7 square bars, or 8 flat bars. A "B" tread made of flat bars shall have separators and bolt through the center. A "B" tread made of square bars shall be trussed.
7. Treads and platforms may be solid if covered by a roof.

(7) **BALANCED STAIRWAY.** All "B" fire escapes, and all fire escapes on schools, theaters, assembly halls, hospitals, nursing homes, residential care institutions, group foster homes, and homes for the elderly either shall reach to the ground or shall have a balanced stairway reaching to the ground. "A" fire escapes which are not on schools, theaters, assembly halls, hospitals, nursing homes, residential care institutions, group foster homes and homes for the elderly may terminate in a platform at least 3 feet long, located not more than 10 feet above the ground and does not serve more than 8 persons.

(8) **RAILINGS.** A railing at least 42 inches in height and having 2 intermediate rails, uniformly spaced, measuring vertically from the floor of the platform, shall be provided on all open sides of platforms. Railings at least 36 inches in height, measuring vertically from the nose of the treads, shall be provided on the open sides of all stairways and on both sides of balanced stairways. Either a railing or a hand-rail fastened to the wall shall be provided on each side of all "B" fire escape stairways.

(a) Every railing shall have posts, not more than 5 feet apart made of not less than $1\frac{1}{2}$ x $1\frac{1}{2}$ x $\frac{1}{4}$ inch angles or tees, or $1\frac{1}{4}$ inch pipe; top rail not less than $1\frac{1}{4}$ x $1\frac{1}{4}$ x $\frac{1}{4}$ inch angle or equivalent; center rail not less than $1\frac{1}{4}$ x $\frac{1}{8}$ flat bar or equivalent. All connections shall be such as to make the railing stiff; 2 bolts ($\frac{3}{8}$ inch or larger) shall be used at the foot of each post wherever possible, or at least one $\frac{1}{2}$ inch bolt shall be used. Railing shall be continuous. No projections on the inside of the railing shall be permitted. Where a railing returns to the wall, it shall be fastened thereto with a through bolt (at least $\frac{5}{8}$ inch diameter), nut, and washer; or (in reinforced concrete) with an approved insert; or the railing shall be made equally secure with a diagonal brace extending at least 3 feet horizontally and 3 feet vertically.

(b) All outside railings which are more than 60 feet above grade shall be at least 6 feet high, measuring vertically from floor of platform or from nose of step. Such railings shall be of special design approved by the department of industry, labor and human relations,

* See Appendix A for further explanatory material.

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 1 ¼ 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 ¾ 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 2 ½ 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.

* See Appendix A for further explanatory material.

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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 134-65.
- (30) COLD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 82-66.
- (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 88-63.

(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 289-66.

(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. 132, 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.