Building Exits Code

American Tentative Standard
Approved by
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SECOND EDITION, 1929

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National Fire Protection Association
International
60 BATTERYMARCH STREET
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National Fire Protection Association

INTERNATIONAL

Executive Office: 60 Batterymarch St., Boston, Mass.

The National Fire Protection Association was organized in 1895 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes over a hundred national and regional societies and associations and more than four thousand individuals, corporations, and organizations.

This book is one of a large number of publications on fire safety issued by the Association. The standard regulations, prepared by the technical committees of the National Fire Protection Association and adopted in the conventions of the Association, are intended to prescribe reasonable measures for minimizing fire losses. All interests concerned have opportunity through the National Fire Protection Association to participate in the development of the standards and to secure impartial consideration of matters affecting them.

Membership in the National Fire Protection Association is open to any Society, Corporation, Firm or Individual interested in the protection of life or property against loss by fire. All the valuable engineering and popular literature issued by the Association is sent, as issued, to every member. The Association is the clearing house for all the authoritative information on fire protection and prevention and members are privileged to submit to it their individual problems for solution. The Association is always glad to send samples of its publications to prospective members.

Building Exits Code

1929

This, the Second Edition of the Building Exits Code, is a reprint of the original edition, 1927, with minor editorial corrections and with the following changes and additions:

Section 11. Fire Exit Drills in Schools, New Material.

21. Schools, Amendments.

25. Places of Public Assembly, New Section.

The detail of these changes and additions will be found in the Proceedings of the National Fire Protection Association, 1929, page 165.

National Fire Protection Association.

Executive Office: 60 Batterymarch St., Boston, Mass.

Building Exits Code Committee.

(N.F.P.A. Committee on Safety to Life)

Sectional Committee, American Standards Association.

Sponsor: National Fire Protection Association.

CHAIRMAN: E. S. CHAPIN, Independence Bureau, 135 South Fifth Street, Philadelphia, Pa.

SECRETARY: ROBERT S. MOULTON, National Fire Protection Association, 60 Batterymarch Street, Boston, Mass.

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*Appointed subsequent to the preparation of the 1929 Edition of the Code.

HISTORY OF THE CODE.

The Building Exits Code as printed herewith had its origin in the work of the Committee on Safety to Life of the National Fire Protection Association which was appointed in 1913. For the first few years of its existence the committee devoted its attention to a study of the notable fires involving loss of life, such as the Binghamton Clothing Factory fire, the Iroquois Theatre fire, the Collinwood School fire, the Triangle Waist Company fire, the Arcadia Lodging House fire, and other similar disasters, analyzing the causes of this loss of life. This work led to the preparation of standards for the construction of stairways, fire escapes, etc., for fire drills in various occupancies and for the construction and arrangement of exit facilities for factories, schools, etc., which form the basis of the present code. These reports were adopted by the National Fire Protection Association and published in pamphlet form as "Outside Stairs for Fire Exits" (1916) and "Safeguarding Factory Workers from Fire" (1918). A pamphlet, "Exit Drills in Factories, Schools, Department Stores and Theatres," published in 1912 following its presentation by Member R. H. Newbern at the 1911 annual meeting of the Association, although antedating the organization of the Committee is considered as having the status of a Committee publication and has been used with the other pamphlets as a groundwork for the present Code. These pamphlets were widely circulated and put into quite general use.

The committee continued its activities developing the detailed line safety requirements for additional classes of occupancy until in 1921 the National Fire Protection Association was requested by the American Standards Association to accept sponsorship for a Building Exits Code. At that time the committee was reorganized to qualify as a Sectional Committee of the A.S.A., a number of additional members being appointed for this purpose. Under new auspices the committee enlarged and extended its work, revising and perfecting the standards prepared in earlier years and extending the fundamental principles already developed to include additional occupancies. These reports in each year were printed, presented to the National Fire Protection Association and duly adopted. In the preparation of each occupancy section the groups affected were consulted. Material on the proposed codes was published in the technical and trade press and otherwise given wide publicity. The reports have been thoroughly discussed at the conventions of the National Fire Protection Association and have also been presented to the meetings of a number of cooperating organizations.

The present listed personnel of this committee is in large part the same as when the committee was originally organized, the members thus bringing to their current work the benefit of a background of long experience in the study of fire safety and exit problems. The first chairman of the committee, Mr. H. W. Forster, was responsible for initiating the work, and carried it on until the press of other duties compelled his resignation in 1923. Mr. Sidney Williams of the National Safety Council was then selected as chairman carrying the work forward to substantially the point represented by the 1927 edition. Mr. Williams was in turn compelled to resign in 1926 because of other responsibilities and the present chairman, Mr. E. S. Chapin of the Independence Bureau (formerly with the Pennsylvania Department of Labor and Industry), was appointed. The secretary of the committee, who has been serving in this capacity since 1921, is Mr. Robert S. Moulton of the National Fire Protection Association.

NATIONAL FIRE PROTECTION ASSOCIATION.

September, 1929.

BUILDING EXITS CODE.

TABLE OF CONTENTS.

NOTE: Additional sections of this Code covering other occupancies are in course of preparation and will be included in subsequent editions of this Code.

INTRODUCTION.

1. The purpose of this Code is to specify exits sufficient to empty buildings promptly in case of fire or other emergency and to provide for construction and protection such that there will be no danger to life from fire, smoke or resulting panic before buildings are emptied. The Code recognizes that life safety is more than a matter of exits; that while in some buildings adequate life safety can be secured by means of exits alone, in most cases there are various other factors which must be considered. This Code accordingly covers various matters besides exits which are essential to life safety. The Code, for example, gives minimum requirements for construction which may be used in buildings of certain occupancies and specifies height limits above which buildings of certain construction and occupancy cannot be used with safety. The protection of property values has not been considered in this Code, although many of the life safety requirements incidentally contribute towards safety for property values.

2. While many of the provisions of this Code are necessarily based largely on engineering judgment, the principles and the applications of the Code have been checked by comparing them with all available actual fire experience, as well as with existing legal requirements and recognized good architectural practice. It can be readily shown that the buildings in which the major losses of life by fire have occurred have fallen far short of the standards of this Code. At the same time it is realized that neither the height and construction limits nor the exits specified herein will ensure absolute safety. The whole matter of life safety is comparative at best, and no possible code can assure 100% safety under all conditions. The intent of these requirements is to afford reasonable life safety without imposing unreasonable limitations or hardships on designers and owners.

3. Attention is called to the fact that the several Engineering Standards (Part A) are to be applied only in accordance with the provisions of the various Occupancy Sections (Part B). It is suggested, therefore, that the reader turn first to the particular Occupancy Section in which he is interested, later referring back to Part A for details of construction of the exit facilities.

4. The present Code includes sections on only four occupancies: schools, department stores, factories, and hospitals and institutions. It is the intention eventually to add other occupancy egress sections to cover all the recognized classes of occupancy. Pending the preparation of other occupancy egress sections the principles established in Section 20, 21, 22, 23 and 24 may be used as a guide in determining exits for types of structures not now specifically covered.

Scope and Purpose.

10. SCOPE. This Code covers the construction, arrangement and use of exit facilities necessary to provide safe means of egress from structures, together with such features of construction and protection as have bearing on safety of egress.

11. The purpose and intent of this Code is to provide reasonable life safety. In cases of practical difficulty or unnecessary hardship, the enforcing authority may grant exceptions from this Code, but only when it is clearly evident that reasonable safety is thereby secured.

12. NEW AND OLD INSTALLATIONS. This Code covers both new and existing construction. In various sections of the Code specific modifi-

cations for existing structures will be found. Except where such modifications are specifically authorized the requirements of the Code apply to both new and old structures and installations.

No changes or alterations shall be made in any building or structure, whether new or existing, except in conformity with the provisions of this Code.

Except as may be otherwise specifically provided, no change of occupancy, whether necessitating physical alterations or not, shall be made in any building or structure, unless such building or structure conforms with the requirements of this Code applying to new buildings of the proposed new use.

13. REFERENCE TO OTHER CODES. This Code is supplemented by various other A.S.A. American Standard Codes in accordance with the references thereto which will be found in various portions of the text. Copies of these Codes are obtainable upon request to the American Standards Association, 29 West 39th Street, New York. These Codes are:

Code of Lighting for Factories, Mills and other places.
Code of Lighting for School Buildings.
Safety Code for Elevators.
Safety Code on Walkway Surfaces.
Safety Code on Floor and Wall Openings, Railings and Toeboards.

14. This Code makes reference to the regulations recommended by the National Fire Protection Association for various matters of fire protection, etc. These regulations, obtainable from the National Fire Protection Association, 60 Batterymarch Street, Boston, are those on:

Automatic Sprinkler Equipments.
National Electrical Code.
Nitrocellulose Motion Picture Film.
Photographic and X-Ray Nitrocellulose Film.
Protection of Openings in Walls and Partitions.
Protective Signaling Systems.
First Aid Fire Appliances.
Private Fire Brigades.
Standpipe and Hose Systems.

Definitions.

20. The word "shall" is mandatory and the word "should" is advisory.

21. The word "approved" means approved by the authority having jurisdiction.

22. The word "new" referring to buildings or exit facilities means that which is constructed or erected subsequent to the date at which this Code goes into effect. The word "existing" refers to that which is already in existence at the time when this Code goes into effect.

Definitions of Building Construction.

31. AREA OR FIRE AREA. The area of any one story included within enclosure or fire walls.

32. BASEMENT. The portion of a building below the principal story which is more than half its ceiling height below grade.

33. BUILDING CODE. The local regulations governing construction, or Federal recommendations, or the Building Code of the National Board of Fire Underwriters where no local code is in force.

34. BULKHEAD OR PENT HOUSE. A superstructure on or above a roof. When only an enclosure for stairways, elevators, or elevator machinery, tanks, ventilating or other equipment, or for janitor's quarters, it does not constitute a story in the determination of heights in this Code.

35. FIRE AREA. See Area.

36. FIRE PARTITION. A partition providing an area of refuge from fire in a building during the egress of the occupants.

37. FIRE-RESISTIVE. Materials or construction which will satisfactorily resist the effects of severe fire.

38. FRAME CONSTRUCTION. Construction in which wooden framework forms the structural support for enclosure walls, floors and roof.

39. HEIGHT OF BUILDING. The number of stories or the vertical distance from mean curb level or ground to the high point of the top of the roof beams, or to average height of the gable for roofs with a pitch of more than 20 degrees. When fronting on two or more streets of different grade, the measurement shall be taken at the mean level of the street having the greatest slope. When a building does not adjoin a street, the measurement shall be taken from the average level of the ground adjoining.

40. INCOMBUSTIBLE. Structures or materials which will not readily ignite and burn when subjected to fire.

NOTE. Treated wood is not considered incombustible.

41. MILL OR "SLOW-BURNING" CONSTRUCTION consists of substantial masonry walls and heavy timber interior construction so designed and arranged as to avoid concealed spaces and to expose the least number of corners or projections.

42. ORDINARY OR JOISTED CONSTRUCTION. Construction having enclosure walls of masonry with floors and partitions of wooden joist and stud construction.

43. PUBLIC ASSEMBLY. See Section 25 for definitions of various special terms used in this occupancy section.

PART A.

ENGINEERING STANDARDS.

Section 1.

STAIRWAYS.

101. The following requirements apply to all stairways constituting required means of egress. If there are additional stairways not conforming to these requirements they shall bear signs indicating that they are not exits.

General Requirements.

(Applying to all types of stairs.)

102. All new stairs (and platforms, landings, etc., used in connection therewith) in buildings four stories or more in height and in all new buildings of fire-resistive construction shall be of incombustible construction throughout. (Handrails are exempted from this requirement.) Stairs in new buildings of non-fire-resistive construction less than four stories in height, and existing stairs in existing buildings, may be of wooden construction provided that the under side of the stairs is protected by cement or gypsum plaster on metal lath, and all concealed spaces are fire stopped; or if under standard automatic sprinkler protection stairs may be of mill construction not varnished or painted with oil paint on the under side.

103. All stairs, platforms, landings, balconies, and stair hallways shall be of sufficient strength to sustain safely a live load of not less than 100 lbs. per square foot with a factor of safety of 4.

104. There shall be no variation in the width of treads and the height of risers in any flight. Where variation in heights of risers in different flights is necessary on account of varying story heights, such variation shall not exceed 3/16 in. All treads shall have a nosing of not less than 1 inch.

105. Where material of stair treads and landings is such as to involve danger of slipping, non-slip material shall be provided on tread surface.

NOTE. This paragraph will be amplified by reference to A.S.A. American Standard Safety Code on Walkway Surfaces, when completed and approved.

106. The space beneath any stairway built in whole or in part of combustible material shall be left entirely open or be completely enclosed without door or other opening.

NOTE: This is to prohibit closets and similar spaces under stairs. It is not to be interpreted to prohibit an enclosed flight of stairs beneath another flight.

107. No arrangement of treads known as winders shall be permitted in new stairways.

NOTE. Winders are permitted only in Class C Stairs, existing stairs in existing buildings, and are penalized by reduction in stair capacity rating.

108. Stairways and intermediate landings shall continue with no decrease in width along the direction of exit travel, except that existing

stairs with decrease in width may be accepted, subject to the provision that the narrowest point shall determine the rated width for all floors above that point (or below in the case of basements).

Arrangement and Access.

109. All new stairways, that are accessible from two or more stories, and extend to one or more of the upper four stories, shall be continued their full width to the roof. Existing stairways should extend to roof if there is safe egress from the roof to an adjacent structure.

NOTE. This rule is made to prevent persons, thinking that they can escape to the roof, finding that the stairs lead only a portion of the way to that point.

110. All stairways shall lead to the street directly or by way of a yard, court, or fire-resistive passage (§111) with width at least equal to the aggregate widths of all the exits discharging through it.

111. Where stairways discharge through fire-resistive passages (see §110) such passages shall be not less than 8 ft. in height for new buildings and 7 ft. in height for existing buildings. Where there is communication between the passage and the street floor all such openings shall be protected by standard fire doors. In the case of smokeproof towers, passages shall be unpierced.

112. All stairs which may be used for exit purposes shall be so arranged as to make clear the direction of egress to the street.

NOTE. This rule is made to prohibit the extending of stairs to the basement in such a way that persons descending from upper floors might unknowingly continue to the basement.

113. Stairs and other exits shall be so located that they are readily accessible and visible. Where not visible to all occupants, adequate signs shall be provided to indicate their location.

Doors. (See also Section 5.)

114. Doors shall not open immediately on a flight of stairs, but on a landing at least the width of the door.

115. Doors giving access to stairways shall swing with the exit of travel, but where swinging doors are not practicable, sliding doors may be permitted by the enforcing authority for Class C stairs. There shall be no obstructions to doors or on stairs or landings. Swinging doors during their swing should preferably not reduce the effective width of stairs or landings (and shall not in Class A stairs) and in no case shall any door at any point in its swing reduce the width of stair or landing to less than 36 inches, nor when open interfere with the full use of the stairs.

116. Doors from stairways to outside the building shall swing out, and be so arranged as not to restrict the effective width of the stairs.

Railings.

117. All stairs shall have walls or well secured balustrades or guards on both sides and shall have handrails on both sides. Any stairway over 66 inches in width shall be provided with one or more continuous intermediate handrails substantially supported; the number and positions of intermediate handrails to be such that there will be not more than 66 inches between adjacent handrails.

118. Handrails and railings shall be in accordance with the requirements of the A.S.A. American Standard Safety Code on Floor and Wall Openings, Railings, and Toeboards, in so far as applicable. (*To take effect when this code is completed and approved.*)

Lighting and Signs.

119. Every stairway, the corridors and passageways appurtenant thereto shall have illumination and signs in accordance with Section 12.

Class A Stairs.

120. Class A Stairs are intended for main stairs for places of public assembly or elsewhere, where large crowds must be accommodated.

121. Stairs shall be at least 44 inches wide. All such widths shall be clear of all obstructions except that handrails attached to walls may project not more than 3½ inches at each side within the required width. If newels project above tops of rails, a clear width of at least 44 inches shall be provided between the face of the newel and the face of the wall or newel opposite.

122. The rise of stairs shall be not more than 7 inches, and the tread exclusive of the nosing be not less than 10½ inches (maximum pitch 33°).

123. Stairways exceeding 10 feet in height shall have an intermediate landing at least 4 feet in length.

124. The walls at the outer corners of landings shall be curved on a radius of at least two feet or a forty-five degree splay not less than 20 in. wide shall be provided to eliminate right angle corners. The required width of landings of Class A stairs shall not be encroached upon by any door during its swing.

125. Swinging doors only shall be used in connection with Class A Stairs.

Class B Stairs.

126. Class B Stairs are intended for new construction for buildings of virtually all occupancies not covered by Class A. The Type B Classification is intended also to cover existing stairs in existing buildings where Class A Stairs would be specified for new construction.

127. Stairs shall be at least 44 inches wide. All such widths shall be clear of all obstructions except that handrails attached to walls may project not more than 3½ inches at each side within the required width. If newels project above top of rails, a clear width of at least 44 inches shall be provided between the face of the newel and the face of the wall or newel opposite.

128. The rise of stairs shall be not more than 7¾ inches, and the tread exclusive of the nosing not less than 9½ inches (maximum pitch 39°).

129. Stairways exceeding 12 feet in height shall have an intermediate landing of at least 4 feet in length.

130. Swinging doors only shall be used in connection with Class B Stairs.

Class C Stairs.

131. Class C Stairs are intended to cover existing stairs which although below the standard for new construction (Type B) are acceptable in most existing buildings.

132. Stairs shall be at least 36 inches wide clear of all obstructions other than handrails. The minimum clear width inside handrails shall be 32 inches.

133. The pitch of stairs shall not exceed 45 degrees, and the treads, exclusive of nosings, shall not be less than 8 inches wide.

Substandard Stairs.

134. In existing buildings where stairs do not comply with the foregoing requirements they may be accepted as Class C Stairs subject to the following reductions from the rated number of units of width (see §146).

(*a*) Excessive Pitch

45° to 50°, deduct 40%
50° to 55°, deduct 65%
55° to 60°, deduct 80%

(*b*) Substandard Width of Tread (Does not apply if deduction has already been made for substandard pitch).

7 in. to 8 in. (exclusive of nosing) deduct 20%
6 in. to 7 in. (exclusive of nosing) deduct 40%

(*c*) WINDERS. Where there are winders measurements of tread width and pitch shall be taken at one foot from the narrow end. These reductions apply in addition to those of (*a*) and (*b*).

One winding stair tread, deduct 25%.
Each additional stair tread, deduct 1%.
(Maximum deduction not to exceed 75%.)

(*d*) No stair having an inclination with the horizontal of more than 60° nor a tread (exclusive of nosing) of less than 6 in. shall be permitted in any case.

Stairway Enclosures.

135. All stairways, except where in special cases open stairways are specifically permitted by occupancy sections, shall be enclosed in standard fire-resistive or fire-retardant stair shafts, as specified in the following paragraphs. Enclosures shall include all landings or parts of floors between stairways which lie in the path of travel down stairways, so that once inside the enclosure persons may go from any part of the stairway to the outside exit without leaving the enclosure.

Stairway enclosures shall not be used for storage and shall not contain any material or equipment liable to cause fire or panic.

136. "Monumental" stairs (as used in public buildings, stores, etc.) leading from the street floor to the second floor (or the basement), which do not constitute required means of exit, are exempted from stairway enclosure requirements provided that they are effectively cut off at the second floor (or basement) by partitions having fire resistance at least equal to that of the required stair enclosure.

NOTE. Such partitions need not be immediately at the head (or foot) of the stairs, but when located away from the stairs the space between stairs and partition shall not be used for any purpose other than as a passageway to or from the stairs.

Type 1. Smokeproof Tower. (Enclosed stairway, exterior access.) This is recognized as the best type, and is always recommended (see §147 for special credit).

137. Stairways shall be completely enclosed by masonary walls not less than 8 inches thick or by walls of other materials and construction having equivalent fire resistance. The enclosure shall extend from the sidewalk, court, or yard level to a roof bulkhead or penthouse, (except where §109 permits stairways not extending the full height of the building) and shall be capped by fire-resistive materials not less than 4 inches thick. There shall be no openings in walls separating the enclosure from the interior of the building. Fixed or automatic fire windows are per-

mitted in an exterior wall not subject to severe fire exposure hazard from the same or nearby buildings. The stairs, landings, platforms and balconies of smokeproof towers shall be solid (unpierced) and made of incombustible materials throughout, except that hand rails may be of wood.

138. Stairways of smokeproof towers shall provide continuous uniform egress from the roof and all stories to grade, (except where §109 permits stairways not extending the full height of the building).

139. Access to the stairway shall be provided from every story through vestibules open to the outside on an exterior wall or from balconies overhanging an exterior wall, but not subject to severe fire exposure hazard. Every such vestibule, balcony or landing shall have an unobstructed length and width not less than the required width of exit doors serving same, and shall be directly open to a street or alley or yard or to an enclosed court open at the top not less than 20 feet in width and 1000 square feet in area. Balustrades on the vestibules and balconies shall be constructed of incombustible materials not less than 4 feet high and solid (small openings for drainage not prohibited). All windows or other wall openings within 10 feet of balconies shall be protected by wired glass in stationary metal sash and frames or approved fire doors or shutters.

140. Access from the building to vestibules or balconies shall be through doorways not less than 40 inches wide for new and 36 inches wide for existing towers. These openings and the entrances to the towers shall be provided with approved, self-closing fire doors swinging with the exit travel. Where locks or latches are provided, they shall be of an approved, pressure release type, extending on the latch side not more than two-thirds the width of the door. Clear wired glass not exceeding 720 square inches shall be provided in all doors giving access to the enclosure.

141. The level of the vestibule or balcony floor shall be placed approximately 7½ inches below the floor level of each story where climatic conditions involve the possibility of blocking doors by snow or ice. In mild climates in which this hazard is not presented, the floors shall be approximately level. There shall be no step from the vestibule or balcony into the stair enclosure.

Enclosed Interior Stairways.

142. GENERAL REQUIREMENTS. The following types of enclosing walls are common. In some buildings two or more of these types may be suitable. Doors shall comply with Section 5. The width of exit doors shall be not less than the required minimum effective width of the stairway. The bottom or exit way from the enclosure shall be at least equal in fire-resistance to the enclosure.

The stairs, landings, platforms and passageways connected therewith shall be completely enclosed by fire-resistive walls or partions substantially constructed of the materials specified in §§143-145.

142 A. At the top of every stairway enclosure (except where stairway does not extend to top story, see §109), metal frame and sash skylights shall be used. Glazing shall be plain glass protected by a substantial wire screen beneath. In lieu of a skylight, equivalent window openings glazed with plain glass, may be provided in penthouse walls.

NOTE. This requirement for skylights also applies to other enclosures such as elevator shafts which are required by other sections of the code to comply with the requirements for stairway enclosures.

143. **Type 2 Enclosure.**—(Recommended for fire-resistive construction). Masonry not less than 8 inches thick, reinforced concrete not less than 6 inches thick, or other equivalent fire-resistive materials and construction.

144. **Type 3 Enclosure.**—(Recommended for new and existing buildings). Brick, concrete, hollow building tile, or gypsum block, not less than 4 inches thick, or equivalent, unless unsupported wall is greater than 15 feet in horizontal and vertical dimensions, in which case thickness shall be not less than 6 inches.

145. **Type 4 Enclosure.**—(For existing buildings and low hazard, non-fire-resistive, new construction.) Partitions of 2 in. x 4 in. wood studs protected on both sides with ¾-inch thick gypsum or cement plaster on expanded metal or wire lath or other metal lath approved as affording equivalent fire resistance.

Hollow partitions shall be fire-stopped with incombustible materials the full depth of each tier of beams with which they connect.

145 A. **Type 5 Enclosure.**—(May be used in existing low hazard buildings where there is valid objection to use of solid enclosures.) Partitions of wired glass in metal framework.

Unit of Stair Width.

(Applies to all classes of stairs.)

146. The unit of stairway width (referred to in occupancy sections as a measure of exit capacity) shall be 22 in. In existing buildings only, 42 in. may be accepted as 2 units. Fractions of a unit shall not be counted except that—

(*a*) In existing buildings a stairway 34 in. wide may be accepted as 1½ units.

(*b*) A credit of 50% of a unit shall be allowed for 12 in. of stair width added to two or more full 22 in. units of stair width.

(*c*) Substandard Class C Stairs shall be rated at a fraction of their actual units of width reduced in accordance with §134.

147. Where stairways are enclosed in standard smokeproof towers (§§137 to 141) the rated units of stairway width for purposes of exit calculation shall be the number of units determined by §146 plus 50%.

Section 2.

OUTSIDE STAIRS.

(Fire Escapes)

201. Outside stairs (fire escapes) may be used as required means of exit only in existing buildings not exceeding six stories or seventy feet in height, subject to the provisions of the occupancy section applying. Outside stairs shall not constitute more than 50% of the required exit capacity in any case. Outside stairs shall not be used on new buildings.

NOTE. Outside stairs or fire escapes are regarded as at best only an expedient permitted to remedy deficiencies in the exit capacity of existing buildings where conditions do not justify the expense of providing additional inside stairways.

The outside stairs specified by this code are far superior to the ordinary fire escapes which are commonly found on existing buildings. These utterly inadequate, flimsy, precipitous fire escapes, unshielded against fire in the structure to which they are attached, are positively a menace because they give a false sense of security. Such escapes are not recognized by this Code as exits.

Even the superior outside stairs constructed in accordance with this Code have serious limitations which may prevent their effective use in time of fire. Even where window protection is provided conditions may be such that fire (or the smoke from fire) on lower floors may render the stairs impassable before the occupants of upper stories have had time to use them. Outside stairs may be blocked by snow, ice or sleet at the time when they are most needed. Persons using outside stairs at a considerable height are likely to be timid and to descend the stairs, if at all, at a rate much slower than that which obtains on stairs inside buildings. This applies to some extent even with the solid tread stairs which are specified by this Code in place of the ordinary slatted tread construction. Outside stairs or fire escapes are not a usual means of egress. Occupants of buildings will not so readily use them in case of fire as they will use the usual means of exit, the inside stairway. Because they are an emergency device not ordinarily used their proper up-keep may be neglected.

202. Outside stairs, subject to the limitations of 201, shall be treated on the same basis as ordinary inside stairs in calculation of exit capacity. The reductions of §134 applying to substandard inside stairs apply also to outside stairs.

Types.

203. The following types of outside stairs are recognized by this Code:

Return platform type, superimposed runs

Straight run type, with platforms continuing in the same direction.

Either of these may be parallel to or at right angles to the building. They may be attached to buildings or erected independently of them and connected by bridges.

204. The following types of fire escapes are not recognized by this Code and are prohibited:

Spiral stairs.

Ladders in any form.

Protection and Arrangement.

205. Stairs shall be protected against fire in the building (or smoke therefrom) in one of the following ways, which are listed in the order of desirability:

a. Stairs enclosed in incombustible towers, affording protection against weather, smoke, or fire, and with access through outside balconies or vestibules.

NOTE. This class of protection is not the equivalent of the standard smokeproof tower. If enclosures conform to the smokeproof tower standard (§§137-141) the exit should be classed as a smokeproof tower. If stairs are so enclosed as to be substantially equivalent to an inside stairway, they should be so classed and should conform to Section 1.

b. Stairs entirely shielded by blank walls, access from wall openings to stairs being by balconies.

c. Stairs shielded by approved *stationary* metal frame windows glazed with wired glass, access from entrance to stairs being by balconies.

206. Where climate is such as to involve the possibility of blocking by snow or ice, roofs are recommended for outside stairs, also enclosures for stairs of the return platform or superimposed type.

207. Outside stairs shall be so located and protected that they will lead by a safe path of travel to the street, in accordance with §§110-111 in so far as applicable.

208. Outside stairs shall extend to the roof where building is fire resistive, or where access to an adjoining building is possible from the roof or where the roof is accessible by extension ladder from the ground or from an adjoining building. In all cases where stairs do not extend to the roof, a permanent ladder for the use of the fire department should lead to the roof, as specified in §236.

Materials and Strength.

209. Iron, steel, or concrete shall be used where structural strength is required; elsewhere other incombustible materials may also be used. No wood shall be employed (unless stairway is so enclosed as to class as an inside stairway as per §205, a. Note).

210. Balconies and stairs shall be designed to carry a load of 100 lbs. per sq. ft., with a factor of safety of 6.

NOTE. This factor of safety is larger than ordinary practice, and is recommended because outside stairs and balconies are usually subject to weakening through corrosion.

211. Stairs shall be designed to support a concentrated load of 200 pounds at the center of each tread with a factor of safety of 6.

212. Minimum dimensions of any structural metal member shall be ¼ in. Except where a suitable fire resistive and waterproof covering is provided, no structural metal member shall be employed the entire surface of which is not capable of being inspected and painted.

213. All supporting members for balconies and stairs, which are in tension and are fastened directly to the building shall pass through the wall and be securely fastened on the opposite side, or they shall be securely fastened to the framework of the building. Where metal members pass through walls, they shall be protected effectively against corrosion.

214. Balcony and stair enclosures and railings shall be designed to withstand a horizontal pressure of 50 lbs. (with factor of safety of 6) per running foot of railing or enclosure without serious deflection, and

support at walls for such railings or enclosures shall be in the manner specified in §213 for tension members.

Class A—Outside Stairs.

NOTE. Class A is a superior type of outside stair, is always recommended where outside stairs are permitted, and is required under certain conditions of height and occupancy.

Stairs and Balconies.

215. Stairs shall be at least 44 in. wide. Such width shall be clear of all obstructions except that handrails may project not more than 3½ in. into the required width at each side.

216. The minimum horizontal dimension of any landing, platform, balcony, or passageway shall be not less than the width of the stairs and in no case less than 44 in. Such dimensions shall be measured in the clear inside all enclosures or obstructing parts, except hand rails.

217. The rise of the stairs shall not be more than 7¾ in. and the tread not less than 9½ in. exclusive of nosing (maximum pitch approximately 39°). Nosing not less than 1 in. wide shall be provided.

218. Treads of stairs and balcony floors shall be solid except that perforations not exceeding ½ in. in diameter may be used for purposes of drainage. Balcony floors should be pitched to secure drainage.

NOTE. Reinforced concrete, checkered steel plates, and safety floorings are among the materials available for solid tread and floor construction.

219. Where tread or floor surface is such as to involve danger of slipping, suitable non-slip surface shall be provided.

NOTE. This paragraph will be amplified by reference to the A.S.A. Code on Walkway Surfaces, if this code, when completed, is applicable to Outside Stairs.

220. Solid risers for stairs shall be provided, preferably in the form of "skirts" extending down from the under side of tread, leaving 1 in. open space for drainage between lower edge of riser and top of tread below.

221. Winding stair treads shall not be used.

222. Stairs shall be built permanently to the ground, no swinging section being permitted.

NOTE. Where it is necessary to prevent free access from the ground to the stairs in order to protect against burglary a door may be placed at the first riser or at a suitable platform. This door shall be opened from the stair side by means of approved panic hardware. Such door shall be protected from the weather by means of a roof or canopy. (Doors are not recommended and should be used only where absolutely necessary.)

223. The maximum vertical distance between platforms or landings shall not exceed 12 ft.

NOTE. Designs involving many landings and short flights of stairs are not recommended.

224. The minimum headroom at all points on balconies and stairs shall be 7 ft. 6 in., measured vertically.

Enclosures and Rails.

225. Enclosures for balconies and stairs shall be provided not less than 5 ft. high (for stairs, measure from center of tread).

226. Enclosures may be of solid, slatted, grille or screen construction, in no case with openings having a horizontal width of more than 3 in.; provided that if a lower rail is employed, not less than 2 in. and

not more than 6 in. above the balcony floor, the space above such rail may have horizontal openings of not more than 6 in.

227. Enclosures or rails not less than 36 in. high and continuous with the stair rails shall be provided on the stair well side of balcony openings.

228. Handrails approximately 33 in. above the forward edge of the tread (measured in line with the face of the riser) shall be provided on both sides of stairs. Construction shall be such that there will be no obstructions tending to break hand hold.

NOTE. For schools which small children attend, it is advisable to provide additional hand rails about 27 in. high.

NOTE. This paragraph will be amplified by reference to A.S.A. safety code on Floor and Wall Openings, Railings and Toeboards, if this code when completed is applicable to Outside Stairs.

Access.

229. Access to Outside Stairway shall be through doorways flush with the floor.

230. Approved doors or casement windows, swinging with the exit travel, shall be used in exit openings. The minimum clear width of individual openings shall be 30 in. and the minimum height 6 ft. 6 in. The aggregate width of doors or casement windows leading from any story to an outside stair shall be at least equal to the width of the outside stair or balcony to which they give access.

231. Doors and casement windows shall swing so as not to interfere with exit travel or reduce required effective width of openings or passageways or balconies. Locks, if employed, shall not require key to operate from inside, except as locking be specifically permitted by occupancy sections for prisons, asylums, etc. Unlocking mechanism shall not require stooping to operate it.

NOTE. In factory, mercantile, theatre, school and office buildings and in other buildings as required by occupancy sections doors shall be kept continually unlocked while buildings are occupied. Where doors are required to be kept unlocked and for operating reasons it is undesirable to allow unrestricted communication between building and outside stairs, doors may be provided with alarms.

232. No gratings, bars, or other obstructions, shall be placed at or over any exit opening (except as provided in occupancy sections applying to certain institutional buildings). Fly screens may be permitted if they are free from heavy cross members and are arranged to open out in a manner which will not interfere with exit travel and are not held closed other than by a spring or a simple readily operated latch.

233. Where doors or casement windows lead to outside balconies, the level of the balcony floor shall be approximately 7¾ in. below the sill level, where climate is such as to involve the possibility of blocking doors by snow or ice; where climate is not such as to involve this possibility the balcony should preferably be level with the sill.

Protection of Openings.

234. Outside stairs shall be so arranged that they will be exposed by the smallest possible number of window and door openings. Openings other than those used as a means of exit should preferably have stationary metal frames and wired glass. There shall be no transoms over doors. Every opening, any portion of which is in the limits specified below shall be completely protected by approved fire doors or metal frame wired glass windows as follows:

a. Horizontally. If within 15 ft. of any balcony, platform, or stairway, constituting a part of the escape proper. This provision does not apply to a platform or walkway leading from the same floor

to the escape proper. Protection need not extend around a right angle corner (outside angle 270°) of the building except where stairs are close to such corner.

b. Below. If within three stories or 35 ft. of any balcony, platform, walkway, or stairway constituting a part of the escape proper, or within two stories or 20 ft. of a platform or walkway leading from any story to the escape proper.

c. Above. If within 10 ft. of any balcony, platform, or walkway, as measured vertically, or from any stair treads, as measured vertically from the face of the outside riser.

d. Top story. Protection for wall openings shall not be required where stairs do not lead to the roof.

235. Where outside stairs are located in courts the least dimension of which is less than one third their height, or in alcoves having width less than one third of their height and depth greater than one quarter of their height, all openings below shall be protected.

Ladders for Fire Department.

236. Where stationary ladders are carried from top balcony to roof (see §208) the following specifications shall apply:

a. Material shall be iron or steel.

b. Rails shall be not less than 2 in. by ½ in.

c. Distance between rails shall be not less than 16 in.

d. Distance between rungs shall be 12 in. in every case, top rung to be within 6 in. of the level of the roof line (or parapet, if a parapet extends above roof line).

e. Rungs shall have diameter not less than ⅞ in. and be riveted in position.

f. Rails shall be supported at intervals of not more than 10 ft.

g. Rails shall extend not less than 45 in. above roof line, or 45 in. above coping or parapet if there is one.

h. Extension of side rails to roof shall be carried over coping or parapet to afford hand hold.

i. Ladders shall be arranged parallel to buildings, with travel either between ladder and building, in which case minimum clearance between center of rungs and building shall be 27 in., or outside of ladder, in which case minimum clearance between center of rungs and building shall be 6½ in.

j. Ladders shall be vertical, or may be positively inclined. No negative incline (ladder sloping out over head of person using it) shall be permitted.

See §§262-270 *for additional requirements on Lights, Signs, and Maintenance applying to Class A Outside Stairs.*

Class B—Outside Stairs.

237. Class B Outside Stairs shall conform to all the preceding requirements for Class A except as modification of requirements is permitted by the following.

Stairs and Balconies.

238. Stairs shall be at least 22 in. wide between rails. (Instead of 44 in. as per §215.) The minimum horizontal dimension of any landing, platform, balcony or passageway shall be 22 in. (Instead of 44 in. as per §216.)

239. The pitch of stairs shall not exceed 45 degrees. Rise shall not exceed 9 inches; seven and three-fourths inches is recommended. Treads

shall not be less than 9 inches, exclusive of nosing. (Instead of 7¾ in. rise and 10 in. tread as per §217.)

240. Solid risers (as per §220) are recommended but not required.

241. Except where outside stairs terminate over streets, alleys or private driveways, stairs shall be built permanently to the ground as per §222. In other cases stairs may (but are not recommended to) terminate in a swinging stairway, to which the following specifications shall apply:

a. Width of swinging section of stairs shall be at least equal to that of the stairs above.

b. Pitch shall not be steeper than that of the stairs above.

c. Railings 42 in. high shall be provided similar to those specified by §243.

d. If distance from lowest platform to ground exceeds 12 ft. an intermediate balcony not more than 12 ft. from the ground nor less than 7 ft. in the clear underneath, shall be provided with width not less than that of the stairs and length not less than 4 ft.

e. Counterweight shall be provided for swinging stairs, and this shall be of type balancing about a pivot, no cables being used. Counterweight shall be securely bolted in place, except that sliding ball weights or their equivalent may be used to hold stairs up and to help lower them. Counterbalancing shall be such that a weight of 150 pounds, one step from pivot will not start swinging section downward, and a weight of 150 pounds, one quarter of the length of the swinging stairs from the pivot will positively cause stairs to swing down.

f. Pivot for swinging stairs shall either have a bronze bushing or have sufficient clearance to prevent sticking on account of corrosion.

g. No latch to lock swinging stair section in up position shall be installed.

h. Latch is suggested to hold stairs down when they have once swung to ground.

i. Railings shall be designed to prevent any possibility of injury to persons at head of stairs or on balconies when stairs swing downward. Minimum clearance between moving sections where hands might be caught shall be 4 inches.

j. Swinging section of stairs shall not be located over doors, over the path of travel from any other exit, nor be in any location where there are or are likely to be permanent or temporary obstructions.

Enclosures and Rails.

242. On buildings over 5 stories or 60 ft. in height, enclosures and rails shall conform to the requirements for Class A (§§225-228).

243. On buildings less than 5 stories or 60 ft. in height, enclosures may be not less than 42 in. high (instead of 5 ft.). Stair enclosures may consist of equally spaced triple railings.

244. Where enclosures are not over 42 in. high the upper member of enclosure, if of suitable construction and free from obstructions tending to break hand hold, may serve as a handrail, instead of providing a separate handrail as per §228.

Access.

245. Access to Outside Stairs should preferably be in accordance with §229, but may be by doors or windows having sills above the floor, subject to the provisions of §§246-249, and otherwise in accordance with the requirements for Class A.

246. Approved doors or casement windows (except as double hung windows are permitted by §247) shall be used, swinging with the exit travel. The minimum clear width of individual openings shall be 24 in. and the minimum height 6 ft. 6 in.

247. Where specifically permitted by occupancy sections, approved, double hung, metal frame, wired glass windows may be used as a means of access to outside stairs, provided that

a. Windows are counterbalanced and operate readily.
b. Minimum clear width of lower sash is 30 in.
c. Minimum clear height of lower sash is 36 in.
d. Window sill is not less than 18 in. and not more than 30 in. above the floor of the room from which escape is to be made.

248. Where sills of door or window openings are over 12 in. above floor, one or more steps of equal height, shall be provided, so that top step is not less than 12 in. or more than 18 in. below sill. Steps shall be full length of window opening and not less than 9 in. wide, exclusive of nosings, and as nearly 7¾ in. high as may be practicable.

249. Where doors or casement windows give access to balconies, balcony floor level shall be in accordance with §233; where double hung windows give access to balcony, balcony level shall be not less than 7 in. nor more than 18 in. below window sill.

See §§262-270 *for additional requirements on lights, signs, and maintenance applying to Class B Outside Stairs.*

Class C—Outside Stairs.

Class C—Outside Stairs represent a lower standard than Class B, and are the minimum permitted under any conditions as a required means of exit. These specifications should be used only in checking the construction of, or making alterations in, an existing fire escape, where it is not practicable to make the escape conform to the specifications for Class B.

Class C Outside Stairs will be found to have a very small rated capacity (see §§202, 134).

250. Class C Outside Stairs shall conform to the preceding requirements for Class A, as modified for Class B, subject to the following additional permitted modifications.

251. Balconies and stairs shall be sufficient to carry a load of not less than 90 lbs. per sq. ft. with a factor of safety of 4. (Instead of §210 and §211).

252. Balcony and stair enclosures and railings shall be of substantial construction, with support at walls as specified in §213. (§212 and §214 waived.)

Stairs and Balconies.

253. Stairs shall be at least 18 in. wide between rails. (Instead of requirements of §215 or §238.)

254. The minimum horizontal dimension of any landing, platform, balcony or passageway shall be 18 in. (Instead of 22 in. as per §238.)

255. The pitch of stairs shall not exceed 60 degrees. Treads shall be not less than 6 in. wide, exclusive of nosing. (Instead of requirements of §239.)

256. Stair treads and balcony floors may be of flat bars on edge, or square bars, supported to prevent turning, with maximum spacing center to center of 1¼ in. (§218 waived.)

257. Stairs having winders shall not be rejected provided that at one foot from the narrow end of the winder the width is not less than 6 in. exclusive of nosing (§221 waived).

NOTE. Winders are heavily penalized in stair capacity rating. (See §134.)

Enclosures and Rails.

258. Enclosures shall be not less than 36 in. high (instead of requirements of §§242, 243).

259. Enclosures and railings shall be of substantial construction suitable for the purpose intended. (Detailed specifications of §§226-228 waived.)

Access

260. Access to Class C Outside Stairs shall be same as specified for Class B (§§245-249) except that balcony floor level may be flush with window sill.

Ladders for Fire Department.

261. Ladders where used shall comply with the requirements of §236 (except that distance between rails of ladders shall be not less than 12 in.) (§236 c waived), and rungs shall have diameter not less than ⅝ in. or be not less than ⅝ in. square and shall be riveted in position (§236 e waived).

Signs and Lighting.

(Applies to all classes of Outside Stairs.)

262. Outside stairs and exit ways leading thereto shall have illumination and signs in accordance with Section 12 except that the signs shall have in addition the words "OUTSIDE STAIRS" in plain letters not less than 2½ in. high.

Maintenance and Painting.

(Applies to all classes of Outside Stairs.)

265. Steel members shall be painted before and after erection.

266. Outside stairs shall be inspected at least annually, and shall be scraped and painted as often as necessary to maintain them in proper condition at all times.

267. Outside stairs shall be kept clear of all incumbrances.

268. Outside stairs shall be promptly cleaned after snow or ice has accumulated upon them.

269. No obstructions such as telephone or lighting wires shall be permitted on or near outside stairs. Electric light or power wires shall not be directly over or within three feet of outside stairs or balconies, unless such wires are enclosed in rigid conduit.

270. Particular attention should be paid to possible interference by awnings at windows or over sidewalk, and to other obstructions at or near the street level. All obstructions found shall be promptly removed.

Unit of Stairway Width.

(Applies to all classes of Outside Stairs.)

271. The unit of stairway width of outside stairs shall be the same as that of inside stairs (see §146) except that Class C outside stairs 18 in. wide between handrails may be accepted as one unit of width. The percentage penalties of §134 apply to outside stairs.

Section 3.

RAMPS.

301. Wherever stairs are called for in other sections of this code, ramps may be substituted.

NOTE. Ramps of moderate slope are recommended in place of stairways in places where large crowds are to be accommodated.

302. For down ramps, one 22 in. unit of ramp width shall be considered the equivalent of one and one half units of stairway width. For up ramps one 22 in. unit of ramp width shall be considered the same as one unit of stairway width.

NOTE. This does not modify the requirement for minimum width of 44 in.

303. Ramps shall comply with all requirements for stairways (construction, width, enclosures, rails, landings, lighting, etc.) in so far as applicable. (See Section 1.)

304. Where stairs of the several classes are specified by the occupancy sections ramps may be substituted as follows:

Class A Stairs—Class A ramp; slope not greater than 1 ft. in 10 ft. (10%).

Class B Stairs—Class B ramp; slope not greater than 1 ft. in 8 ft. (12½%).

Class C Stairs—Class C ramp; slope not greater than 1 ft. in 6 ft. (16 2/3%).

305. Ramps shall be surfaced with suitable non-slip material wherever surface is such as to involve danger of slipping.

NOTE. This paragraph will be amplified by reference to A.S.A. American Standard Safety Code on Walkway Surfaces when completed and approved.

306. Where ramps have slope of less than 1 ft. in 12 ft. (8 1/3%) handrails shall not be required.

307. Landings (see §122) shall not be required for Class A ramps.

Section 4.

HORIZONTAL EXITS.

401. A horizontal exit consists of one or more protected openings through or around a fire wall or a fire partition or of one or more bridges connecting two buildings.

NOTE. As a means of rapid and safe egress from a burning building, the use of horizontal exits is strongly recommended. Such exits afford an area of quick refuge from either side and remove the necessity for hasty flight down stairs. In high buildings in addition to the time required to descend many flights of stairs, there is always danger of stairways becoming blocked by people collapsing from exhaustion before reaching the street level.

402. The required stair capacity for a given number of occupants as given in other sections of this code, may be reduced 33 1/3% on any floor where there is one, and 50% where there are two or more standard horizontal exits.

NOTE. This rule may be applied either to increase the number of occupants allowed with given stairs, or to decrease the stair capacity required with given floor area, as follows:

Number of Standard horizontal exits	Increase in occupants allowed for given stairs	Decrease in stair capacity required for given Area or Population
One	50%	33 1/3%
Two or more	100%	50%

Two standard horizontal exits mean exits from any fire area leading to two other separate fire areas—not two doors to the same area.

This credit is incorporated directly in the stair capacity formula (§2013).

403. FIRE WALLS and fire partitions shall be at least equivalent in fire resistance to the type of stair enclosure required for the building, and in any case at least equivalent in fire resistance to Type 3 enclosure (§144).

Egress from Area of Refuge.

404. Every fire section for which credit is allowed in connection with a horizontal exit shall have in addition to the horizontal exit or exits at least one stairway or other standard exit. (Any fire section not having a stairway shall be considered as part of an adjoining section with stairway, for purposes of determining credits; see §409.)

405. Construction and arrangement shall be such that the stairway or other exit from each possible area of refuge can not be obstructed by the same fire (or smoke therefrom) which may involve the area from which refuge is taken.

406. Every horizontal exit for which credit is given shall be so arranged that there are continuously available paths of travel leading from each side of the exit to stairways or other standard means of egress leading to outside the building.

NOTE. This requirement is complied with where the entire areas from each side of the horizontal exit to the stairways or other standard means of egress are occupied by the same tenant; or where there are standard corridors or other continuously available passageways leading from each side of the exit to stairways or other standard means of egress leading to outside the building. Where such corridors are not normally

in use proper regulations shall be enforced to make them at all times available for emergency exit.

407. Doors used in connection with horizontal exits shall be kept unlocked and unobstructed whenever premises are occupied on either side of the exit.

408. FLOOR AREA. To entitle a building that has one horizontal exit to any reduction in required stair capacity (see §402), the smaller of the two adjoining or connected areas must be able to hold the total population on that level on the basis of not less than 10 sq. ft. of gross floor area per person, and shall have clear passageway (or passageways) from the horizontal exit to the stairway (or other exit from area of refuge) sufficient to accommodate the total population in the passageway (or passageways) on the basis of 4 sq. ft. per person.

409. Where a building has two or more horizontal exits, the maximum reduction in required stair capacity (§402) shall be allowed only in those cases where the smallest of the adjoining or connected areas complies with §408. Where the smallest area does not comply with §408, the smallest area shall be considered a part of the larger adjoining one.

Doorways.

410. UNIT OF WIDTH. A unit of width for door openings shall be 22 in. A 40 in. doorway shall be rated as 2 units. The minimum width of a doorway for which credit is given shall be 30 inches, which shall be counted as one unit of width.

a. Credit shall not be given for fractions of units except that credit of 50% of a unit shall be allowed for 12 in. more of width added to two or more full 22 in. units of doorway width.

411. The minimum number of units of width required at each horizontal exit shall be in accordance with the following formula:

$$A = \frac{N}{50F}$$

Where

A=Number of units of width of horizontal exit.

N=Number of persons permitted on each floor, or the population of the floor as determined by the occupancy section applying.

F—Hazard of occupancy (see §2017).

High hazard, F=1.
Moderate hazard, F=2.
Low hazard, F=3.

412. No opening serving as a horizontal exit shall be less than 30 inches in width and should be preferably not more than 88 inches in width nor more than 80 sq. ft. in area. Where greater widths are required for operating purposes, no credit shall be given for more than 4 units in width for any one opening.

413. DOORS. Each opening serving as a horizontal exit shall be protected by at least one self closing swinging fire door, or automatic sliding fire door. If swinging doors are used, there shall be adjacent openings with swinging doors at each, opening in opposite directions, with signs on each side of the wall or partition indicating as the exit the door which swings with the travel from that side; or other approved arrangements providing doors always swinging with any possible exit travel. (See Section 5 for detailed requirements for doors.)

Bridges and Balconies.

414. The unit of width for bridges and balconies shall be 22 in. In new bridges and balconies the minimum width shall be 2 units, or 44 in. (Handrails may project into this width not more than 3½ in. on each side.) In existing bridges and balconies 42 in. may be accepted as 2 units and 34 in. as 1½ units. In no case shall bridges or balconies less than 34 in. wide be accepted.

415. BALCONIES. Balconies leading around fire walls or fire exit partitions shall conform to the requirements for balconies of smokeproof towers. (See §§137, 141.)

416. BRIDGES. Construction shall be entirely of incombustible material and floors shall be solid. Railings shall be not less than 4 ft. high.

417. The level of the bridge floor should be below the building floor level, by approximately 7¾ in., where the bridge is not completely enclosed and climate is such as to involve possibility of blocking doors by snow or ice; where the bridge is completely enclosed or the climate is such as not to involve this possibility, balcony should preferably be level with the floor.

418. All wall openings, in both of the connected buildings, any part of which are within 10 ft. of any bridge as measured horizontally or below shall be protected with fire doors or metal frame wired glass windows, preferably with stationary sash; provided, however, that where bridges have solid sides not less than 6 ft. in height, such protection of wall openings may be omitted.

419. Where there is a difference in level between connected buildings or floor areas ramps may be employed in accordance with Section 3.

Lighting and Signs.

420. Horizontal exits and passageways, and passageways through areas of refuge, shall have illumination and signs in accordance with Section 12.

Section 5.

DOORS.

501. All doors used in connection with exits shall be substantially constructed and installed in a workmanlike manner, and be fitted with reliable hardware.

502. All exit doors shall swing with the exit travel except as doors sliding across the exit travel may be permitted by other sections of this code. Vertical sliding doors and rolling shutters shall not be used on exits.

NOTE. Swinging doors are preferable and should be used wherever possible.

503. All doors used in connection with exits shall be so arranged as to be always readily opened from the side from which egress is made. Locks, if provided, shall not require key to operate from the inside.

NOTE. In factory, mercantile, theatre, school and office buildings and in other buildings as required by occupancy sections doors shall be kept continually unlocked while buildings are occupied. Where doors are required to be kept unlocked and for operating reasons it is undesirable to allow unrestricted communication between building and outside, doors may be provided with alarms.

Widths.

504. The unit of width for door openings shall be 22 in. A 40 in. doorway shall be rated as 2 units. The minimum width of doorways used in connection with exits shall be 30 in., which shall be counted as one unit of width.

a. Credit shall not be given for fractions of units except that credit of 50% of a unit shall be allowed for 12 in. more of width added to two or more full 22 in. units of doorway width.

Fire Doors.

505. Fire doors shall be of the self closing or automatic types.

A self-closing fire door is one which is normally kept in a closed position by some mechanical device.

An automatic fire door is one which is arranged to close automatically when released by the action of heat.

506. Fire doors shall be kept free from all obstructions.

NOTE. Incombustible guards are recommended to prevent stock being piled against sliding doors. With swinging doors, painting marks on the floor to indicate the path of the door during its swing, will often be helpful in preventing obstruction.

507. Fire doors shall be smoke tight and shall have a fire resistance appropriate to the wall or partition in which they are placed, in accordance with §508.

NOTE. Better fire doors than those specified herein will usually be necessary in order to secure proper fire safety for property, and should be used where circumstances permit.

508. Fire doors in Classes 1, 2 and 3 Stairway Enclosures (§§137-144) and in fire walls and fire exit partitions of horizontal exits shall have a fire resistance of at least one hour. Fire doors in Class 4 Stairway Enclosures (§145) shall have a fire resistance of at least one half hour.

NOTE. A Class B fire door, as described in the Regulations on the Protections of Openings in Walls and Partitions, as recommended by

the National Fire Protection Association, will be accepted as a 1 hour fire test door; Class C as ½ hour fire test door.

It is especially important that fire doors, hardware and heat-release devices used in connection therewith be of approved type.

509. Fire doors shall be installed in accordance with the Regulations for the Protection of Openings in Walls and Partitions against Fire, as recommended by the National Fire Protection Association, in so far as applicable.

Revolving Doors.

510. Revolving doors shall not be used on required exits except that approved collapsible revolving doors may be used between street floor (but not at foot of stairs) and street where specifically permitted by occupancy sections. Where used, revolving doors shall not constitute more than 50% of the required door width.

511. Each revolving door shall receive credit as constituting one-half unit of exit width. (See §504.) At any location the number of revolving doors constituting required exits shall not exceed the number of units of swinging door width immediately adjoining or within 20 ft.

Obstructions, Visibility.

515. All exit doors shall be so arranged as to be readily visible and no obstructions interfering with access or visibility shall be permitted.

516. No draperies shall be permitted over or in front of exit doors.

517. No mirrors shall be placed in exit doors.

Section 6.

AISLES AND CORRIDORS.

601. Safe and continuous passageways, aisles or corridors leading directly to every exit and so arranged as to be conveniently accessible to every occupant shall be maintained at all times on all floors of all buildings.

602. Widths of passageways, aisles or corridors shall be measured in the clear, at their narrowest points. Doors swinging into passageways shall not restrict the effective width at any point during their swing to less than the minimum widths hereinafter specified.

603. The aggregate width of passageways, aisles or corridors leading to any exit shall be at least equal to the required width of the exit. Where all travel to any exit is along the passageway, such passageway shall have a width at least equal to the required width of the exit; where several passageways lead to an exit each shall have a width suitable for the travel which it may be called on to accommodate.

604. The minimum width of any passageway shall be three feet in the clear.

Section 7.

ELEVATORS.

701. Elevators are accepted in lieu of not over 10% of the exits (stairways, etc.) required by other sections of this code, except as otherwise specified in such other sections. Elevators are not accepted as one of the two exits which are required from every building or section (§2011) nor are they counted as an exit in cases where the maximum distance of travel to an exit is specified (§2012).

702. Subject to the limitations of §701, an elevator conforming to the requirements of this Code is accepted as equivalent to one-fifth of a unit of stairway width. (One unit=22 in.)

NOTE. If, therefore, ten units of stair width are required for a certain building, five elevators may be substituted for one of these units.

This is an approximate rule based on average conditions of height, size and speed. Where elevators are provided at all, there are usually more than enough of them to furnish the maximum 10% credit permitted by §701. If desired for special reasons, the exact theoretical equivalent between elevators and stairways may be computed by the following formula:

Number of units of exit width represented by each elevator =

$$\frac{a}{\frac{60c}{b} + 1.5a + 27}$$

Where, a=rated capacity of elevator exclusive of operator.
b=rate of speed of elevator in feet per minute.
c=height of elevator shaft in feet.

703. Elevators shall conform to the Safety Code for Elevators formulated under sponsorship of American Society of Mechanical Engineers, Bureau of Standards, and American Institute of Architects and under the auspices of American Standards Association and hereinafter referred to as the A.S.A. Elevator Code.

704. The following additional requirements apply to all elevators which are counted as required exits. Elevators not complying with these requirements shall bear signs indicating that they are not exits.

NOTE. In most cases the occupancy sections of this code require that elevator shafts be provided with standard enclosures, whether or not the elevators constitute required means of egress.

705. All elevators shall be enclosed in standard fire resistive shafts at least equivalent in fire resistance to the required enclosure for stairs in the same building.

NOTE. Enclosures including elevator landing space are preferable to those including only elevator hoistway proper.

706. It is recommended that elevators should not be in a common enclosing shaft with stairways, and that the path of exit travel from the bottom of one flight of stairs to another should not pass directly in front of elevator doors.

707. Elevator shaft doors shall conform to the section of this code on doors, in so far as applicable (see Section 5).

NOTE. Small clear wired glass panels are desirable for vision but shall not be used where they conflict with other requirements.

708. Access to elevators and from elevators to street shall be provided in accordance with similar requirements for Stairways. (See §§110-113.)

NOTE. This means that elevators constituting required means of egress must discharge at the street floor into a fire resistive corridor or passageway leading to the street; not into an open street floor area where egress to the street might be interfered with by fire in the street floor or basement. (See Department Stores, §2217, for exception to this requirement.)

709. In all computations for elevators only those normally used for passenger service to the floor or floors under consideration shall be counted for exit purposes.

710. Elevator cars and entrances thereto shall be illuminated in accordance with Section 12. The intensity of illumination of the floors and walls of car and doorway shall not be less than one foot-candle.

Section 8.

ESCALATORS.

801. Wherever stairs are specified in other sections of this code escalators complying with the following requirements may be substituted to the extent of not more than 25 per cent of the required stairways, except as this percentage may be modified in special cases by the requirements of occupancy sections.

NOTE. Escalators are not permitted as required means of egress in some occupancies, e. g., Schools.

802. Escalators shall comply with the requirements for escalators given in the A.S.A. Elevator Code (see §703).

803. The following additional requirements apply to all escalators constituting required means of egress. If there are escalators not conforming to these requirements they shall bear signs indicating that they are not exits.

NOTE. In most cases the occupancy sections of this code require that escalators have standard enclosures, whether or not they constitute required means of egress.

804. Only escalators normally operating in the direction of exit travel shall be given credit as required means of egress.

NOTE. In factories and in such other occupancies as may be specifically permitted by the "occupancy" sections where reversible escalators are used for the purpose of conveying employees in and out of buildings they may be accepted as complying with this rule provided that a readily accessible main control panel from which all escalator units may be stopped or reversed is located on the first floor adjacent to and in the same enclosure with the escalators.

805. All escalators for which credit is given as constituting required means of egress shall be of the horizontal tread type. Cleat type escalators are not recognized as required means of egress.

806. Escalators shall comply with all requirements for stairways (construction, enclosures, access, lighting, etc.) in so far as applicable, subject to the exceptions given in §§808-812. The following indicates in detail the application of the Stairway Code requirements to escalators.

807. CONSTRUCTION. Stairway construction requirements (§§102-108) apply to escalators without change.

NOTE. §102 should be especially noted in this connection. It prohibits the use of combustible materials in escalator construction except where wooden construction is specifically permitted for stairways. In all other cases escalators of wooden construction may be installed, provided that they have proper enclosures, but are not accepted as required means of egress.

808. ARRANGEMENT AND ACCESS. Stairway requirements (§§109-113) apply to escalators except that the requirements of §109 in the case of escalators may be met by providing a stairway between the top floor and the roof (not necessary to extend escalator proper to the roof).

809. Railings shall be of the escalator balustrade type surmounted by moving handrails (instead of the provisions §117).

810. LIGHTING. Escalators shall be provided with lighting system in accordance with §119.

811. Intermediate landings (as required by §§122, 127) shall not be required for escalators except that no individual escalator unit may have a vertical travel of more than two stories or 35 feet. Proper landings, similar to those required for stairways, shall be provided at top and bottom of escalators, and between escalator units.

812. PITCH, WIDTH, ETC. Escalators shall conform with §§120-132 (except as to landings, see §811) and as they meet the requirements of the several stair classes shall be rated as Class A, B or C.

813. Escalators shall be enclosed exactly as required for stairways (see §§135-145).

Capacity.

814. Rated units of width of escalators shall be the same as specified for stairways (§146).

NOTE. This is based on the assumption that the escalator may be stopped in case of fire.

Section 9.

SLIDE ESCAPES.

(Spiral and Straight Chutes.)

901. Chutes are classified as special types of Outside Stairs (see Section 2) and may be used only under conditions under which outside stairs would be permitted. Closed chutes are to be considered as Class "B" outside stairs and open chutes as Class "C" outside stairs. Chutes not conforming to these specifications shall not receive credit as required means of egress.

NOTE. Slide escapes, like any other type of fire escape, are at best an expedient permissible only for increasing the exit capacity of an existing building. This or any other type of escape is not a substitute for fire-resistive construction, for automatic sprinkler protection, or for other features which are necessary to human safety in various classes of buildings.

902. OCCUPANCIES WHERE PERMITTED. Slide escapes shall be used only where specifically permitted by the occupancy section applying.

903. NOTE. Occupancy sections thus far developed (1929) permit the use of this type of escape as follows: In new and existing industrial buildings housing high hazard occupancies (e. g. manufacture of explosives, grain elevators, etc.). In existing school buildings, orphan asylums, hospitals, sanitariums and corrective institutions.

904. LIMITATIONS OF HEIGHT. Except in buildings where there are relatively few occupants or where permitted by specific occupancy egress codes, chutes may not constitute a required means of exit in buildings exceeding 70 ft. or six stories in height. (For definition of height see §39.)

905. LIMITATION OF CAPACITY. Chutes shall not constitute more than twenty-five per cent of the required means of egress (stairways, etc.) for any building except as this percentage may be modified for specific occupancies and conditions by the occupancy codes.

Specifications.

906. These specifications cover spiral and straight chutes attached to buildings or erected independently of them, but connected by bridges. Types in common use are:

(*a*) Vertical spiral enclosed chutes.

(*b*) Vertical spiral open chutes.

(*c*) Enclosed straight chutes parallel to or at right angles to buildings.

(*d*) Open straight chutes parallel to or at right angles to buildings.

Design.

907. For all chutes the slope shall be not less than 24 degrees and not more than 42 degrees with the horizontal. On spiral chutes the slope shall be measured by developing the spiral line on the cylindrical section two feet from the inner edge.

NOTE. Where hospital pads are to be used steeper pitches are recommended provided, however, that in no case shall the pitch exceed 42 degrees.

908. On all straight chutes having slopes greater than 30 degrees there shall be a section at the lower end at least 10 feet long, set at an angle

not to exceed 15 degrees with the horizontal, connected with the upper section by a curved compensating section.

909. On spiral chutes, transition from one pitch interval to another where necessary on account of differing story heights shall be made by the use of compensating plates so that there is no perceptible interruption of the slide.

910. Spiral chutes shall be not less than 28 inches nor more than 42 inches wide. Straight chutes shall be not less than 24 inches nor more than 42 inches wide.

NOTE. Where hospital pads are to be used the clear width should be not less than 34 inches and not more than 42 inches for both spiral and straight chutes.

911. The slideways of spiral chutes shall be banked from a point 12 inches from the outer edge to a point 5 inches above the level of the center of the chute.

912. The horizontal distance between vertical supports for straight chutes shall not exceed 10 feet. Spiral chutes shall be braced to the building at each entrance floor and at other points if necessary so that the braces will not be more than 10 ft. apart.

913. On enclosed chutes, doors shall be provided at each entrance, swinging with the exit travel, so constructed that they will not obstruct the use of the chute; the door openings shall be at least 30 inches wide and at least 6 feet 6 inches high. Where entrance is direct from the building with no intervening landing or balcony, access openings may be not less than 42 inches high.

Location and Arrangement.

914. Chutes installed inside buildings shall conform to all requirements for enclosure of stairways (see Section 1).

915. Chutes installed outside buildings shall be protected from fire within the building to which they are attached by one of the following methods. The order indicates the desirability of protection:

(*a*) Incombustible and enclosed chutes affording protection against weather, smoke or fire and with access direct or through covered balconies at vestibules.

(*b*) Chutes entirely shielded by blank walls, access from wall openings to chutes being by horizontal balconies.

(*c*) Chutes shielded by approved *stationary* metal frame, windows glazed with wired glass, and balconies extending in one or both directions to openings protected with approved doors or wired glass windows in a manner similar to that required for the protection of Outside Stairs (see §§234, 235).

916. In all new installations where constituting a required means of egress, spiral chutes shall extend to the roof.

917. In existing installations of spiral chutes on fire resistive buildings chutes shall extend to the roof.

918. The lower edge of the chute at the discharge point shall be at least 12 in. and not more than 20 in. above the ground or walkway level. Where hospital pads are to be used on a chute, the lower end shall terminate in a straight, level discharge table at least 15 feet in length, so arranged as to allow access to both sides.

919. On enclosed chutes in locations where snow or ice may obstruct the discharge point, a shed shall be provided, made of incombustible materials, having a clear height of not less than 7 feet, with roof not less than 8 feet wide and not less than 8 feet long, connected with the enclosure of the chute by metal flashing. Where discharge tables are installed the roof shall extend at least 4 feet beyond the end of the table.

920. No doors shall be allowed at bottom or discharge point of chute.

921. All chutes shall lead directly to the street, to a yard or court connected with the street, or to a fire-resistive passage leading to the street. Such fire-resistive passage shall be at least 44 in. wide, shall be unpierced and shall be not less than 8 feet in height for new buildings and 7 feet in height for existing buildings. Where chutes discharge, the adjacent exposing wall openings, if any, shall be protected in a standard manner to provide for safety of egress.

922. On open spiral chutes the minimum height of outer side shall be 36 inches above the lowest point of the adjacent slideway in the same radial vertical plane, except at entrances. On open straight chutes the minimum height of both sides shall be 24 inches above the lowest point of the slideway (measured vertically), and in all cases shall be as high as the width of the slideway.

923. On straight chutes the entrance landing shall be flush with the lowest point in the adjoining surface of the slideway. On spiral chutes the center of the entrance landing shall be not less than 12 inches nor more than 18 inches above the lowest point in the adjacent slideway in the same radial vertical plane.

Materials and Strength.

924. Iron, steel, or concrete shall be used where structural strength is required; elsewhere other incombustible materials may also be used. No wood shall be employed. (See also §929.)

925. Balconies shall be designed to carry a live load of 100 lbs. per sq. ft., with a factor of safety of 6 (see also §928).

NOTE. This factor of safety is larger than ordinary practice, and is recommended because balconies are unusually subject to weakening through corrosion.

926. All supporting members for balconies and chutes, which are in tension and are fastened directly to the building shall pass through the wall and be securely fastened on the opposite side, or they shall be securely fastened to the framework of the building. Where metal members pass through walls, they shall be protected effectively against corrosion.

927. Balcony and chute enclosures and railings shall be designed to withstand a horizontal pressure of 50 lbs. (with factor of safety of 6) per running foot of railing or enclosure without serious deflection, and support at walls for balcony railings or enclosures shall be in manner specified in §926 for tension members.

928. The chutes and their supports shall be designed to carry the weight of the structure itself and 100 lbs. per lineal foot of slide (as measured at the middle of the slideway) with a factor of safety of 6.

929. Slideways shall be made of galvanized steel with joints lapping over in the direction of descending load or with edges of adjoining sections flanged so as to form a flush joint; all rivets, bolts, etc., to be flatheaded, countersunk, and protected by solder.

Access to Chutes.

930. NEW BUILDINGS. Access shall be through doorways flush with the floor. Only approved forms of doors may be used.

931. Doors, or approved casement windows swinging with the exit travel, shall be used, provided that:

(*a*) Minimum clear width is 30 inches when open.

(b) Minimum height of door opening is 6 feet 6 inches except as provided in §913.

932. Doors and casement windows shall conform to §231.

933. Where doors or casement windows lead to outside balconies, the level of the balcony floor should be below the sill level in accordance with §141.

934. EXISTING BUILDINGS. Access should preferably be in accordance with §§930-933, but may be accepted if conforming to §§245-249.

NOTE: Where hospital pads are to be used it is recommended that each chute should serve only one floor of a building.

Obstructions in Openings.

935. No gratings or other obstructions, shall be placed at or over any exit opening, except in certain institutional buildings where it is not feasible to leave any such openings unprotected, for which specific conditions will be found in the proper occupancy egress code; provided, however, that fly screens may be installed when essential if they are free from heavy cross members and are arranged to open out in a manner which will not interfere with exit travel and are not held closed other than by a spring or a simple, readily operated latch.

Capacity.

936. One chute conforming to these specifications shall be considered as constituting two units of exit width. (E. g. one chute is equivalent in capacity to an outside stairway 44 in. wide.)

Signs and Lighting.

937. Straight or spiral chutes and passageways thereto shall have illumination and signs in accordance with Section 12. This shall not be understood as requiring lights within chutes. Signs directing the way and at the entrances to such chutes shall have in addition to the words specified in Section 12 the words "STRAIGHT CHUTE" or "SPIRAL CHUTE" as the case may require in letters not less than 2½ inches high.

Section 10.

ALARM SYSTEMS.

1000. Alarm systems, in accordance with the following specifications, shall be provided in all buildings where required by the several occupancy sections, and also in all buildings of the following classes (subject to the provisions of the occupancy sections applying):

(*a*) Used as sleeping quarters by twenty or more persons.

(*b*) Used above or below the street (or ground) floor by forty or more persons.

(*c*) Used above the second floor or in sub-basements by twenty or more persons.

If a building is divided by one or more fire walls, each section shall be considered a separate building in applying the foregoing requirements.

1001. This code does not go into details of construction and arrangement of alarm systems, nor do its requirements extend beyond those necessary for safeguarding occupants from fire and fire-panic hazards. The installation of alarm systems in accordance with this code will, however, serve to decrease the fire hazard to property.

NOTE. It is strongly recommended that alarm systems be installed so that in addition to complying with the requirements of this code, they will also comply with the Regulations of the National Board of Fire Underwriters for the "Installation, Maintenance and Use of Protective Signaling Systems" as recommended by the National Fire Protection Association, thus affording greater protection to property.

Electrical alarm systems are preferable to mechanical alarm systems where conditions are such as to require more than one sending station and, usually, where more than one sounding device is required. Mechanical systems are sometimes preferable where but one station is required, particularly where it would be difficult to secure regular and responsible maintenance of an electrical system.

1002. Systems shall be under the supervision of a responsible person who shall cause proper tests to be made at frequent intervals and have general charge of all alterations and additions.

NOTE. No system is sufficiently automatic or durable to avoid the necessity for periodical inspections and working tests of all its parts. Especial importance is placed upon the efficiency and reliability and the methods employed in maintaining and in inspecting alarm systems.

1003. Systems shall be tested daily.

1004. All apparatus requiring winding or replenishing shall be rewound or replenished as promptly as possible after each test or alarm, and shall be kept in normal condition for operation.

SOUNDING DEVICES.

1005. Required sounding devices shall be used for fire alarm purposes only.

1006. Alarm sounding devices shall be provided of such character and so distributed as to be effectively heard in every room above all other sounds.

NOTE. Visible alarm devices may be provided, in addition to required sounding devices, but shall not be deemed substitutes therefor except where specifically permitted by occupancy sections.

1007. Alarm sounding devices shall be distinctive in pitch and quality from all other sounding devices.

1008. All alarm sounding devices should be of the same type.

1009. The manner of sounding alarms should be standardized with a view of obtaining uniformity throughout as large a geographical area as practicable, so that persons moving from one locality to another will not be misled and confused by differences in manner of sounding alarms.

NOTE. This point is of special importance in certain occupancies. For example, pending the time when state-wide uniformity in school alarm systems can be attained, uniformity of alarm signals should be strictly enforced in all public and private schools throughout each city and the adjacent suburban territory.

ALARM SENDING STATIONS.

1010. Alarm sending stations shall be provided near all main exits and in the natural path of escape from fire, at readily accessible and visible points which are not likely to be obstructed.

1011. Sending stations shall be so located that from any part of the building not more than 200 feet will have to be traversed in order to reach a sending station on the same floor, or 100 feet and one flight of stairs to reach a sending station upon another floor located in the natural path of escape from fire. Such stations shall have illumination as required for principal points of exit ways, § 1202.

NOTE. It is recommended that at least one sending station be provided upon each floor.

Where conditions are such as to require but one sounding device for an entire building, the functions of a sounding device and a sending station may be combined in a single mechanism.

1012. The arrangement of sending stations, and the manner of their connection with sounding devices shall be such that there will be no difference between the sounding of actual alarms and drill signals. (See also §1017.)

1013. The manner of operation of alarm sending stations should be standardized so that persons moving from one locality to another will not be misled or confused by differences.

AUTOMATIC FIRE DETECTION SYSTEMS.

1014. Connections may be provided between required alarm systems and automatic fire detection systems (including automatic sprinkler systems), provided that the effectiveness and dependability of operation of the alarm systems from the manual sending stations is not thereby impaired, and that §§1010-1013 are fully complied with.

SUPERVISORY CONTROL OF ALARMS.

1015. Systems shall be so arranged that no manual intervention will be required, following the actuation of a sending station, for causing effective response of all required sounding devices, nor shall facilities be provided whereby such response can be controlled or modified except where otherwise specifically permitted by an occupancy section.

INCIDENTAL FUNCTIONS.

1016. Alarm systems may be arranged for the accomplishment of incidental functions such as the release of self-opening or self-closing doors, cutting off supplies of gas, fuel-oil or electric power, switching on emergency lights, the stopping of air supply ventilating fans, and the

like, in so far as the accomplishment of such incidental functions does not in any way impair the effectiveness or reliability of the required sounding devices in response to the required sending stations.

CODE SIGNALS.

1017. Code signals indicating where the alarm originates should not be used except where needed to indicate the choice of exits. In such cases the occupants shall be drilled in the interpretation of code signals.

NOTE. It is often advisable to give code signals to those in authority and those who will assist the occupants in leaving the building—as, for example, to principals, superintendents, managers, engineers, members of private fire brigades, etc.

CONNECTIONS TO MUNICIPAL DEPARTMENTS.

1018. Alarm systems in localities under protection of regularly organized fire departments or private fire brigades should be arranged to cause automatic transmission of alarms (directly or through an approved central office) to such fire departments or brigades upon operation of any alarm sending station if the area protected by the system is subject to use by 100 or more persons.

NOTE. When no such connection is provided, it is recommended that a municipal fire alarm box be installed either at the main entrance to the building or at the nearest street corner if plainly visible from the main entrance and not more than 300 ft. distant therefrom.

1019. Automatic fire department connections (§1018) shall be so arranged as to permit drills to be conducted by those in authority without calling out the fire department, and so that the actuation of any required alarm sending station will surely call such department.

SECTION 11

FIRE EXIT DRILLS

Introduction.

1101. The purpose of fire exit drills is to ensure the efficient and safe use of the exit facilities available. Proper drills ensure orderly exit under control and prevent the panic which has been responsible for the greater part of the loss of life in the major fire disasters of history. Order and control are the primary purposes of the drill. Speed in emptying buildings, while desirable, is not in itself an object, and should be made secondary to the maintenance of proper order and discipline.

NOTE:—The term "fire exit drill" is used to avoid confusion between drills held for the purpose of rapid evacuation of buildings as described in this section, and drills of fire fighting practice which from a technical viewpoint are correctly designated as "fire drills" although this term is by common usage applied to egress drills in schools, etc.

1102. Drills should be held frequently to be effective.

1103. Fire is always unexpected. Drills should be so arranged that they will ensure orderly exit under the unusual conditions obtaining in case of fire. For this reason drills should be habitually held in unexpected ways and at unexpected times. If the drill is always held in the same way at the same time it loses much of its value, and when for some reason in actual fire it is not possible to follow the usual routine of the fire exit drill to which occupants have become accustomed confusion and panic may ensue. Drills should be carefully planned to simulate actual fire conditions. Not only should they be held at varying times, but should use different means of exit, assumption being made, for example, that some given stairway is unavailable by reason of fire or smoke, all the occupants being led out by some other route. Fire exit drills should be designed to familiarize the occupants with all available means of exits, particularly outside stairs and other emergency exits that are not habitually used during the normal occupancy of the building.

1104. In order to secure proper order and control it is essential that the plan and conduct of the drill be in the hands of responsible persons competent to exercise leadership, who have been carefully schooled in what to do in case of fire emergency.

1105. Satisfactory fire exit drills depend upon some suitable fire alarm system, which should be in accordance with Section 10. The fire alarm should be regularly used as the signal to start the fire exit drill.

1106. Fire fighting should always be made secondary to life safety. Where there is a regularly organized private fire brigade instructions should be given to defer any fire fighting operations that might interfere with prompt and orderly exit until after buildings are vacated. Especial emphasis should be laid on not obstructing lines of exit by means of fire hose laid across stairways, and not blocking open protecting fire doors by hose lines, until all occupants are out of danger.

1107. The usefulness of a fire exit drill and the extent to which it can be carried depends upon the character of the occupancy, it being most effective in occupancies where the population of the building is under discipline and subject to habitual control. For example, schools offer possibilities of more highly developed and valuable fire exit drills than other types of occupancy.

1108. In buildings where the population is of a changing character and not under discipline, for example, in hotels or in department stores,

no regularly organized fire exit drill, such as that which may be conducted in schools, is possible. In such cases the fire exit drills must be limited to the regular employees who, however, can be thoroughly schooled in the proper procedure and can be trained to properly direct other occupants of the building in case of fire. In occupancies such as hospitals, no regularly constituted fire exit drill is practicable. Here again, however, the regular employees can be rehearsed in the proper procedure in case of fire; such training always is advisable in all occupancies whether or not regular fire exit drills can be held.

1109. The following suggested Exit Drill plan (§1110) describes an organization and procedure suitable for a large industrial establishment. This plan may be modified to suit other occupancies and smaller buildings.

A suggested plan for fire exit drills in hospitals, sanitariums, and corrective institutions will be found beginning at §1150, and for fire exit drills in schools, §1170. Drills in other occupancies not specifically covered may be organized in accordance with the general principles herein given.

Suggested
EXIT DRILL CODE
for Industrial Establishments.

1110. Exit drills are intended for the protection and safety of the occupants of buildings, and in order to make them effective every person taking part must realize his or her own responsibility and assist in conducting them in an orderly manner.

Exit drills shall be conducted once in every calendar month and all occupants shall participate therein, unless otherwise specified in the occupancy sections of this code.

Organization.

1111. Every establishment shall appoint, train and maintain the following organization for the purpose of conducting exit drills:

Chief of Exit Drill	Searchers
Floor Chiefs	Monitors
Room Captains	Inspector
Exit Guards	

Where two or more establishments jointly occupy a building wherein exit drills are required, the several establishments shall confer together and select two employees who shall be designated as chief of exit drill and assistant chief of exit drill respectively. They shall have the same duties as provided for those officers in establishments which are sole occupants of a building. Each particular establishment within such a building shall appoint their own floor chiefs and room captains, etc., whose duties shall be the same as provided for those positions in establishments which are sole occupants of a building.

Duties.

1112. CHIEF OF EXIT DRILL. He will have general charge of all matters pertaining to exit drills and organization; fix the time for holding drills; enforce disciplinary measures for failure on the part of occupants to observe rules or requirements; see that overcrowding in rooms or elsewhere is prevented and that sufficient space is given to aisles and passage-

ways to permit quick access to all of the exits. He shall supervise the building alarm system. (§1002)

(*a*) He shall prepare and have conspicuously posted on each floor of each building a notice of the schedule of evacuation and the duties of occupants in case of an alarm.

(*b*) He shall make a survey of the building to determine the capacity of all exit facilities in accordance with the requirements of this Code.

(*c*) He shall make a census of the regular occupants of the building and estimate the maximum number of visitors by rooms and floors in order to determine whether the required means of egress are adequate.

(*d*) If the results of the survey and census show that the egress facilities are inadequate he shall advise the proper authorities of such discrepancy and indicate measures which would bring them up to the standards of this Code.

(*e*) He shall assign at least two exits for the occupants of each room in accordance with facts developed in the survey and the results of actual tests of exit time required. One of these should be the regular entrance.

(*f*) If possible, one or more exits should be reserved as entrances for firemen.

(*g*) He shall assign elevators to certain floors depending upon the building alarm signal given.

(*h*) When changes are made in the occupancy conditions he shall make such changes in the assignment of exits as may be necessary.

(*i*) He will notify all members of the drill exit organization regarding the general plan of exit assignment and the details pertinent to their specific duties, and examine them orally as to their familiarity therewith, going over the ground when necessary.

(*j*) He shall be responsible for planning the shutting off of electricity, power, gas, oil, etc., in case of alarm or fire.

NOTE. This position is differentiated from that of Chief of Fire Brigade, as the duties of the two officers have opposite purposes; one conducts persons away from the scene of a fire, while the other assembles men and apparatus to fight fire.

1113. FLOOR CHIEF: He shall have immediate charge of all occupants on his floor in all matters pertaining to exit drills. He shall be responsible for the enforcement of rules and will report infractions to the chief of exit drill.

(*a*) He shall personally supervise the sounding of the general building alarm on his floor, and see that each movement corresponding to alarm signal is promptly and properly executed.

(*b*) He shall be responsible for the condition of all aisles and passageways, and shall see that chairs, benches and stock in transit are promptly removed to insure unobstructed passageways.

(*c*) He shall select and designate the exits to be used by the occupants on his floor.

NOTE. It is required that he instruct the occupants in the use of all means of egress so that they will be familiar with all routes.

1114. ROOM CAPTAINS: Whenever floors are subdivided into two or more rooms there shall be room captains in each room who will see that each movement corresponding to the alarm signal is promptly executed. He will report to and obey the floor captain on his floor.

NOTE. Assistants should be designated for each of these positions capable of assuming the full duties thereof and in sufficient number to insure adequate supervision of exit drills in all parts of buildings. In large rooms it is advisable to have an Assistant Room Captain for every 50 occupants.

1115. EXIT GUARDS: Guards are subject to the orders of the floor chief or room captains. They shall see that the march from the rooms and in stairways is orderly, without crowding and at uniform speed, with careful observance of spacing between files; they shall be especially watchful to prevent stumbling, trampling or conditions which would require halting of exit march.

(*a*) Guards shall be stationed as follows: (1) One guard on the room side of exit door who shall see that it is opened promptly after the first signal and is kept open until all the occupants have left the room and then that it be closed; (2) at horizontal exit doors, in corridors and on stairway landings or turns. Guards will follow in the rear of the exit column and assist stragglers.

1116. SEARCHERS: There should be at least one man and one woman searcher on each floor. Upon sounding of building alarm they shall visit the toilet rooms and any rooms used and frequented by their sex in which there may be occupants who cannot hear the signal. They shall look out for any people who may become hysterical and faint. They shall leave the floor as soon as possible after the last squad leaves.

1117. MONITORS: Monitors shall have charge of squads of occupants, not to exceed 30 in any one squad; they shall see that the members of their squad quickly form in line, two abreast; they shall cause visitors in their territory to fall in with their squads. Monitors shall march at the head of their squads to the room exit assigned and then lead the march through corridors and stairways as directed by the exit guards.

(*a*) When directed to the sidewalk, monitors shall preserve squad formations and lead them a safe distance away from the building.

(*b*) When the proper signal is given, they shall return to their respective floors at the head of their squads.

(*c*) Monitors shall see that those in their charge conduct themselves in an orderly manner. They shall see that aisles and passageways are cleared of obstructions.

1118. INSPECTOR: He shall report to and obey the chief of exit drill. He shall examine each morning the condition of all doors, stairways, fire escapes and roof exits, if any, and report immediately to the chief of exit drill any obstructions or other unusual conditions. He shall test the building fire alarm system. (See par. 1003.)

1119. SUBSTITUTES: There shall be a substitute assigned to cover every position in the exit drill formation except the position of exit guards, for which there shall be one substitute for every two persons regularly assigned.

Selection of Personnel.

1120. The chief of exit drill should be some one whose position commands respect and insures compliance with all orders and instructions relating to exit drills. Previous fire department or military experience is desirable.

(*a*) Floor chiefs should be men or women in responsible positions who have the trust and confidence of their associates, are self-possessed and capable of speaking the language of the occupants on their floors.

(*b*) Room captains should possess qualifications similar to those of floor chiefs.

(*c*) Exit Guards should be strong men, alert, cool headed and capable of acting quickly in emergencies.

(*d*) Searchers should be strong, cool headed men and women.

(*e*) Monitors should be selected from among the occupants for their fitness as leaders and disciplinarians.

(*f*) Inspectors should be active men, preferably those who have had fire department experience. In large establishments they should be uniformed.

Drill Exercises.

1121. The course of action to be followed by any persons discovering fire shall be to—

1. Warn others who are or may become endangered, utilizing the available alarm system or such other means as may be at their disposal.

2. Notify public fire department or regularly organized fire brigade using alarm box if available.

3. Proceed in accordance with assigned duties in evacuation of occupants or use of fire fighting equipment.

For obvious reasons, drill exercises should follow the same routine, although sounding of public fire alarm may be simulated instead of actual. In large establishments where the discharging of crowds upon sidewalks might cause uninformed persons to turn in an alarm, under the impression that there was actual fire, arrangements should be made to notify the local department regarding the time and place of exit drills.

1122. It is advisable that the alarms announcing drills should originate on different floors in order to afford practice in changing the order of procedure for possession of stairways; excepting that drill evolutions may be so arranged as to take advantage of the additional time required for the descent of those from the upper floors by dismissing such of the lower floors as would not delay the egress of the former.

1123. The marching speed should not exceed 130 steps per minute, without running.

Signals.

1124. FIRE ALARM (see 1017): The building alarm will sound simultaneously throughout each building and may be so designed that it will indicate the general locality of the fire.

(*a*) DRILL GONGS OR BELLS: These gongs or bells shall be hand operated on each floor by the floor chiefs or in each room by the room captains; signals consisting of single taps being employed to regulate exit drill movements.

(*b*) ARM SIGNALS: These will be used to regulate line movements.

1. FORWARD—Raise the right arm vertically above the head;

2. MARCH—Lower in the direction to be followed by the line.

HALT—Extend both arms horizontally across the line of march, holding this position until signal is obeyed.

(*c*) Upon the first stroke of the building alarm all occupants will immediately cease work and as far as possible shut off power to machines and gas or other open flames, close doors and windows which are not to be used as exits. Thereafter each succeeding movement will be announced by single strokes on smaller bells or drill gongs sounded by the floor chief or room captain.

(*d*) **First Stroke of the Drill Gong:** Each occupant will remove any stock, chairs or benches nearest him in the aisles, placing same either under or on top of the work table, machine or desk.

(*e*) Second Stroke: Squads will form double lines facing the exit to be used, each couple joining hands and monitors will take positions at ends of lines nearest exit.

(*f*) Third Stroke: Signal for lines to move with their respective monitors to the door of exit passage. Each file will move forward, observing a one-pace interval on the level and allowing one clear stair tread between files on stairways. The subsequent line movements will be controlled by arm signals of either the room captain or floor chief. After leaving room, movement will be directed by arm signals of exit guards.

Elevators.

1125. Elevators should be reserved for the use of the aged and decrepit who shall be conducted thereto by exit guards.

Upon the first sound of the building alarm elevator attendants shall discharge their passengers at the street level and take their cars to the floor indicated or previously assigned and hold themselves subject to the orders of the floor chief.

1126. POWER PLANT: Upon the first sound of the building alarm the power plant engineer shall shut off power to machines and shafting throughout the building, excepting in cases where it would affect the operation of the fire pumps, elevators or lighting system.

1127. The following is a recommended form of notice to be posted in establishments and read by or to each new occupant:

EXIT DRILL INSTRUCTIONS.

Exit drills are intended for the safety of all occupants of this building and each employe should assist in successfully conducting the drills, realizing that their safety and that of the visiting public is greatly increased thereby. The stronger should assist and encourage the less vigorous or more timid.

Organization.

The Chief of Exit Drills is in immediate command when fire alarm signals sound.

Floor Captains are in direct control of each floor and their instructions should be carefully obeyed.

Floor Captains will designate when and by what exit you are to leave the building. Wait until you receive his command to march.

Follow your monitors.

In the Event of Fire.

Notify others in the building of the danger by the quickest method available.

Immediately send in alarm by operating nearest interior fire alarm box.

Telephone without delay fire headquarters and send in alarm from auxiliary box, or nearest city fire alarm box.

When Alarm Apparatus Sounds in Workroom.

Operatives must:

Stop work.

Shut off power.

Stop machines.

Shut off gas and other open flames.

Close doors and windows opening upon or under fire escapes (excepting those to be used as exits).

Put chairs, stools and other obstructions on top of or under benches to clear the passageway.

Form line promptly with front of column facing the usual egress aisle and wait word of command or signal from Floor Captain.

At Command of March.

March in rapid, orderly manner from building, two abreast as instructed, not crowding upon the couple immediately in front of you, following your monitor.

Preserve the interval in line between yourself and couple in front of you.

Retain formation until dismissed or the line is returned to building.

Women and children always have the right of way.

DON'T

Don't run.

Don't lag behind, breaking up columns.

Don't scream or make unnecessary noise.

Don't laugh or talk.

Don't cause confusion.

Don't remain in toilet or dressing room.

Don't return for your clothing.

Don't try to use elevators.

Don't attempt to leave place in line until you return to the building.

Don't attempt to leave building except in accordance with exit drill regulations.

Don't fail to assist in carrying out instructions.

All exit doors must be kept unbolted and unlocked during working hours.

Suggested

FIRE EXIT DRILLS FOR HOSPITALS, SANITARIUMS, and CORRECTIVE INSTITUTIONS.

(See also Section 24)

1150. As outlined in §2401 and §2402, safety to life in buildings housing sick, infirm and restrained patients is predicated upon fire-safe construction, fire prevention and protection, adequate and competent personnel, and proper exits.

Such occupancies comprise, in large part, varied degrees of physical disability, and removal to the outside, or even disturbance by moving is inexpedient or impracticable in many cases, except as a last resort. Similarly, recognizing the operating necessity for restraint of the insane and incorrigible (oftentimes by use of barred windows and locked doors) exit drills are usually extremely disturbing, detrimental, and frequently impracticable.

In most cases fire and exit drills as ordinarily practised in other occupancies cannot be conducted in hospitals and institutions. Fundamentally, superior construction, early discovery of incipient fires, prompt notification, and first-aid appliances must be relied upon to reduce the occasion for evacuation of buildings of this class to a minimum.

Penal and corrective institutions housing those able to walk do not come within the scope of the Hospital fire drill. For them, discipline is such that habitual control of the occupancy admits of excellent exit drills along the lines recommended in other sections for industrial establishments or schools. Reformatories and asylums should employ a combination of the two drills, depending upon the age of the occupants and the proportions of manual and educational training. All infirmary sections, sick bays, maternity wards, etc., of such institutions should, however, conform to the drill code for hospitals.

1151. Overcrowding in such buildings has a direct bearing on the probability of fire as a hazard to life. Similarly, insufficiency of employees and of attendant supervision decreases the possibility of discovery of fire and transmission of alarm, contributes to panic, and precludes the orderly conduct of fire drills.

1152. The practice of leaving an entire building in the hands of a single member of the staff and a few attendants or nurses is deplored. Leave of absence and "off duty" are not recognized as arguments for the diminution of attendant corps, as commonly practised. Peculiarly enough, overcrowding and lack of attendants are often contemporary. In a crisis, this combination may disorganize the best laid plans for fire and exit drills.

Alarms (See also Section 10).

1153. In case of fire drill audible alarms may be wholly or partly surpressed by the intervention of the superintendent in charge where gongs, sirens, whistles or bells may disturb hospital patients. The person charged with transmitting the alarm in the drill should, however, in all cases go through the motions of transmitting an actual fire alarm.

Considerable use is made in large institutions of a whistle or a siren in the central power plant, in connection with the fire alarm system, to ring out the box location of alarm, and to summon aid from distant points. Where the physical and mental condition of occupants is not such that they are deemed likely to be objectionably affected by the sound of such a siren if used daily to indicate time at regular intervals, its use for fire alarm and fire drill has certain advantages; otherwise, alarm systems should be so designed that initial fire signals will sound only in departmental offices, engine room, fire brigade stations and other central locations, with provisions whereby authorized persons may send subsequent signals to sound a general alarm.

1154. Hospitals should be patrolled at regular intervals, the person charged with this responsibility visiting all parts of the premises including closets, attics, etc. for the purpose of discovering fire in its incipiency.

Fire Marshal in Charge of Drills.

1155. The marshal or institution fire chief in charge of fire drill procedure should be a fireman of experience, possessed of those qualifications

demanding respect and attention, and capable of performing his diverse duties with alacrity and intelligence.

NOTE: Depending somewhat upon the character of buildings, their size and the type of patients housed, the importance of this position should not be underestimated. An ardent and conscientious fire fighter, receiving the cooperation of the staff in his work, adds materially to the safety of the occupants.

1156. DUTIES OF THE FIRE MARSHAL.

(a) He shall be responsible for the location and sufficiency of first aid fire-fighting appliances, and, by regular inspection, shall supervise their repair and maintenance. He shall instruct all employees, including the staff, in the actual handling of extinguishers and in the actual extinguishment of prepared bonfires to acquaint the personnel with their proper use, and to discourage any misgivings concerning handling such appliances.

(b) He shall, by instruction and direction, educate all employees in the purpose and use of the fire alarm system and in the fire drill (and exit drill, if any) in response to alarms.

(c) The method of handling hose lines from interior standpipes should be demonstrated to and practised by all male employees in the separate buildings, and, where chemical tanks or carts are employed, their proper use and handling should be explained and drilled. In cases where water casks and buckets may serve to advantage, bucket brigade drills should be practised.

NOTE: The extent of free brigade practice and drill, and the locations for its performance should not interfere with essential hospital routine. The superintendent should carefully study and consider this problem in cooperation with the fire marshal. Unless otherwise specifically designated, the methods of fire-fighting shall conform to the recommendations of the National Fire Protection Association for Private Fire Brigades. This does not necessarily embrace the operation of organized local or municipal fire departments.

(d) The fire marshal shall make regular inspections of attics, basements, wards, closets and storage spaces, with power to order the removal of unnecessary accumulations of combustibles and to remove all egress obstructions and fire hazards, both structural and operative.

(e) The fire marshal shall note all repairs necessary to fire doors, exit doors, ramps, stairs and other means of egress. Cooperating with the engineer, he shall check up and maintain adequate water supply to sprinkler systems, standpipes, etc., recording for repair all leaks and deficiencies coming to his attention.

Exit Drills.

NOTE: Attention is called to the requirements of §2431 to §2449 of the Section on Hospitals, which recommends and in some cases requires facilities for egress in a lateral direction and which prohibits outside exit stairs, fire escapes and slide escapes. (See also §1150.)

1157. Due to the generally low ratio of attendants to patients and to the inability to hold regularly practised drills as in other occupancies, no regular or constant designation of those responding to fire alarm can be made. All employees should be schooled in the duties of members of the fire brigade in extinguishment of fire, as monitors to direct walking patients, and as guards for attention to bed patients. The relatively large turnover of employees in this class of occupancy accentuates the importance of constant and regular attention to preparedness in fire prevention and

protection, although no standard rule can be laid down as to the extent to which such drills can be practised.

1158. Convalescent patients should be removed from involved zones lest their curiosity or anxiety hamper fire brigade activity, or cause themselves injury. All sections should be assured of a necessary complement of doctors, nurses, attendants and other employees in reserve in readiness to assist in the transfer of bed patients to less exposed areas or sections.

Procedure in Case of Fire.

1159. The following practice is recommended wherever practicable. Modification of the plan or portions thereof may be necessitated by local conditions. The plan is intended to be applicable to any and all employees. It should be noted that the best laid plans for fire drills in existing buildings of substandard or unsuitable construction cannot be expected to ameliorate deficiencies of construction contributing to fire probability, or the opportunity for fire spread.

1160. DISCOVERY OF FIRE.

(a) The person discovering a fire shall immediately send an alarm from the nearest fire alarm box with the least disturbance and commotion and shall see that all doors adjacent to the fire are closed.

(b) He shall advise another employee of location of fire, who in turn shall confirm the original alarm to the main office, and who shall join the discoverer near the fire.

(c) The discoverer shall immediately return to the scene of fire, if possible, and attempt to extinguish it with first aid appliances available.

Fire Brigade.

1161. Those first responding to the fire, together with the alarmists, constitute the first fire defense. They shall strive to extinguish the blaze with the least confusion and annoyance to adjacent sections. Instructions should be "KEEP YOUR HEAD AND DO NOT QUIT, even though unsuccessful, but endeavor to check spread until arrival of the fire department."

Monitors.

1162. The next arrivals, other than actually engaged in fire fighting, and simultaneously with that work, constitute monitors pro tem. They shall open horizontal exit doors to adjacent sections away from the fire, and conduct ambulant patients immediately thereto. Certain of these monitors shall remain with their charges, in readiness to conduct them still farther distant from the source of danger. Any surplus monitors shall return to check up delinquents and serve as guards in the involved section.

NOTE. Monitors shall be provided with the necessary keys to operate all locks on detention room and wards, ward exits and other egress doors.

Guards.

1163. Other arrivals at the fire are guards whose duty it shall be to reassure and endeavor to quiet bed patients in the immediate zone of fire or smoke, and proceed to move the beds of the more seriously excitable to points of vantage in the event of the need for evacuation. By this time, assistance of monitors should be available, and an adequate force must stand guard for this emergency.

1164. If the fire is uncontrollable, or has developed a bad smoke hazard, all available guards, monitors and firemen shall move patients out

of the sections involved by rolling or sliding their beds or mattresses through horizontal exits or down ramps where available; or, as a last resort, if required by continued fire and smoke spread in the sections vacated, by carrying patients in mattresses down stair towers and to the outside.

FIRE EXIT DRILLS IN SCHOOLS

(See also Section 21)

1170. The following requirements are of necessity, general in scope, as it is appreciated they must apply to all types of schools as well as conditions of occupancies, such as truant schools, schools for mentally defective, the blind, deaf and dumb, colleges and public schools. It is fully recognized that no one code can meet all the conditions of the various buildings involved and it will be necessary for some school authorities to issue supplements to these requirements, but all supplements should be consistent with these requirements.

1171. There shall be at least eight fire exit drills a year. In those climates where the weather is severe during the winter months, it is suggested that weekly drills be held at the beginning of the school term so as not to endanger the health of the pupils.

NOTE: It might be well to hold "practice" drills during inclement or winter weather. Such drills would be held at the regular dismissal time, when the pupils are fully clothed, by using the exit drill alarm signal. With such drills there would be no necessity of a return signal.

1172. Drills should be executed at different hours of the day or evening; during the changing of classes; when the school is at assembly; during the recess or gymnastic periods, etc. In other words, they should be executed at such irregular times as would tend to destroy any possible distinction between drills and actual fires. Cards of instruction should be conspicuously posted describing the procedure of the drills.

1173. If a drill is called when pupils are going up and down the stairways, as during the time classes are changing without any semblance of order, the pupils should be instructed to form in file and immediately proceed to the nearest available exit in an orderly manner.

1174. Exit drill alarm systems should be installed in accordance with the requirements of Section 10 of this code. All exit drill alarms should be sounded on independent signal systems and not on the signal system used to dismiss classes. Instructions in the manner of sounding exit drill signals and sending fire alarms should be given to all pupils so that there will be no delay either in emptying the building or calling the fire department in case of an actual fire. Whenever any of the school authorities determine that an actual fire exists, they shall immediately call the local fire department using the public fire alarm system. (See §1018.) In order that pupils will not be returned to a building which is burning, the recall signal shall be one that is separate and distinct from and cannot be mistaken for any other signals. Such signals may be given by distinctive colored flags or banners. If the recall signal is electrical, the buttons should be kept under lock, the key for which should be in the possession of the principal or some other designated person in order to prevent a recall at a time when there is a fire. Regardless of the method of recall, the means of giving the signal shall be kept under a lock.

1175. As all drills represent an actual fire condition (see §11030) pupils should not be allowed to obtain clothing, after the alarm is sounded, even when in home rooms, on account of the confusion which would result

in forming the lines and the danger of tripping over dragging apparel. In order to avoid congestion around the school building which might interfere with the local fire department, each class or group should move to a predetermined point.

1176. Wherever possible, drill lines should not cross a street or highway, especially where the traffic is heavy. Where necessary for drill lines to cross roadways, hand signals reading 'STOP! SCHOOL FIRE DRILL' shall be carried by monitors to the traffic intersecting points in order to stop traffic during the period of the drill.

NOTE. It is recommended that where drill lines must cross roadways, a police officer, school janitor, or a male teacher acting as a traffic officer be on duty to control traffic during drills."

1177. Every fire exit drill shall be an exercise in school management for principal and teachers. The chief purpose of every drill is complete control of the class so that the teacher will form its ranks quickly and silently, may halt it, turn it or direct it as desired. Great stress shall be laid upon the execution of each drill in a brisk, quiet and orderly manner. Running should be prohibited. In case there are pupils incapable of holding their places in a line moving at a reasonable speed, provisions should be made to have them taken care of by the more sturdy pupils, moving independently of the regular line of march.

1178. Monitors shall be appointed from the more mature pupils to assist in the proper execution of all drills. They shall be instructed to hold open doors in the line of march and assist in every practical manner to create an orderly and perfect drill. There shall be at least two substitutes for each appointment so as to provide for proper performance in case of absence of the regular monitors. The searching of toilet or other rooms shall be the duty of the teachers or other members of the staff. If the teachers are to do the searching, it should be done after they have joined their classes to the preceding lines. If, for any reason, a line becomes blocked, some of the pupils should be countermarched to another exit in order to prevent panic conditions arising as a result of inactivity.

1179. It shall be the duty of principals and teachers to inspect all exit facilities daily in order to make sure that all stairways, doors and other exits are in proper condition. Particular attention should be given to keeping all doors unlocked, having doors closed which serve to protect the safety of paths of egress (such as doors on stairway enclosures) and under no conditions blocked open, keeping outside stairs and fire escapes free from all obstructions and clear of snow and ice, allowing no accumulation of snow or ice or materials of any kind outside exit doors which might prevent the opening of the door or interfere with rapid escape from the building.

Any condition likely to interfere with safe exit should be immediately corrected if possible, otherwise reported at once to the appropriate authorities.

NOTE.

It is intent of the Committee in a future report to add to this section suggested drill codes for the following additional occupancies: Department Stores, Theatres.

Section 12.

LIGHTING AND SIGNS.

Exit Illumination.

1201. All stairways and exits and the passageways appurtenant thereto except as otherwise provided in the several occupancy sections shall be properly illuminated to facilitate egress. Such illumination shall be continuous during the time that the conditions of occupancy require that the exit ways be open or available. Artificial lighting shall be employed at such places and for such periods of time as required to maintain the illumination to the full intensities herein specified.

1202. (a) The floors of exit ways of buildings used for public assembly or congregation, schools, department stores, factories, mills and other occupancies as required by the several occupancy sections (Section 21 and following) shall be illuminated at all principal points such as angles and intersections of corridors and passageways, stairways, landings of stairs and exit doorways to intensities of not less than 1.0 foot-candle and at all other points to intensities of not less than 0.5 foot-candle. (See §2145 for exceptions for schools and §2317 for exceptions for factories, mills, etc.)

(b) In like manner other buildings not excepted from these provisions shall have the floors of exitways illuminated to intensities of not less than 0.5 foot-candle at principal points and 0.2 foot-candle elsewhere.

(c) In auditoriums and other places of assembly where pictures, motion pictures or other projections are made by means of directed light the illumination of the floors of exit ways may be reduced during such period of projection to intensities of preferably not less than one fifth of those specified under §1202 (a). At other times the full intensity of illumination should be as required above (a or b).

NOTE. § 1202 prescribes the minimum intensities of illumination, generally greater intensities should be provided. The additional illumination should be from lights placed alternately with the required emergency lights and supplied from the general lighting circuits or sources or other sources similar to the required emergency lighting sources.

1203. The lighting source shall be arranged to assure continued illumination of all exitways in cases of emergency caused by the failure of the principal lighting of the building. Where electric current is the source of the lighting of buildings used for public assembly or congregation, the emergency lighting shall be from a source independent of that for the general lighting or shall be controlled by an automatic device which will operate reliably to switch the circuit to an independent secondary source in the event of failure of the primary source of current.

1204. The lighting and all control apparatus shall be installed so as to be under the supervision of and controlled only by authorized persons.

Exit Signs.

1205. Exit doors and passageways shall have signs visible from the exit approach indicating the way of egress. For auditoriums or other places of public assembly accommodating 100 persons or more there shall be placed over each door or doorway to be used for egress a sign with the word EXIT in plainly legible letters not less than 6 inches high and with principal strokes of such letters not less than ¾ inch in width. All other places, where so required by the several occupancy sections, shall have each exit door or exit way marked by signs with plainly legible letters

not less than 6 inches high or by internally illuminated signs with letters not less than 4½ inches high. Signs in corridors and other passageways where necessary to indicate the direction of egress shall have the words TO EXIT with a suitable pointer or arrow indicating the way. The lettering shall be of sizes not smaller than required for the exit signs.

Exit signs shall be over doors or exitways and shall be suitably illuminated by a reliable light source giving an intensity of not less than 5 foot-candles on the illuminated surface. Such illumination shall be continuous as required for exit ways. Except where otherwise required by law or ordinance exit signs shall have white letters on a green field or for the internally illuminated types shall have green letters of translucent material in an opaque field. Artificial lights giving illumination to exit signs other than the internally illuminated types shall have screens, discs or lenses of not less than 25 square inches area made of translucent material to show green on the side of approach. The green used for translucent materials shall be of the hue known as signal green or admiralty green.

NOTE. Green is prescribed for exit signs in conformity with the color scheme adopted for traffic signals. Except where otherwise required by law or other compelling circumstance the light source should give a white light for the better illumination of the sign and the vicinity of the exit door.

PART B.

OCCUPANCY EGRESS REQUIREMENTS.

Section 20.

GENERAL REQUIREMENTS.

Introduction.

2000. The following "Occupancy Sections" indicate the manner in which the various standards given in Part A should be applied to the several occupancies. In all cases where there may be differences between the requirements of the Occupancy Sections and those of the various "Engineering Standards" in Part A the provisions of the Occupancy Sections take precedence.

2001. The fundamental principle of the code is to provide exits sufficient to empty buildings promptly in case of fire, and to provide for construction and protection such that buildings may be emptied without danger to life by fire, smoke, or resulting panic. Property damage is not the concern of this code, although many of the requirements for life safety will incidentally contribute towards fire safety for property.

2002. The several Occupancy Egress Sections specify certain minimum standards of construction and protection; buildings not complying with these minimum standards are not considered safe no matter what exit facilities are provided. For buildings which comply with these minimum requirements rules are made specifying the number and character of exits required which vary in accordance with the occupancy and the safety of the building.

2003. Fundamental principles of this Code are that there must always be two ways of escape, exits being as remote from each other as possible, and that there must always be an available exit within a reasonably short distance.

2004. The number of persons allowed on each floor (except ground floors, which are treated separately) is in general determined by the formula given in §2013 which it will be noted varies the relation between the population and the exits in accordance with the occupancy, character of construction, protection and various other features which have bearing on life safety. This formula is applied to all buildings, subject to suitable modifications for special occupancies. It governs the relation between population and exits. In occupancies such as factories where control of the population is possible, the occupants are limited in accordance with the exits. In other occupancies, such as department stores, where no control of the population is possible, the average maximum density of population has been determined by counts and reduced to a figure which represents the most dense population likely to occupy a given area. Exits are then specified accordingly.

2005. The assumptions used in developing the formula §2013 are as follows:

(*a*) Rate of travel down stairways, 45 persons per minute per unit of stairway width.

(*b*) Average capacity of stairway enclosures from floor to floor per unit of stairway width, 15 persons. This is an approximation based on an

average story height of 14 ft., one person standing on every other step of the stairs, and a landing area within the enclosure of 16 sq. ft. per story per unit of stairway width, in which people can stand on the basis of one person for every four square feet.

(c) One third of the stairways unavailable by reason of fire or smoke. On this basis the average capacity per floor of stairway enclosures is reduced from fifteen to ten persons.

2006. The formula §2013 represents a practical compromise between two recognized methods of determining exit capacity. The first is the principle that exits should be sufficient to provide for getting all the people out of a building in some specified maximum time, this being usually two or three minutes in the case of schools, theatres, etc. The other theory is that if the stairways are provided with fire-resistive enclosures the population of the building is safe when once inside the stairway enclosure, that if the stairway enclosures are sufficient to accommodate the entire population of the building there is no need for any time limit of emptying. It is obvious that neither of these principles has unlimited application; the time limit rule, for example, not being applicable to very high buildings of the better type, whereas to require that stair enclosures be large enough to accommodate all or nearly all of the population would not be reasonable for a two or three story building. The results of this formula it will be found approximate the results of a "time of emptying" rule for low buildings and the rule based on the accommodation of the population in the stair enclosure for a higher structure.

GENERAL REQUIREMENTS.

2010. The following general requirements apply to buildings of all occupancies, subject to the detailed specifications of the several occupancy sections. Where there are differences between these general requirements and those of the several occupancy sections following, the provisions of the occupancy sections take precedence for the specific occupancies to which they apply.

NOTE. Each occupancy section will be found to be complete in itself so that except where specific cross references are given it will not be necessary to refer to this section in the application of the code. The primary purpose of this section is to establish (in convenient form for reference) the fundamental principles on which the following occupancy sections are based.

2011. From every building or section there shall always be two ways of escape, exits being as remote from each other as practicable.

2012. The exits shall be so arranged that the maximum travel to reach them is as follows:

High hazard occupancy,	75 ft.
Moderate hazard occupancy,	100 ft.
Low hazard occupancy,	150 ft.

(For classification of occupancy hazard see §§2017-2021.)

2013. The relation between the maximum number of persons on each floor (except the street or ground floor which is treated separately by §2014) and the exits shall be determined by the following formula, subject to the provisions of the several occupancy sections. (In some occu-

pancy sections will be found other formulas derived from this basic formula, which take the place of the formula for the occupancies covered.)

$$N = \frac{A \times B \times C \times D \times E \times F}{H}$$

Where

N=No. of persons permitted on each floor above the first.

[This assumes equal population on each floor; see also §2320.]

A=No. of units of stair width (One unit=22 inches).

[Ramps or other types of exit may be substituted for stairs if desired, subject to the rules applying.]

B—Building Construction
Ordinary .....B=4
Mill or Fire Resistive.....B=5

[This means that a building of mill or fire-resistive construction is entitled to 25% more population for given exits than a similar building of ordinary construction.]

C—Protection of Vertical Openings
Open Stairs .....C=2
Stairs enclosed but other vertical openings not protected .....C=4
Stairs enclosed and all other vertical openings protected .....C=5

[The building with stairways enclosed is entitled to 100% more population for given exits than the building with open stairs, and a building with all vertical openings (such as elevator shafts) as well as stairs enclosed is entitled to 150% greater population than the same building with open stairs.]

D—Automatic Sprinkler Protection
Unsprinklered .....D=1
Sprinklered .....D=2

[The buildings with automatic sprinkler protection may have twice the population for given exits that is allowed in the unsprinklered building.]

E—Horizontal Exits
None .....E=2
One .....E=3
Two or more .....E=4

[For description of horizontal exits see Section 4, and §402 for explanation of credits.]

F—Occupancy
Low Hazard .....F=3
Moderate Hazard .....F=2
High Hazard .....F=1

[These values of F show the relative populations permitted for given exits under the three occupancy classifications. See §§2017-2021.]

H=Height of building in stories

[As this factor works out in the formula, if a two-story building were of such size as to require two stairways, a similar three-story building of the same occupancy would require three stairways, a four-story building four stairways, etc.]

Make separate calculation for floors below grade and in such cases for basement use value H=3. For sub-basement H=5.

[A basement is considered to have the same life hazard as the third story, and a sub-basement the same hazard (and accordingly the same exits) as the fifth story.]

But N shall never be less than 10 A, provided that the stairs are enclosed.

[This means that in high buildings where the number of required stairways increases with the height, it is not required to provide additional stairways beyond the point where all the population can be accommodated in the stairway enclosure.]

It is intended that any given stairway may be used as a required exit from all the floors which it serves. If for example the third story of a building is required by the formula to have three stairways, and the second story two stairways, the second floor may utilize the stairways also serving the third floor, so that the total number of stairways required will be three, not five.

For table giving results of this formula see §2022.

NOTE. It should be noted that the absolute values of the factors B, C, D, E, and F have no significance. The ratio between them is what counts.

2014. The street or ground floor exits shall be determined by the following formula. (In some occupancy sections will be found other formulas, derived from this basic formula, which take the place of this formula for the occupancies covered):

$$N = 60 \times A \times F$$

Where,

N=Maximum number of persons on street or ground floor.
A=No. of units of doorway width. (See §504.)
F—Occupancy. (See §§2017-2021.)
Low Hazard, F=3.
Moderate Hazard, F=2.
High Hazard, F=1.

NOTE. The doors specified by this paragraph are for the first floor population and are in addition to those required at the foot of stairways.

2015. The maximum height of buildings shall be in accordance with the following formula, subject to the provisions of the several occupancy sections.

$$\text{Maximum height} = B+C+2D+E+F-10$$

The terms have the same value as defined in §2013. Basements shall be limited the same as three story buildings and sub-basements the same as five story buildings. Buildings exceeding the height limit shall not be used for any except storage purposes, in the stories above the height limits. But, new or existing buildings of fire-resistive construction, with sprinkler protection and all vertical openings enclosed or protected, may be used for low or moderate hazard occupancy, to any height, provided such buildings over ten stories and used for moderate hazard occupancy shall have horizontal exits.

For tabulation showing results obtained from this formula see §2022.

NOTE. This height limitation is based solely on the safety of the occupants. It is recognized that lower maximum limits will and should be provided by building codes from the standpoint of property hazard, conflagration hazard, light and air, and city planning.

2016. Existing buildings may be allowed one third higher than the height determined by the formula §2015; where this gives a fractional result the nearest whole number shall be taken.

Occupancy Classification.

2017. The hazard of occupancy of buildings shall be determined in accordance with the following paragraphs, subject to the provisions of the occupancy sections applying. (The several occupancy sections in general classify the hazards of the specific occupancies treated.) For some occupancies, such as factories, the hazard of the materials stored or used varies widely and the occupancy classification should be varied accordingly by the enforcing authority.

NOTE. The hazard of the contents of a building is an important factor in life safety and in the exits required. (See §2013.)

2018. Where more than one occupancy classification hazard is found in a single building, the most hazardous occupancy found shall govern exit construction and height requirements, except that where higher hazard occupancies are found on upper floors and lower hazard occupancies are found on lower floors, so that the safety of egress of the population of the lower hazard area will not be endangered by fire in the higher hazard area, exceptions may be made by the enforcing authority.

2019. Low HAZARD occupancies are those having contents which do not ordinarily burn rapidly or with excessive smoke and from which neither poisonous fumes or explosions are to be feared in case of fire.

The following list indicates the types of occupancy coming within this class:

Hospitals.

Schools.

Office Buildings.

Industrial properties with occupancies such as:

Asbestos.
Baking Powder.
Black lead.
Buttons (pearl or bone).
Canneries (for fish, fruit, and vegetables).
Chalk and crayon.
Condensed and powdered milk.
Electrolytic reducing works.
Glass.
Glue, mucilage, paste, and size.
Ivory.
Leather (excluding boots and shoes and japanning or enameling).
Metals (excluding japanning or enameling).
Porcelain and pottery.
Talc and soapstone.
Tanneries (excluding japanning or enameling).

2020. MODERATE HAZARD occupancies are those having contents which are liable to burn with moderate rapidity and to give off a considerable volume of smoke, but from which neither poisonous fumes nor explosions are to be feared in case of fire.

The following list indicates the types of occupancy coming within this class:

Department Stores.

Industrial properties with occupancies such as:

Bags (cloth, burlap, and paper).
Bagging and burlap.
Bakeries.
Baskets.
Belting (canvas).
Boots and shoes.
Buttons (metal or cloth covered).
Canvas.
Cardboard.
Carpets and rugs.
Clothing (woolen).
Cordage.
Furs.

Hair goods.
Horn and combs (not pyroxylin plastic).
Packing houses.
Paper mills.
Printing, lithographing, bookbinding.
Soap.
Textile mills.
Tobacco, cigars, cigarettes, and snuff.
Woodworking (excluding dipping or varnishing).

2021. HIGH HAZARD are those having contents which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of fire.

The following list indicates the types of occupancy coming within this class:

Dry Cleaning Establishments.

Industrial properties with occupancies such as:

Artificial flowers.
Artificial leather.
Carpet linings.
Celluloid.
Cereal mills.
Chemicals of all kinds (except where serious flame, fume, or explosion hazards are not present).
Clothing (cotton).
Cotton batting.
Cotton waste.
Explosives.
Feather renovating.
Feed, flour, and grist mills.
Fireworks.
Japanning or Enameling.
Imitation Leather.
Matches.
Rag sorting (cotton).
Shoddy mills.
Starch mills.
Straw goods.
Varnish.
Woodworking (with dipping or varnishing).

Tabulation.

2022. For convenience the formulae of §§2013 and 2015 are expressed in the following table which gives the number of persons allowed on each floor per unit of stair width (= N/A in the formula). The values given are for buildings within the height limitations. Where no figure appears the building is not permitted by §2015 to be used for any except storage purposes. Where the figure appears in parenthesis this applies to existing buildings only (see §2016). This table may also be used in solving the several formulae for stairways, etc., given in the following occupancy sections, subject to the explanatory notes given in each case.

2022. STAIRWAY AND HEIGHT REQUIREMENTS

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Ordinary	Open	None	2		**16**	**16**	**32**	**24**	**48**
			3		**11**	(11)	**22**	**16**	**32**
			4		(8)		**16**	(12)	**24**
			5				(13)		**19**
			6						(16)
			7						(14)
Ordinary	Open	One	2	**12**	**24**	**24**	**48**	**36**	**72**
			3	(8)	**16**	**16**	**32**	**24**	**48**
			4		**12**	(12)	**24**	**18**	**36**
			5		(10)		**19**	(14)	**29**
			6				(16)		**24**
			7				(14)		(21)
			8						(18)
Ordinary	Open	Two or More	2	**16**	**32**	**32**	**64**	**48**	**96**
			3	**11**	**21**	**21**	**43**	**32**	**64**
			4	(8)	**16**	**16**	**32**	**24**	**48**
			5		**13**	(13)	**26**	**19**	**38**
			6		(11)		**21**	(16)	**32**
			7		(9)		(18)	(14)	**27**
			8				(16)		(24)
			9						(21)
Ordinary	Stairs Enclosed but Other Vertical Openings not Protected	None	2	**16**	**32**	**32**	**64**	**48**	**96**
			3	**11**	**21**	**21**	**43**	**32**	**64**
			4	(10)	**16**	**16**	**32**	**24**	**48**
			5		**13**	(13)	**26**	**19**	**38**
			6		(11)		**21**	(16)	**32**
			7		(10)		(18)	(14)	**27**
			8				(16)		(24)
			9						(21)

2022. STAIRWAY AND HEIGHT REQUIREMENTS (Continued)

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Ordinary	Stairs Enclosed but Other Vertical Openings not Protected	One	2	24	48	48	96	72	144
			3	16	32	32	64	48	96
			4	12	24	24	48	36	72
			5	(10)	19	19	38	29	58
			6		16	(16)	32	24	48
			7		(14)	(14)	27	(21)	41
			8		(12)		(24)	(18)	36
			9				(21)		(32)
			10						(29)
			11						(26)
Ordinary	Stairs Enclosed but Other Vertical Openings not Protected	Two or More	2	32	64	64	128	96	192
			3	21	43	43	85	64	128
			4	16	32	32	64	48	96
			5	13	26	26	51	38	77
			6	(11)	21	21	43	32	64
			7	(10)	18	(18)	36	28	55
			8		(16)	(16)	32	(24)	48
			9		(14)		(28)	(21)	43
			10				(26)		(38)
			11				(23)		(35)
			12						(32)
Ordinary	Stairs Enclosed and All Other Vertical Openings Protected	None	2	20	40	40	80	60	120
			3	13	27	27	53	40	80
			4	10	20	20	40	30	60
			5	(10)	16	16	32	24	48
			6		13	(13)	27	20	40
			7		(11)	(11)	23	(17)	34
			8		(10)		(20)	(15)	30
			9				(18)		(27)
			10						(24)
			11						(22)

2022. STAIRWAY AND HEIGHT REQUIREMENTS (Continued)

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Ordinary	Stairs Enclosed and All Other Vertical Openings Protected	One	2	30	60	60	120	90	180
			3	20	40	40	80	60	120
			4	15	30	30	60	45	90
			5	12	24	24	48	36	72
			6	(10)	20	20	40	30	60
			7	(10)	17	(17)	34	26	51
			8		(15)	(15)	30	(23)	45
			9		(13)		(26)	(20)	40
			10				(24)		(36)
			11				(22)		(33)
			12						(30)
Ordinary	Stairs Enclosed and All Other Vertical Openings Protected	Two or More	2	40	80	80	160	120	240
			3	27	53	53	107	80	160
			4	20	40	40	80	60	120
			5	16	32	32	64	48	96
			6	13	27	27	53	40	80
			7	(11)	23	23	46	34	69
			8	(10)	20	(20)	40	30	60
			9		(18)	(18)	36	(27)	53
			10		(16)		(32)	(24)	48
			11		(15)		(29)	(22)	(44)
			12				(27)		(40)
			13						(37)
Mill or Fire Resistive	Open	None	2	10	20	20	40	30	60
			3	(7)	13	13	27	20	40
			4		10	(10)	20	15	30
			5		(8)		16	(12)	24
			6				(13)		20
			7				(11)		(17)
			8						(15)

2022. STAIRWAY AND HEIGHT REQUIREMENTS (Continued)

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Mill or Fire Resistive	Open	One	2	15	30	30	60	45	90
			3	10	20	20	40	30	60
			4	(8)	15	15	30	23	45
			5		12	(12)	24	18	36
			6		(10)	(10)	20	(15)	30
			7		(9)		(17)	(13)	26
			8				(15)		(23)
			9						(20)
Mill or Fire Resistive	Open	Two or More	2	20	40	40	80	60	120
			3	13	27	27	53	40	80
			4	10	20	20	40	30	60
			5	(8)	16	16	32	24	48
			6	(7)	13	(13)	27	20	40
			7		(11)	(11)	23	(17)	34
			8		(10)		(20)	(15)	30
			9				(18)		(26)
			10						(24)
			11						(22)
Mill or Fire Resistive	Stairs Enclosed but Other Vertical Openings not Protected	None	2	20	40	40	80	60	120
			3	13	27	27	53	40	80
			4	10	20	20	40	30	60
			5	(10)	16	16	32	24	48
			6		13	(13)	27	20	40
			7		(11)	(11)	23	(17)	34
			8		(10)		(20)	(15)	30
			9				(18)		(27)
			10						(24)
			11						(22)

2022. STAIRWAY AND HEIGHT REQUIREMENTS (Continued)

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Mill or Fire Resistive	Stairs Enclosed but Other Vertical Openings not Protected	One	2	30	60	60	120	90	180
			3	20	40	40	80	60	120
			4	15	30	30	60	45	90
			5	12	24	24	48	36	72
			6	(10)	20	20	40	30	60
			7	(10)	17	(17)	34	26	51
			8		(15)	(15)	30	(23)	45
			9		(13)		(26)	(20)	40
			10				(24)		(36)
			11				(22)		(33)
			12						(30)
Mill or Fire Resistive	Stairs Enclosed but Other Vertical Openings not Protected	Two or More	2	40	80	80	160	120	240
			3	27	53	53	107	80	160
			4	20	40	40	80	60	120
			5	16	32	32	64	48	96
			6	13	27	27	53	40	80
			7	(11)	23	23	46	34	69
			8	(10)	20	(20)	40	30	60
			9		(18)	(18)	36	(27)	53
			10		(16)		(32)	(24)	48
			11		(15)		(29)	(22)	(44)
			12				(27)		(40)
			13						(37)

2022. STAIRWAY AND HEIGHT REQUIREMENTS (Continued)

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Mill or Fire Resistive	Stairs Enclosed and All Other Vertical Openings Protected	None	2	25	50	50	100	75	150
			3	17	33	33	67	50	100
			4	13	25	25	50	38	75
			5	10	20	20	40	30	60
			6	(10)	17	17	33	25	50
			7	(10)	14	(14)	29	21	43
			8		(13)	(13)	25	(19)	38
			9		(11)		22[1]	(17)	33
			10				20		30[2]
			11				(18)		27
			12						25
			13						23
			14						21
			15						20[3]
Mill or Fire Resistive	Stairs Enclosed and All Other Vertical Openings Protected	One	2	38	75	75	150	113	225
			3	25	50	50	100	75	150
			4	19	38	38	75	56	113
			5	15	30	30	60	45	90
			6	13	25	25	50	38	75
			7	(11)	21	21	43	32	64
			8	(10)	19	(19)	38	28	46
			9		(17)	(17)	33	(25)	50
			10		(15)		30[3]	(23)	45
			11		(14)		27	(20)	41[4]
			12				25		38
			13				23		35
			14				21		32
			15				20		30
			16				19		28
			17				18		27
			18				17		25
			19				16		24
			20				15[3]		23[4]

For footnotes see next page.

2022. STAIRWAY AND HEIGHT REQUIREMENTS (Continued)

Construction	Vertical Opening Protection	Horizontal Exits	Height in Stories	No. Persons per Floor, per Unit of Stair Width					
				High Hazard		Moderate Hazard		Low Hazard	
				Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.	Not Sprklr.	Sprklr.
Mill or Fire Resistive	Stairs Enclosed and All Other Vertical Openings Protected	Two or More	2	50	100	100	200	150	300
			3	33	67	67	133	100	200
			4	25	50	50	100	75	150
			5	20	40	40	80	60	120
			6	17	33	33	67	50	100
			7	14	29	29	57	43	86
			8	(13)	25	25	50	38	75
			9	(11)	22	(22)	44	33	67
			10		(20)	(20)	40	(30)	60
			11		(18)	(18)	36[4]	(27)	55
			12		(17)		33	(25)	50[6]
			13				31		46
			14				29		43
			15				27		40
			16				25		38
			17				23		35
			18				22		33
			19				21		32
			20				20		30
			21				19		29
			22				18		27
			23				17		26
			24				17		25
			25				16		24
			30				13		20
			40				10[7]		15[8]

[1] Applies only to fire resistive buildings. For mill construction height limit is 8 stories for new and 11 stories for existing buildings.

[2] Applies only to fire resistive buildings. For mill construction height limit is 9 stories for new and 12 stories for existing buildings.

[3] No height limit for fire resistive buildings in this class. Values in this column above 15 stories are: 16, 17, 18, 19, 20 stories, 19, 18, 17, 16, 15 respectively; 21 and 22 stories, 14; 23 and 24 stories, 13; 25 and 26 stories, 12; 27 and 28 stories, 11; 29 stories or higher, 10.

[4] Applies only to fire resistive buildings. For mill construction height limit is 10 stories for new and 13 stories for existing buildings.

[5] No height limit for fire resistive buildings in this class. Values in this column above 20 stories are: 21 stories, 21; 22 and 23 stories, 20; 24 stories, 19; 25 stories, 18; 30 stories, 15; 45 stories or higher, 10.

[6] Applies only to fire resistive buildings. For mill construction height limit is 11 stories for new and 14 stories for existing buildings.

[7] No height limit for fire resistive buildings in this class. For buildings over 40 stories, number persons per floor per unit stair width = 10.

[8] No height limit for fire resistive buildings in this class. For buildings over 40 stories, values in this column are: 50 stories, 12; 60 stories or higher, 10.

Section 21.

SCHOOLS.

Introduction.

2101. The purpose of this code is to provide exits sufficient to empty school buildings promptly after alarm of fire has been given, and to provide for construction such that buildings may be emptied without danger to life by fire, smoke or resulting panic. Many of the requirements made for life safety will incidentally contribute materially toward fire safety of school building property.

2102. This section does not go into details of stairway construction and other engineering standards, but hereinafter makes reference to the engineering standards sections of the code for such features, covering here only features where variations from the general standards apply to school buildings.

2103. This code gives minimum requirements in all cases; better construction should be used where circumstances permit.

Buildings of low height are recommended because of their greater life safety and should be used where land is available; this code, however, recognizes the necessity for higher buildings in cities and provides accordingly.

New Building Construction. (For Existing Buildings see §§ 2147-2153).

2104. The following requirements (§§ 2105-2120) shall govern construction and limit heights. (See Section 1 for definitions of terms used in describing types of building construction.)

2105. For the purposes of this code, the basement (or "ground story") shall be considered a story if the ceiling is 7½ feet or more above the grade level at any point next to the building.

NOTE. This is to prevent evasion of requirements, e. g. by designating as "two story and basement" a building which from a life safety standpoint is really a three-story building.

2106. All buildings over two stories in height, and two-story buildings if basements are used or usable for any purpose other than the heating plant, shall be of fire-resistive construction.

2107. Buildings of from three to six stories in height (or two to five-story buildings if basements are used or usable for any purpose other than the heating plant) shall have fire-resistive floors, walls and partitions, but trim, finish floor, sash, doors and frames may be of wood, except where otherwise required.

2108. Buildings of more than six stories (and six-story buildings if basements are used or usable for any purpose other than the heating plant) shall be of fire-resistive construction throughout except that finish floor only may be of wood.

2109. The interior wall and ceiling finish in two-story buildings (see § 2107 for higher buildings) and in one-story buildings if basements are used or usable for any purpose other than the heating plant, where hollow wood studded wall and partition construction is used, shall be plaster, or other finish equally smoke-tight. All hollow spaces in wood stud walls or partitions shall be fire stopped at floor lines with incombustible material. Board floors on wood joists shall be double with fire retarding felt or paper between layers. Wood or other combustible finish shall cover only minor portions of the wall surface and where used shall have plaster or equivalent backing (e. g. wood wainscoting prohibited)

2110. In buildings of more than two stories all glass between rooms and corridors shall be wired glass.

2111. All basement walls and partitions shall be of fire-resistive construction.

2112. It is recommended that first floor be entirely of fire-resistive construction.

2113. Floor construction shall be fire resistive immediately above rooms used for manual training, domestic science, kitchens, laboratories, shops, boiler or heater rooms or fuel storage, or other similar occupancy.

2114. Doors to basement rooms of occupancies listed in §2113, leading to stairs, corridors or other lines of exit shall be self-closing, of metal or metal covered, and windows leading to corridors shall be approved wired glass windows with stationary metal frames.

HEATING PLANTS.

2115. All heating plants within school buildings, including fuel storage rooms, shall be completely surrounded by fire-resistive enclosures with self-closing fire doors protecting all openings thereto, except those in exterior walls.

AUDITORIUMS AND GYMNASIUMS.

NOTE. A subsequent section of this code, on places of public assembly, as covering school auditoriums, is now in course of preparation. Pending its completion, the following general recommendations are made. (See also § 2143.)

2116. Gymnasiums, if used for auditorium purposes, shall be classed as auditoriums.

2117. Auditoriums and gymnasiums should preferably be located on the first floor. No required independent exit should be more than four feet below the finished grade, nor, except balcony exits, more than twenty feet above the finished grade.

2118. If an auditorium and gymnasium are both provided in the same building (so that the gymnasium will not be used for auditorium purposes) the gymnasium may be located on any floor, provided the egress facilities are in accordance with the provisions of this code.

LIGHT WELLS AND SHAFTS.

2119. Light wells are not recommended. If provided, they shall be open at the top. If less than 10 ft. in least dimension, they shall be enclosed by walls having fire resistance at least equal to that specified for stair enclosures and shall have wired glass windows in stationary metal frames.

2120. Elevator and dumb waiter shafts shall be constructed of fire-resistive materials at least equal in fire resistance to the required stair enclosures, and all openings shall be provided with approved fire doors (see Section 5) kept normally closed by means of proper hardware. Other openings such as dust and package chutes shall be enclosed or protected in a standard manner. Incinerator chutes shall be so arranged and protected that fire cannot travel back through them.

Number and Location of Exits.

2121. Stairways and other exits shall be provided in sufficient number to comply with the Rules for Determining Required Exits §§2135-2141), and shall also comply with the following requirements.

NOTE. The term "exit" is intended to describe egress secured through one or more openings leading out of doors either directly, through a stairway, or through a way of access to such an opening or stairway, which way is protected by a smoke stop.

2122. Not less than two enclosed inside stairs, or smokeproof towers, remote from each other, shall be provided from every floor, including basements.

2123. Exits shall be so arranged with respect to corridors, passages and stair wells that there are no pockets or dead ends in which pupils might be trapped.

2124. All required stairways shall be located adjoining outside walls and shall open directly outdoors. This requirement shall not, however, be construed as prohibiting vestibules or other protection against cold or storm, provided there is no curtailment of the exit facilities, as herein specified.

2125. Exits shall be so located that at least one stairway or other exit will be within 100 ft. (measured along the line of travel) of the corridor exit door of every room.

Corridors.

2127. Corridors shall be at least 8 ft. wide. Where doors swing into corridors the clear straight width shall not be less than six feet at any point.

NOTE. It is recommended that in elementary schools lockers should not be located in corridors.

Stairway Construction.

2128. Stairs shall be Class A as specified in the section of this code on stairways. (See §§120-125 and preceding general requirements of Section 1.)

No winders shall be permitted on stairs used by pupils irrespective of whether stairs constitute required means of egress.

2129. Wherever stairways are specified in this code, Ramps of the same class (see Section 3) may be substituted. (Ramps are credited with a greater capacity than stairs, see §2136.)

Stairway Enclosures.

2130. All stairs shall be enclosed with enclosures Types Nos. 1, 2 or 3 as specified in the section of this code on Stairways. (See §§135-144.)

DOORS AND SMOKE STOPS.

2131. All doors into stair enclosures shall be of the self-closing type, shall swing with the exit travel and be smoke resistive.

NOTE. By a smoke-resistive door is meant a light door of metal or metal covered or other approved type with clear wired glass panels.

2132. A smoke stop, with double swing door or doors, of smoke-resistive construction as defined by the foregoing note, should preferably be provided across each corridor between each two stairways, and shall be provided one in every corridor of 300 ft. or more in length, and in any case not over 300 ft. apart. (See also §2126.)

In buildings of non-fire-resistive construction not over two stories in height smoke stop doors may be of ordinary wood panel type not less than 1⅜ in. thick with clear wired glass panels.

2133. Doors in smoke stops and in stair enclosures, if kept normally open, shall be provided with fusible link holds or equivalent devices and shall also be provided with friction devices of a type that may be readily disengaged, so arranged that the doors will be released by heat or may be readily released manually.

2134. Exterior doors shall be operated by bars or other panic hardware device. Single leaf doors rather than double are recommended because hardware now available is more satisfactory for single than double doors. If glass is used in doors, it shall be wired glass.

Bars or other panic hardware devices should be of types that are applied to the surface of the door.

The bar or releasing device should extend for three quarters of the width of the door at the latch side.

The bar or releasing device should have a projection of not more than 3½ inches from the face of the door and the space between the bar and the door should be closed or filled with solid panel allowing not more than 1 inch between the back of the panel and the surface of the door.

Upon this panel should be engraved or embossed in large letters "PUSH."

Rules for Determining Required Exits.

2135. EXITS FROM UPPER STORIES. For floors above the first, stairways (or ramps, see §2136) shall be provided conforming with the preceding general requirements, in accordance with the following formula:

$$A = \frac{G \times H}{120 \times B \times C \times D \times E}$$

Where

A=Number of units of stair width (one unit=22 in.,

B—Construction
- Ordinary B=4
- Fire-Resistive B=5

C—Protection of Vertical Openings [All vertical openings must be protected except as requirements are modified for existing buildings by §2159.]
- Open Stairs C=2
- Enclosed Stairs C=5

D—Sprinkler Protection
- Unsprinklered D=1
- Sprinklered D=2

E—Horizontal Exits [See Section 4]
- None E=2
- One E=3
- Two or more E=4

G=Gross area of each floor in sq. ft. For auditoriums and gymnasiums G=6 × net auditorium area. A separate calculation should be made for auditoriums and gymnasiums and exits provided accordingly, in addition to those required for the rest of the building.

H=Height of building in stories

It is intended that any given stairway may be used as a required exit from all the floors which it serves. If for example the third story of a building is required by the formula to have three stairways, and the second story two stairways, the second floor may utilize the stairways also serving the third floor, so that the total number of stairways required will be three, not five.

For table showing the results of this formula for convenience in calculation see §2022 Tabulation, low hazard column. To apply this to the above formula take the gross area of each floor in square feet (plus six times the floor area of auditoriums and gymnasiums), divide by 40 and divide the result by the numerical value found in the table for the particular condition under consideration. The result will be the number of units of exit width required.

NOTE. This provides exits in sufficient number to empty a three-story fire-resistive building with enclosed stairways in about three minutes at the rate of 45 persons per minute per unit of stair width, and assuming that one third of the exits are not used, the population being determined as follows:

Divide gross area by 2 to get net area used for educational purposes and divide by 20 to get number of occupants. (This provides for average population of most crowded schools as shown by counts of typical schools, and is in substantial agreement with various state laws governing school construction.)

Auditoriums and gymnasiums which may be used for auditorium purposes are figured separately on the basis of one person for each 6 sq. ft. of net floor area. (See §2543.)

The numerical values of the several factors above indicate the variation in the stair capacity required for the several conditions of construction and protection. E. g., the values of B indicate that, other conditions being identical, a building of ordinary construction requires 25% more stairs than a fire-resistive building. A building having open stairways requires 150% more stair capacity than a similar building with enclosed stairs, a sprinklered building needs only half as many stairs as an unsprinklered building, one standard horizontal exit decreases the required stair capacity by one third, etc.

This formula is derived from the general formula §2013, the school being taken as an occupancy of low hazard.

2136. Where down ramps are substituted for stairs (§2129) one unit of ramp width shall be considered equivalent to 1½ units of stairway width. (Extra credit does not apply to up ramps.)

2137. The required exits specified by §2135 shall lead by a direct line of travel to the ground.

2138. A unit of stairway width shall be 22 in. All stairways shall be at least 2 units wide. A unit of door width shall be 22 in. but a 40 in. door may be accepted as 2 units.

2139. All stairways from upper floors shall be continuous from the top floor to the ground level, except stairs used exclusively by janitor or other employees.

2140. BASEMENT EXITS. The basement (or "ground story") shall be treated the same as an upper story in accordance with §2135, except that for basements H=3, and exits shall be provided accordingly, either stairs leading to the first story or doors leading directly outdoors.

2141. FIRST FLOOR DOORS shall be provided as follows:

a. One unit of door width for each unit of stairs from upper floors.

b. One additional unit of door width for each unit of required stairs from basement.

c. One additional unit of door width for each 5000 sq. ft. or fraction thereof of gross area of the first floor.

d. One additional unit of door width for each 900 sq. ft. or fraction thereof of floor area of auditoriums and gymnasiums on the first floor.

2142. EXAMPLE. Assume a three story and basement fire-resistive building having stairs enclosed, no horizontal exits and no automatic sprinkler protection, 60 ft. x 125 ft. (= 7500 sq. ft. per floor). Assume that there is an auditorium, 50 x 60 ft., on the first floor, subject to occupancy simultaneously with the other portions of the building. Assume that

there are no independent exits from basement and that the occupants of the basement must use first floor exit doors.

Stairs from upper stories will be, substituting in the formula §2135:

$$\text{No. units stair width} = \frac{7500 \times 3}{120 \times 5 \times 5 \times 1 \times 2} = 3\tfrac{3}{4}.$$

Therefore 2, 2-unit stairways will be required. Stairs from basement (see §2140) by a similar calculation (H=3 in each case) will be 2, 2-unit stairways.

Street floor doors (see §2141) will be

a. To serve stairways from upper floors 4 units.
b. To serve stairways from basement 4 units.
c. To serve first floor, $\frac{7500}{5000} = 1.5$, or 2 units.
d. To serve auditorium, $\frac{50 \times 60}{900} = 3.3$, or 4 units.

Total street floor doors required=14 units.

This street floor door requirement may be satisfied by providing 7, 40 in. doors or other equivalent arrangement. The doors (*a*) and (*b*) should be located at the stairs, the doors (*d*) should lead directly from the auditorium. The doors (*c*) may be at any convenient location, so disposed that the requirement for two ways out of every floor area will be satisfied.

Auditoriums.

2143. (a) For auditoriums and gymnasiums exit facilities shall be provided in general conformity with those hereinbefore specified for other parts of the building.

(b) Where auditorium and gymnasium exits lead through corridors or stairways also serving as exits for other parts of the building the exit capacity shall be sufficient to permit simultaneous exit from auditorium and class room sections, except in case of auditoriums and gymnasiums of types suitable only for use of the school population (and therefore not subject to simultaneous occupancy) in which case the same exit facilities may serve both sections.

(c) Where school auditoriums are designed for general public assembly purposes they shall conform to Section 25 of this code.

Fire Alarm.

2144. Every building shall be equipped with a fire alarm system in accordance with Section 10.

NOTE: Code signals indicating where the alarm originates are not recommended for schools.

Lighting and Signs.

2145. All auditoriums, assembly halls, gymnasiums, stairways, corridors, exits and exitways shall have illumination and signs in accordance with Section 12. All exits and exitways used by pupils shall be illuminated to intensities not less than required by the A.S.A. American Standard Code of Lighting School Buildings (This Code, edition of 1924, requires 1.0 foot-candle).

NOTE. For details of lighting see A.S.A. American Standard Code of Lighting School Buildings.

EXISTING BUILDINGS.

2146. It is recommended that existing buildings be made to conform to the foregoing requirements as far as possible. The following requirements for existing buildings afford a minimum degree of safety for such buildings. Each building should be taken as a special case to be considered on its own merits. In general it will be found that the installation of automatic sprinklers will be the most satisfactory method of compensating for construction deficiencies in existing school buildings.

Building Construction.

2147. The following requirements (§§ 2105-2120) shall govern construction and limit heights. (See Section 1 for definitions of terms used in describing types of building construction.)

a. For the purposes of this code, the basement (or "ground story") shall be considered a story if the ceiling is 7½ feet or more above the grade level at any point next to the building.

NOTE. This is to prevent evasion of requirements, e. g. by designating as "two story and basement" a building which from a life safety standpoint is really a three-story building.

2148. As minimum requirements for existing buildings of two stories or higher where hollow wood studded wall and partition construction is used, the interior wall and ceiling finish shall be reasonably smoke-tight; board floors on wood joists shall be double with fire retarding felt or paper between the upper and lower flooring, except that existing tight double floors may be accepted without fire retarding felt or paper. For such buildings of over two stories the interior wall and ceiling finish shall be plaster or other finish equally smoke-tight and fire retardant. Wood or other combustible finish shall cover only minor portions of the wall surface (e. g. wood stair soffits and wood wainscoating prohibited) and where used, shall have plaster or equivalent backing.

2149. Boiler or heater rooms or rooms used for fuel storage shall in all cases have incombustible or fire-restrictive enclosure walls and floors, with self-closing fire doors protecting all openings thereto, except those in exterior walls, and ceiling protection of cement or gypsum plaster on metal lath or equivalent. Interior windows between boiler or heater rooms or rooms used for fuel storage and corridors used for exits shall be wired glass in stationary sash.

2150. Three-story non-fire-resistive buildings may be accepted provided basements and rooms used for manual training, domestic science, kitchens, laboratories, shops, boiler or heater rooms, rooms used for fuel storage, or similar occupancy, have walls and ceilings finished on the inside with cement or gypsum plaster on metal lath or equivalent fire and smoke-resistive coverings and all hollow spaces in combustible floors, walls, and partitions above and around them firestopped with incombustible material, or if rooms used for such occupancies are completely protected by an automatic sprinkler system installed in accordance with National Fire Protection Association regulations, and properly maintained.

2151. Four-story non-fire-resistive buildings may be accepted if basements are completely protected by automatic sprinklers and rooms of occupancies listed in §2150 and the ceilings under and the walls around the corridors used for exit, are finished on the inside with cement or gypsum plaster on metal lath, or with equivalent fire and smoke-resistive finish and all hollow spaces in combustible floors, walls and partitions around and above are firestopped with incombustible material; or, if the whole building below the top story* is completely protected by an automatic sprinkler system installed in accordance with National Fire Protection Association regulations, and properly maintained.

*NOTE: See Note on following page.

2152. Five-story non-fire-resistive buildings may be accepted if rooms of occupancies listed in §2150 and the ceilings under and the walls around the corridors used for exit, are finished on the inside with cement or gypsum plaster on metal lath, or with equivalent fire and smoke-resistive finish, and all hollow spaces in combustible floors, walls and partitions around and above are firestopped with incombustible material; and in addition the entire building below the top story* is completely protected by an automatic sprinkler system installed in accordance with National Fire Protection Association regulations and properly maintained.

2153. Auditoriums and gymnasiums should preferably be located on the first floor.

Gymnasiums if used for auditorium purposes, shall be classed as auditoriums.

Auditoriums may be allowed above the first floor if provided with proper exits as specified herein, and in the case of location above the second floor (see § 2147 a) if the entire building up to and including the auditorium or gymnasium story is of fire-resistive construction, or of ordinary construction with all walls and ceilings finished with cement plaster on metal lath or equivalent fire and smoke-resistive finish and all hollow spaces in walls and ceilings firestopped with incombustible material; or if in addition to the minimum structural requirements of §2148, the whole building below auditorium or gymnasium level is protected by an automatic sprinkler system, installed in accordance with National Fire Protection Association regulations, and properly maintained.

Number and Location of Exits.

2154. Stairways and other exits shall be provided in sufficient number to comply with the Rules for Determining Required Exits §§ 2135-2141), and shall also comply with the following requirements.

NOTE. The term "exit" is intended to describe egress secured through one or more openings leading out of doors either directly, through a stairway ramp or outside stairway or through a way of access to such an opening or stairway, which way is protected by a smoke stop.

2155. Not less than two exits, remote from each other, shall be provided from every floor, including basements.

2156. Exits shall be so arranged with respect to corridors, passages, and stair wells that there are no pockets or dead ends in which pupils might be trapped.

2157. Exits shall be so located that at least one stairway or other exit will be within 100 ft. (measured along the line of travel) of the corridor exit door of every room.

Corridors.

2159. Corridors shall be at least 8 ft. wide where doors swing into corridors, the clear straight width shall not be less than 6 ft. at any point.

NOTE. It is recommended that in elementary schools lockers should not be located in corridors.

Stairway Construction.

2160. Stairs shall be Class A or B as specified in the section of this code on stairways. (See §§ 120-130 and preceding general requirements of Section 1.)

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*NOTE. It is strongly advised that automatic sprinkler equipments be installed to protect the entire building, including the top story, although sprinklers may be omitted from the top story without seriously affecting the safety of occupants.

No winders shall be permitted on stairs used by pupils irrespective of whether stairs constitute required means of egress.

2161. Wherever stairways are specified in this code, Ramps of the same class (see Section 3) may be substituted. (Ramps are credited with a greater capacity than stairs, see § 2136.)

Stairway Enclosures.

2162. Stairs shall be enclosed with enclosures Types Nos. 1, 2, 3 or 4 as specified in the section of this code on Stairways (see §§ 135-145), as follows:

(a) All basement stairways.
(b) All stairways in buildings of ordinary construction.
(c) Stairways in fire-resistive buildings three stories or more in height.

DOORS AND SMOKE STOPS.

2163. All doors into stair enclosures shall be of the self-closing type, shall swing with the exit travel and be smoke resistive.

NOTE. By a smoke-resistive door is meant a light door of metal or metal covered or other approved type with clear wired glass panels.

2164. A smoke stop with double swing door or doors, of smoke-resistive construction as defined by the foregoing note, should preferably be provided across each corridor between each two stairways, and shall be provided one in every corridor of 300 ft. or more in length, and in any case not over 300 ft. apart.

In buildings of non fire-resistive construction not over two stories in height, smoke stop doors may be of ordinary wood panel type not less than 1⅜ in. thick with clear wired glass panels.

2165. Doors in smoke stops and in stair enclosures, if kept normally open, shall be provided with fusible link holds or equivalent devices and also shall be provided with an electric release connected to the fire alarm system of the building, so arranged that doors will be released either by heat or by an alarm; or, where there is no electric fire alarm system, friction devices (of a type that may be readily disengaged) may be used for holding doors open.

2166. Exterior doors shall be operated by bars or other panic hardware device. Single leaf doors rather than double are recommended because hardware now available is more satisfactory for single than double doors. If glass is used in doors, it shall be wired glass.

Bars or other panic hardware devices should be of types that are applied to the surface of the door.

The bar or releasing device should have a projection of not more the width of the door at the latch side.

The bar or releasing device should extend for three quarters of than 3½ inches from the face of the door and the space between the bar and the door should be closed or filled with solid panel allowing not more than 1 inch between the back of the panel and the surface of the door.

Upon this panel should be engraved or embossed in large letters "PUSH."

Required Exits.

2167. The necessary exit capacity shall be determined by the same rules as for new buildings (§ 2135-§ 2142), except that an existing 42 in. stairway may be accepted as 2 units and a 34 in. stairway as 1½ units.

Where existing stairways do not provide the necessary number of units thus determined, the required capacity may be obtained by adding Class A Outside Stairs (see Section 2, § 215-235). Enclosed Slide Escapes (Section 9), or Class B Outside Stairs (§ 237-§ 249), may be accepted if already installed.

Fire Alarm.

2168. Every building shall be equipped with a fire alarm system in accordance with Section 10.

NOTE: Code signals indicating where the alarm originates are not recommended for schools.

Lighting and Signs.

2169. All auditoriums, assembly halls, gymnasiums, stairways, corridors, exits and exitways shall have illumination and signs in accordance with Section 12. All exits and exitways used by pupils shall be illuminated to intensities not less than required by the A. S. A. American Standard Code of Lighting School Buildings (This Code, edition of 1924, requires 1.0 foot-candle).

FIRE EXIT DRILLS

2180. Fire exit drills shall be conducted in accordance with Section 11.

Section 22.

DEPARTMENT STORES.

Introduction.

2201. The fundamental principle of this code is to specify exits sufficient to empty department store buildings in case of fire and to provide construction and protection such that buildings may be emptied without danger to life by fire, smoke or resulting panic. Property damage from fire is not the concern of this code, although many of the requirements made for life safety will incidentally contribute toward fire safety for department store property.

2202. This section does not go into details of stairway construction and other engineering standards but makes reference to the engineering standards sections of this code for such features, covering here only features where variations from the general standards apply to department store buildings.

2203. This code gives minimum requirements in all cases; better construction should be used where circumstances permit. It applies to both new and existing buildings; for existing buildings certain modifications are specified.

Number and Character of Exits.

2204. No portion of any building or section shall be more than 100 ft. (along the line of travel) from the nearest exit. Exits shall be as remote from each other as practicable. Exits shall be so arranged with regard to floors that there are no pockets or dead ends of appreciable size in which occupants may be trapped.

2205. Not less than two means of exit shall be provided on every floor, including basements, of every building or section. On the street floor at least one of these shall be a door leading directly outside the building and the other shall be a door leading outside the building or a standard horizontal exit. On upper floors and basements, one exit shall be an inside stairway (or smokeproof tower) and the other or others shall be inside stairways (or smokeproof towers), escalators or horizontal exits.

NOTE. The exits required by this rule may also be included as constituting a part of the required exit capacity specified by §§2222-2226 but in no case shall any other provision of this code be construed as waiving this minimum requirement.

2206. Exit capacity as specified by §§2222-2226 shall be secured by providing standard egress facilities in accordance with the several sections of Part A applied and modified as follows (§§2207-2219):

STAIRWAYS:

2207. Stairways and stairway enclosures shall be in accordance with Section 1. Stairs shall be Class A or Class B for new buildings and may be Class C for existing buildings.

2208. In buildings with standard automatic sprinkler protection and not receiving credit for horizontal exits, 50 per cent of the required

stairways may discharge through the main street floor area instead of direct to the street as required by §110.

OUTSIDE STAIRS:

2209. Outside stairs or fire escapes are not accepted as required means of egress for department store buildings.

HORIZONTAL EXITS:

2210. Horizontal exits shall be in accordance with Section 4.

2211. In fire-resistive buildings with standard automatic sprinkler protection, where fire-exit partitions are provided on all stories (and basements) except the street floor, credit may be received for horizontal exits if all required stairways or other exits from upper floors (and basements) are enclosed and discharge directly to outside the building as per §110 and where all vertical openings are enclosed or protected.

DOORS:

2212. Doors shall be in accordance with Section 5. Revolving doors are permitted subject to the restrictions of §§510, 511. (Revolving doors may be used between street floor and street, but not at foot of stairs.)

2213. The distance between adjoining groups of street floor doors shall not exceed 150 ft. The minimum width of any street floor door group shall be 2 units.

AISLES AND CORRIDORS:

2214. Aisles and corridors shall be in accordance with Section 6.

2215. The minimum width of any aisle leading to exterior doors shall be 5 feet, and the total width of aisles running parallel in either direction shall be at least as great as the required width of exit doors toward which the aisles lead.

ELEVATORS:

2216. Elevators, in accordance with Section 7, may constitute required means of egress, subject to the limitations of §701. (May not constitute more than 10 per cent of required means of egress.)

2217. Elevators may discharge through the main street floor area under the conditions specified in §2208, provided that not more than 50% of the total exit capacity of stairs, escalators and elevators discharges through the main street floor area.

ESCALATORS:

2218. Escalators, in accordance with Section 8, may constitute required means of egress, subject to the limitations of §701. (May not constitute more than 25 per cent of the required exit capacity.)

Escalators may discharge through the main street floor area under the conditions specified in §2208, provided that not more than 50% of the total exit capacity of stairs, elevators and escalators discharges through the main street floor area.

SLIDE ESCAPES:

2219. Slide escapes (Section 9) shall not constitute required means of egress for department stores.

ALARMS AND DRILLS:

2220. Alarm systems shall be in accordance with Section 10.

2221. Fire exit drills shall be in accordance with Section 11.

SIGNS AND LIGHTING:

2221. a. Stairways, exits, exitways and places of assembly shall have illumination and signs in accordance with Section 12.

Required Exits.

2222. Units of exit width in accordance with §§2207-2218 shall be provided for each story above the first (see §2223 for second story of two and three story buildings) in the amount determined by the following formula:

$$A = \frac{G \times H}{100 \times B \times C \times D \times E}$$

Where

A=No. of units of width of stairways, ramps, elevators and escalators.

B—Building Construction.
Ordinary, B=4.
Fire Resistive or Mill, B=5.

C—Protection of Vertical Openings.
Open, C=2.
Required exits enclosed,
but other vertical openings open, C=4.
All enclosed, C=5.

D—Sprinker Protection.
Unsprinklered, D=1.
Sprinklered, D=2.

E—Horizontal Exits.
None, E=2.
One, E=3.
Two or more, E=4.

G=Gross Area of each floor in square feet.

H=Height of building in stories.

It is intended that any given stairway may be used as a required exit from all the floors which it serves. If for example the third story of a building is required by the formula to have three stairways, and the second story two stairways, the second floor may utilize the stairways also serving the third floor, so that the total number of stairways required will be three, not five.

NOTE. This formula is derived from the basic formula §2013 (which see for explanation) on the basis of an average maximum population of one person for each 50 square feet of gross floor area of upper floors, and classifying department stores as a moderate hazard occupancy.

A table showing the results of this formula, for convenience in calculation, will be found in §2022, moderate hazard column. For department stores, take area of each floor, in square feet, divide by 50 and divide the result by the numerical value found in the "moderate hazard" column of the table, for the particular condition under consideration. The result will be the number of units of exit width required.

2223. The exits required for the second story of two- or three-story buildings shall be determined by the following formula:

$$A = \frac{G}{25 \times B \times C \times D \times E}$$

Where the terms have the values given in §2222.

NOTE. The difference in treatment of the second story of two- and three-story buildings is because of the denser population found in department stores of the 5 and 10 cent store class.

The tabulation §2022 may be applied in solving this formula in a manner similar to that explained in the §2222 Note, with divisor 25 instead of 50.

2224. The exits required for sales basements shall be determined by the following formula:

$$A = \frac{G \times H}{40 \times B \times C \times D \times E}$$

Where the terms have the same values as given in §2222 except that for stores having one sales basement H=3, and for two sales basements (a basement and sub-basement or basement and basement balcony), H=5.

NOTE. The tabulation §2022 may be applied in solving this formula in a manner similar to that explained in §2222 note, with divisor 20 instead of 50, and story height, 3.

2225. Basements not used for sales shall have exits in accordance with the following formula:

$$A = \frac{G \times H}{200 \times B \times C \times D \times E}$$

Where the terms have the same values as defined in §2222 except that where there is one basement floor level H=3; where there are two basement floor levels H=5; three, H=7, etc.

NOTE. The tabulation §2022 may be applied in solving this formula in a manner similar to that explained in §2222—Note, with divisor 100 instead of 50, and story height 3, 5, 7, etc., respectively where there are 1, 2, 3, etc. basement floor levels.

Street Floor Exits.

2226. Street floor doors (in accordance with §§2212, 2213) shall be provided with number of units of width at least as many as the aggregate number of units of width of stairways, ramps, elevators and escalators constituting required means of egress for upper floors and basements, plus one unit of door width for each 2000 square feet of street floor area.

Protection of Vertical Openings.

2227. Stairways, ramps, elevators and escalators constituting required exits shall be enclosed when required by §2230 in enclosures not less than the following:

For new buildings—Enclosures Nos. 1, 2 or 3 (see §§135-144).
For existing buildings—Enclosures No. 4 (see §145).

NOTE. It is strongly recommended that all stairways, elevator shafts and other vertical openings be enclosed or protected even where not required.

2228. Where protection of vertical openings other than those constituting required exits is required by §2230, such protection shall be at least equal in fire resistance to the enclosures specified by §2227.

2229. *Mezzanine Floors* or Balconies may be permitted without penalty for unprotected vertical opening between mezzanine and floor below, provided there is not more than one mezzanine floor or balcony between complete floors above and below. Where there is a light well or open space piercing two or more stories, the entire building shall be considered to have unprotected vertical openings. Mezzanine floors shall be considered as half a story for the purposes of the exit capacity and height limit formulas except that when the area of the mezzanine is more than 50% of the area of the floor immediately below it, the mezzanine shall be considered a story.

Limitations in Use of Buildings for Department Store Purposes.

2230. The height of buildings of various types of construction and protection shall not exceed the maximum height determined by the formula §2015, with value of F=2 (moderate hazard). See also §2016 for existing buildings.

NOTE. For table showing the results of this formula see §2022 tabulation, moderate hazard column.

Example of Exit Calculation.

2231. Assume a department store building: 50,000 sq. ft. gross area per floor; fire-resistive construction; 7 stories; one sales basement; automatic sprinklers; one standard horizontal exit; all vertical openings protected; enclosed stairs (no smokeproof towers); no escalators; 10 (or more) elevators.

STAIRWAYS FROM UPPER FLOORS, substituting in formula §2222.

$$\text{No. units required} = \frac{50{,}000 \times 7}{100 \times 5 \times 5 \times 2 \times 3}$$
$$= 23.4$$
$$= 24 \text{ units of stairway width.}$$

Elevators (see §702) may constitute 2 units of width, therefore

Required stairways $= 24 - 2 = 22$ units or 11, 2-unit stairways, or 6, 3-unit stairways and 1, 4-unit stairway, or other equivalent arrangement.

These stairways must be so arranged that no portion of the building is more than 100 ft. distant from one of them.

STAIRWAYS FROM BASEMENT, substituting in formula §2224.

$$\text{No. units required} = \frac{50{,}000 \times 3}{40 \times 5 \times 5 \times 2 \times 3}$$
$$= 25$$

This means 11, 2-unit stairways and one, 3-unit stairway, or other equivalent arrangement.

STREET FLOOR DOORS (see §2226).

For stairways (and elevators) from upper floors	24 units
For stairways from basement	25 units
For street floor $\frac{50{,}000}{2{,}000}$ =	25 units
	74 units

This means 37, 40-in. doors or other equivalent arrangement.

Section 23.

FACTORIES.

Introduction.

2301. The fundamental principle of this code is to specify exits sufficient to empty factory buildings promptly in case of fire and to provide for construction such that buildings may be emptied without danger to life by fire, smoke or resulting panic. Property damage from fire is not the concern of this code, although many of the requirements made for life safety will incidentally contribute toward fire safety for property.

2302. This section does not go into details of stairway construction and other engineering standards but makes reference to the engineering standards sections of this code for such features, covering here only features where variations from the general standards apply to factory buildings.

2303. This code gives minimum requirements in all cases; better construction should be used where circumstances permit. It applies to both new and existing buildings; for existing buildings certain modifications are specified.

Number and Character of Exits.

2304. No portion of any building or section shall be more than 75 ft. (along the line of travel) from the nearest exit in buildings of high hazard occupancy (see §§2011-2013), or more than 100 ft. for medium hazard or more than 150 ft. for low hazard. Exits shall be as remote from each other as practicable. Exits shall be so arranged with regard to floors that there are no pockets or dead ends of appreciable size in which occupants may be trapped.

2305. Not less than two means of exit shall be provided on every floor, including basements, of every building or section. On the street floor at least one of these shall be a door leading directly outside the building, and the other may be a door leading outside the building, or a standard horizontal exit. On upper floors and basements, one shall be an inside stairway (or smokeproof tower) and the other or others may be inside stairways (or smokeproof towers), escalators or horizontal exits; or on existing buildings only, outside stairs.

NOTE. The exits required by this rule may also be included as constituting a part of the required exit capacity specified by §2318 but in no case shall any other provision of this code be construed as waiving this minimum requirement.

2306. Exit capacity as specified by §2318 shall be secured by providing standard egress facilities in accordance with the several sections of Part A applied and modified as follows (§§2307-2321):

STAIRWAYS:

2307. Stairways and stairway enclosures shall be in accordance with Section 1. Stairs shall be Class A or Class B for new buildings and may be Class C for existing buildings.

OUTSIDE STAIRS.

2308. Outside stairs or fire escapes are not permitted as required means of egress for new factory buildings, but Class A or Class B outside stairs not exceeding six stories or 70 ft. in height constructed in accordance with Section 2 may be accepted on existing buildings. Existing Class C outside stairs not exceeding 4 stories or 45 ft. in height may be accepted on existing buildings.

HORIZONTAL EXITS:

2309. Horizontal exits shall be in accordance with Section 4.

DOORS:

2310. Doors shall be in accordance with Section 5. Revolving doors shall not be used in factory buildings.

2311. The distance between adjoining groups of street floor doors shall not exceed 150 ft. The minimum width of any street floor door group shall be 2 units.

AISLES AND CORRIDORS:

2312. Aisles and corridors shall be in accordance with Section 6.

ELEVATORS:

2313. Elevators, in accordance with Section 7, may constitute required means of egress, subject to the limitations of §701. (May not constitute more than 10 per cent of required exit capacity.)

ESCALATORS:

2314. Escalators, in accordance with Section 8, may constitute required means of egress, subject to the limitations of §702. (May not constitute more than 25 per cent of the required exit capacity.)

SLIDE ESCAPES:

2315. Slide escapes (Section 9) shall not constitute required means of egress for factories except that for factories of high hazard occupancy (§2013) they may be permitted subject to the limitations of §901.

ALARMS AND DRILLS:

2316. Alarm systems shall be provided in accordance with Section 10.

2317. Fire exit drills shall be in accordance with Section 11.

Signs and Lighting.

2317. a. Stairways, exits, exitways and places of assembly shall have illumination and signs in accordance with the requirements of Section 12, except that the intensity of illumination at principal points such as angles and intersections of corridors and passageways, stairways, stair landings and exit doorways shall be not less than required by the A.S.A. American can Standard, Code of Lighting Factories, Mills and other Work Places. (This Code, edition of 1921, requires 0.5 foot-candles.)

Allowable Number of Occupants.

2318. The number of persons allowed on each floor (except the street or ground floor which is separately treated in §2319) shall be limited in accordance with the formula §2013. (For table showing results of the formula see §2022.)

2319. The number of persons allowed on the street or ground floor shall be limited in accordance with §2014.

2320. Provided that the total number of persons allowed in a building is not exceeded, the number of persons on any individual floor may be increased 50% over the figure given by the formula §2013.

Posting Allowed Capacity.

2321. On each floor and in each section of each building under the jurisdiction of this code there shall be posted the number of employees to be permitted, as determined by the code, and the manufacturing processes permitted or prohibited.

Limitations in Use of Buildings for Factory Purposes.

2322. The height of buildings of various types of construction, protection and occupancy shall not exceed the maximum height determined by the formula §2015. See also §2016 for existing buildings.

Section 24.

HOSPITALS SANITARIUMS AND CORRECTIVE INSTITUTIONS.

Introduction.

2401. The purpose of this section of the Code is to promote life safety from fire in hospitals, sanitariums and corrective institutions. Exits or character of construction alone are not sufficient to provide proper safety for occupants physically or mentally disabled or under restraint. For this reason this section is treated differently from other sections of the Code, and more emphasis is placed upon construction of buildings, fire prevention and fire protection. Horizontal exits are considered of especial value, and relatively greater credit is given to horizontal exits and to ramps than in other sections of the Code.

Safety to life from fire in hospital and institutional buildings requires that the superintendent and staff give attention to and take adequate measures to meet their responsibilities in all details affecting the fire safety of patients, which is often lost sight of where the needs for medical attention and care of patients absorb the attention of those in charge. Those in authority should be made to realize that the protection of the sick and helpless against loss of life by fire or smoke is a responsibility of importance comparable to that of medical attention.

2402. Safety to life in buildings of this occupancy requires,

(a) Proper construction of buildings.

(b) Adequate exits.

(c) Careful housekeeping and protection of fire hazards.

(d) A competent, trained, staff having adequate personnel on duty at all times.

This section of the Code deals only with structural and exit features and the protection of hazards in so far as this can be accomplished by physical safeguards. It should not be inferred that this section of the code will provide safety unless the other features are also properly covered.

NOTE: Careful housekeeping can be relied upon to reduce the number of fires in good buildings. The most rigid discipline with regard to prohibition of smoking may not be nearly so effective in reducing incipient fires from surreptitious smoking as the open recognition of smoking, with provision of suitable rooms for smoking. Proper education and training of the staff and attendant corps in the ordinary fire hazards and their abatement is unquestionably essential. The problem is a broad one, variable with different types and arrangement of buildings, and the effectiveness of rules of procedure, necessarily flexible, depends in large part upon the superintendent in charge.

2403. In institutions, or parts of buildings housing the violently insane, the necessity for locked doors and barred windows on certain rooms and wards is recognized. In such cases reliable means for rapid release shall be provided by remote control of locks, or by other means, and the dependability of such methods assured by proper maintenance and frequent inspection.

NOTE: Attention is called to the rather common condition of multiplicity of diverse key styles and to the seriousness of such a situation during fire panic.

2404. The use of roller casters is recommended for beds in hospital and infirmary sections.

2405. This section does not go into details of stairway construction and other engineering standards, but makes reference to the other sections of the Code for such features, covering here only features where variations from the general standards apply to hospital and institutional buildings. In cases where there are differences between this section and the general provisions of other sections the provisions of this section take precedence for buildings of this class of occupancy.

NEW AND EXISTING BUILDINGS.

2406. This section of the Code applies to both new and existing buildings; for existing buildings less exacting requirements are made. (See