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Installation of

FIRE DOORS AND WINDOWS

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NATIONAL FIRE PROTECTION ASSOCIATION
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National Fire Protection Association

International

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection. Its membership includes national and regional societies and associations (list on outside back cover) and over eighteen thousand individuals, corporations, and organizations. Anyone interested may become a member; the annual dues are $15.00. Full membership information is available on request.

This is one of a large number of publications on fire safety issued by the Association. All NFPA standards and recommended practices, including this text, are prepared by the technical committees of the NFPA and adopted at an Annual Meeting of the Association. They are intended to prescribe reasonable measures for minimizing losses of life and property by fire.

This text and most other NFPA standards and recommended practices are published in the **National Fire Codes,** a compilation of NFPA's official technical material, issued in seven clothbound volumes. Full information on the availability of these Codes and other NFPA publications can be secured from the Association.

Official NFPA Definitions

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters. One foot = 0.3048 meters. One inch = 25.40 millimeters. One pound per square inch = 0.06805 atmospheres = 2.307 feet of water.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The suitability of devices and materials for installation under NFPA standards is indicated by the listing of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada, the Factory Mutual Laboratories and the American Gas Association (gas equipment) test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

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FIRE DOORS AND WINDOWS

NFPA No. 80 — 1961

This Standard on Fire Doors and Windows, adopted by the NFPA on May 18, 1961, supersedes the 1959 edition of NFPA No. 80, Protection of Openings in Walls and Partitions.

History

The Standard for the Protection of Openings in Walls and Partitions can be traced to the early days of the Association. Reports covering various phases of the problems of protectives for openings were submitted to the Association by several committees concerned and adopted in 1897, 1898, 1899, 1900, 1901, 1902 and 1908. In 1911 a standard on Door Openings was presented and adopted, and Rules for Fire Protection Coverings for Openings in Walls and Partitions on the Interior of Buildings were adopted in 1912. In 1915 the existing rules were recodified and rearranged. A new name, the Committee on Protection of Openings in Walls and Partitions, was chosen in 1916. Revisions recommended by the Committee were adopted by the NFPA in 1916, 1917, 1918, 1926, 1927, 1928, 1931, 1937 and 1941. Editions have been adopted and published by the National Board of Fire Underwriters.

In 1955 the name of the Committee was changed to the Committee on Fire Doors and Windows. This 1961 Edition of the Standard, with a similar change in name, contains amendments to the 1959 Edition which was a complete revision of the 1941 Edition.

1961 Changes

Changes, other than editorial, have been made to 407, 408.b, Table I (Horizontal Sliding, Composite Steel Flush Doors added), 503.e, Table II (Exception deleted), 505.b, 505.b.1, Table III, 601, 605.b, 608.h, and 1102.

New material added includes 20.b, 408.b, 415, 608.b, 608.d, 1103, 1105, 1106, 1313 and to captions to Figures 19, 20, 21 and 22.

Editorial revisions were made in 23, 505.b, 608.b(1), 608.e, 609, 1103.a(2)b, and 1333.

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Standard for the Installation of Fire Doors and Windows.

NFPA No. 80

Section 1.

Scope.

10. This standard is intended to cover the installation and maintenance of fire door assemblies, windows, glass blocks and shutters for the protection of openings in walls to restrict the spread of fire within buildings whether from interior fire or from external fire, including arrangements for automatic operation in case of fire. It is not intended to establish the degree of protection required or to constitute the approval of any product.

11. Incinerator Doors, Record Room Doors and Vault Doors are *not* covered in this standard. For their installation, see the recommendations of the National Fire Protection Association for Incinerators (NFPA No. 82); Record Protection (NFPA No. 232) and Fur Vaults (NFPA No. 81) as published in the National Fire Codes Volumes II and III and in separate pamphlet form.*

*Available from the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

Section 2.

General.

20. Each class of device (doors, shutters, windows, etc.) has desirable and undesirable characteristics and the importance of each of these characteristics must be considered for the specific opening under consideration. A device cannot be expected to perform properly except for the condition for which it was designed. Prospective users should first ascertain from the authority having jurisdiction which type device or material, if any, will be accepted in the location proposed and should make contract subject to the approval of the authority having jurisdiction.

a. Where fire doors also serve as exit doors, the Building Exits Code* (NFPA No. 101) specifies that they must swing with the exit travel except for doors on individual small rooms which may swing in, and that on horizontal exits, where fire doors are required on both sides of the wall, one may be an automatic horizontally sliding door normally open and the other a self-closing door swinging with the exit travel, normally closed. This excludes the following types of doors from use on exits: rolling steel doors or shutters, vertical sliding doors, jackknife doors. Sliding doors shall not be used on access openings to exit stairways, fire escapes or exit ramps, nor on exits to the exterior of the building. For further details, including prohibition of locking of exit doors from the inside, see Building Exits Code.

b. Exit devices are available for use on fire doors and meet the requirements for safety to life. Such devices are produced under Factory Inspection and Label Service of Underwriters' Laboratories, Inc. and are identified by a label which reads "Fire-Door Equipped with Fire-Exit Hardware."

c. Exit doors should normally be closed. Fusible link or similar door closing arrangements are of limited value for exit purposes because quantities of smoke may pass through the door opening before there is sufficient heat to fuse the link.

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d. Doors of small to moderate size are more suitable for exit purposes than very large doors, owing to the relative ease of operation of small doors.

e. Horizontal sliding doors are open to the objection, for exit purposes, of difficulty in reopening once closed in case of fire.

f. Doors swinging in pairs can be arranged satisfactorily for exit purposes, but single doors are preferable. Two single doors installed in a frame with a mullion can be arranged to provide satisfactory exit facilities.

21. It is not intended that this standard should act as an obstruction to the development of new or improved devices. Devices of a design and construction not specifically mentioned may be recognized when bearing the label of a nationally recognized testing and inspection agency or acceptable to authority having jurisdiction.

22. Structural requirements specified in this Standard generally refer to materials and assemblies which through field experience have been found acceptable for such application. Materials and structural designs other than those specifically covered herein may be employed if judged equivalent by the authority having jurisdiction.

23. Despite the provision of protection specified in this standard, walls with openings have a lesser fire resistance than unpierced walls. Fire doors, shutters and fire windows are designed to protect the opening under normal conditions of use, with a clear space on both sides of the opening. When the opening is not used and combustible material is piled against the door, window or shutter, the designed protection cannot be expected. For this reason combustible material should be kept well away from openings. When a door or window opening is no longer to be used, the opening should be bricked up or otherwise filled with construction equivalent to that of the wall.

24. Fire doors, shutters or fire windows are valueless unless properly maintained so that they will close or be closed at the time of fire. Blocking or wedging open of doors shall be prohibited. Periodic inspection of doors, shutters and fire windows, with immediate attention to any necessary repairs and correction of any defects that may interfere with operation, is a very important responsibility of the management of the property.

Section 3.

Classification of Wall Openings and Required Fire Protection Rating of Doors, Shutters and Windows

30. Openings are classed as A, B, C, D, E and F in accordance with the character and location of the wall in which they are situated. In each of the following classes, the minimum fire protection ratings are shown; however, doors, shutters or windows having higher ratings are acceptable.

31. **Class A openings** are in walls separating buildings or dividing a single building into fire areas. Doors for the protection of these openings have a fire protection rating of 3 hours and except by special permission of the authority having jurisdiction shall be installed on each side of the wall.

32. **Class B openings** are in enclosures of vertical communication through buildings (stairs, elevators, etc.). Doors for the protection of these openings have a fire protection rating of 1 or 1½ hours.

33. **Class C openings** are in corridor and room partitions. Doors for the protection of these openings have a fire protection rating of ¾ hour.

34. **Class D openings** are in exterior walls which are subject to severe fire exposure from outside of the building. Doors and shutters for the protection of these openings have a fire protection rating of 1½ hours.

35. **Class E and F openings** are in exterior walls which are subject to moderate or light fire exposure respectively from outside of the building. Doors, shutters or windows (Section 13, 14 and 15) for the protection of these openings have a fire protection rating of ¾ hour.

Section 4.

Classifications and Types of Doors.

40. Classifications.

401. Doors are of several classifications, types and methods of operation.

402. Doors shall be of a type investigated and classified by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

403. The ratings of 3, 1½, 1 or ¾ hours shown in Table I indicate the duration of the test exposure.

404. The letter A, B, C, D or E following the hourly rating, indicates the classification of wall opening for which the door is designed.

405. Sizes of doors in Table 1 are maximum. For larger sizes the authority having jurisdiction shall be consulted as to acceptability. Such doors will not be labeled by Underwriters' Laboratories, Inc., but may be accompanied by a Certificate of Inspection.

406. Doors which have been produced under the Factory Inspection and Label Service Programs of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada, are identified by labels indicating the applicable rating and wall opening classification.

407. When the temperature rise is shown, it indicates the temperature developed on the unexposed face of the door at the end of 30 minutes of fire exposure. Labels may indicate that maximum transmitted temperatures are 250°F or 650°F. If the temperature rise is not indicated, the rise for the door is in excess of 650°F. The temperature rise for doors with glass vision panels of 100 sq. in. or less per wall opening is the same as for similar doors without glass lights. The temperature rise for all doors with glass lights exceeding 100 sq. in. per wall opening is in excess of 650°F.

408. The label on doors covers only the design and construction of the door except as noted below.

a. On composite and hollow metal doors for Class A openings (3 hours) the label also includes the hinges and latching mechanisms.

Table I Sizes, Ratings and Methods of Operation

Type, Method of Operation and Max. Size Opening	Rating and Class Opening	Maximum Exposed Glass Area
COMPOSITE — aluminum (flush)		
Swinging Single 4'0" x 7'0"	1 hr. (B) ¾ hr. (C) ¾ hr. (E)	None None None
COMPOSITE — wood (flush)		
Swinging Single 4'0" x 7'0"	1 hr. (B) ¾ hr. (C)	100 sq. in. per opening 1200 sq. in. per opening
COMPOSITE — plastic (flush)		
Swinging Single 4'0" x 7'0"	1 hr. (B) ¾ hr. (C)	100 sq. in. per opening 100 sq. in. per opening
COMPOSITE — steel (flush)		
Swinging Single 4'0" x 8'0"	3 hrs. (A)	None
Swinging in Pairs 6'0" x 7'0"	3 hrs. (A)	None
Swinging Single 4'0" x 8'0"	1½ hrs. (B) ¾ hr. (C)	100 sq. in. per opening 1296 sq. in. per light
Swinging in Pairs 8'0" x 7'6"	1½ hrs. (D) ¾ hr. (E)	None 720 sq. in. per light
Horizontal sliding		
120 sq. ft. with maximum dimension 12'0"	3 hrs. (A) 1½ hrs. (B) ¾ hr. (C)	None None None
Counter-balanced (freight) 8'0" x 10'0"	1½ hrs. (B)	100 sq. in. per opening
Counter-balanced (dumb-waiter) 4'0" x 5'9"	1 hr. (B)	100 sq. in. per opening

Sizes shown are maximums for labeled doors — for larger sizes see Paragraph 405.

Table I *(continued)*

Type, Method of Operation and Max. Size Opening	Rating and Class Opening	Maximum Exposed Glass Area
HOLLOW METAL — (flush or panel)		
Swinging Single 4′0″ x 10′0″	3 hrs. (A)	None
	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
Swinging in Pairs 8′0″ x 10′0″	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light
Sliding (pass. elevator) 8′0″ x 8′0″	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
HOLLOW METAL — (flush)		
Counter-balanced (freight) 8′0″ x 10′0″	1½ hrs. (B)	100 sq. in. per opening
Counter-balanced (dumb-waiter) 4′0″ x 5′9″	1 hr. (B)	100 sq. in. per opening
	1½ hrs. (B)	100 sq. in. per opening
Swinging (intake chute) 22″ x 19″	1½ hrs. (B)	None
	1 hr. (B)	None
Swinging (discharge chute) 24″ x 30″	1½ hrs. (B)	None
	1 hr. (B)	None
METAL CLAD — (KALAMEIN) (panel)		
Swinging Single 4′0″ x 8′0″	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
Swinging in Pairs 8′0″ x 8′0″	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light
METAL CLAD — (KALAMEIN) (flush)		
Swinging Single 3′9″ x 7′6″	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
Swinging in Pairs 7′6″ x 7′6″	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light

Sizes shown are maximums for labeled doors — for larger sizes see Paragraph 405.

Table I *(continued)*

Type, Method of Operation and Max. Size Opening	Rating and Class Opening	Maximum Exposed Glass Area
METAL CLAD — (KALAMEIN) (flush or panel)		
Counter-balanced (freight) 8'0" x 10'0"	1½ hrs. (B)	100 sq. in. per opening
SHEET METAL — (corrugated or flush)		
Sliding Single 120 sq. ft. with maximum dimension 12'0"	3 hrs. (A)	None
	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
Sliding Center Parting 120 sq. ft. with maximum dimension 12'0"	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light
Sliding Vertical 80 sq. ft. with maximum dimension 10'0"		
Swinging Single 6'0" x 12'0"		
Swinging in Pairs 10'0" x 12'0"		
Counter-balanced (freight) 8'0" x 10'0"	1½ hrs. (B)	100 sq. in. per opening
SHEET METAL — (panel)		
Swinging Single 4'0" x 8'0"	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
Swinging in Pairs 8'0" x 8'0"	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light
STEEL — (interlocking slats)		
Rolling 120 sq. ft. with maximum dimension 12'0"	3 hrs. (A)	None
	1½ hrs. (B)	None
	¾ hr. (C)	None
	1½ hrs. (D)	None
	¾ hr. (E)	None

Sizes shown are maximums for labeled doors — for larger sizes see Paragraph 405.

Table I *(continued)*

Type, Method of Operation and Max. Size Opening	Rating and Class Opening	Maximum Exposed Glass Area
STEEL — (plate)		
Counter-balanced (freight) 8'0" x 10'0"	1½ hrs. (B)	100 sq. in. per opening
Counter-balanced (dumb-waiter) 4'0" x 5'9"	1 hr. (B)	100 sq. in. per opening
	1½ hrs. (B)	100 sq. in. per opening
TIN CLAD — (3 ply)		
Sliding Single 120 sq. ft. with maximum dimension 12'0"	3 hrs. (A)	None
	1½ hrs. (B)	100 sq. in. per opening
Sliding Center Parting 120 sq. ft. with maximum dimension 12'0"	¾ hr. (C)	1296 sq. in. per light
Sliding Vertical 80 sq. ft. with maximum dimension 10'0"	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light
Swinging Single 6'0" x 12'0"		
Swinging in Pairs 10'0" x 12'0"		
TIN CLAD — (2 ply)		
Sliding Single 80 sq. ft. with maximum dimension 10'0"	1½ hrs. (B)	100 sq. in. per opening
	¾ hr. (C)	1296 sq. in. per light
Swinging Single 4'0" x 10'0"	1½ hrs. (D)	None
	¾ hr. (E)	720 sq. in. per light
Swinging in Pairs 8'0" x 10'0"		
Counter-balanced (freight) 8'0" x 10'0"	1½ hrs. (B)	100 sq. in. per opening

Sizes shown are maximums for labeled doors — for larger sizes see Paragraph 405.

b. On fire doors bearing the "Fire Door Equipped with Fire Exit Hardware" label, the label also covers the exit devices which shall bear the "Fire-Exit Hardware" label.

c. On counter-balanced doors the label also includes the guides and latching and counterbalancing mechanisms.

d. On dumb-waiter doors the label also includes the guides, frame, latching and counter-balancing mechanisms.

e. On chute doors the label also includes the frame and latching and closing mechanisms.

f. On sliding passenger elevator doors the label also includes the frame.

g. On rolling steel doors the label also includes the complete assembly necessary.

41. Glass.

411. No glass shall be used in doors for 3 hour (A) or 1½ hour (D) locations.

412. Except when prohibited in Table I, wired glass not less than ¼ in. thick may be used in doors for 1 and 1½ hour (B) locations. The sum of the exposed glass area or areas per wall opening shall not exceed 100 sq. in. No dimension shall exceed 12 in. except under conditions described in Paragraph 21.

413. Except when prohibited in Table I, wired glass not less than ¼ in. thick may be used in doors for ¾ hour (C) locations. Glass for individual exposed areas shall not exceed 1296 sq. in., with no dimension exceeding 54 in.

414. Except when prohibited in Table I, wired glass not less than ¼ in. thick may be used in doors for ¾ hour (E) locations. Glass for individual exposed areas shall not exceed 720 sq. in., with no dimension exceeding 54 in.

415. The glass shall be well imbedded in putty and all exposed joints between the metal and glass shall be struck and pointed.

42. Types of Doors.

421. **Composite Doors.** Composite fire doors are of the flush design and consist of a manufactured core material with chemically impregnated wood edge banding and untreated wood face veneers, or laminated plastic faces, or surrounded by and encased in aluminum or steel.

422. **Hollow-Metal Doors.** Hollow-metal doors are of formed steel of the flush and paneled designs of No. 20 gauge or heavier steel.

423. **Metal-Clad (Kalamein) Doors.** Metal-clad doors are of flush and panel design consisting of metal covered wood cores or stiles and rails and insulated panels covered with steel of 24 gauge or lighter.

424. **Sheet-Metal Doors.** Sheet-metal doors are of formed No. 22 gauge or lighter steel and of the corrugated, flush and paneled designs.

425. **Steel Doors.** Steel doors are of the interlocking steel slat design or plate-steel construction.

426. **Tin-Clad Doors.** Tin-clad doors are of two or three ply wood core construction, covered with No. 30 gauge galvanized steel or terne plate (maximum size 14 in. by 20 in.); or No. 24 gauge galvanized steel sheets not more than 48 in. wide.

Section 5.

Installation of Swinging Doors.

Doors may be either flush or lap mounted.

50. Flush Mounted. Flush mounted doors are hung on a frame set in the wall.

500. Sills.

a. Buildings with noncombustible floors require no special sill construction, if the floor structure is extended through the opening.

b. Sills shall be made of noncombustible material extending 6 in. past the edge of the opening on each side and at least 4 in. out from the face of the wall except as in paragraph d. Figure Nos. 1, 2, 3, and 4, Section 16 show constructions that are acceptable.

c. Concrete for sills shall be of a good grade and shall be at least 4 in. in thickness when used in construction not provided with a steel tread. When a steel tread is used, the concrete shall be not less than 3½ in. in thickness and the tread shall be adequately secured.

d. Noncombustible thresholds may be used in lieu of a sill in Class C openings. Combustible floor coverings shall not be carried through the opening.

501. Walls. Walls shall be of brick, concrete, or concrete block construction, unless walls of other materials are permitted by the authority have jurisdiction. When such other walls are used, the frames shall be securely anchored to ceiling and floor.

502. Lintels.

a. Door frames of other than structural steel channel construction (Figure 5) shall be provided with one of the lintels shown by Figure Nos. 6, 7 and 8, Section 16.

NOTE: Mortar pads shown in Figure 6, Section 16, are required to prevent upward movement of head piece on exposure to fire.

503. Frames.

a. Steel door frames shall be of a type investigated by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

b. Frames which have been produced under the Factory Inspection and Label Service Programs of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada, are identified by labels. The label covers the design and construction and provides for a method of anchoring. Methods of anchoring in brick, concrete and concrete block walls are shown in Figure Nos. 5, 6, 7 and 8, Section 16.

c. Wood or plastic composite doors shall be installed in pressed steel frames of the single type. Composite (aluminum or steel), hollow metal, metal-clad (kalamein), and sheet-metal (flush and panel types) doors shall be installed in pressed steel or channel frames of the single type or frames of the normal or inverted double types. Tin-clad and sheet-metal (corrugated) doors shall be installed in frames of the single type of steel channel.

d. The clearance between the head piece and the jambs for wood or plastic composite doors shall not exceed 1/16 in. For other doors the clearance between the head piece and jambs, and between the meeting edges of doors swinging in pairs shall not exceed 1/8 in. The clearance between the door and the sill shall not exceed 3/8 in.

e. Steel door frames are of four types:

(1). Single Type (Pressed Steel). These frames consist of head and jamb members of pressed steel and are built into the wall during construction. (See Figure 6, Section 16.)

(a). Frames of this type may be provided with solid insulated transoms for 3 hour (A), 1½ hour (B), ¾ hour (C), 1½ hour (D), and ¾ hour (E) locations.

(b). Frames of this type may be provided with fixed glazed sidelights and transoms employing wired glass not less than ¼ inch thick for ¾ hour (C) and ¾ hour (E) locations.

TABLE II

Builders Hardware

Mortise and Surface Hinges for Swinging Doors

Doors up to 60 in. in height shall be provided with two hinges and an additional hinge for each additional 30 in. of height or fraction thereof.

Door Rating, Hr.	Maximum Size Door Width Feet	Maximum Size Door Height Feet	Hinge Size Height In.	Hinge Size Thickness In.	Type Hinge
3, 1½, 1, ¾	4	10	4½	0.180	Steel, Mortise or Surface
3, 1½, 1, ¾	3	7	4½	0.134	Steel, Mortise or Surface
1½, 1, ¾	4	8	4½	0.134	Steel, Mortise or Surface
1½, ¾	4	8	6	0.225	Steel-Olive Knuckle
3, 1½, ¾	4	8	4	0.225	Steel Pivots (Including Top, Bottom and Intermediate)
1½, ¾	4	8	4½	0.180	Bronze-(Iron or Steel Stud and Sockets Provided Adjacent To Each Hinge)
1½, 1, ¾	3	5	4	0.130	Steel, Mortise or Surface
1½, 1, ¾	2	3	3	0.092	Steel, Mortise or Surface

Exception — Composite Doors (wood, plastic or aluminum) shall not be provided with pivots.

(2). Single Type (Steel Channel). These frames consist of head and jamb members of steel channel and are built into the wall during construction. (See Figure 5, Section 16.)

(3). Double Type (Normal). These frames consist of rough buck and cabinet jamb members. The rough buck of pressed steel or steel channel is built into the wall during construction and the finished buck or cabinet jamb of pressed steel is then secured to the rough buck. (See Figure 7, Section 16.)

(a). Frames of this type may be provided with solid insulated transoms for 1½ hour (B) and 1½ hour (D) locations.

(b). Frames of this type may be provided with glazed transoms employing wired glass not less than ¼ in. thick for ¾ hour (C) and ¾ hour (E) locations.

(4). Double Type (Inverted). These frames consist of a rough buck and cabinet jamb members of pressed steel. The rough buck is attached to the concrete masonry of the opening with steel expansion shells and the finished buck or cabinet jamb is secured to the rough buck. (See Figure 8, Section 16.)

504. Astragals. Doors swinging in pairs shall have at least one astragal securely attached in place so as to project approximately ¾ in. (See Figure Nos. 10, 12 and 14, Section 16.)

505. Builders Hardware. (See Figures 9, 10, 11, and 12, Section 16.)

a. Hinges. (See Table II and exceptions.)

(1). Attaching of Hinges to Door. Mortise hinges shall be secured to wood and plastic covered composite doors with No. 12 by 1¼ in. self-tapping sheet-metal screws. Surface hinges shall be secured with steel through bolts. For other types of doors, hinges shall be secured to reinforcements in the door with machine screws or bolted through the door.

(2). Attaching Hinges to Frame. Hinges shall be secured with machine screws to reinforcements of pressed steel frames or directly to steel channel frames.

TABLE III Builders Hardware
Latching Devices for Swinging Doors

	Door Rating Hours	Maximum Opening Height Feet	Latches		
			Single Swing Doors	Doors Swing in Pairs	
				Active Leaf	Inactive Leaf
Composite Wood or Plastic (flush)	1	7	½ in.	—	—
Composite Aluminum (flush)	1	7	½ in.	—	—
Composite Steel (flush)	3	7	3 Pt. Surface	—	—
	3	7	¾ in.	¾ in.	Top & Bottom Bolts
	1½ or ¾	7½	½ in.	¾ in.	Top & Bottom Bolts
Hollow-Metal (Panelled or flush)	3	10	3 Pt. Concealed	3 Pt. Concealed	2 Pt. Concealed
	3	8	¾ in.	—	—
	3	7½	¾ in.	¾ in.	Top & Bottom Bolts
	1½ or ¾	8 to 10	3 Pt. Concealed	3 Pt. Concealed	Top & Bottom Bolts
	1½ or ¾	8	½ in.	¾ in.	Top & Bottom Bolts
Metal-Clad (Panelled or flush)	1½ or ¾	8	½ in.	¾ in.	Top & Bottom Bolts
Sheet-Metal (Panelled or flush)	1½ or ¾	8	½ in.	¾ in.	Top & Bottom Bolts

Note 1: Latch dimensions shown indicate minimum throw.
Note 2: For alternate assemblies, see paragraph 21.

b. Locks or Latches. Locks and latches including fire-exit hardware (panic devices meeting both life-safety requirements and fire-resistance requirements, see Section 20b) except elevator and power operated dumb-waiter doors equipped with electric contacts or interlocks shall be of a type investigated by a nationally recognized testing and inspection agency. All doors shall be provided with mortise locks or latches as specified with an active latchbolt (one that cannot be held in a retracted position). The device may be provided with deadbolts in addition to the active latchbolt.

(1). Attaching Locks, Latches and Flush Bolts. The locks or latches shall be secured to the reinforcements in the door with machine screws or through bolts, except wood composite doors which shall be secured with No. 12 by 1¼ in. self-tapping sheet-metal screws. Flush mounted top and bottom bolts shall be secured to reinforcements in the door with machine screws. Surface mounted top and bottom bolts shall be of steel secured with machine screws to reinforcements or bolted through the door. Attachment of fire-exit hardware of the vertical rod type shall be as required for top and bottom bolts.

(2). Attaching Strikes. The strike plates for single swing doors shall be secured with machine screws to the reinforcing in the frame. Strike plates for doors swinging in pairs shall be secured to the reinforcing in the stationary door. Channel frames for single swing doors shall be provided with rectangular holes to receive the latch bolts. The keeper (for the stationary door of doors swinging in pairs) for the top bolt shall be secured to the frame with steel machine screws. Channel frames shall be provided with a rectangular hole to receive the bolt. A keeper shall be secured in the sill to receive the bottom bolt of the stationary door.

c. Operation of Doors. The door shall swing easily and freely on its hinges. The latches shall operate freely.

506. Fire Door Hardware. (See Figures 13 and 14, Section 16.)

a. General.

(1). Fire door hardware shall be of a type investigated by a nationally recognized testing and inspection

TABLE IV

Fire Door Hardware

Table Giving Number of Hinges and Latches For Different Size Doors of Tin Clad, Hollow Metal and Metal Clad Construction.

Width of Door			0 ft.- 2 ft. 0 in.	2 ft. 0 in.- 3 ft. 0 in.	3 ft. 0 in.- 4 ft. 0 in.	4 ft. 0 in.- 5 ft. 0 in.	5 ft. 0 in.- 6 ft. 0 in.
Height of Door			No. of Latches	No. of Hinges	No. of Hinges	No. of Hinges	No. of Hinges	No. of Hinges
0 ft.	to	5 ft. 0 in.	2	2	2	2	2	2
5 ft. 0 in.	to	6 ft. 6 in.	2	2	2	2	3	3
6 ft. 6 in.	to	8 ft. 6 in.	3	2	2	3	3	4
8 ft. 6 in.	to	10 ft. 6 in.	4	3	3	3	4	4
10 ft. 6 in.	to	12 ft. 0 in.	5	4	4	4	4	4

Maximum door sizes governed by Table I.

TABLE V

Fire Door Hardware

Table Giving Length of Hinges and Latches For Different Widths of Doors of Tin Clad, Hollow Metal and Metal Clad Construction.

Width of Door	*Length of Hinges	No. of Holes in Hinge	Length of Latches
1 ft. 6 in. to 1 ft. 9 in. (incl.)	16 in.	2	Not less than 14¾ in.
1 ft. 9 in. to 2 ft. 0 in.	19 in.	2	" " " " "
2 ft. 0 in. to 2 ft. 4 in.	22 in.	3	" " " " "
2 ft. 4 in. to 2 ft. 8 in.	25 in.	3	" " " " "
2 ft. 8 in. to 3 ft. 0 in.	28 in.	3	" " " " "
3 ft. 0 in. to 3 ft. 4 in.	31 in.	3	" " " " "
3 ft. 4 in. to 3 ft. 8 in.	34 in.	4	" " " " "
3 ft. 8 in. to 4 ft. 0 in.	37 in.	4	" " " " "
4 ft. 0 in. to 4 ft. 4 in.	40 in.	4	" " " " "
4 ft. 4 in. to 4 ft. 8 in.	43 in.	4	" " " " "
4 ft. 8 in. to 5 ft. 0 in.	46 in.	5	" " " " "
5 ft. 0 in. to 5 ft. 4 in.	49 in.	5	" " " " "
5 ft. 4 in. to 5 ft. 8 in.	52 in.	5	" " " " "
5 ft. 8 in. to 6 ft. 0 in.	55 in.	5	" " " " "

*The intermediate hinge straps (when three or more are used) may be not to exceed eight inches shorter than is indicated.

Maximum door sizes governed by Table I.

TABLE VI

Fire Door Hardware

Table Giving Numbers of Latches and Hinges For Sheet Metal Doors.

Height of Door	No. of Latches	No. of Hinges
0 ft. to 5 ft. 3 in.	2	2
5 ft. 4 in. to 8 ft. 3 in.	3	3
8 ft. 4 in. to 10 ft. 3 in.	4	4
10 ft. 4 in. to 12 ft. 3 in.	5	4
12 ft. 4 in. to 14 ft. 4 in.	5	5

Note. For heights in fractional inches, use next higher full inch.

agency or be of a design and construction acceptable to the authority having jurisdiction.

(2). Fire door hardware includes hinge brackets, hinges, catches, latch keepers and operating handle mechanism and, for doors swinging in pairs, top and bottom bolts and for standing doors top and bottom bolt keepers.

(3). Fire door hardware which has been produced under Factory Inspection and Label Service Programs of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada, is identified by labels.

b. Number and Length of Hinges and Latches. (See Tables IV, V, and VI.)

(1). Attaching Hinges and Latches to Door. Upper and lower hinges and latches shall be spaced not less than 8 in. nor more than 14 in. from the top and bottom of the door respectively. Hinges and latches shall be attached by bolting through the door.

(2). Attaching Hinges and Catches to Steel Channel Frames. Hinges and catches shall be bolted, riveted, or welded to the frame.

c. Operation of Doors. The door shall swing easily and freely on its hinges. The latches shall operate freely.

507. Vents.

a. Each tin-clad door formed of 14 in. x 20 in. sheets shall be provided with a vent hole through the middle plate on the exposed side of the door, but not through the wood core. The metal covering around the opening shall be secured with small nails and the exposed wood thoroughly painted.

b. A 3 in. hole shall be made for doors under fifty square feet in area, and a 4 in. hole for doors in excess of fifty square feet.

NOTE: The hole will prevent excessive bulging of the tin covering and rupture of the joints between the plates by permitting the escape of gases generated from the wood core when the door is exposed to fire. Care should be taken to ascertain which is the exposed side of the door before the hole is made. Usually the hole should be made after the door is mounted.

508. **Clearances.** The clearance between the head piece and the jamb for wood composite doors shall not exceed 1/16 in. For other doors, the clearance between the head piece and jambs, and between the meeting edges of doors swinging in pairs, shall not exceed 1/8 in. The clearance between the doors and the sill shall not exceed 3/8 in.

509. **Closing Devices.** (See Section 11.)

51. Lap Mounted. Lap mounted doors are hung on the surface of the wall.

510. **Lap.** The doors shall lap the opening at least 4 in. at the sides and top.

511. **Sills.**

a. Buildings with noncombustible floors require no special sill construction if the floor structure is extended through the opening.

b. Sills shall be made of noncombustible material extending 6 in. past the edge of the opening on each side and at least 4 in. out from the face of the wall. Figures 1, 2, 3, and 4, Section 16, show constructions that are acceptable.

c. Concrete for sills shall be of a good grade and shall be at least 4 in. in thickness when used in construction not provided with a steel tread. When a steel tread is used, the concrete shall be not less than 3½ in. in thickness and the tread shall be adequately secured.

512. **Walls.**

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete block. When concrete blocks are used, see Figures 19 and 20, Section 16 for methods of reinforcement.

b. When doors are mounted on corner walls or on walls more than 18 in. in thickness, the bolts which normally pass through the walls may be anchored within the wall as shown in Figures 23 and 24, Section 16.

513. Lintels. Lintels shall be brick or concrete arches, or steel or reinforced concrete. If of steel or reinforced concrete, they shall be constructed as shown in Figures 15, 16, 17, or 18, Section 16, or as acceptable to the authority having jurisdiction.

514. Fire Door Hardware. (See Figures 13 and 14, Section 16.)

a. General.

(1). Fire door hardware shall be of a type investigated by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

(2). Fire door hardware includes hinge brackets, hinges, catches, latch keepers and operating handle mechanism and, for doors swinging in pairs, top and bottom bolts and for standing doors top and bottom bolt keepers.

(3). Fire door hardware which has been produced under the Factory Inspection and Label Service Program of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada is identified by labels.

b. Attachment of Hinge Wall Strips and Catch Wall Strips. Such strips shall be bolted through the wall. Not less than ¾ in. through bolts shall be used for attaching hinge strips and not less than ½ in. through bolts for catch wall strips. (See Figure 14, Section 16.)

515. Astragals. Doors swinging in pairs shall have at least one astragal securely attached in place so as to project approximately ¾ in. (See Figure Nos. 10, 12 and 14, Section 16.)

516. Clearance. The clearance between the door and the wall, when the door is in closed position, and between the door and the sill shall not exceed ⅜ in.

517. Closing Devices. (See Section 11.)

Section 6.
Installation of Horizontal Sliding Doors.

60. Wall Mounted.

601. Wall mounted doors are hung on the surface of the wall. Horizontal sliding doors of the tin-clad and sheet-metal (flush, corrugated, and composite) types shall be wall mounted.

602. Passenger elevator doors shall be frame mounted as specified in Subsection 62.

603. Lap. The door shall lap the opening at least 4 in. at the sides and top.

604. Sills.

a. In buildings with noncombustible floors, special sill construction is not necessary if the floor structure is extended through the opening.

b. Sills shall be made of noncombustible material and extend 6 in. past the edge of the opening on each side and at least 4 in. out from the face of the wall. Figures 1, 2, 3, and 4, Section 16 show constructions that are acceptable.

c. Concrete for sills shall be of good grade and shall be at least 4 in. in thickness when used in construction not provided with a steel tread. When a steel tread is used the concrete shall be not less than 3½ in. in thickness and the tread shall be adequately secured.

605. Walls.

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete block construction. When concrete blocks are used, see Figures 21 and 22, Section 16 for methods of reinforcement.

b. When doors are mounted on corner walls or on walls more than 18 in. in thickness, the bolts which normally pass through the walls may be anchored within the wall as shown on Figures 23 and 24, Section 16.

606. Lintels. Lintels shall be brick or concrete arches, or steel or reinforced concrete. If of steel or reinforced concrete, they shall be constructed as shown in Figures 15, 16, 17, or 18, Section 16, or as acceptable to the authority having jurisdiction.

607. Astragals. Center parting doors shall have an astragal securely attached in place so as to project approximately ¾ in. (See Figure No. 26, Section 16.)

608. Fire Door Hardware. (See Figures 25, 26, 27, 28, 29 and 30, Section 16.)

a. General.

(1). Fire door hardware shall be of a type investigated by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

(2). Fire door hardware includes tracks, hangers, binders, bumpers, flush pulls, stay rolls, and center latch assembly.

(3). Fire door hardware which has been produced under the Factory Inspection and Label Service Programs of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada, are identified by labels.

b. Track. The mounting of track for tin-clad and sheet-metal doors is similar with the exception that there shall be at least ¾ in. clearance between the top of the sheet-metal door and the track to allow for upward expansion of a heated door. Also the top of a sheet-metal door shall be provided with track binders (Figures 25 and 26, Section 16) to hold the door in position if the hanger wheels should be lifted from the track by expansion.

(1). Mounting Flat Track, Single Door. Length of track shall be equal to twice the width of the wall opening plus 21 in. This length of track is given in terms of the wall opening, 12 in. being allowed for the lap and width of the door, 8 in. for attaching front and back bumpers and 1 in. for clearance when the door is wide open. Wall bolts shall be so spaced that one bolt will be located directly opposite each hanger when the door is closed to permit attachment of front and back bumpers. Wall bolts securing the track in position shall be not less than ¾ in. in diameter and shall be installed through the wall, with track bracket at each bolt. Refer to Table VII for bolt spacings (except as provided in 605.b.). Figures in heavy type in the table indicate spacings for bolts opposite door hangers and number of hangers required. The space "A" in the table giving spacings for wall bolts shall always be on the side of the door opening to which the door closes. This will be the lower end of the track when the track is inclined. The track shall have

TABLE VII
TABLE GIVING DIMENSIONS FOR PUNCHING FLAT TRACK

Size of Opening	Length of Track	Space A 1st Bolt In.	Space B 2nd Bolt In.	Space C 3rd Bolt In.	Space D 4th Bolt In.	Space E 5th Bolt In.	Space F 6th Bolt In.	Space G 7th Bolt In.	Space H 8th Bolt In.	Space I 9th Bolt In.	Space J 10th Bolt In.	Space K 11th Bolt In.
3′ 0″	7′ 9″	1¾	12¼	24	26½	26¾						
3′ 3″	8′ 3″	1¾	12¼	27	28	28¼						
3′ 6″	8′ 9″	1¾	13¼	28	30	30¼						
3′ 9″	9′ 3″	1¾	13¼	31	31½	31¾						
4′ 0″	9′ 9″	1¾	14¼	32	33½	33¾						
4′ 3″	10′ 3″	1¾	14¼	35	35	35¼						
4′ 6″	10′ 9″	1¾	15¼	36	37	37¼						
4′ 9″	11′ 3″	1¾	15¼	19½	19½	38½	38¾					
5′ 0″	11′ 9″	1¾	16¼	20	20	40½	40¾					
5′ 3″	12′ 3″	1¾	16¼	21½	21½	28	28	28¼				
5′ 6″	12′ 9″	1¾	17¼	22	22	30	29	29¼				
5′ 9″	13′ 3″	1¾	17¼	23½	23½	31	30	30¼				
6′ 0″	13′ 9″	1¾	18¼	24	24	32	32	31¼				
6′ 3″	14′ 3″	1¾	12¼	31½	31½	31	31	30¼				
6′ 6″	14′ 9″	1¾	12¼	33	33	32	32	31¼				
6′ 9″	15′ 3″	1¾	13¼	33½	33½	33	33	33¼				
7′ 0″	15′ 9″	1¾	13¼	35	35	34	34	34¼				
7′ 3″	16′ 3″	1¾	14¼	35½	35½	36	35	35¼				
7′ 6″	16′ 9″	1¾	14¼	37	37	37	36	36¼				
7′ 9″	17′ 3″	1¾	14¼	19¼	19¼	19¼	19¼	38	37	37¼		
8′ 0″	17′ 9″	1¾	14¼	20	20	20	20	39	38	38¼		
8′ 3″	18′ 3″	1¾	14¼	20¾	20¼	20¾	20¼	40	39	39¼		
8′ 6″	18′ 9″	1¾	14¼	21½	21½	21½	21½	41	40	40¼		
8′ 9″	19′ 3″	1¾	14¼	22¼	22¼	22¼	22¼	31	31	31	31¼	
9′ 0″	19′ 9″	1¾	14¼	23	23	23	23	31¾	31¾	31¾	32	
9′ 3″	20′ 3″	1¾	15¼	23¼	23¼	23¼	23¼	32¾	32¾	32¾	33	
9′ 6″	20′ 9″	1¾	15¼	24	24	24	24	34	34	33	33¼	
9′ 9″	21′ 3″	1¾	16¼	24¼	24¼	24¼	24¼	35	35	34	34¼	
10′ 0″	21′ 9″	1¾	16¼	25	25	25	25	35¼	35¼	35¼	35½	
10′ 3″	22′ 3″	1¾	17¼	25¼	25¼	25¼	25¼	36¼	36¼	36¼	36½	
10′ 6″	22′ 9″	1¾	17¼	26	26	26	26	37	37	37	37¼	
10′ 9″	23′ 3″	1¾	18¼	26¼	26¼	26¼	26¼	38	38	38	38¼	
11′ 0″	23′ 9″	1¾	18¼	27	27	27	27	38¾	38¾	38¾	39	
11′ 3″	24′ 3″	1¾	19¼	27¼	27¼	27¼	27¼	39¾	39¾	39¾	40	
11′ 6″	24′ 9″	1¾	19¼	28½	28½	28½	28½	40	40	40	40¼	
11′ 9″	25′ 3″	1¾	20¼	29¼	29¼	29¼	29¼	40½	40½	40½	40¾	
12′	25′ 9″	1¾	20¼	30	30	30	30	33	33	33	33	33¼

Figures in heavy type indicate bolts opposite door hangers

an incline of ¾ in. to 1 ft. if door is intended to close by gravity.

(2). Mounting Flat Track, Center Parting Doors. The mounting is similar to the above with the exception that the track for each door is 10 in. shorter. In Table VII giving the length of track, 10 in. is to be subtracted from the total

length, the first bolt hole is to be omitted and 10 in. is to be subtracted from each other bolt hole dimension.

(3). **Mounting Round Track.** When round track is used, the number of brackets provided shall be such that one bracket is located directly under each hanger when the door is closed; one at each end, and at points between end brackets not exceeding 24 in. apart. Bolts securing brackets in position shall be not less than ¾ in. diameter and shall be installed through the wall except as provided in 605b.

(4). **Mounting Box Type Track.** The mounting of this type track for sheet metal and composite sliding door is, in general, similar to that described for mounting flat track. The wall bolts shall be so spaced that they will be located directly opposite each hanger when the door is in a closed position. Wall bolts securing the track brackets in position shall be not less than ¾ in. in diameter and shall be installed through the wall except as provided in 605.b.

c. **Hangers.** Doors for openings six feet and less in width shall be provided with two hangers. Doors for openings in excess of six feet shall have an additional hanger (see Table VII). Two hangers shall be provided on each section of vertically spliced doors. (See Paragraph 609.)

d. **Binders.**

(1). At least two front binders are required. The upper binder shall be placed approximately 24 in. from the top of the door, and the lower binder approximately 18 in. above the sill.

(2). In addition to the above front binders, sheet-metal doors for openings exceeding 8 ft. in height shall be provided with an additional front binder spaced midway between the upper and lower binders.

(3). Sheet-metal doors for openings not exceeding 10 ft. in height shall be provided with one rear binder located midway between the top and bottom. Doors for openings exceeding 10 ft. in height shall be provided with two rear binders located at the quarter points.

(4). Composite doors shall have one base binder and one or more front and rear latches.

(5). The space between the top of the door and the track for sheet-metal doors shall be at least ¾ in. to permit upward expansion on exposure to fire. Track binders or

other approved means shall be provided to prevent door leaving track during exposure to fire. The track binder shall lap the track about ½ in. and be located two inches to one side of the center line of the wall bolts. (See Figures 25 and 26, Section 16.)

(6). The bolts for fastening the front and rear binders to the wall shall be not less than ¾ in. in diameter and extend through the wall. The bolt holes should not be made larger than necessary.

(7). For center parting doors, the head binder shall be bolted to the track and the sill binder securely fastened to the masonry of the sill.

e. Stay Rolls. Figures 27, 28, 29 and 30, Section 16 show acceptable methods of attaching Stay Roll Brackets.

f. Latches, Center Parting Doors. The latch and center pin are shown on Figure 26, Section 16. The center pin shall be located midway between latch and top of door.

g. Chafing Strips. Tin-clad doors shall be provided with half-oval chafing strips; two strips are required on the back or wall side of the door for openings not exceeding 8 ft. in height. Doors for openings exceeding 8 ft. in height shall be provided with three. The length of strips shall be 4 in. less than the door opening. The half-oval strips shall be bolted through the door to the companion strips on the face of the door. The strips shall be parallel to the track and the top strip shall be located one-third the distance from the top of the door and the bottom strip 24 in. from the bottom edge of the door. When three strips are required, the middle strip is to be located midway between the other two.

h. Wedge. On tin-clad and sheet-metal doors, a wedge shall be attached back of the stay roll so that the door will be close to, but not tight against the wall when in closed position. (See Figures 25 and 26, Section 16.)

i. Bumper Shoes. Bumper shoes are required on tin-clad doors, one opposite each bumper and one opposite each binder; fastened to the faces and edges of the door by wood screws. (See Figures 25 and 26, Section 16.)

j. Handles. The flush pull on the back of the door shall be countersunk flush with the surface of the door. Bow-shaped handle on front of door shall be bolted to flush pull

by through bolts or otherwise securely attached. (See Figure 25, Section 16.)

609. Tin-Clad and Sheet-Metal Sectional Door Units. Sectional doors shall be provided with cover plates for the joint between the sections and reinforcing angles or channels running horizontally across the door. When shipped, both cover plates shall be attached to one section of the door, being bolted together through the door. The edge of the adjacent section shall be inserted in the groove formed by these cover plates and secured in a like manner by through bolts. Reinforcing angles or channels shall be secured by through bolts.

610. Vents for Tin-Clad Doors.

a. Each tin-clad door or sectional door formed of 14 in. x 20 in. sheets shall be provided with a vent hole through the middle plate on the exposed side of the door, but not through the wood core. The metal covering around the opening shall be secured with small nails and the exposed wood thoroughly painted.

NOTE: The hole will prevent excessive bulging of the tin covering and rupture of the joints between the plates by permitting the escape of gases generated from the wood core when the door is exposed to fire. Care should be taken to ascertain which is the exposed side of the door before the hole is made. Usually the hole should be made after the door is mounted. Three-inch holes should be made for doors under fifty sq. ft. in area, and 4 in. holes for doors in excess of fifty square feet.

611. Clearances. The clearance between the door and the wall, when the door is in closed position, and between the door and the sill shall not exceed $\frac{3}{8}$ in.

612. Closing Devices. (See Section 11.)

62. Frame Mounted Sliding Passenger Elevator Doors.

620. Sliding passenger elevator doors are of the single, two, and three speed types or single and two speed center parting types.

621. Sills. The metal sills forming a part of the assembly shall be firmly attached to noncombustible base by steel expansion shells or by anchors which bond into the base.

622. Hardware. Hanger assemblies shall be of a type investigated and classified by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

Section 7.

Installation of Vertical Sliding Doors.

70. Wall Mounted.

701. Vertical sliding doors of the tin-clad and sheet-metal (flush and corrugated) types are wall mounted.

702. Lap. The doors shall lap the opening at least 4 in. at the sides and top.

703. Sills.

a. In building with noncombustible floors special construction is not necessary if the floor structure is extended through the opening.

b. Sills shall be made of noncombustible material and extend 6 in. past the edge of the opening on each side and at least 4 in. out from the face of the wall. Figures 1, 2, 3, and 4, Section 16 show constructions that are acceptable.

c. Concrete for sills shall be of good grade and shall be at least 4 in. in thickness when used in constructions not provided with steel tread. When a steel tread is used the concrete shall be not less than 3½ in. in thickness and the tread shall be adequately secured.

704. Walls.

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete block construction. When concrete blocks are used, reinforcement similar to that shown in Figure 19, Section 16, shall be provided.

b. When doors are mounted on corner walls or on walls more than 18 in. in thickness, the bolts which normally pass through the walls may be anchored within the wall as shown in Figures 23 and 24, Section 16.

705. Lintels. Lintels shall be brick or concrete arches, or steel or reinforced concrete. If of steel or reinforced concrete, they shall be constructed as shown in Figures 15, 16, 17, and 18, Section 16, or as acceptable to the authority having jurisdiction.

706. Fire Door Hardware. (See Figure 31, Section 16.)

a. General.

(1). Fire door hardware shall be of a type investigated by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

(2). Fire door hardware includes tracks, brackets, guides, bumpers, and counter-balancing mechanism.

(3). Fire door hardware which has been produced under the Factory Inspection and Label Service Programs of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada are identified by labels.

b. Track.

(1). Two tracks, each with a length equal to twice the height of the opening plus nine inches shall be provided. The track shall be attached with track brackets at each bolt.

(2). The length of the track is given in terms of height of the opening, 4 in. being allowed for the lap of the door, 4 in. for attaching the bumper and 1 in. clearance when the door is wide open.

c. Guides. Two track guides for each track for opening 5 ft. or less in height shall be provided. An additional guide for each track for each 2½ ft. or fraction thereof in excess of 5 ft. in height shall be provided. Each of the track guides shall be bolted through the doors.

d. Cables. Cables shall be of sufficient strength to support the load. Cable brackets are required and shall be bolted through the door. Cable fasteners and thimbles are required. Cable pulleys, with frames and sheaves, shall be bolted through the wall with ¾ inch bolts.

e. Chafing Strips. Two half oval chafing strips shall be provided for back of door not exceeding 8 ft. in width. The length shall be 2 in. less than height of door. The strips shall be held by ¼ in. through bolts with countersunk heads and with nuts bearing against washers. When doors exceed the above dimension, three strips are required.

f. Bumper and Bumper Shoes.

(1). One bumper shall be bolted to top of each track with wall bolts.

(2). Four bumper shoes are necessary, and shall be located at the top and bottom corners of the door. Each bumper shall be fastened to the faces and edges of the door by wood screws.

g. Handles. Flush pull handles on the wall side of the door shall be countersunk flush with the surface of the door. Bow-shaped handles shall be bolted to the flush pull by through bolts or otherwise securely attached.

707. Clearances. The clearance between the door and the wall, when the door is in closed position, and between the door and the sill shall not exceed $\frac{3}{8}$ in.

708. Closing Devices. (See Section 11.)

709. Sheet-Metal Door (Flush & Corrugated Types.)

a. The above rules shall be followed except as specified below.

(1). Rear Binders. Doors shall be provided with one rear binder located at the center of the lintel attached with $\frac{3}{4}$ in. through bolts. (Figure 31, Section 16.)

(2). Chafing Strips. Are not required for corrugated doors.

Section 8.

Installation of Rolling Steel Doors.

801. Mounting.

a. Doors of this type shall be mounted on the face of the wall, between the jambs or in reveal of wall. (See Figures 32, 33, 34, and 35, Section 16.)

b. Doors subject to damage from falling materials at time of fire shall be mounted so that no portion projects beyond the face of the wall.

NOTE: Doors mounted on the face of walls should be confined to fire resistive buildings.

c. Doors mounted between jambs shall be provided with steel or iron plates above and below the mechanism and at the ends, or with an enclosed metal box on the outside of the bracket in order to prevent loose masonry from interfering with the normal operation of the door or the automatic mechanism.

802. Sills.

a. Buildings with noncombustible floors require no special sill construction, if the floor structure is extended through the opening.

b. Sills shall be made of noncombustible material extending 6 in. past the edge of the opening on each side and at least 4 in. out from the face of the wall. Figures 1, 2, 3, and 4, Section 16 show constructions that are acceptable.

c. Concrete for sills shall be of a good grade and shall be at least 4 in. in thickness when used in construction not provided with a steel tread; when a steel tread is used the concrete shall be not less than 3½ in. in thickness and the tread shall be adequately secured.

803. Walls.

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete block construction. When concrete blocks are used, reinforcement similar to that shown in Figure 19, Section 16 shall be provided.

b. When doors are mounted on corner walls or on walls more than 18 in. in thickness, the bolts which normally pass through the walls may be anchored within the wall as shown in Figures 23 and 24, Section 16.

804. Lintels. Lintels shall be brick or concrete arches, or steel or reinforced concrete. If of steel or reinforced concrete, they shall be constructed as shown in Figures 15, 16, 17, and 18, Section 16, or as acceptable to the authority having jurisdiction.

805. Guides.

a. Guides shall be plumb, with proper clearance for expansion between the guides and the sill.

b. The guides shall be bolted together through the wall when each side of the wall is provided with a door. Otherwise, the bolts pass through the wall and thread into nuts on opposite side of the wall. Nuts shall be provided with approved washers. Not less than $\frac{3}{8}$ in. through bolts shall be used.

c. When guides are mounted on corner walls or on walls more than 18 in. in thickness, the bolts which normally pass through the walls may be anchored within the wall as shown in Figures 23 and 24, Section 16.

d. When steel channel frames (as shown in Figure 35, Section 16) are used, the guides shall be secured with $\frac{3}{8}$ in. bolts.

806. Brackets. Brackets mounted on the face of the wall shall be bolted to the wall, above the lintel, with not less than two $\frac{1}{2}$ in. through bolts to each bracket. Brackets mounted between jambs shall be secured at the steel lintel by not less than two $\frac{1}{2}$ in. machine screws to each bracket.

807. Hoods and Cover Plates.

a. When the door is mounted on the face of the wall, the hood shall be tightly secured to the wall and brackets.

b. When the door is mounted between jambs, the cover plate shall be tightly secured to the wall.

808. Closing Devices. (See Section 11.)

Section 9.

Installation of Counter-Balanced Doors for Hoistways.

90. Wall Mounted.

901. Counter-balanced doors are mounted on the inside face of the hoistway enclosure and are of the regular and pass types.

902. Lap. The doors shall lap the openings at least 2 in. on the sides, at least 3 in. at the top and at least 2 in. at the bottom or shall fit the sill closely when not designed to lap it.

903. Sills.

a. In buildings with noncombustible floors special sill construction is not necessary if the floor structure is extended through the opening.

b. Sills shall be of sufficient strength to support the load to be carried by the sill when loading and unloading the elevator car and shall be permanently secured to the building construction at each hoistway landing opening (see Figure 44).

904. Walls.

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete or concrete block construction, unless walls of other materials are permitted by the authority having jurisdiction. When such other walls are used, the frames shall be securely anchored to ceiling and floor.

b. When doors are mounted on corner walls or on walls more than 18 in. in thickness, the bolts which normally pass through the walls may be anchored within the wall as shown in Figures 23 and 24, Section 16.

905. Frames.

a. Shaftside faces of frames and sills should be in alignment and plumb with opening frames above and below.

b. The frame legs shall be secured to the floor beam if the walls are not solid masonry. (See Figure No. 35, Section 16.)

906. Lintels. Lintels shall be brick or concrete arches, or steel or reinforced concrete. If of steel or reinforced concrete, they shall be constructed as shown in Figures 15, 16, 17, or 18, Section 16, or as acceptable to the authority having jurisdiction.

907. Guides.

a. Doors shall operate in steel angle or channel guides securely bolted to opening frames or to the wall with brackets and through bolts.

b. Guides are assembled at the shop in unit lengths, space being allowed between units for clearance and expansion.

c. The guides shall be provided with a spreader below the sill unless they are secured to the structure.

d. The door sections shall engage the guides on each side at least one inch with ¾ in. clearance in each guide for lateral expansion.

Section 10.

Installation of Dumb-Waiter and Chute Doors.

1001. Sills. Dumb-waiter and chute door assemblies shall be installed on masonry sills and securely fastened.

1002. Walls.

a. These assemblies shall be installed in masonry walls in a manner similar to that of pressed steel frames of the single type, as shown in Figure 6, Section 16.

b. When dumb-waiter door assemblies are mounted in walls other than solid masonry, the ends of the guides shall be securely anchored to the floor structures at floor and ceiling levels. When so attached, the guides serve as structural supports for both door and wall.

c. The guides shall be provided with a spreader below the sill unless they are secured to the structure.

1003. Lintels. The lintel shall be noncombustible and adequate for the service.

Section 11.

Closing Devices.

1101. A closing device shall be installed on every fire door, except elevator and power-operated dumb-waiter doors equipped with electric contacts or interlocks.

a. A closing device is a mechanism which, if kept in good working condition, will insure that fire doors are kept in a closed position and latched or, if normally open, will close and latch the door at time of fire.

b. For the purpose of this standard the operation of doors will be divided into two categories:

(1). Self-closing doors are those which when opened return to the closed position.

(2). Automatic closing doors are those which normally remain open but which will close at time of fire.

1102. Self Closing Devices. (See Figures 36 to 43, Section 16, inclusive.)

a. A door may be made self-closing by the installation of:

(1). A system of weights suspended by ropes, wire cables or chains over pulleys. Weights shall be enclosed in suitable boxing for the entire length of travel.

(2). An approved door closer without hold-open feature, mounted on or in a door equipped with builders hardware or its frame.

1103. Automatic Closing Devices. (See Figures 32, 33, 34, and 36 to 43 inclusive, Section 16)

a. A door may be made automatic closing by the installation of:

(1). An approved door closer with hold-open arm embodying a fusible link or other fixed temperature release, or a rate-of-rise of temperature release utilizing heat responsive devices.

(2). An approved wall mounted door closer for horizontal sliding door when equipped with fire door hardware.

(3). A system of weights suspended by ropes, wire cables or chains over pulleys and so arranged that the melting of a fusible link or other approved fixed temperature release, or the operation of an approved rate-of-rise of temperature release, will permit the weights to close the door.

1104. Application of Automatic Closing Devices.

a. The application of automatic closing devices to the various types of doors is explained under the following paragraphs:

(1). Swinging Doors.

(a). Single Swinging Door. Doors of this type may be arranged to close automatically at the time of fire by the attachment of ropes, wire cables, or chains so arranged over pulleys that the melting of a fusible link or other approved fixed temperature release, or the operation of an approved rate-of-rise of temperature release, will drop a weight and pull the door closed. The weight used to close the door shall be enclosed in a suitable boxing for the entire length of travel. The pilot weight shall be suspended from chain or wire cable. Automatic closing of a single swinging door may be accomplished by an approved door closer with hold open arm embodying a fusible link or other fixed temperature release, or a rate-of-rise temperature release.

(b). Doors Swinging in Pairs.

(1). The active door of such doors shall be provided with automatic closing means as described in Paragraph 1104. a. (1). (a). Except as provided in (2), the inactive door shall be equipped with automatic top and bottom bolts and automatic closing means as described in Paragraph 1104. a. (1). (a). In addition an approved coordinating device shall be employed such that the inactive door closes and the top and bottom bolts engage fully before the active door closes.

(2). If the inactive door is provided with manually operated top and bottom bolts, only the active door shall be arranged for automatic closing in accordance with Paragraph 1104. a. (1). (a)., and the inactive door shall be shut, latched and locked at all times, except when opened for specific purposes.

(2). Horizontal Sliding Doors.

(a). Inclined Track. The automatic closing mechanism for sliding doors mounted on inclined tracks shall employ counter-balance weights suspended by ropes over pulleys so that the doors will remain stationary in any position of their travel. The counter-balancing shall be so arranged that the operation of the heat actuated device will release the weights and permit the door to close by gravity.

(b). Horizontal Track. Automatic operation of these doors shall be as described in Paragraph 1104. a. (2). (a). In addition sufficient weights shall be provided to close the doors shut after the heat actuated device has disconnected the counter-balance. The weight used to close the door shall be enclosed in a suitable boxing for the entire length of its travel and shall be suspended from chain or wire cable. See also 1103 a. (2).

(3). Vertical Sliding.

(a). The automatic mechanism for vertical sliding doors shall employ a system of weights suspended by wire cables over pulleys. One of these weights shall be so arranged that the melting of a fusible link or other approved fixed temperature release or the operation of an approved rate-of-rise temperature release will release this weight and permit the door to close by gravity. The total weight of the remaining weights shall be sufficient to prevent the door from dropping suddenly, but not sufficient to prevent it from closing in a positive manner.

(4). Rolling Steel Doors. These doors shall close automatically upon melting of a fusible link or other approved fixed temperature release, or the operation of an approved rate-of-rise temperature release which releases the curtain.

NOTE: The label covers automatic mechanisms and governor for 3 hr. (A) doors.

(5). Dumb-Waiter and Chute Doors.

(a). When of the vertical sliding type, these doors, except when equipped with electric contacts or interlocks, shall employ a system of weights suspended by rope or wire cables so arranged that operation of a heat actuated device will permit the door to close.

(b). Doors of the swinging type (flush design) except when equipped with electric contacts or interlocks, shall be arranged for automatic closing operation as described in Paragraph 1104. a. (1). for swinging doors.

1105. Location of Automatic Releasing Devices.

a. Fusible link or other fixed temperature release devices shall be located in or near the top of the opening.

(1). Authorities having jurisdiction may require an additional device at the ceiling level above the opening. If so, all such devices shall be interconnected as provided in Sections 1105.c. and 1105.d.

b. Heat responsive units of rate-of-rise of temperature releasing devices shall be located over the opening at the ceiling level or on the lower edge of joists or beams so that they are situated in an area where there is no interference with the free circulation of air.

(1). When heat responsive units are situated in exterior locations they shall be installed about 5 ft. above door(s) in multistory buildings. In one story buildings, they shall be installed midway between top of door(s) and top of wall but not to exceed 5 ft. above door(s). For other openings, follow rules for one story buildings, each story of the building.

c. When doors are installed on only one face of the wall, heat responsive units shall be located as required in Section 1105.a. or 1105.b. on each side of the wall and so interconnected that the actuation of any one of them will permit the door to close.

d. When doors are installed on both faces of the wall, heat responsive units shall be located as required in Section 1105.a. or 1105.b. on each face of the wall. They shall be so interconnected that the actuation of any one of them will permit both doors to close.

1106. Mounting of closing devices and actuating mechanisms. All components of closing devices including the actuating mechanisms shall be firmly attached to walls, doors and frames in a manner acceptable to the authority having jurisdiction.

Section 12.

Care and Maintenance.

1201. Doors shall be operable at all times. A continual inspection and maintenance program is necessary to insure that doors will operate under fire conditions.

1202. It is necessary to keep surroundings, including door openings, clear of everything that would be likely to obstruct or interfere with their free operation.

1203. When necessary, a framework of pipe or slats should be built outside of sliding doors to prevent the piling of material against the doors.

1204. Doors shall be kept closed and latched or arranged for automatic closing. Blocking or wedging open of doors shall be prohibited.

1205. Automatic or self-closing devices shall be kept in proper working condition at all times.

1206. Hardware should be examined frequently and any parts found to be inoperative shall be promptly replaced.

1207. Hinges, catches, latches and stay rolls are especially subject to wear and if found defective shall be repaired or replaced.

1208. Guides and bearings should be kept well lubricated to facilitate operation.

1209. Any breaks or tears in the tin or sheet metal covering shall be promptly repaired. Tin clad doors should be inspected for dry rot.

1210. Fusible links or other heat actuated devices shall not be painted. Care must be taken to prevent paint accumulation on stay rolls.

1211. All doors normally held in the open position should be operated at frequent intervals to insure proper operation.

1212. Cables or chains employed on suspended doors should be frequently inspected for excessive wear and stretching. Chains or cables of bi-parting counter-balanced doors need frequent adjustment to insure proper latching and to keep the doors in proper relation to the door opening.

Section 13.

Fire Windows.

130. Classification.

1301. Windows shall be of a type investigated and classified by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

1302. Windows which have been produced under the Factory Inspection and Label Service Program of Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada are identified by labels.

1303. The label on window frames for Class E or F locations reads "Inspected Fire Window."

1304. The label on window frames for Class F locations reads "Inspected Fire Window Frame for Light Exposure."

1305. The label on window frames covers the design and construction of the frame, sash, glass retaining members, and hardware. In addition, for solid-section frames the label includes the solid-section mullions.

131. Wired Glass.

1311. The area of individual glass lights, subject to moderate fire exposure (Class E), shall not exceed 720 sq. in. exposed area except as noted under Solid-Section Frame, Paragraph 1322. Width shall not exceed 48 in. nor height 54 in.

1312. The area of individual glass lights, subject to light fire exposure (Class F), shall not exceed 2916 sq. in. exposed area, with neither the width nor height exceeding 54 in.

1313. The glass shall be well imbedded in putty and all exposed joints between the metal and glass shall be struck and pointed.

132. Types of Frames.

1321. **Hollow Metal Frames.** Hollow metal frames for Class E or F locations consist of reinforced hollow metal sec-

tions and are of the double hung, counterbalanced, pivoted, stationary, tilting, hinged, or projected sash types.

a. Size.

(1). Class E.

Single sash, other than casement	5 ft. 0 in. by 5 ft. 0 in.
Multiple sash, other than casement	6 ft. 0 in. by 10 ft. 0 in.
Casement, single	3½ ft. 0 in. by 10 ft. 0 in.
Casement, pairs	5 ft. 0 in. by 10 ft. 0 in.

(2). Class F.

Single sash	5 ft. 0 in. by 5 ft. 0 in.
Multiple sash, other than sliding and fixed	5 ft. 0 in. by 10 ft. 0 in.
Multiple, sliding and fixed sash	7 ft. 0 in. by 10 ft. 0 in.

1322. Solid-Section Frames. Solid-section frames for Class E openings consist of either rolled steel sections or especially formed pressed steel sections with or without ventilators. The glass area of individual glass lights for rolled steel sections is limited to 350 sq. in. and for pressed steel sections, 720 sq. in.

a. Size.

(1). Rolled Steel Sections.

(a). The detention and side-wall sash types are suitable for openings not exceeding 84 sq. ft. in area with neither dimension exceeding 12 ft. When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed 7 ft.

(b). The lightweight casement types are suitable for openings not exceeding 6½ ft. in either dimension. When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed 3½ ft.

(c). The intermediate weight casement types are suitable for openings not exceeding 60 sq. ft. in area with neither dimension exceeding 10 ft. When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed 6½ ft.

(2). Pressed Steel Sections.

(a). Transom units are suitable for openings not exceeding 5 ft. in width and 9 ft. 6 in. in height, and units without transoms are suitable for openings not exceeding 5 ft. in width and 8 ft. 1 in. in height. When multiple units are installed the distance between unprotected vertical steel mullions shall not exceed 5 ft.

(b). Stationary units are suitable for openings not exceeding 9 ft. in width and 5 ft. in height. When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed 9 ft.

1323. Hollow Metal Solid-Section (Combination) Frames. Combination hollow metal solid-section frames for Class E openings consist of hollow metal sections forming the head, jambs, and sill and solid-section steel sash of the rolled steel type. They are of the double-hung, counter-balanced, or stationary types.

a. Size.

(1). Class E.

Single sash	5 ft. 4 in. by 5 ft. 0 in.
Multiple sash	5 ft. 4 in. by 10 ft. 0 in.

1324. Hollow Metal Plate-Steel (Combination) Frames. Combination hollow metal plate-steel frames consist of hollow metal sections forming the head, jambs and sill, and plate-steel sash. They are of the double-hung, counter-balanced, or stationary types.

a. Size.

(1). Class E.

Single sash, other than casement	5 ft. 0 in. by 5 ft. 0 in.
Multiple sash, other than casement	6 ft. 0 in. by 10 ft. 0 in.
Casement, single	3½ ft. 0 in. by 10 ft. 0 in.
Casement, pairs	5 ft. 0 in. by 10 ft. 0 in.

(2). Class F.

Single sash	5 ft. 0 in. by 5 ft. 0 in.
Multiple sash, other than sliding and fixed	5 ft. 0 in. by 10 ft. 0 in.
Multiple sliding or fixed sash	7 ft. 0 in. by 10 ft. 0 in.

133. Installation.

1331. Frames shall be securely fastened to the masonry wall and be capable of resisting all wind stresses and other stresses, to which they are likely to be subjected.

1332. When windows are provided with fire lock angles, the fire lock angles shall be so adjusted that they pass one another with a minimum of clearance.

NOTE: Fire lock angles are designed to hold the sash and its corners in the frame as the assembly expands under exposure to fire.

1333. Windows shall be glazed with wired glass not less than ¼ in. thick. The clearance between the edges of the glass and the metal framing shall not exceed ⅛ in.

1334. When wire clips are used for glazing windows specifically designed for their use, one wire clip shall be provided in each mounting hole.

1335. When glazing the inside or outside angles shall be resecured in position with the fastenings provided.

1336. The glass shall be well imbedded in putty and all exposed joints between the metal and glass shall be struck and pointed.

1337. When multiple units of the hollow metal and hollow metal combination types join directly with no vertical structural wall member between, non-bearing sheet metal mullions labeled by a nationally recognized testing and inspection agency shall be used. Bearing mullions shall be of masonry or structural steel suitably protected with fireproofing materials acceptable to the authority having jurisdiction.

134. Closing Devices. The authority having jurisdiction should be consulted as to automatic closing devices, if any.

Section 14.

Glass Blocks.

140. Classification.

1401. Glass blocks shall be of a type investigated and classified by a nationally recognized testing and inspection agency or shall be of a design and construction acceptable to the authority having jurisdiction.

1402. Glass blocks are suitable for the protection of exterior openings for Class F locations not exceeding 120 sq. ft. in area, with neither the width nor height exceeding 12 ft.

1403. Glass blocks are of two sizes 5¾ in. sq. or 7¾ in. sq. by 3⅞ in. thick.

141. Installation.

1411. The mortar for installing glass blocks shall consist of one part portland cement, one part hydrated lime and four parts No. 1 screened torpedo sand by volume.

1412. Steel lintels shall be made of 3 in. by 3 in. steel angles, cut to provide 1¼ in. clearance at each jamb, secured to the structural steel of the building with ⅜ in. bolts; provided with heavy galvanized washers in 2 in. slotted holes, spaced 12 in. on center. The blocks shall extend 1⅝ in. into the groove, with glass or mineral wool for expansion in the remaining spaces formed by the angles, and each horizontal row of blocks reinforced with Nos. 9 and 14 Awg galvanized wire mesh for the full length.

1413. Concrete masonry lintels for 7¾ in. by 7¾ in. blocks shall be provided with 2½ in. deep grooves. The blocks shall extend 1½ in. into the groove, with glass or mineral wool in the remaining space, and with each horizontal row of blocks reinforced for the full length with Nos. 9 and 14 Awg galvanized wire mesh, except between the top two rows.

1414. Concrete masonry lintels for the 5¾ in. by 5¾ in. blocks shall be provided with 2⅜ in. deep grooves. The blocks shall extend 1¼ in. into the groove, with glass or mineral wool in the remaining space, and with the first and each fourth horizontal row reinforced for the full length with Nos. 9 and 14 Awg galvanized wire mesh, except between the top two rows.

1415. The jambs of brick or concrete for the 7¾ in. by 7¾ in. blocks shall be provided with 2½ in. deep grooves. The blocks shall extend 1½ in. into the groove, with glass or mineral wool in the remaining spaces in the grooves to provide for expansion of the glass panel.

1416. The jambs of brick or concrete for the 5¾ in. by 5¾ in. blocks shall be provided with 2 in. deep grooves. The blocks shall extend 1¼ in. into the grooves, with glass or mineral wool in the remaining spaces in the grooves to provide for expansion of the glass panel.

1417. Sills shall be made of concrete and coated with an asphalt emulsion to provide for expansion and movement of the panel.

1418. Exterior jamb and lintel edges shall be caulked with waterproofing mastic.

Section 15.

Fire Shutters.

150. Classification.

1501. Doors having ratings of 3 hour (A), 1½ hour (B) (without lights), or 1½ hour (D) shown on the label, may be employed as shutters for the protection of window openings in Class D, E, and F locations when adequately protected against the weather.

1502. Doors having rating of ¾ hour (E) shown on the label, may be employed as shutters for the protection of window openings in Class E or F locations when adequately protected against the weather.

151. Installation.

1511. Shutters should preferably be installed on the inside of the opening.

1512. Except as noted below, the installation of shutters shall be in accordance with the requirements for installation of swinging and sliding tin-clad and sheet-metal doors and for rolling steel doors.

a. Sills shall conform in all essential particulars with the requirements for openings in fire walls or vertical communications through buildings. If no sill is provided, the shutters shall extend not less than 4 in. below the opening.

b. If sliding shutters are installed on the outside of the opening, metal shields shall be provided to protect against accumulation of snow and ice on the track.

c. Shutters shall be secured shut by at least two steel bars or latches working together and spaced about ¼ the distance from top and bottom of the window opening. Latches shall pivot on ⅜ in. bolts through the shutters. Catches shall be securely set in the wall. Catches for shutters in pairs shall be provided with a flare and attached to the shutter by two ⅜ in. through bolts. Hooks or gravity catches securely attached to wall shall be provided to hold the shutter in position when open.

Section 16. Figures.

The figures included in this section illustrate typical good practice. Other methods acceptable to the authority having jurisdiction may be used.

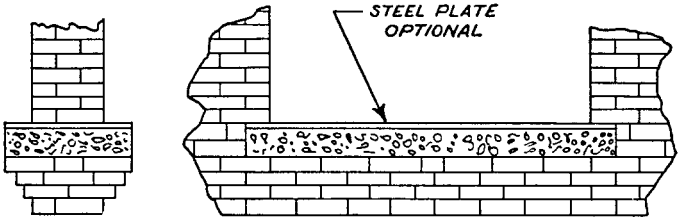

Figure 1. Concrete sill supported by a corbel of brick used with combustible floors.

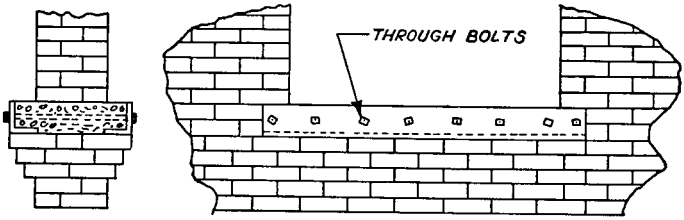

Figure 2. Angle iron and concrete sill supported by a corbel of brick used with combustible floors.

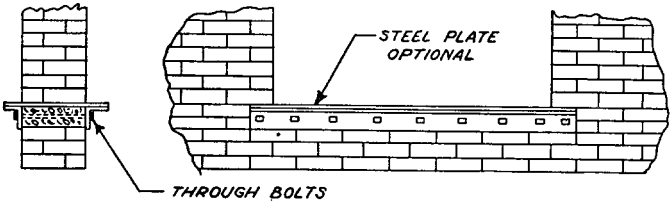

Figure 3. Angle iron and concrete sill used with combustible floors.

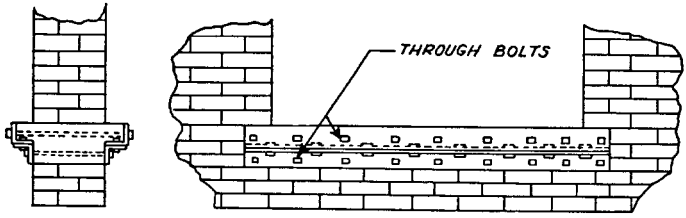

Figure 4. Z-bar and concrete sill used with combustible floors.

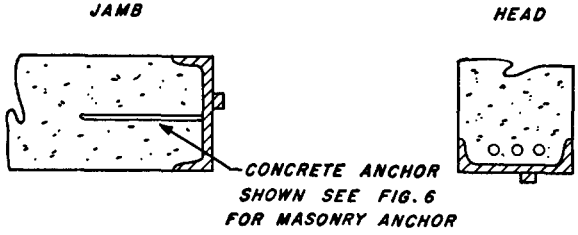

Figure 5. Single type (steel channel) frame.

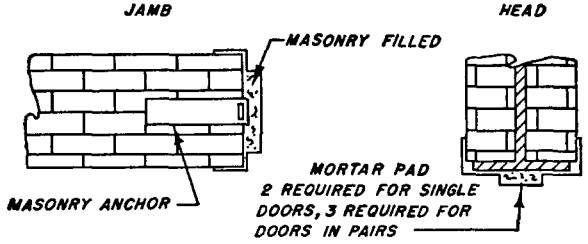

Figure 6. Single type (pressed steel) frame.

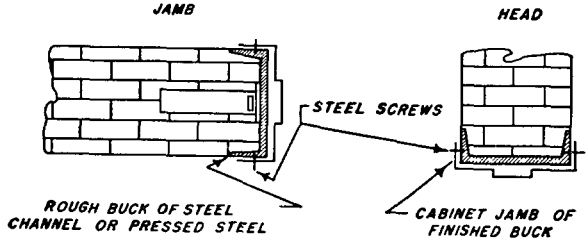

Figure 7. Double type (normal) frame.

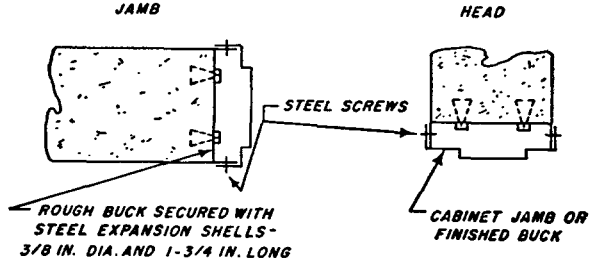

Figure 8. Double type (inverted) frame.

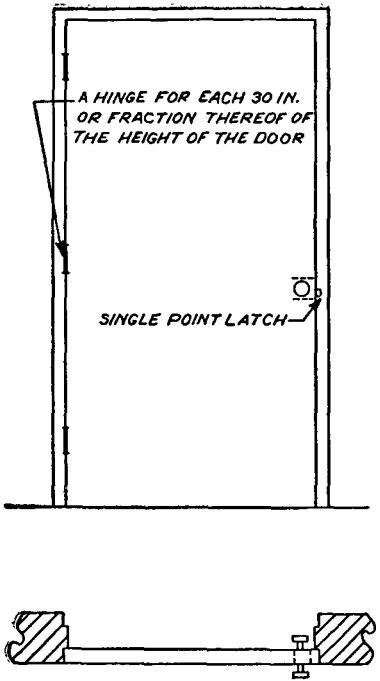

Figure 9. Builders hardware (single swing door with single point latch — flush mounted.)

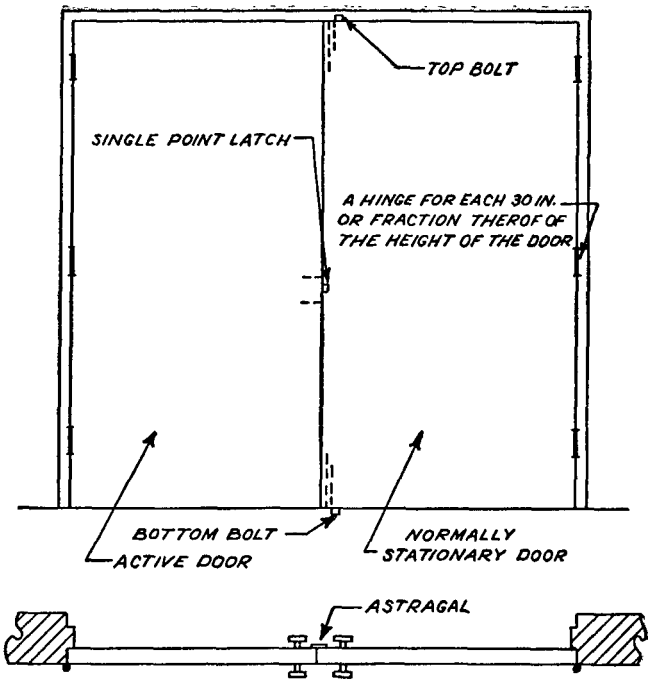

Figure 10. Builders hardware (doors swinging in pairs with single point latch — flush mounted).

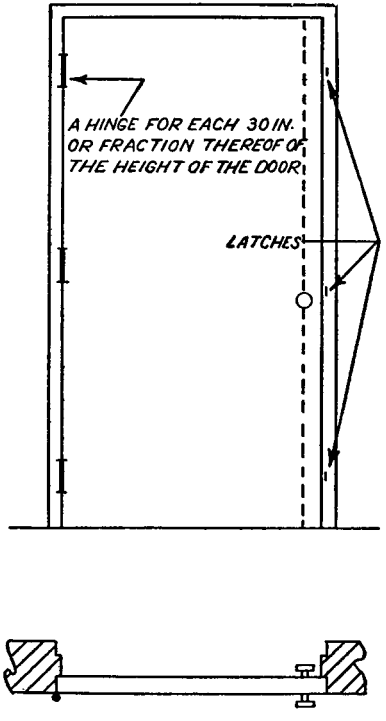

Figure 11. Builders hardware (single swing door with concealed three point latch — flush mounted).

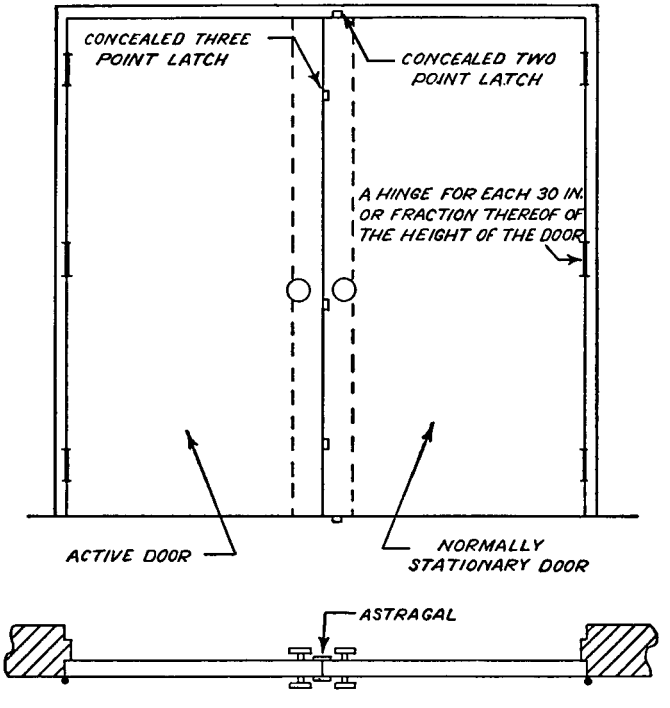

Figure 12. Builders hardware (doors swinging in pairs with concealed two and three point latches — flush mounted).

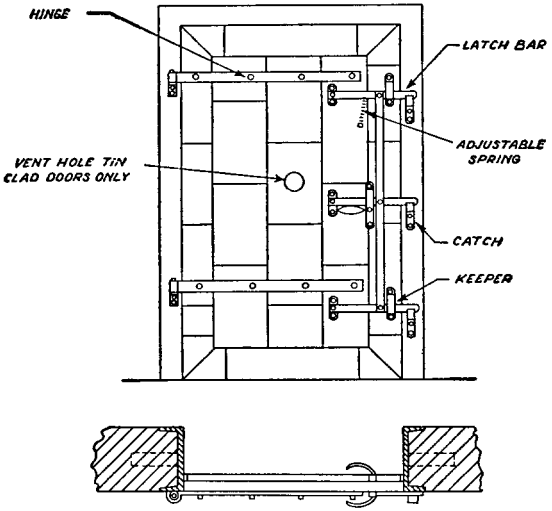

Figure 13. Fire door hardware (single swing door — flush mounted).

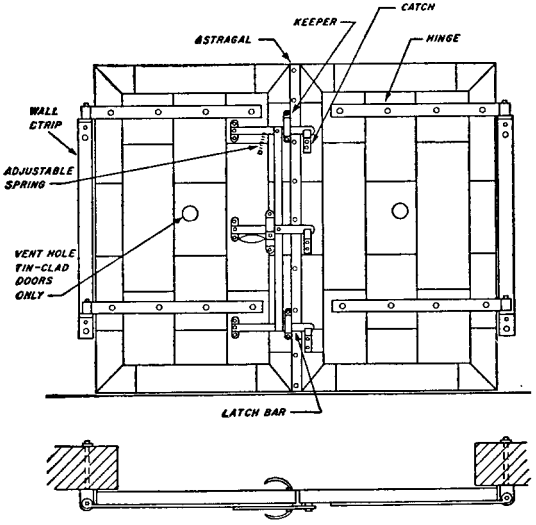

Figure 14. Fire door hardware (doors swinging in pairs — lap mounted).

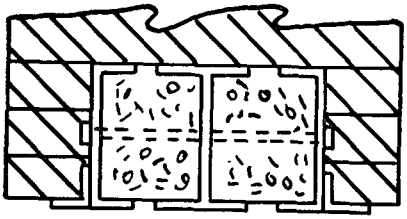

Figure 15. Steel lintel.

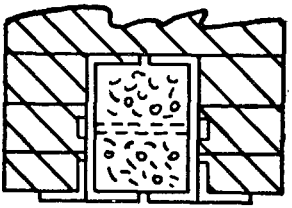

Figure 16. Steel lintel.

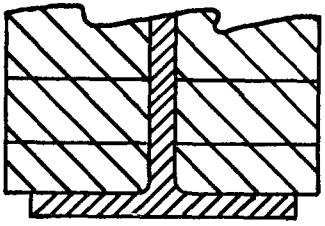

Figure 17. Steel lintel.

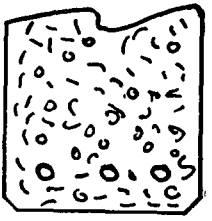

Figure 18. Reinforced concrete lintel.

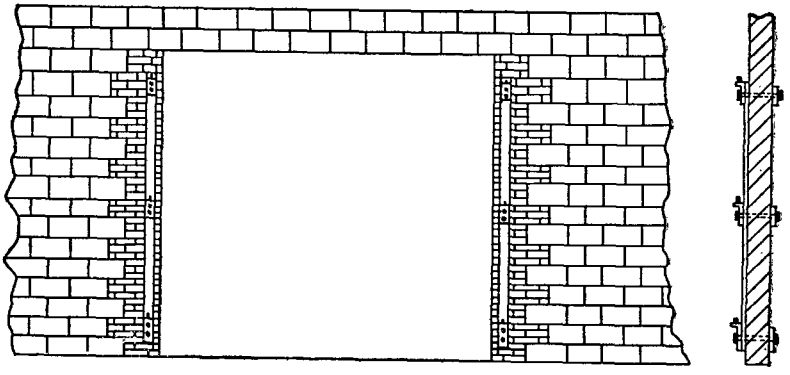

Figure 19. Concrete block wall prepared for doors swinging in pairs — lap mounted, standard method.

Concrete block may be used in lieu of brick, provided all hollow cells within 16 inches of the opening are filled with concrete. It is recommended when openings are subjected to heavy traffic that jambs be protected with steel frames extending full thickness of the wall.

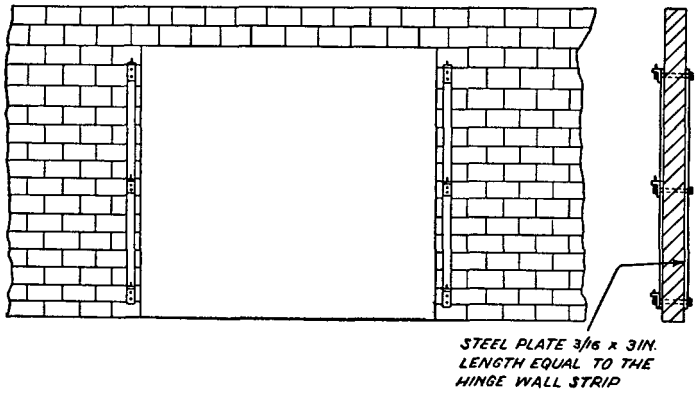

Figure 20. Concrete block wall prepared for doors swinging in pairs — lap mounted.

It is recommended when openings are subjected to heavy traffic that jambs be protected with steel frames extending full thickness of the wall.

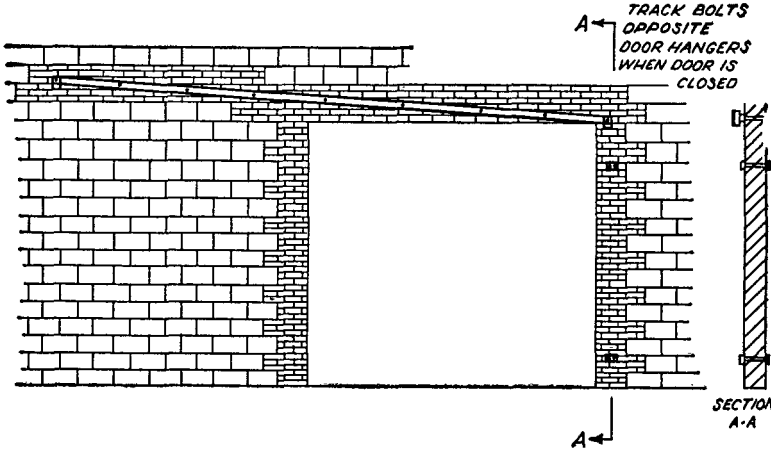

Figure 21. Concrete block wall prepared for a single slide door, standard method.

Concrete block may be used in lieu of brick, provided all hollow cells within 16 inches of opening on each side and all cells where track is mounted are filled with concrete. It is recommended when openings are subjected to heavy traffic that jambs be protected with steel frames extending full thickness of the wall.