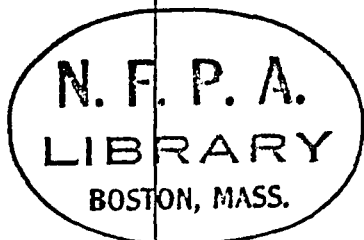


NFPA No.

80

# FIRE DOORS AND WINDOWS 1967

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NATIONAL FIRE PROTECTION ASSOCIATION

International

60 Batterymarch Street, Boston, Mass. 02110

# National Fire Protection Association

## International

### Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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

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\*Among the laboratories nationally recognized by the authorities having jurisdiction in the United States and Canada are the Underwriters' Laboratories, Inc., the Factory Mutual Engineering Corporation, the American Gas Association Laboratories, the Underwriters' Laboratories of Canada, the Canadian Standards Association Testing Laboratories, and the Canadian Gas Association Approvals Division, and Yacht Safety Bureau.

**LISTED:** Equipment or materials included in a list published by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

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**AUTHORITY HAVING JURISDICTION:** The organization, office or individual responsible for "approving" equipment, an installation, or a procedure.

### Units of Measurements

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. One pound = 453.6 grams.

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**Standard for**  
**Fire Doors and Windows**

**NFPA No. 80 — 1967**

This Standard on Fire Doors and Windows, officially adopted by the NFPA on May 18, 1967, supersedes the 1966 edition.

Revisions or additions in the 1967 edition include 25, 412, entire Section 5, 609, title of Section 9, 96, 1104a(b)2, Figures 13, 14, 22, 25, 26, new Figures 45e and 46, and addition of Appendix on the Sizes, Ratings and Methods of Operation of Fire Doors.

**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 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.

In 1955 the name of the Committee was changed to the Committee on Fire Doors and Windows. In 1959 a complete revision of the 1941 edition was adopted including a change in name to correspond with the name of the committee. The 1959 edition was revised in 1961, 1962, 1965, and 1966.

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**SCOPE:** Installation and maintenance of fire doors, windows, shutters and other equipment to restrict the spread of fire, including arrangements for automatic operation in case of fire. Includes installation to protect buildings against external fire, and to restrict spread of fire within buildings. Vault and record room doors are covered by Committee on Record Protection.

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**Standard for**  
**Fire Doors and Windows.**

NFPA No. 80 — 1967

**Section 1.**

**Scope.**

10. This standard is intended to cover the use, 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 4 and 9 and in separate pamphlet form.\*

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\*Available from the National Fire Protection Association, 60 Batterymarch St., Boston, Mass. 02110.

## 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 Life Safety 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 the Life Safety Code.

b. Listed exit devices which meet the requirements for safety to life are available for use on fire doors. Fire doors for use with this hardware bear the marking "Fire Door To Be 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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\*Available from the National Fire Protection Association, 60 Batterymarch St., Boston, Mass. 02110.

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, modified, or improved devices. Listed devices of a design not specifically mentioned, or having construction features differing from those detailed in this Standard, may be recognized.

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.



25. Any assembly provided in accordance with the provisions of this Standard does not necessarily provide the same degree of protection against the spread of fire that is provided by the wall in which the assembly is installed assuming that the wall has fire resistance established in accordance with Standard Methods of Fire Tests of Building Construction and Materials, NFPA No. 251. Therefore the size and number of openings in any wall required to have fire resistance should be held to the minimum necessary to the normal or to emergency operation of the occupancy. The use of assemblies covered by this Standard for decorative, aesthetic and similar purposes in fire resistive walls having fire resistance is not recommended.

### 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.

Fire protection ratings for products meeting this Standard shall be as determined and reported by a nationally recognized testing agency in accordance with Standard Methods of Fire Tests of Door Assemblies (NFPA No. 252, UL 10(b), ASTM E152, USA Standard (A 2.2)).

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.

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. Only listed or labeled doors shall be used.

403. The ratings of 3, 1½, 1 or ¾ hours, as well as the letters A, B, C, D, or E appearing on the label following the hourly rating, indicate the duration of the test exposure and the classification of the wall opening for which the door is designed. Labels provide evidence that the size of the door and the exposed glass area are acceptable under this Standard.

404. When the temperature rise is shown on the label, 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.

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

a. On fire doors bearing the "Fire Door To Be Equipped with Fire Exit Hardware" label, the label covers the reinforcements or construction features necessary for the exit devices which shall bear the "Fire-Exit Hardware" label.

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

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

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

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

f. 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. Wired glass not less than ¼ in. thick may be used in each door of a pair of doors or in a single door for 1 and 1½ hour (B) locations when the exposed glass area does not exceed 100 sq. in. per individual door.

413. Wired glass not less than ¼ in. thick may be used in doors for ¾ hour (C) locations when the glass for individual exposed areas does not exceed 1296 sq. in. with no dimension exceeding 54 in.

414. Wired glass not less than ¼ in. thick may be used in doors for ¾ hour (E) locations when the glass for individual exposed areas does 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.

416. Devices used to view through fire doors rated at 1½ hours or less are permissible if they require a hole no larger than 1 in. in diameter through the door, have at least ¼ in. thick glass disc and are retained in a metal frame which will not melt out when subjected to temperatures in the order of 1700 to 1800°F.

## **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 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.

#### 50. General.

a. Composite, hollow metal and metal clad (kalamein) doors are flush mounted (for doors provided with builders' hardware, see Sub-section 51. For doors provided with fire door hardware, see Sub-section 52).

b. Tinclad and flush or corrugated sheet metal doors may be flush mounted or lap mounted. (See Sub-section 52).

#### 51. Composite, Hollow Metal and Metalclad (Kalamein) Doors.

Composite, hollow metal and metalclad (Kalamein) doors are flush mounted in steel frames with builders hardware. Frames shall be securely anchored to the wall construction (see Section 16, Figures 9-12).

#### 511. Sills.

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

b. Buildings with combustible floors require special sill construction at door openings, as combustible floor construction must not extend through the opening.

c. Sills shall be made of noncombustible materials extending at least the width of the door frame (see Section 16, Figure 2 for recommended construction).

d. If sills are flush concrete construction, they shall be of a good grade and shall be not less than 4 in. thick extending to the wall opening on either side.

e. Raised noncombustible sills or thresholds are acceptable whenever combustible floor coverings are contemplated or are in use on one or both sides of the door openings (see Section 16, Figure 2).

**COMBUSTIBLE FLOOR COVERING SHALL NOT BE PERMITTED TO EXTEND THROUGH DOOR OPENINGS.**

512. Wall Openings. Wall openings shall be constructed to readily accept the fire door frame and shall be designed

so that no structural load is carried by the fire door frame except when frames are of structural steel.

**513. Lintels.** Separate reinforcing units shall be provided for pressed steel door frames when necessary to support overhead wall loads over door openings. Reinforcements of head members of pressed steel door frames shall not be permitted.

**514. Frames.**

a. Only listed steel door frames including method of anchoring shall be used.

b. Wood or plastic faced composite doors shall be installed in pressed steel frames of the single unit type. Tin clad and sheet metal (corrugated) doors shall be installed in steel channel frames. Composite steel faced, hollow metal, metal clad (Kalamein) and sheet metal (flush or panel types) doors shall be installed in pressed steel or steel channel frames.

c. Clearances. The clearance between the door and the frame and between meeting edges of doors swinging in pairs shall not exceed  $\frac{1}{8}$  in. The clearance between the door and the floor with either flush or raised sill shall be not more than  $\frac{3}{4}$  in.

d. Steel door frames are available in several different types.

(1). **Single Unit Type (Pressed Steel).** These frames consist of head and jamb members factory assembled or designed for field assembly. Frames may be constructed to be erected before or after the building of the walls.

(a). Frames of this type may be provided with solid nonoperating transom panels with or without transom bars provided they meet the requirements of 503a.

(b). Frames of this type may be provided with nonoperating solid or glazed transom panels or sidelights. When glass is employed it shall be listed wired glass. (This is intended to mean panels and/or sidelights).

(2). **Two Section Type.** Frames of this type shall consist of a rough buck either pressed steel or steel channels designed to be erected before masonry walls are built or may

be installed in finished masonry wall openings. Finish head and jamb members are secured to rough bucks.

(3). **Single Unit Type (Steel Channel).** Frames of this type shall consist of head and jamb members of structural steel channels either shop or field assembled, to be erected before masonry walls are built. The design and construction is to meet the requirements of 503a.

**e. Transoms.**

(1). Transom panel frame assemblies may be used in Class B, C, D, and E openings. At the discretion of the authority having jurisdiction, transom panel frame assemblies may be used for the protection of Class A openings.

(2). The combined area of door or doors and transom panel shall not exceed 40 sq. ft. for single doors or 80 sq. ft. if more than one door is used.

(3). Transom panels shall have a fire protection rating of the same or greater duration as the door or doors with which they are associated.

**f. Sidelights.**

(1). Sidelights or side panel assemblies may be used in Class B, C, D, and E openings.

(2). The combined area of door(s), transom panel, and/or sidelights or side panels shall not exceed 120 sq. ft. with no dimension greater than 12 ft.

(3). Transom lights or panels and/or sidelights and panels shall have a fire protection rating of the same or greater duration as the door or doors with which they are associated.

**515. Astragals.** Doors swinging in pairs shall have at least one astragal securely attached in place so as to project approximately  $\frac{3}{4}$  in. (see Figures 10, 12 and 14, Section 16).

**516. Builders Hardware** (see Figures 9, 10, 11, and 12, Section 16).

**a. Hinges.** (See Table I.)

(1). **Attaching of Hinges to Door.** Mortise hinges shall be secured to wood and plastic covered composite doors



**TABLE I**  
**Builders Hardware**  
**Mortise and Surface Hinges or Pivots for Swinging Doors\***

NOTE: All hinges or pivots, except spring hinges, must be of the ball bearing type.

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.

For 1 3/4 Inch or Thicker Doors

Door Rating, Hr.	Maximum Size Door		Hinge Size		Type Hinge
	Width Feet	Height Feet	Height In.	Thickness In.	
3, 1 1/2, 1, 3/4	4	10	4 1/2	0.180	Steel, Mortise or Surface
3, 1 1/2, 1, 3/4	4	8	4 1/2	0.134	Steel, Mortise or Surface
1 1/2, 3/4	3'2"	8	6	0.225	Steel-Olive Knuckle or Paumelle
3, 1 1/2, 3/4	4	10	4	0.225	Steel Pivots (Including Top, Bottom and Intermediate)
1 1/2, 1, 3/4	3	5	4	0.130	Steel, Mortise or Surface
1 1/2, 1, 3/4	2	3	3	0.092	Steel, Mortise or Surface
3, 1 1/2, 1, 3/4	3	7	4 1/2	0.128	Steel, Mortise (spring closing)
For 1 3/8 Inch Doors					
1 1/2, 3/4	3	7	3 1/2	0.123	Steel, Mortise or Surface
3, 1 1/2, 1, 3/4	2'8"	7	3 1/2	0.120	Steel, Mortise (spring closing)

\*Spring Hinges are regulated in Section 11.

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.

b. **Locks or Latches.** Only listed 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 used. 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 except when the doors are to be used as a required means of egress (see Section 20a).

The throw of single point latch bolts shall not be less than the minimum shown on the fire door label. If the minimum throw is not shown or the door does not bear a label, the minimum throw shall be as required in Table II.

(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 swing-

**TABLE II Builders Hardware**  
**Latching Devices for Swinging Doors**

For alternate assemblies and exceptions, see paragraphs 21, and 516.

	Door Rating Hours	Maximum Opening Height	Single Swing Doors	Latches	
				Doors in Pairs Active Leaf	Inactive Leaf
Composite Wood (flush)	1½	8'	½ in.	—	—
	1	10'	½ in.	—	—
	¾	7' 2"	½ in.	¾ in.	Top & Bottom Bolts
Composite Plastic (flush)	1½ or			—	—
	1	7' 2"	½ in.	—	—
Composite Steel (flush)	3	8'	3 Pt. Surface	—	—
	3	8'	⅝ in.	⅝ in.	Top & Bottom Bolts
	1½ or ¾	8'	½ in.	⅝ in.	Top & Bottom Bolts

**TABLE II Builders Hardware**  
**Latching Devices for Swinging Doors (Continued)**

For alternate assemblies and exceptions, see paragraphs 21, and 516.

	Door Rating Hours	Maximum Opening Height	Latches		
			Single Swing Doors	Active Leaf	Doors in Pairs Inactive Leaf
Hollow-Metal (Panelled or flush)	3	8'	½ 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

ing 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. Open back strikes shall not be installed in the inactive leaf of pairs of fire doors.

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

**517. Closing Devices.** See Section 11.

**52. Tinclad Doors and Flush or Corrugated Type Sheet Metal Doors.**

Tinclad doors and flush or corrugated type sheet metal doors are provided with fire door hardware and may be flush or lap mounted. Hollow metal and metal clad (kalamain) doors provided with fire door hardware are flush mounted.

**a. Flush mounted doors** are hung in steel channel frames securely anchored to the wall construction.

**b. Lap mounted doors** are hung on the surface of the wall and shall lap the opening at least 4 in. at the top and on each side.

**521. Sills.**

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

**b. Buildings with combustible floors** require special sill construction at door openings, as combustible floor construction must not extend through the opening.

**c. Sills** shall be made of noncombustible materials. Concrete sills shall be of a good grade.

**d. Sills** shall extend at least the width of the door frame for flush mounted door. For lap mounted doors sill shall extend beyond the opening by an amount equal to the projection of the installed door or doors (see Section 16, Figures 1, 3, and 4 for recommended construction).

**522. Walls.**

**a. Walls** shall be plumb and true and present smooth

TABLE III

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

TABLE IV

## 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.

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.

**523. Frames for Use with Flush Mounted Doors.** Frames are not required for lap mounted doors.

a. Only listed or labeled frames of the structural steel type shall be used.

b. Structural steel frames consist of head and jamb members either shop or field assembled and are to be erected before the wall is built.

**524. Astragals.** Doors swinging in pairs shall have at least one astragal securely attached in place so it will project at least  $\frac{3}{4}$  in. (See Figure 14, Section 16).

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

a. Only listed or labeled fire door hardware shall be used.

b. Fire door hardware includes hinge brackets, hinges, latches, latch keepers, and operating handle mechanism; and for the inactive leaf of pairs of doors, top and bottom bolts and keepers.

c. **Hinges and Latches, Number and Length.** (See Tables IV, V, and VI.)

d. **Attaching Fire Door Hardware to Doors.** 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.

e. **Attaching Fire Door Hardware to Frames for Flush Mounted Doors.** Hinges and latch keepers shall be bolted, riveted or welded to the frame.

f. **Attachment of Wall Strips for Lap Mounted Doors.** Hinges and latch keepers shall be mounted on wall strips bolted through the wall. Not less than  $\frac{3}{4}$  in. through bolts shall be used for attaching hinge wall strips and not

**TABLE V**  
**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.

less than  $\frac{1}{2}$  in. through bolts for latch keeper wall strips (see Figure 14, Section 16).

**526. Operation of Doors.** The doors shall swing easily and freely on their hinges. The latches shall operate freely.

**527. Clearances.**

a. **Flush Mounted.** Clearances for flush mounted doors shall not exceed  $\frac{1}{8}$  in. at the sill. Clearances at the meeting edges of doors in pairs shall not exceed  $\frac{1}{4}$  in. for 3 ply tinclad doors or  $\frac{1}{8}$  in. for other doors.

b. **Lap Mounted.** The clearance between the door and the wall when the door is in a closed position, and between the door and the sill shall not exceed  $\frac{3}{4}$  in.

**528. Closing Devices.** See Section 11.

**529. Vents.**

a. Each tin-clad door formed of 14 in. by 20 in. sheets shall be provided with 3 in. diameter vent holes located as shown on Figure 46.

b. The vent holes shall be cut through the sheets on the face of the door to be provided with the fire door hardware, care being taken so as not to interfere with the hardware or to injure the wood core when cutting the holes in the sheets. The metal covering around the opening shall be secured with small nails spaced about 1 in. apart and the exposed wood thoroughly painted.



## Section 6.

### Installation of Horizontal Sliding Doors.

#### 60. Wall Mounted.

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

602. Lap. The door shall lap the openings at least 4 in. at the sides and top.

#### 603. 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  $3\frac{1}{2}$  in. in thickness and the tread shall be adequately secured.

#### 604. 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.

605. 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.

**606. Astragals.** Center parting doors shall have an astragal securely attached in place so as to project approximately  $\frac{3}{4}$  in. (See Figures No. 26, 26a, Section 16.)

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

**a. General.**

(1). Only listed fire door hardware shall be used.

(2). Fire door hardware includes tracks, hangers, track brackets, binders, bumpers, pull handles, stay rolls, and center latch assembly for center parting doors.

**b. Track Binders.** The mounting of track for tin-clad and sheet-metal doors is similar with the exception that there shall be at least  $\frac{3}{4}$  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.

**c. Track.**

(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  $\frac{3}{4}$  in. in diameter and shall be installed through the wall, with track bracket at each bolt. Refer to Table VI for bolt spacings (except as provided in 604.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 an incline of  $\frac{3}{4}$  in. to 1 ft. if door is intended to close by gravity.

**TABLE VI**  
**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"	1½	12¼	24	26½	26¾						
3' 3"	8' 3"	1½	12¼	27	28	28¾						
3' 6"	8' 9"	1½	13¼	28	30	30¾						
3' 9"	9' 3"	1½	13¼	31	31½	31¾						
4' 0"	9' 9"	1½	14¼	32	33½	33¾						
4' 3"	10' 3"	1½	14¼	35	35	35¾						
4' 6"	10' 9"	1½	15¼	36	37	37¾						
4' 9"	11' 3"	1½	15¼	19½	19½	38½	38¾					
5' 0"	11' 9"	1½	16¼	20	20	40½	40¾					
5' 3"	12' 3"	1½	16¼	21½	21½	28	28	28¾				
5' 6"	12' 9"	1½	17¼	22	22	30	29	29¾				
5' 9"	13' 3"	1½	17¼	23½	23½	31	30	30¾				
6' 0"	13' 9"	1½	18¼	24	24	32	32	31¾				
6' 3"	14' 3"	1½	12¼	31½	31½	31	31	30¾				
6' 6"	14' 9"	1½	12¼	33	33	32	32	31¾				
6' 9"	15' 3"	1½	13¼	33½	33½	33	33	33¾				
7' 0"	15' 9"	1½	13¼	35	35	34	34	34¾				
7' 3"	16' 3"	1½	14¼	35½	35½	36	35	35¾				
7' 6"	16' 9"	1½	14¼	37	37	37	36	36¾				
7' 9"	17' 3"	1½	14¼	19¼	19¼	19¼	19¼	38	37	37¾		
8' 0"	17' 9"	1½	14¼	20	20	20	20	39	38	38¾		
8' 3"	18' 3"	1½	14¼	20¾	20¾	20¾	20¾	40	39	39¾		
8' 6"	18' 9"	1½	14¼	21½	21½	21½	21½	41	40	40¾		
8' 9"	19' 3"	1½	14¼	22¼	22¼	22¼	22¼	31	31	31	31¾	
9' 0"	19' 9"	1½	14¼	23	23	23	23	31¾	31¾	31¾	32	
9' 3"	20' 3"	1½	15¼	23¼	23¼	23¼	23¼	32¾	32¾	32¾	33	
9' 6"	20' 9"	1½	15¼	24	24	24	24	34	34	33	33¾	
9' 9"	21' 3"	1½	16¼	24¼	24¼	24¼	24¼	35	35	34	34¾	
10' 0"	21' 9"	1½	16¼	25	25	25	25	35¾	35¾	35¾	35½	
10' 3"	22' 3"	1½	17¼	25¼	25¼	25¼	25¼	36¾	36¾	36¾	36½	
10' 6"	22' 9"	1½	17¼	26	26	26	26	37	37	37	37¾	
10' 9"	23' 3"	1½	18¼	26¼	26¼	26¼	26¼	38	38	38	38¾	
11' 0"	23' 9"	1½	18¼	27	27	27	27	38¾	38¾	38¾	39	
11' 3"	24' 3"	1½	19¼	27¼	27¼	27¼	27¼	39¾	39¾	39¾	40	
11' 6"	24' 9"	1½	19¼	28½	28½	28½	28½	40	40	40	40¾	
11' 9"	25' 3"	1½	20¼	29¼	29¼	29¼	29¼	40½	40½	40½	40¾	
12'	25' 9"	1½	20¼	30	30	30	30	33	33	33	33	33¾

Figures in heavy type indicate bolts opposite door hangers

(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 VI 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  $\frac{3}{4}$  in. diameter and shall be installed through the wall except as provided in 604b.

(4). **Mounting Box Type Track.** When box type track is used the number of track brackets provided shall be such that a bracket is located directly over each hanger when the door is closed, on each end, and such intermediate brackets so that bracket centers shall not exceed  $39\frac{1}{2}$  in. Wall bolts securing brackets in position shall not be less than  $\frac{5}{8}$  in. in diameter and shall be installed through the wall, except as provided in 604b.

d. **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 VI). Two hangers shall be provided on each section of vertically spliced sheet-metal or tin-clad doors. (See Paragraph 608.)

e. **Binders.**

(1). At least two front binders are required for tin-clad and sheet metal doors. The upper binder shall be placed approximately 24 in. from the top of the door, and the lower binder approximately 24 in. above the sill.

(2). In addition to the above front binders, 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 and tin clad doors 7 ft. but not more than 10 ft. in height shall be provided with one rear binder located midway between the top and bottom of the door. Both sheet metal and tin clad doors for openings exceeding 10 ft. in height shall be provided with two rear binders located at the quarter points for sheet metal and third points for tin clad doors.

(4). Composite doors shall have one base binder and one or more front and rear latches. See Figure 25a.

(5). The space between the top of the door and the track for sheet-metal doors shall be at least  $\frac{3}{4}$  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  $\frac{1}{2}$  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). Front and rear binders for tin-clad and sheet metal doors shall be fastened to the wall with bolts having a diameter of not less than  $\frac{3}{4}$  inch and which 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.

f. **Stay Rolls.** Figures 27, 28, 29, 30 and 30a, Section 16 show acceptable methods of attaching Stay Roll Brackets. For concealed type Stay Roll, see Figures 30 and 30a.

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

h. **Chafing Strips.** Tin-clad doors shall be provided with chafing strip assemblies consisting of half-oval strips on the back or wall side of the door bolted through the door to washer strips on the front of the door. The length of the chafing strip assemblies shall be 8 in. less than the door width. Two chafing strip assemblies are required for doors for openings not exceeding 8 ft. in height. Three chafing strip assemblies are required for doors for openings exceeding 8 ft. in height. The chafing strip assemblies shall be parallel to the track and the top strip assembly shall be located one-third the distance from the top of the door and the bottom strip assembly 24 in. from the bottom edge of the door. When three chafing strip assemblies are required, the middle strip is to be located midway between the other two. For doors equipped with two rear binders a flat strip is used in place of the top half-oval strip when three chafing strip assemblies are used.

i. **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.)

j. **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.)

k. **Handles.** The flush pull on the back of the door shall be countersunk flush with the surface of the door. Handle on front of door shall be bolted to flush pull by through bolts or otherwise securely attached. (See Figure 25, Section 16.)

#### 608. Sectional Door Units.

a. **Tin-Clad and Sheet-Metal.** May be furnished in not more than two sections and 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.

b. **Composite Sliding Doors.** Single sliding composite doors shall consist of not less than two (2) or more than five (5) panels. Constructed for either field or factory assembly. For center parting doors not less than two (2) or more than four (4) panels comprise a single door leaf.

#### 609. Vents.

a. Each tin-clad door formed of 14 in. by 20 in. sheets shall be provided with 3 in. diameter vent holes located as shown on Figure 46.

b. The vent holes shall be cut through the sheets on the face of the door opposite the rear binder pockets, care being taken so as not to injure the wood core when cutting the holes in the sheets. The metal covering around the opening shall be secured with small nails spaced about 1 in. apart and the exposed wood thoroughly painted.

**610. Clearances.** The clearance for tin-clad and sheet metal doors between the door and the wall when in closed position shall not be more than  $\frac{3}{8}$  in.; for composite doors not more than  $\frac{1}{2}$  in. and between the door and the sill not more than  $\frac{3}{8}$  in.

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

## 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  $3\frac{1}{2}$  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). Only listed fire door hardware shall be used.

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

##### 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  $2\frac{1}{2}$  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  $\frac{3}{4}$  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  $\frac{1}{4}$  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 Hoistway Doors for Power Elevators and Power Dumb-waiters

#### 90. Scope

901. This section covers only fire door assemblies directly connected with elevator or dumbwaiter operation, and used in vertical hoistway enclosures for the purpose of preventing the passage of fire through such entranceways. Fire door assemblies not connected with the operation shall be installed as provided in other sections of the Standard.

#### 91. General

911. The Section covers widely used, but not all of the door assemblies employed by the elevator and dumbwaiter industries. Only listed door assemblies shall be employed for elevator and dumbwaiter use.

912. Power elevators and power dumbwaiters are to be so arranged that the car will not move away from a floor landing by the normal operating means unless the hoistway door at this landing is in the closed position (See USA Standard Safety Code A17.1 for hoistway door interlocks and combination mechanical locks and electric contacts used for this purpose).

913. Elevator door closing devices of a type that automatically close the elevator hoistway door as a result of fire are not to be employed because of the possibility of trapping persons in the elevator car.

914. Elevator and dumbwaiter door assemblies are installed by either the manufacturer or those familiar with the design requirements of the industry. This Section, therefore, omits information on miscellaneous installation material which is incorporated as part of the industry design and, consequently, not subject to the discretion of uninformed installers.

915. It is the general intent of the Section to promote a design and application that will prevent dislodgment of a door from its entranceway as the result of fire, and prevent distortion of the assembly to the point where fire can readily

pass through the entranceway. In formulating the requirements for fire safety, consideration has been given to the safety requirements for the protection of life and limb.

## **92. Classification of Openings and Types of Doors**

**921.** Classification of openings shall be Class B and types of doors are as defined in Section 3.

**922.** Types of elevator hoistway doors include single swinging, horizontal sliding, and vertical sliding bi-parting counterbalanced. (See Figures 45a, b, c, and d, Section 16.) Swinging doors in pairs, and vertical sliding counterweighted doors are also furnished. Horizontal sliding doors are of the single-speed, two-speed, and three-speed side-opening types, or single-speed and two-speed center-opening types.

**923.** Types of dumbwaiter hoistway doors include vertical bi-parting counterbalanced, swinging, and vertical sliding counterweighted.

## **93. Single Swinging Hoistway Doors for Elevators**

**931.** Entrance Assembly (See Figure 45a, Section 16). The major units of a typical assembly include sill and attachments, frame with attachments, door and hinges, closing device and latching device.

### **932. Requirements**

**a. Door Locking Devices for Elevator Operation.** Hoistway door locking devices (USA Standard Safety Code A17.1) are safety devices furnished for the protection of life and limb. See Paragraph 912.

**b. Closing Devices.** Hoistways shall have self-closing doors which, when opened, return to the closed position.

**c. Hinges.** Hinges shall conform to the requirements of Paragraph 516a and Table I.

**d. Sills.** Sills shall be metal and securely anchored to the building structure and grouted.

**e. Frames.** Frames shall be securely fastened to sill and anchored to hoistway wall with approved type anchors. Vertical frame supports are furnished, when necessary, to position the frame prior to construction of the wall, and may or may not be permanent depending on the type of wall construction.

**f. Locks, Latches, or Latching Devices.** Locks or latches as required in Paragraph 516b shall be provided, or a latching device furnished which prevents the opening of the door when the car is not within the floor landing zone. Such locks, latches, or latching devices shall be located at or near the mid-point of the door height.

**g. Clearance.** The clearance between closed door and frame shall not exceed  $\frac{1}{8}$  in. The clearance between closed door and sill shall not exceed  $\frac{3}{8}$  in.

**933. Walls.** Walls shall be of brick, concrete, or concrete block construction, unless walls of other materials are permitted by the authority having jurisdiction.

**934. Lintels.** Heads of door frames shall be reinforced, or separate lintels provided, depending on type of wall construction and loads to be supported.

#### **94. Horizontal Sliding Hoistway Doors For Elevators**

**941. Entrance Assembly** (See Figure 45b and c, Section 16). The major units of a typical assembly (single slide two-speed and center opening) include sill with attachments, header with vertical strut or other supports, frame with attachments, hanger track assembly, hangers, and door panel (panels).

#### **942. Requirements.**

**a. Door Locking Devices for Elevator Operation.** Hoistway door locking devices (USA Standard Safety Code A17.1) are safety devices furnished for the protection of life and limb. See Paragraph 912.

**b. Closing Devices.** Hoistway door closing devices (closers) are mandatory only for power-operated automatic elevators (USA Standard Safety Code A17.1). Such devices are not essential to fire safety if the design inherently prevents opening of a closed door by heat distortion or failure of the device or connecting linkage. Weights suspended by cables, wire cords, or chains constitute a type closer which falls in this category. Questionable designs shall be 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.

**c. Sills.** Sills shall be metal and securely anchored to the building structure and grouted.

**d. Frames.** Frames shall be securely fastened to sills and header and anchored to hoistway wall with approved type anchors. Headers shall be securely fastened to the building structure by vertical struts (fastened at the bottom to sill and at the top to building structure), or by other substantial means.

**e. Hanger Track Assemblies, Hangers.** The hanger track is fastened to, or integral with, the header. The hangers are secured to the top of door panel (panels) which hang from the track assembly.

**f. Clearance.** Door panels shall clear the frame and sill by not more than  $\frac{3}{8}$  in. when door is in closed position. Two-speed or three-speed panels shall clear each other by not more than  $\frac{3}{8}$  in.

**943. Walls.** Walls shall be of brick, concrete, or concrete block construction, unless walls of other materials are permitted by the authority having jurisdiction.

**944. Lintels.** Heads of door frames shall be reinforced, or separate lintels provided, depending on type of wall construction and loads to be supported.

## **95. Vertical Sliding By-parting Counterbalanced Hoistway Doors for Elevators**

**951. Entrance Assembly** (See Figure 45d, Section 16). The major units of a typical assembly include frame (when used) and attachments, guide rails, door panels with guide shoes and safety meeting edge, counterbalancing mechanism, and door locking device for elevator operation.

### **952. Requirements.**

**a. Door Locking Devices for Elevator Operation.** Hoistway door locking devices (USA Standard Safety Code A17.1) shall conform to Paragraph 912.

**b. Closing Devices.** Hoistway door closing devices (closers) other than controlled power operators are not used with this type of door for reasons of safety to life and limb.

c. **Frames (Required for Non-Load Bearing Walls).** Frames shall be anchored to the hoistway with approved type anchors. Jambs shall be securely fastened to the building structure at top and bottom and shall be of sufficient size to support the elevator door guide rails. Metal sills shall be supplied and securely fastened to the building structure. Shaftside faces of frames and sills should be in alignment and plumb with frames above and below.

d. **Counterbalancing Mechanism.** Upper and lower door panels are connected by chains or cables passing over sheaves mounted from guide rails. Means shall be provided to prevent the lower panel from opening independently of the upper panel.

e. **Safety Meeting Edge.** A non-shearing, non-crushing member is required on the upper door panel by the USA Standard Safety Code A17.1.

f. **Lap.** The doors shall lap the openings at least two inches on the sides and at the bottom, and at least three inches at the top.

g. **Clearance.** Doors when closed shall clear the sills and lintels by not more than  $\frac{1}{2}$  in.

h. **Guide Rails.**

(1). Guide rails shall be securely fastened to frame jambs for full length of frame, or securely anchored to hoistway walls for openings without frames.

(2). They shall be provided with a spreader below the sill unless they are secured to the structure.

(3). Panels shall engage the rails on each side at least one inch.

953. **Walls.** Walls shall be of brick, concrete, or concrete block construction, unless walls of other materials are permitted by the authority having jurisdiction. Walls shall be plumb and true and present smooth surfaces.



**954. Lintels.** Heads of door frames shall be reinforced, or separate lintels provided, depending on type of wall construction and loads to be supported.

**96. Vertical Sliding Bi-Parting Counterbalanced Hoistway Doors for Dumb-waiters.**

**961. Entrance Assembly.** The major units of a typical assembly are pre-assembled, and include frame and attachments, guide rails, door panels with guiding members and with or without safety meeting edge, counterbalancing mechanism, and door locking device for dumbwaiter operation.

**962. Requirements.**

**a. Entrance Assemblies.** The assembly listed in subsection 961 shall be of a listed type.

**b. Door Locking Devices for Dumb-waiter Operation.** Hoistway door locking devices (USA Standard Safety Code A17.1) shall conform to 912.

**c. Closing Devices.** Hoistway door closing devices (closers) other than controlled power operators are not used with this type of door for reasons of safety.

**d. Frames.** Frames including attached guide rails shall be securely attached to building structure by suitable anchoring means.

**e. Counterbalancing Mechanism.** Upper and lower door panels are connected by chains or cables passing over sheaves mounted from guide rails. Means shall be provided to prevent the lower panel from opening independently of the upper panel.

**f. Safety Meeting Edge (Optional).** A safety meeting edge, if provided, shall be on the bottom of the upper door panel, and shall be nonshearing and noncrushing.

**963. Walls.** Wall openings shall be so constructed as to readily accept the dumb-waiter door frame, and shall be designed so that no structural load is carried by the dumb-waiter door frame.

**964. Lintels.** Reinforcements of head members of dumb-waiter door frames shall not be permitted. When it is necessary to support overhead loads, separate reinforcing units shall be provided.

## **Section 10.**

### **Installation of Doors for Chutes and Manually Operated Dumb-Waiters**

**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.

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). A listed door closer, including spring hinge closers, without hold-open feature, mounted on or in 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). A listed door closer with hold-open arm embodying a listed fusible link, listed fixed temperature release, listed rate-of-rise temperature release utilizing heat responsive devices or a listed smoke detection device.

(2). A listed 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 operation of a listed fusible link, listed fixed temperature release or listed rate-of-rise of temperature release or listed smoke detection device will permit the weights to close the door.

(4). A listed self-closing door closer with a hold-open device actuated by a listed automatic fire or smoke detection device. The hold-open device may be separate or incorporated in the door closer.

#### **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 attachment of ropes, wire cables or chains so arranged over pulleys that operation of a listed fusible link, listed fixed temperature release or listed 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 which will not interfere with the full closing of the door, 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 a listed door closer with hold-open arm embodying a listed fusible link, listed fixed temperature release, listed rate-of-rise release or a listed smoke detection device.

##### **(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). Where pairs of fire doors are used, the inactive leaf shall be provided with listed automatic flush bolts or fire-exit hardware. Manually operated bolts may be used on fire doors for other than Class A openings when

the inactive leaf is used solely for the servicing or movement of equipment. The inactive leaf must be kept secured at all times except when it is in actual use and the closing device may be omitted.

**(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 which will not interfere with the full closing of the door, for the entire length of its travel and shall be suspended from chain or wire cable. For exceptions see 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 operation of a listed fusible link, listed fixed temperature release or listed rate-of-rise of 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 operation of a listed fusible link, listed fixed temperature release or listed rate-of-rise of temperature release which releases the curtain.

**(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. A periodic inspection and maintenance program is a very important responsibility of the management of the property to assure the required fire protection.

Fire doors, shutters and windows are valueless unless they are properly maintained and are closed or will close at the time of fire. Repairs shall be made and defects that may interfere with operation shall be corrected immediately.

1202. When it is necessary to replace fire doors, shutters, or windows and/or their frames, hardware and closing mechanisms, they shall meet the requirements for fire protection and be installed as required for new installations elsewhere in this Standard.

1203. Doors, shutters and windows shall be operable at all times. They shall be kept closed and latched or arranged for automatic closing.

Blocking or wedging of doors in the open position is prohibited.

Automatic closing devices shall be kept in proper working condition at all times. Doors normally held in the open position and equipped with self-closing devices shall be operated at frequent intervals to insure proper operation.

Fusible links or other heat actuated devices shall not be painted.

Care must be taken to prevent paint accumulation on stay rolls.

Chains or cables employed on suspended doors should be inspected frequently for excessive wear and stretching.

Chains or cables on bi-parting counter balanced doors need frequent adjustment to insure proper latching and to keep the doors in proper relation to the opening.

1204. Door openings and the surrounding areas must be kept clear of everything that would be likely to obstruct or interfere with their free operation.

When necessary, a barrier should be built to prevent the piling of material against sliding doors.

1205. Hardware shall be examined frequently and any parts found to be inoperative shall be replaced immediately. Hinges, catches, latches and stay rolls are especially subject to wear.

1206. Guides and bearings should be kept well lubricated to facilitate operation.

1207. Broken or damaged lights of glass shall be replaced with listed wired glass, at least  $\frac{1}{4}$  in. thick, well imbedded in putty and all exposed joints between the metal and the glass shall be struck and pointed.

1208. Any breaks in face covering of doors shall be repaired immediately.

1209. Tin-clad and kalamein doors shall be inspected regularly for dry rot.

1210. 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 clear spaces on both sides of the opening. When the opening is not used and combustible material may be piled against or near 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 filled with construction equivalent to that of the wall.



## Section 13.

### Fire Windows.

#### 130. Classification.

1301. Only listed windows shall be used.

1302. The label on window frames for Class E or F locations reads "Inspected Fire Window."

1303. The label on window frames for Class F locations reads "Inspected Fire Window Frame for Light Exposure."

1304. 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 1296 square inches exposed area, with neither the width nor height exceeding 54 inches.

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 sections 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  $\frac{1}{4}$  in. thick. The clearance between the edges of the glass and the metal framing shall not exceed  $\frac{1}{8}$  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 fire-proofing 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. Only listed glass blocks shall be used.

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  $5\frac{3}{4}$  in. sq. or  $7\frac{3}{4}$  in. sq. by  $3\frac{7}{8}$  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  $1\frac{1}{4}$  in. clearance at each jamb, secured to the structural steel of the building with  $\frac{3}{8}$  in. bolts; provided with heavy galvanized washers in 2 in. slotted holes, spaced 12 in. on center. The blocks shall extend  $1\frac{5}{8}$  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  $7\frac{3}{4}$  in. by  $7\frac{3}{4}$  in. blocks shall be provided with  $2\frac{1}{2}$  in. deep grooves. The blocks shall extend  $1\frac{1}{2}$  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  $5\frac{3}{4}$  in. by  $5\frac{3}{4}$  in. blocks shall be provided with  $2\frac{3}{8}$  in. deep grooves. The blocks shall extend  $1\frac{1}{4}$  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  $7\frac{3}{4}$  in. by  $7\frac{3}{4}$  in. blocks shall be provided with  $2\frac{1}{2}$  in. deep grooves. The blocks shall extend  $1\frac{1}{2}$  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  $5\frac{3}{4}$  in. by  $5\frac{3}{4}$  in. blocks shall be provided with 2 in. deep grooves. The blocks shall extend  $1\frac{1}{4}$  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. Listed doors having ratings of 3 hour (A), 1½ hour (B) (without lights), or 1½ hour (D) 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. Listed doors having rating of ¾ hour (E) 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.

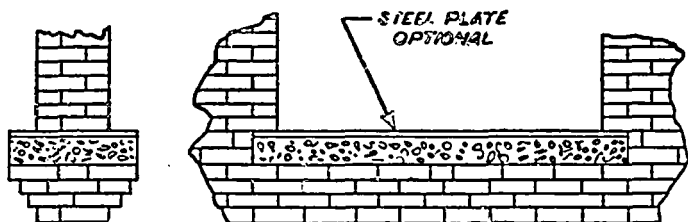


Figure 1. Concrete sill supported by a corbel of brick used with combustible floors.

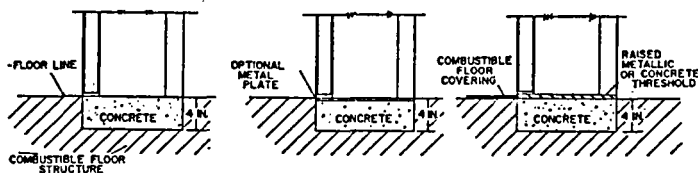


Figure 2. Noncombustible sill used with combustible floors for doors swinging into steel frame.

Combustible floor covering shall not be permitted to extend through the door openings.

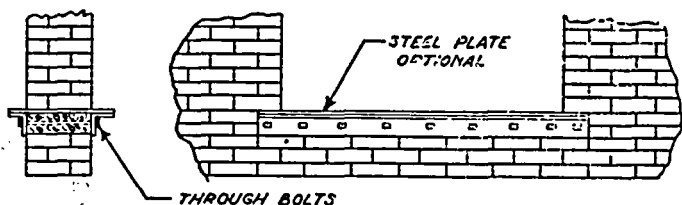


Figure 3. Angle iron and concrete sill used with combustible floors.

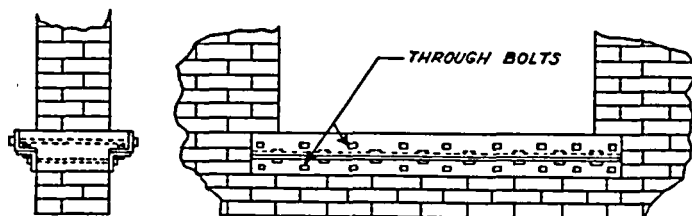


Figure 4. Z-bar and concrete sill used with combustible floors.



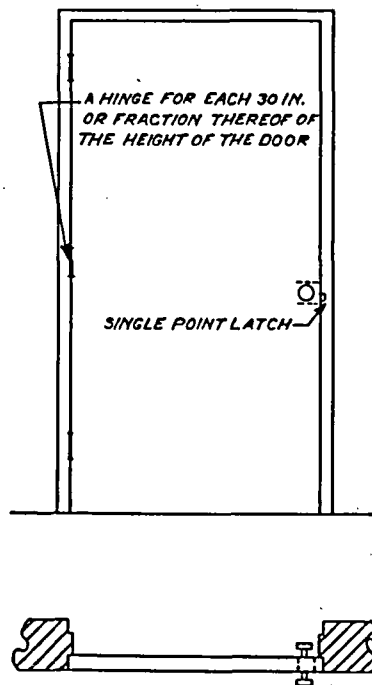


Figure 9. Builders hardware (single swing door with single point latch — flush mounted.)

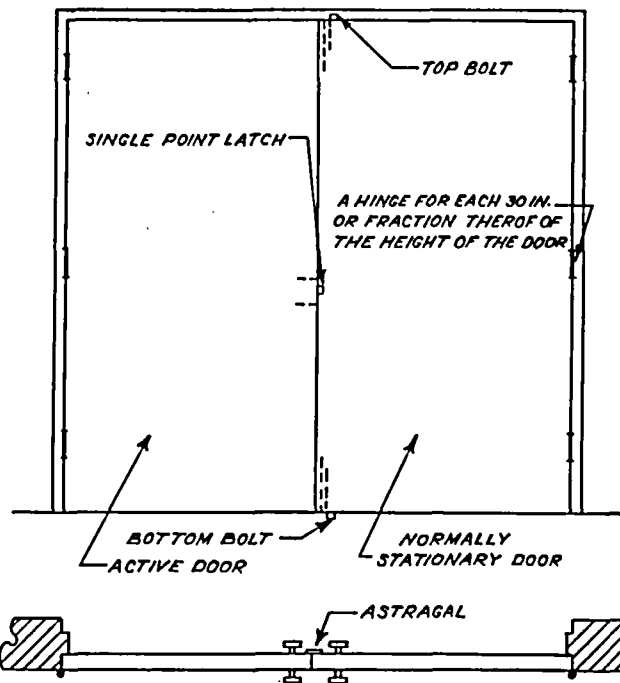


Figure 10. Builders hardware (doors swinging in pairs with single point latch — flush mounted).

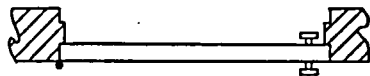
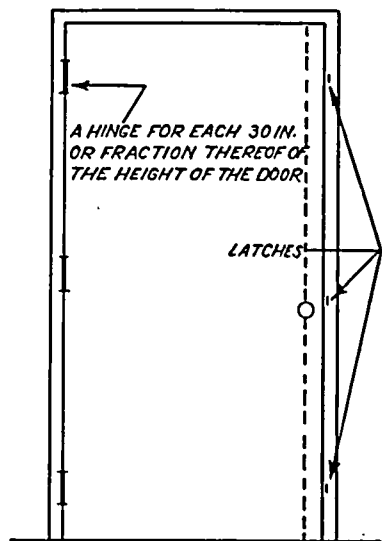


Figure 11. Builders hardware (single swing door with concealed three point latch — flush mounted).

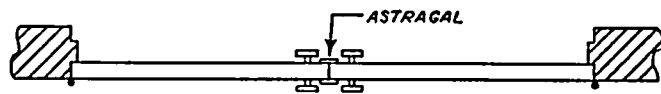
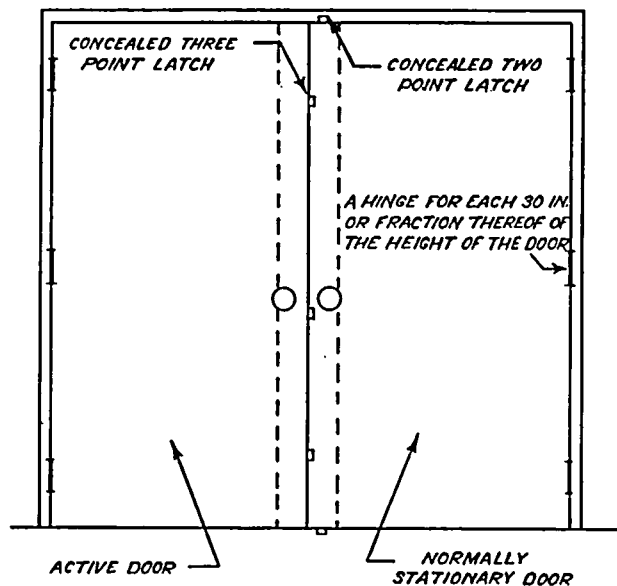


Figure 12. Builders hardware (doors swinging in pairs with concealed two and three point latches — flush mounted).

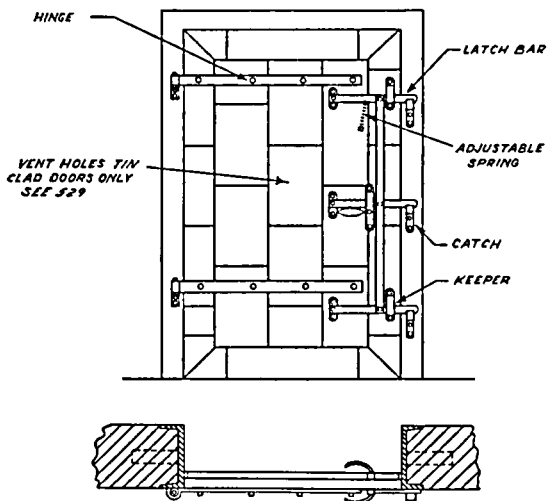


Figure 13. Fire door hardware (single swing door — flush mounted).

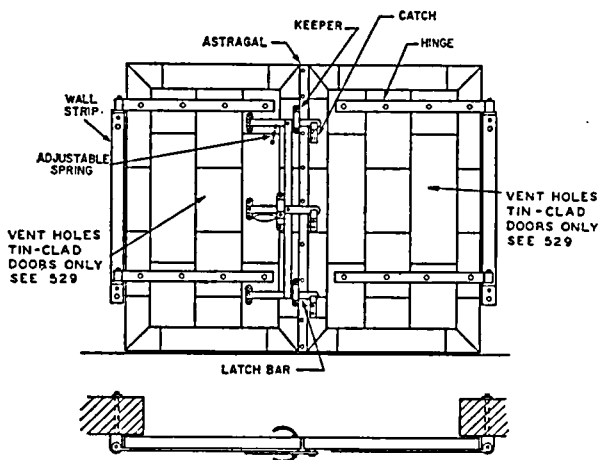


Figure 14. Fire door hardware (doors swinging in pairs — lap mounted).

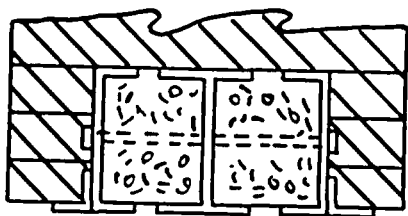


Figure 15. Steel lintel.

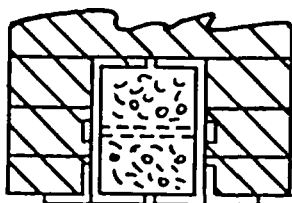


Figure 16. Steel lintel.

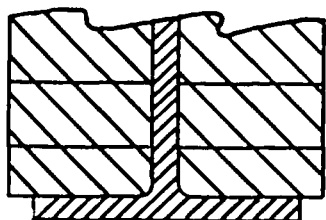


Figure 17. Steel lintel.

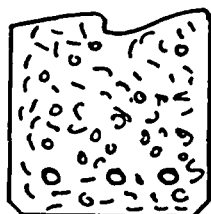


Figure 18. Reinforced concrete lintel.

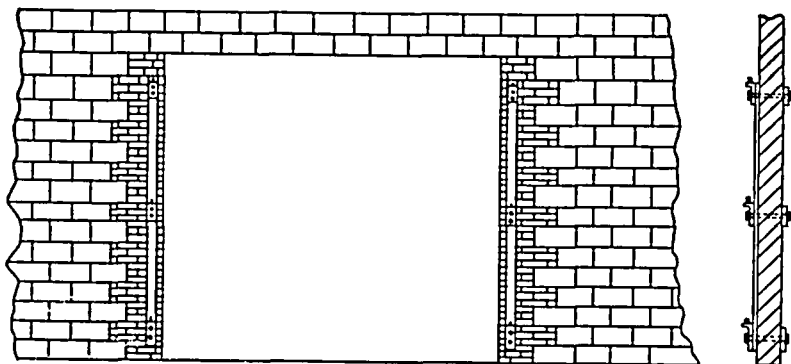


Figure 19. Concrete block wall prepared for doors swinging in pairs — lap mounted, standard method.

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.

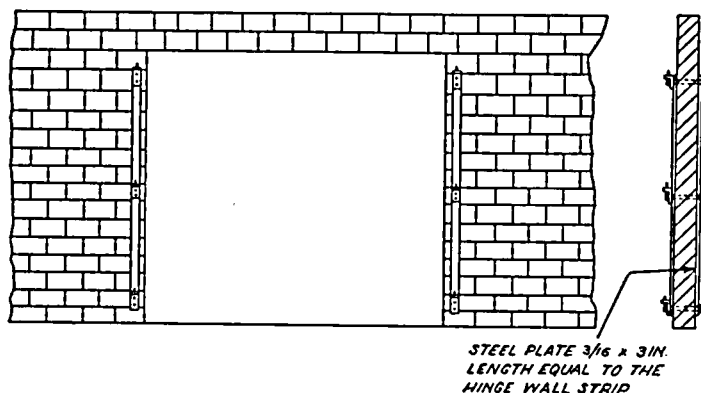


Figure 20. Concrete block wall prepared for doors swinging in pairs — lap mounted.

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

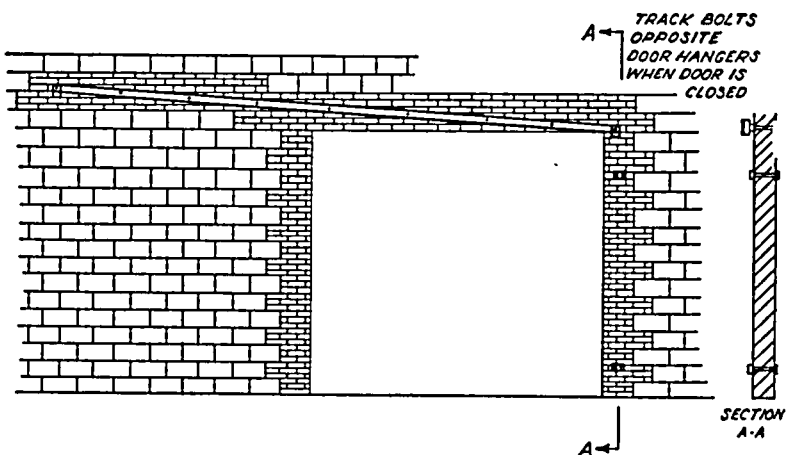


Figure 21. Concrete block wall prepared for a single tin-clad or sheet metal slide door, standard method.

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.

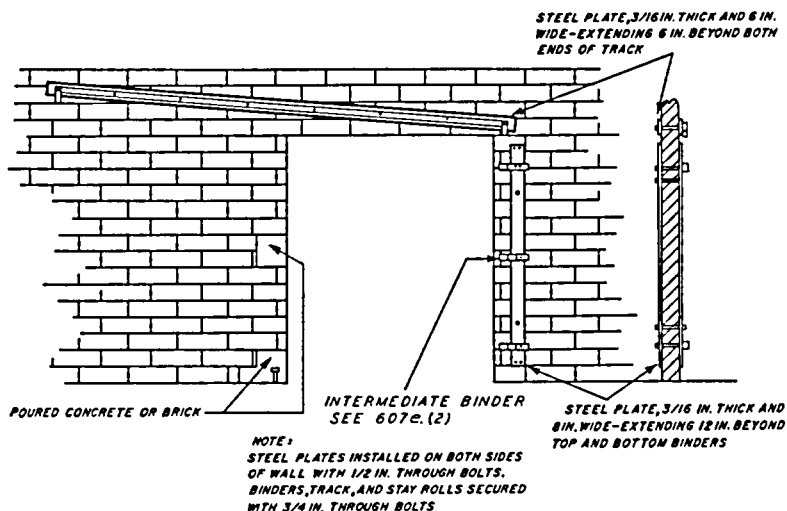


Figure 22. Concrete block wall prepared for a single slide door.

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

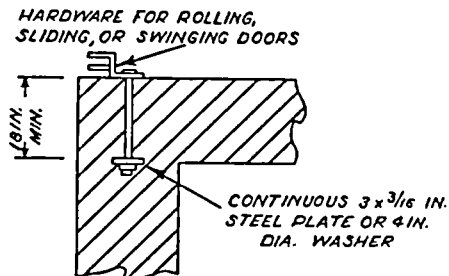


Figure 23. Corner walls.

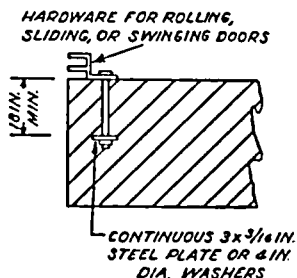


Figure 24. Unusually thick walls.

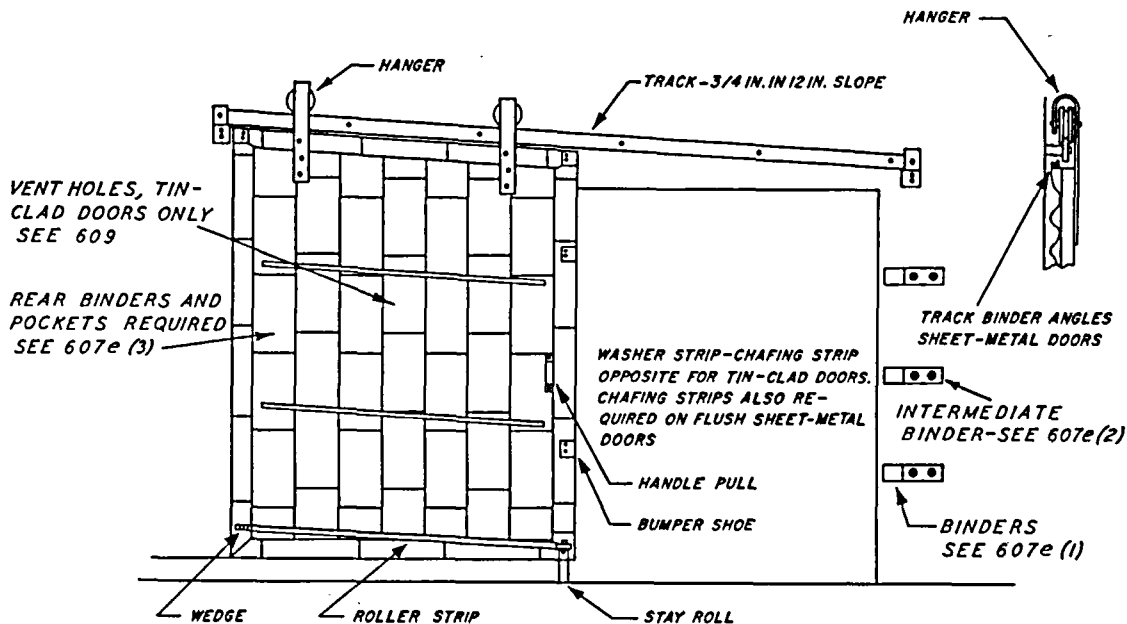


Figure 25. Single sliding door (Inclined track).

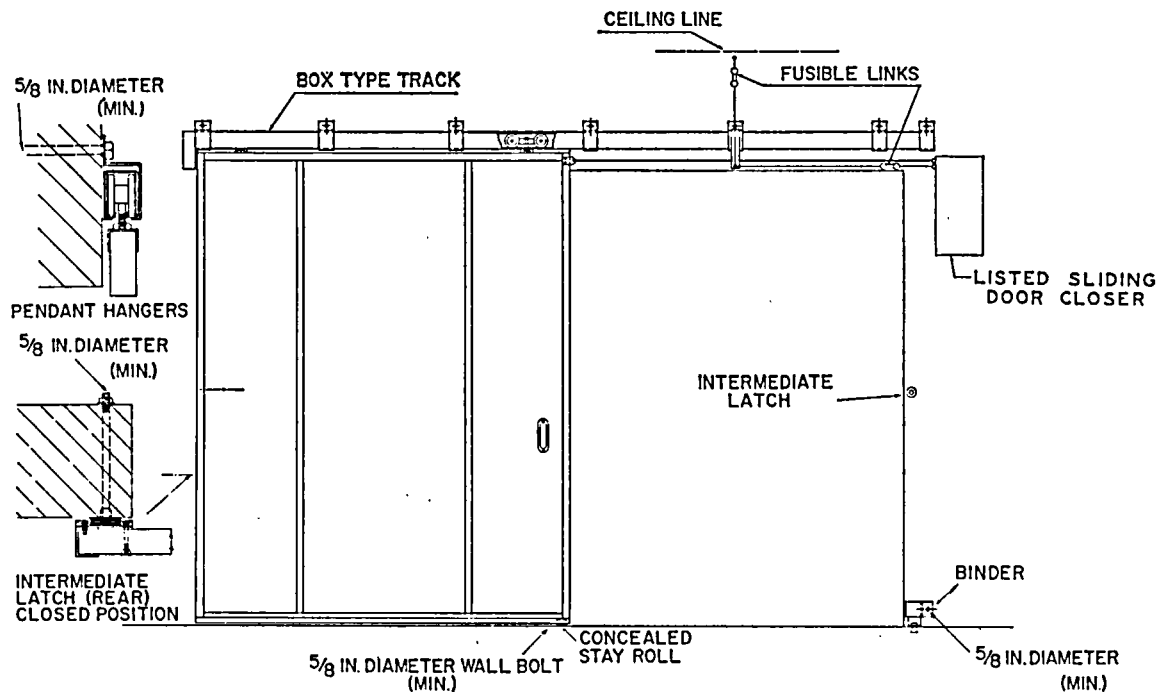
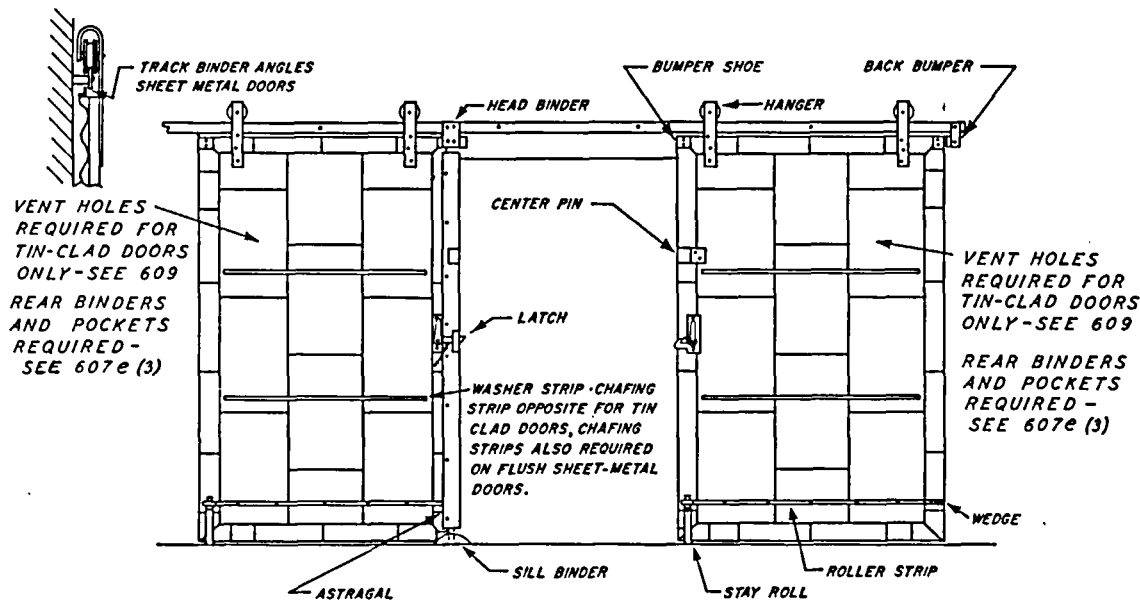


Figure 25a. Horizontal sliding composite door.





**Figure 26. Center parting horizontal sliding doors (level track).**

**NOTE:** Binder and pocket required. (See 607e.) Vent holes required for tin-clad only. (See 609.)

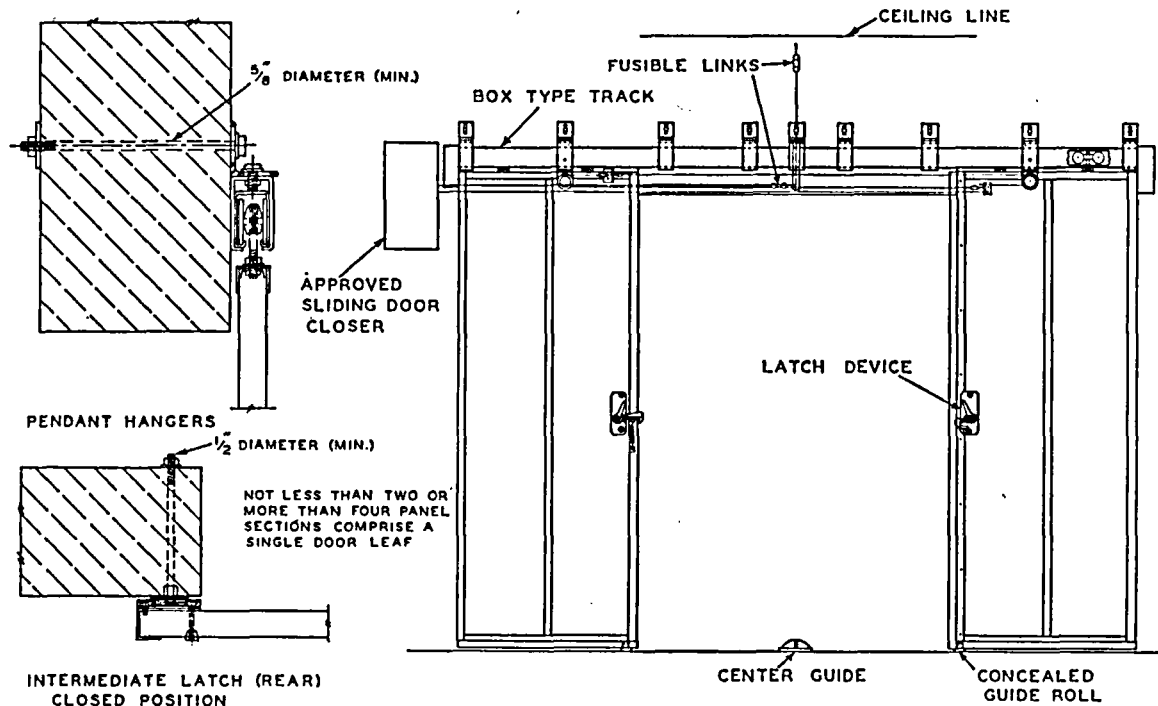


Figure 26a. Center parting horizontal sliding composite doors.

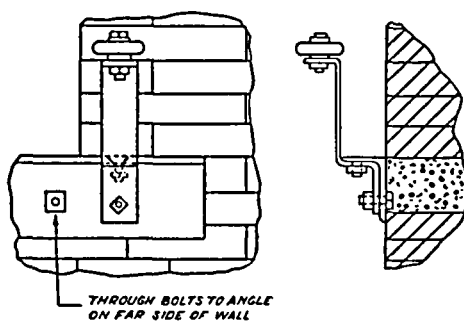


Figure 27. Stay roll.

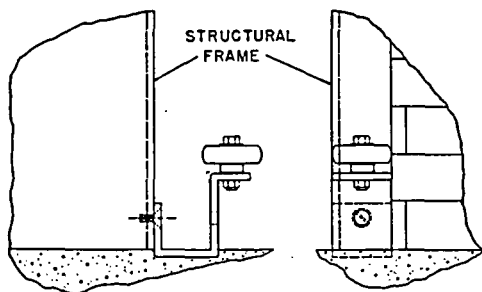


Figure 28. Stay roll.

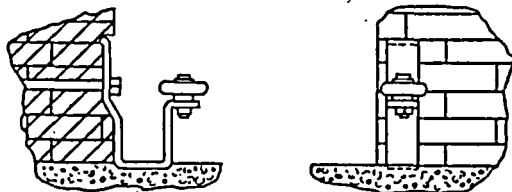


Figure 29. Stay roll.

Figure 30. Concealed type stay roll.

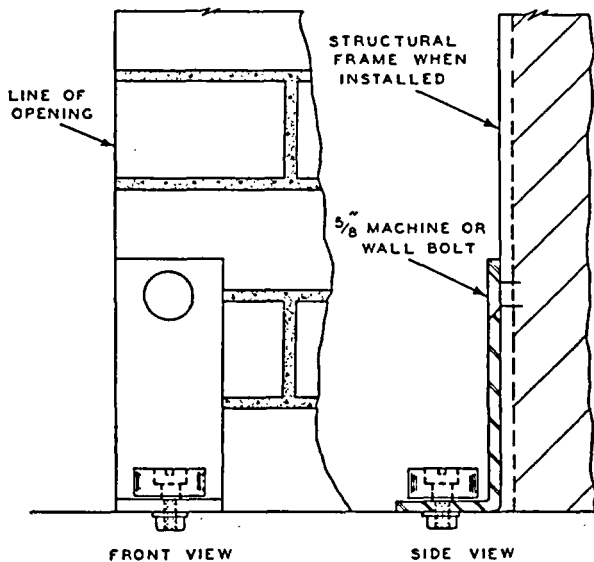
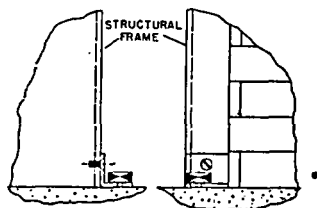
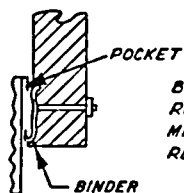
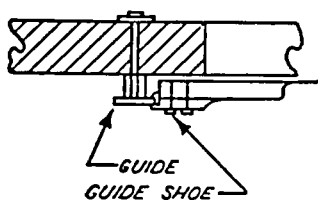
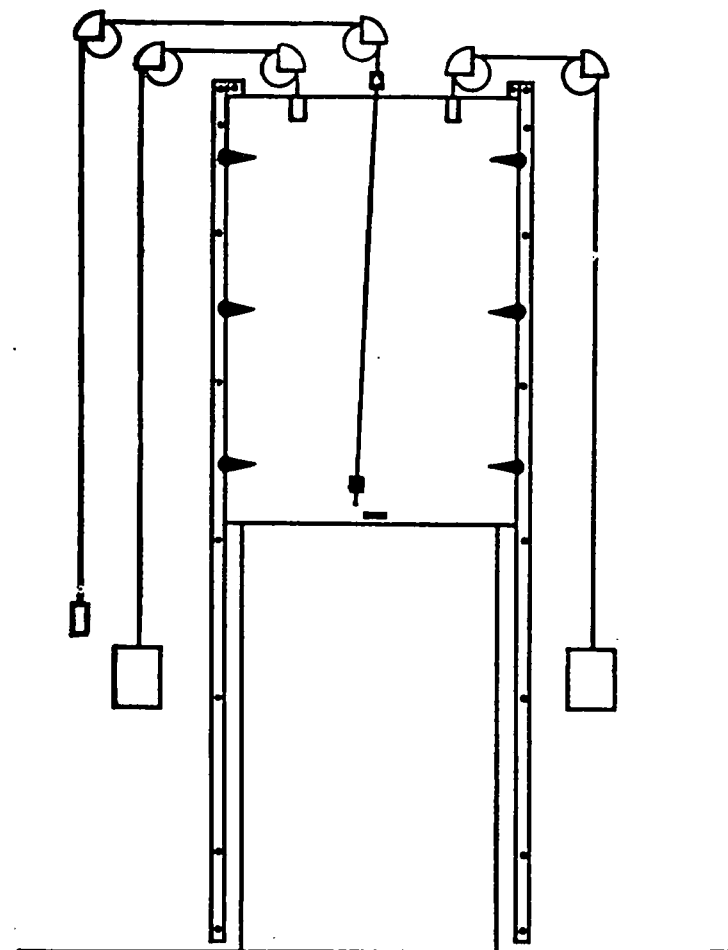


Figure 30a. Concealed type stay roll.



BINDER AND POCKET  
REQUIRED FOR SHEET-  
METAL. FLUSH ALSO  
REQUIRE A ROLLER STRIP

Figure 31. Vertical sliding door.