NFPA No.

80

FIRE DOORS AND WINDOWS 1970

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NATIONAL FIRE PROTECTION ASSOCIATION
International

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Official NFPA Definitions

Adopted Jan. 23, 1964: Revised Dec. 9, 1969. 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 Research Corp., the American Gas Association Laboratories, the Underwriters' Laboratories of Canada, the Canadian Standards Association Testing Laboratories, and the Canadian Gas Association Approvals Division.

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This material has been developed in the interest of safety to life and property under the published procedures of the National Fire Protection Association. These procedures are designed to assure the appointment of technically competent Committees having balanced representation from those vitally interested and active in the areas with which the Committees are concerned. These procedures provide that all Committee recommendations shall be published prior to action on them by the Association itself and that following this publication these recommendations shall be presented for adoption to the Annual Meeting of the Association where anyone in attendance, member or not, may present his views. While these procedures assure the highest degree of care neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

Standard for

Fire Doors and Windows

NFPA No. 80 — 1970

This Standard on Fire Doors and Windows, officially adopted by the NFPA on May 21, 1970, supersedes the 1968 edition.

The parts of the 1970 text which are revisions of the 1968 text or are new are indicated by vertical black lines in the margins. Figures 13, 14, 27b, 28b and 49 are new. Figures 27a and 28a were revised. Appendix C is new to this 1970 edition.

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, 1966, 1967, and 1968.

Committee on Fire Doors and Windows

John G. Degenkolb, *Chairman,*
1720 Chevy Knoll Dr., Glendale, Calif. 91206
S. M. Knight, *Secretary,*
Factory Mutual Research Corp.

Fred Arends, American Rolling Door Institute
M. A. Bridgham, Improved Risk Mutuals
Robert A. Bullard, Bullard Associates, Inc., 76 Lincoln St., Brighton, Mass. 02135 (rep. American Society of Architectural Hardware Consultants)
E. B. Dawson, National Elevator Industry, Inc.
Leon F. Dusing, Steel Door Institute
Malcolm E. Fischer, Overly Manufacturing Co.
Christian Hansen, Pacific Fire Rating Bureau
Wm. S. Haswell, National Builders' Hardware Assn.
Albert E. Hole, Fire Marshals Assn. of North America
Richard A. Hudnut, Builders Hardware Manufacturers Assn.
Harold Locke, Underwriters' Laboratories of Canada
B. J. Macartney, National Automatic Sprinkler & Fire Control Assn.
E. E. Miller, Factory Insurance Assn.
Lloyd S. Shook, Illinois Property Insurance Placement Facility
Wm. N. Stehle, Prince George's County, Hyattsville, Md.
Clifford A. Stevens, National Woodwork Manufacturers Assn., Inc.
Bernard Sussman, National Assn. of Architectural Metal Manufacturers
Lewis W. Vaughan, Canadian Sheet Steel Building Institute
G. M. Watson, American Insurance Assn.
Raymond Ziegler, American Institute of Architects
B. A. Zimmer, Underwriters' Laboratories, Inc.

Alternates.

V. C. Braun, Steel Door Institute (Alternate to Leon F. Dusing.)
Joseph B. Klein, American Institute of Architects (Alternate to Raymond Ziegler.)
Stuart Knott, Builders Hardware Manufacturers Assn. (Alternate to Richard A. Hudnut.)
James Newman, American Insurance Assn. (Alternate to G. M. Watson.)
John S. Russell, American Society of Architectural Hardware Consultants (Alternate to Robert A. Bullard.)
F. S. Sansone, Factory Insurance Assn. (Alternate to E. E. Miller.)
R. M. Tucker, Builders Hardware Manufacturers Assn. (Alternate to Richard A. Hudnut.)

SCOPE: Installation, maintenance and use 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 — 1970

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.*

12. Reference is directed to Recommended Practice for Protection of Buildings from Exterior Fire Exposures* (NFPA No. 80A) for detailed guidance in determination of fire exposure severity and corresponding degree of protection of opening which may be warranted.

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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.

Fire door assemblies for the protection of openings depend on the use of labeled fire doors and frames, listed or labeled latching devices, listed swinging and sliding hardware and closing devices having the required fire protection ratings, which will close or be closed at the time of fire. The effectiveness of the entire assembly as a fire barrier may be destroyed if any component is omitted or one of substandard quality is used.

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) Labeled fire exit devices which meet the requirements for safety to life and for fire protection are available for use on labeled fire doors. Fire doors for use with this hardware bear the marking "Fire Door to be Equipped with Fire Exit Hardware" on the label.

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

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.

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.

g. Fire doors equipped with automatic louvers shall be used only for protecting openings in required enclosures for building service equipment, incidental storage rooms and the like where the opening is not in an exit or otherwise located such that smoke and products of combustion through the louver before its operation could jeopardize the use of exits.

h. Where fire doors are used in stairwell enclosures, such doors shall be constructed so that the maximum transmitted temperature end point shall not exceed 450°F above ambient at the end of 30 minutes of fire exposure. These doors shall be rated for use in 1 or 1½ hour (B) locations.

21. It is not intended that this Standard should act as an obstruction to the development of new, modified or improved devices which meet the intent of these requirements. Conversely it is not intended that this recognition removes the responsibility of the manufacturer from requesting appropriate revision of the Standard.

a. The development of fire doors and related devices is a continuous process, therefore this Standard cannot be up to date at all times. This Standard is intended to be current only to the date of publication.

b. For devices not described in this Standard, the authority having jurisdiction is advised to request from

manufacturers descriptive information provided by nationally recognized testing laboratories concerning acceptable methods for satisfactory field installation, based on fire tests, engineering studies for operation and maintenance considerations, where applicable.

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 in this Standard only for decorative, aesthetic and similar purposes in fire resistive walls is not recommended.

26. Testing Laboratories, Listed and Labeled Products

a. Testing organizations, which at the time of publication of this Standard, maintain periodic in-plant follow-up programs including the inspection of samples selected from current production and stock establishing that the product meets the requirements set forth in the appropriate nationally recognized test standards are Underwriters' Laboratories Inc., Underwriters' Laboratories of Canada and Factory Mutual Research Corporation.

b. Information on listed devices referred to in this Standard may be found in one or more of the following publications:

(1) *The Building Materials List* and *The Fire Protection List* by Underwriters' Laboratories, Inc.

(2) *List of Equipment and Materials, Volumes I and II* by Underwriters' Laboratories of Canada.

(3) *Factory Mutual Approval Guide* by Factory Mutual Research Corporation.

c. Listed items are identified by a label or listing mark in accordance with the policy of the testing agencies named in 26a. Information on the individual listings is contained in the publications referred to in 26b.

d. The label or listing mark of the nationally recognized testing laboratory is evidence that such device or material has been produced under an in-plant follow-up program as described in 26a.

e. For the purposes of this Standard, the term "labeled" shall be understood to mean listed and labeled, or identified in accordance with 26c and 26d and the official definitions of those terms on the front cover hereof.

f. Labels may be metal, paper, stamped or diecast as designated by the testing laboratories.

g. Specifications of items of a generic nature, such as hinges, that are not labeled should comply with the specifications contained herein.

Section 3

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

30. Openings are classified 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 fire protection 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, ANSI Standard A2.2 or Fire Tests of Window Assemblies NFPA No. 257, UL-9, ASTM E163.

31. Three hour fire doors (A) are for use in openings in walls separating buildings or dividing a single building into fire areas.

32. One and one-half hour fire doors (B) and (D) are for use in openings in two hour enclosures of vertical communication through buildings (stairs, elevators, etc.) or in exterior walls which are subject to severe fire exposure from outside of the building. One hour fire doors (B) are for use in openings in one hour enclosures of vertical communication through buildings (stairs, elevators, etc.).

33. Three-quarter hour fire doors (C) and (E) are for use in openings in corridor and room partitions or in exterior walls which are subject to moderate fire exposure from outside of the building.

Section 4.

Classifications and Types of Doors.

40. Classifications.

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

402. Only labeled doors shall be used. Fire door assemblies consist of individually labeled components which are essential to satisfactory performance of the complete assembly. Some labels cover one or more components in addition to the door. For specific information see 405.

403. The ratings of 3, 1½, 1 or 3/4 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, 450°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 doors bearing the "Fire Door" label, the label includes:

(1). On counterbalanced freight elevator doors — the guides, latching and counterbalancing mechanisms.

(2). On rolling steel doors — wall guides, counterbalancing and automatic mechanisms.

(3). On steel sectional (overhead) doors — hinged steel panels, wall guides, interlock at top edge, vertical and horizontal tracks, roller wheels, counterbalancing, automatic closing mechanisms, and governors.

c. On doors bearing the "frame and fire door" assembly label, the label also includes:

(1). On access doors — the frame, hinging, and latching mechanism.

(2). On acoustical doors — the frame, sill and latching mechanism.

(3). On chute doors — the frame, hinging, latching and closing mechanism.

(4). On dumb-waiter doors — the guides, frame, latching and counterbalancing mechanisms.

(5). On service counter doors — Frames, sill, wall guides, counterbalancing and automatic closing mechanisms.

41. Glass.

411. Only labeled wired glass shall be used.

412. No glass shall be used in doors for 3 hour (A) or 1½ hour severe exterior exposure (D) locations.

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

414. Wired glass not less than ¼ in. thick may be used in doors for ¾ hour corridor and room partitions (C) locations when the glass for individual exposed areas does not exceed 1,296 sq. in. with no dimension exceeding 54 in.

415. Wired glass not less than ¼ in. thick may be used in doors for ¾ hour moderate exterior exposure (E) locations when the glass for individual exposed areas does not exceed 720 sq. in. with no dimension exceeding 54 in.

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

417. 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 consist of wood, steel or plastic sheets bonded to and supported by a solid core material.

422. **Hollow-Metal Doors.** Hollow-metal fire doors are of flush or panel design with not less than 20 gage steel faces. Flush door designs include steel stiffeners or honeycomb core material to support the faces. The voids between stiffeners may be filled with insulating material. Panel door designs are of stile and rail construction with insulated panels.

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

424. **Sheet-Metal Doors.** Sheet-metal fire doors are formed of 22 gage or lighter steel and of the corrugated interlocking flush sheets and paneled design.

425. **Rolling Steel Doors.** Rolling steel fire doors consist of mild steel or stainless steel interlocking slats to form a curtain of not less than 22 gage or heavier attached to an overhead barrel mounted on brackets for attachment to walls. The complete assembly includes the operating counter-balance enclosed in the barrel, automatic closing mechanism, the door guides, metal hood enclosure and flame baffle.

426. Tinclad Doors. Tinclad fire doors are of two or three ply wood core construction, covered with 30 gage galvanized steel or terne plate (maximum size 14 in. by 20 in.) or 24 gage galvanized steel sheets not more than 48 in. wide — face sheets to be vented.

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.

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 Appendix A, 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 Appendix A, 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. Frames shall be securely anchored to the wall construction (see Appendix A, Figures 9-14).

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 labeled 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, and metal-clad (Kalamein) 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 with or without solid or glazed transom panels, glazed side lights, solid side panels, transom bars and/or mullions. These frames may consist of one or more units which may be factory or field assembled. They may be designed for erection before or after walls are built.

(a). Frames with transom lights or panels shall have a fire protection rating of the same or greater duration as the door with which they are associated.

(b). Openings in which transom frames shall be installed shall not exceed 40 sq. ft. for single doors or 80 sq. ft. if more than one door is used.

Openings in which transom and side panel frames may

TABLE I

Builders Hardware

Mortise and Surface Hinges or Pivots for Swinging Doors Including Spring Hinges.

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

Door Rating, Hr.	Maximum Size Door Width Feet	Maximum Size Door Height Feet	Minimum Hinge Size Height In.	Minimum Hinge Size Thickness In.	Type Hinge
For 1¾ Inch or Thicker Doors					
3, 1½, 1, ¾	4	10	4½	0.180	Steel, Mortise or Surface
3, 1½, 1, ¾	4	8	4½	0.134	Steel, Mortise or Surface
1½, ¾	3'2"	8	6	0.225	Steel-Olive Knuckle or Paumelle
3, 1½, ¾	4	10	4	0.225	Steel Pivots (Including Top, Bottom and Intermediate)
1½, 1, ¾	3	5	4	0.130	Steel, Mortise or Surface
1½, 1, ¾	2	3	3	0.092	Steel, Mortise or Surface
3, 1½, 1, ¾	3	7	4½	0.109	Steel, Mortise (spring closing)
For 1⅜ Inch Doors					
1½, ¾	3	7	3½	0.123	Steel, Mortise or Surface
3, 1½, 1, ¾	2'8"	7	3½	0.109	Steel, Mortise (spring closing)

NOTE 1: All hinges or pivots, except spring hinges, shall be of the ball-bearing type. Hinges or pivots employing other antifriction bearing surfaces are permitted if they meet the test requirements of ANSI A156.1—1970, Standard for Butts and Hinges.

NOTE 2: 4½ in. high, 0.180 in. thick hinges should be used on doors which are unusually wide and heavy or which will receive high frequency use or unusual stresses.

be installed shall not be greater than 120 sq. ft. with neither dimension exceeding 12 ft.

Frames with solid transoms and/or side panels may be used in 1½, 1, or ¾ hour labeled fire door assemblies provided the transoms and/or side panels are nonoperable. Some frames with solid transom panels are listed for use in 3 hour labeled fire door assemblies.

(c). Frames with glazed transom and/or side lights may be used in ¾ hour labeled fire door assemblies provided the transom and/or side lights are nonoperable. The openings in which such frames are used shall not be greater than 120 sq. ft. in area with neither the height nor width exceeding 12 ft.

(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 514a.

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 ¾ in. (see Figures 10 and 12, Appendix A). Some manufacturers may provide doors swinging in pairs without astragals as indicated in the individual published listings.

516. **Builders Hardware** (see Figures 9, 10, 11, and 12, Appendix A).

a. **Hinges.** Hinges shall be as required in Table 1.

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

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

b. **Locks or Latches.** Only labeled locks and latches or labeled fire exit hardware (panic devices meeting both life safety requirements and fire protection requirements, see 20b) shall be used.

Except for elevator and power-operated dumbwaiter doors equipped with electric contacts or interlocks, all single doors and active leaves of doors in pairs shall be provided with an active latchbolt (one that cannot be held in a retracted position) as specified in Table II. Doors may be provided with dead bolts in addition to the active latchbolt except when they are to be used in a required means of egress. (See 20a.)

Where the inactive leaf of pairs of doors is not required for exit purposes, it shall be provided with labeled self-latching top and bottom bolts or labeled two-point latches.

Where both leaves are required for exit purposes, they shall be provided with labeled fire exit hardware except that, where acceptable to the authority having jurisdiction, the inactive leaf may be provided with labeled automatic top and bottom bolts that are self-unlatching when the active leaf is opened; and the active leaf may have either labeled fire exit hardware or any labeled latch which may be opened by one obvious operation from the egress side. When automatic bolts are used, the inactive leaf shall have no knob or other visible hardware.

The throw of single point latchbolts shall not be less than the minimum shown on the fire door label. If the mini-

TABLE II Builders Hardware
Latching Devices for Swinging Doors
For alternate assemblies and exceptions, see paragraphs 21, and 516.

	Single Swing Doors			Doors in Pairs		
	Door Rating Hours	Maximum Opening Height	Min. Latch Throw	Maximum Opening Height	Active Leaf Minimum Latch Throw	Inactive Leaf
Composite Wood (flush)	1½	10′	½ in.	—	—	—
	1	10′	½ in.	7′ 2″	¾ in.	Top & Bottom Bolts
	¾	8′	½ in.	7′ 2″	¾ in.	Top & Bottom Bolts
Composite Plastic (flush)	1½	7′ 2″	½ in.	—	—	—
	1	7′ 2″	½ in.	—	—	—
	¾	7′ 0″	½ in.	—	—	—
Composite Steel (flush)	3	8′	3 Pt. Surface	—	—	—
	3	8′	⅝ in.	7′ 6″	⅝ in.	Top & Bottom Bolts
	1½	8′	½ in.	7′ 6″	⅝ in.	Top & Bottom Bolts
	¾	8′	½ in.	7′ 6″	⅝ in.	Top & Bottom Bolts
Hollow Metal (flush)	3	10′	½ in.	8′	¾ in.	Top & Bottom Bolts
	1½	10′	½ in.	9′	¾ in.	Top & Bottom Bolts
	¾	10′	½ in.	9′	¾ in.	Top & Bottom Bolts
Hollow-Metal (Panelled or flush)	3 or 1½ or ¾	10′	3 Pt. Concealed	10′	3 Pt. Concealed	2 Pt. Concealed
Metal-Clad (Panelled or Flush)	1½ or ¾	8′	½ in.	8′	¾ in.	Top & Bottom Bolts
Sheet-Metal (Panelled or flush)	1½ or ¾	8′	½ in.	8′	¾ in.	Top & Bottom Bolts

mum 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 steel sheet-metal screws. Flush mounted top and bottom bolts shall be secured to reinforcements in the door with machine screws. Surface mounted top and bottom bolts shall be of steel secured with machine screws to reinforcements or bolted through the door. Attachment of fire-exit hardware of the vertical rod type shall be as required for top and bottom bolts.

(2). Attaching Strikes. The strike plates for single swing doors shall be secured with machine screws to the reinforcing in the frame. Strike plates for doors swinging in pairs shall be secured to the reinforcing in the stationary door. Channel frames for single swing doors shall be provided with rectangular holes to receive the latch bolts. The keeper (for the stationary door of doors swinging in pairs) for the top bolt shall be secured to the frame with steel machine screws. Channel frames shall be provided with a rectangular hole to receive the bolt. A keeper shall be secured in the sill to receive the bottom bolt of the stationary door. 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 (kalamein) 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 Appendix A, Figures 1, 3, and 4 for recommended construction).

522. Walls.

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete block. When concrete blocks are used, see Figures 19 and 20, Appendix A, 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 25 and 26, Appendix A.

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

a. Only 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 ¾ in. (See Figure 16, Appendix A.)

TABLE III

Fire Door Hardware

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

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

TABLE IV

Fire Door Hardware

Table Giving Length of Hinges and Latches For Different Widths of Doors of Tinclad, 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.

525. Fire Door Hardware. (See Figures 15 and 16, Appendix. A.)

a. Only 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 III, IV and V.)

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 ¾ in. through bolts shall be used for attaching hinge wall strips and not less than ½ in. through bolts for latch keeper wall strips (see Figure 16, Appendix A).

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

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. 4 in.	5	4

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

527. Clearances.

a. Flush Mounted. Clearances for flush mounted doors shall not exceed 3/4 in. at the sill. Clearances at the meeting edges of doors in pairs shall not exceed 1/4 in. for 3 ply tinclad doors or 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 shall not exceed 3/8 in., and between the door and the sill shall not exceed 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 Figures 48 and 49, Appendix A.

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. Doors shall lap openings at least 4 in. at the sides and top. Where doors provide protection of openings located in walls above floor level and no projecting sill is provided, the doors shall lap the bottom of the opening at least 4 in.

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, Appendix A show constructions that are acceptable.

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

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 23 and 24, Appendix A 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 25 and 26, Appendix A.

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 17, 18, 19, or 20, Appendix A, 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 ¾ in. (See Figures No. 28, 28a, Appendix A.)

607. Fire Door Hardware. (See Figures 27, 28, 28a, 29, 30, 31 and 32, Appendix A.)

a. General.

(1). Only labeled 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 ¾ in. clearance between the top of the sheet-metal door and the track to allow for upward expansion of a heated door. Also the top of a sheet-metal door shall be provided with track binders (Figures 27 and 28, Appendix A) 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. For tinclad and sheet-metal fire doors the 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 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 ¾ in. to 1 ft. if door is intended to close by gravity.

TABLE VI

Table Giving Dimensions for Punching Flat Track for Tinclad and Sheet-Metal Fire Doors.

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

Figures in heavy type indicate bolts opposite door hangers

(2). For hollow-metal doors wall bolts shall be located 2 in. from each end of track, opposite hangers when the door is in a closed position and additional bolts on centers not to exceed 24 in. Wall bolts shall be installed through the wall except as provided in 604b.

(3). Mounting Flat Track, Center Parting Doors. The mounting is similar to the requirements of 607c(1). For tinclad and sheet-metal doors 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.

(4). 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. Wall bolts securing brackets in position shall be installed through the wall, except as provided in 604b.

(5). 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 39½ in. Bolts securing brackets in position shall be installed through the wall except as provided in 604b.

d. Hangers. Not less than two hangers shall be provided for each door. Tinclad, sheet-metal and composite doors for openings in excess of 6 ft. shall have an additional hanger (See Table VI). Two hangers shall be provided on each section of vertically spliced sheet-metal or tinclad doors (See 608).

e. Binders.

(1). At least two front binders are required for tinclad 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 fire doors shall have one front binder near the sill, one or more intermediate front binders and one or more intermediate rear binders.

(5). Hollow-metal doors shall have front binders as specified for tinclad doors. In addition to front binders, hollow-metal doors shall be provided with continuous interlocking binders at rear and head. The interlocking rear and head binders shall be either secured directly to the masonry wall by steel bolts and steel expansion shields or to the opening framing by means of steel machine bolts (see Figures 27b and 28b).

(6). The space between the top of the door and the track for sheet-metal doors shall be at least ¾ in. to permit upward expansion on exposure to fire. Track binders or other approved means shall be provided to prevent door leaving track during exposure to fire. The track binder shall lap the track about ½ in. and be located two inches to one side of the center line of the wall bolts. (See Figures 27 and 28, Appendix A.)

(7). Front and rear binders for tinclad and sheet metal doors shall be fastened to the wall with bolts having a diameter of not less than ¾ inch and which extend through the wall. The bolt holes should not be made larger than necessary.

(8). 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.

(9). All center parting sliding doors shall be provided with sill binders or center guides to maintain the doors in proper alignment when they are closed. See Figures 28, 28a and 28b.

They shall be securely attached to concrete sills with machine screws and steel shells or metal thresholds shall be drilled and tapped to receive machine screws.

f. Stay Rolls. Figures 29, 30, 31, 32 and 32a, Appen-

dix A show acceptable methods of attaching Stay Roll Brackets. For concealed type Stay Roll, see Figures 32 and 32a.

g. Latches, Center Parting Doors. The latch and center pin are shown on Figures 28 and 28a, Appendix A. The center pin shall be located midway between latch and top of door.

All center parting doors shall be provided with a latch (See Figures 28, 28a and 28b). A center pin shall be provided on all center parting tinclad and sheet-metal doors (see Figure 28).

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 27 and 28, Appendix A.)

j. Bumper Shoes. Bumper shoes are required on tinclad doors, one opposite each bumper and one opposite each binder; fastened to the faces and edges of the door by wood screws. (See Figures 27 and 28, Appendix A.)

k. Handles. Means shall be provided for opening the doors from either side. If flush pulls are used they shall not be back to back. Handles shall be securely attached.

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 tinclad door formed of 14 in. by 20 in. sheets shall be provided with 3 in. diameter vent holes located as shown on Figure 48. Each section of spliced single doors and each leaf of center-parting doors shall be vented as provided for two-hanger doors in Figure 48.

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 between the wall and the door when in the closed position shall not be more than ¾ in. The clearance between any door and the sill shall not be more than ⅜ in.

611. Closing Devices. (See Section 11.)

Section 7.

Installation of Vertical Sliding Doors.

70. Wall Mounted.

701. Vertical sliding doors of the tinclad 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, Appendix A show constructions that are acceptable.

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

704. Walls.

a. Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete block construction. When concrete blocks are used, reinforcement similar to that shown in Figure 21, Appendix A, 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 25 and 26, Appendix A.

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 17, 18,

19 and 20, Appendix A, or as acceptable to the authority having jurisdiction.

706. **Fire Door Hardware.** (See Figure 31, Appendix A.)

a. **General.**

(1). Only labeled 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 2½ ft. or fraction thereof in excess of 5 ft. in height shall be provided. Each of the track guides shall be bolted through the doors.

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

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

f. **Bumper and Bumper Shoes.**

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

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

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

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

708. Closing Devices. (See Section 11.)

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

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

(1). Rear Binders. Doors shall be provided with one rear binder located at the center of the lintel attached with $\frac{3}{4}$ in. through bolts. (Figure 33, Appendix A.)

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

710. Vents.

a. Each tinclad door shall be provided with 3 in. diameter vent holes located as shown on Figure 48. Doors up to 6 ft. wide shall be provided with three vents and doors over 6 ft. wide shall be provided with four vents as shown for two-hanger doors.

b. The vent holes shall be cut through the sheets on the face of the door to be provided with the guide shoes, care being taken so as not to interfere with the hardware or 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 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 34, 35, 36, and 37, Appendix A.)

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, Appendix A 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 21, Appendix A 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 25 and 26, Appendix A.

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 17, 18, 19, and 20, Appendix A, 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 washers having adequate bearing surface. 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 25 and 26, Appendix A.

d. When steel channel frames (as shown in Figure 37, Appendix A) 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 ANSI Safety Code for Elevators, Dumbwaiters and Moving Walks, 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 47a, b, c, and d, Appendix A.) 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 47a, Appendix A). 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 (ANSI Safety Code for Elevators, Dumbwaiters and Moving Walks, 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 1/8 in. The clearance between closed door and sill shall not exceed 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 47b and c, Appendix A). 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 (ANSI 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 (ANSI 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 47d, Appendix A). 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 (ANSI 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 ANSI 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 ½ 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. Door Locking Devices for Dumb-waiter Operation. Hoistway door locking devices (ANSI A17.1) shall conform to 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.

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

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 (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.

Operation of Doors

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. When required by this section, only labeled door closers with or without hold-open arms, fusible links and release of the fixed temperature, rate-of-rise or smoke detector types shall be used.

b. 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.

c. 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 38 to 45, Appendix A, 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 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 34, 35, 36, and 38 to 45 inclusive, Appendix A.)

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

(1). A door closer with hold-open arm embodying a fusible link, fixed temperature release, rate-of-rise tem-

perature release utilizing heat responsive devices or a smoke detection device.

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

(4). A self-closing door closer with a hold-open device actuated by an 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 doors and each leaf of doors in pairs of this type shall be arranged to close automatically at the time of fire by attachment of ropes, wire cable or chains so arranged over pulleys that operation of a fusible link, fixed temperature release, or 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 a chain or wire cable. Automatic closing may also be accomplished by a door closer with hold-open arm embodying a fusible link, fixed temperature release, rate-of-rise release or a smoke detection device. When there is an astragal, a coordinating device shall be employed so that the inactive leaf closes and latches before the active door closes

(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 posi-

tion 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 fusible link, fixed temperature release or 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 fusible link, fixed temperature release or 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.

1107. Power Actuated Fire Doors. When fire door assemblies, except as described in Section 9, Hoistway Doors For Power Elevators and Power Dumb-waiters, are equipped with power actuated devices, either the door or power actuating device shall be provided with a listed releasing mechanism that will permit the required self-closing feature to function and close the door automatically in case of fire irrespective of power failure or manual operation.

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 labeled wired glass, at least ¼ 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. Tinclad 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 labeled window assemblies shall be used.

1302. The label on window frames for Class E locations reads "Fire Window Frame."

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

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. Only labeled wired glass shall be used.

1312. 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.

1313. 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.

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. Maximum 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	3 ft. 6 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 are of formed steel sections with or without ventilators. The area of individual glass lights shall not exceed 350 sq. in.

a. Maximum Size.

(1). 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.

(2). 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.

(3). 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.

1323. Hollow Metal Plate-Steel (Combination) Frames. Combination hollow metal plate-steel frames consist of hol-

low metal sections forming the head, jambs and sill, and plate-steel sash. They are of the double-hung, counterbalanced, or stationary types.

a. Maximum 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	3 ft. 6 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 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 labeled wired glass not less than ¼ in. thick. The clearance between the edges of the glass and the metal framing shall not exceed ⅛ in.

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

1335. When glazing, the inside or outside angles shall be secured 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 member between, nonbearing labeled sheet-metal mullions shall be used. Bearing mullions shall be suitably fire protected with materials acceptable to the authority having jurisdiction.

134. Closing Devices. All fire windows installed for the protection of Class E and F openings shall be of a fixed type or shall be automatic closing. The automatic closing device may be an integral part of the window assembly or a separate system such as weights suspended by ropes, wire cables or chains over pulleys so arranged that operation of a fusible link, fixed temperature device, a rate-of-rise device, or smoke detection device will permit the weights to close the window.

Section 14.

Glass Blocks.

140. Classification.

1401. Only labeled 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 5¾ in. sq. or 7¾ in. sq. by 3⅞ in. thick.

141. Installation.

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

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

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

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

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

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

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

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

Section 15.

Fire Shutters.

150. Classification.

1501. Labeled 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. Labeled 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.

Access Doors.

160. General.

1601. An access door is a fire protective door assembly of smaller size than conventional doors and used to provide access to utility shafts, chases, manways, plumbing equipment, doors to service equipment for elevators and dumbwaiters, or as a scuttle hole to gain entry into an attic or space above a ceiling.

1602. Access doors shall be either an integral unit including door, frame, hinges and latch bearing the "Frame and Fire Door" label (see 405c(1) or the assembly shall consist of a labeled door, frame, and latch. Hinges shall be as specified in Table I.

1603. Access doors shall be kept in the closed and latched position when not in use.

161. Installation.

1611. When installed in vertical surfaces, access doors shall be suitable for Class B openings. In addition, the maximum transmitted temperatures shall not exceed 250°F at the end of 30 minutes of fire exposure.

1612. When installed in a vertical surface the following shall apply:

a. Access doors shall be self-closing when the opening is more than 144 sq. in. in area.

b. Self-closing shall be accomplished by use of a closer or by top hinging to provide gravity closing.

c. The door shall be automatic latching. Doors having both dimensions greater than 18 in. shall be openable from the inside without the use of a key or tool.

Section 17.

Service Counter Doors

170. General.

1701. A Service Counter Door is a labeled fire door assembly used for the protection of openings in walls where the primary purpose of the opening is for nonpedestrian use, such as counter service for food, pharmaceutical dispensary, package and baggage transfer, or storage openings and observation ports.

1702. Door construction may be as follows:

a. Door panels may be a single or multiple section vertical type, integrally mounted in a four-sided frame to form a labeled door and frame assembly; or

b. Door curtain may be of the interlocking slat type integrally mounted in a four-sided frame to form a labeled door and frame assembly.

c. Door curtain may be of the interlocking slat type including guides, brackets and hoods for mounting direct to masonry walls or noncombustible opening framing.

1703. Closing devices shall conform to Section 11.

171. Installation.

1711. Service Counter Doors may be factory or field assembled and may be installed during construction of the wall or may be installed in a prepared wall opening.

1712. When Service Counter Doors are mounted in walls other than solid masonry, the frame or guides shall be anchored to steel struts running from floor to a supporting member above.

1713. Heads of integral door frame assemblies shall not support wall above. Separate lintels shall be provided of a size based on type of wall construction and loads to be supported.

APPENDIX A

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

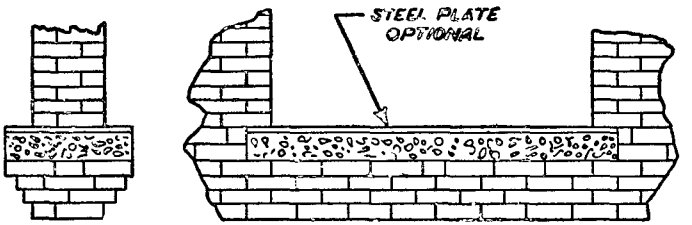


Figure 1. Concrete sill supported by a corbel of brick used with combustible floors.

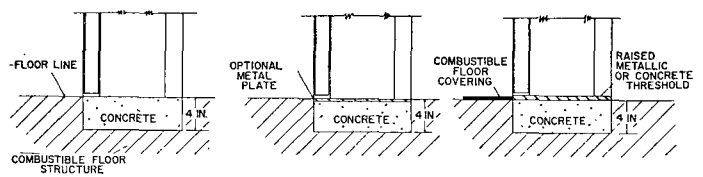


Figure 2. Noncombustible sill used with combustible floors for doors swinging into steel frame.

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

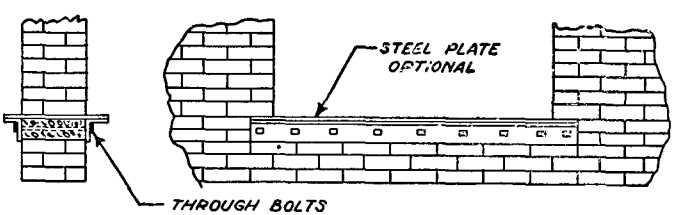


Figure 3. Angle iron and concrete sill used with combustible floors.

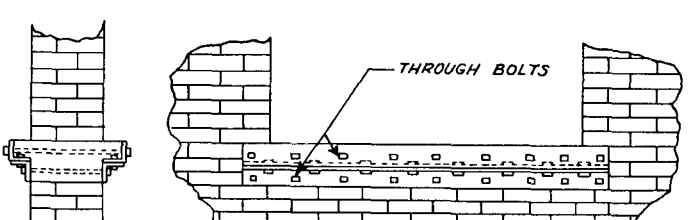


Figure 4. Z-bar and concrete sill used with combustible floors.

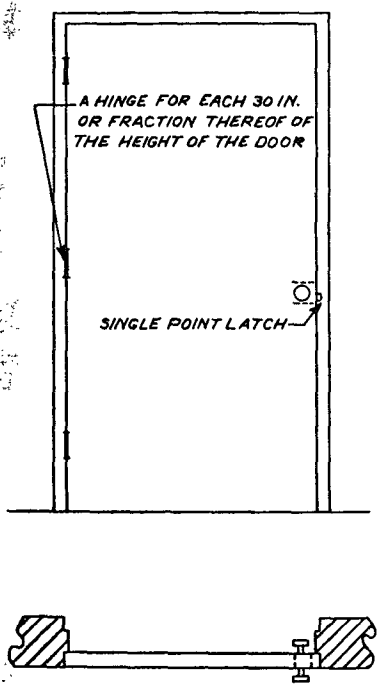


Figure 9. Builders hardware (single swing door with single point latch — flush mounted.)

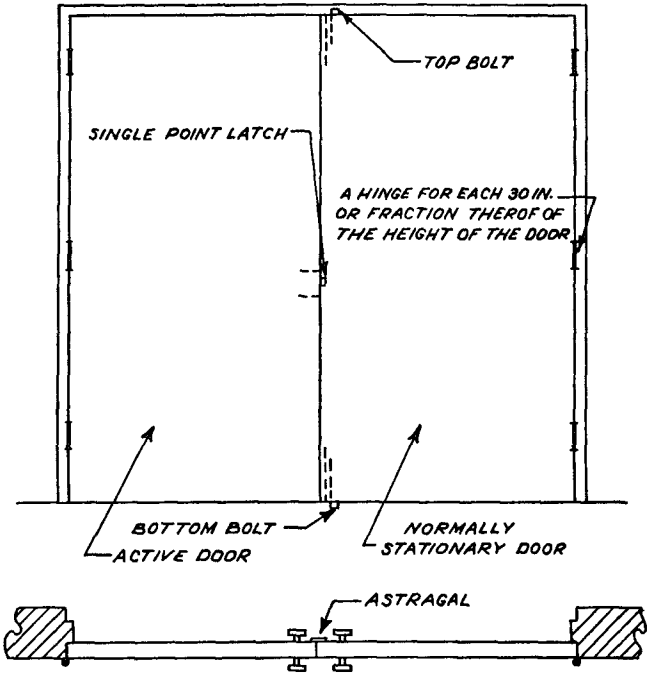


Figure 10. Builders hardware (doors swinging in pairs with single point latch — flush mounted).

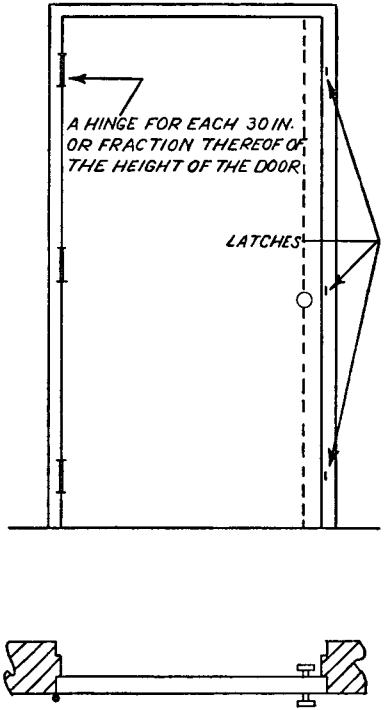


Figure 11. Builders hardware (single swing door with concealed three point latch — flush mounted).

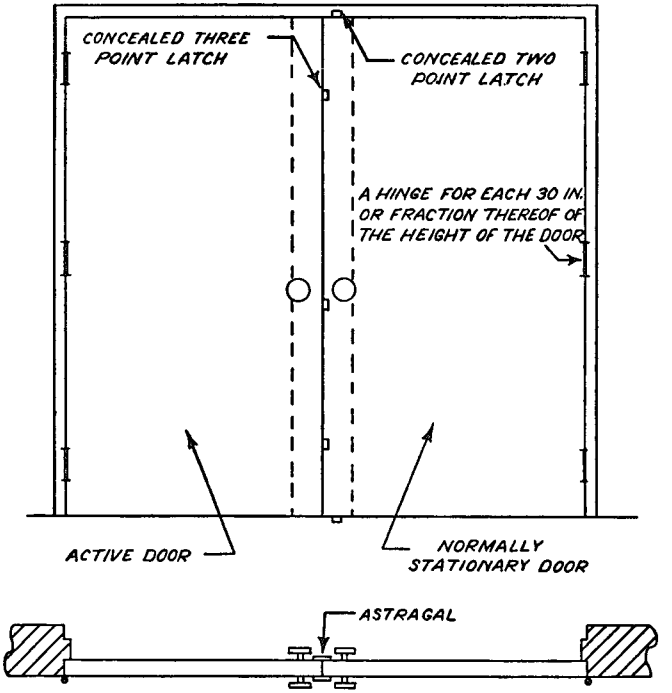


Figure 12. Builders hardware (doors swinging in pairs with concealed two and three point latches — flush mounted).

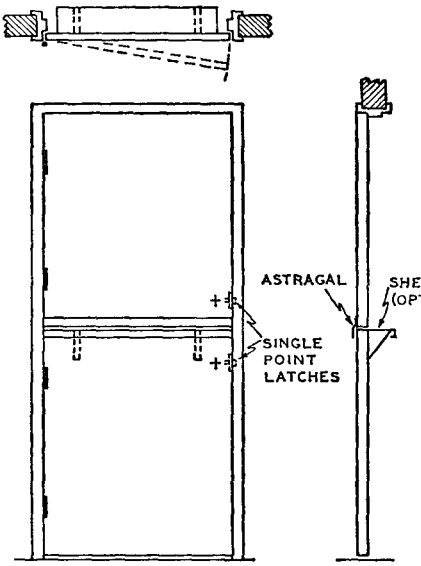


Figure 13. Dutch door and frame.

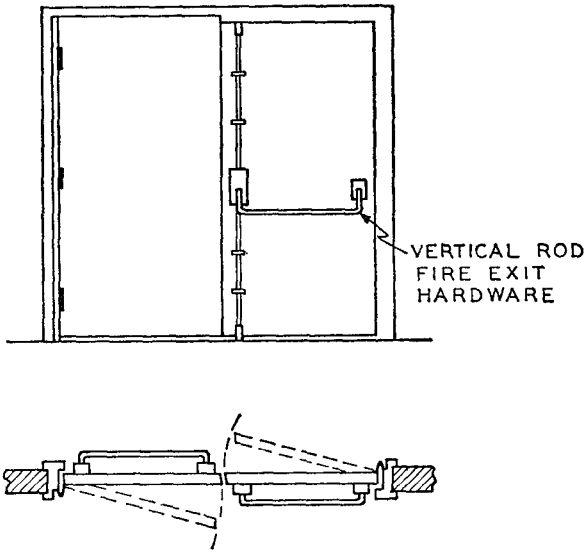


Figure 14. Double egress door and frame.

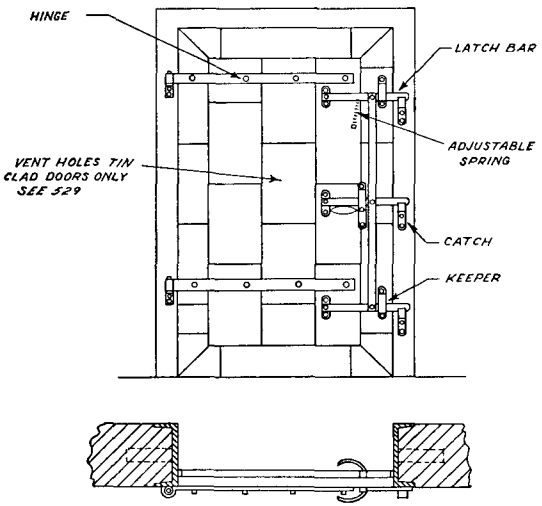


Figure 15. Fire door hardware (single swing door — flush mounted).

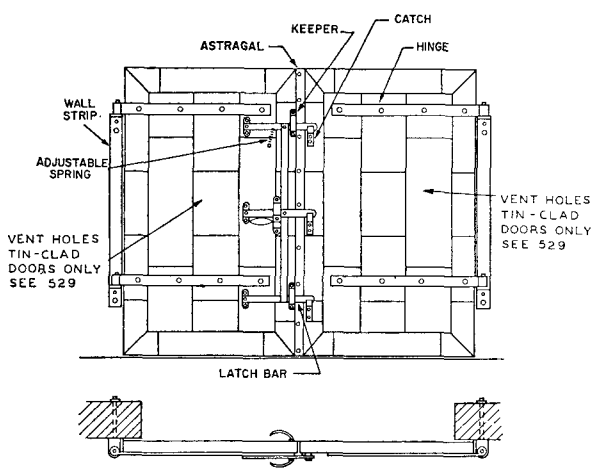


Figure 16. Fire door hardware (doors swinging in pairs — lap mounted).

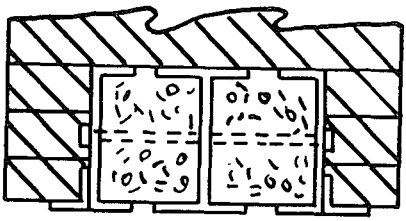


Figure 17. Steel lintel.

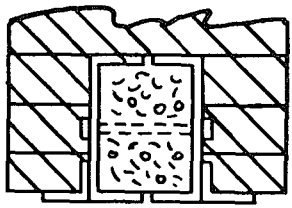


Figure 18. Steel lintel.

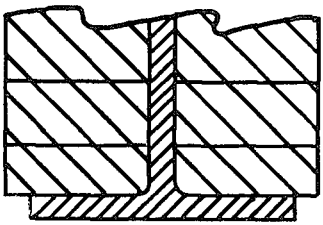


Figure 19. Steel lintel.

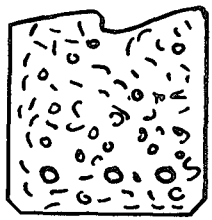


Figure 20. Reinforced concrete lintel.

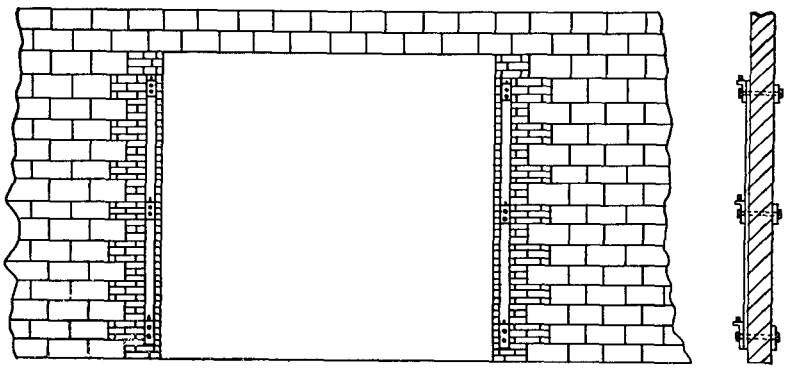


Figure 21. Concrete block wall prepared for doors swinging in pairs — lap mounted, standard method.

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.

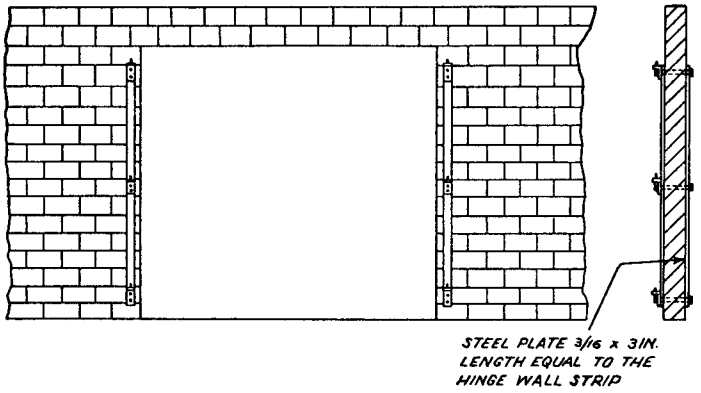


Figure 22. Concrete block wall prepared for doors swinging in pairs — lap mounted.

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

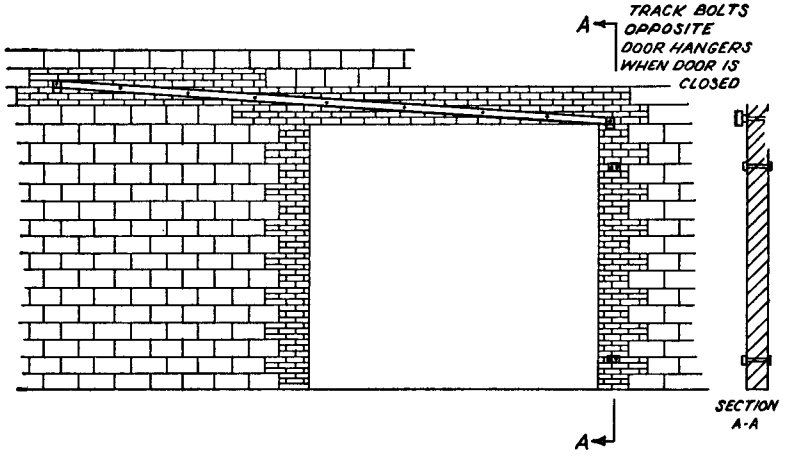


Figure 23. Concrete block wall prepared for a single tinclad or sheet metal slide door, standard method.

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.

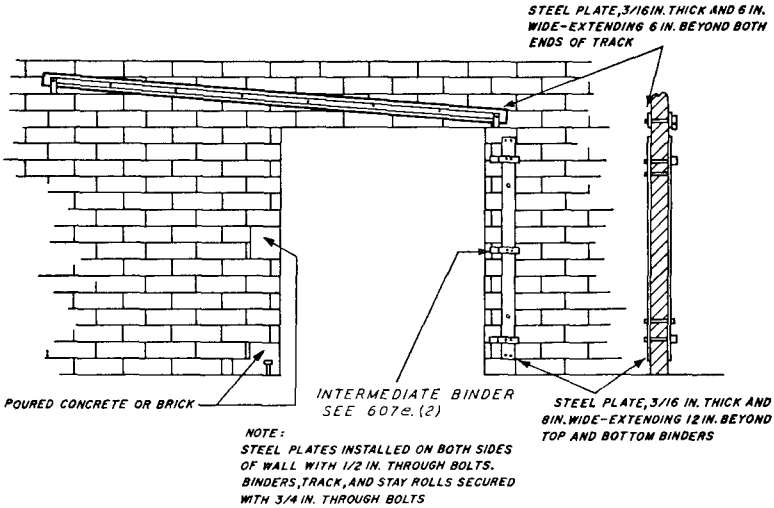


Figure 24. Concrete block wall prepared for a single slide door.

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

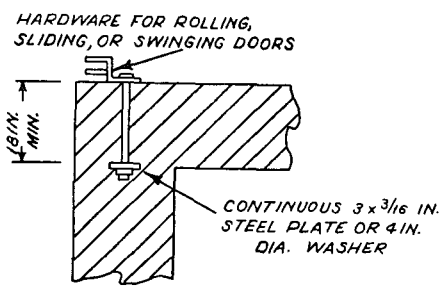


Figure 25. Corner walls.

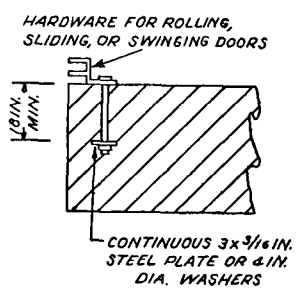


Figure 26. Unusually thick walls.

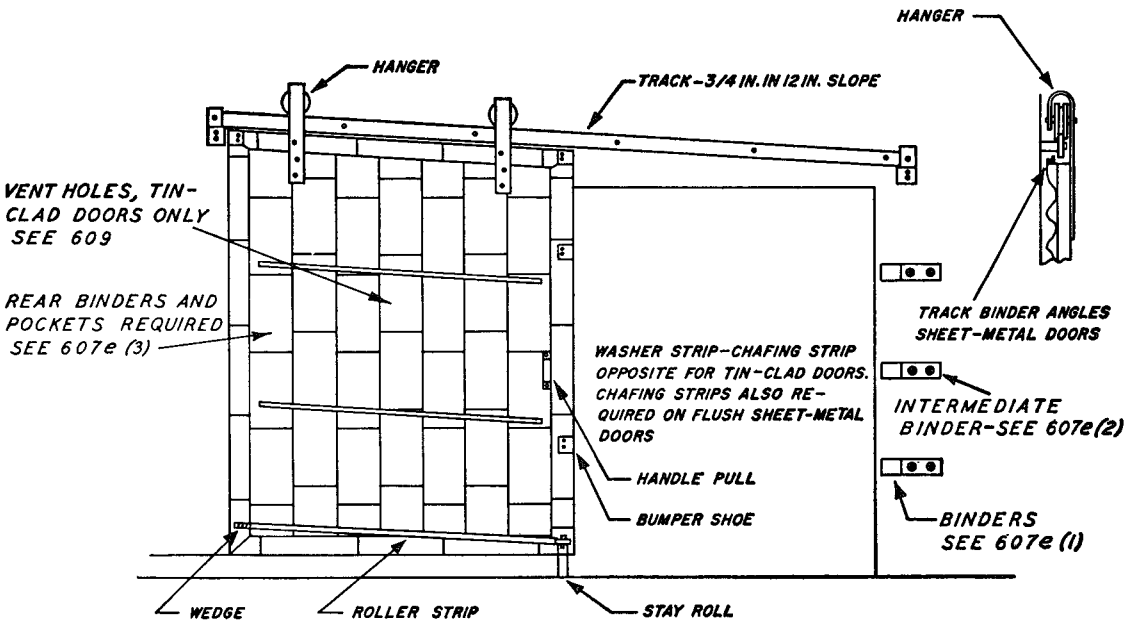


Figure 27. Single sliding door (inclined track).

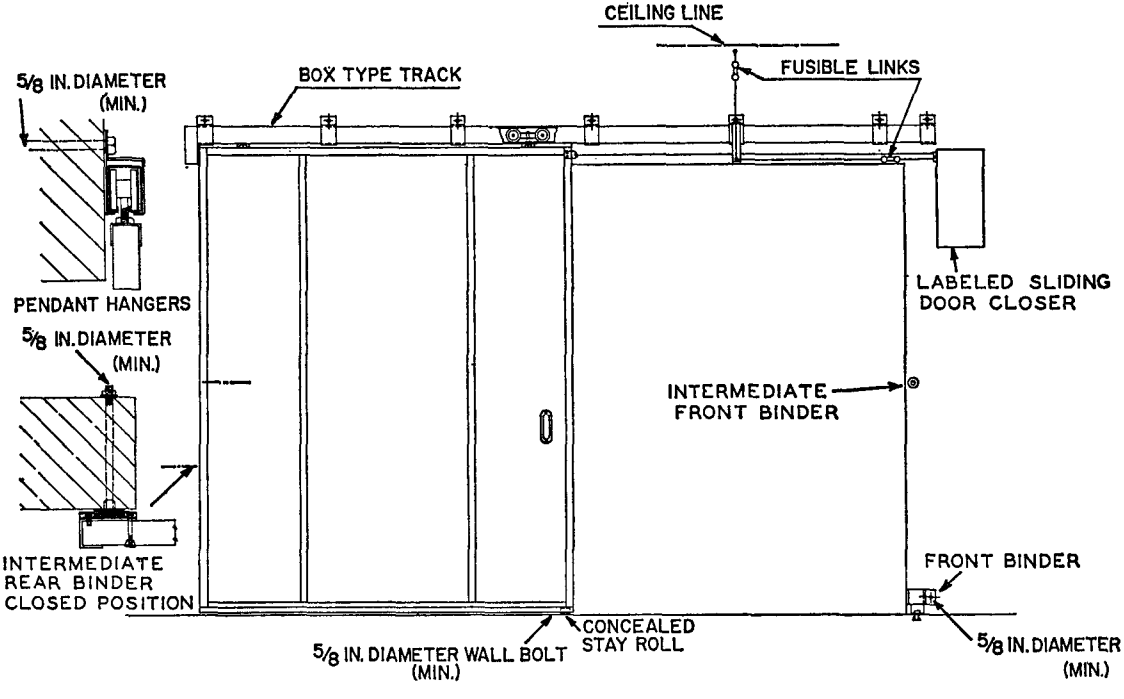


Figure 27a. Horizontal sliding composite door.

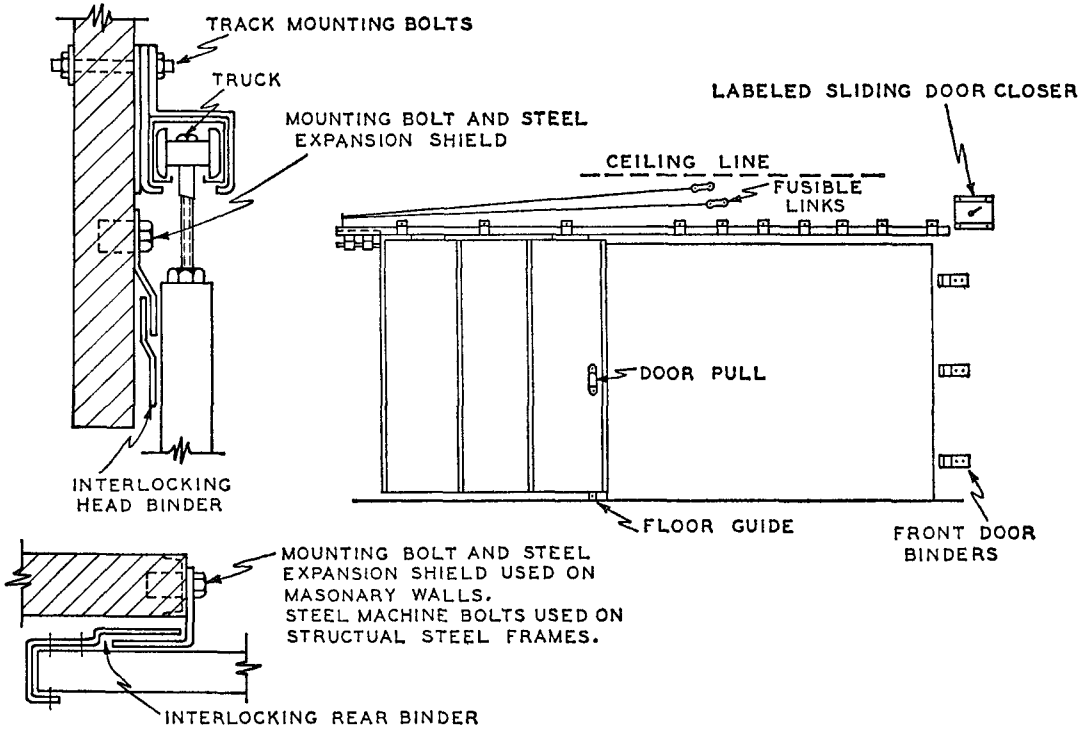


Figure 27b. Horizontal sliding hollow metal door.

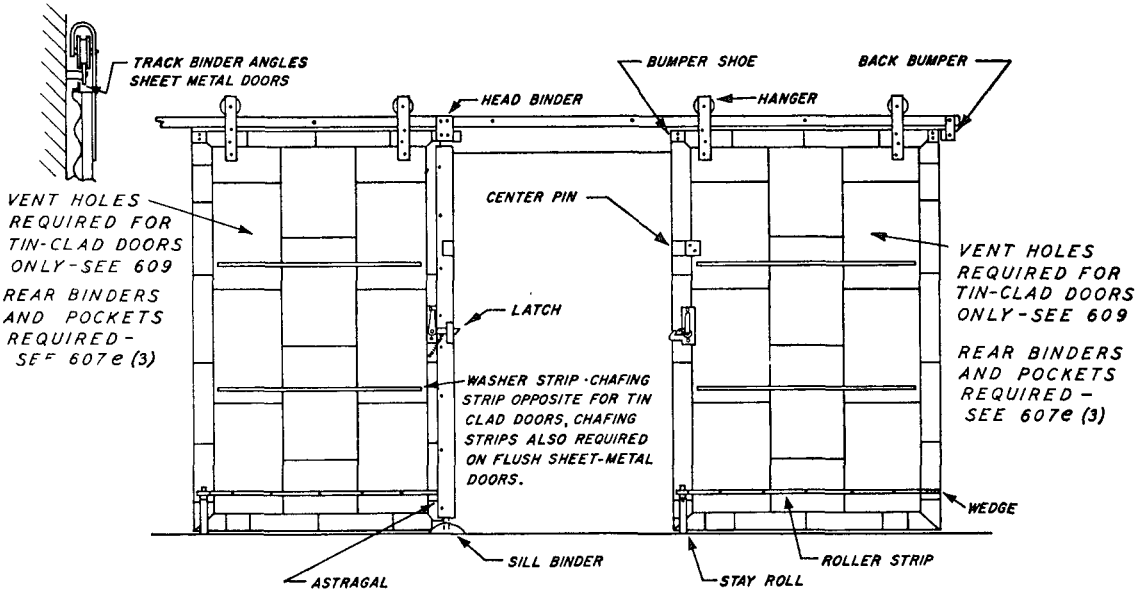


Figure 28. Center parting horizontal sliding doors (level track).

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

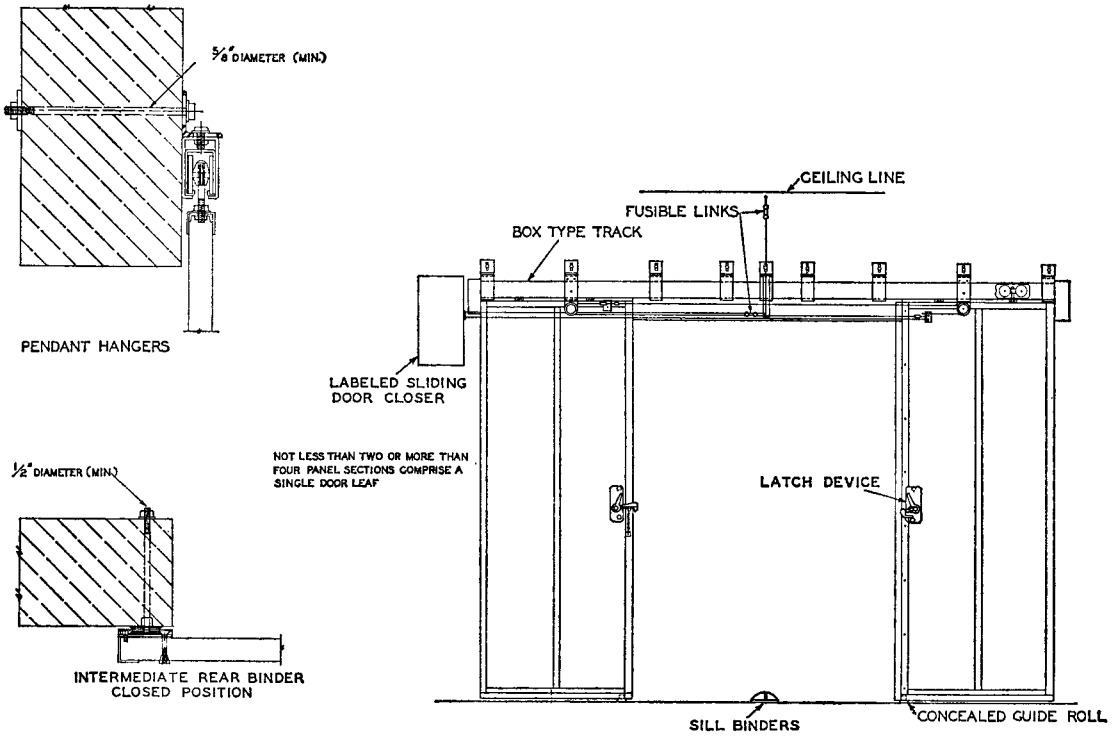


Figure 28a. Center parting horizontal sliding composite doors.

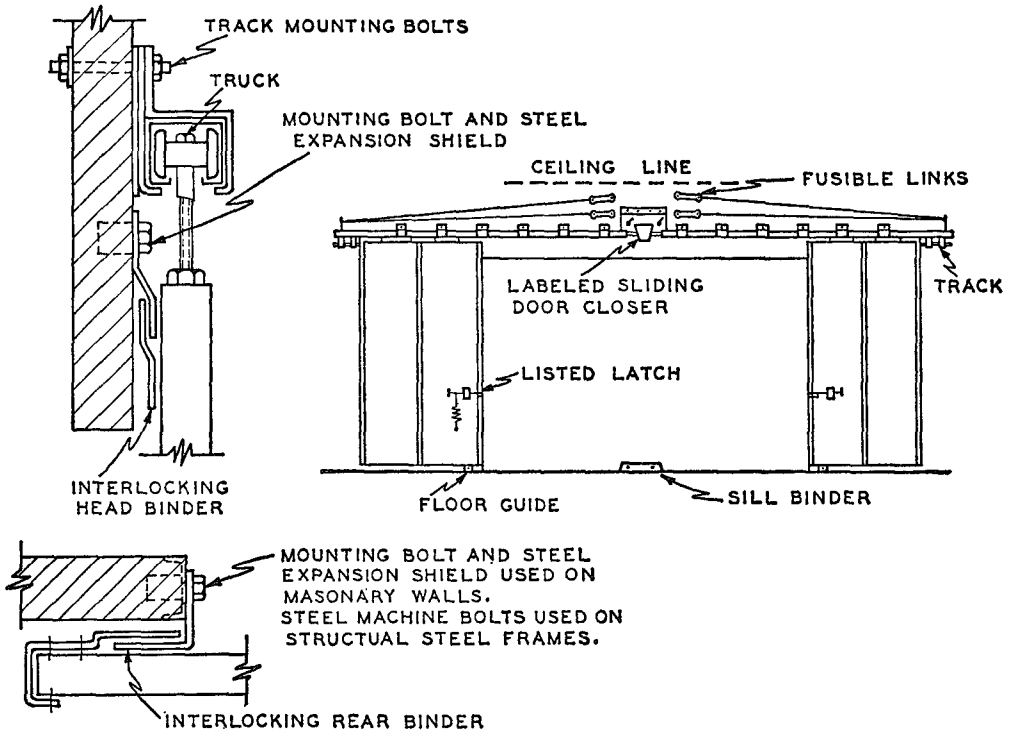


Figure 28b. Center parting horizontal sliding hollow metal doors.

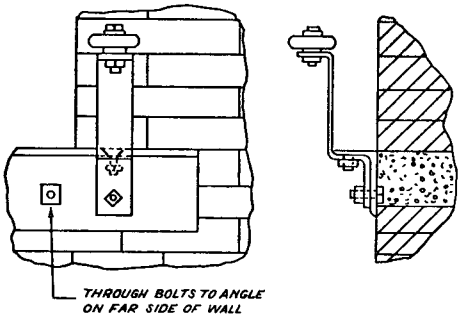


Figure 29. Stay roll.

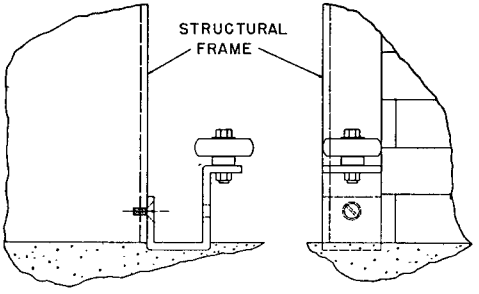


Figure 30. Stay roll.

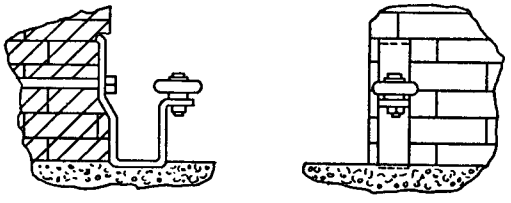


Figure 31. Stay roll.

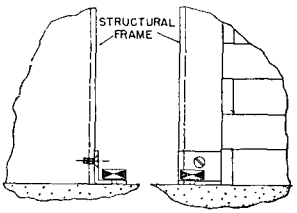


Figure 32. Concealed type stay roll.

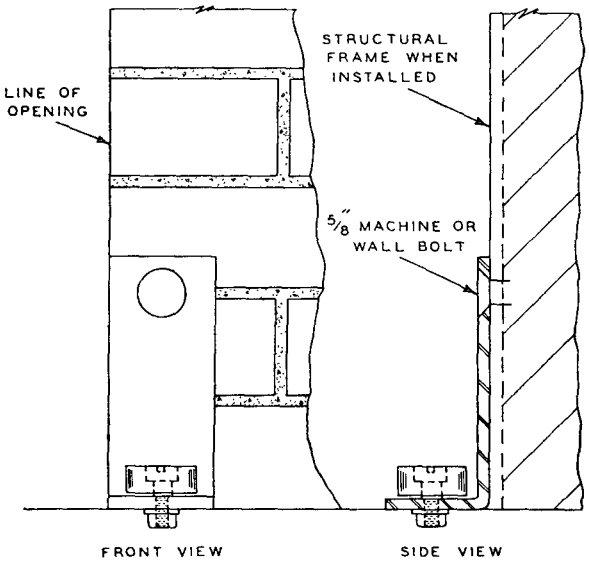
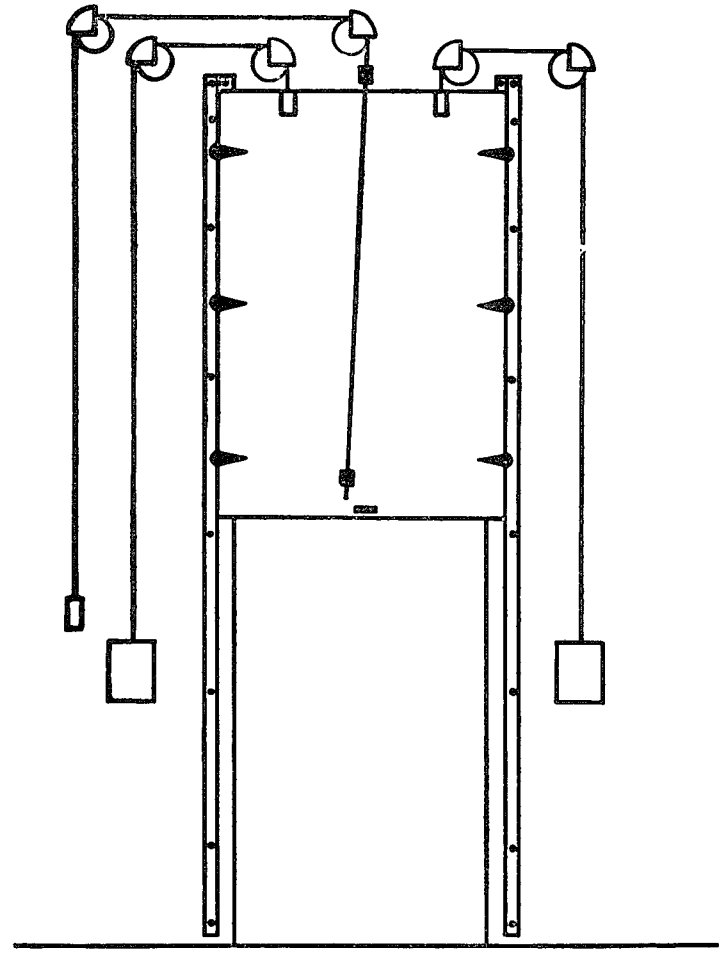
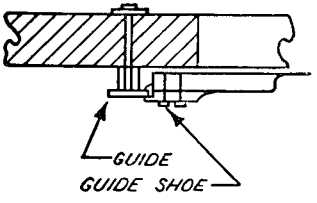


Figure 32a. Concealed type stay roll.





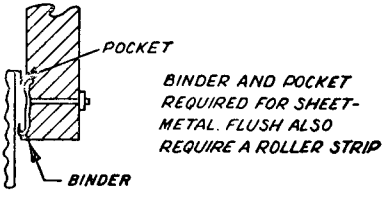


Figure 33. Vertical sliding door.

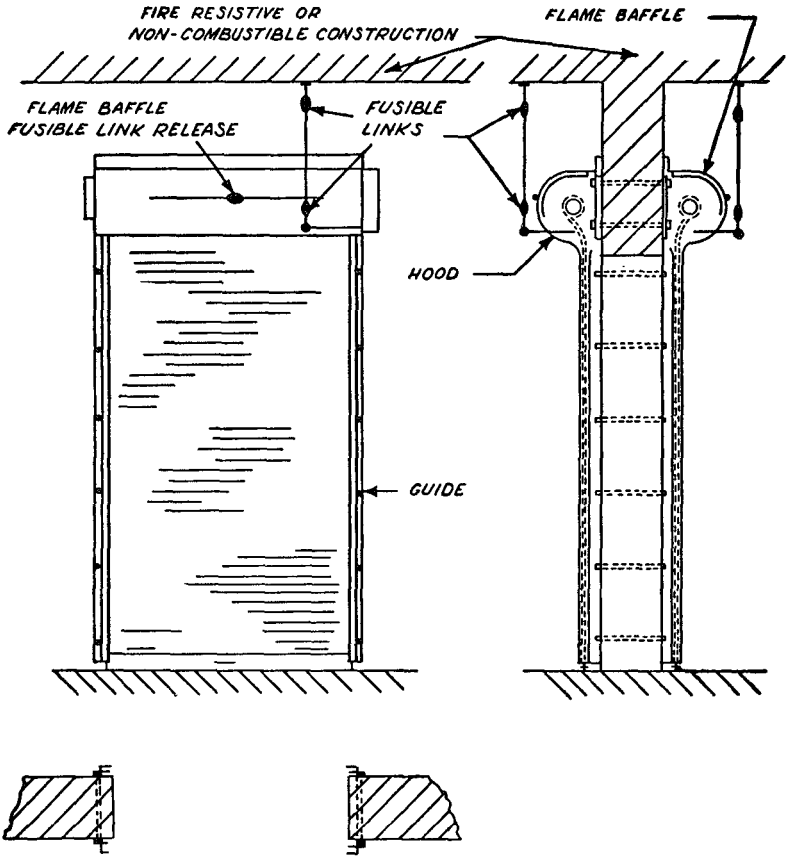


Figure 34. Rolling steel doors surface mounted.