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FIRE DOORS AND WINDOWS 1983

NATIONAL FIRE PROTECTION ASSOCIATION, INC.
Batterymarch Park, Quincy, MA 02269

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Continued on inside back cover

SC-AM-83

Standard for
Fire Doors and Windows

NFPA 80-1983

1983 Edition of NFPA 80

This edition of NFPA 80, *Standard for Fire Doors and Windows*, was prepared by the Technical Committee on Fire Doors and Windows, released by the Correlating Committee on Building Construction, and acted on by the National Fire Protection Association, Inc. on May 18, 1983, at its Annual Meeting in Kansas City, Missouri. It was issued by the Standards Council on June 9, 1983 with an effective date of June 29, 1983.

The 1983 edition of this standard has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 80

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, 1968, 1970, 1973, 1974, 1975, 1977, 1979, and 1981.

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NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or of any document developed by the Committee on which the member serves.

Contents

Introduction

0-1 Each class of device (doors, shutters, windows, etc.) has certain advantages and limitations, 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.

0-2 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.

0-3 Where fire doors also serve as exit doors, the *Life Safety Code®*, NFPA *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.

0-4 Labeled fire exit hardware which meets 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.

0-5 Reference is directed to NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, for detailed guidance in determination of fire exposure severity and corresponding degree of protection of opening which may be warranted.

0-6 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.

0-7 Doors of small to moderate size are more suitable for exit purposes than very large doors, owing to the relative ease of operation of the smaller doors.

0-8 Horizontally sliding doors for exit purposes are objectionable in that they are difficult to reopen once they are closed in case of fire. Swinging doors, integral with the sliding fire doors, can overcome this objection if they are tested and listed and if they are furnished without any obstruction to clear passage.

0-9 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.

0-10 Structural requirements specified in this standard generally refer to materials and assemblies which, through field experience, have been found acceptable for such application. Walls and lintels, providing they are of fire-rated construction, should provide the support required for the type of door to be installed. Materials and structural designs other than those specifically covered herein may be employed if judged equivalent by the authority having jurisdiction.

0-11 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 closed with construction equivalent to that of the wall.

0-12 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 NFPA 251, *Standard Methods of Fire Tests of Building Construction and Materials*. 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 emer-

gency 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.

0-13 Fire doors, shutters, or fire windows are of value only if properly maintained so that they will close or be closed at the time of fire. 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. (*See Chapter 14.*)

0-14 The use of swinging non-rated doors mounted in openings in fire walls where the openings are protected by fire doors is open to objection because of the possibility of interference of the closing action of the fire door by the proximity of the non-rated doors.

Standard for
Fire Doors and Windows

NFPA 80-1983

NOTICE: Information on referenced publications can be found in Appendix D.

Chapter 1 General

1-1 Scope.

1-1.1 This standard shall cover the installation and maintenance of fire door assemblies, windows, glass blocks, and shutters for the protection of openings in walls to restrict the spread of fire and smoke 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.

This standard is based on product and engineering practices recognized as being acceptable at the date of issue. Therefore, provisions of this standard are not intended to be applied retroactively to installations which were in compliance at the time of installation.

NOTE: The authority having jurisdiction may require upgrading of existing installations to meet current standards and requirements only when the lack of compliance with this standard presents a serious fire or life safety hazard. It should be noted that care and maintenance of materials for ongoing and existing installations should be maintained in accordance with the standards under which they were installed.

1-1.2 Incinerator doors, record room doors, and vault doors are not covered in this standard. For their installation, see NFPA 82, *Standard on Incinerators, Waste and Linen Handling Systems and Equipment*, NFPA 232, *Standard for the Protection of Records*, and NFPA 81, *Standard for Fur Storage, Fumigation and Cleaning.*

1-1.3 For standards on the installation of hoistway doors for elevators and dumbwaiters see the applicable sections of ANSI/ASME A17.1, *Safety Code for Elevators and Escalators* (1981 edition). (*See Appendix D, Section D-1.5.*)

1-2 New Developments.

1-2.1 This standard shall not act as an obstruction to the development of new, modified, or improved devices which meet the intent of these requirements. It shall be the responsibility of the manufacturer to furnish the necessary information to effect the updating of the requirements pertaining to such new and improved devices.[1]

1-2.2 For devices not described in this standard, the authority having jurisdiction shall request from manufacturers descriptive information provided by a testing laboratory concerning acceptable methods for satisfactory field installation based on fire tests and engineering studies for operation and maintenance considerations, where applicable.

1-3 General Limitations.

1-3.1 Fire doors and windows are classified by the authority having jurisdiction by designating a required fire protection rating expressed in hours or fractions thereof, an alphabetical letter designation, or combination of the former with an additional letter suffix. (*See Appendix F.*)

1-3.2 Fire doors equipped with automatic louvers or special closures for conveying systems shall be used only for protecting openings in required enclosures where the opening is not in an exit or otherwise located so that products of combustion flowing through the opening could jeopardize the use of exits prior to operation of the louver.

1-3.3 Sliding Doors.

1-3.3.1 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 unless the sliding door has an integral swinging door.

1-3.3.2 The combination unit shall be tested and listed, and the swinging door shall be furnished without any obstruction to clear passage.

1-3.4 Plant-ons shall not be applied to fire doors except when specifically provided for in the published listings. (*See Appendix G.*)

1-3.5 Preparation of fire door assemblies for locks, latches, hinges, concealed closer, glass lights, vision panels, louvers, astragals and laminated overlays shall be performed in conformance with the manufacturer's inspection service procedure and under Label Service. (*See Appendix H.*)

[1]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.

Exception No. 1: Preparation for surface applied hardware, function holes for mortise locks, holes for labeled viewers, a maximum ¾-in. wood and composite door undercutting, and protection plates (see 2-8.3) may be performed at the job site.

Exception No. 2: ⅓ or ½ hr labeled doors with proper reinforcement may be prepared in the field for fitting, hardware and astragals.

1-4 Definitions.

Access Door. A door assembly, with a fire protection rating, of smaller size than conventional doors and used to provide access to utility shafts, chases, manways, plumbing equipment, doors to service for elevators and dumbwaiters, or as a scuttle hole to gain entry into an attic or space above a ceiling.

Active Leaf. The first operating door of a pair; usually that one in which a lock is installed.

Ambient. The temperature of the room in which the test is being conducted.

Anchor. A device for attaching frames to the surrounding structure.

Approved. Acceptable to the authority having jurisdiction.

NOTE: The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Astragal. (Overlapping or Wrap-Around). A vertical molding attached to the meeting edge of one leaf of a pair of doors for protection against weather conditions, to minimize the passage of light between the doors, and/or to retard the passage of smoke, flame or gases during a fire.

Astragal. (Split). A vertical molding attached to both leaves of a pair of doors at the meeting edges for protection against weather conditions. Can be used when both leaves are active.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local, or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

Automatic Closing Device. A device attached to a door or window frame which causes the door or window to close when activated as a result of a predetermined temperature, rate of temperature rise, smoke, or other product of combustion detector.

Automatic Closing Door. Doors which are normally open but will close when the automatic closing device is activated at the time of fire.

Automatic Fire Detectors. Either individual devices or prescribed combinations of devices designed to detect flame, heat, smoke, or combustion gases resulting from fire.

Automatic Top and Bottom Bolt. (*See Flush Bolts.*)

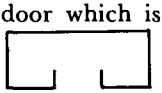
Barrel. (Rolling Steel Door). A cylindrical horizontal member at the head of the opening which supports the door curtain and contains the counter-balance springs.

Binders. (Sliding Door, Horizontal and Vertical). Pieces of hardware used to hold a sliding door to the wall preventing lateral movement from the wall.

Biparting. Term describing a vertically sliding door in which one half of the door moves up and one half of the door moves down to open. Also, a horizontal sliding door in which one door moves to the right and one to the left to open.

Bottom Bar. (Rolling Steel Door). A structural reinforcing member at the lower edge of the door curtain assembly.

Box Track. A type of track used with sliding door which is formed from a sheet of steel in the shape as shown:



Brackets. (Sliding Door, Rolling Steel). Plates bolted to the wall or to extensions of the guide wall angles which serve to support the barrel and form end closers for the hood.

Builders Hardware. (*See Section 1-9.*)

Bumpers. (Sliding Door). Stops to limit the closing or opening movement of a sliding door.

Center Latch. A latch used to hold the two halves of a center-parting, or biparting fire door together; usually two pieces surface applied to doors and interlocked in the closed position.

Chafing Strip. (Sliding Door). Metal strip applied to the back surface of a sliding door to protect the door surface from damage from the wall.

Channel Frame. A frame that consists of head and jamb members of structural steel channels, either shop or field assembled, to be used with masonry walls.

Closing Device. A means of closing a door from the partial or full opened position.

Concrete Lintel. A precast concrete horizontal member spanning and carrying the load above an opening.

Continuous Glazing Angles or Channels. (Window). Continuous steel angles or channels used to hold glass in a window.

Coordinator. A device used on pairs of swinging doors that prevents the active leaf from closing before the inactive leaf closes.

Counterbalancing. A method by which the hanging weight of the door curtain is balanced by helical torsion springs or weights.

Cover Plate. (Slide Door Vertical and Horizontal). A plate to cover the joint between the section of multiple panel doors, usually applied to front and back of door.

Crush Plates. Continuous steel-bearing plates provided when doors are mounted on concrete masonry unit walls with hollow cells to receive through-wall bolts to prevent crushing of the hollow concrete masonry unit.

Curtain. (Rolling Steel). The door closure consisting of interlocked slats and bottom bar.

Curtain Slats. (Rolling Steel). Formed sheet steel members which, when interlocked together, form the door curtain.

Detectors. (*See Automatic Fire Detectors.*)

Door, Access. (*See Access Door.*)

Door, Automatic Closing. (*See Automatic Closing Door.*)

Door Closer. A labeled device applied to a door and frame to cause the open door to close by mechanical force. The closing speed may be regulated by this device.

Door Holder/Release Device. A labeled, fail-safe device, controlled by a detection device, used on an automatic closing door to release the door at the time of fire.

Door, Power Operated. (*See Power Operated Fire Doors.*)

Door Protection Plate. Protective material applied to the face of a door and generally made of approximately 0.050 in. (1.2 mm) thick brass, bronze, aluminum or stainless steel or ⅛ in. (3.2 mm) thick laminated plastic. (*See 2-8.3 for size limitations.*)

Door, Self-Closing. (*See Self-Closing Doors.*)

Door, Service Counter. (*See Service Counter Door.*)

Double Egress. A pair of swinging doors, each leaf of which swings in the opposite direction from the other.

Dutch Door. A door divided horizontally so that the lower part can be shut while the upper part remains open.

Egress Side. The side of an opening from which traffic exits.

Electric Contacts. An electrical device, the function of which is to prevent operation of the elevator-driving machine by the normal operating device unless the hoistway door is in the closed position.

Finish Frame. A subframe attached to a rough buck to which the door is attached.

Fire Door. The door component of a fire door assembly.[1]

Fire Door Assembly. Any combination of a fire door, frame, hardware, and other accessories which together provide a specific degree of fire protection to the opening.

Fire Door Hardware. Fire door hardware is applied to both swinging and sliding doors and consists of the items referred to in Tables 3-8A, 3-8B, 3-8C, and 4-5A. (*See also Figures A-29, A-31, A-34, A-37, and A-41—A-45 in Appendix A.*)

Fire Exit Hardware. Labeled devices for swinging fire doors installed to facilitate the safe egress of persons. They consist of a crossbar and various types of latch mechanisms that cannot hold the latch in a retracted locked position. They are labeled for both fire and panic. Fire exit hardware has a permanently attached metal label which is serially numbered and shows the manufacturer's name and type of approval. The label is extended to differentiate between panic hardware, which is not acceptable for use on fire doors, and fire exit hardware.

Fire Lock Angles. (Sliding Door, Horizontal). A sheet metal angle designed to hold the assembly in position during a fire test.

Fire Shutter. A labeled door assembly that is used for the protection of a window opening in an exterior wall. (*See Shutter.*)

Flame Baffle. A hinged sheet metal piece within the hood which, when released, closes the space between the top of the curtain and the hood of a rolling door.

Flush Bolts, Automatic. A mortised bolt installed near the top or bottom of the inactive leaf of a pair of doors. The bolt holds the inactive leaf in a closed position until the active leaf is opened.

Flush Bolts, Manual. A mortised bolt installed near the top or bottom of the inactive leaf of a pair of doors. The bolts are manually extended and/or retracted into or out of the header or sill by means of a lever.

Frame (Window). A window frame is the perimeter section of a window.

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[1]The fire protection rating of a fire door presumes that the door is installed with the appropriate frame, hardware, and other accessories required by this standard. In any instance, where any of the required elements are omitted, the assembly rating is void by this standard and the opening protection is not considered equivalent to the labeled or otherwise indicated fire protection rating of the door component.

Fusible Link. Two pieces of metal held together by low-melting-point solder.

Glazing Angle Clips. Steel angle clips used to hold glass in place in windows glazed only with glazing compound. Glazing angles are attached to window members with screws and are completely covered by the glazing compound.

Governor. (Sliding, Vertical and Rolling Steel Doors). A mechanical device which limits the speed of descent of the door during automatic closure.

Guides. (Sliding, Vertical and Rolling Steel Doors). Vertical assemblies in which the curtain travels and which are fastened to the jamb. The guides retain the edges of the door curtain and close the space between the curtain edges and the jamb.

Guide Rail. (Sliding Door, Vertical) . A steel member attached to wall or frame, used with vertical sliding doors to guide the door.

Guide Shoe. (Sliding Door, Vertical). A member attached to vertical sliding doors used to guide and retain door on guide rail.

Guide Wall Angle. (Sliding Vertical and Rolling Steel Doors). That component of the guide assembly which is fastened to the jamb.

Hanger. (Sliding Door, Horizontal). A member used to attach horizontally sliding door to track and roll on or in track.

Heat Actuated Device. Heat actuated devices include fixed temperature releases, rate-of-temperature-rise releases, and door closers with hold-open arms embodying a fusible link.

Hoistway Door Interlocks. A locking device that prevents operation of the elevator-driving machine by the normal operating device unless the hoistway door is locked in the closed position and prevents the opening of the hoistway door unless the car is within the landing zone and is either stopped or being stopped.

Hollow Metal Frame. A frame formed from sheet metal.

Hood. (Rolling Steel Door). A sheet metal housing which mounts horizontally between the brackets. It serves as an enclosure for the coiled curtain and closes the space between the door coil and the lintel.

Inactive Leaf. The one of a pair of doors that is ordinarily latched closed. The second operating door of a pair.

Interviewers. A viewing device installed in a door to permit observation of persons opposite the security side of the door without having to open the door.

Jackknife Door. A door which folds and unfolds like a jackknife while opening and closing.

Keeper. A guide and a restraint used on latching devices.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Lap Mounted. (Sliding Door, Vertical, Horizontal, Rolling Steel, Swing Door). Refers to doors mounted on the face of a wall and overlapping the opening by a prescribed dimension.

Latching Device. A spring loaded latch bolt or a gravity operated steel bar that after release by physical action returns to its operating position and automatically engages the strike plate when it is returned to the closed position.

Lintel. A horizontal member spanning and carrying the load above an opening.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The "authority having jurisdiction" should utilize the system employed by the listing organization to identify a listed product.

Louver, Automatic. An opening in a door with a series of slats or blades to allow passage of air, designed to close automatically in the event of fire.

Mullion. Vertical member set in a double door opening which will allow both leaves to be active. May be fixed or removable. A mullion may also occur between a door and a sidelight or a separate, framed, glazed area.

Mullion, Window. A mullion is the separate steel member or members used to join windows in a multiple window opening, either horizontally or vertically.

Muntin. A bar member supporting and separating panes of glass within a sash, door or glazing frame.

Muntin, Window. A muntin is a tee-shaped bar in a frame or ventilator, dividing the glass.

Noncombustible. (*See NFPA 220, Types of Building Construction.*)

Open Back Strike. Strike applied to the inactive leaf of a pair of doors and cut away at the back to permit either leaf to open or close independently.

Plant-ons. A decorative trim applied to the surface of the door. (*See Appendix G.*)

Power Operated Fire Doors. Doors which are normally opened and closed electrically, pneumatically, or mechanically.

Rolling Steel Door. A closure consisting of an interlocking steel slat curtain, bottom bar, wall guides, and an automatic release device, which, on release, will cause the curtain to close.

Rough Buck. A subframe, usually channel shaped, attached to an existing wall to which the finish frame is attached.

Round Track. A circular roll formed steel track used for supporting and/or guiding horizontal or vertical sliding doors.

Safety Meeting Edge. (Elevator Doors). A resilient member used on the leading edges of elevator doors to prevent crushing or shearing edges.

Sash, Window. A sash is the horizontal or vertical sliding component of a window.

Self-Closing Doors. Doors which, when opened and released, return to the closed position.

Self-Latching Bolt. An automatic latching device which engages in a keeper to hold a door leaf in a closed position and must be manually released.

Service Counter Door. 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 observation ports.

Shall. Indicates a mandatory requirement.

Shutter. A labeled door assembly that is used for the protection of a window opening in an exterior wall. (*See Fire Shutter.*)

Side Light. A frame, prepared for glass installation in the field, attached to the door frame.

Single Point Latch. A latch located in the edge of a door to engage either in the frame or in the edge of the inactive leaf of a pair.

Sliding Hardware. A system of rails, hangers, rollers, guides, binders, and closing devices that may be made self-closing by gravity, weights, and pulleys or spring actuated devices.

Smoke Detector. A device which senses visible or invisible particles of combustion.

Solid Section Frame. (*See Channel Frame.*)

Spring Hinge. A closing device in the form of a hinge with a built-in spring used to hang and close the door.

Spring Release Device. (Sliding Door, Vertical, Horizontal, Rolling Steel Door). A device, which, when activated, releases part of the spring counterbalancing force and causes the door to close.

Snub Rollers. (*See Stay Rollers.*)

Stay Rollers. (Sliding Door, Horizontal). A device used on horizontally sliding doors at the back lower corner to guide the door and prevent the door from moving away from the wall under fire conditions.

Strike Plate. A wear plate for projecting hardware or a wear plate and keeper for a latchbolt.

Struts. Adjustable, vertical members that extend from the head of the hollow metal frame to the ceiling to hold the frame rigidly in place.

Swing-In. A door that swings into a room or building.

Swing-Out. A door that swings out of a room or building.

Three Point Latch. A self-latching device designed to latch a door at the top, bottom and edge by an interconnected mechanism so that all latches operate simultaneously.

Track Binders. (Sliding Doors, Sheet Metal). A device mounted on a sheet metal sliding door and projecting behind the track to prevent the door from moving away from the wall under fire conditions.

Transom. An opening in a frame above the door opening separated by a horizontal member having glass, panel or louver installed.

Transom Panel. A panel installed in a frame above the door opening.

Vents. (Sliding Door, Horizontal Tinclad Only). A hole cut in a fire door to allow for venting of the products of combustion.

Ventilator, Window. A ventilator is that part of a projected, casement, or pivoted window that opens.

Vertical Sliding Door. Labeled single piece and section doors operating in a vertical direction.

Wedge. (Sliding Door, Horizontal Tinclad and Flush Sheet Metal). A plate mounted on the face of a slide door designed to force the door against the wall.

Window. Windows are integral fabricated units, placed in an opening in a wall, and are primarily intended for the admission of light, or light and air, and not primarily intended for human entrance or exit.

Wired Glass. Glass with wire netting embedded in it.

Wire Glazing Clips. Wire glazing clips are small spring wire clips used to hold glass in place when windows are glazed with only glazing compound.

1-5 Listed and Labeled Products. (*See Definitions, Section 1-4.*)

1-5.1 Listed items shall be identified by a label, a listing, or a classification mark.

NOTE: Labels or classification marks may be of metal, paper, or plastics, or may be stamped or diecast into the item.

1-5.2 The label, the listing, or the classification mark shall be considered as evidence that samplings of such devices or materials have been evaluated by test and that these devices or materials are produced under an in-plant follow-up program.

1-5.3 Specification of items of a generic nature, such as hinges, that are not labeled shall comply with the specifications contained herein.

1-6 Classifications and Types of Doors.

1-6.1 Only labeled or listed doors shall be used.[1]

1-6.2 The label on doors covers only the design and construction of the door.

Exception No. 1: On fire doors bearing the "Fire Door to Be Equipped with Fire Exit Hardware" label, the label shall cover the reinforcements or construction features necessary for the exit devices which shall bear the "Fire Exit Hardware" label.

Exception No. 2: On doors bearing the "Fire Door" label, the label shall include:

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

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

(c) 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.

(d) On elevator doors — see Section 7-3.

[1]Doors are of several classifications, types, and methods of operation. 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 1-6.2 and Appendix F.*)

Exception No. 3: On doors bearing the "Frame and Fire Door" assembly label, the label also shall include:

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

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

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

(d) On dumbwaiter doors — see 7-3.4.

(e) On service counter doors — frames, sills, wall guides, counterbalancing, and automatic closing mechanisms.

(f) On material conveying systems — the frame, sill guides, and automatic closing systems (refer to Appendix C for guidelines).

1-6.3 Authorities having jurisdiction shall be consulted as to the size of oversize doors which may be deemed acceptable in a given location.[1]

1-7 Glass.

1-7.1 Only labeled wired glass, not less than ¼ in. (6.35 mm) thick, labeled for fire protection rating and installed in approved steel frames, shall be used. The glass shall be well imbedded in putty and all exposed joints between the metal and glass shall be struck and pointed.

1-7.2 Glass shall *not* be used in *either* doors having a 3-hour fire protection rating or doors having a 1½-hour fire protection rating for use in severe exterior fire exposure locations.

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[1]Testing laboratories may provide a label or certificate of inspection for doors larger than the maximum sizes indicated in Appendix B. Doors exceeding those size limitations have not been subjected to the Standard Fire Test. In certain cases the testing laboratory may be prepared to furnish a label or certificate of inspection for such oversize doors. They do not indicate that the doors are capable of furnishing standard fire protection but only that they conform to the requirements of design, materials, and construction as established by the individual listings.

1-7.3 Wired glass shall be permitted in doors having the following fire protection ratings, when so tested:

Door Rating (hr)	Max. Area of Glass per Door Leaf[2,3] (sq in.) (m²)
½ & ⅓	limited to the maximum area tested[1]
¾	limited to the maximum area tested[1]
1 & 1½[2]	100 sq in. (.065 m²)

NOTE 1: Maximum area of individual exposed lights 1296 sq. in. (.84 m²) with no dimension exceeding 54 in.(1.37 m).

NOTE 2: See also requirements in 1-7.2.

NOTE 3: See also requirements for elevators in 7-2.2.3.

1-7.4 Devices used to view through fire doors rated at 1½ hours or less shall be labeled.

1-8 Types of Door Construction.

1-8.1 General. The following types of door construction generally follow terminology of the industry and of testing laboratory classification and are offered for descriptive identification of available doors.

1-8.2 Composite Doors. Composite fire doors consist of wood, steel, or plastic sheets bonded to and supported by a solid core material.

1-8.3 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.

1-8.4 Metal Clad (Kalamein) Doors. Metal clad fire doors are of flush or panel design consisting of metal covered wood cores or stiles and rails and insulated panels covered with steel of 24 gage or lighter.

1-8.5 Sheet Metal Doors. Sheet metal fire doors are formed of 22 gage or lighter steel and are of corrugated, flush sheet, or panel design.

1-8.6 Rolling Steel Doors. Rolling steel fire doors consist of steel or stainless steel interlocking slats to form a curtain of not less than 22 gage attached to an overhead barrel mounted on brackets for at-

tachment 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.

1-8.7 Tinclad Doors. Tinclad fire doors are of two- or three-ply wooden core construction, covered with 30-gage galvanized steel or terne plate [maximum size 14 in. by 20 in. (.36 m by .51 m)] or 24-gage galvanized steel sheets not more than 48 in. (1.22 m) wide. Face sheets shall be vented.

1-8.8 Curtain-type Doors. Curtain-type doors consist of interlocking steel blades or a continuous formed spring steel curtain installed in a steel frame.

1-8.9 Wood Core Type. Wood core-type doors consist of wood, hardboard or plastic face sheets bonded to a wood block or wood particleboard core material with untreated wood edges.

1-9 Classification of Hardware for Fire Doors.

1-9.1 Hardware required for the installation of all types of fire doors appears in this standard as:

(a) Described in those sections covering installation.

(b) Listed in Tables 2-8A, 2-8B, 3-8A, 3-8B, 3-8C and 4-5A. (*See illustrations of typical applications in Appendix A.*)

1-9.2 Hardware for fire doors shall be referred to as "Builders Hardware" and "Fire Door Hardware." Within the category of "Builders Hardware" is "Fire Exit Hardware."

1-9.3 In this standard, builders hardware is applied only to swinging doors and consists of the items referred to in Tables 2-8A and 2-8B. (*See illustrations in Figures A-20—A-28.*) These include hinges (full mortise, half mortise, half surface, full surface, olive knuckle, paumelle or spring); single-, two-, or three-point locks and latches; top and bottom bolts (flush, surface, or concealed); and door closers. This type of hardware is not usually shipped from the factory with the fire doors.

Fire exit hardware consists of exit devices which have been labeled both for fire and panic protection. (*See fire exit hardware as illustrated in Figures A-24 and A-25.*)

1-9.4 Fire door hardware is applied to both swinging and sliding doors and consists of the items referred to in Tables 3-8A, 3-8B, 3-8C, and 4-5A. (*See illustration in Figures A-29, A-31, A-34, A-37, and A-41–A-45.*) Fire door hardware that is applied to swinging

doors consists of surface mounted strap hinges, surface applied latches, and closing devices. In this standard, all hardware for sliding doors is fire door hardware. This type of hardware is normally shipped from the factory with the fire doors.

1-10 Classification of Labeled Door Frames.

1-10.1 Single Unit Type.

1-10.1.1 Aluminum. These frames consist of head and jamb members with or without solid transom panels and have a maximum rating of 45 minutes. 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.

1-10.1.2 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.

1-10.1.3 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 shall meet the requirements of 2-5.1.

1-10.1.4 Wood. These frames consist of head and jamb members with or without solid transom panel and have a maximum rating of 20 minutes. 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.

1-10.2 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.

1-11 Placement of Detectors.

1-11.1 All detectors, including fusible links, shall not be placed in the so-called dead air space developed at the intersection of the wall and ceiling directly above the fire door. (*See Figures A-58 and A-59.*)

1-11.2 Detectors for the release of fire doors may be part of an overall system, such as a fire alarm, water flow alarm, or carbon dioxide release system, which will release the door.

Chapter 2

Installation of Swinging Doors with Builders Hardware

2-1 Doors. Swinging composite, hollow metal, flush sheet metal, metal clad (Kalamein) and wood core doors with builders hardware shall be flush mounted in labeled door frames.

2-2 Sills.

2-2.1 In buildings with noncombustible floors, special sill construction shall not be required if the floor structure is extended through the door opening.

2-2.2 In buildings with combustible floors, special sill construction shall be required if the floor structure is extended through the door opening, as combustible floor construction shall not extend through the door opening.

2-2.3 Sills shall be constructed of noncombustible materials. For frames having a jamb depth of 4 in. (102 mm) or less, the sill width shall be equal to the jamb depth. When frames have a greater jamb depth, the sills shall have a minimum width of 4 in. (102 mm) and shall be installed so that the sill extends from the face of the frame on the door side into the frame. (*See Figure A-2.*)

2-2.4 Flush concrete sills shall extend to the wall opening on both sides.

2-2.5 Raised noncombustible sills or thresholds shall be acceptable whenever combustible floor coverings are contemplated or are in use on one or both sides of the door openings. (*See Figure A-2.*)

2-2.6 Combustible floor covering shall not be permitted to extend through door openings.

2-3 Wall Openings. Wall openings shall be constructed to readily accept the fire door frame. The frame shall be considered to be non-load-bearing except when specifically designed to carry loads. Frames shall be securely anchored to the wall construction.

2-4 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. (*See Figures A-5—A-8.*)

2-5 Frames.

2-5.1 Only labeled door frames shall be used.[1]

2-5.2 Methods of anchoring shall be as shown in the listing or as provided in *Safety Standard for Fire Door Frames* (*UL 63 or ANSI A155.1*).

2-5.2.1 Door frames intended for drywall installation shall be of the wrap around type.[2] Anchors shall be appropriately secured to vertical wall studs and floor.

2-5.2.2 Proprietary type slip-on door frames (i.e., those for use on pre-prepared openings in drywall construction) shall be installed in accordance with the manufacturer's installation instructions.

2-5.2.3 Door frames provided with expansion bolt-type anchors are intended to be installed in masonry walls only.

2-5.3 Wood or plastic-faced composite or wood core doors shall be installed in labeled door frames of the single unit type. Steel-faced composite, hollow metal, metal clad (Kalamein), and flush sheet metal doors shall be installed in pressed steel or steel channel frames.

2-5.4 The clearance between the door and the frame and between meeting edges of doors swinging in pairs shall not exceed ⅛ in. (3.18 mm). The clearance between the bottom of the door and a raised noncombustible sill shall not exceed ⅜ in. (9.53 mm). Where there is no sill, the maximum clearance between the bottom of the door and the floor shall not exceed ¾ in. (19.1 mm).

2-6 Frames with Transoms, Side Lights, or Panels.

2-6.1 Side lights, side panels and/or transoms shall be non-operable when installed in labeled frames.

2-6.2 Frames with solid transoms and/or panels shall be permitted in situations where 3-, 1½-, 1- or ¾-hour fire protection is required.

2-6-3 Frames with glazed transoms and/or side lights shall be permitted in situations where ¾-hour fire protection is required.

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[1]Door frames may carry a label stating the hourly rating. The rating of the installed assembly will carry the rating of the door or the door frame, whichever is less.

[2]Test information suggests that a door frame butted to the end of a drywall construction will not perform under standard fire and hose stream test methods.

2-7 Astragals. Doors swinging in pairs located within a means of egress shall not be equipped with astragals that inhibit the free use of either leaf. Pairs of doors in other locations and that require astragals shall have at least one attached in place so as to project approximately ¾ in. (19.1 mm) or as may be otherwise indicated in the individual published listings. (*See Figures A-21, A-23 and A-31.*)

NOTE: (*See 2-8.2.4.*)

2-8 Builders Hardware. (*See Figures A-20—A-27.*)

2-8.1 Hinges.

2-8.1.1 Hinges shall be as required in Table 2-8A.

2-8.1.2 Attaching Hinges to Doors. Mortise hinges shall be secured to reinforcements in the doors with steel machine screws and surface hinges shall be attached with steel through-bolts.

Exception: Mortise hinges shall be secured to wood and plastic covered composite or wood core doors with No. 12 by 1¼-in. (31.75-mm) flat threaded-to-the-head, steel wood screws.

2-8.1.3 Attaching Hinges to Frame. Hinges shall be secured to frames with steel screws. Types of screws will vary depending on material used for the manufacture of labeled door frames. Refer to labeled door frame manufacturers' instructions and published listings for specific screw requirements.

2-8.2 Locks or Latches.

2-8.2.1 Only labeled locks and latches or labeled fire exit hardware (panic devices) meeting both life safety requirements and fire protection requirements shall be used.[1]

2-8.2.2 Fire exit hardware shall be installed only on fire doors bearing the marking, "Fire Door to Be Equipped with Fire Exit Hardware."

2-8.2.3 All single doors and active leaves of pairs of doors shall be provided with an active latch bolt (one that cannot be held in a retracted position), as specified in Table 2-8B.

Exception No. 1: Doors other than those used in means of egress may be permitted to be provided with dead bolts in addition to the active latch bolts or as otherwise permitted by the authority having jurisdiction.

[1]See Sections 0-3 and 0-4, Introduction.

Exception No. 2: Locks with dead bolts which are interconnected with latch bolts and retract when the latch bolt is retracted may be used on fire doors within a means of egress.

Exception No. 3: Latching arrangements which do not provide positive latching in the normal mode may be used provided that, in a fire emergency, the door becomes positively latched by means of an automatic fail-safe device which is activated by an automatic fire detector (see 2-8.6).

2-8.2.4 Where both leaves are required for exit purposes, they shall be provided with labeled fire exit hardware.

Exception: Where acceptable to the authority having jurisdiction, pairs of doors not provided with an astragal are permitted to have labeled fire exit hardware and an open back strike intalled on the inactive leaf, and either labeled fire exit hardware or any labeled latch capable of being opened by one obvious operation from the egress side on the active leaf.

2-8.2.5 Where a pair of doors is needed for the movement of equipment and where the inactive leaf of the pair of doors is not required for exit purposes, labeled top and bottom self-latching or automatic flush bolt or labeled two point latches are acceptable.

Exception: Manually operated, labeled top and bottom flush or surface bolts on the inactive leaf of a pair of doors shall be permitted to be used when acceptable to the authority having jurisdiction provided they do not pose a hazard to safety to life. This provision limits their use to rooms not normally occupied by humans (e.g. transformer vaults, storage rooms). The inactive leaf shall not require a closer.

2-8.2.6 The throw of single point latchbolts shall not be less than the minimum shown on the fire door label. If the minimum throw is not shown or the door does not bear a label, the minimum throw shall be as required in Table 2-8B.

2-8.2.7 Attaching Locks, Latches, Top and Bottom Bolts, and Fire Exit Hardware. Locks, latches, surface mounted top and bottom bolts, and fire exit hardware shall be secured to reinforcements in the doors with machine screws or be attached with through-bolts. Flush mounted top and bottom bolts shall be secured to reinforcements in the doors with machine screws.

Exception: Locks and latches shall be attached to wood and plastic covered composite or wood core doors with not less than No. 8 flat, threaded to the head, wood screws or be attached with through-bolts. Fire exit hardware and surface mounted top and bottom bolts shall be attached to wood and pastic covered composite doors with through-bolts.

Table 2-8A Builders Hardware

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

Doors up to 60 in. (1.52 m) in height shall be provided with two hinges or two spring hinges and an additional hinge or spring hinge for each additional 30 in. (.762 m) of door height or fraction thereof. The distance between hinges may exceed 30 in. (.762 m).

Door Rating, Hr	Maximum Door Size Width, Ft (m)	Maximum Door Size Height, Ft (m)	Minimum Hinge Size Height, In. (mm)	Minimum Hinge Size Thickness, In. (mm)	Type Hinge
For 1¾-In. (44.5-mm) or Thicker Doors					
3, 1½, 1, ¾, ½, ⅓	4 (1.22)	10 (3.05)	4½ (114.3)	0.180 (4.57)	Steel, Mortise or Surface
3, 1½, 1, ¾, ½, ⅓	4 (1.22)	8 (2.44)	4½ (114.3)	0.134 (3.40)	Steel, Mortise or Surface
1½, ¾, ½, ⅓	3 ft 2 in. (.96)	8 (2.44)	6 (152.4)	0.225 (5.72)	Steel-Olive Knuckle or Paumelle
3, 1½, ¾, ½, ⅓	4 (1.22)	10 (3.05)	4 (101.6)	0.225 (5.72)	Steel Pivots (including top, bottom and intermediate)
1½, 1, ¾, ½, ⅓	3 (.91)	5 (1.52)	4 (101.6)	0.130 (3.30)	Steel, Mortise or Surface
1½, 1, ¾, ½, ⅓	2 (.61)	3 (.91)	3 (76.2)	0.092 (2.34)	Steel, Mortise or Surface
3, 1½, 1, ¾, ½, ⅓	3 (.91)	7 (2.13)	4½ (114.3)	0.134 (3.40)	Steel, Mortise or Surface (labeled self-closing)
3, 1½, 1, ¾, ½ ⅓	3 (.91)	7 (2.13)	4 (101.6)	0.105 (2.67)	Steel, Mortise or Surface (labeled self-closing)
For 1⅞-In. (34.93-mm) Doors					
3, 1½, ¾, ½ ⅓	3 (.91)	7 (2.13)	3½ (88.9)	0.123 (3.12)	Steel, Mortise or Surface
3, 1½, 1, ¾, ½ ⅓	2 ft 8 in. (.81)	7 (2.13)	3½ (88.9)	0.105 (2.67)	Steel, Mortise or Surface (labeled self-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 *Standard for Butts and Hinges (ANSI A156.1)*. Spring hinges shall be labeled.

NOTE 2: 4½-in. (114-mm) high, 0.180-in. (4.57-mm) thick hinges should be used on doors which are unusually wide and heavy or which will receive high frequency use or unusual stresses.

NOTE 3: Some manufacturers may provide fire doors with hinges of lighter weight which are not ball bearing when they are part of a listed assembly and meet the test requirements of ANSI A156.1 and have been tested to a minimum of 350,000 cycles.

NOTE 4: Pivot sets made up of components smaller and/or of a lighter gage than shown in Table 2-8A may be used provided they meet the requirements of ANSI A156.4 and are in accordance with the manufacturers' labeled service procedures.

Table 2-8B Builders Hardware

Latching Devices for Swinging Doors

For alternate assemblies and exceptions, see Section 2-8

	Single Swing Doors			Doors in Pairs		
	Door Rating Hours	Maximum Opening Height	Minimum Latch Throw	Maximum Opening Height	Active Leaf Minimum Latch Throw	Inactive Leaf
Composite Wood (flush)	1½	10 ft (3.05 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
	1	10 ft (3.05 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
	¾	10 ft (3.05 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
Composite Plastic (flush)	1½	9 ft (2.44 m)	½ in. (12.7 mm)	7 ft (2.13 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
	1	9 ft (2.44 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
	¾	10 ft (3.05 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
Composite Steel (flush)	3	8 ft (2.44 m)	3 Pt. Surface	—	—	—
	3	8 ft (2.44 m)	⅝ in. (15.88 mm)	7 ft 6 in. (2.29 m)	⅝ in. (15.88 mm)	Top & Bottom Bolts
	1½	8 ft (2.44 m)	½ in. (12.7 mm)	7 ft 6 in. (2.29 m)	⅝ in. (15.88 mm)	Top & Bottom Bolts
	¾	8 ft (2.44 m)	½ in. (12.7 mm)	7 ft 6 in. (2.29 m)	⅝ in. (15.88 mm)	Top & Bottom Bolts
Hollow Metal (flush)	3	10 ft (3.05 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
	1½	10 ft (3.05 m)	½ in. (12.7 mm)	9 ft (2.74 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
	¾	10 ft (3.05 m)	½ in. (12.7 mm)	9 ft (2.74 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
Hollow Metal (Panelled or flush)	3 or 1½ or ¾	10 ft (3.05 m)	3 Pt. Concealed	10 ft (3.05 m)	3 Pt. Concealed	2 Pt. Concealed
Metal Clad (Panelled or flush)	1½ or ¾	8 ft (2.44 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
Sheet Metal Panelled or flush)	1½ or ¾	8 ft (2.44 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
Wood Core	⅓	10 ft (3.05 m)	½ in. (12.7 mm)	8 ft (2.44 m)	¾ in. (19.05 mm)	Top & Bottom Bolts
Wood Core	½	9 ft (2.74 m)	½ in. (12.7 mm)	—	—	—

2-8.2.8 Attaching Strike Plates to Frame. Strike plates shall be secured to the frame with steel screws. Types of screws will vary depending on material used for the manufacture of labeled door frames. Refer to labeled door frame manufacturers' instructions and published listings for specific screw requirements.

Exception: Channel frames shall be provided with holes to receive latch bolts and top bolts.

2-8.2.9 Strike plates for doors swinging in pairs shall be secured to reinforcements in the inactive leaf with machine screws.

Exception: Strike plates for wood and plastic covered composite doors swinging in pairs shall be attached to the inactive leaf with not less than No. 8 flat, threaded-to-the-head, wood screws.

2-8.2.10 Open back strikes shall be permitted to be used in lieu of conventional strikes only where specifically provided for in the published listings. (*See Section 2-7 and Figure A-28.*)

2-8.3 Protection Plates. The top of the plate shall be a maximum of 16 in. (406 mm) above the bottom of the door. Such plates may be on both door faces. No other plates shall be installed. (*See Appendix G.*)

Exception: Where otherwise tested and approved.[1]

2-8.4 Closing Devices.

2-8.4.1 When there is an astragal or projecting latch bolt that prevents the inactive door from closing and latching before the active door closes and latches, a coordinating device shall be used. A coordinating device shall not be required where each door closes and latches independently of the other.

2-8.4.2 A closing device shall be installed on every fire door.

Exception: Where pairs of doors are provided/for mechanical equipment rooms to permit movement of equipment, the closing device may be omitted on the inactive leaf.

2-8.4.3 Attachment. All components of closing devices used shall be securely attached to doors and frames by steel screws or through-bolts.

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[1]Some manufacturers provide doors with protection plates of other sizes or materials, as indicated in their individual published listings.

2-8.4.4 Adjustment. All closing mechanisms shall be adjusted to overcome the resistance of the latch mechanism so that positive latching is achieved on each door operation.[1]

2-8.5 Door Holder/Release Devices. Holder/release devices shall be permitted in conjunction with doors illustrated in Figures A-20 through A-28 and as shown in Figure A-51 when acceptable to the authority having jurisdiction.

2-8.6 Automatic Fire Detectors.

2-8.6.1 Detectors for the release of fire doors shall be permitted to be part of an overall system, such as a fire alarm, water flow alarm, or carbon dioxide release system, which will release the door.

2-8.6.2 When smoke detectors are used they shall be located as shown in Figure A-51.

2-8.6.3 Installation. Detectors and their components shall be installed in accordance with the manufacturer's instructions.

2-8.7 Operation of Doors. All swinging doors shall be closed and latched at the time of fire. For the purposes of this section the operation of doors is divided into three categories.

2-8.7.1 Self-closing Doors. The door shall swing easily and freely and shall be equipped with a closing device to cause the door to close and latch each time it is opened. The closing mechanism shall not have a hold-open feature.

2-8.7.2 Automatic Closing Doors. A door may be made automatic closing by the installation of a closing device and a separate, labeled, fail-safe door-holder/release device or a hold-open mechanism which may be an integral part of the basic closing device or an integral closing device which permits free swinging of the door during normal operation and automatically closes the door during an alarm condition, provided the hold-open mechanisms are released by one or a combination of automatic fire detectors acceptable to the authority having jurisdiction.

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[1]Adequate spring power is essential for hydraulic door closers to close a fire door with sufficient force to overcome the resistance of the latching mechanism. However, too much spring power causes opening resistance and makes it difficult for the handicapped, infirm and young children to open doors.

Closers are classified in sizes from 2 to 6 with an increased closing force for higher numbers. Generally a size 4 minimum closer should be used on exterior fire doors and a size 3 minimum on interior fire doors. Door widths greater than 3 ft 2 in. (.97 m) exterior and 3 ft 4 in. (1.02 m) interior, parallel or single lever arm applications and abnormal air pressures will usually require increasing to the next closest size. A combination of these factors could require increasing two sizes. Individual manufacturers' recommendations should be consulted.

2-8.7.3 Power Operated Fire Doors. Power operated fire doors shall be equipped with a releasing device which will automatically disconnect the power operator at the time of fire, allowing a self-closing or automatic device to close the door irrespective of power failure or manual operation.

2-8.8 Application of Door Holder/Release Devices.

2-8.8.1 Door holder/release devices shall be installed in accordance with the manufacturer's instructions and only in conformance with the individual manufacturer's published listings.[1]

2-8.8.2 Location of smoke detectors used to control door holder/release devices shall be as shown in Figure A-51.

Exception: A detector shall not be required on the exterior (outside) wall.

2-8.9 Application, Installation and Adjustment.

2-8.9.1 The installation of all components of a fire door assembly shall be in accordance with the specific listing of each component.

2-8.9.2 All components shall be installed in accordance with the manufacturer's installation instructions and shall be adjusted to function as described in the listing.

2-8.9.3 All components of a fire door assembly shall be firmly attached to walls, doors and frames in a manner acceptable to the authority having jurisdiction.

2-8.9.4 Mounting to masonry walls shall be by means of through-bolts except where steel shells are permitted elsewhere herein.

2-8.9.5 All mounting screws, bolts, or shields shall be steel except where permitted elsewhere herein.

2-8.9.6 Attachment to doors with composite cores shall provide firm anchorage for anticipated use.

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[1]Labeled door holder/release devices for swinging doors should, whenever possible, be installed at the top of the door as close as possible to the lock edge and should be located to avoid interference with any other hardware. If necessary, the holder/release may be located at the bottom of the door as close as possible to the lock edge with the device installed on the wall or floor.

2-9 Gasketing. Gasketing on fire doors or frames shall be furnished only in accordance with the published listings of the door, frame, or gasketing material manufacturer.

Exception: Where acceptable to the authority having jurisdiction, gasketing of noncombustible or limited combustible material (see NFPA 220) may be applied to the frame providing closing and latching of the door is not thereby inhibited.

Chapter 3

Installation of Swinging Doors with Fire Door Hardware

3-1 Mounting of Doors.

3-1-1 Swinging tinclad doors and flush- or corrugated-type sheet metal doors with fire door hardware shall be flush or lap mounted.

3-1.2 Flush mounted doors shall be hung in steel channel frames securely anchored to the wall construction.

3-1.3 Lap mounted doors shall be hung on the surface of the wall and shall lap the opening at least 4 in. (102 mm) at the top and on each side.

3-2 Vents.

3-2.1 Each tinclad door formed of 14-in. by 20-in. (.36-m by .51-m) sheets shall be provided with 3-in. (76.2-mm) diameter vent holes located as shown in Figure A-33.

3-2.2 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. (25.4 mm) apart and the exposed wood thoroughly painted.

3-3 Sills.

3-3.1 In buildings with noncombustible floors, special sill construction shall not be required, if the floor structure is extended through the door opening.

3-3.2 In buildings with combustible floors, special sill construction shall be required if the floor structure is extended through the door opening, as combustible floor construction shall not extend through the door opening.

3-3.3 Sills shall be constructed of noncombustible materials.

3-3.4 Sills shall extend at least the depth of the door frame for flush mounted doors. For lap mounted doors, sills shall extend beyond the opening by an amount equal to the projection of the installed door or doors. (*See Figures A-1, A-3, and A-4 for recommended construction.*)

3-4 Walls.

3-4.1 Walls shall be plumb and true and present smooth surfaces They shall be of brick, concrete, or concrete masonry unit construction except that when hollow concrete masonry units are used, the wall opening shall be reinforced to provide anchorage for door-mounting hardware equal to that of brick or concrete as illustrated in Figure A-16. In lieu of using brick or filling the hollow concrete masonry units, continuous steel bearing plates (crush plates) $\frac{3}{16}$ in. by 3 in. (4.76 mm by 76.2 mm) minimum, may be used to bridge the cavities and to prevent the through-wall bolts from crushing the hollow blocks (*see Figure A-17*). Door assemblies, if used on walls of other construction, shall be as listed.

3-4.2 Attachment of the door assembly to the wall shall be by through-wall bolts. As an alternate, expansion anchors may be used in concrete, brick or filled concrete masonry unit walls if the following conditions are met. (*See Figures A-9 and A-10.*)

(a) They shall be manufactured from steel and shall be zinc or cadmium coated.

(b) They shall conform to Federal Specification FF-S-325 (Sept. 10, 1957, and Interim Amendment 3, July, 1965).

(c) They shall be of the following types as shown in the above specification.

1. Group III, Types 1 and 2
2. Group II, Type 4, Classes 1 and 2
3. Group VIII, Types 1 and 2
4. Group II, Type 3, Class 3

(d) The expansion anchors shall be set in accordance with FF-S-325 in holes which shall be true and clean.

(e) The compressive strength of the concrete shall not be less than 2000 psi (13788 kPa) and the bolt load shall not exceed $\frac{1}{4}$ of the proof test load.

(f) When used in brick or filled concrete masonry unit walls, the bolt load shall not exceed $\frac{1}{12}$ of the proof test load.

(g) No expansion anchor shall be set closer to the edge of the wall opening than 6 times the diameter of the anchor or closer to each other than 8 times the diameter of the anchor.

3-5 Frames.

3-5.1 Frames shall not be required for lap mounted doors.

3-5.2 Only labeled frames of the structural steel type shall be used for flush mounted doors. The frames shall be erected before the wall is built.[1]

3-6 Clearances.

3-6.1 Flush Mounted. The noncombustible clearance between the bottom of flush mounted doors and a raised, noncombustible sill shall not exceed ⅜ in. (9.53 mm). Where there is no sill, the maximum clearance between the bottom of the door and the floor shall not exceed ¾ in. (19.05 mm). Clearances at the meeting edges of doors in pairs shall not exceed ¼ in. (6.35 mm) for 3-ply tinclad doors or ⅛ in. (3.18 mm) for other doors.

3-6.2 Lap Mounted. The clearance between the bottom of lap mounted doors and a raised noncombustible sill shall not exceed ⅜ in. (9.53 mm). Where there is no sill, the maximum clearance between the bottom of the door and the floor shall not exceed ¾ in. (19.05 mm). The clearance between the door and the wall when the door is in the closed position shall not exceed ⅜ in. (9.53 mm).

3-7 Coordinating Devices. When there is an astragal or projecting latch bolt that prevents the inactive door of a pair of doors from closing and latching before the active door closes and latches, a coordinating device shall be used. A coordinating device shall not be required where each door closes and latches independent of the other door.

3-8 Fire Door Hardware. (*See Figures A-29 and A-31.*)

3-8.1 Only labeled fire door hardware shall be used. The design and construction of typical fire door hardware for swinging fire doors is illustrated in *Swinging Hardware for Standard Tin-Clad Fire Doors*, ANSI A133.1.

3-8.2 Fire door hardware includes hinge brackets, hinges, latches, latch keepers, and operating handle mechanism; for the inactive door or pairs of doors, top and bottom bolts and keepers.

3-8.3 Hinges and Latches, Number and Length. (*See Tables 3-8A, 3-8B and 3-8C.*)

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[1]Structural steel frames consist of head and jamb members, either shop or field assembled.

Table 3-8A

Fire Door Hardware

Table Giving Number of Hinges and Latches for Different Size Doors of Tinclad 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

For SI Units: 1 ft = 0.3048 m.

Table 3-8B

Fire Door Hardware

Table Giving Length of Hinges and Latches for Different Widths of Doors of Tinclad 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 more than 8 in. shorter than is indicated.

For SI Units: 1 ft = 0.3048 m; 1 in. = 25.4 mm.

Table 3-8C

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.
For SI Units: 1 ft = 0.3048 m; 1 in. = 25.4 mm.

3-8.4 Attaching Fire Door Hardware to Doors. Upper and lower hinges and latches shall be spaced not less than 8 in. (203 mm) nor more than 11 in. (279 mm) from the top and bottom of the door.

3-8.5 Attaching Fire Door Hardware to Frames for Flush Mounted Doors. Hinges and latch keepers shall be bolted, riveted or welded to the frame.

3-8.6 Attachment of Wall Strips for Lap Mounted Doors. Hinges and latch keepers shall be mounted on wall strips bolted to or through the wall. (*See 3-4.2.*) Not less than ¾-in. (19.05-mm) bolts shall be used for attaching hinge wall strips and not less than ½-in. (12.7-mm) bolts for latch keeper wall strips. (*See Figure A-31.*)

3-9 Operation of Doors. The doors shall swing easily and freely on their hinges. The latches shall operate freely.

3-10 Closing Devices for Swinging Tinclad and Sheet Metal Fire Doors. Swinging tinclad and sheet metal fire doors shall be equipped with self-closing or automatic closing devices to ensure that they will be closed and latched at the time of fire.[1] Other arrangements acceptable to or required by the authority having jurisdiction shall be permitted.

[1]Self-closing devices for these doors consist of a system of weights suspended by ropes, wire cables or chains over pulleys arranged to return the door to the normally closed position each time it is used.

Automatic closing devices consist of a system of weights suspended by ropes, wire cables or chains over pulleys and a hold-open device with a release mechanism which is activated by an automatic fire detector. Upon the detection of fire, additional closing weights are released causing the door to close and latch.

The above automatic closing system may be used with a listed releasing device in addition to fusible links and in conjunction with a fire detection system in order to actuate the closing system.

All weights shall be enclosed in a substantial metal enclosure for their entire length of travel. Pulleys over which the weight cable or chain passes shall be shielded to prevent the cable or chain from jumping off the pulley and thereby possibly preventing the door from closing. (*Typical arrangements are shown in Figures A-30 and A-32.*)

3-11 Automatic Fire Detectors.

3-11.1 Detectors or fusible links shall be installed on both sides of the wall, interconnected so that the operation of any single detector or fusible link will permit the door to close and latch. (*See Figures A-30 and A-32.*)

Exception: A detector or fusible link shall not be required on the exterior (outside) wall.

3-11.1.1 When fusible links are used, one fusible link shall be located near the top of the opening and additional links shall be located at or near the ceiling on each side of the wall.

3-11.1.2 When smoke detectors are used, they shall be located as shown in Figure A-51.

3-11.2 Installation. Detectors and their components shall be installed in accordance with the manufacturer's instructions.

Chapter 4

Installation of Horizontally Sliding Doors

4-1 Doors. Sliding tinclad, metalclad (Kalamein), composite, hollow metal and sheet metal (flush and corrugated) doors shall be wall mounted (hung on the surface of the wall).

4-1.1 Doors shall lap openings at least 4 in. (102 mm) 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. (102 mm).

4-1.2 Astragals. Center parting doors shall have an astragal securely attached in place so as to project a minimum of ¾ in. (19.05 mm). (*See Figure A-37, A-37A, and A-37B.*)

4-1.3 Vents.

4-1.3.1 Each tinclad door formed of 14-in. by 20-in. (.36-m by .51-m) sheets shall be provided with 3-in. (76.2-mm) diameter vent holes which may be field or factory cut and shall be located as shown in Figure A-40. Each section of spliced single doors and each leaf of center parting doors shall be vented as provided for two-hanger doors in Figure A-40. Other types of doors containing combustible core material shall be vented as provided for by the manufacturer's procedure under label service.

4-1.3.2 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. (25.4 mm) apart and the exposed wood thoroughly painted.

4-1.4 Clearances. When in the closed position, the clearance between the wall and the door or the frame and the door shall not be more than ¾ in. (19.05 mm) (*see Figures A-37C, A-37D and A-37E*). The clearance between any door and the sill shall not be more than ⅜ in. (9.53 mm).

4-1.5 Sectional Door Units.

4-1.5.1 Tinclad, Metalclad (Kalamein), or Sheet Metal. These units shall not be furnished in more than two sections. Channels or reinforcing angles shall be installed horizontally across each section and shall be through-bolted. One section shall have two cover plates through-bolted to that section, forming a channel. The other section shall be field installed by inserting it into the channel formed by the cover plates and shall be through-bolted.

4-1.5.2 Hollow Metal or Composite. These units shall be furnished in not more than five panels, constructed for either field or factory assembly. For center parting doors, not more than four panels shall comprise a single leaf.

4-2 Sills.

4-2.1 In buildings with noncombustible floors, special sill construction shall not be required if the floor structure is extended through the door opening.

4-2.2 In buildings with combustible floors, special sill construction shall be required if the floor structure is extended through the door opening, as combustible floor construction shall not extend through the door opening.

4-2.3 Sills shall be constructed of noncombustible material and extend 6 in. (152 mm) past the edge of the opening on each side and at least 4 in. (102 mm) out from the face of the wall. (*Figures A-1, A-3, and A-4 show constructions that are acceptable.*)

4-3 Walls.

4-3.1 Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete masonry unit construction except that when hollow concrete masonry units are used, the wall opening shall be reinforced to provide anchorage for door-mounting hardware equal to that of brick or concrete as illustrated in Figure A-18. In lieu of using brick or filling the hollow concrete masonry units, continuous steel bearing plates (crush plates) may be used to bridge the cavities and to prevent the through-wall bolts from crushing the hollow blocks (*see Figure A-19*). Door assemblies, if used on walls of other construction, shall be as listed.

4-3.2 Attachment of the door assembly to the wall shall be by through-wall bolts. As an alternate, expansion anchors may be used in concrete, brick or filled concrete masonry unit walls if the following conditions are met. (*See Figures A-9 and A-10.*)

(a) They shall be manufactured from steel and shall be zinc or cadmium coated.

(b) They shall conform to Federal Specification FF-S-325 (Sept. 10, 1957, and Interim Amendment 3, July 16, 1965).

(c) They shall be of the following types as shown in the above specification.

1. Group III, Types 1 and 2
2. Group II, Type 4, Classes 1 and 2
3. Group VIII, Types 1 and 2
4. Group II, Type 3, Class 3

(d) The expansion anchors shall be set in accordance with FF-S-325 in holes which shall be true and clean.

(e) The compressive strength of the concrete shall not be less than 2000 psi (1378 kPa) and the bolt load shall not exceed ¼ of the proof test load.

(f) When used in brick or filled concrete masonry unit walls, the bolt load shall not exceed $\frac{1}{12}$ of the proof test load.

(g) No expansion anchor shall be set closer to the edge of the wall opening than 6 times the diameter of the anchor or closer to each other than 8 times the diameter of the anchor.

4-4 Lintels. Lintels shall be brick, concrete or masonry arches, steel, or reinforced concrete. lf of steel or reinforced concrete, they shall be constructed as shown in Figures A-5, A-6, A-7 or A-8 or as acceptable to the authority having jurisdiction.

4-5 Fire Door Hardware. (*See Figures A-31, A-37, and A-41—A-44.*)

4-5.1 Only labeled fire door hardware tested and/or listed for use with the door shall be used. (The design and construction of typical fire door hardware for sliding tinclad and flush and corrugated sheet metal fire doors is illustrated in *Sliding Hardware for Horizontally Mounted Tinclad Fire Doors*, ANSI A143.1-1973.)

4-5.2 Fire door hardware shall include tracks, hangers, track brackets, bumpers, binders, pull handles, stay rolls, center latch, center floor stop and astragal, and center binders.

NOTE: Some manufacturers label procedures do not require the use of center latches and center floor stops.

4-5.3 Track.

4-5.3.1 Tracks may be flat, box, angle, J Section or round track. (*See Figures A-40A, A-40B, A-40C, A-40D, A-40E, A-40F and*

Table 4-5A.) Tracks may be inclined or level, depending on the manufacturer's specific label service procedure.[1]

The wall bolts may not be less than ⅜-in. (15.8-mm) diameter. The bolt spacing depends upon the manufacturer's specific test and label service procedure, but certain standards have been set for the flat track and round track systems used with tinclad and sheet metal fire doors. For tinclad and sheet metal fire doors the length of the track shall be equal to twice the width of the opening plus 21 in. (.53 mm).[2] Wall bolts shall be spaced that one bolt will be located directly opposite each hanger when the door is closed.[3] Table 4-5A gives spacings for wall bolts. When the track is inclined, it shall have an incline of ¾ in. (19.05 mm) to 1 ft (.305 m).

4-5.3.2 Mounting Track, Hollow Metal Doors. For hollow metal doors, wall bolts shall be located 2 in. (50.8 mm) 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. (.61 m). Wall bolts shall be installed through the wall except as provided in 4-3.2.

4-5.3.3 Mounting Flat Track, Center Parting Doors. The mounting is similar to the requirements of 4-5.3.1. For tinclad and sheet metal doors the track for each door shall be 10 in. (254 mm) shorter. In Table 4-5A, giving the length of track, 10 in. (254 mm) shall be subtracted from the total length, the first bolt hole shall be omitted, and 10 in. (254 mm) is to be subtracted from each other bolt hole dimension.

4-5.3.4 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. (.61 m) apart. Wall bolts securing brackets in position shall be installed through the wall, except as provided in 4-3.2.

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[1]For hollow metal and composite type doors, level tracks are generally used although incline tracks are allowed where the manufacturer has specific label service. Generally the hangers are located at a track bracket when the door is closed, although some manufacturers have label service for the location of hangers at other than track bracket locations. Bolt spacings vary from manufacturer to manufacturer, but generally they do not exceed 24 in. (.61 m) on center over the opening and do not exceed a maximum of 39½ in. (1 m) for the storage track beyond the opening.

[2]This length of track is given in terms of the wall opening, 12 in (305 mm) being allowed for the lap and width of the door, 8 in. (203 mm) for attaching front and back bumpers and 1 in. (25.4 mm) for clearance when the door is wide open.

[3]Refer to Table 4-5A for bolt spacing (except as provided in 4-3.2). Figures in heavy type in the table indicate spacings for bolts opposite door hangers and number of hangers required.

Table 4-5A

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 cBolt 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	13¾	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	
9'9"	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	34½	
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	
12'0"	25'9"	1¾	20¼	30	30	30	30	33	33	33	33	33¼

NOTE 1: Figures in heavy type indicate bolts opposite door hangers.

NOTE 2: The space "A" shall always be on the side of the door to which the door closes.

For SI Units: 1 ft = 0.3048 m; 1 in. = 25.4 mm

4-5.3.5 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. (1.0 m). Bolts securing brackets in position shall be installed through the wall except as provided in 4-3.2.

4-5.4 Hangers. Not less than two hangers shall be provided for each door. Tinclad and sheet metal doors for openings in excess of 6 ft (1.83 m) shall have an additional hanger. (*See Table 4-5A.*) Two hangers shall be provided on each section of vertically spliced sheet metal or tinclad doors. (*See 4-1.5.*)

4-5.5 Binders.

4-5.5.1 Binders for tinclad, metalclad (Kalamein), and sheet metal doors shall meet the following requirements:

(a) At least two front binders are required for tinclad, metalclad (Kalamein), and sheet metal doors. The upper binder shall be placed approximately 24 in. (.61 m) from the top of the door and the lower binder approximately 24 in. (.61 m) above the sill.

(b) In addition to the above front binders, doors for openings exceeding 8 ft (2.44 m) in height shall be provided with an additional front binder spaced midway between the upper and lower binders.

(c) Sheet metal doors for openings not exceeding 10 ft (3.05 m) in height and tinclad and metalclad (Kalamein) doors 7 ft (2.13 m) but not more than 10 ft (3.05 m) in height shall be provided with one rear binder located midway between the top and bottom of the door. Sheet metal, metalclad (Kalamein), and tinclad doors for openings exceeding 10 ft (3.05 m) in height shall be provided with two rear binders located at the quarter points for sheet metal and third points for tinclad and metalclad (Kalamein) doors. [*Some metalclad (Kalamein) doors do not require rear binders as indicated in their individual label procedures.*]

(d) The space between the top of the door and the track for sheet metal doors shall be at least ¾ in. (19.05 mm) to permit upward expansion on exposure to fire. Track binders or other approved means shall be provided to prevent the door leaving track during exposure to fire. The track binder shall lap the track about ½ in. (12.7 mm) and be located 2 in. (50.8 mm) to one side of the center line of the wall bolts. (*See Figures A-34 and A-37.*)

(e) Front and rear binders for tinclad, metalclad (Kalamein), and sheet metal doors shall be fastened to the wall with bolts having a diameter of not less than ¾ in. (19.05 mm) and which extend through the wall.[1]

(f) 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.

[1]The bolt holes should not be made larger than necessary.

4-5.5.2 Binders for Composite Doors. Composite fire doors shall have one front binder near the sill, one or more intermediate front binders, and one or more intermediate rear binders.

4-5.5.3 Binders for Hollow Metal Doors. Some hollow metal doors require binders as specified in 4-5.5.2 and others require front binders as specified for tinclad doors with continuous or intermediate and interlocking binders at rear and head. The interlocking rear and head binders shall be either secured directly to the masonry wall by through-wall bolts or by steel bolts and steel expansion anchors, or to the opening framing by means of steel machine bolts. (*See Figures A-43, A-44, A-44A and A-44B.*)

4-5.5.4 Binders for Center Parting Doors. 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 A-37, A-42 and A-44.*)

The sill binder or center guides shall be securely attached to concrete sills with machine screws and steel expansion anchors, or to metal thresholds drilled and tapped to receive machine screws.

NOTE: Some manufacturers can provide assemblies without the use of a sill binder or center guide when using an astragal and center binder arrangement in accordance with the individual manufacturer's label service procedure (*see 4-5.2*).

4-5.6 Stay Rolls.

4-5.6.1 Stay rolls shall be installed in an approved manner. (*See Figures A-11 through A-15B.*)

4-5.6.2 Wedge. On tinclad, metalclad (Kalamein), and sheet metal doors, a wedge shall be attached at the end of the roller stays, so the door will be close to, but not tight against, the wall when in closed position. (*See Figures A-34 and A-37.*)

4-5.7 Latches, Center Parting Doors. Center parting doors requiring a center latch shall be provided with a fusible link arrangement when the doors are power-operated which will hold the latch in an unlatched position during day-to-day operation, but which will cause the latch to operate and secure the door in the event of a fire. All tinclad, metalclad (Kalamein), and sheet metal doors shall be provided with a center pin located midway between the latch and the top of the door. (*See Figure A-37.*)

4-5.8 Chafing Strips. Tinclad and metalclad (Kalamein) 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. (203 mm) less than the door width. Two chafing strip assemblies shall be required for doors 8 ft 4 in. (2.54 m) in height or less. Three chafing strip assemblies shall be required for doors exceeding 8 ft 4 in. (2.54 m) 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. (.61 m) from the bottom edge of the door. When three chafing strip assemblies are required, the middle strip shall be located midway between the other two. For doors equipped with two rear binders a flat strip shall be used in place of the top half-oval strip when three chafing strip assemblies are used.

4-5.9 Bumper Shoes. Bumper shoes shall be required on tinclad and metalclad (Kalamein) doors, one opposite each bumper and one opposite each binder, fastened to the faces and edges of the door by wood screws. (*See Figures A-34 and A-37.*)

4-5.10 Handles. Means shall be provided for opening the doors from either side. If flush pulls are used they shall not be back-to-back on tinclad doors.

NOTE: Self-closing devices for these doors could be as follows:

(a) For incline track doors gravity would be the closing means with a counterweight to control the closing speed, but not prevent it from closing after each opening of the door.

(b) For level track doors, a closing weight sufficient to close the door after each opening. For composite and hollow metal fire doors, a labeled tension spring device could be used for the same purpose if it was designed for the frequency of operation expected.

Automatic closing devices could be as follows:

(a) For incline track doors a system of weights suspended by ropes, wire cables or chains over pulleys with the door counterbalanced to keep the door in whatever position desired. Upon the detection of fire, the counterbalance weight is released and the door closes.

(b) For level track doors, a front weight and rear weight counterbalanced to keep the door in whatever position desired. Upon the detection of fire, the rear weight is released and the door closes. Another method uses a front weight which is not connected to the door in ordinary day-to-day usage, but upon the detection of fire, the weight is released and engages the door and closes it. For composite and hollow metal fire doors, in addition to the weight system, the closing power may be provided by a labeled tension spring device.

In any of the above automatic closing systems, a labeled releasing device may be used in addition to fusible links and in conjunction with a fire detection system in order to actuate the closing system.

All weights shall be enclosed in a substantial enclosure for their entire length of travel. Pulleys over which the weight cable or chain passes shall be shielded to prevent the cable or chain from jumping off the pulley and thereby possibly preventing the door from closing.

Other arrangements of weights, labeled tension spring devices or hold-open devices and detectors which are acceptable to or required by the authority having jurisdiction may be used. (*See Figures A-35, A-36, A-36A, A-38, A-39, A-39A, A-41, A-42, A-43 and A-44.*)

4-6 Closing Devices for Horizontally Sliding Composite, Hollow Metal, Tinclad, Metalclad (Kalamein), and Sheet Metal Fire Doors.

4-6.1 Horizontally sliding fire doors shall be equipped with self-closing or automatic closing devices to ensure that they will close or be closed at the time of fire.[1]

4-6.2 Power-operated fire doors shall be equipped with an integral or a separate listed releasing device which will automatically disconnect the door from the control of the power operator at the time of fire. The releasing device shall be activated at the time of fire by detectors or fusible links installed on both sides of the wall and interconnected so that the operation of the single detector or fusible link will permit the door to be disconnected and closed.

4-6.3 Automatic Fire Detectors.

4-6.3.1 Detectors or fusible links shall be installed on both sides of the wall and interconnected so that the operation of any single detector or fusible link will permit the door to close. (*See Figures A-36, A-36A, A-39 and A-39A.*)

(a) For tinclad, metalclad (Kalamein), and sheet metal doors, one fusible link shall be mounted on an arm projecting from the leading edge of the door or doors near the top of the opening, and a second fusible link shall be at or near the ceiling on each side of the wall. (*See Figures A-35 and A-38.*)

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[1]Self-closing devices for these doors consist of a system of weights suspended by ropes, wire cables, or chains over pulleys arranged to return the door to the normal closed position each time it is used.

Automatic closing devices for tinclad, metalclad (Kalamein), and sheet metal fire doors consist of a system of weights suspended by ropes, wire cables or chains over pulleys, and a hold-open device with a release mechanism which is activated by a device for the detection of fire.

Automatic closing devices for composite and hollow metal fire doors may be of the type described above or may consist of a labeled tension spring device with hold-open and detector controlled release. (*See Figures A-42 and A-43.*)

The weights, ropes, cables or chains and hold-open device are arranged to keep the door in a normal open position. When fire occurs the detector causes the release to disconnect the hold-open device from the door, which is then free to close. (Typical arrangements are shown in Figures A-35, A-36, A-38 and A-39.) Other arrangements of weights, ropes, cables or chains, hold-open devices and detectors, acceptable to or required by the authority having jurisdiction, may be used.

(b) For composite and hollow metal doors, one fusible link shall be centered just above the opening and another at or near the ceiling at each side of the wall. (*See Figures A-41—A-44.*)

(c) When smoke detectors are used, they shall be located as shown in Figure A-51.

4-6.3.2 Detectors and their components shall be installed in accordance with the manufacturer's instructions.

Chapter 5

Installation of Vertically Sliding Fire Doors

5-1 Doors. Vertically sliding doors of the tinclad, sheet metal (flush and corrugated), and steel sectional (overhead) types shall be wall mounted.

5-1.1 The tinclad and sheet metal doors shall lap the opening at least 4 in. (102 mm) at the sides and top. The steel sectional doors shall lap the opening at least 2 in. (50.8 mm) at the sides and top. The sides of the sectional door shall be mounted within wall guides, and the top edge shall engage in an interlock along the lintel.

5-2 Vents. Each tinclad door shall be provided with 3-in. (76.2-mm) diameter vent holes located as shown in Figure A-40. Doors up to 6 ft (1.83 m) wide shall be provided with three vents and doors over 6 ft (1.83 m) wide shall be provided with four vents, as shown for two-hanger doors.

5-2.1 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 not to interfere with the hardware or injure the wood core when cutting the holes in the sheet. The metal covering around the opening shall be secured with small nails spaced about 1 in. (25.4 mm) apart and the exposed wood shall be thoroughly painted.

5-3 Clearances. The clearances between the door and the wall when the door is in the closed position and between the door and sill shall not exceed ⅜ in. (9.53 mm).

5-4 Sills.

5-4.1 In buildings with noncombustible floors, special sill construction shall not be required if the floor structure is extended through the door opening.

5-4.2 In buildings with combustible floors, special sill construction shall be required if the floor structure is extended through the door opening, as combustible floor construction shall not extend through the door opening.

5-4.3 Sills shall be constructed of noncombustible material and shall extend 6 in. (152 mm) past the edge of the opening on each side and 4 in. (102 mm) out from the face of the wall. (*See Figures A-1, A-3, and A-4.*)

5-5 Walls.

5-5.1 Walls shall be plumb and true and present smooth surfaces. They shall be of brick, concrete, or concrete masonry unit construction except that, when hollow concrete masonry units are used, the wall opening shall be reinforced to provide anchorage for doormounting hardware equal to that of brick or concrete as conceptually illustrated in Figure A-16, and shall include anchorage of the wall-mounted pulleys which carry the weight of the door and counter balances. In lieu of using brick or filling the hollow concrete masonry units, continuous steel bearing plates (crush plates), $\frac{3}{16}$ in. by 3 in. (4.76 mm by 76.2 mm) minimum, may be used to bridge the cavities and to prevent the through-wall bolts from crushing the hollow blocks (*see Figure A-17*). Door assemblies, if used on walls of other construction, shall be as listed.

5-5.2 Attachment of the door assembly to the wall shall be by through-wall bolts. As an alternate, expansion anchors may be used in concrete, brick or filled concrete masonry unit walls if the following conditions are met. (*See Figures A-9 and A-10.*)

(a) They shall be manufactured from steel and shall be zinc or cadmium coated.

(b) They shall conform to Federal Specification FF-S-325 (Sept. 10, 1957, and Interim Amendment 3, July 16, 1965).

(c) They shall be of the following types as shown in the above specification.

1. Group III, Types 1 and 2
2. Group II, Type 4, Classes 1 and 2
3. Group VIII, Types 1 and 2
4. Group II, Type 3, Class 3

(d) The expansion anchors shall be set in accordance with FF-S-325 in holes which shall be true and clean.

(e) The compressive strength of the concrete shall not be less than 2000 psi (13788 kPa) and the bolt load shall not exceed $\frac{1}{4}$ of the proof test load.

(f) When used in brick or filled concrete masonry unit walls, the bolt load shall not exceed $\frac{1}{12}$ of the proof test load.

(g) No expansion anchor shall be set closer to the edge of the wall opening than 6 times the diameter of the anchor or closer to each other than 8 times the diameter of the anchor.

5-6 Lintels. Lintels shall be brick, concrete, or masonry arches, steel, or reinforced concrete. If of steel or reinforced concrete, they shall be constructed as shown in Figures A-5, A-6, A-7, or A-8, or as acceptable to the authority having jurisdiction.

5-7 Fire Door Hardware for Tinclad and Sheet Metal Doors. (*See Figure A-45.*)

5-7.1 Only labeled fire door hardware shall be used.

5-7.2 Fire door hardware shall consist of tracks, brackets, guides, bumpers and counter-balancing mechanisms.

5-7.3 Track. Two tracks, each with a length equal to twice the height plus 9 in. (229 mm), shall be provided. The track shall be attached with track brackets at each bolt.[1]

5-7.4 Guides. Two track guides shall be provided for each track for openings 5 ft (1.52 m) or less in height. An additional guide for each track shall be provided for each 2½ ft (.76 m) or fraction thereof in excess of 5 ft (1.52 m) in height. Each of the track guides shall be bolted through the door.

5-7.5 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-in. (19.05-mm) bolts.

5-7.6 Chafing Strips.

5-7.6.1 Tinclad and flush-type sheet metal doors shall be provided with two half-oval chafing strips for the back of doors not exceeding 8 ft (2.44 m) in width. The length shall be 2 in. (50.8 mm) less than the height of the door. The strips shall be held by ¼-in. (6.35-mm) through-bolts with countersunk heads and with nuts bearing against washers. When doors exceed the above dimension, three strips shall be required.

5-7.6.2 Chafing strips shall not be required for corrugated doors.

5-7.7 Bumpers and Bumper Shoes.

5-7.7.1 One bumper shall be bolted to the top of each track with wall bolts.

5-7.7.2 Four bumper shoes 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.

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[1]The length of the track is given in terms of height of the opening, 4 in. (102 mm) being allowed for the lap of the door, 4 in. (102 mm) for attaching the bumper and 1 in. (25.4 mm) clearance when the door is wide open.

5-7.8 Rear Binders. Doors shall be provided with one rear binder located at the center of the lintel and attached with ¾-in. (19.05-mm) bolts. (*See Figure A-45.*)

5-7.9 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.

5-8 Fire Door Hardware for Steel Sectional Doors.

5-8.1 The *"Fire Door"* label on a sectional door shall include the hinged steel panels, wall guides, interlock at the top edge, vertical and horizontal tracks, roller wheels, counterbalance, automatic closing mechanism, and governors.

5-8.2 The horizontal track section shall extend from the wall a distance of the wall opening height plus 3 ft (.91 m) and shall be connected by a fusible track link to the vertical track section such that it can break away from the vertical track section if subjected to damage from falling materials at the time of fire.

5-8.3 The wall guides shall be plumb and bolted to or through the wall. The guides shall extend above the wall opening a distance of 2½ in. (63.5 mm).

5-8.4 An angle-type interlock shall be bolted to the lintel and shall engage a matching pocket on the top edge of the door when in the closed position.

5-8.5 Counterbalancing Mechanism. The sectional door shall be counterbalanced by an overhead horizontal helical spring on a shaft. The shaft shall be attached to a reel with a steel cable, which is attached to both sides of the door near the bottom edge.

5-9 Closing Devices for Vertically Sliding Tinclad, Sheet Metal, and Steel Sectional Fire Doors.

5-9.1 Vertically sliding tinclad, sheet metal, and sectional steel doors shall be equipped to close automatically so they will close or be closed at the time of fire.

5-9.2 Automatic Closers.

5-9.2.1 Automatic closing, vertically sliding doors shall be suspended by a system of weights and ropes, wire cables, or chains over pulleys. All weights shall be enclosed in a substantial metal enclosure for the entire length of travel. Pulleys over which the weight cable or chain passes shall be shielded to prevent the cable or chain from jumping off the pulley.

5-9.2.2 The automatic closing mechanism for vertically sliding tinclad and sheet metal doors shall employ a system of weights suspended by wire cables over pulleys. One of these weights shall be so arranged that the operation of a fusible link or detector 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 enough to prevent it from closing in a positive manner.

5-9.2.3 Vertically sliding sectional doors shall close automatically upon operation of a fusible link or detector which releases the overhead sectional door, and the governor shall control the rate of descent.

5-9.3 Automatic Fire Detectors.

5-9.3.1 Detectors or fusible links shall be installed on both sides of the wall and shall be interconnected so that the operation of any single detector or fusible link will permit the door to close.

Exception: A detector or fusible link is not required on the exterior (outside) wall.

(a) For tinclad and sheet metal doors, one fusible link shall be located at the center near the bottom of the door, and additional links shall be located at or near the ceiling on each side of the wall. (*See Figures A-45 and A-46.*)

(b) For steel sectional doors, one fusible link shall be located near the top of the opening near the automatic release mechanism on the door in an area where there is no obstruction to the circulation of air, and additional links shall be located at or near the ceiling on each side of the wall. (*See Figure A-47.*)

(c) When smoke detectors are used they shall be located as shown in Figure A-51.

5-9.3.2 Installation. Detectors and their components shall be installed in accordance with the manufacturer's instructions.

Chapter 6

Installation of Rolling Steel Doors

6-1 Doors.

6-1.1 The mounting for rolling steel doors shall be either face-of-wall mounted (*see Figure A-48*) or between-the-jamb mounted. (*See Figures A-49 and A-50.*)

6-1.2 The opening shall be protected by either a single or double door installation, as determined by the authority having jurisdiction.

6-1.3 Doors mounted on the face of the wall and subject to damage from falling debris shall be protected by the building structure.

6-2 Sills.

6-2.1 In buildings with noncombustible floors, special sill construction shall not be required if the floor structure is extended through the door opening.

6-2.2 In buildings with combustible floors, special sill construction shall be required if the floor structure is extended through the door opening, as combustible floor construction shall not extend through the door opening.

6-2.3 Sills shall be constructed of noncombustible material. They shall extend 6 in. (152 mm) past the edge of the opening on each side and at least 4 in. (102 mm) out from the face of the wall. (*Figures A-1, A-3, and A-4 show acceptable constructions.*)

6-3 Walls.

6-3.1 Walls shall be plumb and true and present smooth surfaces. They shall be brick, concrete, or concrete masonry unit construction except that, when hollow concrete masonry units are used, the wall opening shall be reinforced to provide anchorage for door-mounting hardware equal to that of brick or concrete as conceptually illustrated in Figure A-16. In lieu of using brick or filling the hollow concrete masonry units, continuous steel bearing plates (crush plates) $\frac{3}{16}$ in. by 3 in. (4.76 mm by 76.2 mm) minimum mounted on the side of the wall opposite the door may be used to bridge the cavities and to prevent the through-wall bolts from crushing the hollow blocks as conceptually illustrated in Figure A-17. Door assemblies, if used on walls of other construction, shall be as listed.

6-3.2 Lintels. Heads of door frames shall be reinforced or suitable lintels shall be provided, depending on the type of wall construction and loads to be supported.

6-3.3 Frames. Frames are not required for rolling steel door installations. When frames or jambs only are provided, only structural steel or formed steel plate shall be used. Pressed steel frames are not permitted.

6-4 Assembly of Rolling Doors.

6-4.1 Guides.

6-4.1.1 The guides shall be mounted plumb and with sufficient clearances allowed for vertical expansion when exposed to fire.

6-4.1.2 The guides for between jamb-mounted doors shall be either exposed or concealed in a pocket or wall reveal.

6-4.1.3 Attachment of the door assembly to the wall shall be by through-wall bolts. As an alternate, expansion anchors may be used in concrete, brick or filled concrete masonry unit walls if the following conditions are met. (*See Figures A-9 and A-10.*)

(a) They shall be manufactured from steel and shall be zinc or cadmium coated.

(b) They shall conform to Federal Specification FF-S-325 (Sept. 10, 1957, and Interim Amendment 3, July 16, 1965).

(c) They shall be of the following types as shown in the above specification.

1. Group III, Types 1 and 2
2. Group II, Type 4, Classes 1 and 2
3. Group VIII, Types 1 and 2
4. Group II, Type 3, Class 3

(d) The expansion anchors shall be set in accordance with FF-S-325 in holes which shall be true and clean.

(e) The compressive strength of the concrete shall not be less than 2000 psi (13788 kPa) and the bolt load shall not exceed ¼ of the proof test load.

(f) When used in brick or filled concrete masonry unit walls, the bolt load shall not exceed $\frac{1}{12}$ of the proof test load.

(g) No expansion anchor shall be set closer to the edge of the wall opening than 6 times the diameter of the anchor or closer to each other than 8 times the diameter of the anchor.

6-4.1.4 When structural steel frames are used at jambs, guides shall be secured to the frame with machine bolts of not less than ⅜ in. (9.5 mm) diameter.

6-4.2 Brackets.

6-4.2.1 Brackets mounted on the face of the wall shall be bolted either to the wall or to an extension of the guide wall angle with not less than two ½-in. (12.7-mm) diameter through-bolts or machine bolts to each bracket.

6-4.2.2 Brackets mounted between the jambs shall be secured to the lintel or to the side of the jambs by not less than two machine bolts of ½ in. (12.7 mm) diameter.

6-4.3 Hoods and Housings. When the door is mounted on the face of the wall or between jambs, the metal hood and housing shall be tightly secured to the brackets and/or wall.[1]

6-5 Closing Devices.

6-5.1 An automatic closing device shall be installed on every rolling steel door.

6-5.2 Rolling steel doors shall be made automatic closing by the incorporation of an integral escapement system consisting of either a spring-releasing device or an auxiliary push-down spring which, when activated by release of a fusible link or detector, will cause the door to close.

6-5.3 The automatic closing mechanism shall be enclosed in a metal housing to protect the mechanism from debris and ensure proper operation in the event of fire.

6-5.4 A governor, when employed on a door, shall be an integral mechanism working in coordination with the closing device and shall control the closing speed of the door.

6-6 Automatic Fire Detectors.[2]

6-6.1 Detectors or fusible links shall be installed on both sides of the wall and interconnected so that the operation of any single detector or fusible link will permit the door to close.

Exception: A detector or fusible link is not required on the exterior (outside) wall.

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[1]A flame baffle may be an integral part of the hood or curtain and utilized where required to protect the opening.

[2]The arrangements shown in Figures A-48, A-49, and A-50 are recommended to give the performance intended. Other arrangements acceptable to the authority having jurisdiction may be used.

6-6.2 When fusible links are used, one fusible link shall be located near the top of the opening and additional links shall be located at or near the ceiling on each side of the wall. (*See Figures A-48—A-50.*)

6-6.3 When smoke detectors are used, they shall be located as shown in Figure A-51.

6-6.4 Detectors and their components shall be installed in accordance with the manufacturer's instructions.

6-7 Power-Operated Fire Doors. Power-operated fire doors are those which normally are opened and closed by power. They shall be equipped with a releasing device which will automatically disconnect the power operator at the time of fire, allowing a self-closing or automatic closing device to close the door irrespective of power failure or manual operation.

Chapter 7

Installation of Hoistway Doors for Elevators and Dumbwaiters

7-1 Scope. This section covers only fire door assemblies in hoistway entrances directly connected with elevator or dumbwaiter operation and used in the vertical hoistway enclosure for the purpose of preventing the passage of fire through such entrances. Fire door assemblies not connected with access to cars shall be installed as provided in other sections of this standard.

7-2 General Requirements.

7-2.1 Doors shall be 1 hour (B) or 1½ hour (B).

7-2.1.1 Labeled hoistway doors for elevators and dumbwaiters shall be installed in walls of brick, concrete or concrete block construction unless otherwise tested or listed.

7-2.1.2 Hoistway door frames for use with elevators and dumbwaiters intended to be installed in walls constructed of gypsum wallboard shall be installed in accordance with the listing and labeling procedures including the manufacturer's installation instructions.

7-2.2 Hoistway Door Vision Panels.

7-2.2.1 Manually operated or self-closing hoistway doors of the vertically or horizontally sliding type, for elevators with automatic or continuous-pressure operation, shall be provided with a vision panel.[1]

Exception: Where a corridor position indicator is provided at the landing of automatic-operation elevators.

7-2.2.2 In multiple section doors, the vision panel shall be required in one section, but shall be permitted in all sections. All swinging elevator doors shall be provided with vision panels.

7-2.2.3 Where required or used, vision panels shall conform to the following requirements:

(a) The area of any single vision panel shall be not less than 25 sq in. (.016 m^2), and the total area of all vision panels in any hoistway door shall be not more than 80 sq in. (.052 m^2).

(b) The clear opening of each vision panel shall not permit passage of a ball 6 in. (152 mm) in diameter.

[1]Vision panels may be provided for any type of hoistway door, irrespective of the type of operation of the elevator.

(c) Muntins used between panel sections shall be of noncombustible material and of substantial construction.

(d) Vision panel openings shall be glazed with labeled clear wire glass not less than ¼ in. (6.35 mm) thick.

(e) The center of the panel shall be located not less than 54 in. (1.37 m) nor more than 66 in. (1.68 m) above the landing.

Exception: For vertically sliding biparting counterbalanced doors, it shall be located to conform with the dimensions indicated insofar as the door design will permit.

(f) The vision panels in swinging doors shall be located for convenient vision when opening the door from the car side.

7-2.3 Doors serving elevators not required to conform with the requirements of Rule 211.3, Operation of Elevators Under Fire or Other Emergency Conditions, ANSI/ASME A17.1, *Safety Code for Elevators and Escalators*, shall be closed when not in use and shall remain closed in a fire emergency. (*See Section 1-1.3.*)

7-2.4 When required by the authority having jurisdiction, doors serving elevators required to conform with Rule 211.3 (*see 7-2.3*) shall be automatically closed after a predetermined time interval.

7-3 Types of Doors.

7-3.1 Labeled Swinging Hoistway Doors for Elevators — Fire Rated Entrance Assembly. (*See Figure A-52.*) The major components of a typical assembly (single swinging or double swinging) shall include sill and attachments, frame with attachments, door panel and hinges, closing devices, and latching device.

7-3.2 Labeled Horizontally Sliding Hoistway Doors for Elevators — Fire Rated Entrance Assembly. (*See Figures A-53 and A-54.*) The major components of a typical assembly (single- or multi-section, side or center opening) shall include landing sill with attachments, header with vertical struts or other supports, frame with attachments, hanger track assembly, hangers, door panel, and door-closing devices where required.

7-3.3 Labeled Vertically Sliding Hoistway Doors for Elevators — Fire Rated Entrance Assembly. (*See Figure A-55.*) The major components of a typical assembly (vertically sliding biparting counterbalanced or vertically sliding counterweighted, single- or multi-section) shall include frame and attachments, landing sills, guide rails, door panel with guides, counterbalancing mechanism or counterweight, and door-locking device for elevator operation.

7-3.4 Labeled Hoistway Doors for Dumbwaiters — Fire Rated Entrance Assembly. The major components of a typical assembly are preassembled and shall conform to 7-3.1 for swinging doors; 7-3.2 for horizontally sliding doors; and 7-3.3 for vertically sliding doors. (*See Figure A-56 for vertically biparting doors.*)

Chapter 8 Installation of Chute Doors

8-1 General.

8-1.1 Chute doors shall be of the swinging type, hinged on side or bottom for intake and on side or top for discharge.

8-1.2 Chute doors shall have a fire protection rating of 1 hour (B) or 1½ hour (B).[1]

8-2 Sills. Chute door assemblies shall be installed on masonry sills and shall be securely fastened to the sill or the chute.

8-3 Walls. Walls shall be plumb and true and shall be of brick, concrete or concrete masonry unit construction. Door assemblies, when used on walls of other construction, shall be as listed. No part of the assembly shall project into the chute.

8-4 Lintels. The lintel shall be constructed of noncombustible materials and adequate for the service.

8-5 Closing Device. Doors shall be arranged for automatic closing operation as described in 3-10 for swinging doors.

[1]Some chute doors, depending on location, may be required to have a temperature rise of not more than 250°F (121°C) at the end of 30 minutes exposure to the standard fire test as described in NFPA 252, *Standard Methods of Fire Tests of Door Assemblies.*

Chapter 9 Installation of Fire Shutters

9-1 General.

9-1.1 Fire doors without glass lights shall be used as fire shutters.

9-1.2 Shutters shall be of three general types:

(a) Swinging door

(b) Horizontally or vertically sliding door

(c) Rolling steel door.

9-2 Installation.

9-2.1 The installation of shutters shall be in accordance with the requirements for installation of swinging, sliding, and rolling steel doors.

9-2.2 When shutters are installed on the outside of an opening, they shall be protected against the weather to ensure proper operation.[1]

9-3 Operation of Shutters.

9-3.1 All shutters shall be equipped to close automatically in the event of fire.

9-3.2 The operation of shutters shall be in accordance with the requirements for operation of swinging, sliding, and rolling steel doors.

9-4 Location of Detection Device. Fusible links shall be located in the proximity of the shutter near the top of the opening and in an area where there is no obstruction to the circulation of air.

[1]Shutters may be installed on the inside or outside of an opening or between jambs, but preferably on the inside or between jambs for ease of maintenance and protection from adverse weather conditions.

Chapter 10 Installation of Access Doors

10-1 General.

10-1.1 Each access door shall either be an integral unit including door, frame, hinges, and latch bearing the "Frame and Fire Door Assembly" label, or consist of a labeled door, frame, and latch with hinges that conform to Table 2-8A.

10-1.2 Doors shall be self-latching. Doors shall be openable from the inside without the use of a key or tool.

10-1.3 Access doors shall be kept in the closed and latched position when not in use.

10-2 Installation.

10-2.1 Access doors shall have a fire protection rating of 1 hour (B) or 1½ hour (B).[1]

10-2-2 When installed in a vertical surface, access doors shall be self-closing. This shall be accomplished by use of a closer or by top hinging to provide gravity closing.

10-2.3 A horizontally mounted access door shall be self-closing and shall be used only if it has been tested as a component of a fire-rated floor, floor-ceiling, or roof-ceiling assembly.

10-3 Walls. Walls shall be plumb and true and shall be of brick, concrete or concrete masonry unit construction. Door assemblies, when used on walls of other construction, shall be as listed. When door assemblies are used in fire-rated ceiling assemblies, they shall be tested in the horizontal position and be installed as listed.

---

[1]Some access doors, depending on location and the proximity of combustibles, may be required to have a temperature rise of not more than 250°F (121°C) at the end of 30 minutes exposure to the standard fire test as described in NFPA 252, *Standard Methods of Fire Tests of Door Assemblies.*

Chapter 11 Installation of Service Counter Doors

11-1 Door Construction. Door construction shall be as follows:

(a) Door panels of 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 curtains of the interlocking slat type integrally mounted in a four-sided frame to form a labeled door and frame assembly; or

(c) Door curtains of the interlocking slat type including guides, brackets and hoods for mounting directly to masonry walls or noncombustible opening framing.

11-2 Installation.

11-2.1 Service counter doors shall be either factory or field assembled and shall be installed during construction of the wall or in a prepared wall opening.

11-2.2 When service counter doors are mounted in walls other than solid masonry, the frame or guides shall be anchored to steel struts running from the floor to a supporting member above.

11-2-3 Heads of integral door frame assemblies shall not support a wall above. Separate lintels shall be provided of a size based on the type of wall construction and loads to be supported.

11-2.4 Walls. Walls shall be plumb and true and shall be of brick, concrete, or concrete masonry unit construction. Door assemblies, if used on walls of other construction, shall be as listed.

11-3 Automatic Closers.

11-3.1 All service counter doors shall be equipped to close automatically in the event of fire.

11-3.2 A service counter door of the rolling type shall be made automatic closing by incorporation of an escapement system consisting of a spring-release device or an auxiliary push-down spring.

11-3.3 A service counter door of the swinging or sliding type shall be made automatic closing by a system of weights suspended by ropes, cables, or chains over pulleys which, when activated by release of an automatic fire detector, will cause the door to close.

11-3.4 A governor, when employed on a service counter door, shall work in coordination with the closing device and shall control the closing speed of the door.

11-4 Automatic Fire Detectors.

11-4.1 Detectors or fusible links shall be installed on both sides of the wall and interconnected so that the operation of any single detector or fusible link will permit the fire door to close.

11-4.1.1 When fusible links are used, one fusible link shall be located near the top of the opening and additional links shall be located at or near the ceiling on each side of the wall.

11-4.1.2 When smoke detectors are used, they shall be located as shown in Figure A-51.

11-4.1.3 Detectors and their components shall be installed in accordance with the manufacturer's instructions.

Chapter 12 Installation of Fire Windows

12-1 Classification.

12-1.1 Only labeled windows shall be used in window openings (*see Appendix F*).

12-1.2 Labels.

12-1.2.1 The label on ¾-hour windows for wall openings shall read "Fire Window Frame."

12-1.2.2 The Fire Window Frame label shall cover the design and construction of the frame, ventilator, glass retaining members, and hardware. (*See Appendix E for types of window ventilators.*)

12-1.2.3 The label on hot-rolled or extruded steel section windows shall include the hot-rolled or extruded steel mullions.

12-1.2.4 The label on hollow metal and hollow metal plate steel combination section windows shall include hollow metal mullions.

12-1.3 Bearing mullions shall be fire protected with materials acceptable to the authority having jurisdiction.

12-2 Wired Glass.

12-2.1 Only labeled wired glass not less than ¼ in. (6.35 mm) thick shall be used.

12-2.2 The individual glass exposed area shall not exceed 1296 sq in. (.836 m^2) with no dimension exceeding 54 in. (1.37 m).

12-3 Types of Windows.

12-3.1 Hollow Metal Windows.

12-3.1.1 Hollow metal windows consist of formed steel sheet, reinforced as required, and are of the double hung, casement, pivoted, stationary, tilting, hinged or projected types.

12-3.1.2 Maximum Size Openings.

(a) Single window, other than casement: 5 ft 0 in. by 5 ft 0 in. (1.52 m by 1.52 m).

(b) Multiple window, other than casement: 7 ft 0 in. by 10 ft 0 in. (2.13 m by 3.05 m).

(c) Single casement window: 3 ft 6 in. by 10 ft 0 in. (1.07 m by 3.05 m).

(d) Multiple casement window: 7 ft 0 in. by 10 ft 0 in. (2.13 m by 3.05 m).

12-3.2 Hot-Rolled or Extruded Steel Section Window.

12-3.2.1 The heavy intermediate window frame and ventilator sections shall be a minimum depth of $1\frac{5}{16}$ in. (3.3 cm) with integrally rolled weathering contacts.

12-3.2.2 The standard intermediate window frame and ventilator sections shall be a minimum depth of $1\frac{1}{4}$ in. (3.2 cm) with integrally rolled weathering contacts.

12-3.2.3 The residential-type window frame and ventilator sections shall be a minimum depth of 1 in. (2.5 cm) with integrally rolled weathering contacts.

12-3.2.4 The industrial-type window frame and ventilator sections shall be a minimum depth of $1\frac{1}{4}$ in. (3.2 cm) with applied weathering contacts.

12-3.2.5 Maximum Size Openings.

(a) The heavy intermediate and industrial types shall be used for openings not exceeding 84 sq ft (7.8 m^2) in area with neither dimension exceeding 12 ft (3.66 m). When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed 7 ft (2.13 m).

(b) The standard intermediate types shall be used for openings not exceeding 60 sq ft (5.57 m^2) in area with neither dimension exceeding 10 ft (3.05 m). When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed $6\frac{1}{2}$ ft (1.98 m).

(c) Residential-type windows shall be used for openings not exceeding $6\frac{1}{2}$ ft (1.98 m) in either dimension. When multiple units are installed, the distance between unprotected vertical steel mullions shall not exceed $3\frac{1}{2}$ ft (1.07 m).

12-3.3 Hollow Metal Plate Steel (Combination) Window.

12-3.3.1 These consist of formed sheet steel frame sections at the head, jambs and sill, and plate steel window. They are of the double-hung, counterbalanced, or stationary types.

12-3.3.2 Maximum Size Openings.

(a) Single window: 5 ft 0 in. by 5 ft 0 in. (1.52 m by 1.52 m).

(b) Multiple window: 7 ft 0 in. by 10 ft 0 in. (2.13 m by 3.05 m).

12-4 Installation.

12-4.1 Frames shall be securely fastened to the wall and shall be capable of resisting all wind stresses and any other stresses for which the window was designed.

12-4.2 Fire Lock Angles.

12-4.2.1 Fire lock angles shall be designed to hold the ventilator in the frame as the assembly expands under exposure to fire.

12-4.2.2 When the window is provided with fire lock angles, the fire lock angles shall be so adjusted that they pass one another with a minimum of clearance.

12-4.3 Installation of the Glass.

12-4.3.1 The clearance between the edges of the glass and the metal framing shall not exceed ⅛ in. (3.18 mm).

12-4.3.2 Wire clips, glazing angle clips, continuous glazing channels or continuous glazing angles shall be used to retain the glass. When wire clips or glazing angle clips are used for glazing the window, one wire clip or glazing angle clip shall be installed in each mounting hole. When continuous glazing angles or channels are used, a screw or screw and nut shall be installed in each mounting hole.

12-4.3.3 The glass shall be well-imbedded in putty and all exposed joints between the metal and the glass shall be struck and pointed.

12-5 Closing Devices. All fire windows shall be of a fixed type or shall be automatic closing. The automatic closing device may be an integral part of the assembly or a separate system, such as weights suspended by ropes, wire cables, or chains over pulleys, so arranged that operation of the automatic fire detector will permit the ventilator to close.

Chapter 13 Installation of Glass Blocks

13-1 Classification.

13-1.1 Only labeled glass blocks shall be used.

13-1.2 Glass blocks shall be permitted for the protection of exterior openings not exceeding 120 sq ft (11.15 m²) in area with neither the width nor height exceeding 12 ft (3.66 m).

13-1.3 Glass blocks shall be of two sizes: 5¾ in. (146.05 mm) square or 7¾ in. (197 mm) square by 3⅞ in. (98.43 mm) thick.

13-2 Installation.

13-2.1 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.

13-2.2 Steel lintels shall be made of 3-in. by 3-in. (76.2-mm by 76.2-mm) steel angles, cut to provide 1¼-in. (31.8-mm) clearance at each jamb secured to the structural steel of the building with ⅜-in. (.38-mm) bolts, provided with heavy galvanized washers in 2-in. (50.8-mm) slotted holes spaced 12 in. (305 mm) on center. The blocks shall extend 1⅝ in. (41.3 mm) 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.

13-2.3 Concrete masonry lintels for 7¾-in. by 7¾-in. (197-mm by 197-mm) blocks shall be provided with 2½-in. (63.5-mm) deep grooves. The blocks shall extend 1½ in. (38.1 mm) 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.

13-2.4 Concrete masonry lintels for the 5¾-in. by 5¾-in. (146.1-mm) by 146.1-mm) blocks shall be provided with 2⅜-in. (60.3-mm) deep grooves. The blocks shall extend 1¼ in. (31.8 mm) 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.

13-2.5 The jambs of brick or concrete for the 7¾-in. by 7¾-in. (197-mm by 197-mm) blocks shall be provided with 2½-in. (63.5-mm) deep grooves. The blocks shall extend 1½ in. (38.1 mm) into the groove, with glass or mineral wool in the remaining spaces in the grooves to provide for expansion of the glass panel.

13-2.6 The jambs of brick or concrete for the 5¾-in. by 5¾-in. (146.1-mm by 146.1-mm) blocks shall be provided with 2-in. (50.8-mm) deep grooves. The blocks shall extend 1¼ in. (31.75 mm) into the grooves, with glass or mineral wool in the remaining spaces in the grooves to provide for expansion of the glass panel.

13-2.7 Sills shall be made of concrete and coated with an asphalt emulsion to provide for expansion and movement of the panel.

13-2.8 Exterior jamb and lintel edges shall be caulked with waterproofing mastic.

Chapter 14 Care and Maintenance

14-1 General.[1]

14-1.1 When a door or window opening is no longer to be used, the opening shall be filled with construction equivalent to that of the wall.

14-1.2 Doors, shutters, and windows shall be operable at all times. They shall be kept closed and latched or arranged for automatic closing.

14-1.3 When it is necessary to replace fire doors, shutters, windows or their frames, hardware, and closing mechanisms, replacements shall meet the requirements for fire protection and be installed as required for new installations elsewhere in this standard.

14-1.4 Repairs shall be made and defects that may interfere with operation shall be corrected immediately.

14-2 Specific Requirements.

14-2.1 Inspections.[2]

14-2.1.1 Hardware shall be examined frequently and any parts found to be inoperative shall be replaced immediately.[3]

14-2.1.2 Tinclad and Kalamein doors shall be inspected regularly for dry rot.

14-2.1.3 Chains or cables employed on suspended doors shall be inspected frequently for excessive wear and stretching.

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[1]Walls with openings have less 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.

[2]Fire doors, shutters, and windows are valueless unless properly maintained and closed or able to close at the time of fire. A periodic inspection and maintenance program should be implemented and should be the responsibility of the property management.

[3]Hinges, catches, closers, latches, and stay rolls are especially subject to wear.

14-2.2 Lubrication and Adjustments.

14-2.2.1 Guides and bearings shall be kept well-lubricated to facilitate operation.

14-2.2.2 Chains or cables on biparting counterbalanced doors shall be checked frequently and adjustments made to ensure proper latching and to keep the doors in proper relation to the opening.

14-2.3 Prevention of Door Blockage.

14-2.3.1 Door openings and the surrounding areas shall be kept clear of everything that would be likely to obstruct or interfere with the free operation of the door.

14-2.3.2 When necessary, a barrier shall be built to prevent the piling of material against sliding doors.

14-2.3.3 Blocking or wedging of doors in the open position shall be prohibited.

14-2.4 Maintenance of Closing Mechanisms.

14-2.4.1 Self-closing devices shall be kept in proper working condition at all times.

14-2.4.2 Doors normally held in the open position and equipped with automatic closing devices shall be operated at frequent intervals to ensure proper operation.

14-2.4.3 Fusible links or other heat-actuated devices shall not be painted.

14-2.4.4 Care shall be taken to prevent paint accumulation on stay rolls.

14-2.5 Repair of Fire Doors and Windows.

14-2.5.1 Broken or damaged lights of glass shall be replaced with labeled wired glass, at least ¼ in. (6.35 mm) thick and well-imbedded in putty, and all exposed joints between the metal and the glass shall be struck and pointed.

14-2.5.2 Any breaks in face covering of doors shall be repaired immediately.

14-2.6 Fire Prevention. Combustible material shall be kept well away from openings.

Appendix A
Drawings of Fire Door Assemblies and Components

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

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

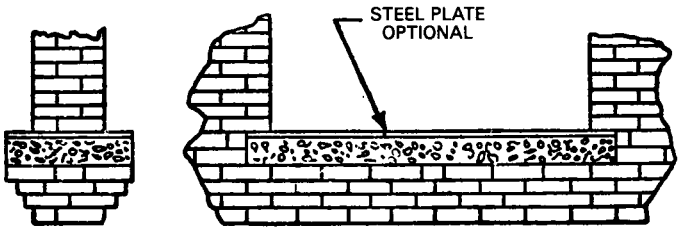


Figure A-1 Concrete sill supported by a corbel of brick used with combustible floors.

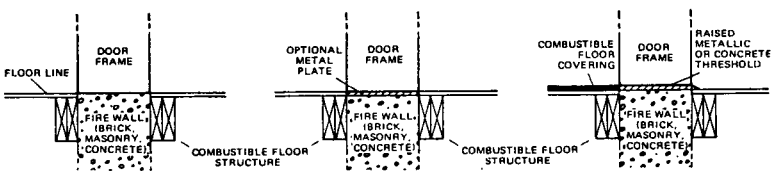


Figure A-2 Noncombustible sill used with combustible floors for doors swinging into steel frame.

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

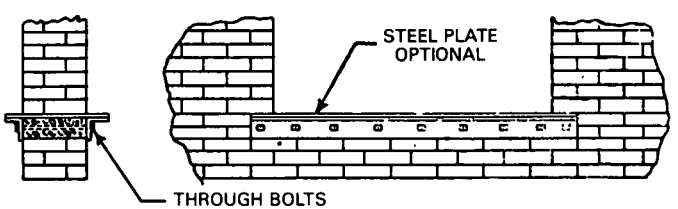


Figure A-3 Angle iron and concrete sill used with combustible floors.

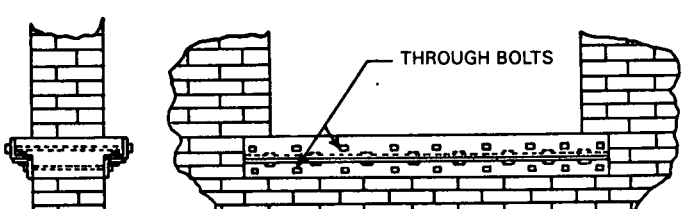


Figure A-4 Z-bar and concrete sill used with combustible floors.

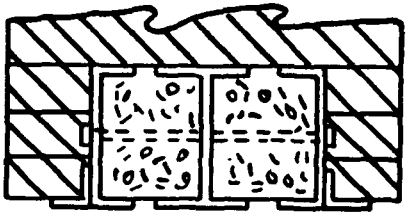


Figure A-5 Steel lintel.

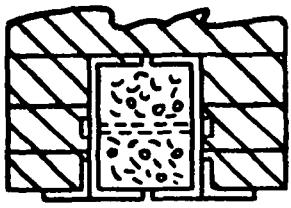


Figure A-6 Steel lintel.

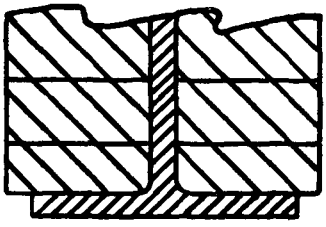


Figure A-7 Steel lintel.

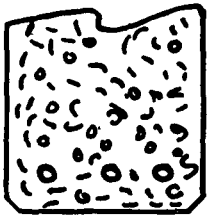


Figure A-8 Reinforced concrete lintel.

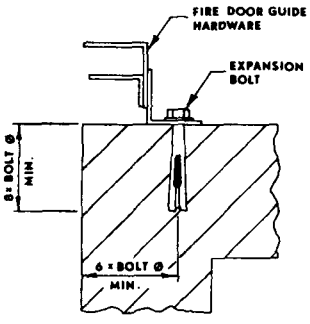


Figure A-9 Corner walls.

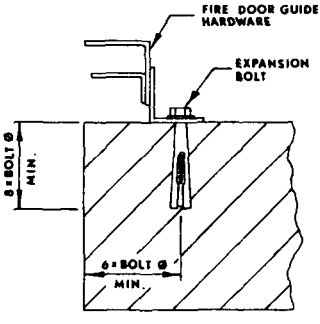


Figure A-10 Unusually thick walls.

For SI Units: 1 in. = 25.4 mm.

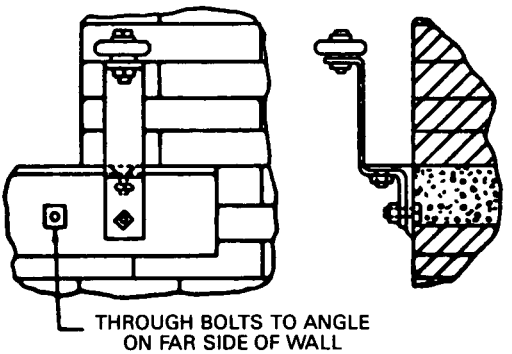


Figure A-11 Stay roll.

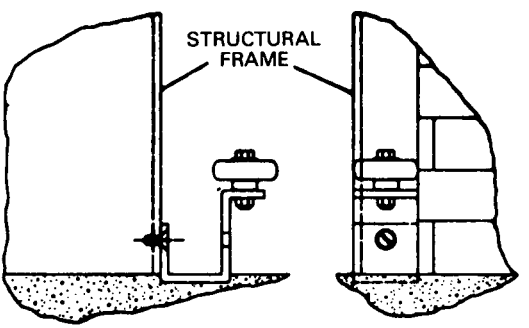


Figure A-12 Stay roll.

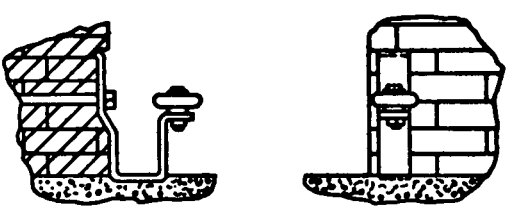


Figure A-13 Stay roll.

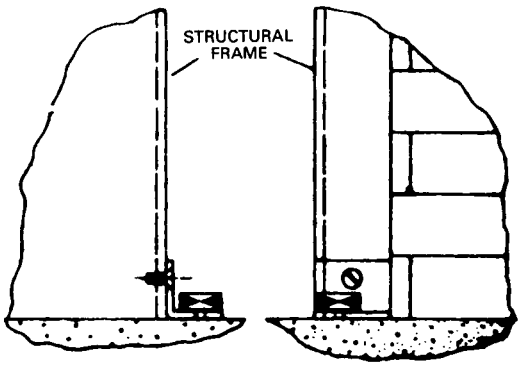


Figure A-14 Concealed type stay roll.

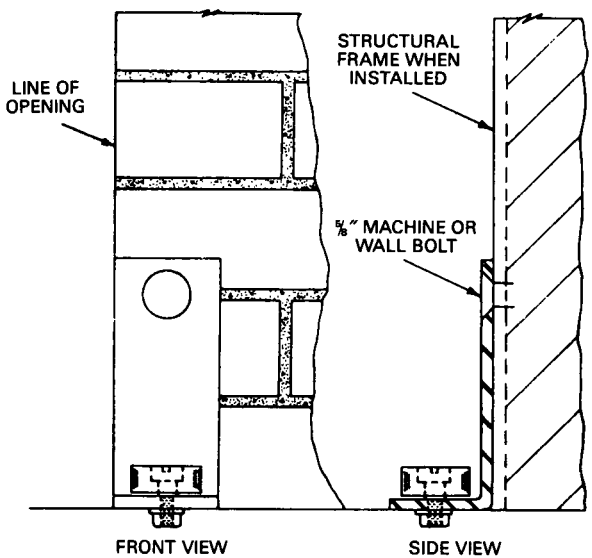


Figure A-15 Concealed type stay roll.

For SI Units: 1 in. = 25.4 mm.

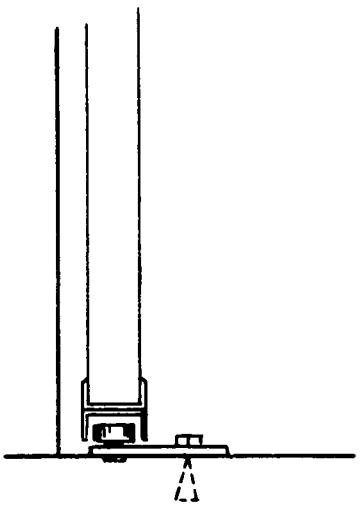


Figure A-15A Stay rolls.

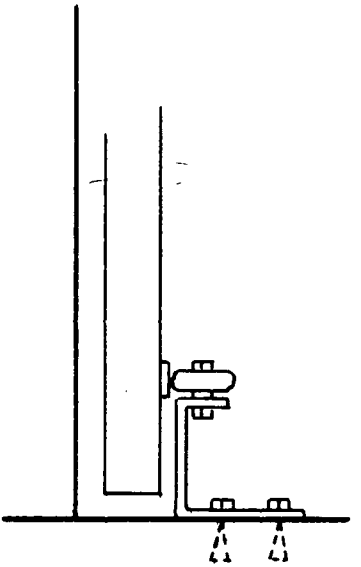


Figure A-15B Stay rolls.

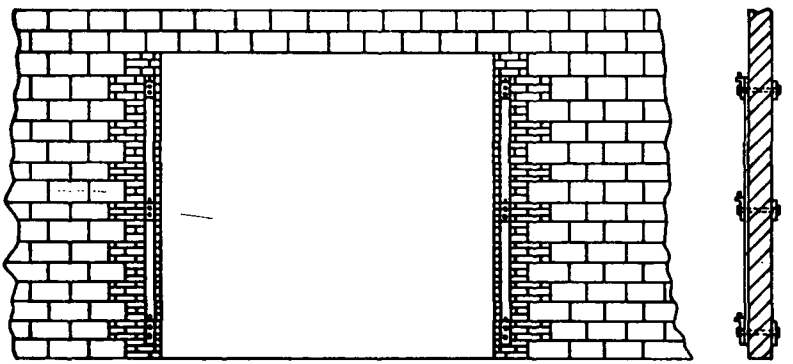


Figure A-16 Hollow concrete masonry wall prepared for doors swinging in pairs — lap mounted, standard method.

This illustrates typical reinforcement of a hollow concrete masonry wall opening to provide adequate anchorage of the door-mounting hardware. Brick reinforcement may be omitted provided all hollow cells within 16 in. (.41 m) 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.

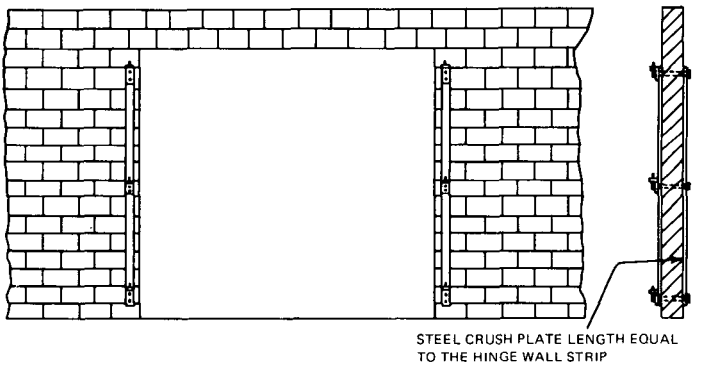


Figure A-17 Hollow concrete masonry wall prepared for doors swinging in pairs — lap mounted.

This illustrates typical reinforcement for anchorage of door-mounting hardware by use of steel plates to bridge cavities in the hollow concrete masonry units and to prevent their crushing. It is recommended when openings are subjected to heavy traffic that jambs be protected with steel frames extending full thickness of the wall.

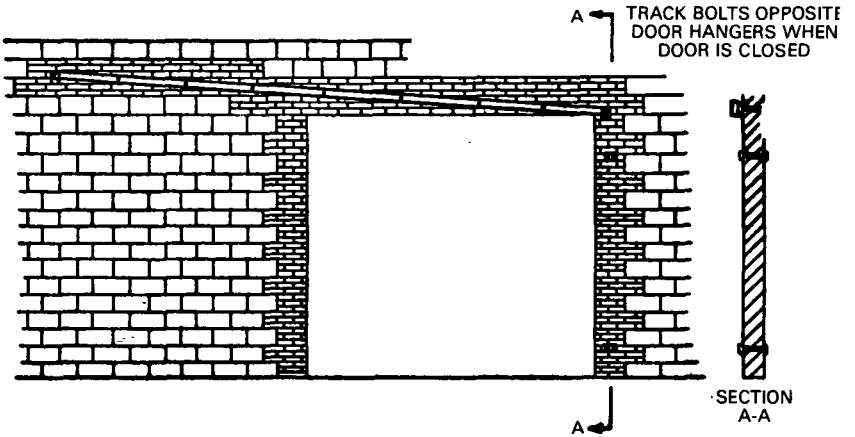


Figure A-18 Hollow concrete masonry wall prepared for single tinclad or sheet metal sliding door, standard method.

This illustrates typical brick reinforcement of a hollow concrete masonry wall opening to provide adequate anchorage of the door-mounting hardware. Brick reinforcement may be omitted provided all hollow cells within 16 in. (.41 m) 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.

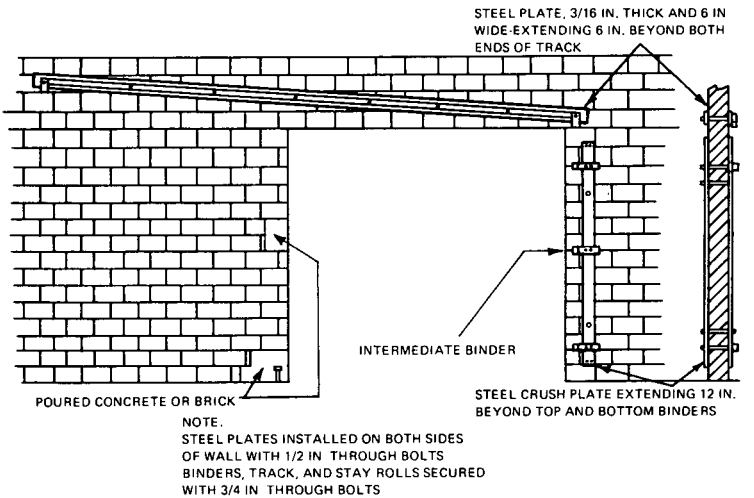


Figure A-19 Hollow concrete masonry wall prepared for a single sliding door.

This illustrates typical reinforcement for anchorage of door-mounting hardware by use of steel plates to bridge the cavities in the hollow concrete masonry units and to prevent their crushing.

For SI Units: 1 in. = 25.4 mm.

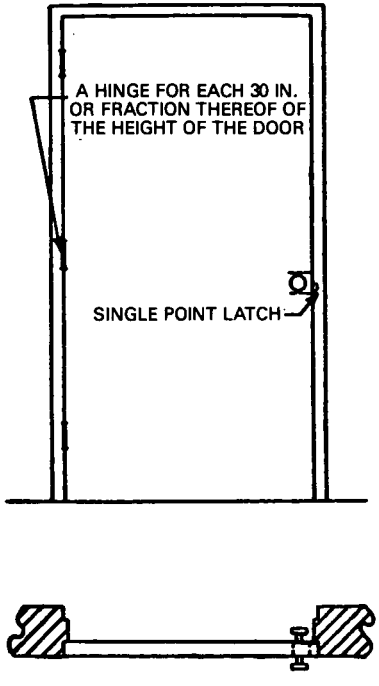


Figure A-20 Builders hardware (single swinging door with single point latch — flush mounted.)

For SI Units: 1 in. = 25.4 mm.

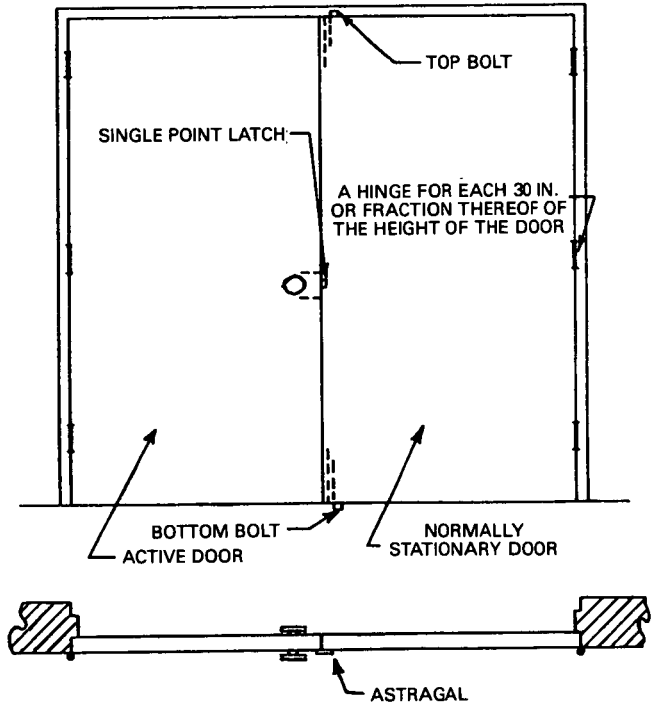


Figure A-21 Builders hardware (doors swinging in pairs with single point latch — flush mounted.)

NOTE: The astragal may be attached to inside of inactive leaf or outside of active leaf.

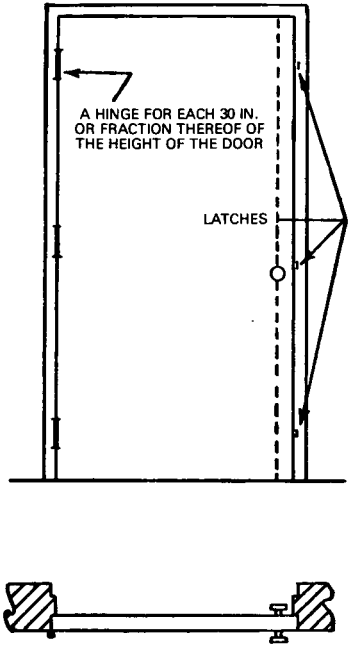


Figure A-22 Builders hardware (single swinging door with concealed three point latch — flush mounted.)

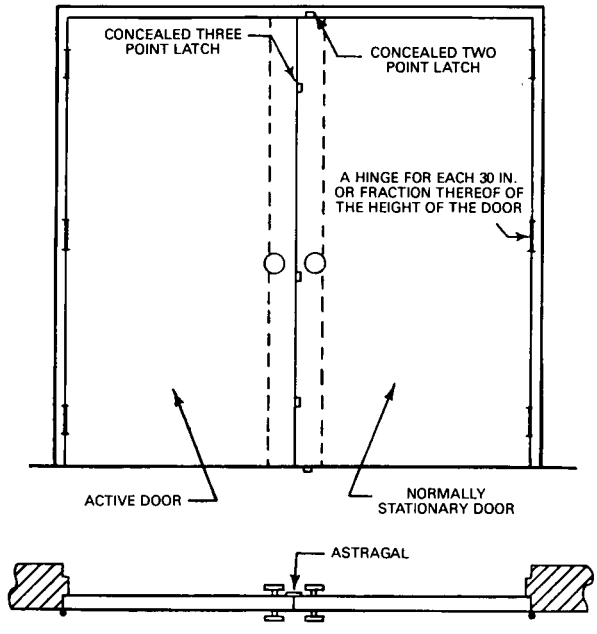


Figure A-23 Builders hardware (doors swinging in pairs with concealed two and three point latches — flush mounted.)

For SI Units: 1 in. = 25.4 mm.

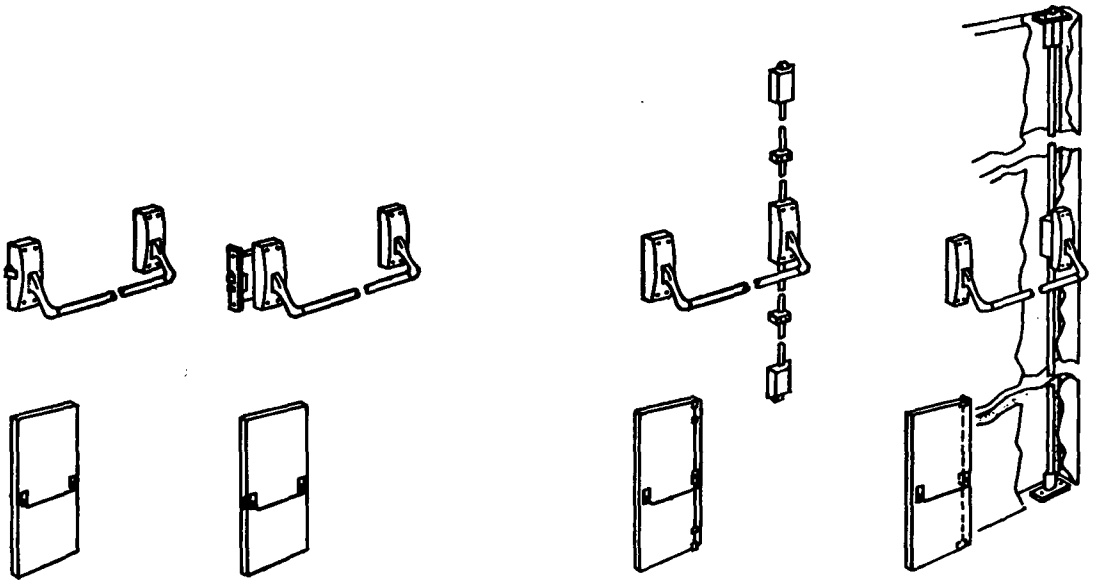


Figure A-24 Types of fire exit hardware.

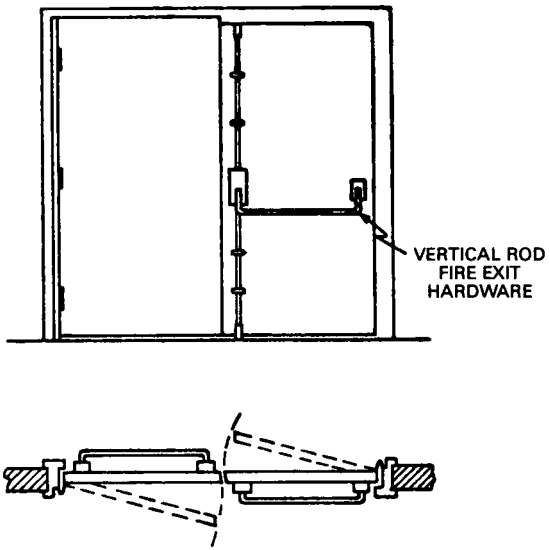


Figure A-25 Double egress door and frame.

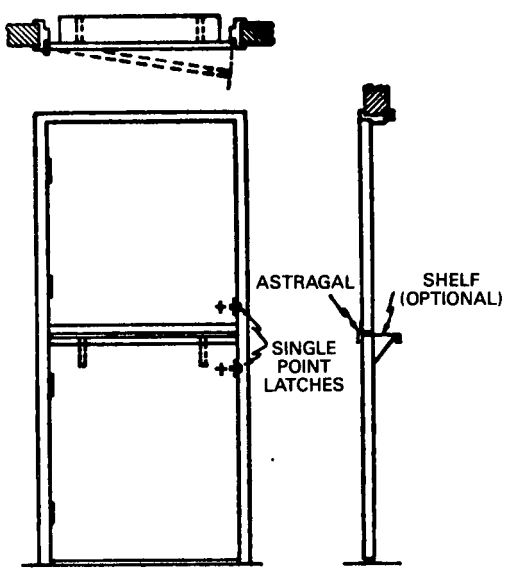
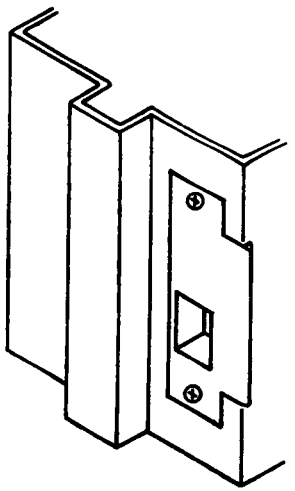
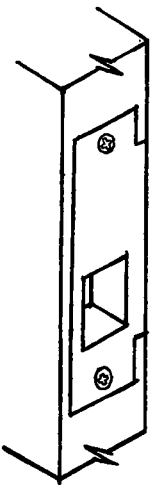


Figure A-26 Dutch door and frame.



SINGLE DOOR INSTALLED IN JAMB.



PAIRS OF DOORS INSTALLED IN EDGE OF INACTIVE LEAF.

Figure A-27 Typical latch strike for single or pairs of doors.

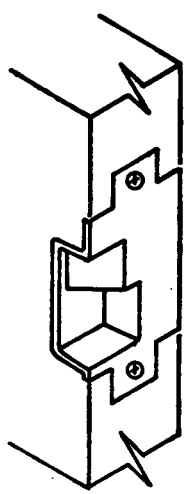


Figure A-28 Typical "open-back" latch strike for pairs of doors, installed in edge of inactive leaf when permitted by individual published listings.

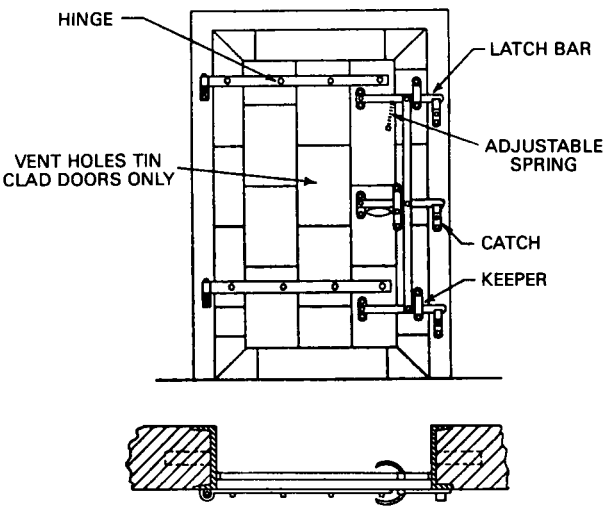


Figure A-29 Fire door hardware (single swinging door — flush mounted.)

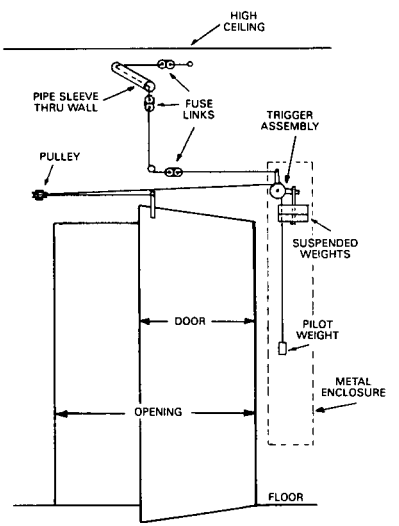


Figure A-30 Closing devices for single swinging door.

NOTE: Fusible links are needed on both sides of the wall.

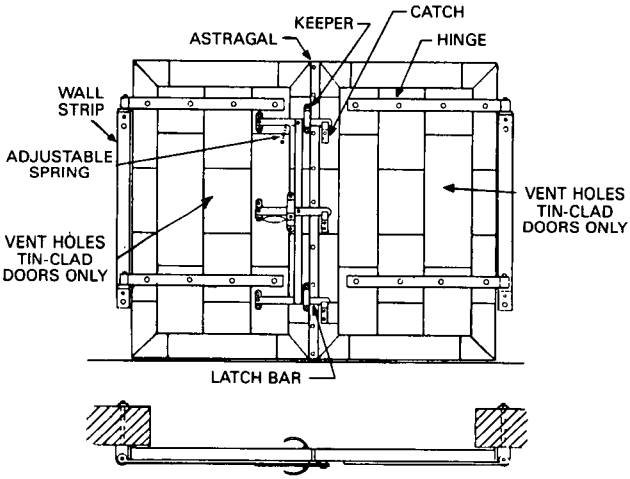


Figure A-31 Fire door hardware (doors swinging in pairs — lap mounted.)

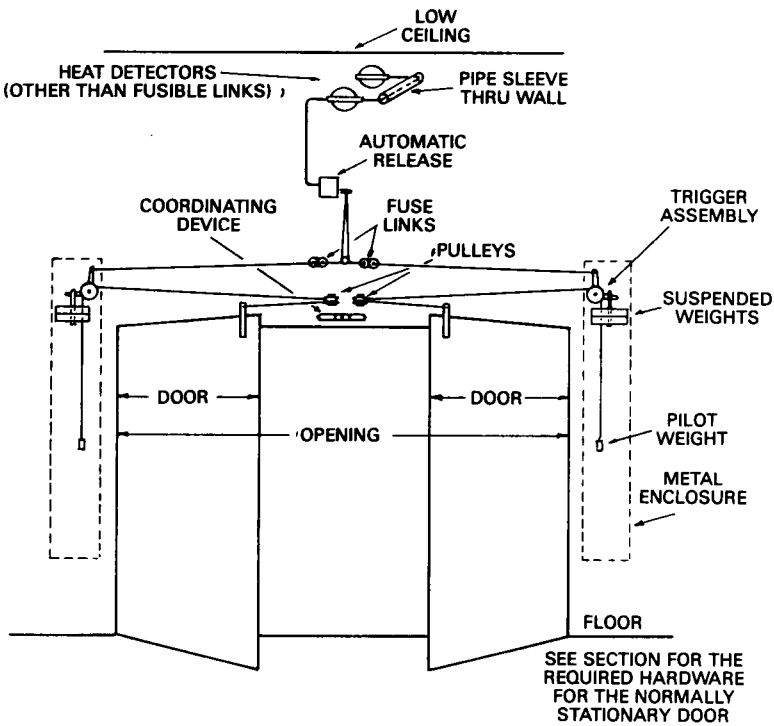
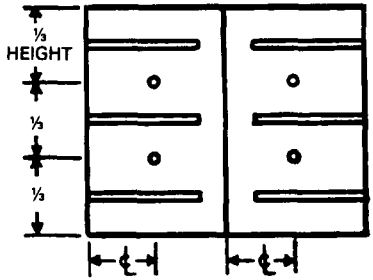
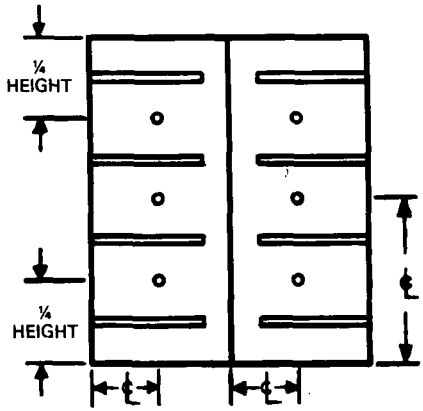


Figure A-32 Closing devices for doors swinging in pairs.



TWO-3-INCH DIAMETER VENT HOLES REQUIRED FOR EACH DOOR LEAF UP TO AND INLCLUDING 8 FEET 6 INCHES IN HEIGHT.



THREE-3-INCH DIAMETER VENT HOLES REQUIRED FOR EACH DOOR LEAF 8 FEET 6 INCHES AND UP TO AND INCLUDING 12 FEET IN HEIGHT.

Figure A-33 Location of vent holes for swinging doors.

For SI Units: 1 in. = 25.4 mm; 1 ft = 0.3048 m.

***INSERT

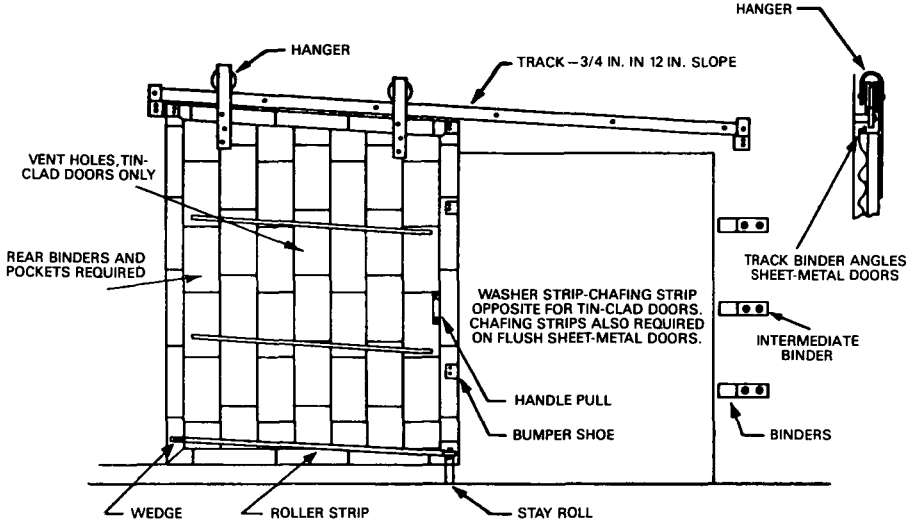


Figure A-34 Single sliding door (inclined track).

For SI Units: 1 in. = 25.4 mm.

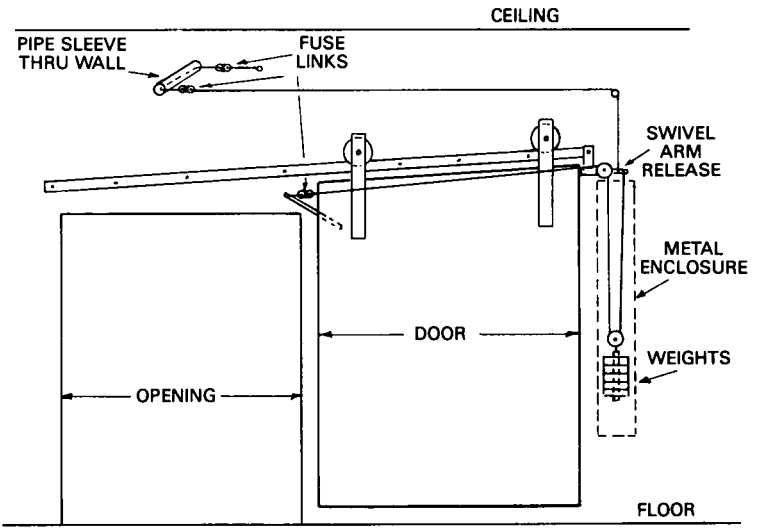


Figure A-35 Closing devices for single sliding door (inclined track).

NOTE: Fusble links are needed on both sides of the wall.

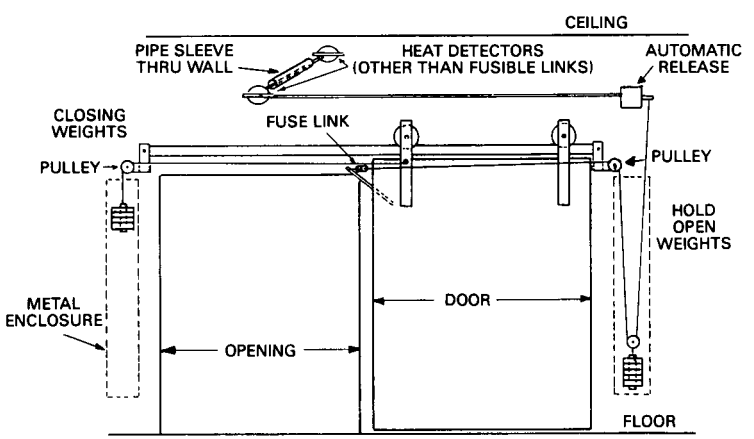


Figure A-36 Closing devices for single sliding door (level track).

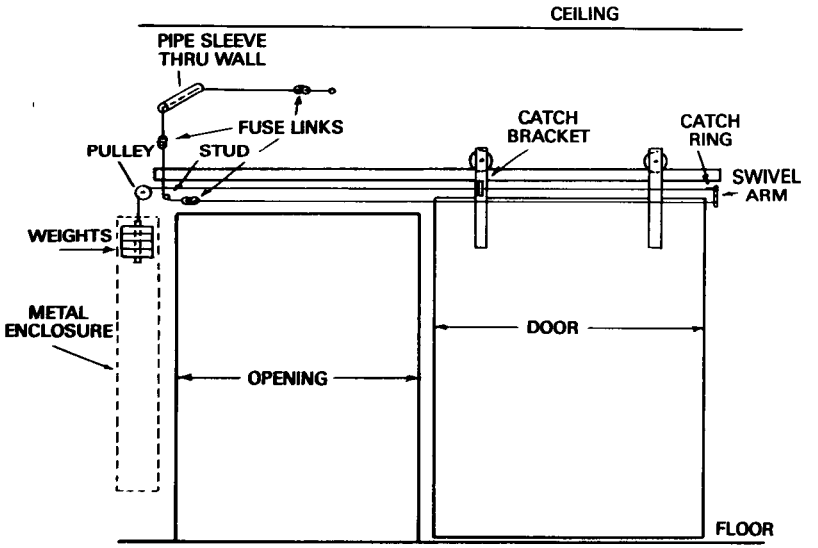


Figure A-36A

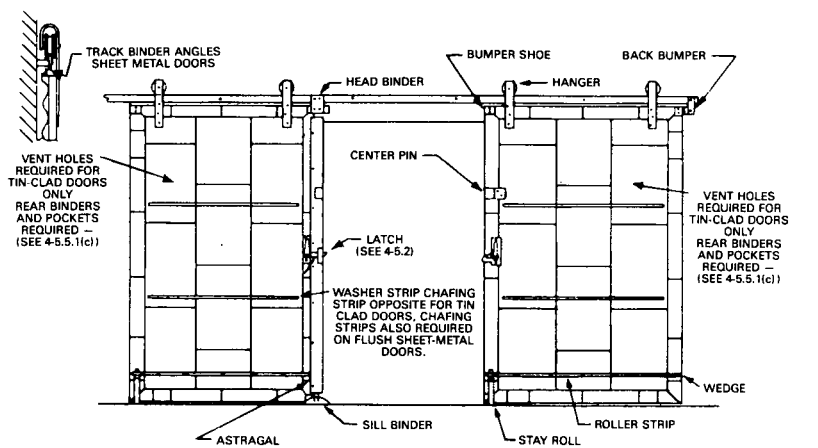


Figure A-37 Center parting horizontally sliding doors (level track).

NOTE: Binder and pocket required. Vent holes required for tinclad only.

Astragal Arrangements

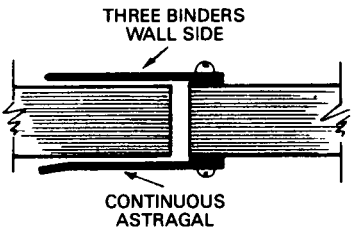


Figure A-37A

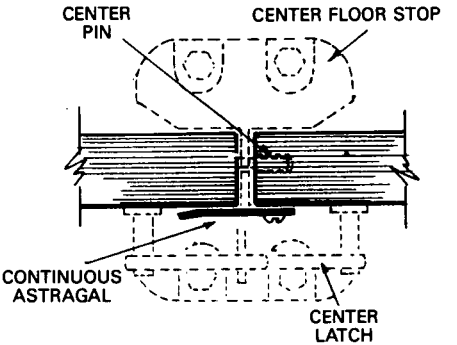


Figure A-37B

Clearances

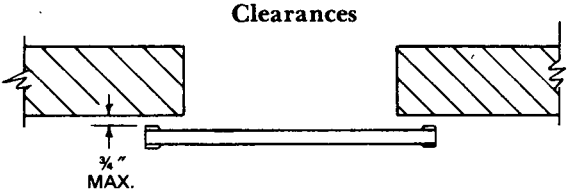


Figure A-37C

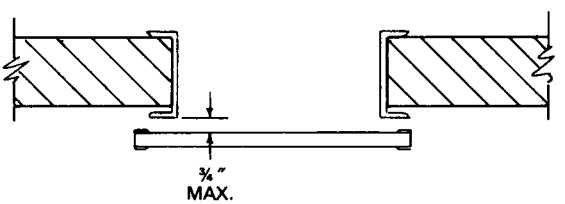


Figure A-37D

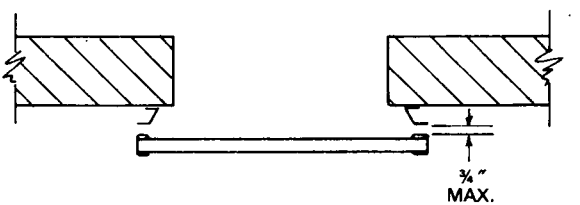


Figure A-37E

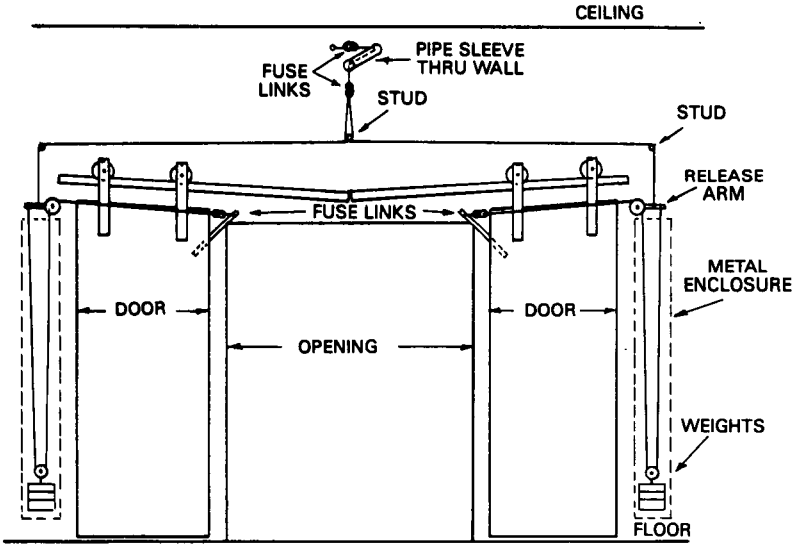


Figure A-38 Closing devices for center parting horizontally sliding doors (inclined track).

NOTE: Fusible links are needed on both sides of the wall.

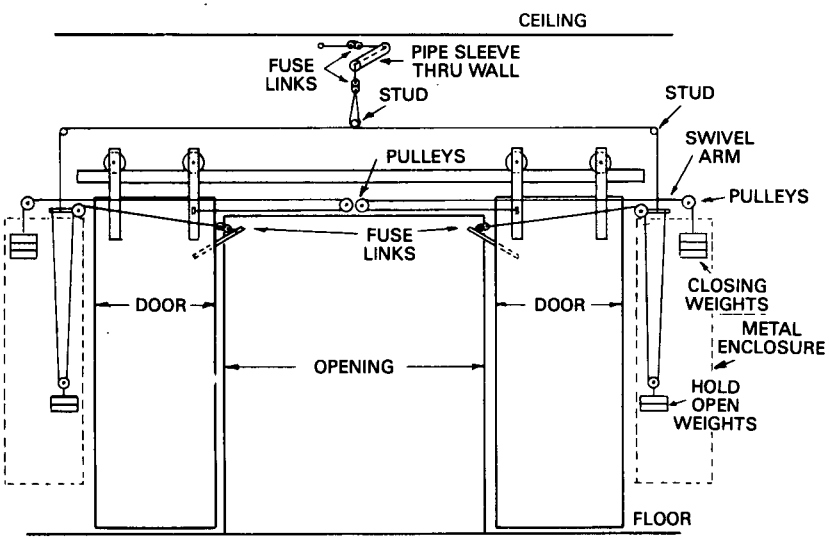


Figure A-39 Closing devices for center parting horizontally sliding doors (level track).

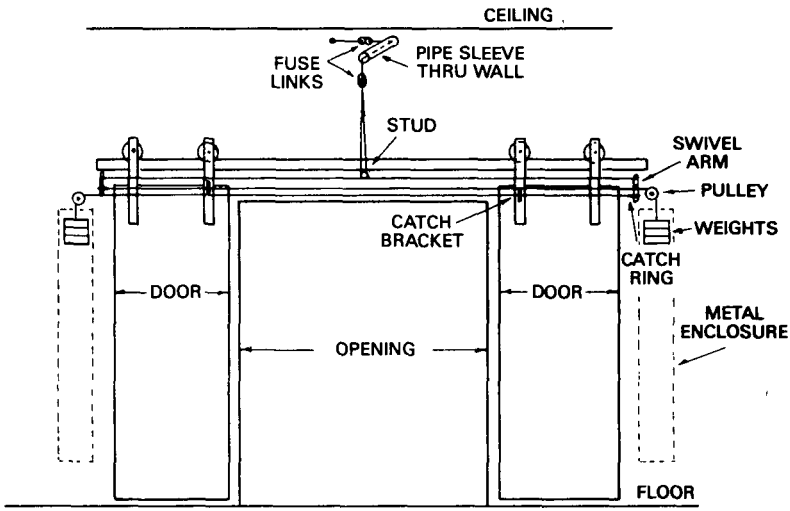

CEILING
FUSE LINKS
PIPE SLEEVE THRU WALL
STUD
SWIVEL ARM
PULLEY
CATCH BRACKET
WEIGHTS
CATCH RING
DOOR
DOOR
METAL ENCLOSURE
OPENING
FLOOR

Figure A-39A

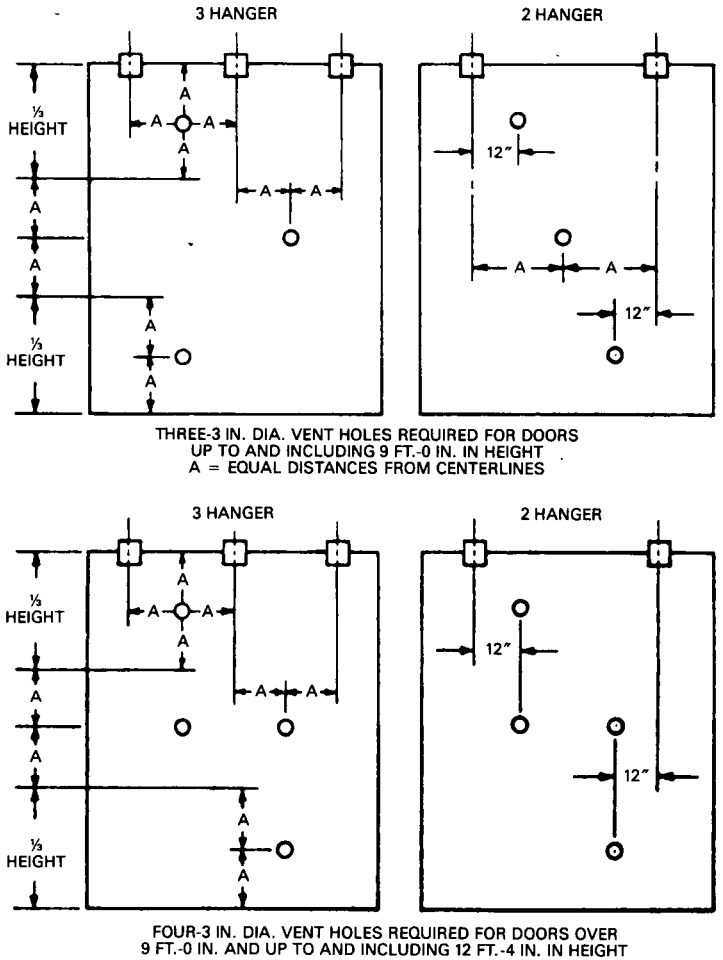


Figure A-40 Location of vent holes for horizontally sliding door.

NOTE: For vertically sliding doors the vent holes are to be positioned similarly, but so as not to interfere with the attached hardware.

For SI Units: 1 in. = 25.4 mm; 1 ft = 0.3048 m.

Track Arrangements

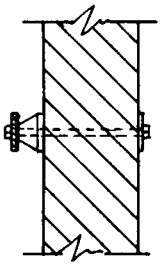


Figure A-40A

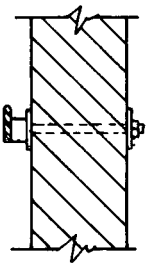


Figure A-40B

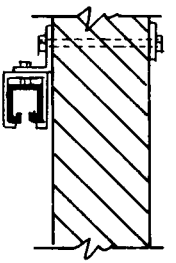


Figure A-40C

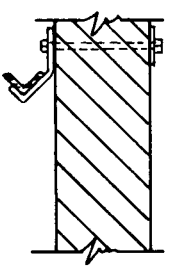


Figure A-40D

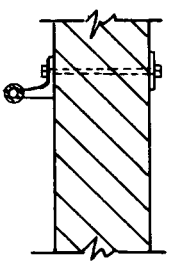


Figure A-40E

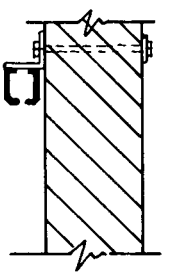


Figure A-40F

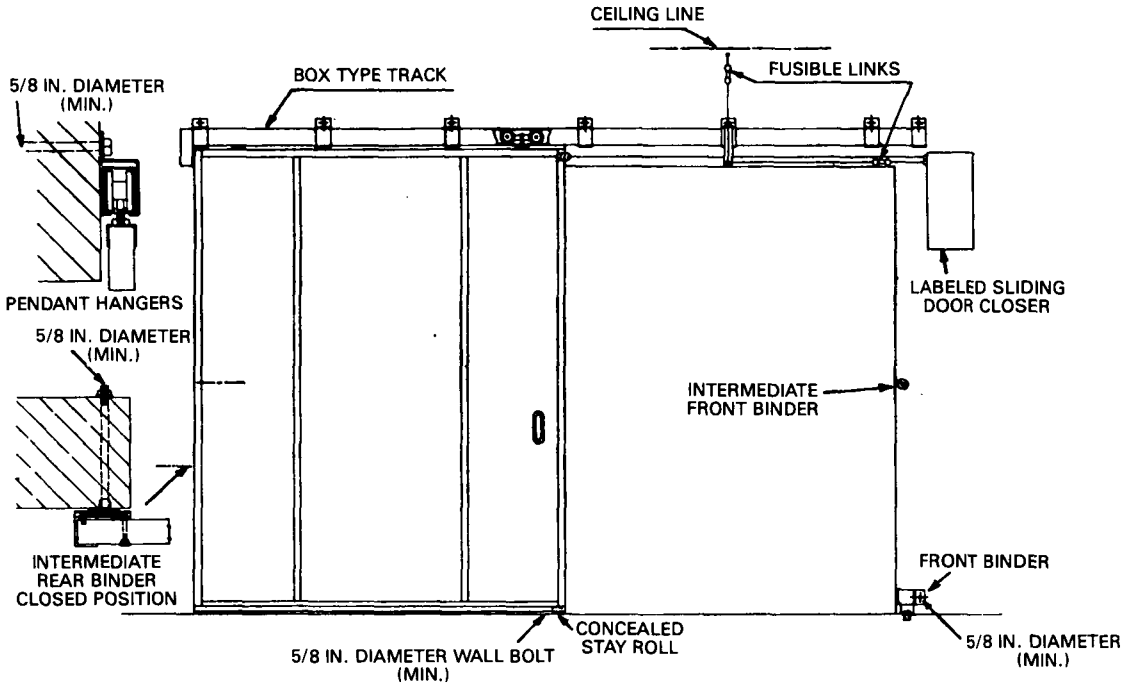


Figure A-41 Horizontally sliding composite door.

NOTE: Fusible links are needed on both sides of the wall.

For SI Units: 1 in. = 25.4 mm

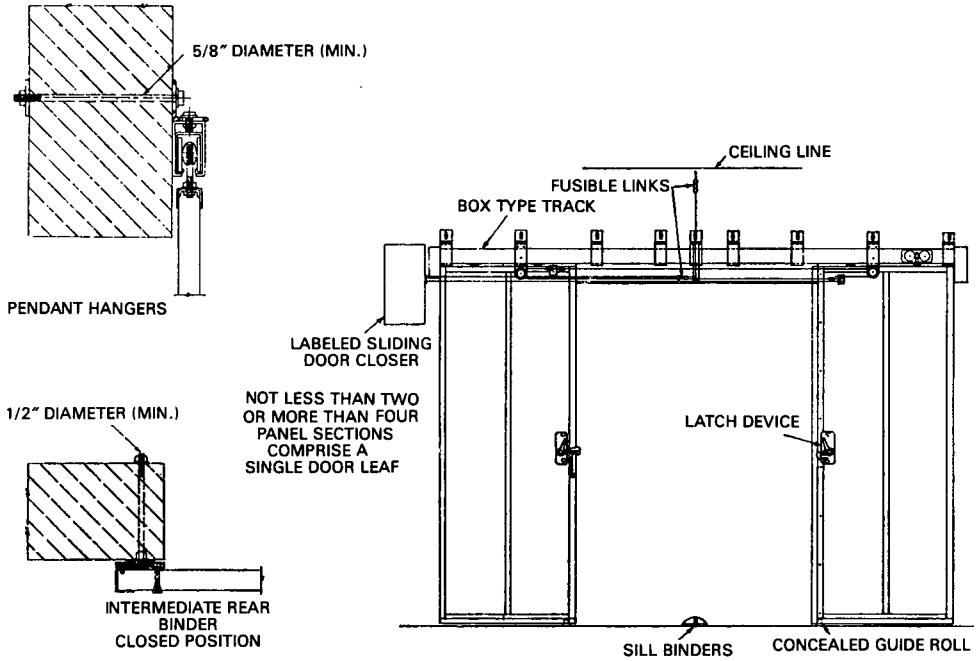


Figure A-42 Center parting horizontally sliding composite door.

NOTE: Fusible links are needed on both sides of the wall.

For SI Units: 1 in. = 25.4 mm

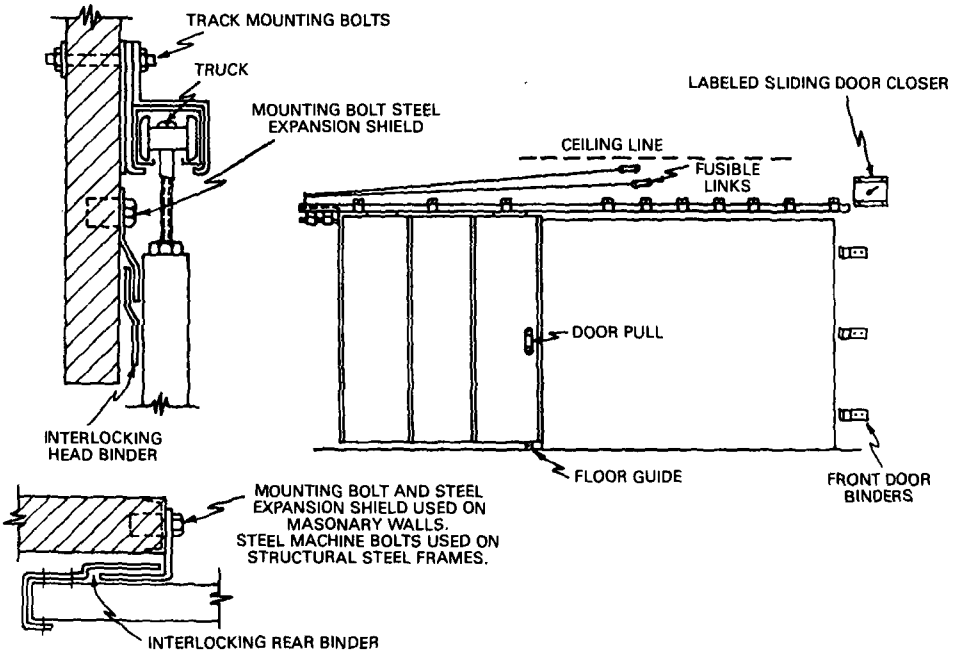


Figure A-43 Horizontally sliding hollow metal door.

NOTE: Fusible links are needed on both sides of the wall.

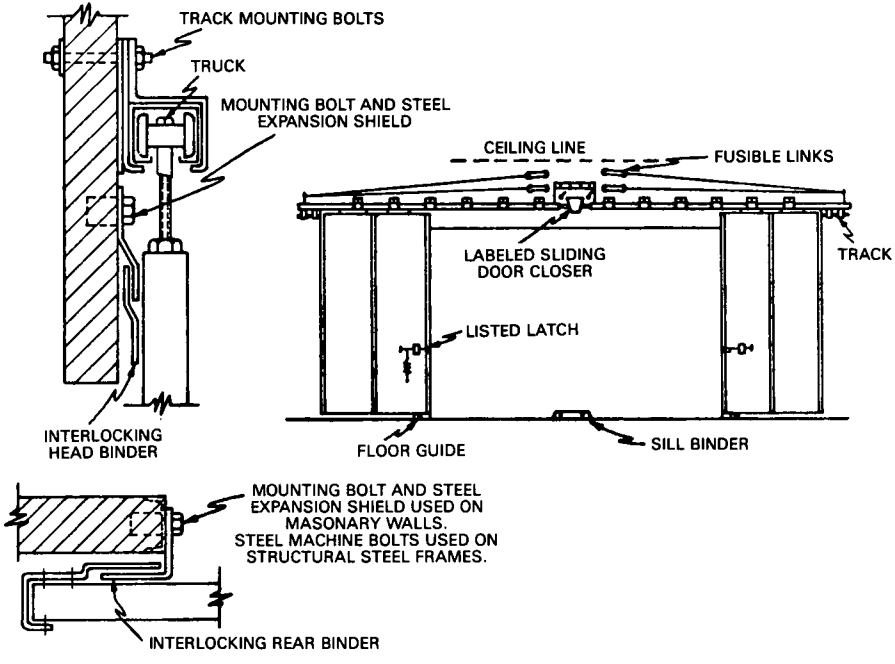


Figure A-44 Center parting horizontally sliding hollow metal door.

NOTE: Fusible links are needed on both sides of the wall.

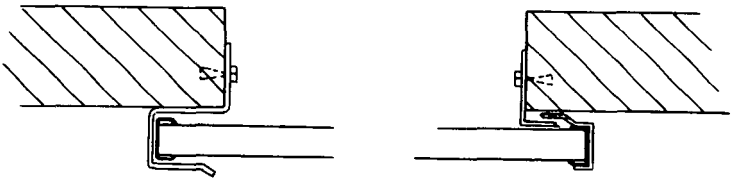


Figure A-44A Binder Arrangements.

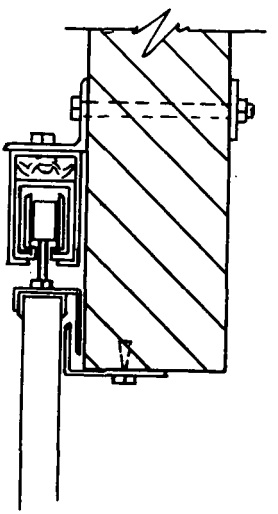


Figure A-44B Binder Arrangements.

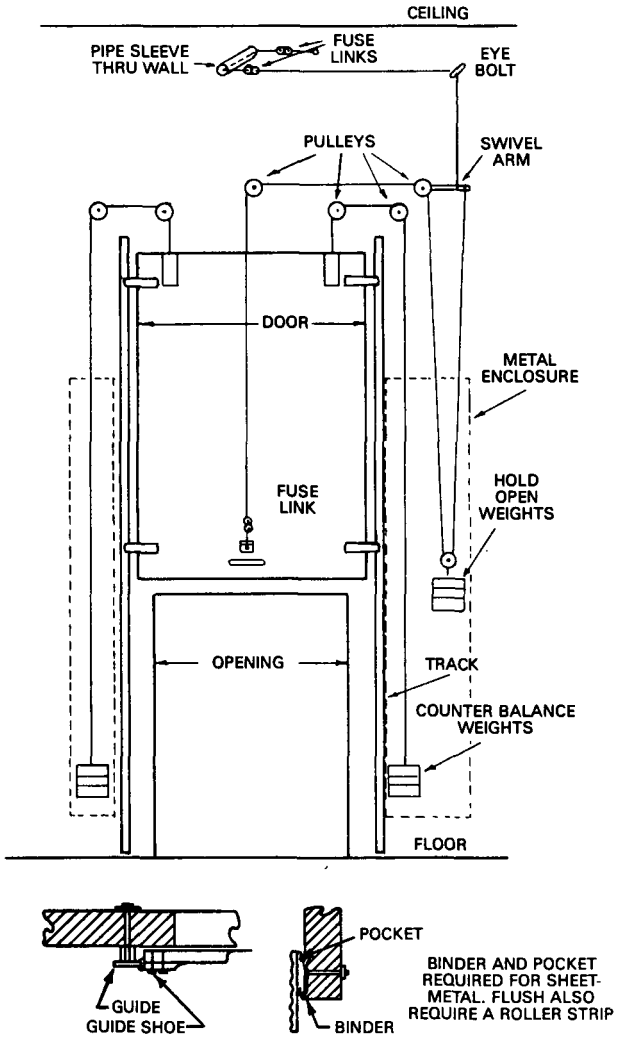


Figure A-45 Vertically sliding door.

NOTE: Fusible links are needed on both sides of the wall.

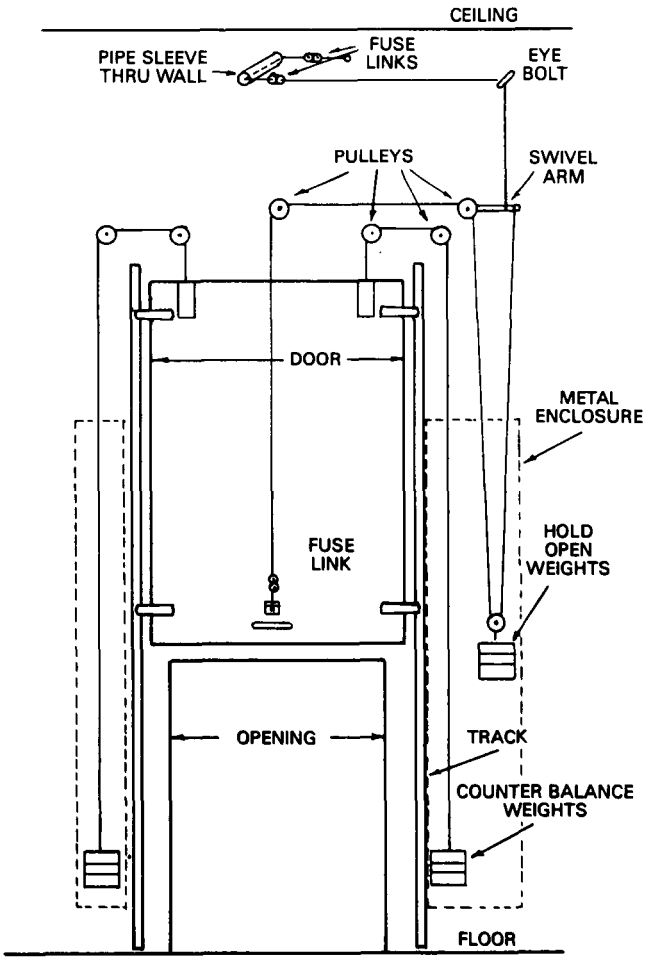


Figure A-46 Closing devices for vertically sliding door.

NOTE: Fusible links are needed on both sides of the wall.