

KENYA STANDARD

DKS 3050-2: 2026

ICS

First Edition

Fire doors and door-sets — Part 2: Specification

DKS 3050-2: 2026

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Flammatech Ltd.
Kenya National Fire Brigade Association
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Masinde Muliro University of Science and Technology
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In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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Fire doors and door-sets — Part 2: Specification

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Foreword

This Kenya Standard was prepared by the Equipments for Firefighting and Fire protection Technical Committee under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

Kenya Bureau of Standards (KEBS) has established Technical Committees (TCs) mandated to develop Kenya Standards (KS). The Committees are composed of representatives from the public and private sector organizations in Kenya.

Kenya Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft Kenya Standards are circulated to stakeholders through the KEBS website and notifications to World Trade Organization (WTO). The comments received are discussed and incorporated before finalization of the standards, in accordance with the Procedures for Development of Kenya Standards.

Kenya Standards are subject to review, to keep pace with technological advances. Users of the Kenya Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

During the preparation of this standard, reference was made to the following document:

IS 3614, Fire doors and door sets — Specification.

Acknowledgement is hereby made for the assistance derived from this source.

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Introduction

One of the key fire safety requirements to consider when planning and designing industrial and non-industrial buildings is providing means to restrict the spread of fire, both internally and externally. The spread of fire can be minimized if the respective floor areas are limited and divided into smaller sections, each section being separated by perfectly separating walls and openings therein fitted with fire doors. The design of fire doors and the materials used in their construction must be such that the doors can provide an effective barrier to the spread of fire and smoke.

This standard will provide adequate guidance to both the manufacturer and the user in regard to materials to be used and construction to be adopted for fire-check doors capable of giving the required fire protection.

Fire doors and door-sets — Part 2: Specification

1 Scope

This Draft Kenya Standard establishes the requirements for the design, materials, and construction of fire-rated metal and wooden doors, specifically swing doors, sliding doors, and roller shutters. The standard also provides requirements for the supply, installation, and routine maintenance of fire door assemblies. The scope extends to the necessary protection of door or wall openings, including the adjoining floors and ceilings, to ensure effective fire and smoke compartmentation within a structure and prevent the spread of smoke.

This standard is not applicable to doors that are vertical sliding, or swinging doors used in hoist-way doors for lifts and dumbwaiters. Fire safety curtains and vault doors are also not covered in this standard.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

KS ISO 3575, *Continuous hot-dip zinc-coated and zinc-iron alloy-coated carbon steel sheet of commercial and drawing qualities*

KS ISO 3008-1, *Fire resistance tests — Door and shutter assemblies — Part 1: General requirements*

ISO 834-1, *Fire-resistance tests — Elements of building construction — Part 1: General requirements*

ISO 834-8, *Fire-resistance tests — Elements of building construction — Part 8: Specific requirements for non-load bearing vertical separating elements*

ISO 3009, *Fire-resistance tests — Elements of building construction — Glazed elements*

KS ISO 13943, *Fire safety — Vocabulary*

KS ISO 8275, *Hinged or pivoted doors — Determination of the resistance to vertical load*

KS ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

EN 1154, *Controlled door closing devices*

EN 1935, *Single-axis hinges*

EN 1155, *Covers door closers with electrically powered hold-open functionality*

EN 1158, *Pertains to door closer coordinators, such as those used with double doors*

DKS 3050-1, *Fire doors and door-sets — Part 1: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in DKS 3050-1 apply.

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4 Determination of the fire resistance of the door

4.1 The fire resistance of a door assembly shall be determined by subjecting a full-size construction to test in accordance with the procedures laid down in KS ISO 3008-1. The test standard requires the tested construction to be fully representative of the assembly to be used in practice in terms of -;

- a) materials and methods of construction;
- b) size;
- c) number of leaves; and
- d) mode of operation, including all glazed openings and essential building hardware.

4.1.1 If the provision of supplies made is already covered by the specimen tested earlier or covered under a third-party certification programme, then additional tests may not be required for the determination of fire resistance of doors, except under the following circumstances:

- a) Change in design and construction of the door, including infill material;
- b) The overall perimeter of the door, width, and height, or total area, is more than the tested specimen. This is applicable for both doors with or without a vision pane;
- c) Change in the size of the vision glass or vision pane.

NOTE Vision pane on a fire door shall not be more than 0.12 m² for an uninsulated door, and in case of an insulated door, it shall not be more than 0.06 m². For other provisions of vision panes, (see 6).

- a) For doors with continuous partitions as a part of an assembly or fixed glazed partitions, it is necessary to provide an assessment report from an approved laboratory based on one or more combinations of test reports. These reports shall be validated for integrity or integrity along with insulation.
- b) The time gap between tests should not exceed five years. However, in case of any material and design change, it should be tested and certified once again.

4.2 The fire resistance is given as the number of minutes during which the assembly meets the relevant criteria, that is:

- a) Integrity and insulation or
- b) Only integrity in accordance with this standard, the details of which shall be included in the report.

4.2.1 For the classification of fire resistance, doors are classified based on the last specific fire resistance period they pass during testing before failure occurs. When multiple criteria are assessed during the test, different classification periods might apply for each criterion.

5 Classification of fire doors based on fire resistance

5.1 The manufacturers shall follow a standard procedure for labeling the product as per the following criteria. Fire ratings for fire door assemblies are expressed in minutes and prefixed by the letters 'FD'; for example, FD 30 indicates a 30-minute fire door or door-set.

5.1.1 Fire doors shall be tested for the criteria as listed below, along with the minimum requirements in Table 1:

- a) integrity; and
- b) insulation

Table 1 — Classification of insulated and uninsulated door with fire rating

S/N	Fire door classification	Uninsulated door		Insulated door	
		Integrity (minutes)	Insulation (minutes)	Integrity (minutes)	Insulation (minutes)
i.	FD 30	30	NA	30	30
ii.	FD 45	45	NA	45	30
iii.	FD 60	60	NA	60	30
iv.	FD 90	90	NA	90	30
v.	FD 120	120	NA	120	30
vi.	FD 180	180	NA	180	30
vii.	FD 240	240	NA	240	30

5.2 Insulated door

5.2.1 Insulated doors shall be tested for both integrity and insulation and designated accordingly. For example, if a door has passed 120 minutes of integrity and 30 min of insulation, then it is designated as 'FD 120 with 30 minutes of insulation'.

5.2.2 The provision of this standard requires any insulated fire door to have a minimum insulation fire resistance period of 30 min.

5.3 Uninsulated door

5.3.1 A door tested for fire rating of integrity only and not requiring any minimum insulation shall be considered as an uninsulated door.

5.3.2 The door shall be designated accordingly. For example, if a door has passed 120 minutes of integrity alone and no insulation or for insulation less than 30 min, it is designated as 'FD 120'.

5.4 Maximum fire rating (integrity) for hinged-type doors is 180 min and for roller shutters, 240 min.

5.4.1 The fire door label shall indicate whether the door is insulated or uninsulated, and it shall display the ratings for both integrity and insulation, along with the manufacturer's details and door classification (see Clause 7).

5.4.2 The testing procedure shall be as given in Clause 4.

6 Vision panel on fire doors for fire resistance

6.1 Fire doors can be fitted with a glazed vision panel. However, vision panels are sensitive to the substrate into which they are fitted. The vision panel should only be cut into doors that are designed to receive apertures.

6.1.1 The vision panel should therefore only be fitted into a fire door under the control of the fire door manufacturer. Apertures should not be cut on-site.

6.1.2 The glass should not exceed in area or any of the dimensions of that previously tested specimen (perimeter or square metre).

6.2 Maximum allowed size for a vision pane (glass) or panel is 0.12 m² for an uninsulated door.

6.2.1 For insulated doors, the maximum glass shall not exceed more than 0.06 m².

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6.2.2 The glazing material (glass) shall remain clear fire rated for the entire duration of intended test (for integrity) of the door assembly.

6.2.3 Wired glass shall not be used as a vision panel; also, inter-layered glass or laminated gel glass that becomes opaque and affects visibility shall not be used.

6.3 Wherever the user/application requires a larger vision panel, the overall glass area can be increased by up to 15 % of the door leaf size, provided the door has been tested with a larger glass. Such an increase is not applicable for any insulated door.

6.3.1 Each glazing unit shall be identified with a label of the glass manufacturer with the intended rating. The label shall be visible after installation.

NOTE Apertures other than those used for vision panel should be discussed by the purchaser with the fire door manufacturer.

7 Types of fire doors

7.1 Fire doors shall be of the following types:

- a) fire rated hinged doors (metallic);
- b) fire rated roller shutter (metallic);
- c) fire rated sliding doors (metallic); and
- d) fire rated hinged doors (wooden composite).

7.2 Fire rated hinged doors (metallic)

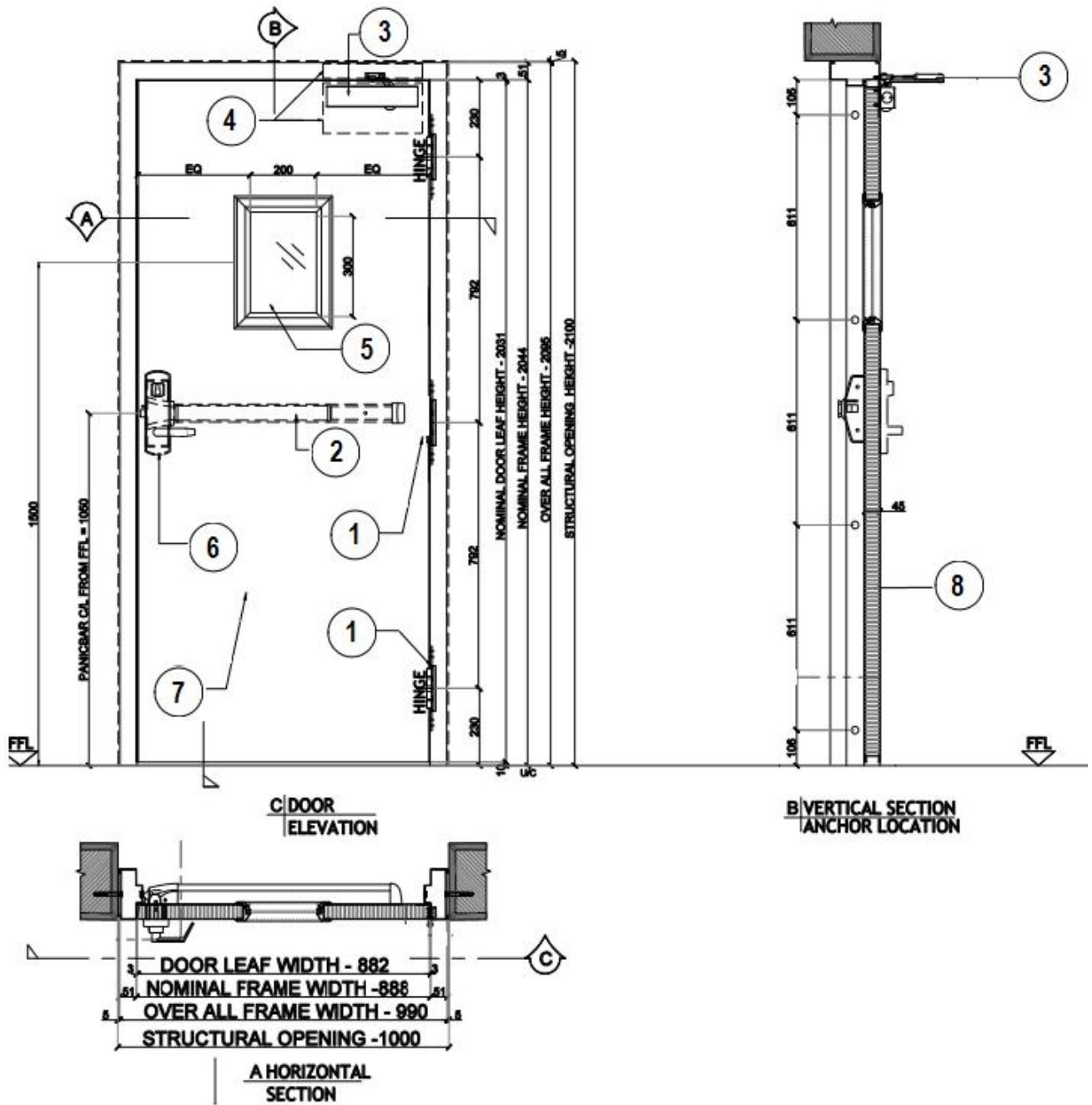


Figure 1 a) — Single leaf door

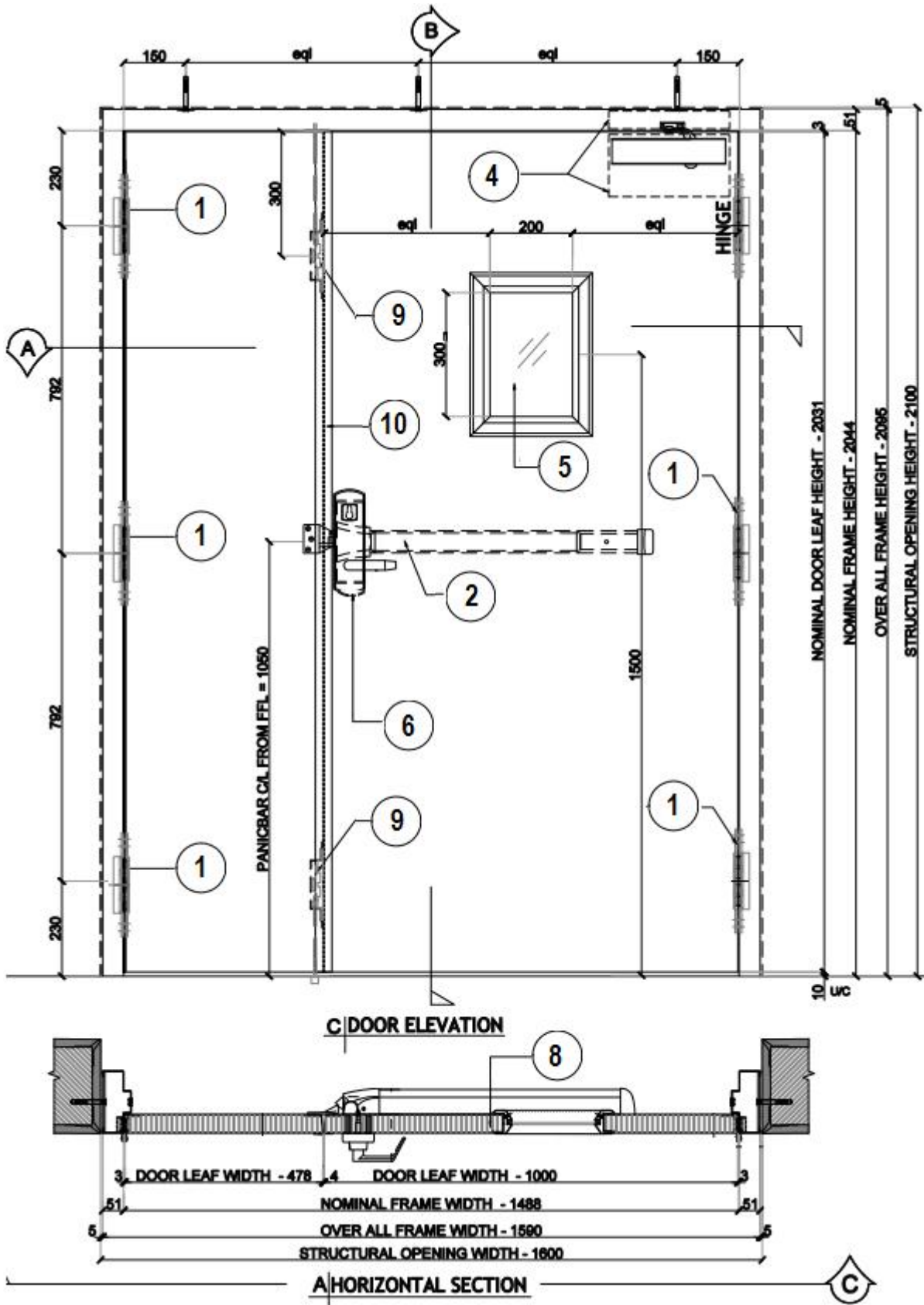
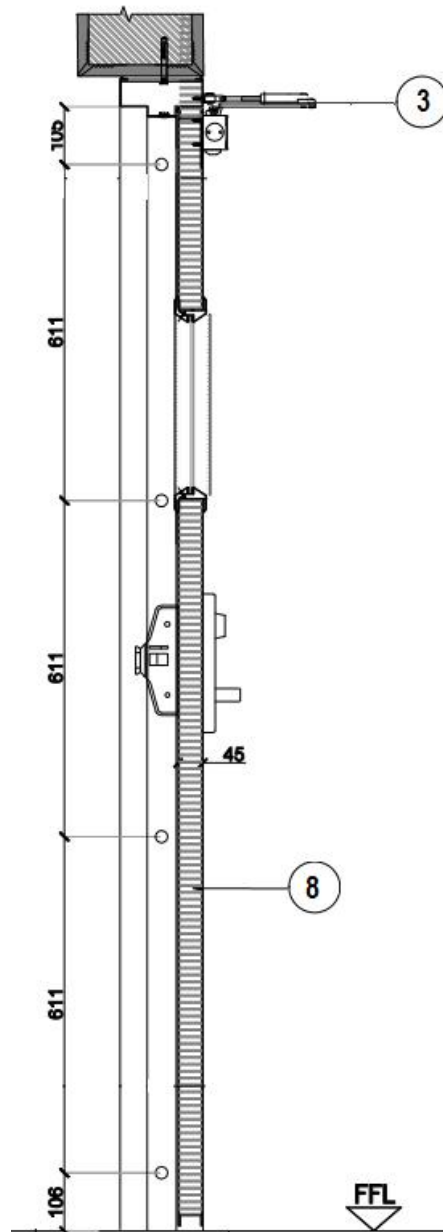


Figure 1 b) — Double leaf fire rated hinged door



B VERTICAL SECTION
ANCHOR LOCATION

Figure 1 c) — Section B-B

Table 2 —

S/N	Tag
i.	Hinge
ii.	Panic bar
iii.	Door closer
iv.	Door closer reinforcement

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S/N	Tag
v.	Vision panel (fire rated)
vi.	Door lock
vii.	Door leaf
viii.	Infill material
ix.	Flush bolt
x.	Astragal

This covers all types of fire rated hinged doors (both insulated and uninsulated) which are metallic (also known as the hollow metal door or sandwiched panel door). The overall specification covers;

- a) materials;
- b) sizes;
- c) general construction requirements;
- d) design; and
- e) finishing of standard steel fire doors and frames.

It is intended to define standard items not subject to variations. The products defined herein should have demonstrated successful performance to establish.

7.2.1 Material

7.2.1.1 Zinc coated steel shall be of the alloyed type and shall conform to KS ISO 3575. The coating weight shall meet or exceed the minimum requirements for coatings of 120 g/m², total of both sides.

7.2.1.2 When zinc coated steel is specified for anchors and accessories, and electrolytic alloy-deposited zinc-coated steel shall be provided.

7.2.1.3 Materials like embossed design, grained steel design can be used as fire doors for better aesthetics, duly covered under galvanized material. Surface interior finishes on the doors, if any, shall not compromise the construction integrity of the doors.

7.2.1.4 Alternative materials like stainless steel or laminated steel may be used in fire doors when tested and comply with all requirements of this standard.

7.2.1.5 Test certificates for galvanized steel shall not be used for stainless steel doors and vice versa, as the composition of material changes, and so does the performance of the door.

7.2.2 Sizes

7.2.2.1 The maximum doorway opening size for any hinged fire door compartment shall not exceed 7.2 m² with the maximum permissible width of 2.4 m and height of 3.0 m.

NOTE The maximum area of the door can be increased for a specific requirement as mutually agreed to between the parties. This will be based on the clause of the field of direct application. However, the same shall not be applicable for insulated doors.

7.2.3 Construction

7.2.3.1 Construction shall be of the type of fire door and frame assembly that has been investigated and successfully fire tested in accordance with this standard.

7.2.3.2 The assembly shall be identified by label(s) and/or an approved identification marking of the certification agency accepted by the competent authority.

7.2.3.3 The door label shall indicate the applicable fire test rating for the door construction furnished, as per 5.

7.2.4 Fire door frames

7.2.4.1 Fire door frames are affected by the fire resistance ratings that apply to doors. There is no fire rating for a basic fire door frame unless the labeling on the frame specifically states that the frame is rated for fire rating as a complete assembly, including door leaf and hardware. Steel sheet thickness is as highlighted in table 2.

Table 3 — Steel sheet thickness for frames

Frame depth (mm)	Steel sheet thickness (mm)
150	1.2
>150	1.6

NOTE 1 Higher thickness of material can be used.
NOTE 2 Maximum depth of fire rated frame shall not be more than 350 mm.

7.2.4.1 Door frames shall have a grooved profile with provision for a smoke seal in either single rebate or double rebate, with or without architrave, all tested as an assembly.

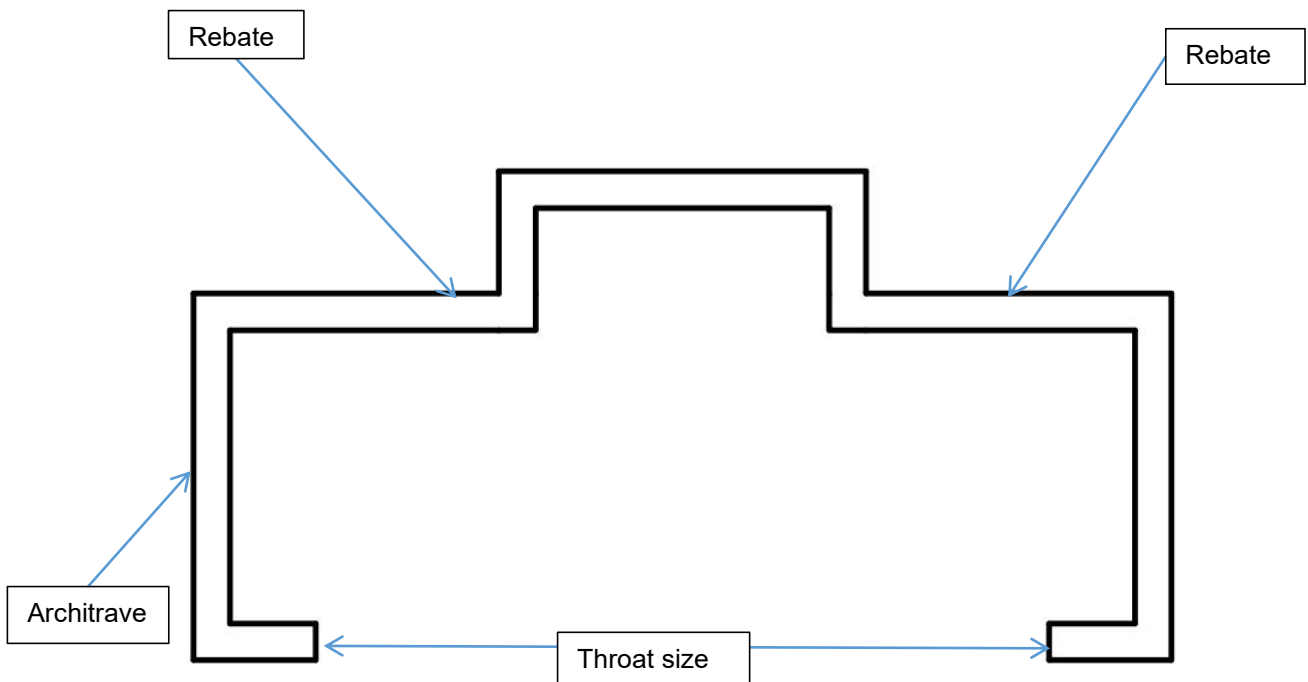


Figure 2 — Frame

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7.2.4.2 Any change in the frame design shall be either confirmed by third-party certification and approval as per the requirement or by a new type test, depending upon the approval of the authority under whose jurisdiction the product may be used.

7.2.4.3 Frame design and construction shall be as per the tested specimen both for single and double rebate profile. Frames can be supplied in butt, mitered or welded assembly, with proper reinforcement and protection for taking required hinges, locks and strike plates, including door closers.

7.2.4.4 Fire rated EPDM (ethylene propylene diene monomers) or suitable fire rated gaskets are required for doors to control the spread of smoke. A bottom seal may not be required for smoke and draft control assemblies.

NOTE 1 If there is any other combination, the entire assembly needs to be tested.

NOTE 2 Fire rated door assembly tested with 1.2 mm thick steel frames can be manufactured with increased sheet thickness of the specimen tested to meet the durability and operational requirements.

For example, if a 1.2 mm frame is tested and approved, the use of a higher thickness, 1.6 mm, can be acceptable, without any additional test. However, reducing the sheet thickness of the tested specimen sample to meet any specific requirement shall not be permitted. Similarly, by increasing the sheet thickness, the manufacturer shall not exceed the size (width/height) or intended duration of the specimen tested.

7.2.5 Door leaf

7.2.5.1 There are various constructions used for the manufacture of fire doors. These can be used in a number of configurations, which vary from single leaf and double leaf single swing, with a possible option for storey-height door-sets using transoms or flush-over panels. It is important to note that doors tested in one configuration might not be suitable for another configuration.

7.2.5.1.1 Single skin door leaf shall not be used as a fire door. Doors tested with single skin shall not be part of this standard.

7.2.5.1.2 The maximum door leaf width for single leaf shall not exceed 1 250 mm in width and the provision of maximum door width and door height shall be in line with the sizes as mentioned in 7.2.2. The door leaf thickness is as in Table 3.

Table 4 — Steel sheet thickness for door leaf

Fire door rating (min)	Steel sheet thickness (mm)
FD 60	0.8
FD 120 and above	1.2

NOTE Above are applicable provided they satisfy the requirement of fire door testing.

7.2.5.2 The infill material used shall be resin-bonded. Materials like resin-bonded honeycomb paper core, mineral wool, ceramic wool and proprietary material may be used as infill, provided they satisfy the requirement of fire door rating. Polyurethane foam (PUF) as an infill material for fire doors shall not be permitted.

7.2.5.2.1 The performance of the door varies based on the infill material and hence interchanging the infill material to satisfy the requirement shall not be permitted without carrying out additional tests. Doors shall be tested for different categories as insulated and uninsulated doors.

7.2.5.3 The maximum allowable limit for the bottom undercut of the door shall not be more than 19 mm for doors fixed on the floor. In case of a door fixed on sill (where the bottom of the door is above the floor level, say by 100 mm and above), the undercut should not be more than 9 mm. The maximum undercut a door manufacturer can provide shall be based on the test evidence.

7.2.5.4 The internal construction of the door shall be provided with rigid reinforcement in addition to the core. All double leaf fire door assembly shall be provided with and tested with astragals to ensure compatibility with actual fire performance.

7.2.6 Vision panel

7.2.6.1 The provision of glazing and glazing material should be in line with the maximum permissible limit outlined in Clause 6 and Table 4. The hourly rating of the door dictates the type of door and the maximum size of the vision panels used on the door. The position of the vision panel to be located at least 1300 mm from the base frame from the bottom.

Table 5 — Dimensions for vision panel

S/N	Type of door	Maximum width mm	Maximum height mm	Maximum area m²
i.	Uninsulated door	400 (height 300)	800 (width 150)	0.12
ii.	Insulated door	200 (height 300)	400 (width 150)	0.06

7.2.7 Louvers

7.2.7.1 Fire rated louvers can be used on fire doors subject to the same have been tested as a complete assembly on a fire door and labeled. It can be used and shall not exceed maximum area of 0.135 m², maximum width of 300 mm and maximum height of 450 mm.

7.2.7.2 Doors with glass lights, or doors equipped with fire exit devices may not have louvers.

7.2.7.3 All louvered fire rated doors shall have label indicating the size of the louvers and the test certificate reference of the louver’s manufacturer.

7.2.8 Builder’s hardware

7.2.8.1 All hardware used on fire doors shall be fire rated, and certified except for hinges, if it is of minimum size 100 mm × 75 mm × 3 mm and in stainless steel of grade SS 304 and above. Similarly, pull handles may not require specific fire rating if it is in stainless steel of grade SS 304 and above.

7.2.8.1.1 All other mechanical and functional hardware like, locks, panic devices, lever handles, door closers, shall be type tested and certified for use on fire doors for specified rating and need not necessarily part of specimen testing as detailed in 4.1.

7.2.8.1.2 Third-party certified products from an approved certification body may be used as a component if it satisfies the requirements for use on fire door. Individual test certificate for hardware shall be obtained from the approved test agency or copy of type test carried out by the manufacturer not earlier than five years may be submitted.

NOTE All hardware shall carry an appropriate label as per best practices for fire rating, and the test certificates shall be made available for evaluation by the competent authority.

7.2.8.2 Products which are not covered under Kenya Standards may be used on fire doors provided the same are type tested or used on a specimen door and certified for use on fire doors with the respective fire rating. Since the nature of hardware is based on application and function, the certified products can be used on fire doors as long as they satisfy the requirements of intended fire rating.

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7.2.8.3 The provision of latched and unlatched doors applies to all fire doors without any modification of the standard requirement. If the door is tested in the latched condition with lever handle, then the manufacturer shall supply the doors only in the latched condition. Use of dead lock (without latch, only cylinder operated) on fire doors is allowed, subject to the door being tested in an unlatched condition, wherein the door is held in position with the pressure of the door closer. Shaft locks shall be type tested for fire door application, as they may not be cylinder-operated.

NOTE The hardware includes hinges, locks and latches (lever operated), lever handles, exit devices, door closers (concealed and surface mounted), flush bolts (mechanical or automatic), seals and thresholds. In addition, it shall also include all electrified hardware like electric strike, magnetic locks and motorized locks, and closing devices.

7.2.8.4 The fire doors and hardware shall have proper certification. The following hardware shall have labels, without which the fire door shall not carry any label of certification:

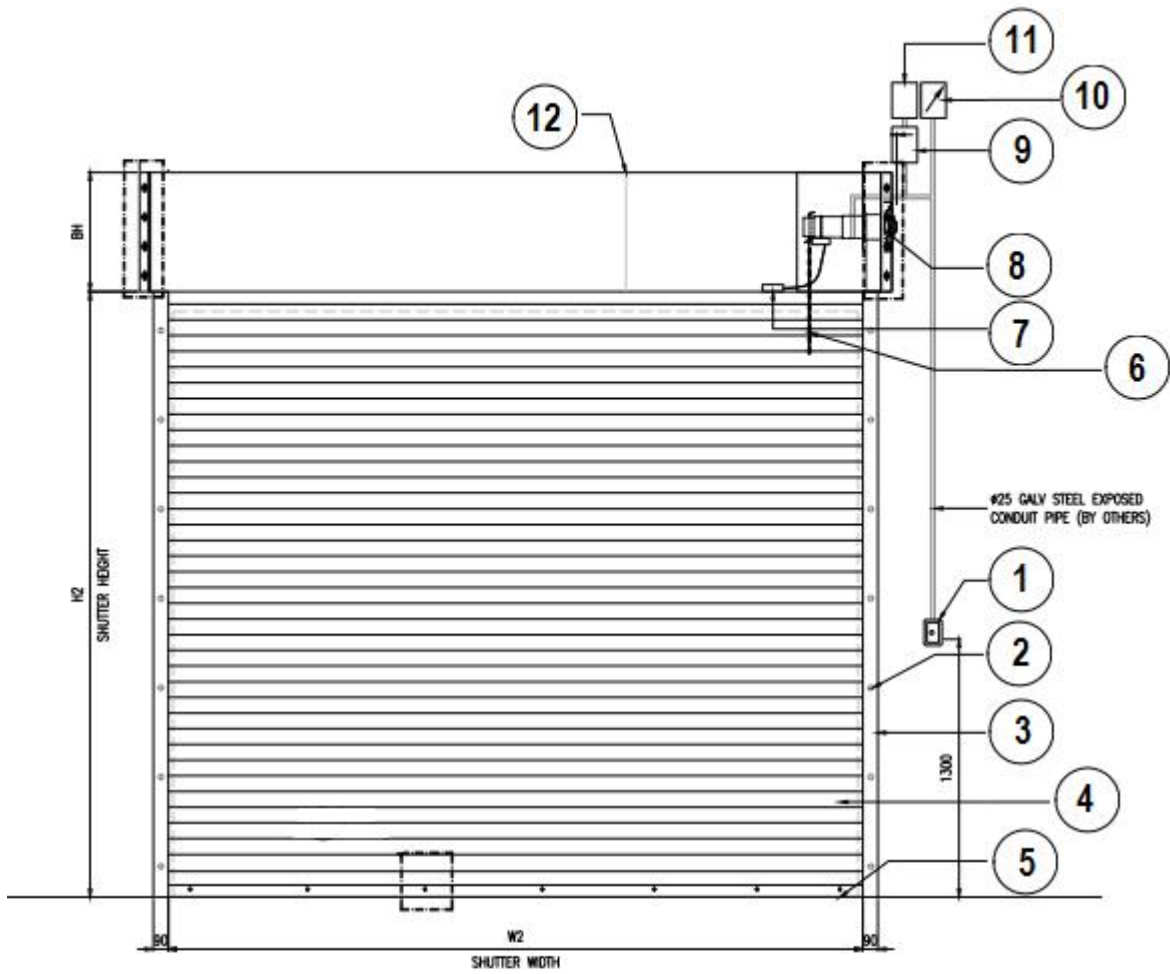
- a) Locks, latches and dead bolts — Visible label of certification on lock for end for fire rating along with proper certification.
- b) Emergency exit devices (panic devices) — Visible label of certification on the panic devices with proper certification. Towards the use of panic devices, the same is allowed as projections in clear width of the door(s).
- c) Door closers — Visible label of certification on the door closer body (does not include covers). Mechanical hold-open units are not allowed on fire rated doors.
- d) All fire doors shall be equipped with proper EPDM smoke seals to limit the spread of smoke. Other seals like door bottoms, surface mounted and perimeter seals can be used in addition to smoke seals, subject to the requirement or for acoustic doors.
- e) All hardware — Visible label of certification on all accessories which are directly related to the performance rating of fire doors.
- f) Door eye viewer shall be fire rated to the same rating as of the door but limited to 60 min for fire doors of rating above 60 min. The maximum size of the hole shall not be more than 19 mm, factory prepared for receiving the hardware. No modification shall be carried out at site.
- g) Signs can be fixed on the door by using adhesives and the overall size of the signage shall not be more than 5 % of the face of the fire door leaf on which it is attached.
- h) Where the hardware does not come with certified label like electrified hold open devices, door coordinators or stops, then the same has to be certified by the manufacturer of hardware for suitability on use of fire doors with relevant type test certificates.
- i) Door holder/release devices for swinging doors should, wherever 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 permitted to 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.
- j) Fire door shall not have the following hardware;
 - i. Tower bolts;
 - ii. Aldrops;
 - iii. Slide bolts; and
 - iv. Chains with pad locks.
- k) Fire doors shall carry dead bolts (cylinder operated), if the door is tested only in unlatched condition.
- l) Wherever electrified hardware is used, the fire door shall carry electrical conduits inside the door leaf and power transfer between the frame and door leaf for secure transfer of wires.
- m) All fire doors once installed shall be self-closing and all hold open devices shall be electrified and should be actuated by active fire alarm system, in case of an emergency.

- n) All double leaf doors shall have concealed lever action flush bolts on top and bottom of the inactive leaf (except panic device door). If the door height is more than 2 100 mm, then the flush bolt shall be with extended rod. Automatic flush bolts can be used as an alternative to a mechanical flush bolt, if a door coordinator is used.
- o) Single-leaf doors can have single point panic device or two point panic device on the door based on the architectural requirement. However, for a double leaf door only the following combination is allowed:
 - i. One single-point latch on the active leaf and one number panic device with vertical shoot bolt on top and bottom on the inactive leaf.
 - ii. One number of each panic device with vertical shoot bolt on both top and bottom on active and inactive leaf.
 - iii. Panic bolts without bottom rod is not allowed on fire doors unless the same has been tested and approved on a assembly of doors.
 - iv. If the width of the inactive leaf is less than 450 mm, then, one panic device may be allowed. However, the inactive leaf shall still have lever action flush bolts both on top and bottom.
 - v. All double doors with electromechanical/electrical devices and/or panic device shall be equipped with door coordinator demonstrating the sequence of closing when opened together at the time of fire approval.
 - vi. Electrified panic device can be used if security is a concern. Security hardware used shall be in fail-safe mode in case of an emergency.
- p) Electromagnetic locks and electrified security locks can be used on all fire doors in combination with other hardware like latches, panic devices provided they are of fail-safe type. Fail secure type cannot be used on any escape routes and exit pathways.

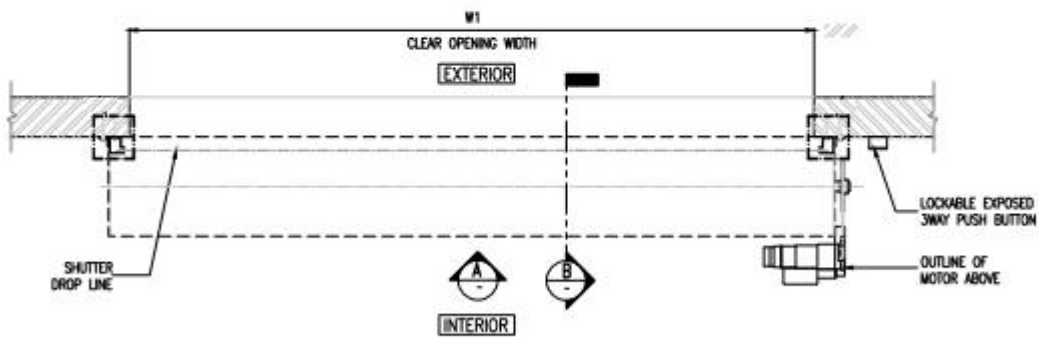
Any further requirements of hardware can be based on the standard for architectural hardware or as per international standard(s).

7.3 Fire rated roller shutters (metallic)

The provisions of this standard cover all types of automatic roller shutters (motorized with fusible link) which are tested for fire rating and intended use of the compartmentalization of structural opening. It includes the use of sensors and automation devices including motors to suit various construction requirements. The average closing speed of fire-rated roller shutters shall be 50 mm/s to 100 mm/s.



A INTERNAL ELEVATION - FIRE RATED ROLLER SHUTTER



01 PLAN - FIRE RATED ROLLER SHUTTER

Figure 3 a) — Component parts of fire-rated roller shutter (metallic) (plan and elevation view)

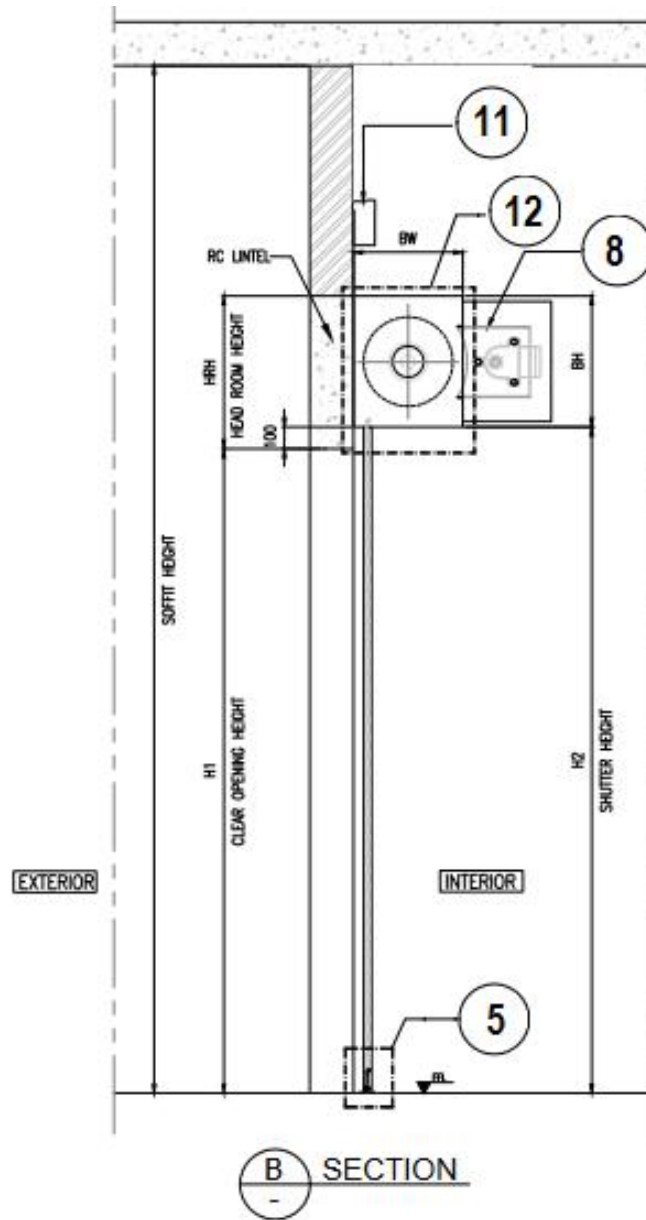


Figure .3 b) — Metallic roller shutter – (cross section)

Table -6 — Parts

S/N	Tag
i.	Loackable exposed push bar
ii.	Capping for guide fixing holes
iii.	Guide rail
iv.	Slat
v.	Bottom bar with bottom weather seal
vi.	Manual override hand chain
vii.	Thermal fusible link
viii.	Motor
ix.	Fire alarm conversion panel

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S/N	Tag
x.	Electric isolator
xi.	Fire alarm signal
xii.	Shutter box

7.3.1 Material

7.3.1.1 Zinc coated steel shall be of the alloyed type and shall conform to KS ISO 3575. The coating weight shall meet or exceed the minimum requirements for coatings of 120 g/m², total of both sides.

7.3.1.2 When zinc coated steel is specified for guide, rail, bottom bar and accessories, and electrolytic alloy-deposited zinc-coated steel shall be provided.

7.3.1.3 Alternative materials like stainless steel or laminated steel may be used in fire doors when tested and comply with all requirements of this standard.

7.3.1.4 Test certificates for galvanized steel shall not be used for stainless steel doors and vice versa, as the composition of material changes, and so does the performance of the door.

7.3.2 Size

7.3.2.1 Fire rated roller shutter shall suit the structural opening size of a maximum 24 m² for a given opening. The maximum width shall not be more than 6 m, and the maximum height shall not be more than 6 m. The sizes are measured for the clear structural opening width and height of the wall or steel structure.

NOTE The maximum area of the shutter can be increased for a specific requirement as mutually agreed to between the parties.

7.3.3 Construction

7.3.3.1 Roller shutter

7.3.3.1.1 The roller shutter shall be formed of rolled steel of not less than 0.8 mm or 1.2 mm, and 1.6 mm in thickness based on the intended fire rating. Each slat shall be provided on both edges with curls to form an interlocking hinge extending the full width of the roller shutter; the centre of interlock shall be not less than 45 mm or more than 75 mm (nor more than 125 mm if the slats are thicker in mm), and the bridge depth shall be not less than 10 mm. The roller shutter shall extend at least 50 mm into the channel guides.

The roller shutter shall be secured to the barrel by either of the following methods:

- a) Rings or collars of MS or GI as per ISO 3008-1, not less than three in number, shall be scarves or bolted to the barrel and fixed at centres not exceeding 0.50 m. A flat steel bar at least 25 mm × 6 mm shall be attached to the rings or collars, and the top slat shall be attached to the bar by screws or bolts not less than 8 mm in diameter spaced not more than 300 mm apart; or
- b) Chains shall be of mild steel not less than 1 mm × 12 mm thick and 40 mm wide, each link being formed of at least three layers of strip riveted together with two 3 mm rivets. The links shall be coupled by means of mild steel pins not less than 3 mm in thickness. Each chain shall be attached to the barrel by screws not less than 8 mm in diameter spaced not more than 300 mm apart, and shall be riveted to the top slat of the roller shutter by at least two rivets not less than 5 mm in diameter, through the connecting link.

7.3.3.1.2 The roller shutter shall be of such a length as to extend from the floor of the opening to the top of the barrel and then round at least a quarter of the circumference of the barrel before fixing to it.

7.3.3.2 End lock

7.3.3.2.1 The end lock shall be constructed of steel not less than 3 mm thick, fitted at each end of each slat and welded or riveted thereto with two tinned or black iron rivets not less than 3 mm diameter.

7.3.3.2.2 The end locks shall be so designed as to fit the contour of the roller shutter slats and fill the channel guides as closely as possible, consistent with the movement of the roller shutter.

7.3.3.3 Bottom bar/rail

7.3.3.3.1 The bottom bar/rail of the roller shutter shall be of T-bar not less than 100 mm and the bottom bar may be built up of two mild steel angles, each not less than 50 mm × 50 mm × 3 mm, one angle to be provided on each side of the bottom slat of the roller shutter, and both angles to be securely bolted or riveted to the roller shutter as described before. The roller shutter shall extend to a minimum depth of 35 mm between the angles or plate and T. Spot welding at a maximum of 300 mm centres, instead of bolting or riveting, may also be suitably adopted.

7.3.3.3.2 The bottom bar/rail shall extend to the full width of the roller shutter except for that portion necessary for housing within the channel guides, and shall make close contact with the sill when the shutter is closed.

7.3.3.4 Guides

7.3.3.4.1 The roller shutter shall move in channel guides constructed of galvanized steel or cold-rolled steel not less than 3 mm thick extending continuously from within the barrel enclosure to within a distance of not more than 30 mm and not less than 20 mm from the floor of the opening. The guides shall be of a depth sufficient to allow the roller shutter to extend at least 50 mm to 65 mm into the guides based on the size.

7.3.3.5 Brackets, supporting axle, and roller

7.3.3.5.1 The brackets shall be of steel and shall be of enclosed type, arranged to support the bearings of the axle, and shall be of sufficient size to close completely the ends of the barrel enclosure.

7.3.3.6 Barrel and axle

7.3.3.6.1 The barrel shall be of a mild steel tube not less than 80 mm outside diameter and not less than 3 mm in thickness, mounted on a mild steel axle not less than 25 mm in diameter, the axle shall extend the full length of the barrel with a minimum bearing of 25 mm at each end. The barrel shall enclose helical steel springs for counter-balancing the roller shutter with or without counterbalancing.

7.3.3.6.2 The barrel shall be mounted on rigid or self-aligning ball bearings and be fitted with a spring charging device to enable the spring to be adjusted after the roller shutter is in position.

7.3.3.7 Barrel enclosure

7.3.3.7.1 The barrel shall be completely enclosed with steel pressed casing in an angular or square shape. This should also cover the motor. The thickness of the cover shall be minimum 1.2 mm.

7.3.3.8 Chains

7.3.3.8.1 Chains shall be provided instead of handles or angles. The same should be hanging up to a height of 1.0 m from the floor level. This is mandatory for the roller shutters in case of an emergency or any power failure.

7.3.4 General requirement of fire rated roller shutter

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- a) It should be fire rated for minimum 60 min and maximum 240 min.
- b) Power operated fire roller shutter are those that normally are opened or closed by power. They shall be permitted to be furnished with a sensor that causes the door closer to stop or reverse upon contact with an obstruction under normal conditions.
- c) An automatic closing device (motorized) shall be installed on every roller shutter.
- d) Roller shutters shall close automatically upon activation of fire alarm system or release of a fusible link.
- e) The automatic closing mechanism shall be enclosed in a metal housing to protect the mechanism from debris and ensure operation in the event of fire.

7.3.5 Operator

7.3.5.1 The operator shall be of minimum following specification:

- a) Operator/motor of 220 V, 50 Hz single phase type for shutter size up to 5 000 mm × 5 000 mm; and if the size of the roller shutter is more than the above mentioned size, then the operator shall be of 415 V, 50 Hz, 3 phase. It should be provided along with additional accessories like, one unit push button switch (up, stop, down), and have IP 65 rating.
- b) Motor capacity — 1 H.P., for sizes less than 5 000 mm × 5 000 mm, 3 H.P., for sizes above 5,000 mm × 5 000 mm.
- c) Current rating — 5 Amp for sizes less than 5 000 mm × 5 000 mm, 9 Amp for sizes above 5,000 mm × 5 000 mm,

7.3.5.2 Additional accessories for fire operation fusible link and 24 V solenoid release, including fire alarm backup panel.

7.3.6 Hardware

7.3.6.1 All hardware used on roller shutter shall be fire rated, and certified, and for galvanized steel. Similarly, pull handles may not require specific fire rating if it is in galvanized steel.

7.3.6.1.1 All other mechanical and functional hardware shall be type tested and certified for use on roller shutter for specified rating and need not necessarily part of specimen testing as detailed in 4.1.

7.3.6.1.2 Third-party certified products from an approved certification body may be used as a component if it satisfies the requirements for use on fire door. Individual test certificate for hardware shall be obtained from the approved test agency or copy of type test carried out by the manufacturer not earlier than five years may be submitted.

NOTE All hardware shall carry an appropriate label as per best practices for fire rating, and the test certificates shall be made available for evaluation by the competent authority.

7.3.6.2 Products which are not covered under the Kenya Standards may be used on roller shutter provided the same are type tested or used on a specimen roller shutter and certified for use on roller shutter with the respective fire rating. Since the nature of hardware is based on application and function, the certified products can be used on roller shutter as long as they satisfy the requirements of intended fire rating.

7.3.6.3 The shutter manufacturer shall ascertain the use of particular hardware with proper certification. If the roller shutter manufacturer is not supplying hardware as part of the assembly, then the door shall be construed as non-fire rated and shall not be acceptable to authorities having jurisdiction. The standard makes it mandatory on the door manufacturer to supply the hardware along with glazing material as a complete system, so that there is no scope of deviation in the functionality and performance of the product. The following hardware shall have labels, without which the fire door shall not carry any label of certification:

- a) All hardware — Visible label of certification on all accessories which are directly related to the performance rating of fire doors.

- b) Signs can be fixed on the shutter by using adhesives and the overall size of the signage shall not be more than 5 % of the face of the fire door leaf on which it is attached.
- c) Where the hardware does not come with certified label like electrified hold open devices, door coordinators or stops, then the same has to be certified by the manufacturer of hardware for suitability on use of fire doors with relevant type test certificates.
- d) Wherever electrified hardware is used, the fire door shall carry electrical conduits inside the door leaf and power transfer between the frame and door leaf for secure transfer of wires.
- e) Electrified panic device can be used if security is a concern. Security hardware used shall be in fail-safe mode in case of an emergency.

Any further requirements of hardware can be based on the standard for architectural hardware or as per international standard(s)

7.4 Fire rated sliding door (metallic)

The requirements of the fire rated sliding door including automated sliding door with telescopic sealing arrangement, horizontal single or double (bi-parting) are given hereunder. Doors shall be equipped with self-closing or automatic closing devices which are heat-actuated to ensure that they shall close or be closed at the time of a fire. Closing devices shall be:

- a) A system of weights or
- b) A certified closing device.

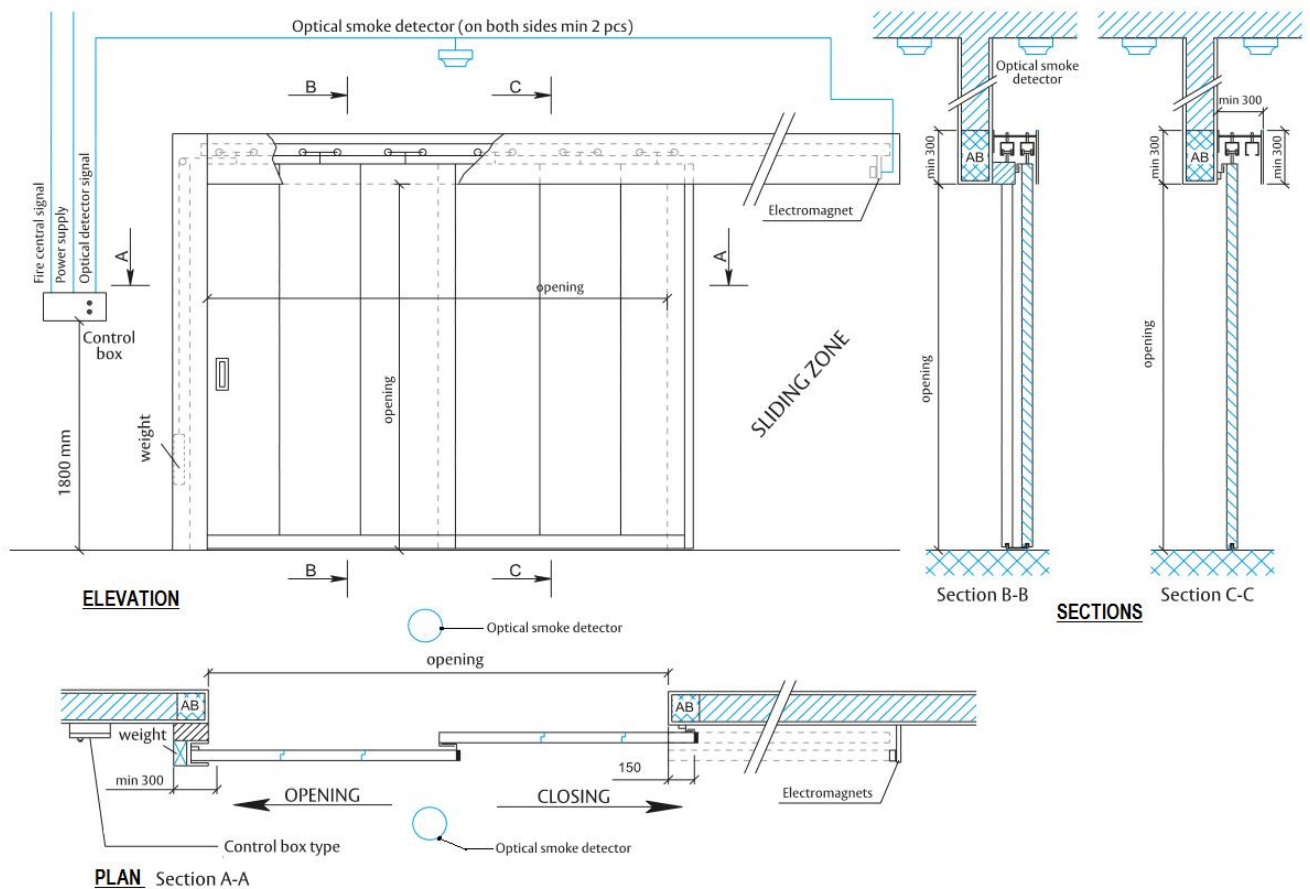


Figure 4 — Fire-rated sliding door (system of weights)

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Automatic closing doors shall not have a delay of more than 10 s in the initiation of closing or reclosing.

7.4.1 Material

7.4.1.1 When specified, hot dipped zinc coated galvanized steel shall be of the alloyed type and comply with KS ISO 3575. Metallic coating by hot-dip process, zinc-coating or zinc-iron alloy-coating (galvanizing) using hot-dip process may also be used. The weight of coating shall meet or exceed the minimum requirement of 122 g/m² total for both sides.

7.4.2 Sizes

7.4.2.1 The maximum size of the opening shall be limited to 48 m² and the maximum permissible wall width shall be 8.0 m and wall height shall be 6.0 m. For opening heights above 6.0 m, the manufacturer shall provide relevant certificate of approval. The maximum fire rating for the door shall be 120 min.

7.4.3 Construction of sliding door leaf

7.4.3.1 Sliding door leaf

7.4.3.1.1 Flush, fully bonded door with groove/spring element connection of galvanized steel sheet of minimum 0.75 mm thickness without primer-coating shall be used. Thickness of each element shall be minimum 72 mm with the panel depth varying between 230 mm to 1 550 mm each. They shall be connected at the factory or in strict supervision at the site by internal threaded rods. The maximum individual panel weight should not be more than 180 kg with 30 min insulation for both 90 min and 120 min integrity fire doors.

7.4.3.1.2 The system shall be supported by hydraulic soft stop for continuously adjustable closing speed of 0.08 m/s to 0.2 m/s which is invisibly integrated into the weight box. Grip handle and recessed handle shall be provided for manual operation. Integrated floor guide roller with ball-bearing shall be provided for smooth operation. Integrated guidance damper for single-leaf doors and surface-mounted guidance damper bracket for double-leaf doors shall also be provided.

7.4.3.1.3 The box track shall be cold-rolled, galvanized C-profile with three-way adjustable suspension brackets and bolt plug-in connection for a precise track joint. Track wall connection profile may be used to compensate for any irregularities in the wall. Two set of galvanized pairs of rollers with ball bearings per panel shall be provided. Box track should be clad with galvanized sheet steel cover.

7.4.3.1.4 Unless tested otherwise, doors shall lap the openings at least 102 mm at the sides and top. Where doors provide protection of openings located in walls above floor level and no projection sill is provided, the doors shall lap the bottom of the opening at least 102 mm.

7.4.3.1.5 Attachment of the door assembly to the wall shall be by means of through-wall bolts.

7.4.3.1.6 As an alternate, expansion anchors shall be permitted to be used in concrete, brick, or filled concrete masonry unit walls if the requirements in 7.6 are met.

7.4.4 General requirement of fire rated sliding door

7.4.4.1 Closing devices

7.4.4.1.1 Fire rated sliding doors shall be equipped with self-closing or automatic door closing devices to ensure that they shall close or be closed at the time of a fire. Closing devices shall be a system of weights or a certified closing device. Automatic closing doors shall not have a delay of more than 10 s in the initiation of closing or reclosing.

7.4.4.1.2 The average closing speed shall be not less 152 mm/s, not including any initial delay time. The average closing speed for doors used in buildings where access by the general public is not restricted, shall be not more than 610 mm/s.

7.4.4.2 Releasing devices

7.4.4.2.1 Power operated doors not equipped with standby or emergency power shall be equipped with an integral or a separate labeled releasing device that shall automatically disconnect the door from the control of the power operator at the time of a fire.

7.4.4.2.1.1 The releasing device shall be activated at the time of the 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 shall allow the door to be disconnected and closed. If closing is achieved by power operation, standby or emergency power shall be provided.

7.4.4.2.1.2 The time delay from failure of normal power operation to emergency power operation shall not exceed 10 s.

7.4.4.2.1.3 The standby or emergency power source shall be sufficient to operate a minimum of 50 closing cycles of the door. If door opening also is achieved by power operation, the standby or emergency power source shall be sufficient to operate a minimum of 50 opening and closing cycles of the door.

7.4.4.2.2 Power operation shall not allow opening if temperatures on either side of the door reaches 260 °C.

7.4.4.3 Hardware

7.4.4.3.1 Only hardware certified for use with the door shall be permitted to be used.

7.4.4.3.1.1 Fire door hardware shall include tracks, hangers, track brackets, bumpers, binders, pull handles, stay rollers, centre latch and centre floor stop if required, astragal, and centre binders. Tracks shall be flat, box, angle, J-section, or round. Tracks shall be inclined or level, depending on the manufacturer's procedure.

7.4.4.3.2 The wall bolts shall not be less than 15.8 mm in diameter. The bolt spacing depends on the manufacturer's specific test.

7.4.4.3.2.1 Not less than two hangers shall be provided for each door.

7.4.4.3.2.2 At least two binders shall be required on the vertical jambs, and at least one shall be required at the head.

7.4.4.3.3 Bi-parting sliding doors shall be provided with the sill binders or centre guides if required by individual manufacturers.

7.4.4.3.3.1 Stay rollers shall be installed in an approved manner.

7.4.4.3.3.2 Where doors are power operated, centre-parting doors requiring a centre latch shall be provided with a fusible link arrangement that shall hold the latch in an unlatched position during day-to-day operation while causing the latch to operate and secure the door in the event of a fire.

7.4.4.3.3.3 Handles shall be provided for opening the doors from either side.

7.4.4.3.3.4 If flush pulls are used, they shall not be located back-to-back.

7.5 Fire rated hinged doors (wooden composite)

7.5.1 Material

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7.5.1.1 Timber and timber boards/composite material used in the construction of fire doors shall be of thoroughly seasoned hard wood.

7.5.1.2 The moisture content of any material used in the construction of wooden composite door sets comprises of frame and shutter when used in door set shall not be more than 15 %.

7.5.2 Sizes

7.5.2.1 The maximum door way opening size for any hinged wooden fire door compartment shall not exceed 3.78 m² with the maximum permissible door width shall not be more than 1 800 mm and height of 2 100 m.

7.5.2.2 The door sets shall be factory prepared for all hardware and no work shall be carried out on doors at site.

7.5.3 Construction

7.5.3.1 Door frames should be supplied by the door manufacturer only, with proper certification and test results for the size of the door sets.

7.5.3.2 The maximum rating for a fire door shall generally be 120 min. The options available being:

- a) 30 min wooden composite doorset;
- b) 60 min wooden composite doorset; and
- c) 120 min wooden composite doorset.

7.5.3.3 Suitability of different timber species for door frames shall be checked by the door manufacturer, since some materials are not recommended for door manufacturing.

7.5.3.4 Rating for fire door assemblies are given in min and prefixed by the letters 'FD' that is, FD 30 equates to a 30 min fire door or doorset. The most commonly specified integrity levels are:

- a) FD 30 — 30 min (half an hour);
- b) FD 60 — 60 min (1 h); and
- c) FD 120 — 120 min (2 h).

7.5.3.5 All dedicated fire doors providing a half hour or greater performance are usually fitted with intumescent seals. There are various types of intumescent seals, all of which can react differently. Intumescent seals shall be provided by the fire door manufacturer on all three sides of the door leaf and on the meeting stile of the double leaf door or as per test evidence. Alternatively, the same can be provided on the frame and meeting stile of the double leaf door. It is essential that the intumescent seal to be used is of the same formulation, dimensions and configuration as that in the door manufacturer's fire test report.

7.5.3.5.1 The intumescent fire seal should be encased in a PVC sheath on all four sides and can be of any colour. Intumescent seal provided on the door leaf shall expand in the event of fire closing the gap between the frame and shutter. This should be independent of the smoke seal, which is fixed either in the grooved frame profile or stuck with adhesive on the entire perimeter of the frame.

7.5.3.5.2 The intumescent seal should be of adequate size as per the test sample tested at the laboratory. Usually, a combination of intumescent fire seal and intumescent fire and smoke seal is placed facing each other on all joints. The joints here are referred as:

- a) Frame and shutter facing each other in case of single leaf that is, on both frame and door leaf.
- b) Also at shutter to shutter facing in double leaf that is, on the meeting stile of the double leaf door.

7.5.3.5.3 The intumescent fire seal shall be independent of smoke seal.

7.5.3.5.4 The intumescent seal may not be required at the bottom of the door leaf. Intumescent seals may be visible at the head of the door.

7.5.3.5.5 Intumescent seals shall be minimum 10 mm wide and 4 mm thick for 60 min door and 15 mm wide and 4 mm thick for 120 min door.

7.5.3.6 Inside the door leaf, fire-resistant infill materials such as rock wool, perlite, and fire-resistant door core boards are often used to enhance the fire resistance of the wooden door leaf.

7.5.3.7 Doorsets shall be tested for integrity and insulation, as mentioned earlier.

NOTE 1 All fire doors are required to have a smoke seal and intumescent seal as a standard component of the door assembly.

NOTE 2 There are different types of smoke seals available, and the most appropriate type shall be chosen.

7.5.4 Vision pane

7.5.4.1 Glazing may range from a small vision pane in a door to a glazed screen for maximum light transmission and safety. The same shall not be more than 0.06 m² with the maximum width or height not exceeding 300 mm.

7.5.4.1.1 Ordinary glass cracks when exposed to heat and is liable to fall out fairly early in a fire. Fire resisting clear fire rated glass shall be used for the intended fire rating.

7.5.4.2 The size of the glass and the method of its retention are important factors which influence its integrity.

7.5.4.2.1 As the temperature approaches the softening point, a large sheet will tend to collapse earlier than a smaller one. On the unexposed face, beading retaining the glass is subjected to radiant and conducted heat through the glass and to convection currents at the top of the pane. This can raise the temperature sufficiently to ignite timber beading after about 20 min.

7.5.4.2.3 To delay the ignition of beading to 30 min, it is necessary to provide protection by impregnation of a surface coating or a surface covering of non-combustible material or fit a fire resistant glass secured using a fire resistant glazing systems which hold the glass firmly in place during normal use, but in the event of fire, the intumescent material expands securing and insulating the glass and protecting the surrounding timber.

7.5.4.3 For longer periods of fire protection, an improved retention system for the glazing is needed, the glass pane should be small and the method of fixing it should ensure that no direct path can be created for the transference of hot gases.

7.5.5 Finishing

7.5.5.1 The fire rated wooden doors finishing is very important. The different finishing that can be done are; foil wrap, Lamination or painting among others.

7.5.6 Builder's hardware

7.5.6.1 The provision of latched and unlatched door is applicable on all fire doors without any compromise of the standard requirement.

7.5.6.2 If the door is tested in latched condition with lever handle, then the manufacturer shall supply the doors only in latched condition.

7.5.6.3 Use of dead bolts on fire doors are allowed subject to the door has been tested in unlatched condition.

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7.5.6.4 This shall be in line with the hardware conditions and application as recommended, see 7.2.8.

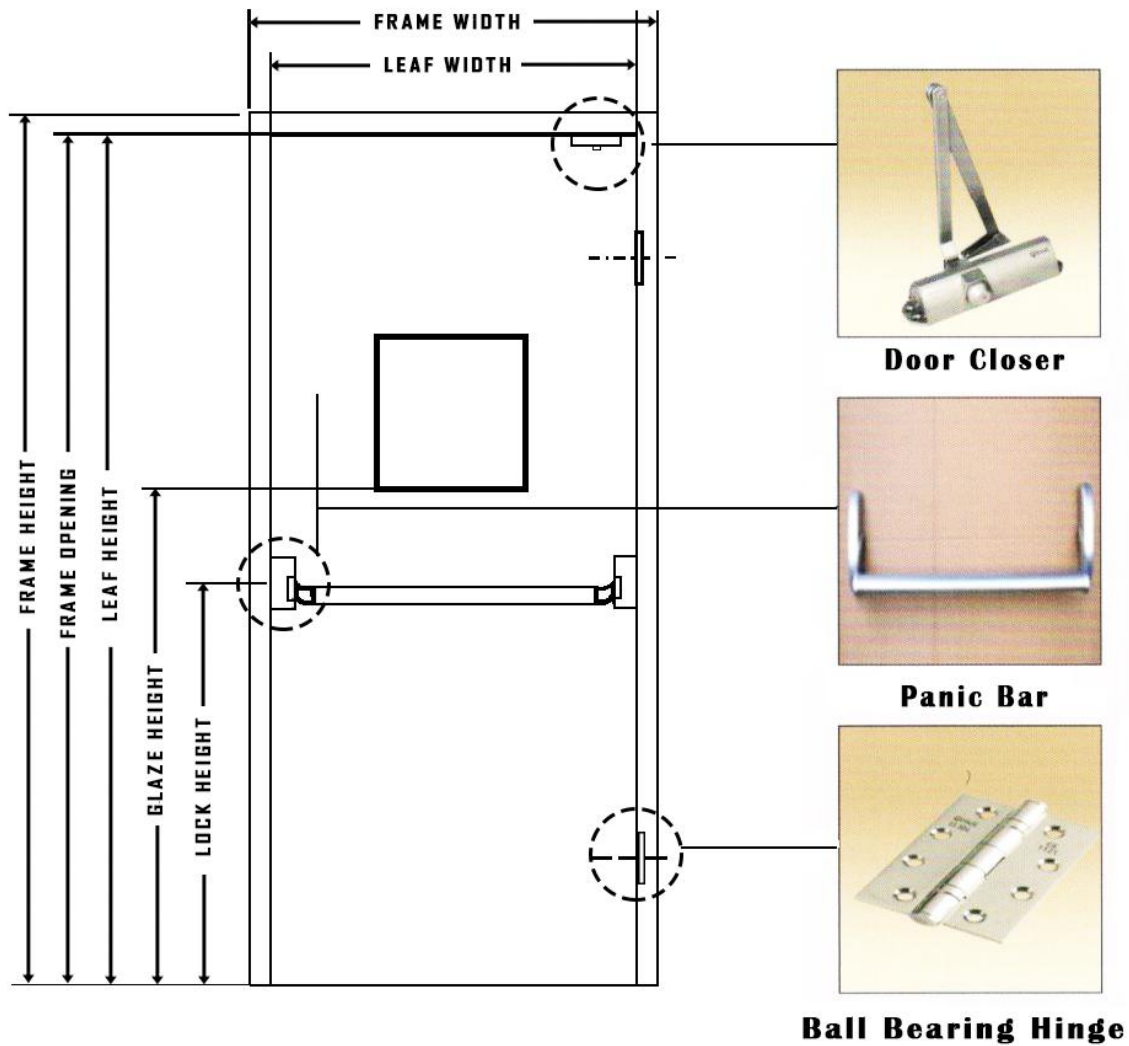


Figure 5 — Typical single leaf fire rated hinged wooden door

7.6 General requirement of fire doors

7.6.1 The fire ratings for 30, 60, 90, 120, 180 min shall be acceptable for evaluation of products and their intended usage and application.

7.6.2 Fire doors shall be classified based on their intended rating.

7.6.2.1 All fire doors shall be classified and labeled for integrity and for insulation as applicable for insulated doors.

7.6.3 All fire doors shall be identified by a label preferably bearing a unique number.

7.6.4 Where the products are tested and certified by any approved laboratory, the label shall specify the name of the agency and the certificate number.

7.6.5 Labels shall be applied in locations that are easily visible and convenient for identification by the competent authority.

7.6.5.1 All components shall be labeled in fire door assembly as required and shall be considered as evidence that specimens of such devices or materials have been evaluated by test(s) and that such devices or material are manufactured under in-plant and follow-up inspection programme.

7.6.6 Specification of items which are generic in nature, such as hinges, locks, lever handles, closing devices shall be fire rated.

7.6.6.1 Any architectural hardware that does not have a label or supporting third party certification for the intended fire rating shall not be used as a component in the assembly of fire doors.

7.6.6.2 The liability of identification and submission of relevant test documents shall be with the fire door manufacturer, who will be responsible for the system as a complete assembly.

7.6.6.3 All fire doors shall be provided with fire-rated smoke check sealing, which is also applicable for all types of fire doors, swing, sliding, and roller shutters. The performance of fire doors shall include a smoke check.

7.6.7 Proper seals should be provided to stop the spread of fire and smoke in a building. It is not mandatory to have a door bottom seal, unless desired or the area under consideration is pressurized.

7.6.8 Where sliding fire doors are used, the same shall be labeled for the relevant fire rating, including all accessories as an assembly.

7.6.9 Roller steel fire door shall be labeled for the required fire rating and shall be furnished as a complete assembly that includes:

- a) Slats
- b) Roller shutters
- c) Bottom bars
- d) Barrel
- e) Guides
- f) Brackets
- g) Hood
- h) Automatic closing devices and any other component required.

For other builder's hardware, the requirements as recommended in 7.2.8 shall be applicable.

8 Marking and labelling

8.1 The fire door manufacturer shall supply frame and doors with appropriate labels in the prescribed format. The fire door manufacturer shall maintain record of all labels supplied with the following information for evaluation by competent authority:

- a) Buyer's purchase order number, and address;
- b) Serial number, and the year of manufacture; and
- c) Fire rating, and label details.

8.2 The label shall be affixed on the door leaf that is visible and convenient for identification by the competent authority.

8.3 The label shall contain the following information:

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- a) name of the manufacturer;
- b) type of fire door;
- c) fire rating classification (see clause 5);
- d) serial number of the door;
- e) year of manufacture; and
- f) certificate reference number.

9 Storage, handling, and installation of hinged doors

9.1 Site storage

9.1.1 All doors and frames shall be stored horizontally under cover.

9.1.2 The units shall be placed on at least 100 mm high wood sills or in a manner that will prevent damage, including rusting.

9.1.3 The use of non-vented plastic or canvas shelters that can create a humidity chamber shall be avoided.

9.1.4 A 6.3 mm space between the doors shall be provided to promote air circulation.

9.1.5 If the wrapper on the door becomes wet, it must be removed immediately.

9.1.6 Proper jobsite storage is extremely important in maintaining the quality and integrity of the factory finish, including paint applied, if any. Improper storage of materials will have an adverse effect on the factory finish, including factory-applied paints.

9.2 Frame Installation

9.2.1 Frames shall be installed plumb, level, rigid and in true alignment as recommended in the erection instructions for steel frames and installation guide for doors and hardware.

9.2.1.1 All frames, other than drywall slip-on types, shall be fastened to the adjacent structure so as to retain their position and stability. Slip-on dry wall frames shall be installed in prepared wall openings in accordance with manufacturer's instructions.

9.2.1.2 The maximum allowable gap between the frames shall not be more than 5 - 8 mm and should be sealed with proper fire rated sealant once the frames are installed.

9.2.1.3 It is critical that correct methods of installation are adopted to ensure that a doorset, when fixed into the wall, will achieve the fire rating designated for the opening. It is strongly recommended that installation of fire doorsets is carried out by installers trained in fixing the doorsets in accordance with the manufacturer's fixing instructions. The same shall be guaranteed by the installer on completion of installation.

9.2.2 Compatibility of the surrounding structure

9.2.2.1 The type of surrounding structure or wall/partition into which a fire door can be installed will have to be determined by fire resistance test and should not be changed without agreed expert opinion or test evidence.

9.2.2.2 The type of surrounding structure or wall/partition can exert an influence upon the fire performance of the assembly, hence it should be suitably fire rated.

9.2.2.3 The manufacturer's recommendations should be followed with regard to the approved types of surrounding structure within which the door shall be fitted.

9.2.3 Sealing between the door assembly and the surrounding structure

9.2.3.1 To maintain the fire resistance of a fire-resisting wall or partition when fitted with a door assembly, the junction between the two elements should be adequately sealed. Ideally, a wall or partition should be built up to the rear of the door frame without gaps. This is not always possible, and to ensure easy installation of the door assembly, the opening should be made within the permissible tolerance of 5 mm on all three sides.

9.2.3.2 The gap between the door frame and wall opening can vary greatly and is usually masked with an architrave and/or with fire stop sealant. For partitions, the maximum gap shall not be more than 2.5 mm on all three sides.

9.2.4 Where grouting is required in masonry installations, frames shall be suitably braced or fastened in such a way that will prevent the pressure of the grout from deforming the frame members. Head members of frames shall not be grouted with the grout mixture. Grout shall be mixed with cement and sand slurry to a maximum ratio of 1:3.

9.2.4.1 Steel frames, including fire rated frames, do not necessarily require grouting to achieve fire rating. Grouting shall not be used for frames installed in plasterboard walls.

9.2.4.2 Alternatively, use of fire rated polyurethane foam or such fire rated materials may be recommended for all kind of frames.

9.3 Door installation

9.3.1 Doors shall be installed and fastened to maintain alignment with frames to achieve maximum operational effectiveness and appearance.

9.3.1.1 Doors shall be adjusted to maintain perimeter clearances of maximum 3 mm to 4 mm.

9.3.1.2 Shimming shall be performed by the installer as needed to ensure that the proper clearances are achieved.

9.3.2 Clearance gaps

9.3.2.1 Failure of fire-resisting door assemblies under test can be due to burn-through at the clearance gap between the door leaf edge and the door frame. Doors should be hung to give an equal gap across the head and down both jambs.

9.3.2.2 A typical gap to achieve good fire performance is between 2 mm and 4 mm. With the exception of uninsulated fire doors, it is recommended that all fire doors are fitted with intumescent seals or combined intumescent and smoke seals.

9.3.2.3 Certain smoke seals might require a larger gap in order to operate without causing significant frictional increases, but the gap should remain within tested tolerances.

9.3.3 Under-door (threshold) gaps

9.3.3.1 Under-door (threshold) gaps should be in accordance with the manufacturer's installation instructions for the particular doorset design.

9.3.3.2 When fitted, smoke seals that is, door automatic bottom drop seal, should give an even contact with the floor but should not exhibit significant increased frictional forces that could interfere with the closing action of the door.

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9.3.3.3 The maximum undercut gap shall not be more than 19 mm, provided the same has been tested in similar condition (see also 7.2.5).

9.4 Hardware Installation

9.4.1 Installation of hardware items shall be in accordance with good practices and hardware manufacturer's recommendations/templates.

9.4.1.1 Installation guide for doors and hardware, and recommended practice for hardware if available shall be followed.

9.4.1.2 All hardware shall be reinforced with appropriate reinforcement, including screws and fasteners as suggested by the hardware manufacturer's manual.

9.4.2 Fixing of smoke seal

9.4.2.1 When it is necessary to fit seals on site, either in the frame or the door edge, it is important to follow the manufacturer's recommendations precisely for the type and mode of operation of the door concerned.

9.4.2.2 Care is necessary when fitting self-adhesive seals to ensure that the groove is dry and free from dust or sawdust to ensure a good bond. The self-adhesive action deteriorates at lower temperatures, and additional mechanical fixing might be necessary if the seals are fitted at temperatures below 10 °C.

9.4.2.3 Seals may be surface-mounted if they are sufficiently thin, but such seals are more prone to detachment than those fitted into grooves.

9.5 Door and frame maintenance

9.5.1 Once the doors and frames are installed, the owner or end user shall responsibly and properly maintain the doors and frames in accordance with good practices and as per the manufacturer's maintenance manual.

9.5.2 Fire doors are intended to provide a similar level of fire resistance as the fixed elements of building, for example, walls and floors, and evaluated by the similar procedures and criteria. However, since such doors are often opened and closed many times a day, this mobility is likely to cause a more rapid deterioration in the fire resistance performance. This deterioration can take two main forms:

- a) Damage to the leaf or the components making up the assembly, and
- b) Wear and tear in the building hardware, or a reduction in the effectiveness of fixings, causing the door to fail to self-close, thereby resulting in a breach of the fire barrier.

9.5.3 It is important, therefore, for inspection, it shall be undertaken at least once a year. Maintenance and repair of any damage to be done after inspection, for the required fire resistance to be maintained.

9.5.3.1 The marking of individual components can be an aid to the correct replacement of those components when necessary.

10 Storage, handling, and installation of roller shutters

10.1 Site Storage

10.1.1 All roller shutters shall be stored horizontally under cover in the job site.

10.1.2 The surface of the floor shall be flat and should have sufficient support for the hood. The slats shall not touch the floor and shall be rolled on to the hood. The minimum space under the rolled slates and floor shall be 100 mm.

10.1.3 The place shall be dry and free from water or wet surface including wrappers. Proper site storage is important in maintaining the quality and integrity of the applied paint surface.

10.2 Mounting of roller shutter

10.2.1 The mounting for the roller shutter shall be, either on the face-of-wall or between the jambs. Shutters mounted on the face of the wall and subject to damage from falling debris shall be protected by the building structure.

10.2.1.1 Fire rated roller shutters shall have minimum 800 mm head room clearance for fixing of hood and operator.

10.3 Supporting construction

10.3.1 Walls shall be plumb and true, present smooth surfaces, and have a fire resistance rating as required by the competent authority. Walls shall be of brick, concrete, or concrete masonry unit construction except that, where 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.

10.3.1.1 Heads of door frames and other structural openings shall be reinforced, or suitable lintels shall be provided, depending on the type of wall construction and loads to be supported. Frames may not be required for roller shutter installations. Where channel frames or jambs are provided, nominal structural steel or formed steel plate shall be used. Channel frames or jambs shall be in accordance with the manufacturer's listing.

10.4 Assembly components

10.4.1 An automatic closing device shall be installed on every roller shutter (motorized). Roller shutter shall close automatically upon activation of fire alarm system or release of a fusible link or detector. The automatic-door closing mechanism shall be enclosed in a metal housing to protect the mechanism from debris and ensure operation in the event of fire.

10.4.1.1 A governor, where employed on a door, shall have an integral mechanism working in coordination with the closing device, impact switch and shall control the closing speed of the door.

10.4.2 Power operated fire doors are those that normally are opened or closed by power. They shall be furnished with a sensor that causes the door closer to stop or reverse upon contact with an obstruction under normal conditions.

10.4.2.1 Power-operated fire doors shall be equipped with an automatic closing device that, upon activation, will cause the door to close irrespective of power loss or operation under normal conditions, and remain closed or be capable of opening and then reclosing until the automatic-door closing device has been reset.

10.5 Assembly of roller shutters

10.5.1 Guides

10.5.1.1 The guides shall be mounted plumb and with sufficient clearances allowed for vertical expansion when exposed to fire. The guides used between jamb-mounted doors shall be either exposed or concealed in a pocket or wall reveal.

10.5.1.2 Attachment of the door assembly to the wall shall be by means of through-wall bolts. As an alternative, expansion anchors shall be permitted to be used in concrete, brick, or filled concrete masonry unit walls if the following conditions are met:

- a) Expansion anchors shall be manufactured from steel and shall be zinc-coated or cadmium coated.

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- b) Where used in brick or filled concrete masonry unit walls, the result of the shear and tensile load applied to the bolt shall not exceed 1/12th of the proof test load.
- c) No expansion anchor shall be set closer to the edge of the wall opening than six times the diameter of the anchor or closer to another anchor than eight times the diameter of the anchor.
- d) Where structural steel frames are used at jambs, guides shall be secured to the frame with machine bolts of not less than 9.5 mm in diameter.

10.5.2 Brackets

10.5.2.1 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 through-bolts or machine bolts 12.7 mm in diameter per bracket.

10.5.2.2 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 12.7 mm diameter.

10.5.3 Hoods and housings

10.5.3.1 Where the roller shutter is mounted on the face of the wall or between jambs, the metal hood and housing shall be secured tightly to the brackets or wall.

10.5.3.1.1 Where a flame baffle is provided, the fusible link connection to the flame baffle shall be permitted to be independent of the detectors or fusible link connections that activate the door's automatic door closing mechanism.

11 Storage, handling and installation of horizontal sliding doors.

11.1 Site storage

11.1.1 Sliding door panels should be stored horizontally under cover.

11.1.1.1 The surface of the floor shall be flat and should have sufficient support at the bottom with wooden spacers.

11.1.1.2 The panels shall not touch the floor and shall be covered with wrappers to avoid exposure to dust and water.

11.1.1.3 The place shall be dry and free from water or wet surface, including the wrappers. Proper site storage is important in maintaining the quality and integrity of the applied paint surface.

11.2 Sliding door panels

11.2.1 Sliding door panels shall be permitted to be single section or multiple sections.

11.2.1.1 Connection between the panels shall be in accordance with the manufacturer's instructions and the individual published listing.

11.2.1.2 Hollow metal doors shall be furnished in not more than five panels, constructed for either field or factory assembly.

11.2.1.3 For bi-parting doors, not more than four panels shall comprise a single leaf.

11.2.1.4 Personnel swinging-type pass doors shall be permitted to be used if tested with the sliding door.

11.2.1.5 The pass door shall be provided with hinges, latch set, and spring hinges or door closer.

11.2.2 Mounting of sliding doors

11.2.2.1 Horizontally sliding doors shall be wall mounted in a track attached to a wall in accordance with the manufacturer's instructions.

11.2.2.1.1 When in the closed position, the clearance between the wall and the sliding door or the frame and the sliding door shall not be more than 19 mm. Unless tested otherwise, sliding doors shall lap openings at least 102 mm at the sides and top.

11.2.2.2 Where sliding doors provide protection of openings located in walls above floor level and no projection sill is provided, the sliding door shall lap the bottom of the opening at least 102 mm.

11.2.2.2.1 Bi-parting doors shall have an astragal securely attached in place to project a minimum of 19 mm unless otherwise required or permitted in the individual manufacturer's published listing.

11.3 Supporting construction**11.3.1 Walls**

11.3.1.1 Walls shall be plumb and true and have a fire resistance rating as required by the authorities.

11.3.1.1.1 They shall be of brick, concrete, or concrete masonry; the wall opening shall be reinforced to provide anchorage for door mounting hardware equal to that of brick or concrete.

11.3.1.2 Attachment of the door assembly to the wall shall be by means of through-wall bolts. A chafing strip to be applied on the back surface of the door.

11.3.1.2.1 As an alternate, expansion anchors shall be permitted to be used in concrete, brick, or filled concrete masonry unit walls if the following conditions are met:

- a) Expansion anchors shall be manufactured from steel and shall be zinc-coated or cadmium-coated.
- b) The compressive strength of the concrete shall not be less than 13.8 MPa (2,000 psi), and the bolt load shall not exceed the proof test load.
- c) Where used in brick or filled concrete masonry unit walls, the bolt load shall not exceed 1/12th of the proof test load. No expansion anchor shall be set closer to the edge of the wall opening than six times the diameter of the anchor, or closer to another anchor than eight times the diameter of the anchor.

11.4 Assembly components

11.4.1 See 7.4.4.1 for requirements of closing devices.

11.4.2 See 7.4.4.2 for requirements of releasing devices.

11.4.3 See 7.4.4.3 for requirements hardware.

Annex A
(normative)

General guidance for fire door performance

A.1 General

A.1.1 Each class of device (for example, doors/shutters) has certain advantages and limitations, and the importance of each of these characteristics needs to be considered for the specific opening under consideration, based on performance. A device cannot be expected to perform properly except under the condition for which it was designed. This does not only include testing and meeting the provision of the standard but also the functionality of the product in use.

A.1.2 Fire door assemblies for the protection of openings depend on the use of labeled fire doors and frames, certified and labeled latching devices, swinging and sliding hardware, and closing devices having the required fire protection ratings that close or are closed at the time of fire. The effectiveness of the entire assembly as a fire barrier could be destroyed if any component is omitted or even if one of the component is substandard in quality.

A.1.3 Where fire doors are used in a means of egress, they are required to swing along the direction of exit travel except for doors on individual small rooms, which may be permitted to swing in. The following types of doors may not be permitted to be used on exits:

- a) Roller steel doors or shutters, and
- b) Horizontal or vertical sliding doors.

A.1.4 Fusible link or similar door-closing arrangements are of limited value for exit purposes because quantities of smoke can pass through the door opening before there is sufficient heat to fuse the link.

A.1.5 Doors of small to moderate sizes are more suitable for exit purposes than very large doors because of the relative ease of operation of smaller doors.

A.1.6 Horizontally sliding doors for exit purposes are not suitable because they are difficult to reopen once they are closed in the case of fire. Swinging doors that are integral with the sliding fire doors are considered suitable if they are tested and certified and if they are furnished without any obstruction to clear the passage.

A.1.7 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 certain fire resistance. Therefore, the size and number of openings in any wall required to have fire resistance should be kept to the minimum necessary for the normal or emergency operation of the occupancy.

A.1.8 Safety glazing is also an important consideration when using glazing materials in fire door's vision pane and in fire resistance rated walls that could be subject to accidental human impact [see IS 16231 (Part 4)].

A.1.9 Access doors installed in a horizontal plane (horizontal access doors) for use in fire-rated floors, or floor-ceiling or roof-ceiling assemblies are designed to maintain the fire resistance rating of the building construction material. The size and number of such door openings should be limited in accordance with the fire-rated assembly. Horizontal access doors differ from access doors installed in the vertical plane (vertical access doors) because they are tested to perform as an essential component of the fire-rated assembly in which they are installed so that the rating of the entire assembly is maintained by the installation of the horizontal access door. Therefore, these doors do not have a fire protection rating. Vertical access doors,

however, are tested in accordance with the same test used to measure the fire performance of standard size doors.

A.1.10 Fire doors, shutters, are of value only if properly maintained so that they close or are closed during the time of fire. Periodic inspection of doors/shutters, with immediate attention to any necessary repairs and correction of any defects that could interfere with operation, is an important responsibility of the management of the property.

A.1.11 The use of swinging, non-rated doors mounted in openings in fire walls, which could interfere with the closing of the fire doors, should not be permitted.

A.2 Installation and maintenance

The competent authority may decide upgrading of existing installations to meet current standards and requirements only where 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.

A.3 Electronic and similar storage of details of range of fire doors (model/variety) including their unique serial number and compliance to this standard should preferably be maintained for reference and use.

A.4 Fire protection rating

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 not supplied, omitted by the manufacturer of the door, the assembly rating is void for the purpose of this standard and the opening protection is not considered equivalent to the certified or otherwise indicated fire protection rating of the door component.

A.5 Doors are of several classifications, types, and methods of operation. Fire door assemblies consist of individually certified components that are essential for the satisfactory performance of the complete assembly. Some certification cover one or more components in addition to the door.

A.6 Fire doors/shutters, are of value only if properly installed so that they close at the time of fire. They should be self-latching, except if the certified fire door supplied is tested in unlatched condition. All fire doors shall be self-closing. Non-egress doors like horizontal and vertical shaft doors, may not have the self-closing device if the door under consideration is always in latched or locked condition.

A.7 Where the fire door assembly has components with different fire rating, then the components with the least fire rating will be considered as the rating of the assembly.

A.8 In communicating doors or connecting rooms between hotel sleeping rooms, the closing devices may be omitted with the approval of the competent authority. In a residential apartment's entrance door, there may be an exception for not using a closing device as the door will remain always in closed condition.

A.9 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 persons with disabilities, the elderly, and young children to open doors. Door closers may be classified in sizes from 2 to 6 with an increased closing force for higher numbers. Generally, a minimum size 4 or above closer should be used on exterior fire doors and a minimum size 3 or above closer should be used on interior fire doors.

Door widths greater than 970 mm in exterior and 1 020 mm in interior parallel or single lever arm applications, and abnormal air pressures usually require an increase to the next size. A combination of these factors could necessitate an increase of two sizes. Individual manufacturer's recommendations should be consulted. Spring hinges should be adjusted to achieve positive latching when allowed to close freely from an open position of 30°.

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A-10 Certified and labelled door holder/release devices for swinging doors should, wherever 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 permitted to 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.

A.11 Structural changes in the design of frame may have an impact on the fire rating of the door. Any changes in depth of frame or two-piece frame (both side architrave), use of sub-frames and pressure fixed frames should be based on proper test evidence and certification under third party certification program.

A.12 Fire door/shutters may lose their purpose unless they are properly maintained and closed or are 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.

A.13 Hinges, catches, closers, latches, and stay rolls are especially subject to wear and needs maintenance.

Annex B (normative)

Supply/installation of fire doors

B.1 Letter of compliance

The typical letter for supply and installation of fire rated doors is given below:

To

The Owner or End User

Project Name

Location

Sub: Confirmation of supply and installation of fire rated doors and doorsets in (project name)

Ref: Certification numbers:

1) (Product type, Issuing lab, Date of issue)

2) (Product type, Issuing lab, Date of issue)

Further to the receipt of order (reference) we hereby confirm the following material has been supplied and installed as a complete assembly. The products supplied are detailed below vide (list of unique serial number of labelling) and are as per the above tested specimen.

Door type	Size (Wall opening)	Quantity	Door classification code	Unique serial number of labelling	Invoice number	Remarks
Fire door	1 000 × 2 100 900 × 2 400	100		XXXXXX Invoice number		Fully compliant
Total doors		100				

As a primary supplier of fire door and hardware, we hereby confirm the products supplied and installed are covered under our certification programme/test reports (details enclosed). All hardware supplied are equally fire rated, the individual test certificates of components and door assembly are also attached herewith.

Door Manufacturer:

(sign and seal)

Encl: Copies of certificates-indicating date of testing and validity date

B.2 Typical contents of test report

B.2.1 The detailed test report shall be as highlighted in the KS ISO/IEC 17025.

Bibliography

- [1] UL 10C (USA) Fire test for door assemblies
- [2] **UL 10B** (USA) Fire test for door assemblies
- [3] NFPA 80

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