Spotting Fire Doors Failures

TOKIO MARINE INSURANCE GROUP

Fire doors exists in almost every building and are purposely built to provide compartmentalization against smoke and fire in accordance with the local regulatory requirements. Thus, they are a crucial component of passive fire protection.

In this article, we discuss fire door neglect and how to spot the potential faults that could be compromising fire safety in the workplace.

1. Introduction

Fire doors are considerably more than just a piece of furniture, even though we use them daily without giving them a second thought. An entire door assembly, including frame, leaf, necessary hardware, edge seals and integral panels, makes up a fire door. None of these components shall fail in the case of a fire. To meet necessary standards, a fire door must pass through one or more of a series of standardized test before obtaining its certification and fire-rating.

☛ Point : Look for labels or similar markings that shows the door is certified.

Photo 1: Example of certified fire-rated door
Source: author's past surveys

2. Fire Door – The Basics

For an effective fire door to function properly, many components are involved. Figure 1 in the next page illustrate the different components of a fire door.

The door itself is usually made from a solid timber frame and sometimes covered with fire resistant glazing glass.

Around the edges of the door will be intumescent seal or intumescent strip. An intumescent seal is chemically designed to expand when temperatures reach beyond 200°C to seal the gaps between the door and frame.

The door is also fitted with an auto door closer or electro-mechanical mechanisms to keep the fire doors open. The mechanism is linked to the fire alarm system.

Ideally, fire doors should be always closed.

3. Fire Door Failures

Thus, why can fire doors experience failure in critical moments? According to the UK's Fire Door Inspection Scheme (FDIS), **75% of fire doors failed to meet the required standards** due to negligence, incorrect specification and lack of knowledge of their importance (Figure 2, page 3).

(https://www.ifsecglobal.com/fire-news/fdis-finds-three-quarters-of-fire-doors-failed-inspections-in-2019/)

Simple inspections after installation of fire door may assist in ensuring that the fire door is secure to carry out its function. However, where should you start when recognizing a door's possible flaw?

4. Fire Door Fault Checks Explained

Upon operation, a fire door utilizes many of its components, all of which must work together to make the door functional and effective in a fire situation. In general, there are eight key areas to consider when performing routine risk assessments and identifying potential flaws.

1) Door Handle

Our hands usually reach for the door handle when opening or closing a door. If the door handle or knob is missing or even loose, it could make it more difficult to open a door in an emergency. Hence, a door handle should always be present and its screws tight. Secure door handle through bolt-through fixing or lock or latch case will prevent loose screws. Ensure that the handle is easy to use, operates smoothly and returns easily to its original position after use.

Most fire codes dictate that the fire door must also open, without a key, in the direction of travel if it is part of an escape route.

☛ Point : Screws of a door handle be tight!

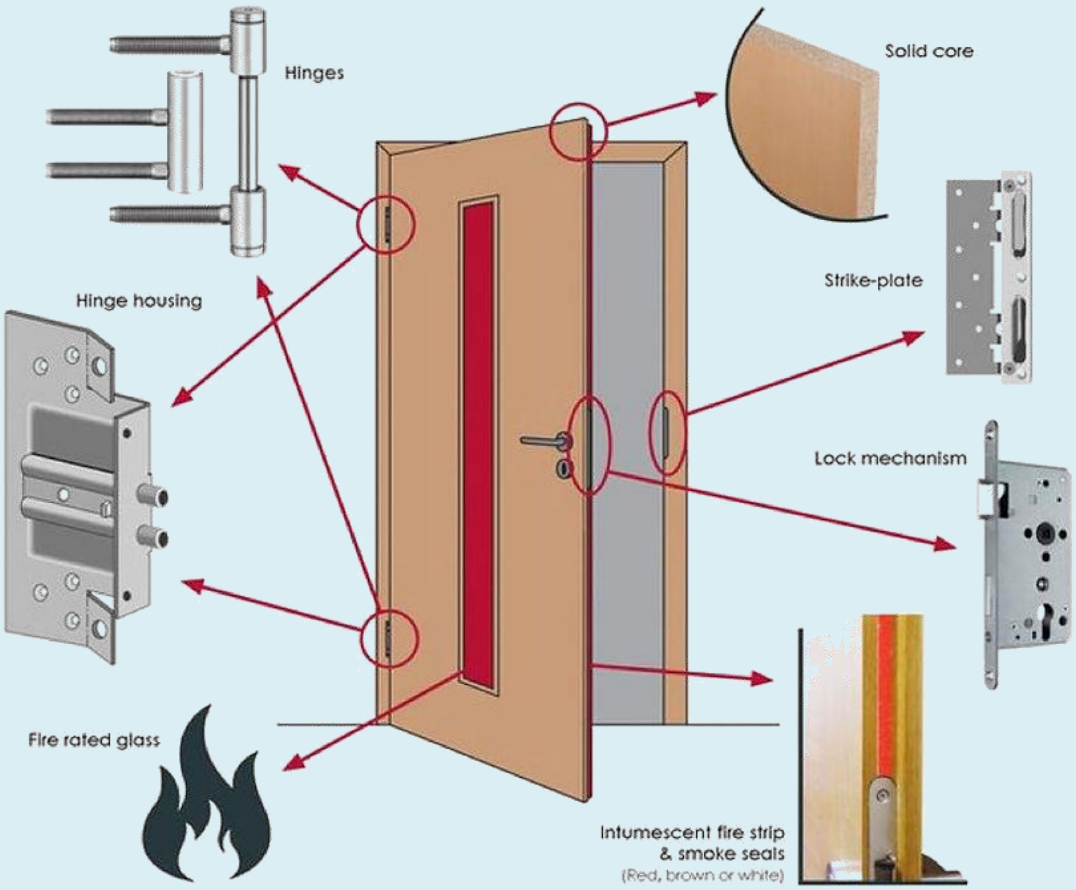

Figure 1: Anatomy of Fire Door
Source: R2R Maintenance & Fire Stopping

Photo 2: Missing door handle
Source: author's past surveys

Photo 3: Example of oil leaking from hinge
Source: Safelincs fire safety forum

2) Hinges

Hinges are a necessary pivot action fixing that provides the movement to a door. According to the National Fire Protection Association (*NFPA 80 – Standard for Fire Doors and Other Opening Protectives*), doors up to 1.5m (60 in.) shall be provided with at least 2 hinges and doors in excess of 1.5m shall have an addition hinge for each 0.76m (30 in.) of door height. Thus, fire door standing over 2.26m will require 4 hinges. This will prevent the door from warping in a fire due to its weight, and so should you see a fire door only hung on two hinges, it must be changed. Screws must be fitted securely, and the hinges themselves must be free of metal fragments and oil leakage as this could indicate signs of wear.

☛ Points : No missing door knob or handle.
Screws of a door handle must be tight!
No oil leaking from hinges.

Figure 2: Key Statistics of fire door failures
Source: FDIS

3) Locks and Latches

An effective fire door must close completely in order to create a fire barrier. Doors are held shut by locks and latches; therefore, they must be fixed firmly and functioning properly. During inspection, it is crucial to check whether the latch engages fully into the strike plate and whether the door can be held firmly in place without rattling. Failure to do so may indicate faulty or damaged hardware.

To repeat the same point mentioned in 1) again, fire codes dictate that the fire door must also open, without a key, in the direction of travel if it is part of an escape route.

☛ Point : Locks and latches be fixed firmly, and hardware is not damaged or faulty.

4) Door Closers

Door closers facilitate the operation of a fire door and certified. A fire door should always sit into the door frame and close tightly using its own self-closing mechanism.

When performing checks, a recommendation is to open a door to 5 degrees or 75mm, and upon letting it go, it should close and engage the latch successfully. If this cannot be achieved, it could indicate that the door closer was incorrectly installed or damaged and, therefore, needs adjustments or replacement. Adjustments can be made to the closing power and speed of door closers, and in busy environments such as schools and hospitals, a prolonged closing action is useful, giving people extra time to pass through the doorway.

☛ Point : Fire door should sit into the door frame by itself.

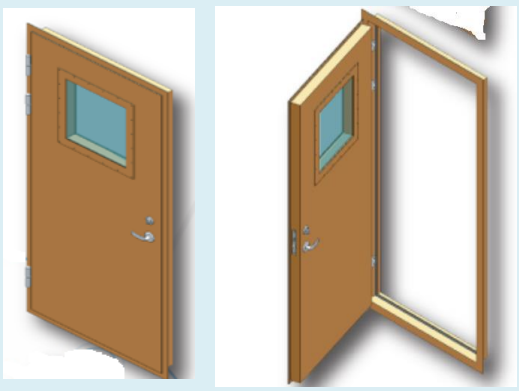

Figure 3: Example of fire door sitting into the door frame
Source: Hock Seng Marine engineering Pte Ltd

5) Hold Open Devices

Buildings with heavy foot traffic may benefit from electromagnetic hold-open devices tested to local regulations and are approved. These devices allow fire doors to close on their own in the event of fire. Given the complexity of these systems and the necessity of routine maintenance, it is important to identify any potential issues. Should an electromagnetic hold-open device not release the door when a fire alarm is activated, a problem has occurred and must be resolved immediately.

Electromagnetic devices that are affixed to walls (Photo 4), fire door being wedged open (Photo 5) and electromagnetic devices not energized (photo 6) are common findings in our fire safety surveys.

☛ Point : Electromagnetic mechanisms must be functional!

Photo 4: Faulty electromagnetic holder

Photo 5: Fire door wedged open by tying

Photo 6: Electromagnetic door not energized

Source: author's past surveys

6) Exit Devices

Exit devices are designed to provide safe and effective escape through a doorway with minimum effort. All panic and emergency exit devices must function correctly, with fixings on the operating device, bolts and strikes tightly fit. Emergency exit devices such as push bar should be tested, certified, approved and maintained regularly.

Besides their mechanical operation, it is vital to keep emergency exits clear and without obstruction – to ensure quick evacuation.

☛ Point : Exit devices must be operational.

Photo 7: Push bar

Source: Beacon Commercial Door & Lock

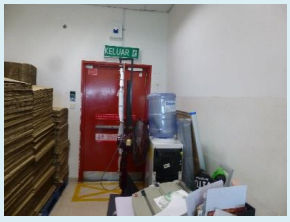

Photo 8: Obstruction to emergency exit

Source: author's past surveys

7) Door Seals

When rated 0.5hr or 1.0hr, a fire door is certified to withstand smoke and fire for 30 or 60 minutes, respectively. For this to be valid, the fire door is installed with intumescent seals and during a fire, it will expand to cover the space between the door and its frame. Intumescent seals should track continuously around the frame or door leaf and must remain in good condition, intact and undamaged.

If you can see excessive gaps between the side of the door and the frame, a fire door may be ineffective because smoke may enter through the gap.

A maximum gap of 3.18mm (1/16 in.), according to NFPA 80, is recommended around all fire doors and can be assessed with simple gap tester tools.

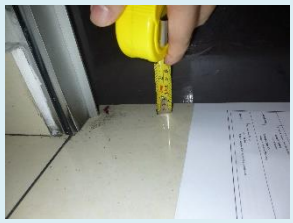

Photo 9 & 10: Checking the gap between fire door and floor

Source: author's past surveys

☛ Point : No excessive gaps between door and floor.

8) Signage

Despite not being a mechanical component of a fire door, signage is nevertheless crucial to fire door safety and must be considered when checking for faults. Providing quick and key information in an emergency such as 'Fire Door Keep Shut' signage must be fitted to both sides of a fire door.

☛ Point : Exit Signage shall be present and visible.

5. Summary

A fully working fire door is a requirement for fire safety and they must undergo routine maintenance intervals to maintain their quality while in use. Understanding the different parts of a fire door and the potential flaws to watch out for while assessing its condition is the first step. It is important to seek expert guidance immediately if there is any doubt.

Checks can save lives but where action is an obligation, knowing what to look out for is only half of the responsibility. The other half is to ensure safety actions are being implemented.

Published By:
Risk Engineering Department
Email: TMA_RE@tokiomarineasia.com

Tokio Marine Asia Pte. Ltd.
20 McCallum Street #13-01
Tokio Marine Centre Singapore 069046

A member of the Tokio Marine Group

[Contact]

Writer: Mr. Chee Joo Hian, Manager, Risk Engineering Dept., Tokio Marine Asia Pte. Ltd.