



06 December, 2025

Test Report Reference: 2876205



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Fire Test of Door Assembly

According to UL 10C

“Single Swinging Metal Door Assembly”

Test Report



Prepared by: Advanced Construction Technology Services KSA -
Fire Testing Division

Client: Gulf Diamond Industrial Factory

Test Assembly: Single Swinging Metal Door Assembly



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Test Report

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SASO-Approved Lab

Revision: 0	Date: 06 December 2025	Author: Mahmoud Mokhtar
Client: Gulf Diamond Industrial Factory, 3 rd industrial city, Dammam, KSA Mr. Khaled Al-Abdullah +966 56 118 8855	Project: Test Sample: Single-swinging metal door assembly Project Reference: 2876205 Sample Reference: 001 Number of Pages: 14	
Test Location: Advanced Construction Technology Services (ACTS) Fire Testing Laboratory, Dammam, Saudi Arabia Tel: 00966138967147	Test Program: UL 10C, 2016 Sample Received: 26 November, 2025 Testing Date: 02 December, 2025	

Executive summary

The fire resistance test was conducted on a single-swinging metal door assembly with dimensions of 1000 mm wide x 2200 mm height and a leaf thickness of 45 mm, according to the UL 10C standard. The tested door assembly was manufactured/supplied by Gulf Diamond Industrial Factory. It was installed in an opening in a brick wall, nominally 3000mm wide, 3000mm high, and 200mm thick. The metal door leaf was installed in the frame with three hinges (**Brand: D&D**), secured by a latch lock with a panic bar (**Brand: AKADA**). The landing side of the door was towards the furnace.

The door assembly has been exposed to a fire scenario as per UL 10C – fire endurance test, followed by a hose stream test. The tested door remained in its original opening, without flame penetration or structural failure, up to 150 minutes of exposure to fire, followed by a hose stream test.

The maximum temperature recorded for the unexposed surface after 30 minutes of fire exposure was approximately **235 °C**.

The test door assembly succeeded in withstanding the fire endurance and hose stream tests as per UL 10C acceptance criteria for $2\frac{1}{2} - h$ (150 minutes), and the test was terminated based on the client's request.

Notes

- The test results relate only to the item tested.
- The report is the client's property and cannot be given to a third party without the client's consent.
- The report shall not be reproduced except in full without the written approval of ACTS.
- ACTS recommended that the significance of this report be considered for one (1) year from the date of testing.

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Summary of Test Results

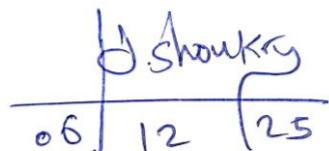
Test	Rating	Result
Fire Resistance	$2\frac{1}{2} - h$ (150 minutes)	“Pass”
Performance Acceptance Criteria:	<ul style="list-style-type: none"> • The tested door assembly fulfilled the fire endurance and hose stream acceptance criteria of UL 10C for 150 minutes. 	
Un-exposed surface temperature after 30minutes of fire exposure	235 °C	
Remarks: This report details the method of construction, the test conditions, and the results obtained when the specific element of construction described herein was tested following the procedure outlined in UL10C-2016. Any significant deviation with respect to size, constructional details, loads, stresses, edge, or end conditions other than those allowed under the field of direct application in the relevant test method is not covered in this report”.		
The test was terminated after 150 minutes of fire exposure as per the client's request		

Prepared by:



Dr. Mahmoud Mokhtar

Reviewed and approved by:



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1. Introduction

The performance of walls, columns, floors, doors, and other building components under fire-exposure conditions is a major concern in ensuring that constructions are safe and do not pose a threat to neighboring structures or the public. So that the fire-resistive properties of materials and assemblies must be measured and specified according to a common standard expressed in terms that apply alike to a wide variety of materials, situations, and conditions of exposure. Performance is defined as the period of resistance to standard exposure elapsing before the first critical point in behavior is observed.

The test exposes a test specimen to a standard fire exposure controlled to achieve specified temperatures and pressure conditions throughout a specified period. The exposure, however, is not representative of all fire conditions, which vary with changes in the amount, nature, and distribution of fire loading, ventilation, compartment size and configuration, and heat sink characteristics of the compartment.

2. Scope

The test exposes a specimen to a standard fire exposure controlled to achieve specified temperatures throughout a specified period, followed by the application of a specified standard fire hose stream. Major variations from the construction or conditions that are tested are capable of substantially changing the performance characteristics of the assembly. This method does not provide the following:

- Full information as to the performance of all door assemblies in walls constructed of materials other than those tested.
- Evaluation of the degree by which the door assembly contributes to the risk of fire by the generation of smoke, toxic gases, or other products of combustion.
- A temperature limit on the unexposed side of the door assembly.
- Measurement of the degree of control or limitation of the passage of smoke or products of combustion through the door assembly.

3. General Description of the Test Specimen

- The tested specimen was a single-swinging metal door assembly. The photos of the exposed and unexposed faces of the door assembly, and its accessories (hinges, latch bolt, and panic bar) are presented in **Figure 1**.
- The hardware/accessories details are included in **Tables 1** and **2**. The description of the test specimen below has been prepared based on the available information provided by the client and partially verified by ACTS.

Table 1: Test Sample Description – Door

Component	Dimensions	Material
Door Leaf	Single swinging/hinged leaf 900mm wide, 2130mm high, and 45mm thick	Steel, 1.2 mm sheet thickness
Frame	1000mm wide, 2200mm high, and 200mm depth	Steel, 1.2 mm sheet thickness

Table 2: Ironmongery

Hinges	
Material	Stainless Steel
Brand	D&D
Quantity	Three Hinges
Size, mm	100 × 100
Number of knuckles	Five knuckles
Fixing Method	Fixed onto the door leaf and frame using four screws from each side.
Panic bar/ free exit hardware	
Brand name	AKADA
Material	Stainless Steel

**Figure 1:** Photos of the door assembly and hardware, (A) Exposed face, (B) Un-Exposed face, (C) Latch bolt, (D) panic bar, and (E) Hinge

4. Method of Test

- The specimen was installed vertically in a supporting construction with the landing side into the furnace.
- The gap between the frame and the supporting construction was filled with cement mortar.
- The gaps/clearances between the doors' leaves and the frame are measured as presented in **Figure 2**.
- Three thermocouples were fixed on the unexposed face to monitor and assess the thermal insulation capability of the sample, as shown in **Figure 2**.
- The sample was exposed to a controlled fire scenario as per UL 10C standard.
- The initial average temperature of the unexposed surface temperature of the specimen was 26.5 °C, and the ambient temperature in the Lab was 26 °C.
- The commencement of the test was considered the moment when the program to follow the heating curve was initiated (igniting the burners).
- The elapsed time was measured from this point, and all automatic systems for measurement and observation began at this time. And the furnace was controlled to comply with the temperature conditions.
- From the commencement of the test, the following measurements and observations were recorded during the test period, where appropriate.
- Monitor and record temperatures both inside the furnace and the unexposed surface temperature
- Monitor and record Flame penetration, openings, or cracks,

Observations were made on the general behavior of the test specimen during the course of the test, and notes concerning phenomena such as smoke emission, cracking, melting, softening, spalling, or charring, etc. of materials of the test specimen were made.

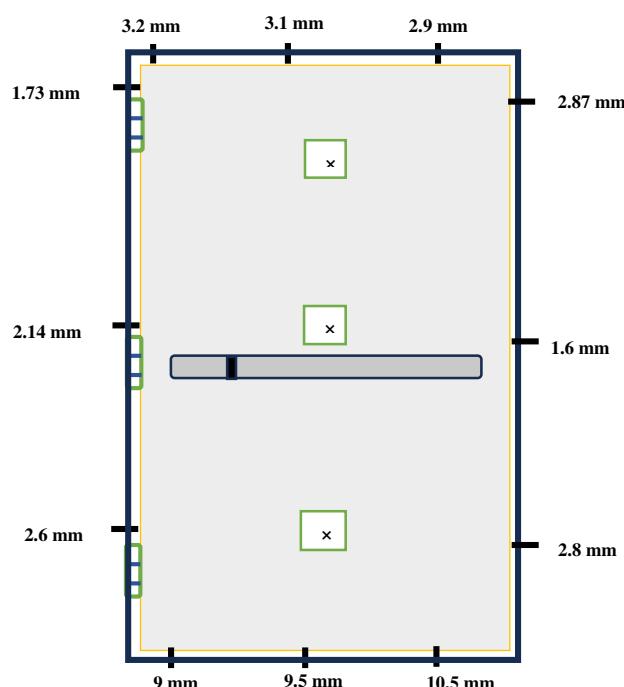


Figure 2: Gaps Measurement, and unexposed thermocouple locations

5. Summary of Visual Observations during the Test

During the Test

Table 3 summarizes the fire test visual observations witnessed during the test.

Table 3: Fire test visual observations during the test

Time, minutes	Observations (from the Unexposed Side)
0	Test commenced
30	Unexposed surface temp. reached 235 °C
60	No significant changes
90	Discoloration at the stiffener's locations
120	No significant changes
150	Fire endurance test terminated
153	Hose stream test: Pass

Figures 3 -5 show the door assembly at different periods of the fire exposure.



Figure 3: Test started.



Figure 4: After 100 minutes of starting the test.



Figure 5: Test terminated after 2.5h

6. Hose Stream

Within three minutes after the termination of the fire endurance test, the test assembly was subjected to the impact, erosion, and cooling effects of a hose stream directed first at the bottom center of the assembly and then at all parts of the exposed surface. The hose stream was applied, with a smooth steady movement of the hose at a rate to ensure that all parts of the test assembly are impacted by the hose stream. When all parts of the test assembly have been impacted by the hose stream, the application pattern was reversed as shown in **Figures 6** and **7**. The minimum water pressure at the base of the nozzle was 30 psi and applied for 35 seconds.

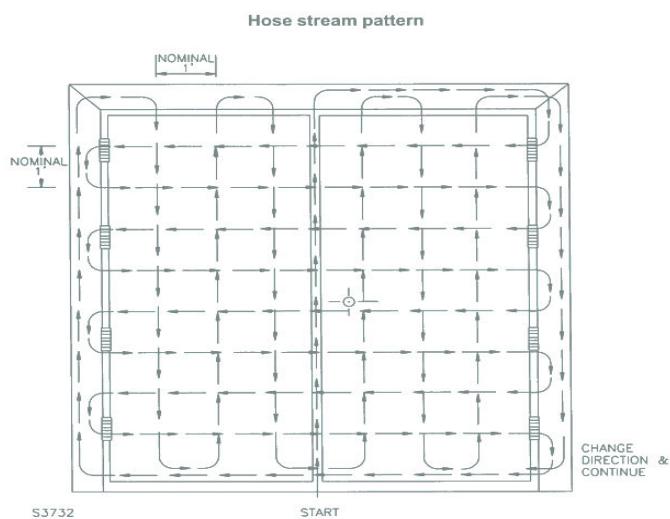


Figure 6: Hose stream pattern



Figure 7: Hose stream test after 150 minutes fire endurance

7. Acceptance Criteria according to UL10C-2016

The following conditions of acceptance apply according to UL10C-2016:

- A door assembly is considered to meet the requirements for intended performance when it remains in the opening during the fire endurance test and hose stream test within the following limitations:
 - o The test assembly shall withstand the fire endurance test and hose stream test without developing openings anywhere through the assembly.
 - No flaming shall occur on the unexposed surface of a door assembly, nor shall the sample permit the passage of hot gases sufficient to ignite the cotton pad.
 - o **Exception No. 1:** Sustained flaming of less than 10 seconds duration is permitted.
 - o **Exception No. 2:** After 30 minutes, intermittent light flaming [not greater than 152 mm long, nor burning for periods exceeding 5-minute intervals] along the edges of doors is permitted.
 - o **Exception No. 3:** Light flaming during the last 15 minutes of the classification period of 45 minutes or greater, is permitted on the unexposed surface area of the door, when it is contained within a distance of 38.1 mm from a vertical door edge, and within 76.2 mm from the top edge of the door and within 76.2 mm from the top edge of the frame of a vision panel.
- When hardware is to be evaluated for use on fire doors, it shall hold the door closed following the conditions of acceptance for the intended door assembly classification period, and, in addition, the latch bolt shall remain projected and shall be intact after the test. The hardware is not required to be operable after the test.
- In addition to the above, for swinging doors, the following applies:
 - o The movement of swinging doors shall not result in any portion of the edges adjacent to the door frame moving from the original position in a direction perpendicular to the plane of the door more than the thickness of the door during the entire classification period, nor more than 1-1/2 times the door thickness as a result of the Hose Stream Test.
 - o An assembly consisting of a single swinging door shall not separate from the frame more than 12.7 mm at the latch location.
 - o Door frames to be evaluated with doors shall remain securely fastened to the wall on all sides and shall not permit through openings between the frame and doors or between the frame and adjacent wall.

8. Furnace and unexposed temperatures

The furnace thermocouples employed to measure the temperature of the furnace were distributed to give a reliable indication of the average temperature in the vicinity of the test specimen. These thermocouples were positioned so that they are not in contact with the flames from the furnace burners; nine thermocouples were provided in an area of 9 m². The average temperature of the furnace, as derived from the thermocouples specified, was monitored and controlled such that it complies with the standard temperatures. The temperature was recorded at intervals of 1 second. For the unexposed surface temperature, three thermocouples were

attached to the unexposed surface of the door to monitor the temperature rise, following standard requirements. The thermocouples were fixed using a thermocouple pad and heat-resistant adhesive. The temperature records are presented in **Figure 8**. The average temperature was compared to the requirements above.

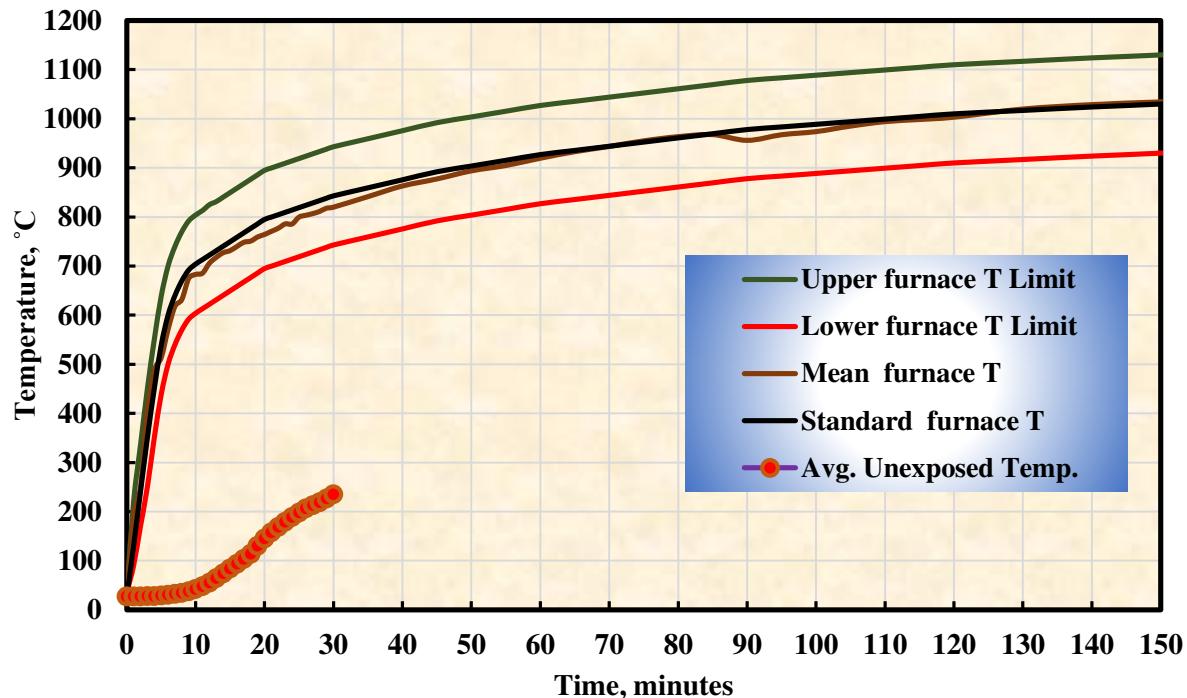
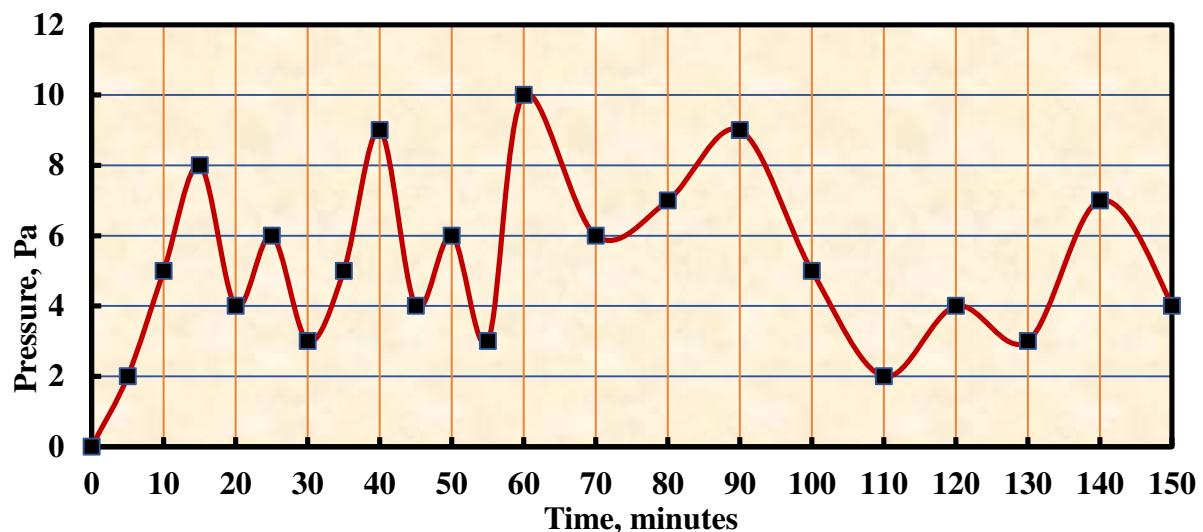


Figure 8: Furnace and unexposed temperatures

9. Furnace Pressure

- The neutral plane within the test furnace shall be established before the initiation of the fire test. Such pressure shall remain constant or increase to maintain the neutral plane upon initiation of the fire test. Control of the furnace pressure is to be established beginning no later than 5 minutes after the start of the test and is to be maintained throughout the remainder of the fire test.
- Pressures are to be read at intervals not exceeding 1 minute.
- The pressure that is maintained over the top one-third of the door assembly is not to exceed 20 Pa over any portion of the test sample. The pressure recorded from the first sensor is presented in **Figure 9**.

**Figure 9:** Furnace Pressure at neutral plane

After the Test

After the fire test and the hose stream test, the door assembly maintained its original place. **Figures 10** and **11** show the exposed and unexposed faces of the door after both tests, respectively.

**Figure 10:** Exposed face After the application of the hose stream



Figure 11: Unexposed face after the application of the hose stream

10. Conclusions

- The test of the door assembly was conducted according to UL10C-2016.
- The samples were provided by the client to the ACTS laboratory. ACTS did not interfere with the sample selection except for the sample's test requirements.
- The test results were evaluated according to the performance criteria referred to in UL10C-2016.
- The test results were valid for the test configuration only and do not imply any product certification and/or classification.
- **The single-swinging/ hinged metal door assembly met the requirements of the UL10C standard fire endurance and hose stream tests for 150 minutes.**

****End of Report****