

CASE STUDY - 06

Challenge

In early 2020, Rhino Doors was contacted by a client with a challenge: to supply a number of high-performance fire doors for the planned Bank Station Capacity Upgrade project (BSCU) within the London Underground.

Whilst the fire performance itself – with an integrity rating of 60 minutes (E60 in accordance with EN 1634-1) – is not particularly onerous, there were other performance requirements that complicated matters somewhat.

1. A total of 20 doors were required, comprising of 18 double leaf and 2 single leaf. All doors were different sizes, ranging from structural openings of 1,700mm wide x 2,250mm high, up to 4,320mm wide x 2,800mm high
2. All doors were to operate as 'normally held open doors', released to close during an emergency
3. Latchless design
4. Stainless steel construction
5. The doors needed to be latchless when closed to facilitate escape into the safe area
6. Cold smoke leakage to be $<3.0\text{m}^3/\text{m/h}$ @25Pa, in accordance with EN 1634-3
7. Subject to +/- 200Pa reciprocating pressure when the doors are in the closed position

The project required doors to be located in both new build areas and within existing station structures. This would, therefore, require the management of complex geometries and interfaces, and coordination with other building elements.

A final challenge related to the installation of the doors where, due to Bank station acting as a connection hub for other lines, interfaces with other lines would be necessary, and understandably there was a desire to keep disruptions to a minimum.



Successful completion of 100 minute fire test on 4.32m wide x 2.8m high double leaf test door

Solution

The two primary performance aspects of these doors were fire performance and cold smoke leakage performance. Understandably, it is a requirement that any door tested and approved under a fire test must subsequently be constructed for use in exactly the same way – i.e. any changes necessary after an initial cold smoke test would have to be incorporated into the ultimate fire test design.

A further complication with the large size of the doors meant that the test furnaces available in the UK at the time were unfortunately too small to validate the production door size needed, meaning that the use of laboratories in mainland Europe would be necessary.

To mitigate the risks associated with the design of these doors, Rhino proposed a two-stage project to the client, comprising:

- Stage 1 – Design, Development & Test
- Stage 2 – Manufacture & Installation

Prior to commitment to Stage 1, Rhino provided indicative prices for the supply and installation element under Stage 2. These were then validated with very little change in price, following the successful complete of Stage 1.

Rhino first commenced with cold smoke leakage tests using a carbon steel version of the adopted design that was essentially the largest leaf size that could be accommodated in the approved test rig. This allowed repeated tests using different seal types in order to optimise performance, before committing to destructive fire testing. The same carbon steel test variant was also used to verify agreed opening forces for the design.

Following successful cold smoke tests, a series of fire tests in accordance with EN 1634-1 were completed at the test facility of ift Rosenheim in Germany, using their large 5m x 5m test furnace. Tests included a double leaf variant tested from both sides, and a single leaf variant tested from one side – collectively these tests qualified all of the doors supplied against fire from either side of the door.

Results

The fire doors overperformed against the specification, achieving a 90-minute duration (E90 to EN 1634-1) with the tests only being terminated at the request of the test facility due to a large amount of radiated heat passing into the test building – a consequence of the very large door size.

The expectation was that the doors would certainly have achieved a duration of 2 hours or longer, had the tests been permitted to continue, and this was certainly proven to an extent when a slightly smaller, single leaf variant was repeat tested in the UK, achieving a 2-hour (E120) rating before Rhino terminated the test.

Find out how Rhino Doors can engineer a portal/entry solution for you at:

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