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# Assessment report

The Fire Resistance Performance of Insulated Steel Doorsets for:
Extension of Operating Theatre Block of Tuen Mun Hospital

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# Quality management

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| | | Signature |  |  |  |

# Executive summary

This report presents an assessment of the fire resistance performance of the insulated steel doorset as tested described in report 144097FU140081 and as subsequently assessed in WFA 3001764-07, when modified as detailed in the Section 6 of this report.

This assessment report is subject to the limitations and requirements described in Sections 3 and 5 of this report.

The assessment presented in Clause 6.1 of Section 6 of this report considers the fire resistance performance of the insulated steel doorset as tested described in report 144097FU140081 and as subsequently assessed in WFA 3001764-07, when subject to further modifications for the project known as:

Clause 6.1 Extension of Operating Theatre Block of Tuen Mun Hospital

The Conclusion of this assessment is presented in Section 7,

This report is invalidated if applied in combination with any other assessment not described in Section 6.

## Contents

# 1. Introduction

This report presents an assessment of the fire resistance performance of the insulated steel doorset as tested described in report 144097FU140081 and subsequently assessed in WFA 3001764-07, when modified as detailed in the Section 6 of this report to suit the requirements of the project known as: Extension of Operating Theatre Block of Tuen Mun Hospital.

# 2. Assessment framework

## 2.1 Assessment approach

An assessment is an opinion of the likely performance of a component or element of structure if it was subjected to a standard fire test.

This assessment report has adopted the procedures of the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF)[1].

The PFPF guide provides a framework for undertaking assessments in the absence of specific fire test results. Some areas where assessments may be offered are:

- Where a modification is made to a construction design that has already been tested.
- The interpolation or extrapolation of results of a series of fire resistance tests or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product.
- Where, for various reasons – e.g., size or configuration – it is not possible to subject a construction or a product to a fire test.

Assessments will vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

Established empirical methods and experience of fire testing similar products have been used in this assessment to extend the scope of application by determining the limits for the design based on the tested constructions and performances obtained.

This assessment has been written using test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been accepted as appropriate to support the manufacturer's stated design.

## 2.2 Declaration

The PFPF 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' requires a declaration from the client.

By accepting and signing the fee proposal relating to this assessment, and by subsequently distributing copies of this assessment, Hung Team Building Materials Co Ltd and Nabtesco Corporation confirm that:

- To their knowledge, the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by test authority in accordance with the standard against which this assessment is being made, and the results are not in agreement with this assessment.

[1] Passive Fire Protection Forum (PFPF), 2019, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information – they agree to ask the assessing authority to withdraw the assessment.
- They have obtained appropriate permission to use all data submitted in support of this assessment.

# 3. Limitations

This assessment report:

- does not provide an endorsement by Warringtonfire of actual products supplied.
- may be used to directly assess fire hazard under a nominated regime, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all conditions
- only relates to the actual prototype test specimens, testing conditions and methodology described in the supporting data, and does not imply any performance abilities of constructions of subsequent manufacture
- is based on information and experience available at the time of preparation; the published procedures for the conduct of tests and the assessment of test results are the subject of constant review and improvement and it is recommended that this report be reviewed on or, before, the stated expiry date
- is valid provided only if no additional modifications are made to the systems detailed in this report; details of construction shall be consistent with the requirements stated in the relevant test reports and all referenced documents
- is valid only if accompanied by full copies of the indicated supporting data summarised in Appendix A.

If contradictory evidence becomes available the assessment will be unconditionally withdrawn and Hung Team Building Materials Co Ltd and Nabtesco Corporation will be notified in writing. Similarly, the assessment is invalidated if the assessed construction is subsequently tested because actual test data takes precedence over an expressed opinion.

Because of the nature of fire testing, and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

The scope of this report is limited to assessments of the variations to the tested systems as described in Section 6.

Warringtonfire has not verified that every aspect of the assessed constructions complies with relevant building codes or standards.

This report details the methods of construction, test conditions and conclusions that are expected if the assessed system had been tested in accordance with BS EN 1634-1:2014+A1:2018.

This report is only valid for the assessed system and shall not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions other than those identified in this report may invalidate the findings of this assessment.

The supporting test data for this assessment report is summarised in Appendix A.

Any figures included in this report are provided for illustrative purposes only and may not reflect the latest design drawings.

When several modifications might apply to the same system, the assessed performance is only applicable to compatible combinations of modifications as clearly identified in this report.

This report has been prepared based on information provided by the Applicant. Warringtonfire has not verified the accuracy or completeness of that information and will not be responsible for any errors or omissions that might be incorporated into this report as a result.

# 4. Summary of proposed modifications

The proposed modifications in the following clause of Section 6 of this report relate to insulated steel doorsets based on test data provided by 144097FU140081 and the subsequent assessment presented in WFA 3001764-07 as summarised in Appendix A:

Clause 6.1 Extension of Operating Theatre Block of Tuen Mun Hospital

# 5. General requirements

Doorsets shall be installed into supporting the construction of brickwork, concrete blockwork, or reinforced concrete shown by separate fire test evidence to be capable of providing the necessary support for the required period of 120 minutes.

Doorsets shall be constructed in a similar manner from materials and components of the same manufacture and equivalent quality as tested or, as otherwise assessed by Warringtonfire.

# 6. Assessment

## 6.1 Extension of Operating Theatre Block of Tuen Mun Hospital

### 6.1.1 Proposal

It is proposed that based on the doorset as tested described in 1144097FU140081 and modified within the scope of the assessment presented in WFA 3001764-07, doorsets can be constructed to satisfy the requirements of the project known as Extension of Operating Theatre Block of Tuen Mun Hospital when fitted with Nabco door operators.

The proposed doorsets are required to provide fire resistance performances of 120 minutes integrity and insulation ($I_1$). Particular details of the proposed doorsets are summarised below.

**Automatic door operator models, see Figures 1 and 2**

- The proposed doorsets are to be fitted with either of the following operator models:
  - Nabco GT-10A, see Figure 1
  - Nabco GT8400, see Figure 2

**Opening force**

- The proposed door operators shall be adjusted to require an opening force of at least 56 N·m, whether or not there is a functioning power supply.

**Asymmetrical installation of door operators**

- Door operators shall only be fitted where the building design strategy defines the direction of fire risk as being from a single identified direction, in which case the operators shall only be fitted on the unexposed side of the target doorset.
- Applications in which the proposed door operators occur on the exposed side of doorsets are not within the scope of this assessment.

**Door operator power supply**

- Door operators shall be installed in the fail secure mode.
- In the event of power failure, the operators shall return leaves to the closed position so that leaves can only be opened manually, requiring an opening force of at least 56 N·m.

**Door operator function – passive fire protection**

- This assessment relates only to automatic mechanical operation and excludes connections to any alarm, detection, or magnetic hold-open system.

In all other respects ,the doorsets shall be as tested and described in 1144097FU140081 or, as otherwise described in WFA 3001764-07.

### 6.1.2 Discussion

**Supporting fire test data - 144097FU140081**

The tested specimen described in 144097FU140081 was double-leaf, unequal-width, single-acting doorset assembly with leaves were 2400mm high by 1100mm + 700mm wide by 60mm thick.

Integrity was maintained for the 152-minute duration of the test without failure, and the insulation $I_1$ performance was 148 minutes.

The leaves were mounted on four butt hinges each. A mortice lock and bolts were fitted but were not engaged for the test.

The sole means of retaining the leaves in the closed position were the overhead surface mounted closers on the unexposed side.

The closer on the 1100mm wide active leaf required an opening force of approximately 56 N·m measured at the lever handle position nominally 1000mm from the hanging edge of the leaf.

**Door operators, asymmetrical installation**

Door operators provide the function of closing door leaves and subsequently maintaining them in the closed position. If there are rebated meeting edges, leaves are closed in the correct sequence.

When fitted to the unexposed face of a doorset, the proposed operators are protected from direct fire exposure by the proven insulating performance of the target doorset.

The installation conditions of the proposal ensure that the operators will be similarly protected when fitted to the target doorset i.e., they will only occur on the unexposed side away from direct exposure.

This configuration is necessary because there is no data available to confirm the ability of the proposed operators to maintain leaves in the closed position when they are exposed to standard fire test conditions.

This condition reproduces the restraint of the unlatched and unbolted doorset as tested, the leaves of which were retained in the closed position by closers mounted on the unexposed side.

**Door operator opening force**

To ensure the proposed operators reproduce comparable restraint to the tested closers, they shall be adjusted to require a minimum opening force of 56 N·m, which is based on the measured opening force required for the active leaf of the tested doorset.

**Door operator power supply**

The proposed door operators rely on an external power supply. In order that the operators contribute in a similar manner to the door closers as originally tested, they shall be fitted in a fail secure mode.

This will ensure that whether or not there is a power supply to the operators in the event of fire exposure, an uninterrupted closing function is maintained, requiring a minimum opening force of 56 N·m.

### Passive fire protection

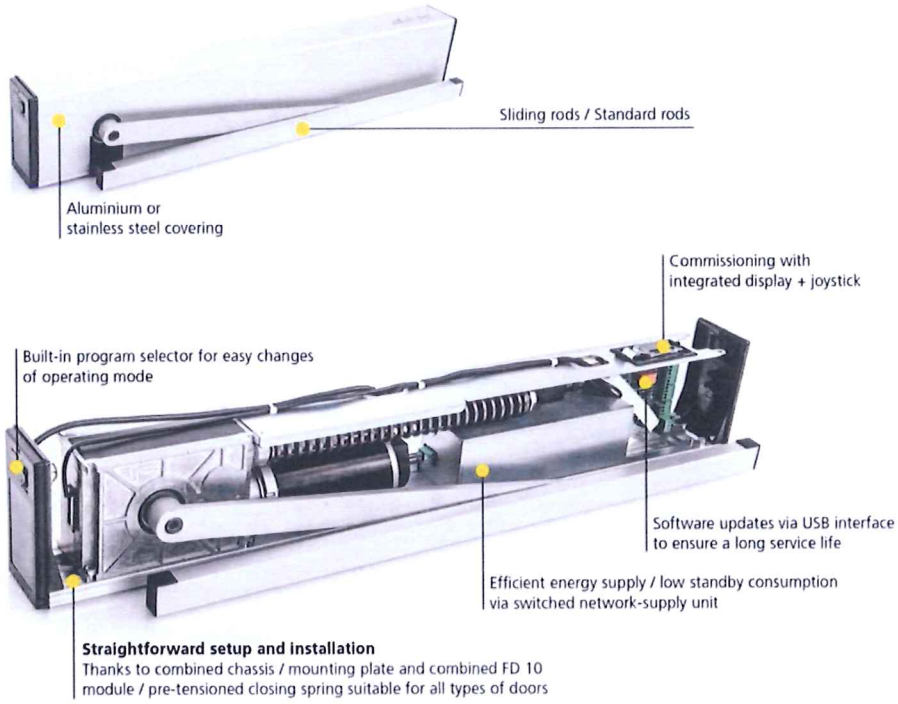
Assessments relate only to passive fire protection, the installation conditions clarify that any involvement of active forms of fire protection such as detection, alarm or, hold-open systems are not within the scope of this report.

### Overall performance

When the Nabco GT-10A and GT8400 door operators are installed and adjusted as proposed, it is considered that they would effectively reproduce the contribution of the tested door closers for the required period of 120 minutes.

**Figure 1**

**Nabco GT-10A door operator, reproduced from promotional information by Nabtesco Corporation.**

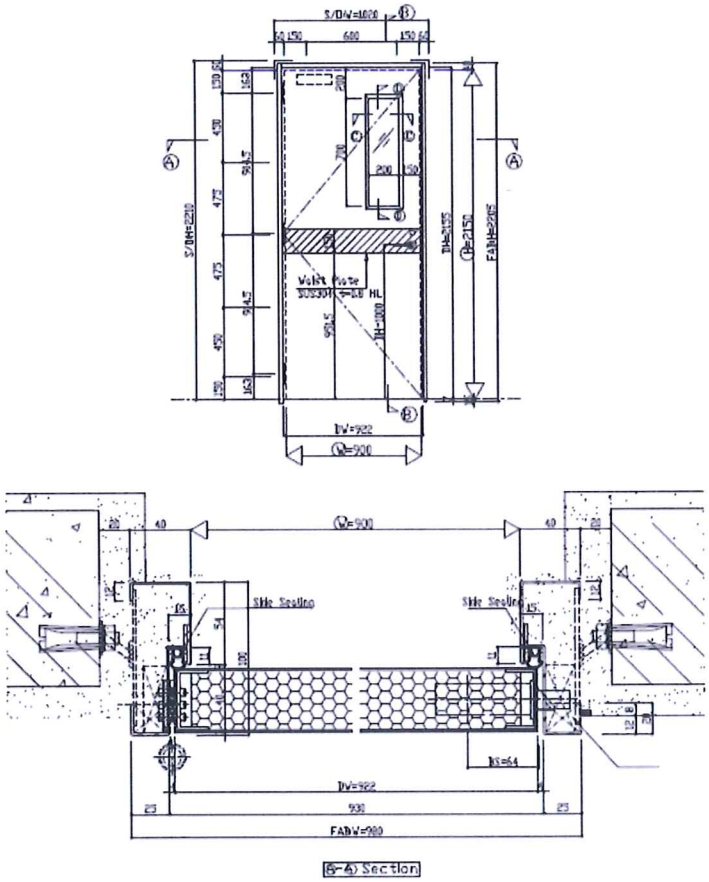



| | |
|---|---|
| Power transfer | Standard rods (pushing function)<br>Sliding rods (pushing and pulling function) |
| Weight of drive system | 8.2kg |
| Protection rating | IP 20 |
| Ambient temperature | -15 to +50 °C |
| Operating voltage | 230 VAC (+10/-15 %), 50 Hz, 10/13 A |
| Power consumption of drive system | maxx 350 W |
| Rated motor capacity | 100 W |
| Stand-by consumption | 4 W |
| Power supply, external user | 24 VDC (±10 %), 1,4 A |
| Lintel depth standard rods | max. 250 mm |
| Lintel depth sliding rods | -50 / +150 mm |
| Opening speed | max. 40°/s |
| Closing speed | max. 40°/s |
| Relative humidity | max. 85 % |
| Output shaft torque | permanent max. 56 Nm<br>short max. 165 Nm |

**Figure 2**

**Nabco GT8400 door operator, reproduced from promotional information by Nabtesco Corporation.**

| Specification | | |
|---|---|---|
| Model | GT8400 | |
| Air Tightness | BS EN 12207 : Class 2 | |
| Recommended Clear Opening | Single | 700–1200mm (W) x 2100 - 2400mm (H) |
| | Double | 1400–1800mm (W) x 2100 - 2400mm (H) |
| Max. Door Weight | 250kg | |
| Operation | Power open, Spring close | |
| Open Timer | 1 - 30s adjustable | |
| Size of Operator | 140mm (D) x 152mm (H) | |
| Operating Voltage | 220V AC ±10% 50/60Hz | |




(B-B) Section

(A-A) Section

# 7. Conclusions

If the specimen doorset described in 144097FU140081 and otherwise within the scope of WFA 3001764-07 had been further modified as described in Clause 6.1 of this report to suit the project known as:

Extension of Operating Theatre Block of Tuen Mun Hospital

it is expected that the proposed doorset designs would have been capable of 120 minutes integrity and insulation $I_1$.

### Validity of supporting data

This Conclusion is conditional on the referenced test and assessment data being currently valid.

# 8. Validity

Warringtonfire does not endorse the tested or assessed product in any way. The conclusions of this assessment may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. It is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment relates to a notional performance with respect to BS EN 1634-1:2008 based on the evidence summarised in Appendix A.

This assessment is provided to Hung Team Building Materials Co Ltd and Nabtesco Corporation for their own specific purposes.

Acceptance of this assessment is at the discretion of the relevant building authorities.

# Appendix A Summary of supporting data

The test report summaries in this Appendix are for information only. Reference shall be made to complete copies of test reports for full specimen and performance details.

## A.1 Fire resistance test report 144097FU140081

| | |
|---|---|
| Report co-sponsor | Faith Mark Consultants Ltd, who has given permission for the use of this data |
| Test laboratory | FUGRO |
| Test date | 24 October 2014 |
| Test standard | BS EN 1634-1:2008 |
| Specimen summary | A double-leaf, unequal-width, single-acting, insulated steel doorset with a glazed aperture in each leaf.<br><br>The leaves were 2400mm high by 1100mm + 700mm wide by 60mm thick and opened away from the heating conditions.<br><br>The leaves comprised: an internal framework of 45mm by 30mm (30mm by 15mm by 1.5mm SHS profiles separated by 30mm by 15mm thick MgO board), infill panels of 45mm thick Perlite, sub-facings and edgings of 6mm thick MgO board, and outer facings of 1.2mm thick mild steel.<br><br>The meeting edge of the active leaf incorporated an astragal formed in the leaf skin, providing a 25mm wide rebate.<br><br>The top, meeting, and hanging edges of the leaves were centrally fitted with Vica 30mm by 4mm intumescent seals. Vica 1200 automatic threshold seals were mortised into the bottom edges of the leaves.<br><br>The door frame was a single-rebated steel profile lined internally with 6mm thick MgO board and fully grouted with cement mortar. The frame profile included a thermal break of 15mm thick MgO concealed with a 15mm wide intumescent seal (described as Lorient 1504DS in the schedule of components, and as 15mm by 4mm in the Figures), adjacent to the face of the stop<br><br>The leaves were mounted on butt hinges. A mortice latch and flush bolts were fitted, but not engaged during the test.<br><br>The active leaf and passive leaf were glazed respectively with 42m thick Guangdong Tak Lap glass panes of nominal sight sizes 455mm high by 455mm wide, and 1210mm high by 205mm wide. The panes were retained by planted beads of MgO board, which were faced with mild steel.<br><br>Vica Pyrotape of 18mm by 3mm was fitted in the bottoms of the glazing channels, and Acton Fire acrylic sealant was applied between the beads and the glass panes. |
| Test Results | Integrity:<br>Sustained flaming — 152 minutes, no failure<br>Gap gauges — 152 minutes, no failure<br>Cotton pad — 152 minutes, no failure<br>Insulation $I_2$, leaf/frame — 148 minutes, failure on left hand jamb at mid-height<br>Glazed area A — 152 minutes, no failure<br>Glazed area B — 152 minutes, no failure |

## A.2 Assessment report WFA 3001764-07

| | |
|---|---|
| Co-applicant | Faith Mark Consultants Ltd, who has given permission for the use of this data |
| Primary supporting data | 144097FU140081 |
| Secondary supporting data | R14J21-1, R14J21-3, R18M05-1B |
| Target construction | A double-leaf, unequal-width, single-acting, insulated steel doorset with a glazed aperture in each leaf. |
| Performance standard | BS EN 1634-1-2008 |
| Assessed performance | Up to 120 minutes integrity and insulation ($I_1$) with respect to BS EN 1634-1, and up to 120 minutes integrity and insulation with respect to BS 476:Part 22:1987. |
| Assessment scope | Alternative ironmongery - generic conditions<br>Door frame profiles<br>Doorset configuration, leaf size, leaf thickness: 60 and 120 minutes<br>Transom panels for latched, single-leaf doorsets: 60 and 120 minutes<br>Glazed apertures: 60 and 120 minutes<br>Secondary glass pane<br>Stainless steel leaf skins<br>Concealed hinges<br>Transom panels for latched, double-leaf doorsets: 60 and 120 minutes<br>Smoke control doorsets<br>Stainless steel astragal<br>Lorient air transfer grilles for uninsulated doors<br>BS 476:Part 22:1987 |

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