

Grenfell Tower – fire safety investigation:
The fire protection measures in place on the night of the fire, and conclusions as to:
the extent to which they failed to control the spread of fire and smoke;
the extent to which they contributed to the speed at which the fire spread.

Phase 1 Report – Appendix I

Flat entrance and stair fire doors – requirements and provisions

REPORT OF

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Fire Safety Engineering

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On instructions of	:	Cathy Kennedy, Solicitor, Grenfell Tower Inquiry
Subject Matter	:	To examine the circumstances surrounding the fire at Grenfell Tower on 14 th June 2017
Inspection Date(s)	:	6 th October, 1 st November, 7-9 th November 2017

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Appendix I– Flat entrance and stair fire doors – requirements and provisions

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I1 Introduction

I1.1 Purpose of Appendix I

I1.1.1 In this Appendix I set out my investigation regarding:

- a) what fire doors were present in Grenfell Tower the night of the fire – the flat entrance fire doors and the fire doors to the protected stair;
- b) who specified the doors as installed in Grenfell Tower;
- c) the fire door specification in Grenfell Tower and if it was compliant with the applicable statutory and non-statutory guidance at the time of installation;
- d) the onsite construction and installation of those fire doors and if it was compliant with the product fire test report; and
- e) the inspection and maintenance regime in place for fire doors, prior to the fire.

I1.1.2 I have based my review on evidence provided to me to date and as referenced herein. I am aware that further evidence will be provided to me on the subject of fire doors and I will update my analysis when I have reviewed this additional evidence.

I1.1.3 I am particularly interested in additional evidence regarding the maintenance regime for fire doors and what activities took place before the fire by the Responsible Persons to understand the existing fire door condition. I will do this work in Phase 2.

I1.1.4 The BRE has conducted two fire tests: one of a flat entrance door and one of a door from the protected stair at Grenfell Tower, on 13/02/2018 and 05/02/2018 respectively. The results of these fire tests support my own findings on site in November 2017. The stair door test report is reference P111605-1000 (MET00021780) and the flat entrance door test report is P111605-1001 (MET00019996).

I1.1.5 There were multiple purposes for the fire doors installed in the common lobby, to the protected stair in Grenfell Tower. This Appendix focuses on the fire doors separating the flats from the protected lobby, and from that lobby to the protected stair, as these are the most critical for the life safety of residents in my opinion.

I1.1.6 To achieve the purpose stated above, this Appendix is split into the following sections:

- a) Section I2 provides relevant background information which assists in the reading of this Appendix

- b) Section I3 states the key milestones in the design, occupation, and refurbishment of Grenfell Tower where works to fire doors were undertaken.
- c) Section I4 establishes the performance standards for and compliance of the main flat entrance doors on Levels 04-23 of Grenfell Tower at the key milestones of construction, occupation and refurbishment.
- d) Section I5 establishes the performance standards for and compliance of the fire door to the protected stair enclosure on Levels 04-23 of Grenfell Tower at the key milestones of construction, occupation and refurbishment.
- e) Section I6 establishes the performance standards for and compliance of the fire door to the protected stair enclosure on Levels Ground-03 of Grenfell Tower during the 2012-2016 refurbishment.

I1.1.7 In Appendix M of my Expert Report I have also provided a detailed report on historic timber fire doors. This should be considered when reading this Appendix I.

I1.1.8 In Appendix B of ADB 2013, it sets out the relevant test standard for the appropriate performance for fire doors. Please refer to Section 3 in my main Expert Report.

I1.1.9 Appendix B states “*Any test evidence used to substantiate the fire resistance rating of a door or shutter should be carefully checked to ensure that it adequately demonstrates compliance and is applicable to the adequately complete installed assembly. Small differences in detail (such as glazing apertures, intumescent strips, door frames and ironmongery etc.) may significantly affect the rating.*”

I1.1.10 I have reviewed the relevant test evidence, and how it relates to the fire doors installed at Grenfell Tower, on that basis.

I2 Background information

I2.1 Types of fire doors

I2.1.1 The terminology used to define types of fire doors is not consistent in the design documents I have reviewed. To assist the reader, I have used the terminology set out below in Table I.1. I have also provided a more detailed glossary of key terms in Section I2.2.

Table I.1: Fire door terminology used in this Appendix

Terms used in this Appendix	Approved Document B 2010/ Approved Document B 2013 terminology	CP3: Chapter IV: Part 1. (1971) terminology	London Building (Constructional) amending bylaws 1966	LGA guide <i>Fire safety in purpose-built blocks of flats</i> (2011) terminology
Fire Door in Protected Stair Enclosure	Fire door in a compartment wall enclosing a protected shaft forming a stairway situated wholly or partly above the adjoining ground in a building used for flats, other residential, assembly and recreation, or office purposes (Table B1)	Access to Main Stairways (Section 4.4.3)	Separation between tenancies (Section 11.06)	Doors to the common corridor or lobby (Section 62.7)
Main Flat Entrance Fire Door	Fire door in a compartment wall if it separates a flat from a space in common use (Table B1)	Dwelling entrance door (Section 3.3.4.3.1)	Separation between tenancies (Section 11.06)	Doors forming part of the protected escape route from the flat entrance door to the final exit, including the flat entrance door itself (Section 62.12)
Protected Lift Shaft Fire Door	Fire door in a compartment wall enclosing a protected shaft forming a lift or service shaft (Table B1)			
Protected Entrance Hall Fire Door (hall within a flat)	Fire door forming part of the enclosure of a protected entrance hall or protected landing in a flat (Table B1)	Fire resisting doors in the walls of the entrance hall, lobby or circulation space within a flat. (Section 2.2.2.2)		Doors forming part of the protected entrance halls and stairways within flats (Section 62.12)

I2.1.2 The types of fire doors listed in Table I.1 are shown below, indicatively in Figure I.1– a floor plan of a typical upper floor in Grenfell Tower.

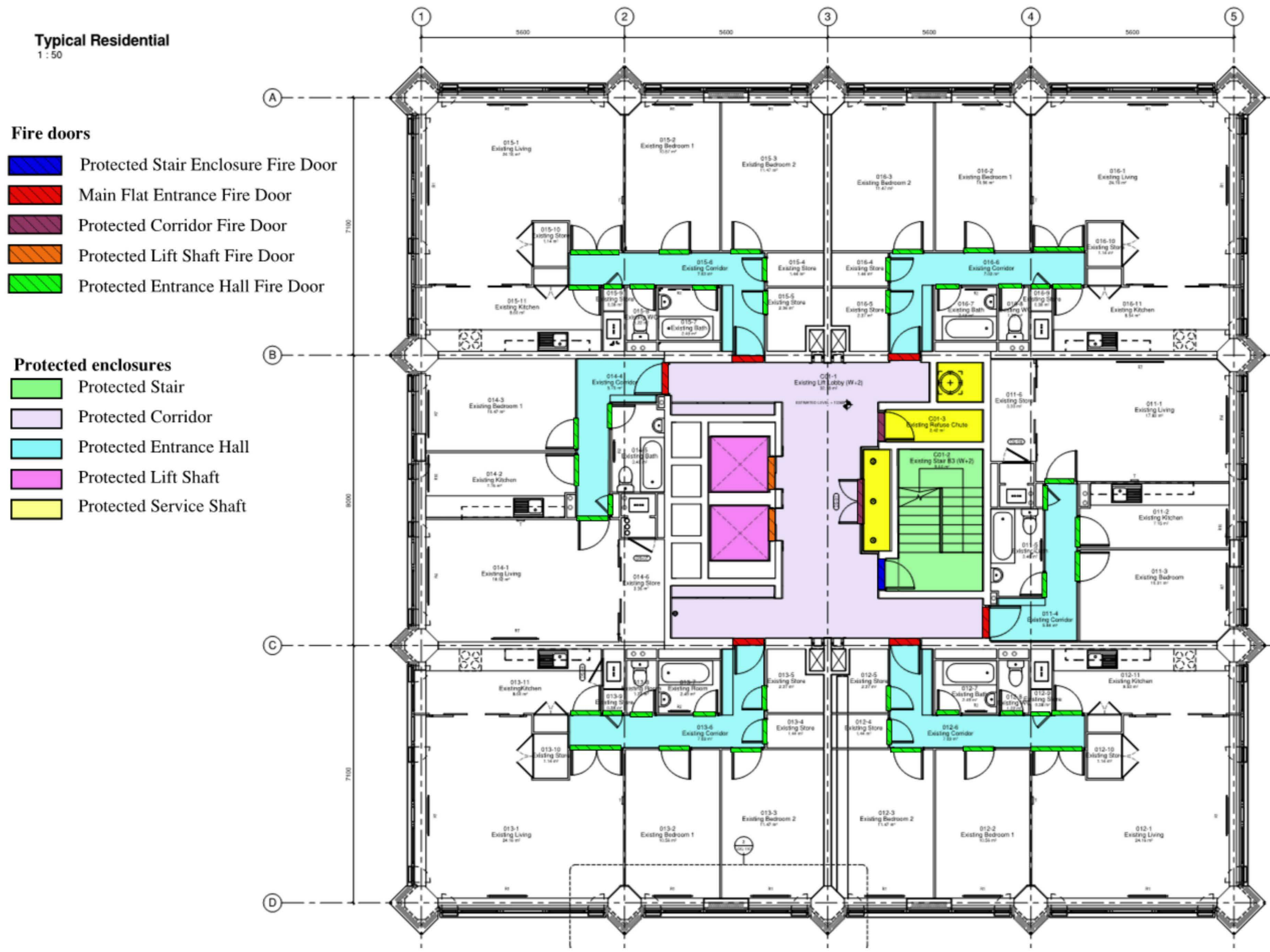


Figure I.1: Indicative locations of types of fire doors on a typical residential floor(SEA00010474)

I2.2 Fire Door terminology

I2.2.1 The following terminology as listed below is relied upon throughout this Appendix.

I2.2.2 **Architrave**- trim that serves to mask the joint between a door frame and the surrounding structure, which can be integral with the frame or a separate element (BS 8214:2016 Section 3.1)

I2.2.3 **Assessment**- technical evaluation of the expected performance of a door assembly in lieu of testing, carried out by a competent authority, with reference to relevant test evidence, for changes to components or arrangements (BS 8214:2016 Section 3.2)

I2.2.4 **Competent person**- suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions, to enable the required task(s) to be carried out correctly (BS 8214:2016 Section 3.3)

I2.2.5 **Common stair**- an escape stair serving more than one flat (ADB 2013 Appendix E)

I2.2.6 **Door**- building component for closing an opening in a wall that allows access and might or might not admit light when closed. NOTE The word “door” is used as a generic term for door leaves and door assemblies. (BS 8214:2016 Section 3.4)

I2.2.7 **Door assembly**- complete assembly as specified and installed, including door frame and one or more leaves, together with door hardware, glazing, seals and other components, supplied from more than one source. NOTE A door assembly can also include associated over panels and side panels (which can be glazed) as part of a fire door screen. (BS 8214:2016 Section 3.5)

I2.2.8 **Door frame**- fixed surround into which are fitted one or more door leaves NOTE A door frame can also be designed to surround other panels, and can include sill, threshold, architraves or other cover moulds. A door frame can be a separate item to be fixed to the adjacent structure, or it can be an integral part of a wall or partition. (BS 8214:2016 Section 3.6)

I2.2.9 **Door hardware**- small components, usually metal, used mainly for the operation or support of doors (BS 8214:2016 Section 3.7.1)

I2.2.10 **Essential door hardware**- items that are necessary to achieve the fire-resisting performance of a fire door assembly when incorporated into a building. (BS 8214:2016 Section 3.7.2. NOTE further Guidance on essential door hardware is given in Annex B of BS 8214:2016)

I2.2.11 **Non-essential door hardware**- items that are not necessary to achieve the fire-resisting performance of a fire door assembly, but which if fitted might affect

that performance (BS 8214:2016 Section 3.7.3 NOTE further Guidance on essential door hardware is given in Annex B of BS 8214:2016)

- I2.2.12 Door leaf-** hinged or pivoted part within a door frame (BS 8214:2016 Section 3.8)
- I2.2.13 Doorset-** pedestrian doorset, industrial, commercial and/or garage doorset, rolling shutter and/or operable fabric curtains including any frame or guide, door leaf or leaves, rolling or folding curtain, etc., which is provided to give a fire resisting and/or smoke control capability when used for the closing of permanent openings in fire resisting separating elements, including any side panel(s), vision panel(s), flush over panel(s), transom panel(s) and/or glazing together with the door hardware and any seals (whether provided for the purpose of fire resistance or smoke control) which form the assembly and fulfilling the provisions of BS EN 16034. NOTE Doorsets are supplied from a single source as defined in BS EN 12519. (BS 8214:2016 Section 3.9)
- I2.2.14 Fire door-** door which, together with its frame and hardware as installed in a building, is intended (when closed) to restrict the passage of fire and/or smoke, and is capable of meeting specified performance criteria to those ends. NOTE A fire door may have one or more leaves, and the term includes a cover or other form of protection to an opening in a fire-resisting wall or floor or in a structure surrounding a protected shaft. (BS 8214:2016 Section 3.10); Or
A door or shutter provided for the passage of persons, air, or objects, which, together with its frame and furniture as installed in a building, is intended (when closed) to resist the passage of fire and/ or gaseous products of combustion and is capable of meeting specified performance criteria to those ends. (It may have one or more leaves and the term includes a cover or more leaves and the term includes cover or other form of protection to an opening in a fire resisting wall or floor, or in a structure surrounding a protected shaft). (ADB 2013 Appendix E).
- I2.2.15 Fire-resisting door- Notional FD30 door-** A door assembly that satisfied the current specification, or fire resistance test, for 30 minutes at the time of construction of a block of flats or manufacture of the door. (LGA, 2011, Fire safety in purpose built blocks of Flats-Glossary, p179).
- I2.2.16 Fire-resisting door- Upgraded FD30S door-** A ‘notional FD30’ door, fitted with intumescent strips and smoke seals, and with any other necessary work carried out, such that it may reasonably be anticipated that it would satisfy the relevant test requirements for 30 minutes integrity and control of the passage of smoke at ambient temperature. (LGA, 2011, Fire safety in purpose built blocks of Flats-Glossary, p179)
- I2.2.17 Fire-check doors –** ‘This British Standard [BS 459-3 1951] gives details of the construction of two types of door and suitable frames which have been shown to provide effective barriers to the passage of fire for the times stated. Since the

doors do not comply with the appropriate periods with all the requirements for the fire resistance specified in B.S. 476 Part 1 'Fire tests on building materials and structures' they have been termed 'fire-check' doors' (BS 459-3 1951, Scope)

- I2.2.18 Firefighting shaft-** A protected enclosure containing a firefighting stair, firefighting lobbies and, if provided, a firefighting lift, together with its machine room (ADB 2013 Appendix E).
- I2.2.19 Firefighting stair-** A protected stairway communicating with the accommodation area only through a firefighting lobby (ADB 2013 Appendix E) (note firefighting lobby not necessary in accordance with Section 17.14 of ADB 2013 where stair opens into a protected corridor of a residential building)
- I2.2.20 Fire door assembly-** door assembly, intended, when closed, to restrict the passage of fire and/or smoke and to be capable of meeting specified performance criteria to those ends. (BS 8214:2016 Section 3.11)
- I2.2.21 Fire resistance-** ability of a component or construction of a building to meet for a stated period of time some or all of the appropriate criteria specified in BS 476-22 or BS EN 1634-1. (BS 8214:2016 Section 3.12)
- I2.2.22 Jamb-** A side post or surface of a doorway, window, or fireplace (Oxford English dictionary)
- I2.2.23 Intumescent fire seal-** seal used to impede the flow of heat, flame or gases, which only becomes active when subjected to elevated temperature NOTE Intumescent fire seals are components which expand, helping to fill gaps and voids, when subjected to heat in excess of ambient temperatures. (BS 8214:2016 Section 3.13). Note that intumescent strips referenced later in this section are a type of intumescent seal.
- I2.2.24 Latch-** self-engaging fastener which secures a moveable component (e.g. door) in a closed position and which can be released by hand (BS 8214:2016 Section 3.14)
- I2.2.25 Lock-**fastener which secures a moveable component in a closed position within an opening and which is operated by a key or other device (BS 8214:2016 Section 3.17)
- I2.2.26 Protected corridor/ lobby-** A corridor or lobby which is adequately protected from fire in adjoining accommodation by fire resisting construction. (ADB 2013 Appendix E)
- I2.2.27 Protected entrance hall/ landing-** A circulation area consisting of a hall or space in a flat, enclosed in fire rated construction (other than any part which is an external wall of a building). (ADB 2013 Appendix E)

- I2.2.28 Protected shaft-** A shaft which enables persons, air or objects to pass from one compartment to another and which is enclosed with fire resistant construction. (ADB 2013 Appendix E)
- I2.2.29 Protected stairway-** A stair discharging through a final exit to a place of safety (including any exit passageway between the foot of the stair and the final exit) that is adequately enclosed in fire resisting construction. (ADB 2013 Appendix E)
- I2.2.30 Rebate-** A step-shaped recess cut along the edge or in the face of a piece of wood, typically forming a match to the edge or tongue of another piece. (Oxford English dictionary).
- I2.2.31 Single action-** action of a door leaf of a (single or double leaf) doorset that opens in only one direction (BS EN 1634-1 Section 3.4)
- I2.2.32 Double action-** action of a door leaf of a (single or double leaf) doorset that opens in two directions (BS EN 1634-1 Section 3.5)
- I2.2.33 Seal-** fitting provided to close a gap for the purpose of controlling the passage of air, smoke, water, fire, sound, etc. (BS 8214:2016 Section 3.16)
- I2.2.34 Self-Closing Device-** A device which is capable of closing the door from any angle and against any latch fitted to the door. Note: rising butt hinges which do not meet the above criteria are acceptable where the door is a cavity barrier. (ADB 2013 Appendix E)
- I2.2.35 Smoke seal-** seal fitted to the leaf edge or frame reveal for the purpose of restricting the flow of smoke or hot gases (BS 8214:2016 Section 3.17).
- I2.2.36 Third-party certification scheme-** scheme undertaken by an independent third-party certification body that certifies conformity to the provisions of a recognized document which is appropriate to the purpose for which a product, material or process is to be used. (BS 8214:2016 Section 3.18)
- I2.2.37 Cill-** member which connects two frame jambs together at the base which may or may not be set into the floor and remains visible (BS EN 1634-1 Section 3.7)
- I2.2.38 Gap-** clearance between two adjacent surfaces and/or edges e.g. between the edge of the leaf and the reveal of the frame or between the face of the leaf and the frame stop. NOTE This does not refer to the integrity failure gap for which the gap gauges are referenced. (BS EN 1634-1 Section 3.8)
- I2.2.39 Standard supporting construction-** form of construction used to close off the furnace and to support the doorset or openable window being evaluated and which has a quantifiable influence on both the thermal heat transfer between the construction and the test specimen and provides known resistance to thermal distortion. (BS EN 1634-1 Section 3.10)

- I2.2.40 Associated supporting construction-** specific construction in which the doorset or openable window is to be installed in practice and which is used to close off the furnace and provide the levels of restraint and thermal heat transfer to be experienced in normal use. (BS EN 1634-1 Section 3.11)
- I2.2.41 Test specimen-** doorset or openable window which is to be installed in a standard or associated supporting construction to allow it to be evaluated (BS EN 1634-1 Section 3.12).
- I2.2.42 Transom-** member that extends across the frame from jamb to jamb at the head of the leaf and which creates an aperture to house a transom panel (BS EN 1634-1 Section 3.13).
- I2.2.43 Transom panel-** panel which is incorporated within a doorset or openable window and fitted above the leaf or leaves and is bounded on all edges by the frame head, the jambs and the transom (BS EN 1634-1 Section 3.14).
- I2.2.44 Flush over panel-** panel which is incorporated within a doorset or openable window and fitted above the leaf or leaves within the frame head and the jambs and with no transom. (BS EN 1634-1 Section 3.15).
- I2.2.45 Side panel-** panel which is incorporated within a doorset or openable window and fitted at one side of a leaf and is bounded on all edges by the perimeter frame, the jambs and the transom (when applicable) (BS EN 1634-1 Section 3.16).
- I2.2.46 Integrity-** *the ability of a specimen of a separating element to contain a fire to specified criteria for collapse, freedom from holes, cracks and fissures and sustained flaming on the unexposed face* (BS 476-20:1987 Section 2.9).
- I2.2.47 Insulation-** the ability of a specimen of a separating element to restrict the temperature rise of the unexposed face to below specified levels (BS 476-20:1987 Section 2.8).

I2.3 Fire door testing- Expression of results

- I2.3.1** The current statutory guidance ADB 2013 sets fire doors performance in terms of integrity, and in some instances cold smoke leakage and insulation based on performance achieved when tested to either National or European Standards.
- I2.3.2** The relevant test standard referenced in Table B1 of ADB 2013 for fire doors are BS 476-22 (no year specified, 1987 is current) /BS 476-31.1 (no year specified, 1983 is current) for National classification and BS EN 1634-1:2008/ BS EN 1634-3:2004 for European classification.
- I2.3.3** The performance standards for the main flat doors and stair doors are assessed later in this appendix: however, in the text below I establish how test results are interpreted to the relevant guidance as this applies to all types of fire doors.

I2.3.4 BS 476-22:1987

I2.3.5 The test standard BS 476-22:1987 has different methodologies for whether the door requires insulation performance or not.

I2.3.6 In this section I will assume a partially insulated doorset as this covers insulation and integrity measurement/ failure.

I2.3.7 Section 7.6.2 of BS 476-22 states:

I2.3.8 *“7.6.2.1 The results shall be stated in terms of the elapsed time to the nearest minute, between the commencement of heating and the time of failure in accordance with BS 476-20 with respect to the two criteria given in 7.6.1.”*

I2.3.9 The criteria of failure in 7.6.1 of BS 476-22 is integrity and insulation failure.

I2.3.10 The expression of results to BS 476-20 states:

I2.3.11 *“11 Expression of results*

I2.3.12 *11.1 The test results shall be stated in terms of the elapsed time **rounded down, to the nearest minute**, between the commencement of heating and failure under one or all of the criteria given in clause 10. If no integrity or insulation failure occurred in a separating element during the heating period, then the times stated for these criteria shall be the elapsed time between the commencement and the termination of the heating.”*

I2.3.13 BS EN 1634-1:2008

I2.3.14 BS EN 1634-1 is the relevant European test standard for measuring the integrity and insulation performance of a doorset.

I2.3.15 Section 12 of BS EN 1634-1 states:

I2.3.16 *“12 Test report*

I2.3.17 *In addition to the items required by EN 1363-1, the following shall also be included in the test report:*

I2.3.18 *J) results stated in terms of the **elapsed time, in completed minutes**, between the commencement of the test and the time to failure of integrity and, when required, the time to failure of insulation under the normal and, if appropriate, the supplementary procedure and, where required, the full time history of the radiation as specified in EN 1363-2; the results shall be reported on each of the performance criteria listed in Clause 11”*

I2.3.19 The results of the BS EN 1634-1 test are then used to provide a classification of the door to BS EN 13501-2.

I2.3.20 Section 7 *Classification procedure for fire resistance* 7.1 *General* 7.1.1 *Procedure* Clause 7.1.1(e) of BS EN 13501-2 states:

I2.3.21 “For any of the tests and criteria R, E, I, W, and K the obtained times in minutes shall be rounded down to the nearest lower value included in the following series: 10, 15, 20, 30, 45, 60, 90, 120, 180, 240, 360.”

I2.3.22 Clause 7.5.5 of BS EN 13501-2 provides the guidance on classifying fire doors based on the results of a BS EN 1634-1 test. This is shown in Figure I.2.

Table 6 — Classes for fire doors and shutters including their closing devices

E	15	20	30	45	60	90	120	180	240
EI ₁	15	20	30	45	60	90	120	180	240
EI ₂	15	20	30	45	60	90	120	180	240
EW		20	30		60	90	120		

Figure I.2: European Fire door classifications (Adapted from BS EN 13501-2)

I2.3.23 Clause 7.5.5.4 and Table 6 of BS EN 13501-2 provides the classes that fire doors can be made based on a BS EN 1634-1 test.

I2.3.24 Note when two performances are assessed i.e. integrity and insulation the lower result determines the classification as per clause 6.5.1 of BS EN 13501-2).

I2.3.25 It should be noted the test undertaken was only for integrity and insulation. A separate test to BS EN 1634-3 would be required to demonstrate the cold smoke seal (Sa) provision.

I3 Timeline of fire door installation/ remediation at Grenfell Tower

I3.1.1 Table I.2 provides a time line of the works carried out on fire doors during the design, occupation, and refurbishment of Grenfell Tower. The statutory guidance and Approved Guidance in place at time of the works is set out in the legislation section. The number of doors replaced/ Responsible Person, notified person or principle designer/ door suppliers were established from the Relativity documents referenced in the brackets.

Table I.2 Timeline of works to Grenfell tower relating to fire doors

Project Milestone	Description of fire door work undertaken	Status of work	Statutory requirements in place	Approved guidance documents in place	Non-statutory guidance in place	Number of fire doors installed and/ or upgraded to protected stair enclosure	Number of main flat entrance fire doors installed and/ or upgraded	Responsible person, notified person or principle designer	Door Supplier
1972-1974	Grenfell Tower constructed. Fire doors to protected stair; main flat doors and protected entrance halls of flats installed	Building design	London Building Acts (Amendment) Act 1939 Regulations: London Building (Constructional) Bylaws 1972	LCC guide <i>Means of escape in case of fire</i> (1967 amendment), GLC Code of Practice for buildings of excess height (Section 20 of the London Building Acts) (1970)	British Standard CP3: Chapter IV: <i>Precautions against fire: Part 1. Fire precautions in flats and maisonettes over 80ft in height</i> (1971)	Unknown. Original design drawings have not been provided	Unknown. Original design drawings have not been provided	Unknown	Unknown
1985	Building Regulations application AR/BR/2/150917 for the provision of new self-closing fire resisting flat entrance doors	Unknown	London Building Acts (Amendment) Act 1939 Regulations: London Building (Constructional) Bylaws 1972	LCC guide <i>Means of escape in case of fire</i> (1967 amendment), GLC Code of Practice for buildings of excess height (Section 20 of the London Building Acts) (1970)	British Standard CP3: Chapter IV: <i>Precautions against fire: Part 1. Fire precautions in flats and maisonettes over 80ft in height</i> (1971)	Unknown	Unknown	Unknown	Unknown
2011 - 2013	Flat entrance door replacement programme following consultation with LFB. Fitting of 106 replacement flat entrance doors to tenanted apartments by Masterdor. No works done to 12 Leaseholder flats and 2 Tenanted flats	Building in occupation	Regulatory Reform (Fire Safety) Order 2005	Approved Document B (2010); DCLG guides for the HHSRS (Enforcement, Operation and Landlord) (2006)	LGA guide <i>to Fire safety in purpose-built blocks of flats</i> (2011) BS 8214 (2008) <i>Timber-based fire door assemblies</i> <i>Code of practice</i> BS 9991 (2011)	No works undertaken	106 No. Masterdor Suretors of Fire Resistance specification FD30S installed to replace existing flat front doors on Level 04 - 23 (MAS00000003)	Responsible Person: Chief Executive of the Royal Borough of Kensington and Chelsea (as stated in TMO00831859 & TMO00830598) & TMO (as stated in TMO00830598)	Manse Masterdor Ltd (MAS00000016)

Project Milestone	Description of fire door work undertaken	Status of work	Statutory requirements in place	Approved guidance documents in place	Non-statutory guidance in place	Number of fire doors installed and/ or upgraded to protected stair enclosure	Number of main flat entrance fire doors installed and/ or upgraded	Responsible person, notified person or principle designer	Door Supplier
2014-2016	FP/14/03563 - TMO submitted a Building Regulations ‘Full Plans application’ reference.	Building design	Building Act 1984, Regulatory Reform (Fire Safety) Order 2005, Housing Act 2004 Regulations: Building Regulations 2010, Housing Health and Safety Rating System (England) Regulations 2005	Approved Document B (2013), BS 9991 (2011), DCLG guides for the HHSRS (Enforcement, Operation and Landlord) (2006)	BS 8214 (2008) <i>Timber-based fire door assemblies Code of practice</i> LGA <i>guide to Fire safety in purpose-built blocks of flats</i> (2011)	6 No. WOOD DOORSETS INTERNAL FLUSH PANEL VENEERED FD30S. Manufacturer: David Smith St Ives Limited, (or equivalent) on Ground Level to Level 3 (<i>1279 A2 Door Schedule</i> (RYD00092648) & SEA00000169)	Level G – 3: 9 No. WOOD DOORSETS INTERNAL FLUSH PANEL VENEERED FD60S. Manufacturer: David Smith St Ives Limited, (or equivalent) on Levels 1 to 3 (<i>1279 A2 Door Schedule</i> (RYD00092648) & SEA00000169	Unknown	Unknown

I3.1.2 This Appendix focuses on two of the main types of fire doors installed in Grenfell Tower as these are in my opinion the most critical for mitigating potential fire and smoke spread which would affect the life safety of residents. The doors specifically considered are:

- a) Main flat entrance fire doors
- b) Protected stair enclosure fire doors

I3.1.3 Two main stages of works were undertaken on Grenfell Tower related to fire doors. These were the 2011 main flat door upgrade of tenanted flats (on Levels 4 - 23) and the 2012 to 2016 refurbishment of Levels 1-3 where nine new flats were created. As the refurbished areas of Levels 1-3 were not affected by the fire the compliance of this area is dealt with separately in this Appendix to the main stair/ protected stair doors on Levels 4-23.

I3.1.4 The structure of this Appendix is therefore as follows:

- a) Section I4-Main flat door compliance- Levels 4-23
- b) Section I5- Protected Stair door compliance- Levels 4-23
- c) Section I6- Fire door compliance on Levels 1-3

I4 Levels 04-23-Main flat doors

I4.1 Location of main flat doors

I4.1.1 Figure I.3 below shows the location of the main flat doors.

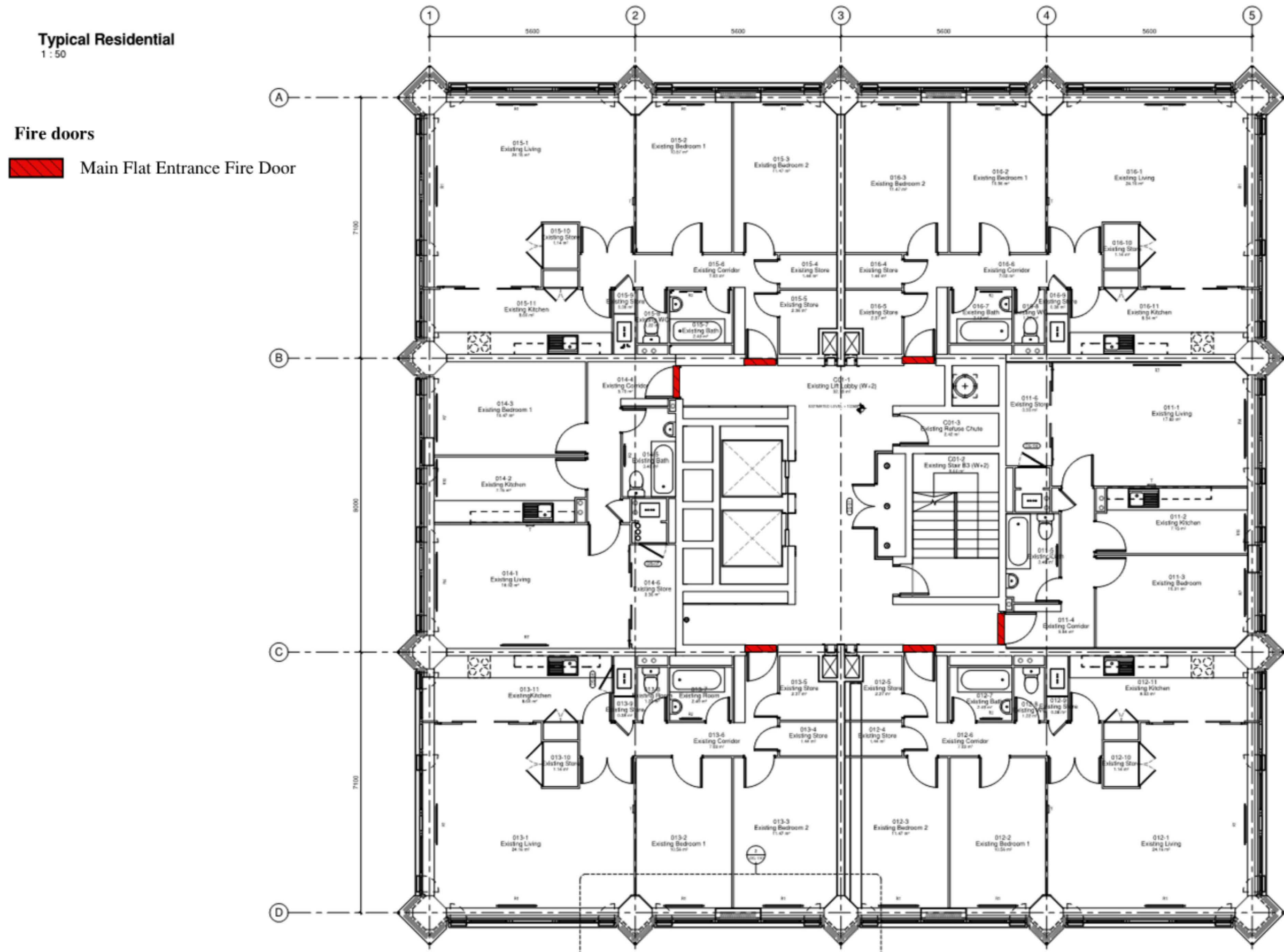


Figure I.3 Location of main flat entrance fire doors (SEA00010474)

I4.2 Responsibility for the performance of main flat doors

- I4.2.1** Two types of resident groups lived in Grenfell tower at the time of the fire. These were tenants and leaseholders.
- I4.2.2** The original building consisted of 120 flats between Levels 4 and 23. An additional nine flats were added in the 2014-2016 refurbishment (TMO00837465).
- I4.2.3** Of the 120 No. original flats between Levels 4 and 23; 14 were leasehold flats and 106 were tenanted flats (TMO00837465).
- I4.2.4** A tenanted flat is one where the occupier rents the flat from the Royal Borough of Kensington and Chelsea (RBKC) Council. In this case the Council is responsible for demonstrating the compliance of the main flat fire doors with the required fire performance.
- I4.2.5** A leasehold flat is where the occupier owns the flat but not the land it sits on. The leaseholder rents the flat for a period of time from the free holder.
- I4.2.6** From the TMO's perspective (TMO10037573), the Leaseholder was responsible for demonstrating the compliance of the main flat fire doors with the required fire performance.
- I4.2.7** I have received a chronology prepared by RBKC dated 28 September 2018 [RBK00029883] of "*the involvement of RBKC in decisions relating to tenant and leaseholder flat entrance doors in Grenfell Tower*". This Chronology cites numerous incidences of correspondence and meetings between RBKC, RBKC Housing, RBKC Environmental Health, LFEPa [now abolished], LFB and the Secretary of State for Communities and Local Government between November 2010 and May 2017.
- I4.2.8** It appears from this chronology that issues as to the responsibility for and enforcement authority in relation to compliance of the leaseholder doors was an ongoing issue up to the time of the fire on 14 June 2017. I will investigate this in Phase 2 of the Inquiry.

I4.3 Performance standards for flat entrance doors

- I4.3.1 Original installation (1972)**
- I4.3.2** As I have explained in Section 4 of my main report, Grenfell Tower was constructed in accordance with the performance specifications set out in CP3 Chapter 4 part 1 (1971).
- I4.3.3** Section 2.3.4 of CP3 Chapter 4 part 1 (1971) states smoke control in a common corridor approach should be designed to one of the three following principles:

“2.3.4.1 An uncontrolled penetration of smoke to a common corridor from a dwelling which is on fire will jeopardize the escape of the occupants if no other route is available. This risk can be partially reduced by the increased standard of protection recommended within a dwelling for Stage I purposes and by the fitting of fire resisting, self-closing entrance doors (without glazing) to all dwellings. This code offers designers three ways of securing a degree of protection against penetration of smoke to the common corridor from the front door of a dwelling:

*1) **Smoke containment**....*

*2) **Smoke dispersal** by which smoke is cleared from stage II escape routes by natural cross ventilation. The effectiveness of this method depends on wind and temperature conditions and on ventilation openings being permanently open or opened manually or automatically at the time of fire*

*3) A new method of smoke control by which smoke is repelled by **mechanical ventilation** from pressurized areas.”*

I4.3.4 To comply with CP3 Chapter 4 part 1 (1971) Section 2.3.7, Grenfell Tower was designed using the **mechanical ventilation** method of protection to the common corridor using the principles set out in section 2.3.7.2.

I4.3.5 There is no diagram in CP3 Chapter 4 part 1 (1971) for the mechanical ventilation case; however general layout of smoke dispersal design for corridor access to a single stair case is stated in Figure 16 of CP3 Chapter 4 part 1 (1971) (refer to Figure I.4).

I4.3.6 As smoke dispersal relies on natural ventilation I have assumed that the mechanical ventilation system would have been designed to the same performance standard.

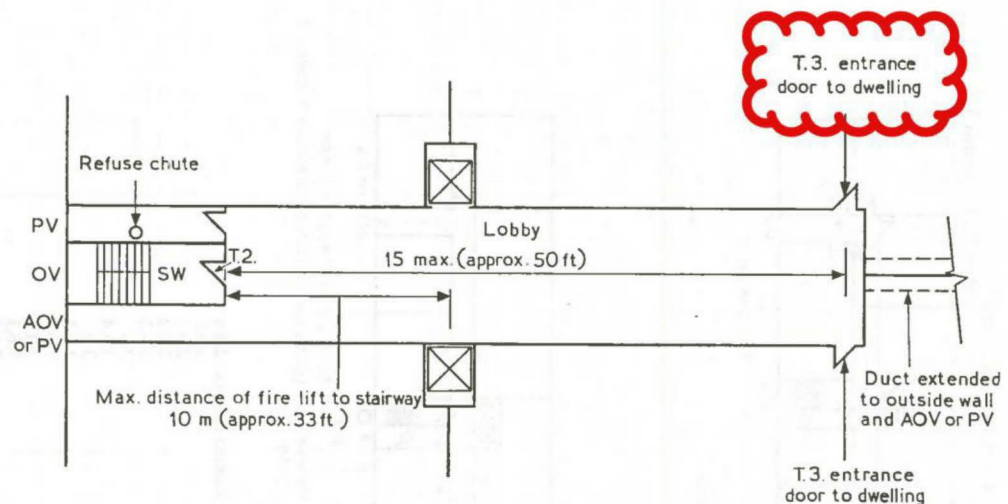


Figure I.4 smoke dispersal methodology of CP3 Chapter 4 part 1 (1971) (Figure 16 of CP3 Chapter 4 part 1 (1971))

I4.3.7 The recommended performance specification for fire doors using smoke dispersal method are shown on diagram 16 (in Figure I.4) as *Type 3 (T.3)* fire resisting doors, and as explained below.

I4.3.8 The performance standards for *Type 3* fire resisting door are stated in Section 4.3.2.3 of CP3 Chapter 4 part 1 (1971) as:

“The door, or leaf thereof when fitted in a 25mm (approximately 1in) rebated frame should satisfy the requirements of test as to freedom from collapse for not less than 30 minutes and resistance to passage of flame for not less than 20 minutes. The door should either be a single leaf swinging in one direction only or double leaf with each leaf swinging in the opposite direction from the other leaf, and with rebated meeting stiles. The door should be fitted in frames having a rebate of not less than 12mm (approximately 1/2 inch) and should be fitted with an automatic self-closing device which may (except where otherwise recommended) consist of rising butt hinges.”

I4.3.9 The performance standards established above are shown indicatively on the over marked plan drawing in Figure I.5. The specific locations of the main flat entrance doors are highlighted with an orange circle.

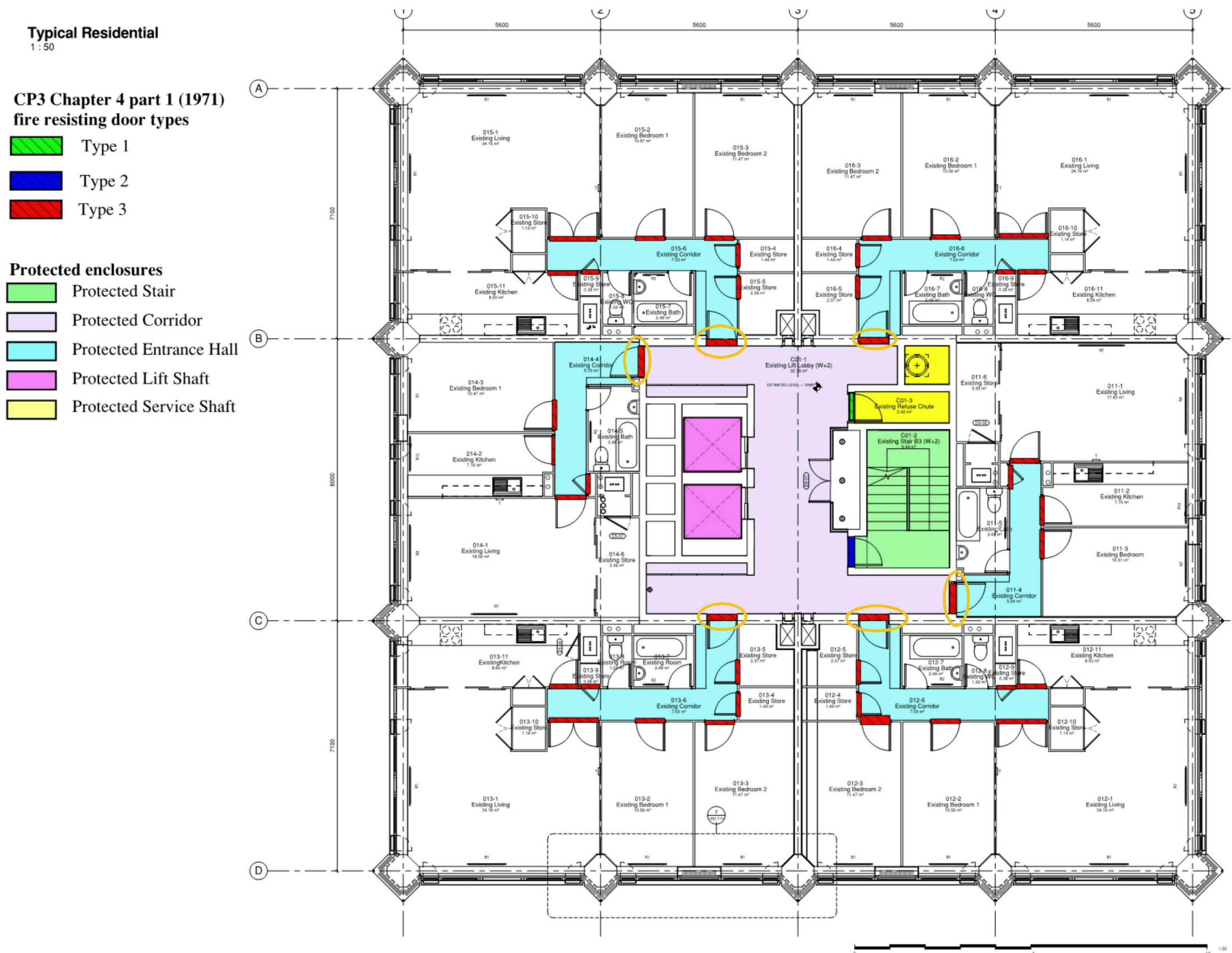


Figure I.5 CP3 Chapter 4 part 1 (1971) fire doors – recommended performance (SEA00010474)

- I4.3.11** It should be noted that CP3 Part 4 was not the only guidance that was available at the time and which included requirements for the performance for flat front entrance doors.
- I4.3.12** However, as I have explained in Section 4 of my report, the lobby smoke control system relies on fire doors to the stairs and to the flats, in conjunction with the ventilation provision. In my opinion, the performance for those doors as required by CP3 1971 therefore takes precedence where their performance is higher than any other of the available design standards at the time.
- I4.3.13** **Building Regulations application AR/BR/2/150917 for the provision of new self-closing fire resisting flat entrance doors (1985)**
- I4.3.14** The RBKC chronology (RBK00000275) states that in January 1985 Building Regulations application AR/BR/2/150917 was made for:
- “the provision of three security screens and doors; the redecoration of the lobbies (incl. new self closing fire resisting flat entrance doors); the provision of escape lighting system”*
- I4.3.15** It is unclear whether this would have been considered maintenance of an occupied building or new building work.
- I4.3.16** The relevant guidance for new high rise residential construction in London in 1985 was CP3 Chapter 4 part 1 (1971), therefore if this Building Regulations application had been considered as building work, the performance requirements for the flat entrance doors would have been those as described in Section I4.3.1.
- I4.3.17** In terms of ongoing maintenance work requirements, high rise residential buildings did not require a fire certificate in accordance with the Fire Precautions Act 1971.
- I4.3.18** However, as I describe in Appendix D, Section 10 *“Courts Power to prohibit or restrict use of certain premises until excessive to persons in the case of fire is reduced”* of the Fire Precautions Act 1971 states:
- “If as regards any premises to which this section applies the fire authority are satisfied that the risk to persons in case of fire is so serious that, until steps have been taken to reduce the risk to a reasonable level, the use of the premises ought to be prohibited or restricted, the authority may make a complaint or, in Scotland, a summary application to the court; and the court on being similarly satisfied may by order prohibit or restrict, to the extent appropriate in the circumstances of the case, the use of the premises until such steps have been taken as, in the opinion of the court, are necessary to reduce the risk to a reasonable level.”*
- I4.3.19** I am not aware of any such complaint to the court having been made for Grenfell Tower under the Fire Precautions Act 1971.

I4.3.20 TMO Tenant door replacement/ Leaseholder door replacement (2011) (Building in occupation) main flat entrance fire door performance requirements

I4.3.21 The TMO issued a letter (TMO10048276) to their tenants on 02/03/2011 which states:

“You may recall that we wrote to you back in September 2009 to advise you that our Fire Consultant would shortly be carrying out a Fire Risk Assessment within the communal area of your block. These assessments are now legal requirements and were being carried out following extensive consultation between the TMO, RBKC and the London Fire Brigade. The Assessment for your blocks made a number of recommendations for improving fire safety and one of these relates to upgrading the flat entrance doors. Therefore, I am writing to advise you that your block has been included in the 2011-2012 flat entrance door replacement programme.”

I4.3.22 There are three potential methods available when carrying out fire risk assessments in sleeping accommodation, which provide specific guidance on fire doors.

I4.3.23 The DCLG produced a guidance document called *Fire safety risk assessments sleeping accommodation* to assist the Responsible Person to discharge their duties under the RR(FS)O 2005 for sleeping accommodation in occupation. The relevant performance standards from this for fire doors are stated in Section I4.3.26 of this Appendix.

I4.3.24 The Local Government Association produced guidance documentation *Fire Safety in purpose-built blocks of flats* in 2011 to assist the Responsible Person to discharge their duties under the RR(FS)O 2005 for flats in occupation. The relevant performance standards from this for fire doors are stated in Section I4.3.31.

I4.3.25 The approved design guidance document in force at the time (ADB 2010) could also have been used as a benchmark standard to determine where the fire safety provisions in Grenfell tower were sufficient. The relevant performance standards from this for fire doors are provided in this Appendix at Section I4.3.46.

I4.3.26 DCLG *Fire safety risk assessments sleeping accommodation* main flat entrance fire door performance standards (relevant to 2011 door replacement)

I4.3.27 The following guidance in relation to main flat entrance fire doors is provided in the DCLG guide *Fire safety risk assessments sleeping accommodation*.

I4.3.28 Part 2 *Further guidance on fire risk assessment and fire precautions*: Section 4 *Further guidance on escape routes* 4.2 *Escape route layout* states:

“In flats and maisonettes served by a single stairway, the layout in Figure 54 will be generally acceptable as long as the following apply:

- Access to the stairway from a dwelling is through two fire doors, this is achieved by using a protected corridor.*
- The stairway is a protected escape route leading to a final exit.*
- The travel distance from the dwelling entrance door to the common stair is limited to 7.5m.*

This principle applies to tall buildings. However, where your building has more than a ground and three upper storeys, seek advice from a competent person.”

I4.3.29 The DCLG guidance is shown on Figure I.6.

Figure 54: Single stairway and automatic ventilation

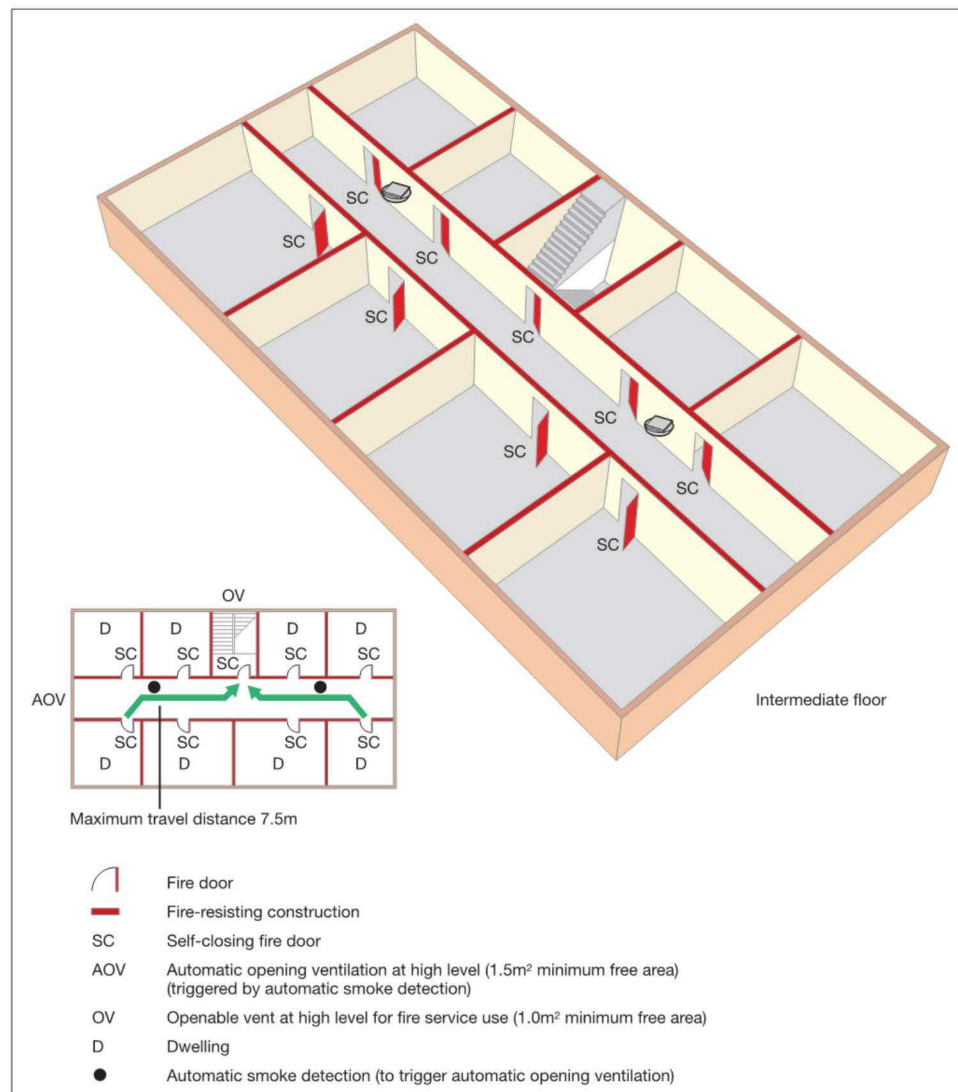


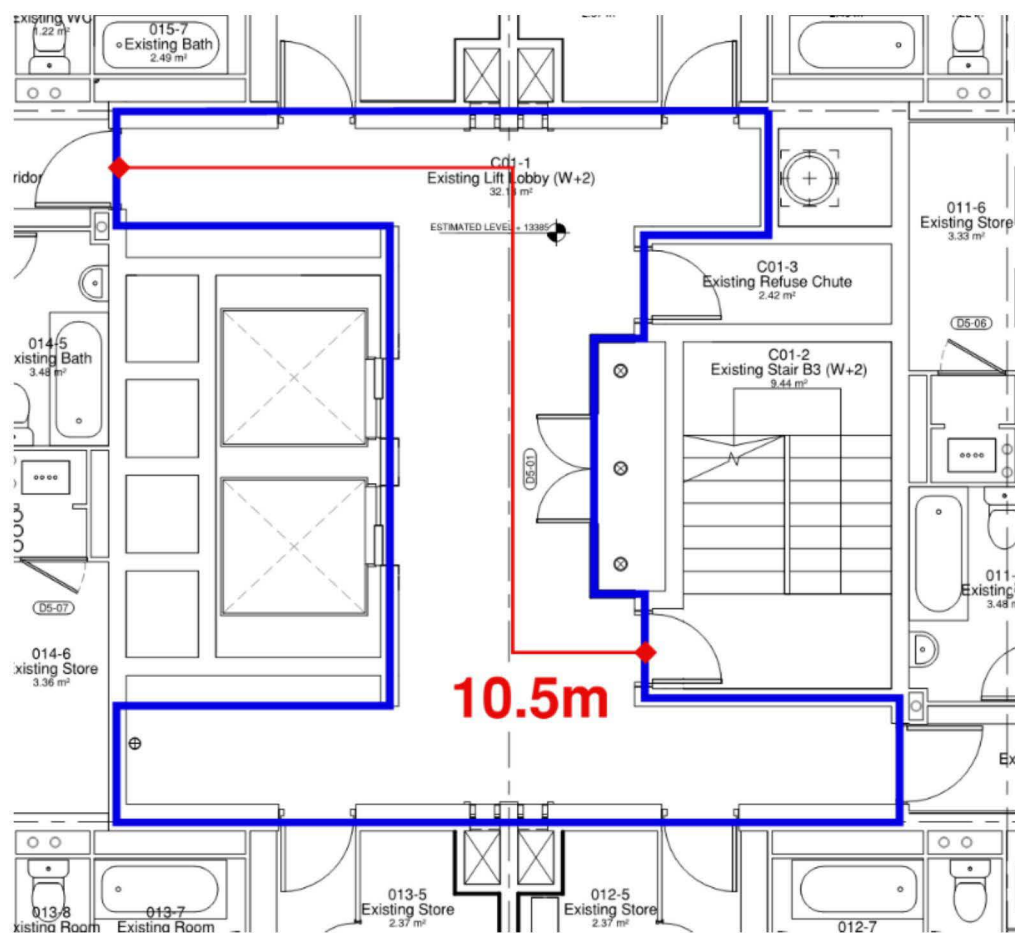
Figure I.6 Single stair way fire door provision (adapted from DCLG *Fire risk assessments in sleeping accommodation* guidance diagram 54)

- I4.3.30** In accordance with Figure 54 of the DCLG guidance (refer to Figure I.6 of this Appendix) all doors opening onto a protected corridor should be self-closing fire doors however no fire resistance duration is specified.
- I4.3.31** **Local Government Association- *Fire safety in purpose-built blocks of flats* main flat entrance fire door performance standards (relevant to 2011 door replacement)**
- I4.3.32** The following guidance in relation to fire doors is provided in the Local Government Association (LGA) guide *Fire safety in purpose-built blocks of flats*.
- I4.3.33** Page 95 of the LGA guidance document states:

“Benchmarks for existing blocks of flats (corridor or lobby approach) – single direction escape

- In unventilated lobbies, increases from the 4.5m limit to 6m are likely to be acceptable with no additional measures.*
- In unventilated lobbies, increases up to 7.5m will require additional measures, such as ‘upgraded FD30S’ doors (see later). Beyond 7.5m, the lobby should be ventilated.*
- In ventilated lobbies and corridors, increases from 7.5m up to 10m are likely to be acceptable in most situations with no additional measures.*
- In ventilated lobbies and corridors, travel distances of ten to 15m may be acceptable, providing **all doors** to the common corridor or lobby are at least ‘upgraded FD30S’ doors (see later) and the smoke ventilation comprises PVs or AOVs.*
- In ventilated lobbies and corridors, travel distances over 15m are likely to be unusual, and cannot be considered acceptable without additional measures, which might include ‘replacement FD30S’ doors, AOVs or automatic fire detection. The advice of specialists will be necessary.”*

I4.3.34 During my post-fire site inspections, I measured the travel distances in the common corridors and found they exceed the limit of 10m set out above, and they were measured as 10.5m from flat ‘4’ on typical residential levels (shown in Figure I.7).



I4.3.35 As the measured travel distance in the common corridors is more than 10m, the LGA guidance would be that “***all doors** to the common corridor or lobby are at least ‘upgraded FD30S’ doors (see later) and the smoke ventilation comprises PVs or AOVs*”.

I4.3.36 The stair door also opens to the common lobby and should therefore, in my opinion, be included in any such upgrade. That is how I read the phrase “all doors” in this guidance. The LGA guidance makes no specific statement regarding stair doors, except when addressing ‘fire-fighting facilities’ in Sections 71.1 to 71.7. I describe the LGA guidance in Section I5.2.29 of this Appendix.

I4.3.37 I deal with the additional issues regarding the stair door, for firefighting purposes (which requires a higher performance standard) in Section I6 of this Appendix.

I4.3.38 The LGA guidance only ever recommends fire door replacement when the travel distances in a common corridor/lobby exceed 15m.

I4.3.39 Additionally, Section 62.17 of the LGA guidance also states:

“It will not be practicable to test existing doors to confirm their actual fire resistance. Therefore, three options exist in relation to original fire-resisting doors that do not meet current benchmark standards. These are:

- accept the door as it is, provided it is a good fit in its frame and that it satisfied the standard applicable to fire-resisting doors at the time of construction of the building or manufacture of the door (‘notional FD30’ door)*
- upgrade the door by, for example, fitting intumescent strips and smoke seals along the edges, and fitting a protected letter box (‘upgraded FD30S’ door)*
- replace the door with an FD30S door (‘replacement FD30S’ door).”*

I4.3.40 I have explained in Appendix M of my Expert Report, my concerns with this approach as a basis for fire performance in existing buildings and in light of the particular stair door construction at Grenfell Tower.

I4.3.41 As I have explained earlier in this report, the standard applicable to flat entrance fire-resisting doors at the time of construction of the building was CP3 Chapter 4 part 1 (1971); to comply with that standard required 30 minutes’ stability and 20 minutes’ integrity to BS 476-1 (1953).

I4.3.42 Section 62.18 of the Local Government Association guidance states:

“An upgraded FD30S door cannot be guaranteed to achieve the same performance as a replacement FD30S door, for which there will be a fire test certificate. This is to be expected and is reasonable provided that the door has sufficient thickness of timber (e.g. 44 millimetres). Simply fitting intumescent strips and smoke seals to a thin door or one with panels will not render it suitably fire-resisting. Specialist advice may need to be sought in order to make an assessment of the likely benefits of upgrading existing fire-resisting doors. Guidance on upgrading fire-resisting doors is also published by the Timber Research and Development Association (TRADA).”

I4.3.43 Section 62.20 of the Local Government Association guidance states:

*“The fitting of suitable self-closing devices- whether to replace rising butt hinges (pictured below) or because the doors are not fitted with self-closing devices- **Must** be undertaken in the short term as a matter of priority”*

I4.3.44 Due to the travel distances within the common corridor of Grenfell Tower exceeding 10m, the LGA guide recommends all doors to the common corridor or lobby are at least ‘upgraded FD30S’. This performance standard from the LGA guidance has been indicatively marked up on the plan in Figure I.8 for all flat doors to the common lobby.

I4.3.45 The location of the main flat entrance fire doors which are the subject of this section are highlighted with orange circles.

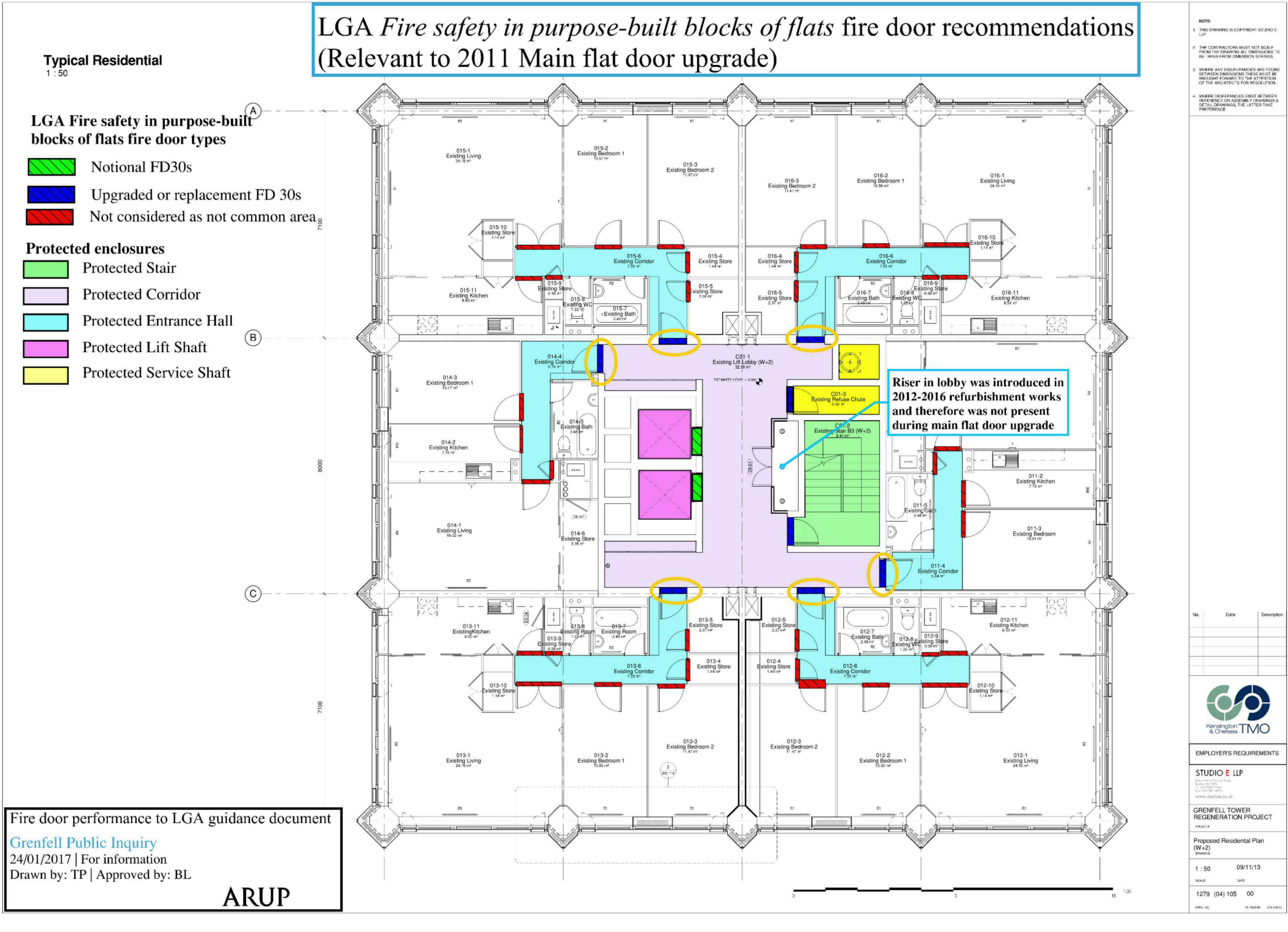


Figure I.8 LGA fire door – recommended performance (SEA00010474)

I4.3.46 Approved Document B main flat entrance fire door performance standards (relevant to main flat entrance fire door replacement in 2011)

I4.3.47 The LGA guidance document *Fire safety in purpose-built blocks of flats* Section 23.3 states:

I4.3.48 *“It is wholly inappropriate to impose the current guidance for new blocks of flats retrospectively to existing buildings. Nevertheless, current guidance can be considered when setting benchmarks against which to assess the adequacy of fire protection within existing blocks of flats ”*

I4.3.49 The current approved guidance at the time of the 2011 main flat entrance door replacement was the 2006 edition of ADB incorporating 2007 and 2010 amendments. I will refer to this version as ADB 2010.

I4.3.50 Note this is an earlier version than ADB 2013 that I reference in regards to the 2012-2014 refurbishment in other sections of my report.

I4.3.51 ADB 2010 could therefore have been used as a benchmark standard to determine where there were deficiencies in the fire safety provisions of Grenfell Tower in 2011, as this was the current statutory guidance at the time of the door replacement.

I4.3.52 The specific guidance on the main flat entrance fire door performance standards from the ADB 2010 is provided below.

I4.3.53 Section 5.5 and 5.6 of ADB 2010 states:

“5.5 Details of the fire resistance test criteria and standards of performance are set out in appendix B

5.6 All fire doors need to be fire resisting to meet the provisions in this Approved Document should have the appropriate performance given in Table B1 of Appendix B”

I4.3.54 Approved Document B 2010 Appendix B paragraph 1 states:

1) All fire doors should have the appropriate performance given in table B1 either:

a) by their performance under test to BS 476-22... in terms of integrity for a period of minutes e.g. FD30. A suffix (S) is added for doors where restricted smoke leakage at ambient temperature is needed or

b) ...All fire doors should be classified in accordance with BS EN 13501-2:2003

*The requirement (in either case) is for test exposure from **each side of the door separately**, except in the case of lift doors which are tested from the landing side only.*

*Any evidence used to substantiate the fire resisting rating of a door or shutter should be carefully checked to ensure that it adequately demonstrates compliance and is applicable to the **complete installed assembly**. Small differences in detail (such as Glazing apertures, intumescent strips, door frames and ironmongery etc.) may significantly affect the rating*

I4.3.55 The fire resistance duration of a fire door can either be demonstrated by British standards or European standards. All of the test reports received as part of the disclosure used British Standard test methods. I have therefore referred to the British Standard performance standards only in this Appendix.

I4.3.56 ADB 2010 Table B1 row 2a recommends where a door is

“In a compartment wall if it separates a flat from a space in common use”

the

“Minimum fire resistance of door in terms of integrity (minutes) when tested to BS 476-22” is for a performance of FD 30S.

I4.3.57 Based on the ADB 2010 recommendations above the performance of the main flat entrance door was to be 30 minutes’ integrity to BS 476-22:1987 and achieve a smoke leakage performance standard of less than 3m³/hour/m length of door (at the head and jambs only) to BS 476 Section 31.1 (as per note 2 of Table B1).

I4.3.58 For cold smoke leakage performance designated by the suffix ‘S’ or ‘Sa’, note 2 to Table B1 of ADB 2010 provides an exemption:

“Unless pressurization techniques complying with BS EN 12101-6:2005 Smoke and heat control systems – Part 6: Specification for pressure differential systems – Kits are used, these doors should also either:

- a) have a leakage rate not exceeding 3m³/m/hour (head and jambs only) when tested at 25 Pa under BS 476 Section 31.1 Methods for measuring smoke penetration through doorsets and shutter assemblies, method of measurement under ambient temperature conditions; or*
- b) Meet the additional classification requirements of S_a when tested to BS EN 1634-3:2004 Fire resistance tests for door and shutter assemblies, Part 3 – smoke control doors”*

I4.3.59 I have undertaken a review of the smoke ventilation system in Appendix J in accordance with BS EN 12101-6:2005. I have concluded that a compliant system was not provided at Grenfell Tower. As a result, Note 2 of Table B1 of ADB 2010 applied. The flat entrance fire doors were therefore required to have smoke leakage performance demonstrated by one of the two methods listed above.

I4.3.60 The following performance standards, other than integrity and smoke leakage performance, are also made in ADB 2010.

I4.3.61 Section 5.7 of ADB 2010 states:

“Where glazed elements in fire resisting enclosures and doors are only able to satisfy the relevant performance in terms of integrity, the use of glass is limited. These limitations depend on... the provisions set out in appendix A Table A4.”

I4.3.62 Table A4 *Limitations on the use of uninsulated glazed elements on escape routes* of ADB 2010 states that no part of the wall or door leaf between residential/ sleeping accommodation and a common escape route (corridor, lobby or stair) of a single stairway building can contain uninsulated glazing however:

“These limitations do not apply to glazed elements which satisfy the relevant insulation criteria, see table A1

I4.3.63 In terms of locks Section 5.11 of ADB 2010 states:

In general, doors on escape routes (whether or not the doors are fire doors), should either not be fitted with lock, latch or bolt fastenings, or they should only be fitted with simple fastenings that can be readily operated from the side approached by people making an escape. The operation of these fastenings should be readily apparent without the use of a key and without having to manipulate more than one mechanism. “

I4.3.64 In terms of self-closing devices, paragraph 2 of Appendix B of ADB 2010 states:

“All fire doors should be fitted with a self-closer device except for fire doors to cupboards and to service ducts which are normally kept locked shut and fire doors within flats (self-closing fire devices are still necessary on flat entrance doors)”

I4.3.65 Where a self-closing device is defined in Appendix E of ADB 2010 as:

“A device which is capable of closing the door from any angle and against any latch fitted to the door

***Note:** rising butt hinges which do not meet the above criteria are acceptable where the door is in a cavity barrier.”*

I4.3.66 In terms of door hinges, paragraph 7 of Appendix B of ADB 2010 states:

“Unless shown to be satisfactory when tested as part of a fire door assembly, the essential components of any hinge on which a fire door is hung should be made entirely out of materials having a melting point of less than 800°C.”

I4.3.67 In terms of signage, paragraphs 8 and 9 of Appendix B of ADB 2010 states:

“8 Except for doors identified in paragraph 9 below, all fire doors should be marked with the appropriate fire safety sign complying with BS 5499-5:2002

9 The following fire doors are not required to comply with paragraph 8 above:

a. doors to and within flats.”

I4.3.68 Doors to protected stair enclosures would therefore require signage compliant with BS 5499-5:2002.

I4.3.69 The fire door performance standards above have been indicatively marked on a floor plan in Figure I.9. The main flat entrance fire doors are highlighted with orange circles.

I4.3.70 Summary of ADB 2010 fire door performance

I4.3.71 Table I.3 and Figure I.9 below provides a summary table of the fire door standards in accordance with Approved Document B 2010.

Table I.3: ADB 2010 fire door performance standards

Fire door installation and/or replacement milestone	Relevant design guidance document	Door type	Fire resistance (Integrity only) performance standard	Smoke leakage performance standard	Glazing	Self-closer performance standard	Standard for the performance of door fastenings	Door swing direction recommendations	Hinges – recommendations	Signage – recommendations
2011 -2013 door replacement	Approved Document B 2010	Fire door in a compartment wall if it separates a flat from a space in common use	No integrity failure up to 30 minutes when tested to BS 476-22 in accordance with line 2a of Table B1 of ADB 2010	Have a leakage rate not exceeding 3m³/m/hour (head and jambs only) when tested at 25 Pa under BS 476 Section 31.1 in accordance with line 2a of Table B1 of ADB 2010	No glazing unless the glazing as per table A4 unless the glazing has been demonstrated to achieve an insulation performance equivalent to the required integrity performance	Required as per ADB 2010 Appendix B paragraph 2. Must close door from any angle and against any latch as per ADB 2016 Appendix E definition.	Locks should only be fitted which are readily openable without a key from the side approached by people making their escape (as specified by Section 5.11 of ADB 2010)	In direction of escape as per Section 5.14 of ADB 2010	Unless shown to be satisfactory when tested as part of a fire door assembly, then constructed entirely out of materials having a melting point of less than 800°C. (ADB 2010 Appendix B paragraph 7)	No signage required (Appendix B paragraph 9 ADB 2010)

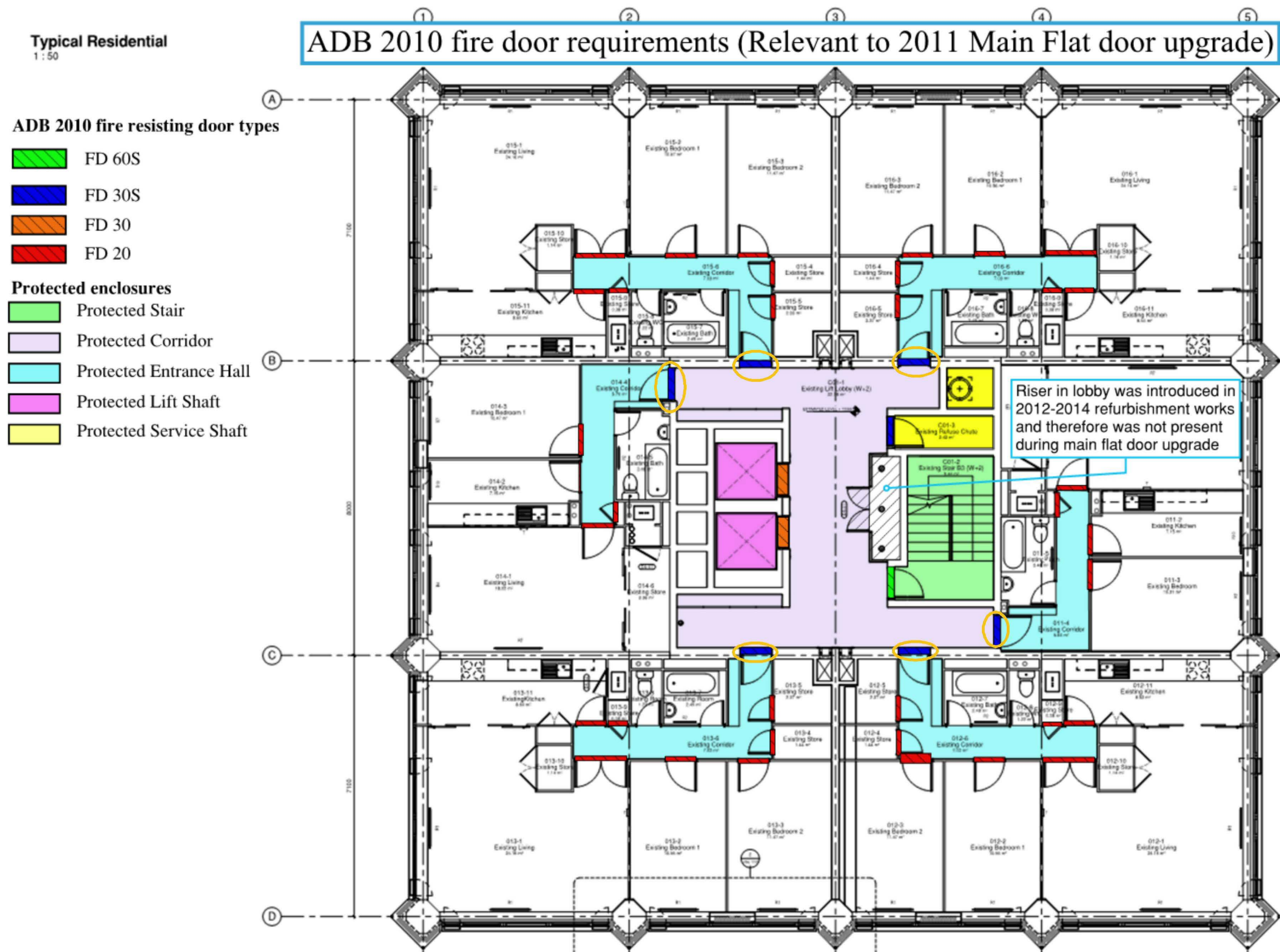


Figure I.9 ADB 2010 fire door recommended performance standards (SEA00010474)

I4.3.72 Overall summary of Main flat entrance fire door performance standards

I4.3.73 The integrity/stability/ cold smoke leakage standard at the time of construction (1972), flat door replacement (1985), and TMO Tenant door replacement (2011) described above are summarised below in Table I.4.

Table I.4: Overall summary of main flat entrance fire door performance standards

Construction milestone	Relevant Guidance	Performance standard for main flat entrance fire door
Construction (1972)	CP3 Chapter 4 part 1 (1971)	Self-closing 30 minutes' stability 20-minute integrity to BS 476-1:1953
Flat door replacement (1985)	CP3 Chapter 4 part 1 (1971)	Self-closing 30 minutes' stability 20-minute integrity to BS 476-1:1953
TMO Tenant door replacement (2011)	DCLG Fire safety risk assessments sleeping accommodation	Self-closing fire door
	Local Government Association- Fire safety in purpose-built blocks of flats	Self-closing Upgraded or replacement FD30S Fire door
	ADB 2010	Self-closing FD30S Fire door

I4.4 Main flat door works prior to 2011

I4.4.1 The original building design consisted of 120 main flat fire doors. No information has been received as part of the disclosure stating the original design performance for the main flat entrance doors.

I4.4.2 A Building Regulations application *AR/BR/2/150917* (RBK00000275) for the provision of new self-closing fire resisting flat entrance doors was made in 1985. No information has been provided as part of the disclosure of the number of flat entrance doors replaced or the fire performance required of the fire door assembly products proposed as part of these works.

I4.5 TMO tenant door replacement (2011)

I4.5.1 Number and location of doors replaced

I4.5.2 Between 25th April 2011 and 19th August 2013, the TMO carried out a programme of replacing doors on dwellings occupied by RBKC tenants to comply with fire safety standards (MAS00000003).

I4.5.3 The doors were supplied by Manse Masterdor Ltd – see spreadsheet of which doors were supplied to which flat number at MAS00000003. It does not appear from this spreadsheet that any doors were supplied for use in communal areas i.e. between the lobbies and the stairwell (and see contract with RBKC which

refers to ‘renewal of flat/entrance doors to the existing housing stock’ MAS00000039).

- I4.5.4** The spreadsheet of Masterdor doors (MAS00000003) states that 109 doors were supplied to Grenfell tower.
- I4.5.5** Of the 109 No. doors on the spreadsheet, three are duplicates (Flats 106, 114, 202). The reasons why there are duplicate doors on the list is unknown.
- I4.5.6** Discounting the duplicate doors, 106 No. fire doors were therefore supplied by Manse Masterdor Ltd in May/June 2011.
- I4.5.7** Of the 106 No. doors that Manse Masterdor Ltd provided, 104 No. were to replace the front door of tenanted flats. This was confirmed by cross checking the Manse Masterdor Ltd door specification spreadsheet (MAS00000003) against the finalised list of tenanted vs leaseholder flats (TMO00837465).
- I4.5.8** The 2 No. tenanted flats where the doors were not specified to be replaced (as per the specification spreadsheet MAS00000003) were Flats 154 and 166.
- I4.5.9** Of the 106 No. doors that Masterdor provided, 2 No. were listed in the specification spreadsheet (MAS00000003) to replace the front door of leaseholder flats. This was confirmed by cross checking the Masterdor door specification spreadsheet (MAS00000003) against the finalised list of tenanted vs leaseholder flats (TMO00837465). It is unclear if this was a mistake as the works were only intended to be to tenanted flats.
- I4.5.10** 12 No. of the 14 No. leaseholder flats were therefore omitted from the scope of the 2011 flat front door upgrades. The compliance of these doors is discussed in Section I4.7.
- I4.5.11** On the basis of the above, 14 No. flats (12 No. leaseholder and 2 No. tenanted) between Levels 4 and 23 had main front doors which were either the original installation in 1972, or may have been replaced in 1985. Their location and impact (where relevant) on the performance of the lobbies is dealt with in Section 14 of my main report.
- I4.5.12** **Product specification**
- I4.5.13** The Manse Masterdor Ltd Suredor brochure (TMO00831637) was included as part of the TMO’s disclosure.
- I4.5.14** This brochure was for Suredor GRP doors, and describes the doors as a “*fibreglass composite*” door.
- I4.5.15** The door leaf is described in the product brochure as:
- “Made from GRP (Glass reinforced polymer) ... The GRP skins are bonded to a PVC composite sub-frame, which offers complete waterproofing of the insulating core, and removes all exposed timber from the door. The insulating*

core of the door is made from 100% CFC free polyurethane, which provides superior thermal performance, and enhances the doors sound proofing."

I4.5.16 The door frame is described in the product brochure as:

"A specially designed, 5 chamber 70mm, multiple seal, white, fully reinforced PVCu outer frame"

I4.5.17 In terms of fire testing the product brochure states:

"BS 476 part 22 Suredor FD 30 testing to satisfy the criteria for integrity and stability."

It should be noted that the brochure does not state that the doors have been tested for cold smoke leakage or insulation.

I4.5.18 The fire test report referenced by the product brochure is:

Fire Test Report No BTC 14434F

I4.5.19 **Compliance of product specification with the relevant guidance**

I4.5.20 I have used the spreadsheet (MAS00000003) as the product specification for the main flat door replacement in 2011 as I understand that it is intended to show what doors were supplied for use at Grenfell Tower.

I4.5.21 Two fire test reports (report BTC 14434F (MAS00000001) produced for LB Plastics dated 16 February 2006 and report Chilt/RF07024 (MAS00000002) produced for LB Plastics and dated February 2007 were submitted by Masterdor Ltd as part of the disclosure process.

I4.5.22 Report BTC 14434F (MAS00000001) is referenced in the Suredor product brochure by Manse Masterdor as the relevant test report for demonstrating the Masterdor Suredor achieves the required integrity and insulation rating (TMO00831637).

I4.5.23 The 2011 door specification spreadsheet (MAS00000003) has been compared with the detailing of the fire door assembly tested and as described in the test report BTC 14434F(MAS00000001). The purpose of this is to determine whether the doors installed were the same as the fire doors tested, so as to substantiate their fire resistance rating (this compliance assessment method is explained in Appendix A of the Approved Document B). The analysis follows.

I4.5.24 Report Chilt/RF07024(MAS00000002) is not referenced in the Manse Masterdor Suredor product brochure therefore it is unclear if this test report is relevant to the Masterdor doors installed in Grenfell Tower in 2011. Regardless I have incorporated this in my compliance assessment.

I4.5.25 I make two general observations here before the detailed review is presented.

- I4.5.26** Firstly, both disclosed test reports (BTC 14434F(MAS00000001) and Chilt/RF07024(MAS00000002)) show that the doorsets tested achieved 30 minutes' integrity. However, this was only from one direction only for both of the separate door sets.
- I4.5.27** The reverse direction was not tested for either door set as would be required for compliance with ADB 2010 Appendix B paragraph 1. I therefore conclude insufficient evidence has been submitted to date to demonstrate compliance with ADB 2010.
- I4.5.28** Secondly my review of both disclosed test reports (BTC 14434F(MAS00000001) and Chilt/RF07024(MAS00000002)) has allowed me to conclude that the cold smoke leakage performance has not been provided, as would be required for compliance with ADB 2010 Appendix B Table B1. Additionally, Section 6 of the code of practice for fire doors BS 8214-2008 states:
- "In the case of a fire door, it is only the complete assembly as described in the relevant fire test report, that can be deemed to provide the required performance. Therefore, a door leaf, door frame, building hardware or any other component part cannot be fire-resisting in isolation from other parts. As the constituent parts of a fire door often interact in quite subtle ways, any changes from the original tested specification can significantly alter the performance of the assembly installed."*
- I4.5.29** Therefore, in my analysis of the Grenfell Tower door specification with the components tested in report BTC 14434F (MAS00000001) and Chilt/RF07024 (MAS00000002), I will determine what if any alterations I can observe.
- I4.5.30** Finally, I surveyed eight main flat doors on Levels 4 – 23 on 19/11/2017.
- I4.5.31** The surveys conducted were non-intrusive visual inspection and these site findings are referred to herein also. I had to finish my inspections early due to safety concerns.
- I4.5.32** As established above, all 106 doors main flat entrance doors replaced in 2011 were specified as Masterdor Suredor with the only variations being the locks and whether glazing was installed.
- I4.5.33** On this basis, it is my opinion that the results of the eight door survey I carried out would apply to all of the 106 main flat entrance doors replaced in 2011.
- I4.5.34** **Door leaf construction**
- I4.5.35** The 2011 door specification in the spreadsheet MAS00000003 does not confirm what the core material the door leaf was constructed with. The retrospective fire resistance test undertaken by BRE Global on one of the front entrance doors from Grenfell states *"Details of the leaf construction were not*

available". I would need to arrange for specific testing to establish what the core materials in the fire doors in Grenfell Tower were formed of.

I4.5.36 I note however that the product brochure (TMO00831637) states the core is Polyurethane. Polyurethane is a combustible material as I have established from the SPFE *Handbook* 5th edition Table A.39 which lists a heat of combustion for polyurethane.

I4.5.37 The eight doors that I surveyed consisted of a polymeric foam type core which is similar to the test specimen in report BTC 14434F (MAS00000001). All 8 doors were all noted as 45mm thick which is in accordance with the FD30 test specimen in report BTC 14434F (MAS00000001).

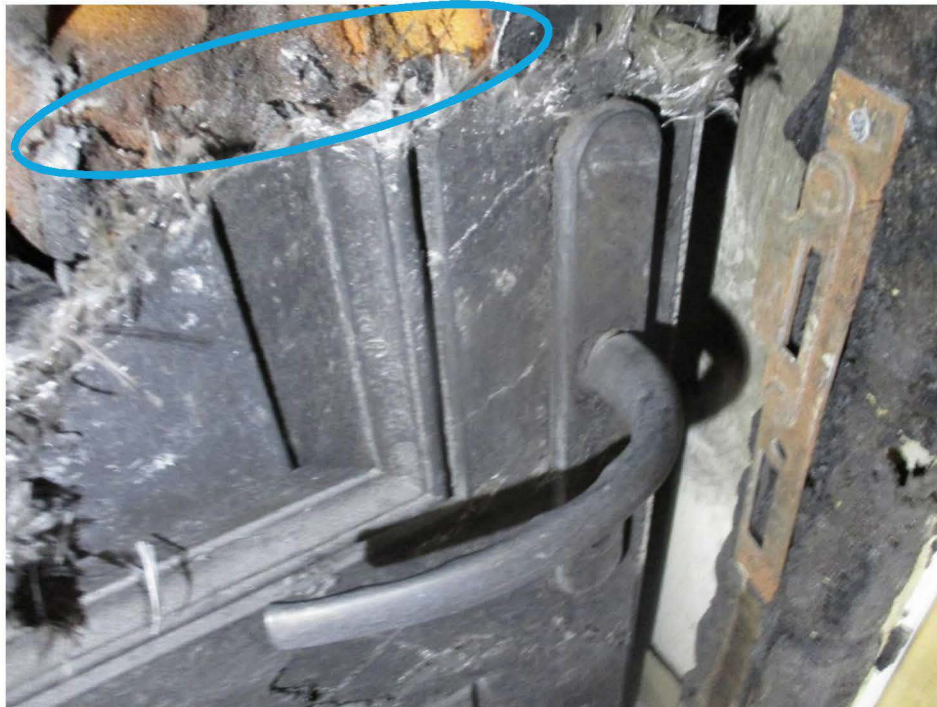


Figure I.10: Polymeric based foam core of door circled in blue (photo from Flat 26)



Figure I.11: 44mm door leaf (photo from Flat 26)

I4.5.38 Surrounding structure to the door assembly

I4.5.39 All eight of the flat main entrance fire doors I surveyed were installed in concrete walls.

I4.5.40 The British Standard *Code of practice for fire doors* (BS 8214:2008) Section 9.3 states:

“9.3 Compatibility of door frames with surrounding structure. The type of surrounding structure or wall/partition into which a fire door can be installed will have been determined by fire resistance test and should not be changed without agreed expert opinion or test evidence (see BS EN 1634-1 for further guidance).”

I4.5.41 The test reports BTC 14434F (MAS00000001) and Chilt/RF07024 (MAS00000002) were conducted in a plasterboard wall construction and not concrete.

I4.5.42 This is a different kind of construction and it is not possible to rely on this test when installing doors in concrete construction. A separate fire test is required.

I4.5.43 Glass specification

I4.5.44 The spreadsheet MAS00000003 lists 48 of the 109 doors in the 2011 door replacement as fitted with glass described as:

6.8 Lam ‘SC’ ×7 Pyroshield textured.

- I4.5.45** The test specimen in report BTC 14434F (MAS00000001) is listed in table 18 of the support fire test report does not contain glass. Therefore, this means the fire test does not cover any door containing glazing and cannot be relied upon to assure fire performance of any door that includes glazing.
- I4.5.46** The test specimen in Chilt/RF07024 (MAS00000002) is stated on Page 14 that the glazing installed in the door set was:
- “Double glazed unit comprising 10mm Pilkington pyrodur (exposed face), 8mm steel spacer and 6.4mm Pilkington Optilam laminated glass unexposed face”*
- I4.5.47** This glass specification is not what is specified in the 2011 door upgrade specification listed in the spreadsheet MAS00000003 therefore Chilt/RF07024 cannot be relied upon as relevant test evidence for the fire performance of the 48 doors where glazing was specified.
- I4.5.48** Of the 48 doors where glazing was installed, none were specified in accordance with the test evidence relied upon.
- I4.5.49** Note the main flat door to Flat 23 inspected by my team and I contained glazing (Refer to Figure I.12) however there was no marking on it to indicate what type.

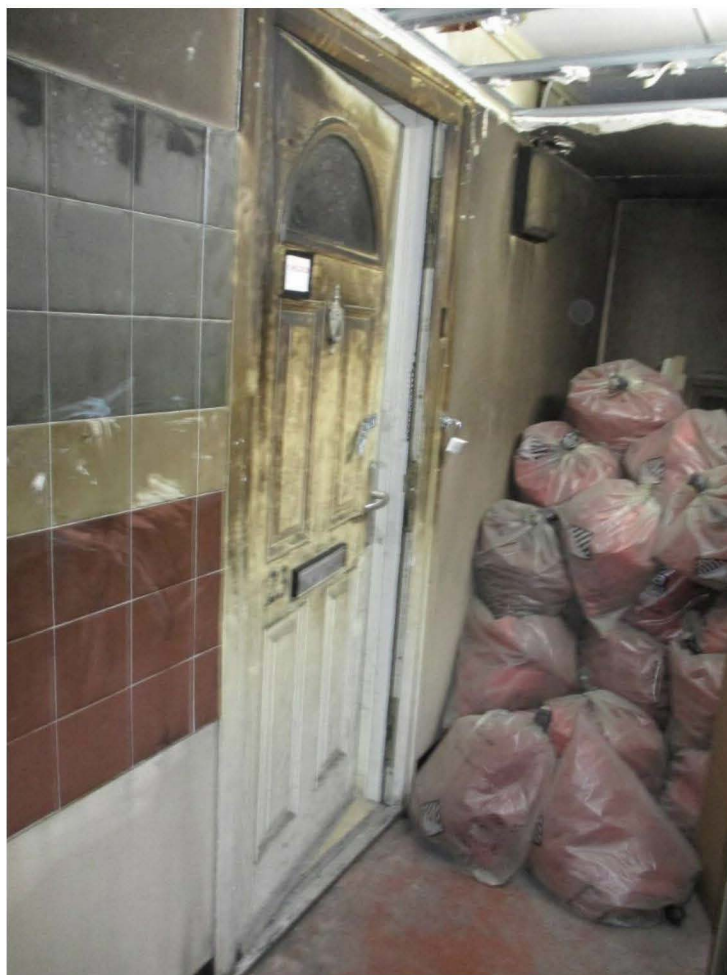


Figure I.12: Flat 23 entrance door (Glazing in place)

I4.5.50 Lock Type

I4.5.51 The spreadsheet MAS00000003 lists three different lock types used on the 109 replacement doors. The specification is provided in Table I.5.

Table I.5: locks specified in the 2011 door replacement (adapted from MAS00000003)

LOCK TYPE	Quantity	Description
LCK-WH-TRU-LOCK-45-LH.S	37	W'haus 20fp Lev/Op Lock / Trulock / 45 BS / LH / Snib
LCK-WH-TRU-LOCK-45-RH.E	1	W'haus 20fp Lev/Op Lock / Trulock / 45 B/S (RH O/In) / ELR
LCK-WH-TRU-LOCK-45-RH.S	71	W'haus 20fp Lev/Op Lock / Trulock / 45 BS / RH / Snib

I4.5.52 The test specimen in report BTC 14434F (MAS000000001) is listed in table 25 of said report as installed with a *Fullex Crimebeater SL16* lock. This is not what is specified in the 2011 specification listed in Table I.5.

I4.5.53 The test specimen in report Chilt/RF07024 (MAS00000002) is listed on page 14 of said report as having a *Wienkhaus STV-F2070 3-point lock*. This is not what is specified in the 2011 specification listed in Table I.5.

I4.5.54 Therefore, of the 109 replacement doors specified in 2011 none were provided with locks that complied with the test evidence supplied to date.

I4.5.55 Of the eight main flat doors surveyed by my team and I eight were fitted with three-point locks. The lock product installed could not be determined through visual inspection (refer to Figure I.13).



Figure I.13: Example lock (from Flat 24)

I4.5.56 **Letter plate type**

I4.5.57 A letter plate is defined in BS 6100-6 as:

“A slotted plate fixed over a slot in a door leaf to permit letters or similar material to be delivered”

I4.5.58 Of the 109 doors replacement doors specified in 2011, the spreadsheet MAS00000003 states all 109 were installed with *UAP 12" L/Plate (170d) Satin/Blk (FD 60)* letter plates.

- I4.5.59** The test specimen in report BTC 14434F (MAS000000001) is listed in table 29 of said report as installed with a *Paddock Fire Master P207* letter plate. This is not the same as the 2011 specification listed in the spreadsheet MAS000000003.
- I4.5.60** The test specimen in report Chilt/RF07024 (MAS000000002) is shown in Figure 1 of page 15 of said report and has no letter plate installed.
- I4.5.61** Therefore, of the 106¹ replacement doors specified in 2011 none were specified with letter plates in accordance with the test evidence supporting a fire resistance performance of the Manse Masterdor from BTC 14434F (MAS000000001).
- I4.5.62** Of the eight main flat doors surveyed by my site inspection team and I, four had letter plates. The type of letter plate could not be confirmed through visual inspection only (refer to Figure I.14). It should be noted that the specification spread sheet (MAS000000003) states that all 106 doors installed in 2011 should have been fitted with letter boxes.



Figure I.14: Example letter box (Flat 23)

- I4.5.63** Photographs taken within Grenfell Tower after the fire on 17/06/2018 show evidence the letterbox (MET00018830) installed within the Masterdor Suredoor contained intumescent materials (i.e. materials that char and swell on

¹ 109 doors are listed, however 3 items in this list are duplicates

heating – typically used in fire products to close gaps and joints during fire exposure).

I4.5.64 I have included that photograph in Figure I.15 along with my own photograph of the Level 6 lobby directly outside Flat 36; there is no sign of heat or damage within the lobby therefore any intumescence would be a result of heat within the flat.

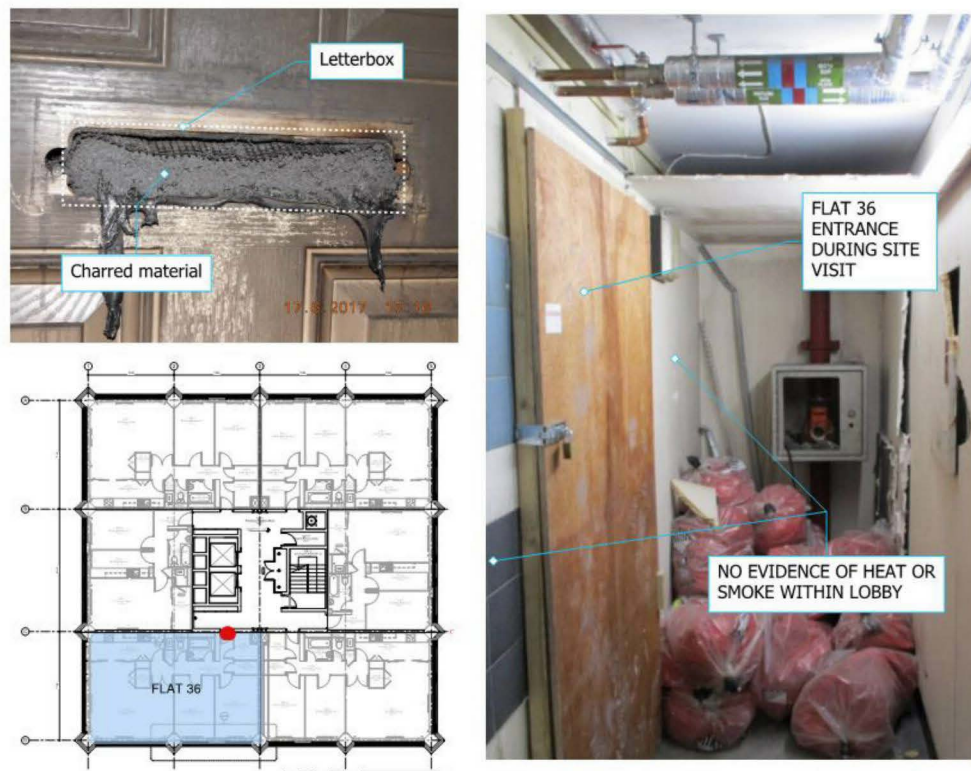


Figure I.15 Flat 36 Letterbox (MET00018830) and Level 6 lobby outside Flat 36 flat entrance door

I4.5.65 Door Closer type

I4.5.66 Of the 109 doors replaced, the spreadsheet MAS00000003 states all 109 were installed with *Astra 3003 Concealed Door Closer V1 PL3* door closers.

I4.5.67 The latch of the test specimen in report BTC 14434F(MAS00000001) was disengaged therefore the door closing in the test was reliant on the door closer installed. For this reason, the door closer must be identical to that tested. This is specified in table 24 of the report as a *Dorma TS 72* closer. This is not the closer specified in the 2011 door specification listed in the spreadsheet MAS00000003.

I4.5.68 The latch of the test specimen in report Chilt/RF07024 (MAS00000002) was engaged therefore the door leaf in the test was not reliant on the door closer

installed and any closer could be used as long as in accordance with 6.2.3.2 of BS476-22:1987;

“The test construction shall incorporate all hardware essential for the provision of the fire resistance of the element in practice. It is not necessary to test floor springs and devices fixed only to the test construction, where, once closing has been achieved, other components are responsible for providing the maintenance of the closed condition, e.g. the latch on a hinged door leaf (see A.2.3).”

I4.5.69 Where A.2.3 of BS 476-22:1987 states:

“It is recommended that care is exercised in the choice of these components as they will probably at best only be allowed to be interchanged over a restricted range of similar components or at worst may not be capable of being varied at all.

Hinged timber doors are particularly vulnerable to errors in specifications relating to products that need to be morticed into the stiles or rails of the construction. If too much timber is removed, localized burn-through might well occur which would cause a loss of integrity. Similarly, any component that creates a thermal bridge when it is attached to the edge of a door, e.g. a broad leaf hinge or a closer arm, is also likely to cause a loss of integrity.

Whilst there is no requirement to fit non-essential items of door furniture to the test specimen, it is recommended that any item that may subsequently be fitted which could cause a failure, e.g. letter plates, security lenses or push/pull handles, should either be incorporated in the test specimen or should be the subject of a separate evaluation.”

I4.5.70 Concealed door closers (as specified in the 2011 door upgrade) must be morticed into the door stile. Therefore, in accordance with the guidance of A.2.3 of BS 476-22:1987, although the closers were not required to maintain the closed position of the door, they should have been included as part of the test specimen. This is due to the potential to cause an early failure in a fire resistance test.

I4.5.71 Concealed door closers were noted on all eight of the flat main doors surveyed by my site inspection team and I. These were all disconnected at the time of survey therefore the action of the self-closers could not be verified.

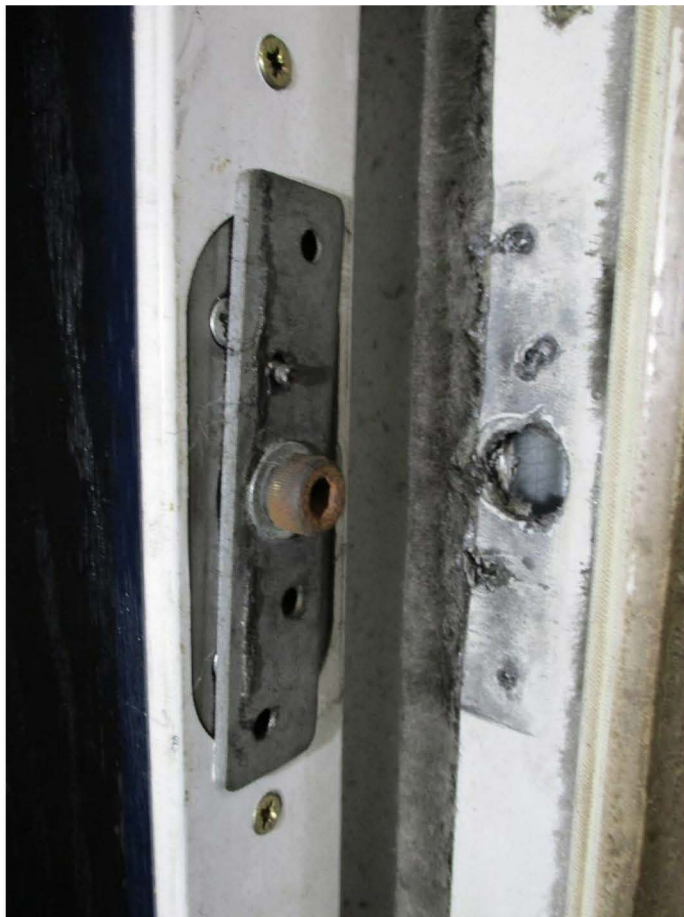


Figure I.16: Example concealed door closer (photo from Flat 22)

I4.5.72 Further to this evidence taken from photographs disclosed by the MPS dated 17/06/2017 (three days after the fire) shows that door closers had been disconnected on the following flats: 11(MET00018872), 12(MET00018980), 13(MET00018994), 14 (MET00018857), 15(MET00018903), 16(MET00018921), 35(MET00019026), 41(MET00018937), 42(MET00019023), 43(MET00018999). None of these flats were part of the eight that I surveyed.

I4.5.73 The photographs disclosed by the MPS dated 17/06/2017 (three days after the fire) do show that the door closer on flat 23 was attached. This is shown in Figure I.17.



Figure I.17 Door closer on flat 23 (circled in blue) was attached (MET00018892)

- I4.5.74** It should be noted that photos disclosed by the MPS show the front entrance door of Flat 34 was fitted with an overhead door closer instead of the specified *Astra 3003 Concealed Door Closer V1 PL3*. It is unclear if this was installed in 2011 or was added to the door later.

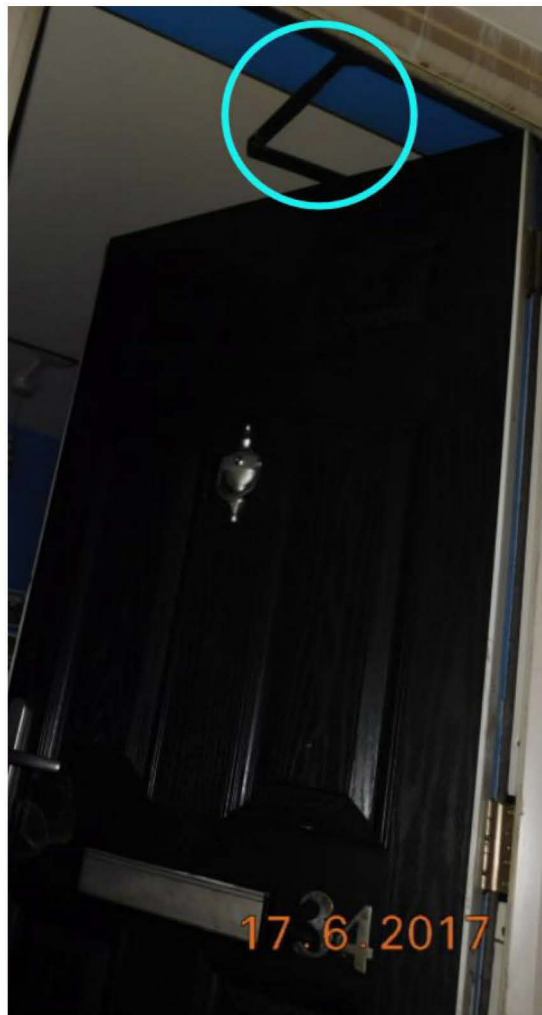


Figure I.18 Flat 34- Overhead door closer installed instead of the specified *Astra 3003 Concealed Door Closer VI PL3* (MET00018847)

- I4.5.75** The lack of effective door closers is non-compliant with ADB 2010 and the LGA guidance. Whether this was an original installation non-compliance or an ongoing maintenance issue shall be investigated fully in Phase 2.
- I4.5.76** At this stage I would however like to highlight several witness statements which seem to indicate the door closers were disconnected prior to the fire.
- I4.5.77** The Witness statement from Sener Macit of Flat 113, Floor 14 (IWS00000069) states:

I believe that as part of the Refurbishment, my front door was replaced. This is the front door to Flat 133, I believe that they replaced the door with a fire door. The new front door would automatically close. We had a letterbox on the door and this would automatically shut. A few months after the door had been fitted it became difficult to close the door properly. One day it became jammed open, which meant I could not close the front door.

I called the "TMO" emergency contact number. I spoke to someone at the "TMO" and I reported the problem. They treated it as an emergency. They sent round a handyman. He was there within a few hours. He looked at the door and he took out a mechanism from within the door. He told me that this was the automatic closing mechanism. He said that this was what was causing my door to jam. He said he needed to remove it.

I asked him if he was going to replace the mechanism. The handyman told me that he would not be replacing it because it wasn't possible to replace just the mechanism. He said that the whole door would need to be replaced in order for it to automatically close. He told me that there was nothing wrong with the door. What I assumed he meant by this was that it would cost money to replace the whole door, when only the closing mechanism needed to be replaced.

The handyman told me that there were other front doors in the Tower which also did not automatically close and the tenants didn't mind it. He told me that it was not necessary for my door to automatically close. I didn't know anything about fire safety at the time and so I just accepted his advice. I thought he was the expert. From this date onwards, my front door did not automatically shut and I would have to close it myself.

I4.5.78 The Witness statement from Hoang Khanh Quang of Flat 76, Floor 10 (IWS00000080) states:

I did not have any fire blankets or fire extinguishers in the flat. I got a new front door around 3-4 years ago. The old door did not have springs. The new door had springs but the springs were not working. The TMO took out the springs. I asked the TMO to repair the door but they told me to call the company myself. No one mentioned to me that I needed a fire door.

I4.5.79 The Witness statement from Zoe Dainton of Flat 12, Floor 4 states (IWS000000806):

Our new front door had a letterbox with springs and bristles. In my opinion it was better than the old door. It felt more secure and kept more heat in. I do not remember how many hinges there were, but there were no obvious gaps between the door and the doorframe. I also remember there was some plastic around the doorframe, which I assume stopped any draught coming in.

About a year after our new front door was fitted, it stopped closing properly. We reported this to the TMO, who sent someone round. They removed a chain, which fixed the problem and made the front door lighter.

I4.5.80 These witness statements therefore indicate that the self-closers were disconnected on the instructions of the TMO for at least three of the flats.

I4.5.81 I have identified an additional four witness statements that state issues with the self-closing action of the main flat front entrance doors.

I4.5.82 Kassemjdian of Flat 141, Floor 17 (IWS00000949) states:

“The front door would automatically shut but it wouldn’t lock when it shut. This meant that sometimes the front door would blow open if the windows in the flat were open. The wind coming through the windows could blow the front door open and closed again”

I4.5.83 Jafari Flat of Flat 86, Floor 11 (IWS00000683) states:

“We also had problems with our front door which should have been self closing but was not. Notting Hill Housing Association were supposed to come and fix it, but they didn’t. Although most flat doors were changed during the refurbishment our door was not.”

I4.5.84 Youssef Khalloud of Flat 85, Floor 11 (IWS00000473) states:

“The door only has one lock. It does not lock automatically if you shut it behind you. On our front door there was nothing in the frame inside the door to pressure it to close if you left the door open. There used to be a door closer on the frame inside the old door, but it had been broken for a long time. It was making noise when you used the door. When they came to put in the new doors during the renovation of the building, we just told the builders to take off the closer. They did not replace it.”

I4.5.85 Roy Smith of Flat 95, Floor 12 (IWS00000771) states:

“Rydon installed a new front door just before Christmas in 2016. It had a security chain and a spyhole; it also has a self-closer mechanism. Shortly afterwards as I was opening or closing it I heard a crack and the weight and chain snapped and fell inside the door. After that the door no longer self-closed”.

I4.5.86 Rabia Yahya of Flat 152, Floor 18 (IWS00000498) states:

“At some point while we were living at Grenfell, our front door was changed”

“The door closed automatically at first, and had a letter flap and a peep hole”

“Unfortunately, the new door soon broke. It came off its hinges and jammed so we couldn’t close it. We reported this to the TMO and to a woman from Rydon, but no one ever came to fix it. Instead, Bellal had to take out the pole from the centre of the door which makes it a fire door. This enabled us to close it, but after that, the door didn’t close automatically.”

I4.5.87 Based on these witness statements I have therefore identified seven flats (Flat 76, Flat 86, Flat 85, Flat 95, Flat 113, Flat 141, Flat 152) where the door self closer did not operate as required for compliance with ADB 2010.

I4.5.88 Further to this the witness statement of a caretaker employed in Grenfell Tower (MET00019959) provides evidence that more door closers were disconnected:

“Just after the warranty ran out, the doors started going wrong. They had internal door closers that were pulling out from the door because they had tiny little screws holding them in and they had a massive fat spring inside

The door had a hole drilled into it, had an enclosed spring that went into the door and would have a chain which attached to the frame. The springs were quite big and the screws that were holding them in were too small. Some of the screws were pulling out of the door and some were pulling out of the frame. If it's coming out of the frame or the door, the chain goes round, you can't shut the door. You can't re-attach it because of the fixings, so I would have no alternative but to remove it. I think I did this to about ten doors”

I4.5.89 And also evidence that they were not replaced with another door closer:

“Obviously, no one was going to come back to repair the doors, and I couldn't, so all I could do was remove the door closer. This now made that an illegal door, because with the closer pulled out, the door wouldn't self-shut.”

I4.5.90 This indicates that non-functioning doors closers were a systematic problem across all of the Manse Masterdor doors installed in 2011.

I4.5.91 **Hinge type**

I4.5.92 Of the 109 doors replaced, the spreadsheet MAS00000003 states all 109 were installed with *HNG-MK2-MASTER-SAX3 hinges*.

I4.5.93 The test specimen in report BTC 14434F (MAS00000001) is listed in table 22 of said report as installed with 3No *Laird DNCADG0008/DNCBG001A hinges*. This is not as specified in the 2011 specification listed in the spreadsheet MAS00000003.

I4.5.94 The test specimen in report Chilt/RF07024 (MAS00000002) is listed on page 14 of said report as installed with 4No *Seley Engineering Asia Masterdor HNG 133 stainless steel hinges*. This is not as specified in the 2011 specification listed in the spreadsheet MAS00000003.

I4.5.95 Of the 109 replacement doors specified in 2011 none were specified with hinges in accordance with the test evidence supplied to date.

I4.5.96 Three hinges were noted for every door frame assembly of the eight flats surveyed by my site inspection team and I which is consistent with the test report BTC 14434F (MAS00000001) however the product type could not be ascertained in the visual site inspection.



Figure I.19: Example door hinge (Flat 24)

I4.5.97 Frame type

I4.5.98 Of the 109 doors upgraded, the spreadsheet MAS00000003 states all 109 were installed with *PVC SK77950 GRP SK FD frames*.

I4.5.99 The test specimen in report BTC 14434F(MAS00000001) is listed in table 9 of said report as *SK77950/S11 Steel reinforced*. The frame of the test specimen in report BTC 14434F is therefore the same as that specified in the 2011 specification listed in the spreadsheet MAS00000003.

I4.5.100 The test specimen in report Chilt/RF07024 (MAS00000002) is listed on page 12 of said report as installed with a *UPVC with steel reinforcement as supplied by Sheerframe SR77950* frame. This is not as was specified in the 2011 specification listed in the spreadsheet MAS00000003.

I4.5.101 The frame type on all eight of the flat fire doors inspected by my site inspection team and I were PVC/metal construction which is consistent with both the specification in the spreadsheet MAS00000003 and the test reports (report BTC 14434F (MAS00000001) and report Chilt/RF07024 (MAS00000002)).

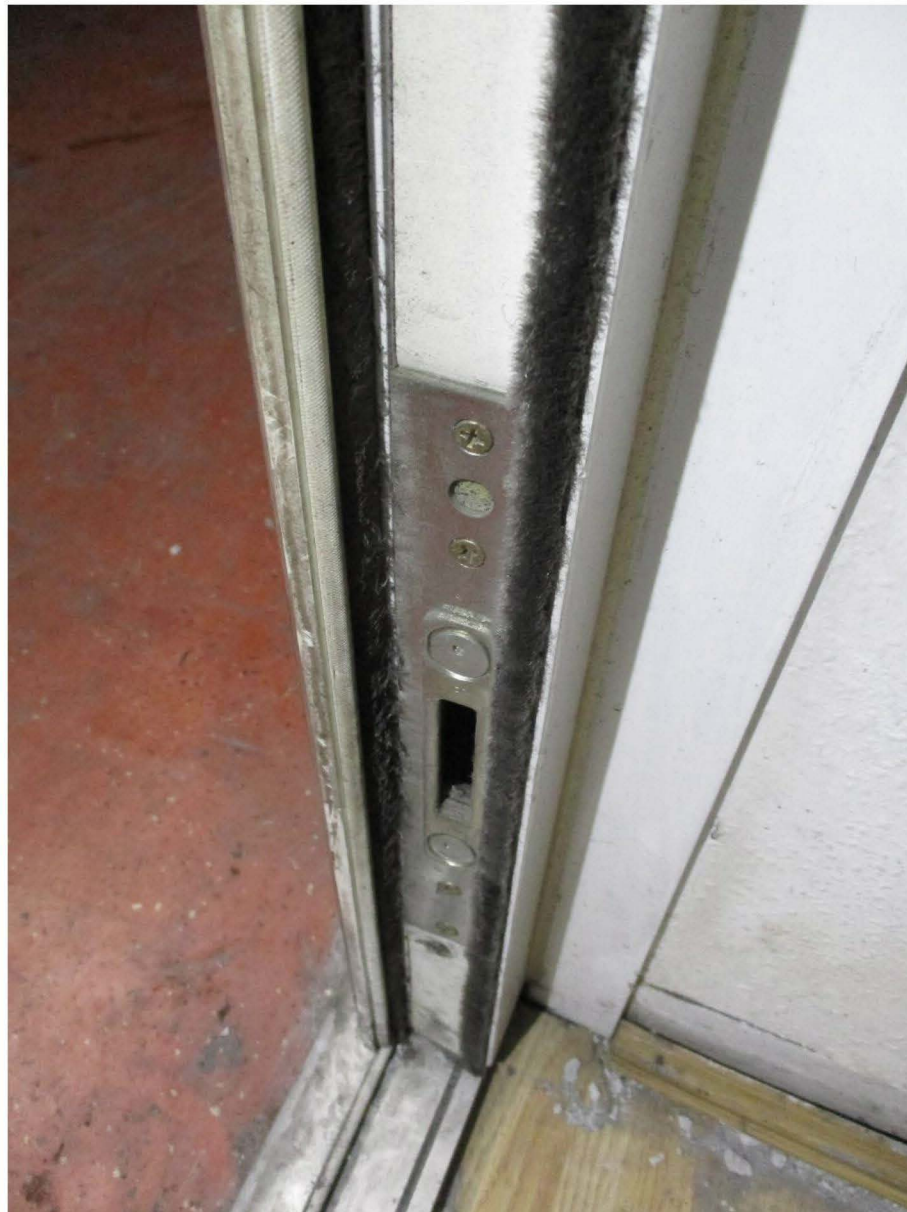


Figure I.20: Example photo of door frame (from Flat 22)

I4.5.102 Intumescent Seals

I4.5.103 The provision of intumescent seals to the 2011 door replacement is provided in the spreadsheet MAS00000003. This specification is provided in Table I.6.

Table I.6: Intumescent seal specification

PCode	Description
INT-3262	25 x 2.5mm Intumescent Flex Graphite Strip
INT-3263	30 x 2.5mm Intumescent Flex Graphite
INT-3264	100 x 30mm Intumescent Graphite Hinge Protection
INT-3265	140 x 75mm 1mm Intumescent Graphite Lock Protection

I4.5.104 The test specimen in report BTC 14434F (MAS000000001) is listed as having the following intumescent seals in Table I.7.

Table I.7: B14434F (MAS000000001) Intumescent seal specification

Position of intumescent seal	Test report BTC 14434F (MAS000000001) specification
Door leaf-Hanging edge	16mm wide 1mm thick (table 8 of BTC 14434F)
Door leaf-Closing edge	10mm wide 2mm thick (table 8 of BTC 14434F)
Door frame- Inside face of frame	1No 25m wide 3mm thick strip (table 10 of BTC 14434F)
Door frame- Outside face of frame	1No 30mm wide 2mm thick strip 2No 10m wide 2mm thick strips (table 10 of BTC 14434F)
Hinges	1mm LPH intumescent (Table 25 of BTC 14434F)
Locks	1mm LPH intumescent (Table 25 of BTC 14434F)

I4.5.105 The provision of 1mm intumescent seals to the lock and hinges (refer to Table I.7) on the test specimen in report BTC 14434F (MAS000000001) is in accordance with the 2011 door specification in the spreadsheet MAS000000003. However, the specification of 2.5mm intumescent flex graphite strips in MAS000000003 does not correlate with any of the intumescent strips installed on the specimen tested in report BTC 14434F (MAS000000001) (refer to Table I.7).

I4.5.106 The test specimen in report Chilt/RF07024 (MAS000000002) is listed as having the following intumescent seals in Table I.8.

Table I.8: Chilt/RF07024 (MAS00000002) intumescent seal provision

Position of intumescent seal	Test report Chilt/RF07024(MAS00000002) specification
Doorleaf-Closing edge	1mm thick Envirograph HP paper (pg. 13 of Chilt/RF07024)
Door frame- Inside face of frame	Envirograph ES253 3mm thick strip (pg. 13 of Chilt/RF07024)
Hinges	1mm Envirograph HP (pg. 13 of Chilt/RF07024)
Locks	1mm Envirograph HP (pg. 13 of Chilt/RF07024)

I4.5.107 The provision of 1mm intumescent seals to the lock and hinges (refer to Table I.8) on the test specimen in report Chilt/RF07024 (MAS00000002) is in accordance with the 2011 door specification in the spreadsheet MAS00000003. However, the specification of 2.5mm intumescent flex graphite strips in MAS00000003 does not correlate with any of the intumescent strips installed on the specimen tested in report Chilt/RF07024 (MAS00000002) for the door leaf or frame (refer to Table I.8).

I4.5.108 Of the 109 replacement doors specified in 2011 none were specified with intumescent strips in accordance with the test evidence supplied to date.

I4.5.109 Intumescent seals were noted on all eight of the flat fire doors inspected by my site inspection team and I however the exact dimension could not be ascertained by visual inspection. Further inspection would be required to verify all of the required intumescent strips for compliance with the test reports (report BTC 14434F (MAS00000001) and report Chilt/RF07024 (MAS00000002)).

I4.6 Fire testing of Main Flat doors after the Grenfell Tower Fire

I4.6.1 As set out in Section I4.5 the test evidence disclosed by Manse Masterdor does not demonstrate compliance of the main flat entrance doors, as installed in Grenfell Tower.

I4.6.2 BRE Global, on behalf of the MPS, tested a Flat entrance door on 13/02/2018 to BS EN 1634-1:2014. This is a retrospective test of a door taken from Grenfell Tower after the 14 June 2017. I have reviewed the relevant report produced following this test i.e. P111605-1001 (MET00019996).

I4.6.3 Approved Document Part B 2010 was the relevant statutory guidance at the time of installation of the flat entrance doors in 2011-2013. In ADB 2010 Appendix B Paragraph 1, both BS 476-22 and BS EN 1634-1 are stated as suitable test methods for demonstrating the fire resistance of fire doors.

- I4.6.4** BS EN 1634-1 is a more onerous fire resistance test than BS 476-22 which was the standard that the Manse Masterdor was originally tested to.
- I4.6.5** BS EN 1634-1 is more onerous due to a requirement for a higher effective furnace pressure to be applied to the top of the door leaf during the test. This is described in further detail in Appendix M.
- I4.6.6** I have not compared the fire resistance test results obtained prior to the Grenfell Tower fire, Report BTC 14434F (MAS00000001) and Report Chilt/RF07024 (MAS00000002) with the BRE Global test (MET00019996) for this reason.

I4.6.7 The key features of the Manse Masterdoor flat entrance door tested by BRE Global as described in report P111605-1001 (MET00019996) are as listed below:

Table I.9 Key features of the Manse Masterdoor flat entrance door tested by BRE P111605-1001 (MET00019996)

Supporting construction	Concrete blockwork and brick
Aperture dimensions	910mm wide x 2105mm high
Door frame height/depth	70mm wide x 1990mm high
Door frame width	Not stated
Door leaf dimensions	765mm wide x 1947mm high x 45mm deep
Vision panel dimensions	Semi-circular with diameter/width of 520mm
No. hinges	Three
Door closer	Fitted to exterior of exposed side
Seals	Sides and top fitted with approx. 8mm nylon brush and 10mm wide white gasket seal. Threshold fitted with 4mm black plastic smoke strip and 10mm white gasket seal.
Maximum gap between door leaf and frame	18mm



Figure I.I.21: Photograph of door assembly tested

- I4.6.8** The result of the fire test (MET00019996) show that the door achieved 15 minutes integrity. This is lower than the 30 minutes integrity required for compliance with ADB 2010.
- I4.6.9** I am not aware that BRE Global on behalf of MPS have conducted a BS EN 1634-3:2004:” Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware. Smoke control test for door and shutter assemblies” test for any flat entrance door samples. Therefore, the smoke leakage performance, ‘S_a’ of the flat entrance door tested is unknown.
- I4.6.10** This is relevant for the performance of the lobby smoke ventilation system also, as Table B1 of ADB 2010 states:
- “Unless pressurization techniques complying with BS EN 12101-6:2005 Smoke and heat control systems – Part 6: Specification for pressure differential systems – Kits are used, these doors should also either:*
- c) have a leakage rate not exceeding 3m³/m/hour (head and jambs only) when tested at 25 Pa under BS 476 Section 31.1 Methods for measuring*

smoke penetration through doorsets and shutter assemblies, method of measurement under ambient temperature conditions; or

- d) *Meet the additional classification requirements of S_a when tested to BS EN 1634-3:2004 Fire resistance tests for door and shutter assemblies, Part 3 – smoke control doors”*

I4.6.11 At the time of the door replacement in 2011, there was no pressurisation system installed in Grenfell Tower, to the standard in *BS EN 12101-6:2005*.

I4.6.12 I have been unable to find records that the presence or not of a smoke leakage performance in accordance with Table B1 of the ADB was ever considered as part of the specification of the 2011 door replacement.

I4.7 Main Flat doors not replaced in 2011

I4.7.1 The following Section reviews the compliance of the 12 leaseholder and 2 tenanted flats where the main flat entrance fire door was not replaced in 2011.

I4.7.2 Number and location of doors replaced

I4.7.3 It was explained in Section I4.5 that Manse Masterdor Ltd replaced 106 No. of the 120 No. main flat entrance fire doors in Grenfell Tower in 2011.

I4.7.4 There were therefore 14 No. main flat entrance doors on Levels 4 – 23 (12 leaseholder and 2 tenanted flats) which were out-with the scope of the 2011 door replacements.

I4.7.5 On 11 February 2013, the TMO included the following excerpt in internal email correspondence (TMO10029177): *“The following flat entrance doors are the original fire rated flat entrance doors and which were fitted with a self-closing device. These are flush solid doors and are all close fitting. These flats are numbers 56, 61, 86, 92, 112, 142, 154, 156, 165, 174, 185, 195, and 206. If any of these flat entrance doors are replaced in the future, then any replacement doors must comply with the requirements of the Building Regulations when installed.”*

I4.7.6 A further email on 15 August 2013 states (TMO10039346):

“The assessor's view was that the existing doors were sufficiently fire retardant to comply with the purpose-built flat guidance and would therefore satisfy the LFB. However, any replacement doors should meet current standards and be FD30s, self-closing etc.”

I4.7.7 Product specification

I4.7.8 A fire resistance performance specification for the original installation of the 120 No. main flat entrance fire doors in 1972 has not been provided as part of the disclosure process.

- I4.7.9** A Building Regulations application *AR/BR/2/150917* (RBK00000275) for the provision of new self-closing fire resisting flat entrance doors was made in 1985. No information has been provided as part of the disclosure of the number of flat entrance doors replaced or the fire door performance proposed. Nor if any of the flats were leaseholder flats.
- I4.7.10** 106 No. of the 120 No. main flat entrance doors were replaced by Manse Masterdor Ltd in 2011.
- I4.7.11** The 14 doors not replaced in 2011 (12 leaseholders and 2 tenanted flats) were therefore either the original 1972 installation or the 1985 replacements. However, as I have explained above no information of the products installed at either date has been disclosed to date.
- I4.7.12** **Compliance of product specification with the relevant guidance**
- I4.7.13** As the fire door assemblies installed in either the original 1972 installation or any subsequent replacement of the doors to flats 56, 61, 86, 92, 112, 142, 154, 156, 165, 174, 185, 195, and 206 cannot be concluded currently, the compliance of said doors cannot therefore be confirmed at this time either. Further to this as all of the doors were lost in the fire their compliance will not be able to be confirmed. The effect of these doors on the protection of the lobbies is discussed further in Section 14 of my main report.

I4.8 Summary of flat entrance fire door types at Grenfell Tower

- I4.8.1** Based on the spreadsheet MAS00000003, I have calculated that the following types of flat entrance fire doors were installed on the 120 flats from Levels 4 – 23 the night of the fire:
- a) 14 doors that were not replaced in 2011 (12 leaseholders, 2 tenanted flats);
 - b) 58 unglazed Masterdor Suredors installed in 2011; and
 - c) 48 glazed Masterdor Suredors installed in 2011.
- I4.8.2** I am aware that MPS are creating a tally of door types found on site, and I will update my numbers should relevant evidence make that necessary.
- I4.8.3** However, based on my current understanding of door types, with the combination of 14 doors not replaced in 2011 and 48 glazed doors from the 2011 door replacement, 52% doors were substantially non-compliant. The remainder of the doors are also not compliant with the provided relevant test evidence.
- I4.8.4** The test evidence used to substantiate the fire resistance rating of the doors is not applicable to the complete installed assembly. Multiple differences have been observed.

I5 Levels 4-23 - Fire Doors to the Protected Stair

I5.1 Location of stair doors

I5.1.1 Figure I.22 below shows the location of the door in a compartment wall enclosing protected shaft forming a stairway.

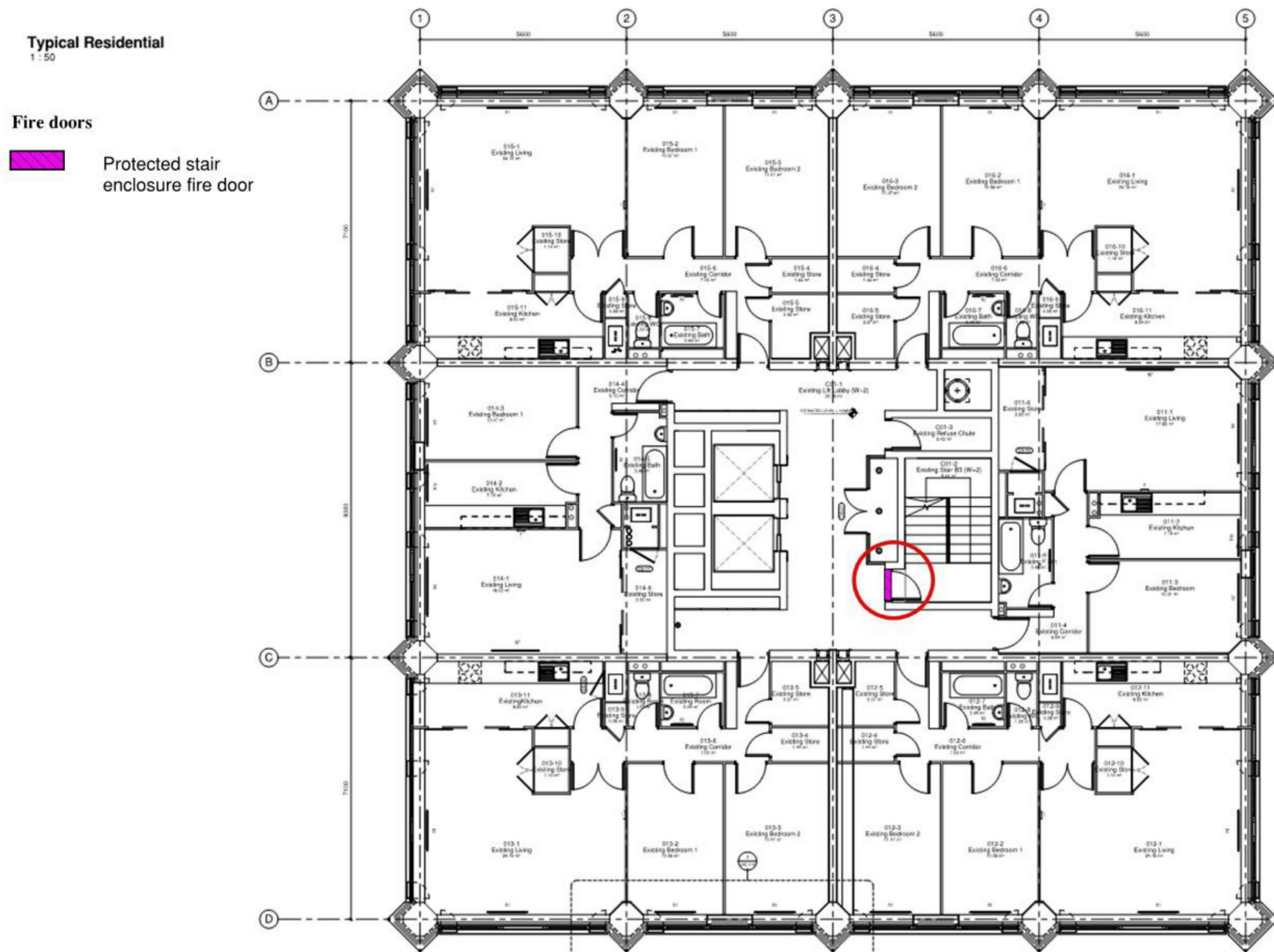


Figure I.22: Location of door to protected stair enclosure (door circled in red)(SEA00010474)

15.2 Performance Standards for Doors to Protected Stair enclosures

15.2.1 As Grenfell Tower was designed with a single stair, the stair has a dual function of both a means of escape and firefighting access.

15.2.2 The level of fire performance of a firefighting stair generally exceeds that of a stair used for means of escape only.

15.2.3 Original installation performance standards (1972 - 1974)

15.2.4 The recommended performance specification for fire doors separating the main stairway from the common corridors are stated in Section 4.4.3 of CP3 Chapter 4 part 1 (1971) as:

“Access to main Stairways should be gained through Type 2 doors placed in the enclosing walls of the stairways.”

15.2.5 CP3 Chapter 4 part 1 (1971) Section 4.3 Fire Resisting Doors states:

4.3.2 Types of fire resisting door. The types of fire resisting door numbered 1, 2 and 3 correspond to the recommendations of CP 3, Chapter IV, Parts 2 and 3. Type 4 is a further type recommended in this Code for places where glazed doors are recommended across corridors.”

“4.3.2.2 Type 2 door. The door, or leaf thereof when fixed in a frame with a 25mm rebate (approximately 1in) should satisfy the requirements of test as to both freedoms from collapse and resistance to passage of flame for not less than 30 minutes. The door may be single or double leaf, swinging in one or both directions. Such doors should be fitted with a self-closing device (other than rising butt) and the frame may have either no rebate or a rebate of unspecified depth; meeting stiles should not be rebated.

With any doors fitted in frames without rebates, the clearance between leaf and frame, or leaf and leaf, should be as small as reasonably practicable.”

4.3.2.3 Type 3 door. The door, or leaf thereof when fitted in a 25mm (approximately 1in) rebated frame should satisfy the requirements of test as to freedom from collapse for not less than 30 minutes and resistance to passage of flame for not less than 20 minutes. The door should either be a single leaf swinging in one direction only or double leaf with each leaf swinging in the opposite direction from the other leaf, and with rebated meeting stiles. The door should be fitted in frames having a rebate of not less than 12mm (approximately 1/2 inch) and should be fitted with an automatic self-closing device which may (except where otherwise recommended) consist of rising butt hinges”

“4.3.2.5 Glazing. Doors having a half hour fire resistance or one hour fire rating may incorporate fixed glazing so long as the fire resistance in respect of

integrity and stability is maintained. For the particulars of fire rated glazing, see CP 153: Part 4."

- I5.2.6** From the text in 4.3.2.2 and 4.3.2.3 of CP3 Chapter 4 part 1 (1971) it can be seen that a Type 2 door requires a higher performance (30 minutes integrity and 30 minutes stability) than a Type 2 door (20 minutes integrity 30 minutes stability). A Type 2 door is specified with a 25mm rebate and a Type 3 door is specified with a 12mm rebate, as a result
- I5.2.7** It should be noted that there is one instance where either a Type 2 or a Type 3 door can be installed with no rebate or rebate of unspecified depth as stated below:
- "The door may be single or double leaf, swinging in one or both directions. Such doors should be fitted with a self-closing device (other than rising butt) and the frame may have either no rebate or a rebate of unspecified depth; meeting stiles should not be rebated. With any doors fitted in frames without rebates, the clearance between leaf and frame, or leaf and leaf, should be as small as reasonably practicable."*
- I5.2.8** This clause only applies to doors swinging in both directions as if a rebate was fitted the door or doors would not be able to swing in both directions. This interpretation is further confirmed by reference to the 1965 national building regulations Clause E11 (c) which states:
- "As to any such door falling into sub paragraph (a)(iii) or (iv), the clearance between the leaf or leaves of the door and the frame and (where there are two leaves) between the leaves shall be as small as reasonably practicable"*
- I5.2.9** Sub paragraphs (a)(iii) and (iv) refer specifically to a single leaf door swinging in both directions and a double leaf door, each leaf of which swings in both directions and not to doors swinging in one direction as installed as the stair door in Grenfell Tower"
- I5.2.10** The method of test exposure to demonstrate stability and integrity is defined in section 4.3.1 of CP3 Chapter 4 part 1 (1971) as:
- "In all cases, the tests referred to under 4.3.2 are those laid down in BS 476."*
- I5.2.11** The relevant BS 476 standard in 1971 was BS 476-1:1953.
- I5.2.12** As I described in Section I4, it should be noted that CP3 Part 4 was not the only guidance that could have been used to obtain stair door fire performance for the original design and construction. However, I have concluded CP3 1971 was the basis for design of Grenfell Tower – see section 4.2 for further details.

I5.2.13 Performance standard for doors to the protected stair enclosure between 1972 and 2005

I5.2.14 High rise residential buildings did not require a fire certificate in accordance with the Fire Precautions Act 1971.

I5.2.15 However, as I describe in Appendix D, Section 10 “*Courts Power to prohibit or restrict use of certain premises until excessive to persons in the case of fire is reduced*” of the Fire Precautions Act 1971 states:

“If as regards any premises to which this section applies the fire authority are satisfied that the risk to persons in case of fire is so serious that, until steps have been taken to reduce the risk to a reasonable level, the use of the premises ought to be prohibited or restricted, the authority may make a complaint or, in Scotland, a summary application to the court; and the court on being similarly satisfied may by order prohibit or restrict, to the extent appropriate in the circumstances of the case, the use of the premises until such steps have been taken as, in the opinion of the court, are necessary to reduce the risk to a reasonable level.”

I5.2.16 I am not aware of any complaint to the court having been made for Grenfell Tower under the Fire Precautions Act 1971.

I5.2.17 Performance standards for doors to the protected stair enclosure post 2005

I5.2.18 After 2005 the RR(FS)O 2005 applied, regarding the statutory fire safety duties and general fire precautions at Grenfell Tower.

I5.2.19 As explained, for the main flat entrance fire doors there were three guidance documents available with performance standards for fire doors: the DCLG *Fire safety risk assessments sleeping accommodation*; the LGA guidance *Fire safety in purpose-built blocks of flats*; or the Approved guidance ADB 2010/ ADB 2013.

I5.2.20 DCLG guide *Fire safety risk assessments sleeping accommodation* (relevant to door to the protected stair enclosure compliance post 2005)

I5.2.21 The following guidance is provided in relation to doors to protected stair enclosures in the DCLG guide *Fire safety risk assessments sleeping accommodation*.

I5.2.22 For means of escape purposes, as I have explained in Section I4.3.26, Figure 54 of the DCLG guidance would require a self-closing fire door to the protected stair enclosure however no fire resistance period is stated.

I5.2.23 For firefighting purposes, the following guidance is provided in the DCLG guide.

I5.2.24 Part 2 *Further guidance on fire risk assessment and fire precautions* Section 3 *Further guidance on firefighting equipment and facilities* 3.3 *Other facilities (including those for firefighters)* states:

“Building Regulations and other Acts, including local Acts, may have required firefighting equipment and other facilities to be provided for the safety of people in the building and to help firefighters. Fire safety law places a duty on you to maintain such facilities in good working order and at all times.

These may include:

- *access for fire engines and firefighters;*
- *firefighting shafts and lifts;*
- *fire suppression systems, e.g. sprinklers, water mist and gaseous;*
- *smoke-control systems;*
- *dry or wet rising mains and firefighting inlets;*
- *information and communication arrangements, e.g. fire telephones and wireless systems and information to brief the fire and rescue service when they arrive; and*
- *firefighters’ switches.”*

I5.2.25 The DCLG guidance makes no requirement on installing a new firefighting shaft (and hence any associated doors to the protected stair enclosure) to comply with current guidance.

I5.2.26 The DCLG guidance only requires that if there is an existing firefighting shaft it must be maintained in good working order at all times.

I5.2.27 The fire resistance period for the existing stair doors was tested by BRE on behalf of the MPS (MET00021780) and found to achieve 16 minutes integrity fire resistance to BS 476-22. This is substantially lower than the current benchmark standard of 60 minutes integrity fire resistance as I described in I5.3.

I5.2.28 I also note in Appendix M that this stair door type is a common construction form as it is consistent with the design of a no. 3 Class A Door in the London Constructional Amending Bylaws.

I5.2.29 **Local Government Association- *Fire safety in purpose-built blocks of flats* door to protected stair enclosure performance standards (relevant to compliance post 2005)**

I5.2.30 As I have explained in Section I4.3.31 the LGA guidance would require that due to the noncompliant travel distances the doors to the protected corridor

should be “*upgraded or replacement FD30s*” for means of escape purposes. This would include the door to the protected stair enclosure.

I5.2.31 In terms of Firefighting facilities LGA guidance Section 71.5 states

“The current benchmark design guidance for firefighting facilities for new blocks of flats is as follows:

Flats over 18m in height should be provided with a firefighting shaft, consisting of a firefighting stairway and a fire main located in the stairway, and a firefighting lift. The firefighting lift can, in blocks of flats, open into the common corridor giving access to the flat entrance doors, providing the lift doors are no more than 7.5m from the door to the stairway.”

I5.2.32 Figure 13 of the LGA guidance then shows the performance standards of the firefighting shaft. This is shown in Figure I.23 below.

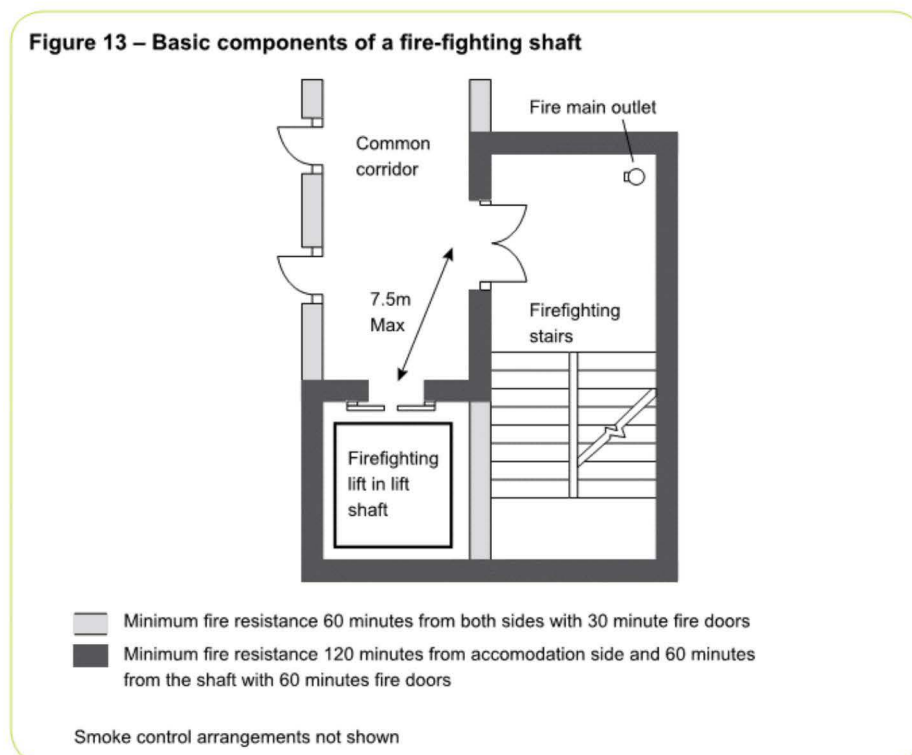


Figure I.23: Firefighting Shaft requirements (Adapted from Figure 13 of the LGA guidance)

I5.2.33 The LGA guidance also states in Section 71.7 states:

“In existing blocks of flats, the fire-fighting facilities may not be in accordance with the above (Current design guidance). In these circumstances, the advice of the fire and rescue service may need to be sought, as it may not be possible, or even appropriate, to consider upgrades to meet current benchmarks. What is important is that the facilities provided should, at least, meet the standard of

the day when the block was built and that these should be maintained in efficient working order.”

- I5.2.34** The requirement for the performance of a door to the firefighting shaft of 60 minutes is explicitly stated in the LGA guidance as the current benchmark standard. It is not explicitly stated whether an existing block of flats should or shouldn't be upgraded to this standard as it is left to the discretion of the fire and rescue service. No guidance is provided on what circumstances could result in the fire and rescue service requiring an upgrade to the firefighting shaft.
- I5.2.35** As I explain in I5.2.27 the historic stair door fire performance of certain types of doors may be substantially below the current benchmark, even if provided with intumescent seals for example. This is not made clear or acknowledged in the LGA guidance.
- I5.2.36** The standard of the day when Grenfell Tower was constructed was *CP3 Chapter 4 part 1 (1971)*. To comply with that standard would have required 30-minute stability and integrity doors fixed into a 25mm rebated frame (as explained in I5.2.3).
- I5.2.37** However, as the measured travel distance in the common corridors is noncompliant with Table 1 of ADB 2013 and exceeds 10m, the LGA guidance would be that *“all doors to the common corridor or lobby are at least ‘upgraded FD30S’ doors (see later) and the smoke ventilation comprises PVs or AOVs”²*.
- I5.2.38** I note that the LGA guidance only recommends upgrading the door (i.e. fitting with intumescent strip seals and smoke seals) so that it is classed as an ‘upgraded FD30S’ door where the existing door satisfied the specification at the time of construction and was therefore a ‘notional FD30’.
- I5.2.39** The stair door also opens to the common lobby and is therefore relevant to this advice. A stair door is critical in preventing smoke or fire from penetrating the stair – where it can:
- Impact the safety of occupants on the fire floor as they escape down the building;
 - Impact the safety of occupants on floors above and below the fire floor by permitting fire or smoke to spread between floors via the stairs;
 - Impact the safety of occupants on floors above and below the fire floor, if they are required to use the stairs to escape the building;

² Please refer to Appendix J where I explain my current views about the condition and compliance of that smoke ventilation system

- d) Impact the ability of the fire service to move around the building in accordance with their standard operational procedures for fighting fires in high rise buildings.

- I5.2.40** I have explained the actual fire performance of historic timber fire doors (such as those which appear to have been present on the stairs at Grenfell Tower) in Appendix M.
- I5.2.41** In Appendix M, I have identified that doors with a rebate of 12.5mm and of a similar construction to a No.3 Class A door to London Building Constructional Bylaws 1966 only achieve 12 minutes integrity.
- I5.2.42** Work by Morris (1971) shows that a door, of similar construction to a No.3 Class A door, upgraded with an intumescent strip could achieve 30 minutes integrity to BS 476-1 (1953) but later evidence from BRE digest 155 and 220 shows that it would fail to achieve 30 minutes to the more onerous fire resistance standard of BS 476-8 (1972) which superseded the 1953 test. In the 1972 test it would only achieve 20 minutes integrity.
- I5.2.43** I have concluded there is an entire subsection of doors that could have been installed to comply with the *London Constructional Byelaws* which cannot achieve 30 minutes integrity to the test standard at the time of construction; and even if upgraded with an intumescent seal cannot achieve 30 minutes fire resistance to any subsequent revision of the fire resistance test standard.
- I5.2.44** I have concerns about the LGA guidance, as no reference is made in the guide to the fact that the lower performance of such doors is well established by a body of published evidence on the issue, specifically regarding fire check doors. All the evidence currently available to me about the Grenfell stair doors indicates that they are in this category of door also.

I5.3 ADB 2010 door to protected stair enclosure

- I5.3.1** It should be noted that to comply with Section 17.2 of ADB 2010 the stair was required to be a firefighting shaft. Firefighting shafts have specific design requirements which are generally more onerous than that for means of escape due to the dual nature of the shaft as both an escape route and a place for firefighters to conduct search and rescue operations/ firefighting.

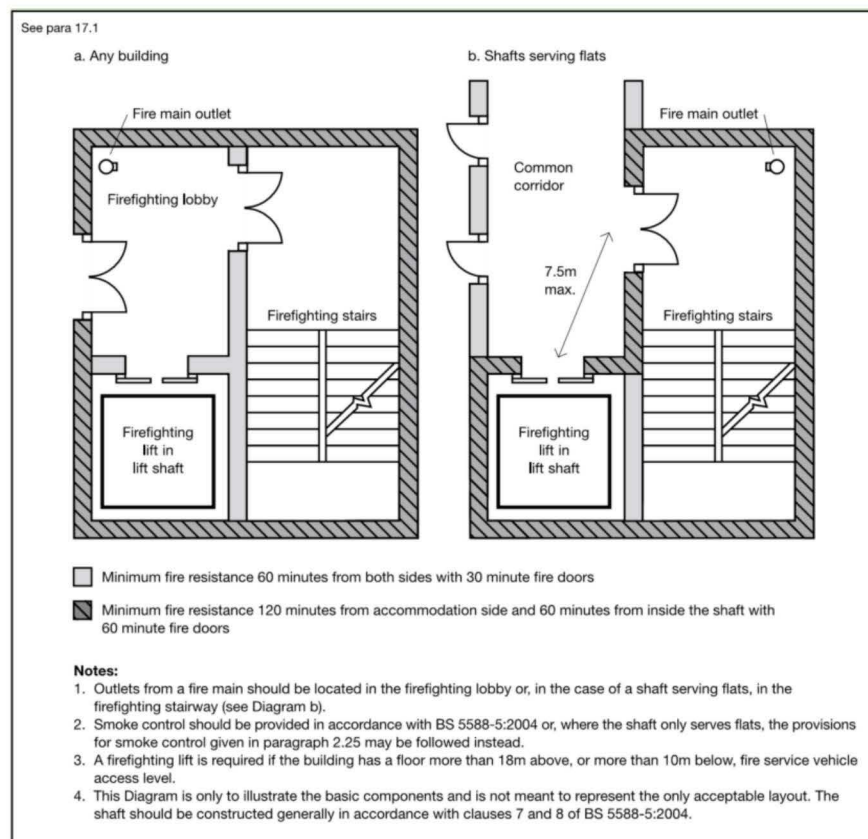


Figure I.24: Diagram 52 of ADB 2010

I5.3.2 Diagram 52b) of ABD 2010 (shown in Figure I.24) states that the:

“Minimum fire resistance (of the firefighting shaft) 120 minutes from accommodation side and 60 minutes from inside the shaft with 60-minute fire doors”

I5.3.3 This fire door performance specification exceeds the minimum requirement set out in Table B1 row 2b and therefore supersedes it, as by complying with the firefighting stair requirement you would also comply with the means of escape requirement.

I5.3.4 The protected stair enclosure fire doors therefore were recommended to achieve a performance requirement of 60 minutes’ integrity to BS 476-22:1987.

I5.3.5 Note this Figure is also reproduced, as I said earlier, in the LGA guide.

I5.3.6 **Overall summary of performance standards of doors to the protected stair enclosure**

I5.3.7 Table I.10 below provides an overall summary of the performance standards

Table I.10: Summary of the performance requirement for the door to the protected stair enclosure

Construction milestone	Relevant Guidance	Performance requirement of main flat entrance fire door
Construction (1972)	CP3 Chapter 4 part 1 (1971); or London Building (Constructional) amending bylaws 1966	Self-closing 30 min stability 30-minute integrity to BS 476 (year not specified) BS 476-1:193 current at this time. Three types of specified construction or 30 min stability 30-minute integrity to BS 476-1:1953.
RR(FS)O 2005 compliance post 2005	DCLG <i>Fire safety risk assessments sleeping accommodation</i>	Self-closing fire door (no specific performance standard stated)
	Local Government Association- <i>Fire safety in purpose-built blocks of flats</i>	At least self-closing Upgraded FD30S Fire door [Note for fire-fighting facilities: "at least meet the standard of the day when the block was built and that these should be maintained in efficient working order"]
	ADB 2013	Self-closing FD60S Fire door

I5.4 Number and location of doors replaced

- I5.4.1** The original building design consists of one door to the protected stair enclosure on every level from Level 4-23. The original building installation therefore included 20 No doors to the protected stair on Levels 4-23.
- I5.4.2** No evidence has been provided as part of the disclosure that the protected stair doors on Levels 4-23 have ever been upgraded or replaced.
- I5.4.3** No stair fire doors are listed on the Manse Masterdor Ltd specification spreadsheet for the 2011 door replacement.
- I5.4.4** No communal fire doors are listed above level 4 on the Studio E door schedule (RYD00092648) for the refurbishment works undertaken in 2012-2016.
- I5.4.5** I have set out in detail in Appendix M the evidence I do have to date regarding the age of the stair fire doors.
- I5.4.6** I have concluded that it is more than likely than not that the stair doors present in the Tower on 14 June 2017 were the original stair doors, with a brush seal (either for draught exclusion or for cold smoke leakage) installed at a later unknown date. Note it is unclear whether intumescent materials were installed underneath this brush seal.

I5.5 Product specification

I5.5.1 No documents have been disclosed which provide a design specification for the original doors to the protected stair enclosure.

I5.5.2 In Appendix M I have compared the stair door set dimensions and materials used in its construction with the design guidance relevant from the time of construction of Grenfell Tower in 1972 and through to the night of the fire in 2017 to ascertain whether the stair doors were:

- a) Original and unaltered since 1972;
- b) Original but upgraded sometime between 1972 and 2017;
- c) Replaced in their entirety between 1972 and 2017.

I5.5.3 Based on the evidence I have reviewed in Appendix M, I am satisfied that the stair door was constructed as a No. 3 Class A door from Table G of Schedule VI of the *London Building Constructional Amending Bylaws* applicable at the time of construction.

I5.6 Compliance of the stair door product with the relevant guidance

I5.6.1 Site inspection

I5.6.2 I inspected one door to the protected stair enclosure. This was on Level 6. I was unable to carry out a detailed inspection of the other doors due to time constraints on site. However, and as demonstrated in my photos in Appendix C, the stair doors in general appear to be of the same type on the other floors - where they were still in place after the fire. At this stage therefore I consider this door to be representative.

I5.6.3 The door leaf was measured as 44mm. This is typical of an FD30 fire door as per the Industry guidance document TRADA WIS 1-13.

I5.6.4 My site inspection determined that the frame rebate was 12mm. This is less than the 25mm required for a Type 2 fire resisting door as would have been required for compliance with CP 3 (1971).

I5.6.5 A rebate is a deep groove or notch cut into the edge of building material. The groove allows a tight fit with other objects that are placed against or into the material.

I5.6.6 The door to the protected stair enclosure on Level 6 is therefore noncompliant with the performance standards at the time of the original installation in 1972 as the rebate is too small.

- I5.6.7** The level 6 stair door was fire tested to BS 476-22 by BRE as part of the MPS investigation (MET00021780). The door was found to achieve 16 minutes integrity and 3 minutes insulation. This is a lower standard than the 60 minutes integrity to comply with current guidance in ADB 2013.
- I5.6.8** This 16 minute integrity performance of the level 6 stair door cannot be directly compared to the original 30 minutes stability and integrity requirement (to comply with the relevant guidance of CP3 part 4 (1971) when installed in 1972) as the test standard relevant in 1972 was BS 476-8:1972.
- I5.6.9** I do not know why the lower standard Class A.No3 doors were deemed to satisfy at the time of construction when their performance is lower than that of a Type 2 door required to comply with CP 3 Part 4 (1971). On this basis, my opinion is that none of the stair doors from Level 4 upwards complied with the design guidance used for the original design of the building (CP3 1971).
- I5.6.10** I observed a brush seal routed into the edge of the door leaf at the sides and top of the door. This could be either a cold smoke seal or a draught excluder. Based on visual observation I cannot confirm if the brush seal was fitted on top of an intumescent seal as part of a combined smoke/ intumescent seal.
- I5.6.11** If the door is not fitted with intumescent seals, it would not be considered an upgraded FD30S door and therefore would not be compliant with the LGA guidance either.
- I5.6.12**
- I5.6.13** If the door was benchmarked against the applicable standard of ADB 2013 it would not achieve the recommended FD60S as the door leave is only 44mm which typically only achieves 30minutes integrity.
- I5.6.14** Figure I.25, Figure I.26, and Figure I.27 show photographs taken of the door to the protected stair enclosure on Level 6 during my site inspections.



Figure I.25: Level 6 stair door



Figure I.26: Level 6 stair door (brush seal present, unknown if intumescent seal present below brush seal)

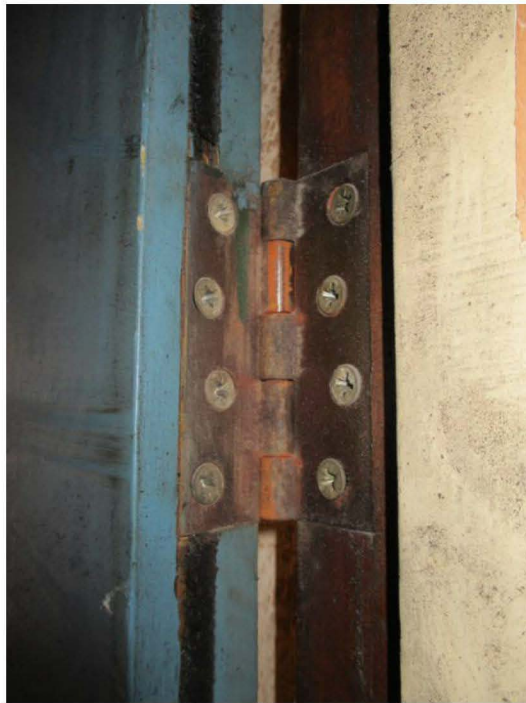


Figure I.27: Level 6 stair door (brush seal present, unknown if intumescent seal present below brush seal)

I5.6.15 From review of photographs disclosed by the MPS I have observed the following.

I5.6.16 Figure I.28 shows the level 10 stair door. The photograph shows the closing edge of a stair door with what appears to be a groove routed into the wood. No seals can be observed in this photo in the closing edge of the door leaf. I have labelled these observations in Figure I.28.

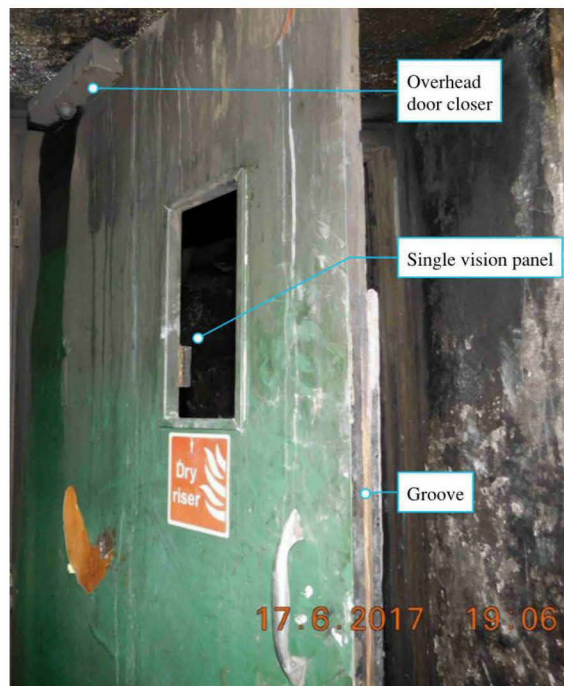


Figure I.28 Level 10 stair door (MET00018829)

I5.6.17 Figure I.29 shows the level 11 stair door. The closing edge of level 11 stair doors contains what appears a discontinuous brush seal. I have labelled this in Figure I.29.



Figure I.29 Level 11 stair doors (MET00018873)

I5.6.18 Figure I.30 shows the level 19 stair door. The closing edge of level 19 stair doors contains what appears to be a groove routed into the wood. No seals can be observed in this photo in the closing edge of the door leaf. The internal framing of the door is also noted as “*stile and rail plasterboard composite*” type consistent with a No. 3 Class A door from Table G of Schedule VI of the *London Building Constructional Amending Bylaws*. I have labelled these observations on the photo below Figure I.30.

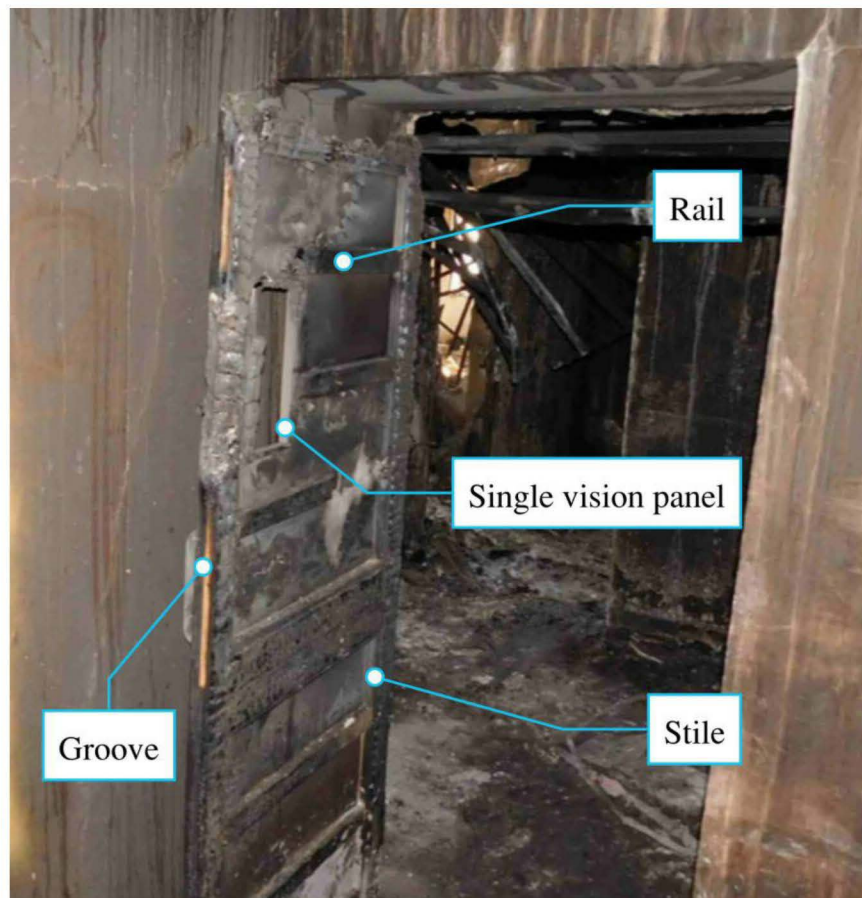


Figure I.30 Level 19 stair door(MET00018975)

- I5.6.19** It is unclear whether the level 10 and 19 stair doors were originally fitted with the smoke seals on the sides and top of the door leaf as I observed on the level 6 door, and heat from the fire melted them/removed them somehow, or if they were not installed at all, on the night of the fire.
- I5.6.20** The smoke leakage performance of the stair doors is not known as I am not aware of any tests of stair door samples to BS 476-31.1 “*Fire tests on building materials and structures, Section 31.1. Methods for measuring smoke penetration through doorsets and shutter assemblies, method of measurement under ambient temperature conditions*” being undertaken by BRE Global on behalf of MPS

I6 Levels Ground- to Level 3- 2012-2016 Refurbishment

I6.1 Fire door performance standards

- I6.1.1** The relevant Approved Guidance for the 2012-2016 refurbishment was ADB 2013. In terms of fire door performance there is no material difference between

ADB 2010 and ADB 2013. I explained the fire door requirements in Section I4.3.46 and I5.3 for ADB 2010 are therefore the same as those for ADB 2013.

I6.1.2 This guidance is summarised in Table I.11 below for reference.

Table I.11: Summary of ADB 2013 fire door requirements

Door type	ADB 2013 Performance requirement
Main flat entrance fire door	FD30S
Door to Protected Stair Enclosure	FD60S

I6.2 Fire strategy compliance

I6.2.1 Exova Warrington Fire produced a fire strategy for the renovation of Grenfell Tower on 07/11/13 (MT14652R Issue No: 03) (EXO00001106). The limitations of the report are not stated: therefore, it is not clear whether the performance standards stated are applicable only on Ground Level to Level 3 or for all levels of the building.

I6.2.2 The fire door specification for the existing stair as provided on page 7 of the Exova fire strategy is shown in Table I.12.

Table I.12: Exova fire strategy fire door specification for doors to protected stair enclosure

Location of fire door	Exova fire strategy performance standards	Compliance with ADB 2013
Doorways therein fitted in the new stair	Self-closing "FD30S"	Compliant with ADB 2013 Table B1
Existing stair which serves the new office accommodation (and which serves as an alternative escape from the boxing club)	Self-closing "FD30S"	Compliant with ADB 2013 Table B1
Where parts of the walls enclosing this stair form part of the enclosure to the fire-fighting lobbies	Self-closing "FD60S"	Compliant with ADB 2013 Table B1

I6.2.3 Further specification is given on page 8 of the Exova fire strategy which states:

"Doorways within compartment walls will be fitted with self closing doors having a 60-minute standard of fire resistance, except where a different standard will be necessary to satisfy B5."

I6.2.4 Exova state the B5 requirements on page 8 of their strategy as:

"The entrance hall containing the stair will be separated from all the accommodation by construction having a 120-minute standard of fire resistance. All connections to the accommodation in this enclosure (except the

connections to the common lobbies) will be via lobbies enclosed to the same standard of fire resistance with the openings fitted with self closing doors of the following standard:

To the accommodation – “FD60S”; and

To the stair – “FD30S”.

- I6.2.5** No further specification is provided for the fire resistance duration of the main flat doors of the Exova fire strategy. As I have stated above it is unclear if this specification of fire doors in compartment walls refers only to Ground Level to Level 3, or refers to all levels of the building.
- I6.2.6** The as built door schedule is stated in the Studio E document *1279 A2 Door Schedule*. (RYD00092648). The door schedule lists the specified fire performance of all of the fire doors installed as part of the 2012-2016 refurbishment. Studio E also produced a set of as built drawings to represent these requirements. I have reviewed the door schedule and drawings for compliance against the performance standards of ADB 2013.
- I6.2.7** It should be noted that no stair doors above level 4 were listed as having had work undertaken on them (either upgrading or replacement) in the 2012-2016 refurbishment.
- I6.2.8** Email correspondence from Paul Hanson (Senior Building Control Surveyor (Fire Regulations) of RBKC to David Hughes (site manager of Rydon) sent at 1408 on 05/07/2016 (TMO00829727) states:
- “Hi David,*
- I confirm that due to the need for the powered lobby ventilation system to draw inlet air from the stairway, it is recommended that the ‘smoke seals’ are not included on the doors between the stairway and the lobby to enable the system to operate at full efficiency.”*
- I6.2.9** Note this does not refer to any intumescent seals.
- I6.2.10** As the Studio E door schedule (RYD00092648) makes no reference to stair door replacements occurring above level 4 I have assumed that the reference to the lack of cold smoke seal is only referring to the works to levels 01-03.
- I6.2.11** This specification that smoke seals are not provided to the stair doors is noncompliant with ADB 2006 Table B1 note 2 which states that smoke seals can only be omitted if:
- “pressurisation techniques complying with BS EN 12101-6:2005.... are used”.*
- I6.2.12** The stairwell pressurisation of the stairwell was not designed to comply with BS EN 12101-6:2005 as I have explained in Section 14 of my main report.

- I6.2.13** I have provided my indicative mark-ups of the fire performance required for compliance with ADB 2013 in the figures below. This represents my opinion regarding the non-compliance (or not) with the Studio E specification. These are shown in Figure I.31, Figure I.32, Figure I.33, Figure I.34.
- I6.2.14** The full list of non-compliances with the Studio E Door schedule (RYD00092648) is provided in Table I.13.

ADB 2013 fire door requirements (Relevant to 2012-2016 Refurbishment)

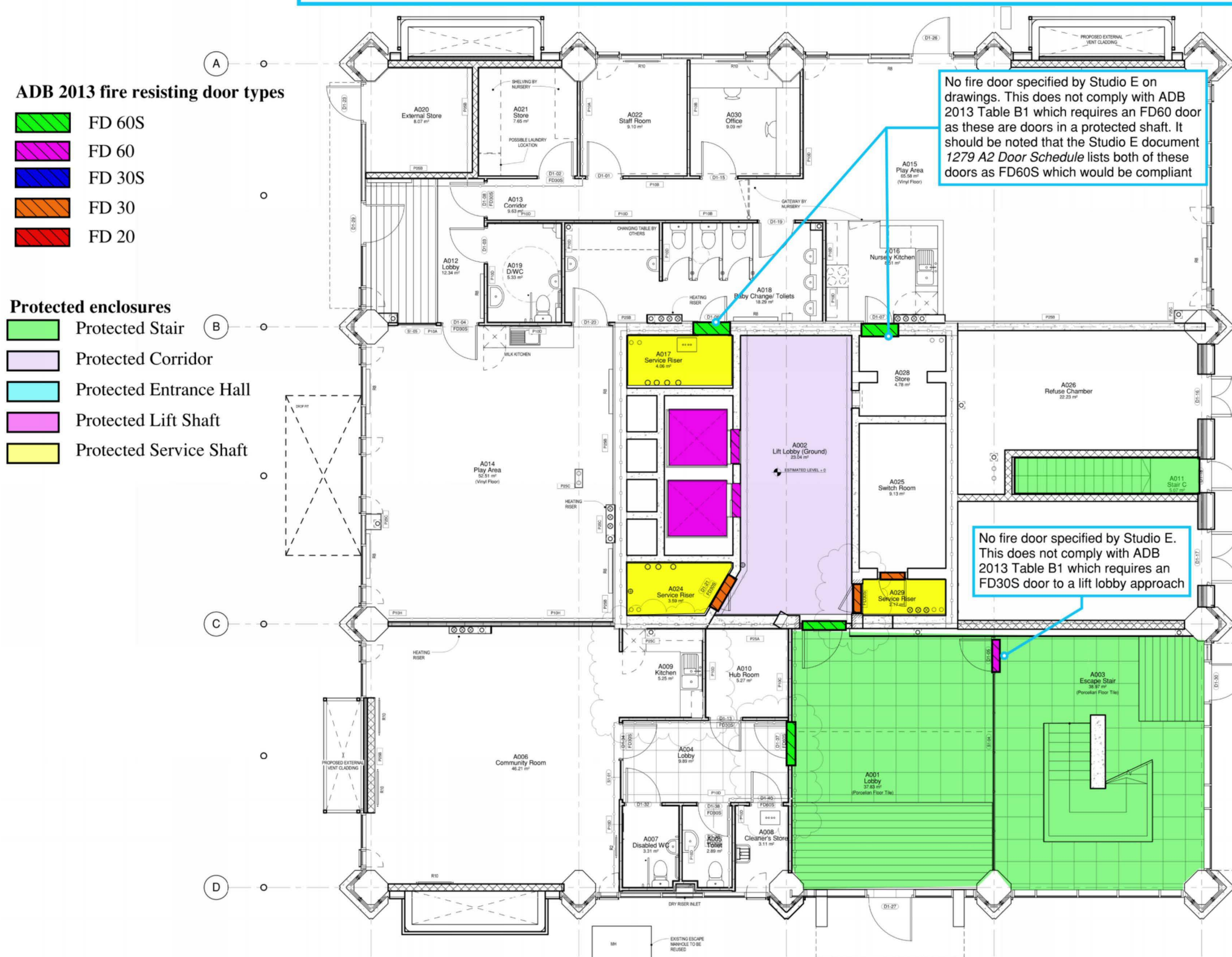


Figure I.31: Indicative over marking of ADB 2013 compliant fire doors on the Studio E as built ground floor plan (SEA00003232)

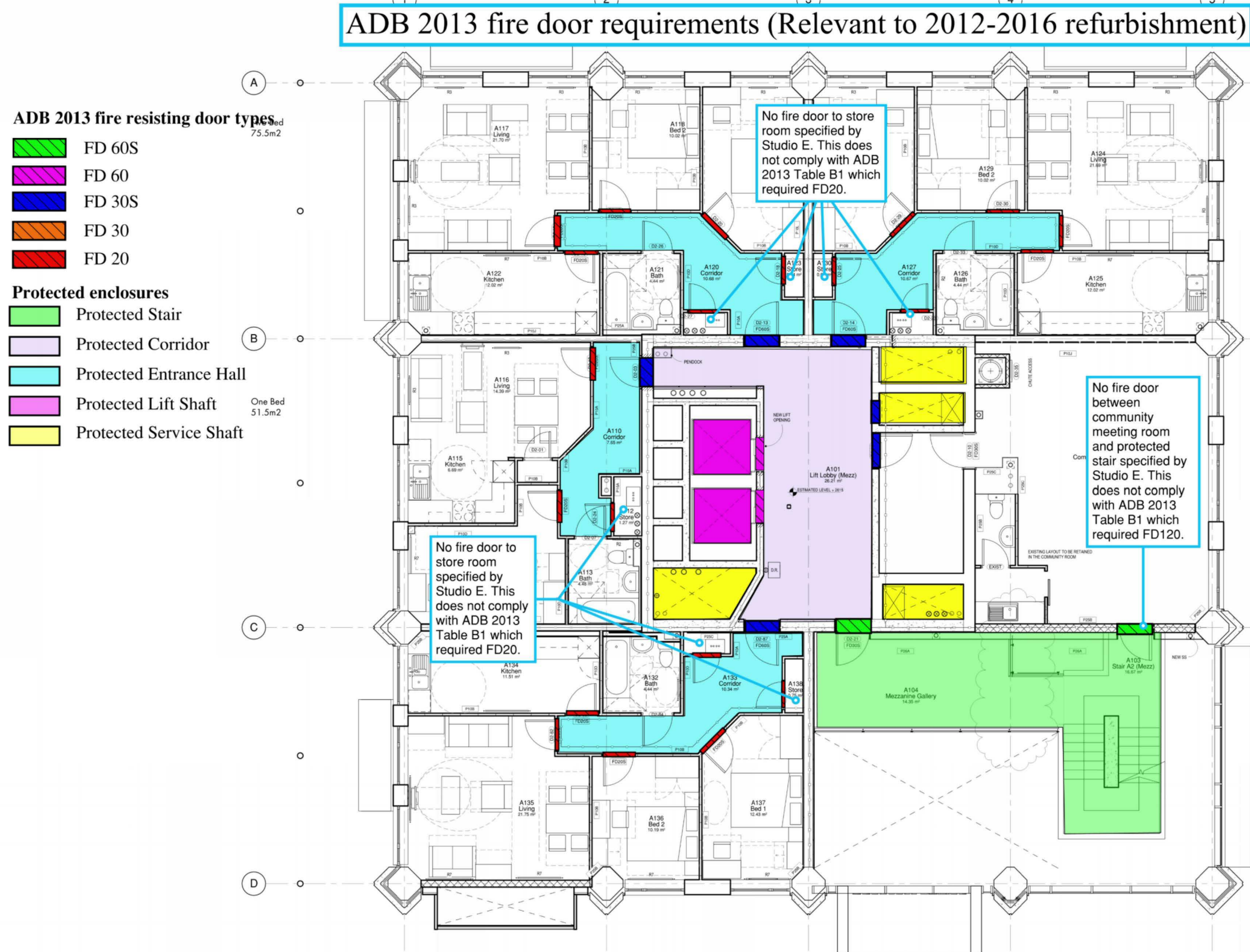


Figure I.32: Indicative over marking of ADB 2013 compliant fire doors on the Studio E as built level 1 floor plan (SEA00003231)

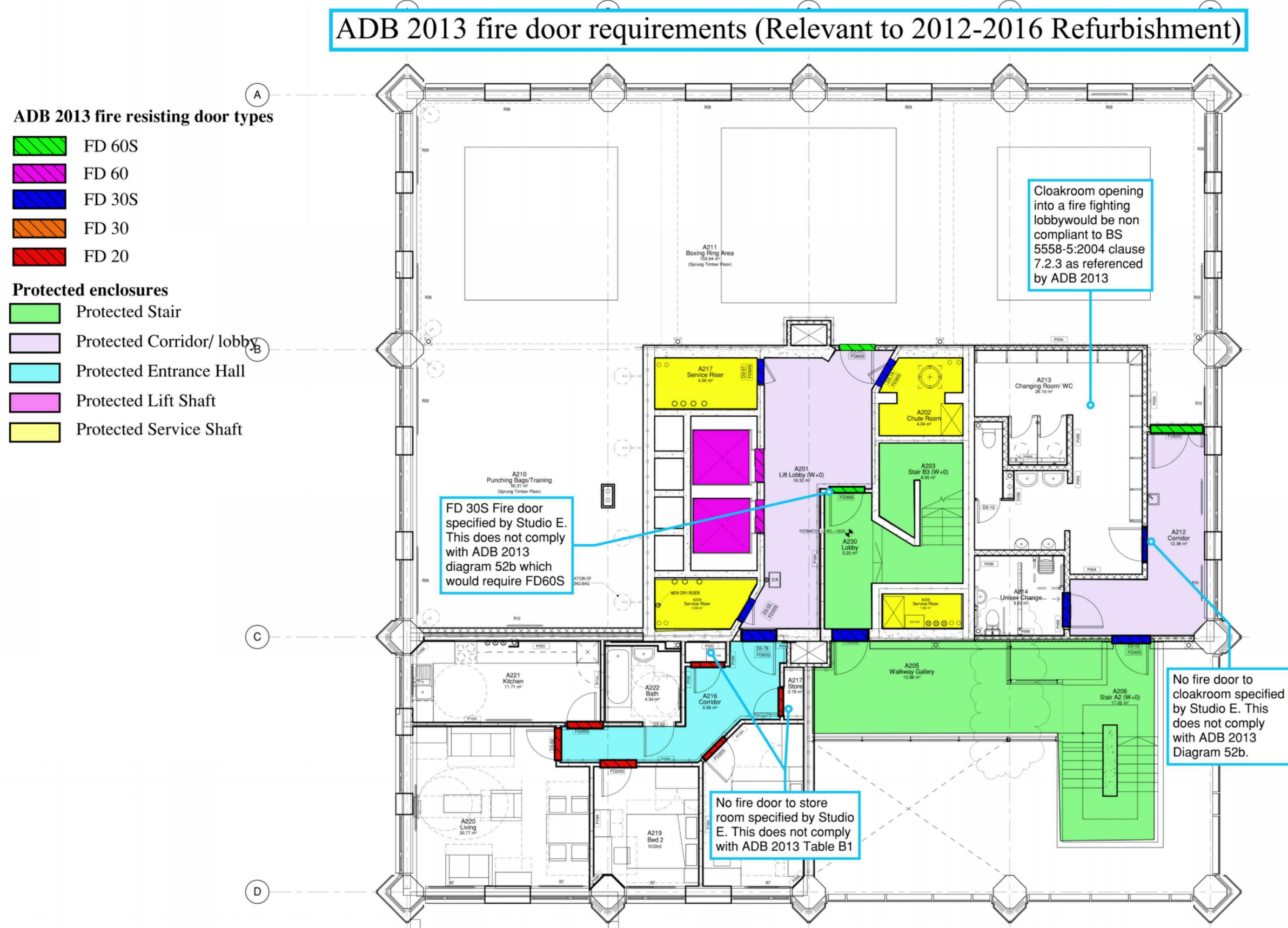







Figure I.33: Indicative over marking of ADB 2013 compliant fire doors on the Studio E as built level 2 floor plan (SEA00003149)

ADB 2013 fire door requirements (Relevant to 2012-2016 refurbishment)

ADB 2013 fire resisting door types

-  FD 60S
-  FD 60
-  FD 30S
-  FD 30
-  FD 20

Protected enclosures

-  Protected Stair
-  Protected Corridor
-  Protected Entrance Hall
-  Protected Lift Shaft
-  Protected Service Shaft

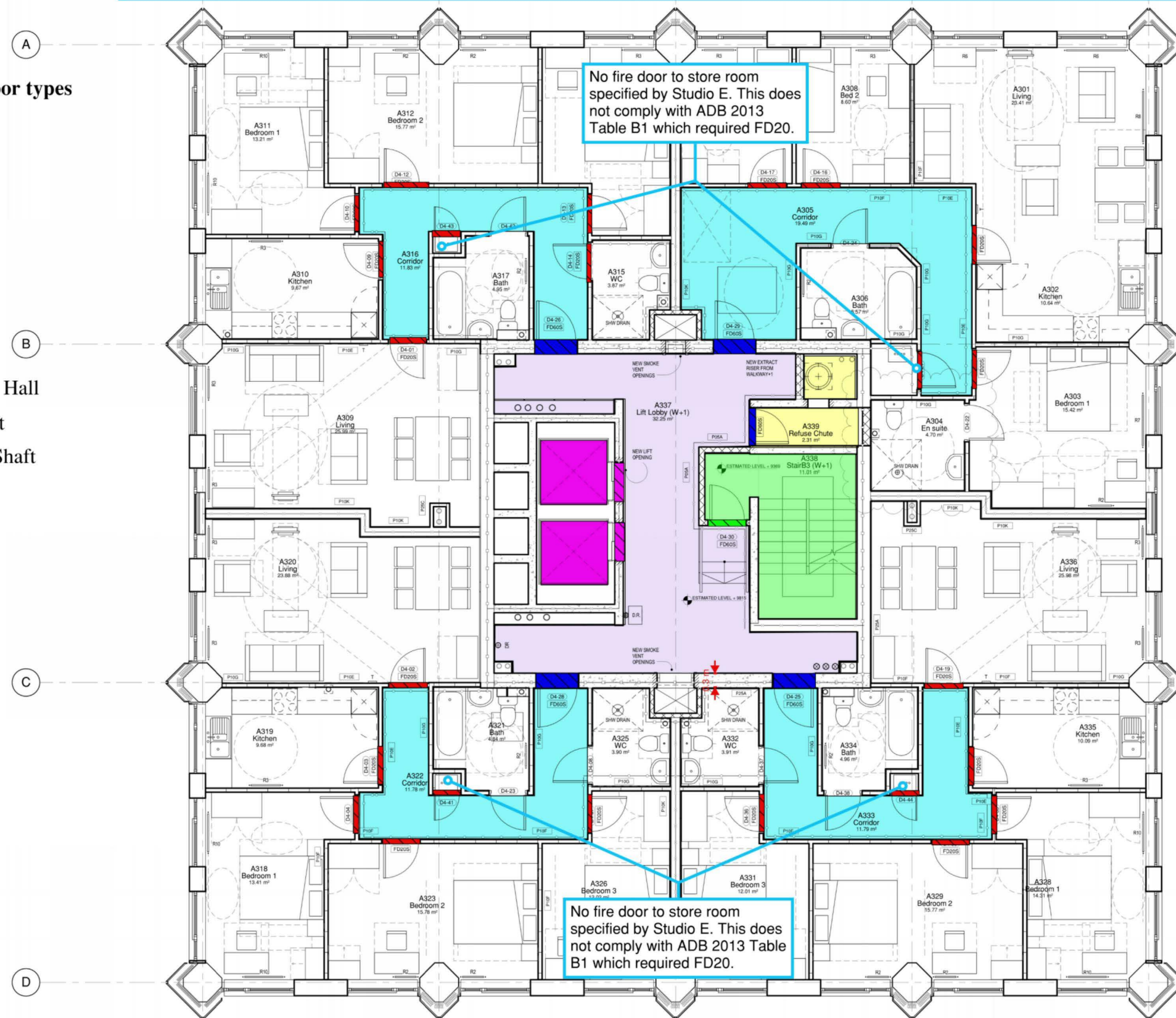


Figure I.34: Indicative over marking of ADB 2013 compliant fire doors on the Studio E as built level 3 floor plan (SEA00003229)

Table I.13: Compliance of Studio E Specification (red highlighting indicated where I conclude there is a specific noncompliance in the door specification; yellow highlighting indicates an inconsistency between the as build plans and the door schedule (RYD00092648))

Door Ref	Type	Room No.	Room	FR	Closer	Non compliances in Studio E Specification
D1-05	Protected Stair Door	A003	Escape Stair			No fire resistance duration provided on door schedule or Studio E as built drawings however FD60S would be required for ADB 2013 compliance
D1-06	Door in a compartment wall enclosing a protected shaft	A018	Baby Change/ Toilets	FD60S	Yes	No fire resistance duration stated on Studio E Fire strategy drawings which would be non-compliant however FD60S fire resistance duration stated in door schedule which is compliant with ADB 2013
D1-07	Door in a compartment wall enclosing a protected shaft	A016	Nursery Kitchen	FD60S	Yes	No fire resistance duration stated on Studio E Fire strategy drawings which would be non-compliant however FD60S fire resistance duration stated in door schedule which is compliant with ADB 2013
D2-02	Door to protected stair	A103	Stair A2 (Mezz)			No fire resistance duration provided on door schedule or Studio E as built drawings however FD60S would be required for ADB 2013 compliance
D2-85	Store opening into protected entrance hall	A138	Store		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D2-86	Store opening into protected entrance hall	A133	Corridor		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D2-24	Store opening into protected entrance hall	A112	Store		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D2-27	Store opening into protected entrance hall	A120	Corridor		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D2-18	Store opening into protected entrance hall	A123	Store		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D2-25	Store opening into protected entrance hall	A127	Corridor		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D2-23	Store opening into protected entrance hall	A127	Corridor		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D3-69	Store opening into protected entrance hall	A215	Store		No	No fire resistance duration provided on door schedule or Studio E as built drawings however FD20 would be required for ADB 2013 compliance
D3-16	Door to protected stair	A201	Lift Lobby (W+0)	FD30S	Yes	Fire resistance duration provided on door schedule and Studio E as built drawings of FD 30S is less than the FD60S required for ADB 2013 compliance
D3-09	Door to firefighting lobby	A214	Unisex Change		No	No fire resistance duration stated on door schedule or Studio E as built drawings however FD30S would be required for ADB 2013 compliance
D3-08	Door to firefighting lobby	A212	Corridor		No	No fire resistance duration stated on door schedule or Studio E as built drawings however FD30S would be required for ADB 2013 compliance
D4-43	Store opening into protected entrance hall	A316	Corridor		No	No fire resistance duration stated on door schedule or Studio E as built drawings however FD30S would be required for ADB 2013 compliance. Additionally, a 25mm door is less than the standard thickness of a 30-minute door (44mm)
D4-21	Store opening into protected entrance hall	A342	Storage		No	No fire resistance duration stated on door schedule or Studio E as built drawings however FD30S would be required for ADB 2013 compliance
D4-41	Store opening into protected entrance hall				No	No fire resistance duration stated on door schedule or Studio E as built drawings however FD30S would be required for ADB 2013 compliance. Additionally, a 25mm door is less than the standard thickness of a 30-minute door (44mm)
D4-44	Store opening into protected entrance hall	A333	Corridor		No	No fire resistance duration stated on door schedule or Studio E as built drawings however FD30S would be required for ADB 2013 compliance. Additionally, a 25mm door is less than the standard thickness of a 30-minute door (44mm)

I6.3 Product compliance

I6.3.1 The NBS specification (SEA00000169) for the 2012-2016 upgrade written by Studio E Architects specifies five types of fire door to be installed. These were:

- *410-WOOD DOORSETS INTERNAL FLUSH PANEL PAINTED - NON FIRE RATED/FD20S/FD30S Manufacturer: David Smith St Ives Limited, (or equivalent) Marley Road, St Ives, Huntingdon, Cambs, PE27 3EX T:01480 309900 F:01480 494832. Product reference: Timber Doorset.*
- *411-WOOD DOORSETS INTERNAL FLUSH PANEL PAINTED FD60S. Manufacturer: David Smith St Ives Limited, (or equivalent). Marley Road, St Ives, Huntingdon, Cambs, PE27 3EX T:01480 309900 F:01480 494832. Product reference: 60 min Timber Doorset.*
- *412 WOOD DOORSETS INTERNAL FLUSH PANEL VENEERED FD30S. Manufacturer: David Smith St Ives Limited, (or equivalent) Marley Road, St Ives, Huntingdon, Cambs, PE27 3EX T:01480 309900 F:01480 494832. Product reference: Timber Doorset.*
- *413 WOOD DOORSETS INTERNAL FLUSH PANEL VENEERED FD60S. Manufacturer: David Smith St Ives Limited, (or equivalent). Marley Road, St Ives, Huntingdon, Cambs, PE27 3EX T:01480 309900 F:01480 494832. Product reference: Timber Doorset*
- *420 WOOD DOORSETS FLAT ENTRANCE DOORS FD30S. Manufacturer: John A Russell Joinery Ltd., 8 Dilwara Avenue, Whiteinch Glasgow, G14 0QS; <http://www.russelltimbertech.co.uk/>; www.russelltimbertech.co.uk/. Product reference: QTE 2 High Performance Fire Resistant Security Door Sets 30 minute.*

I6.3.2 No test evidence for any of the five door types listed in the NBS specification has been provided by Studio E as part of the disclosure process therefore full compliance of the specification cannot be determined. As the Studio E door Schedule (RYD00092648) does not list any replacement doors above Level 3 I have assumed that this specification is only applicable to Levels 1-3.

I6.4 Site evidence

I6.4.1 Observations from site between the 7th and 9th November 2017 identified that the doors to the new apartments appear to have been fitted with door leaves that achieved a 60-minute rating (Figure I.35, Figure I.36). The letterboxes were also labelled as fire resisting items (Figure I.37).

I6.4.2 While there is evidence of fire resistance of some of the door components, I have not been able to confirm yet if the overall door assemblies (including frame, leaf, hinges, handles, locks, self-closers, spy-holes and seals) achieved the required rating of FD60S.

I6.4.3 This is not possible until I am provided with the relevant test evidence for the specific doors installed at Grenfell Tower.



Figure I.35: fire door marking on entrance door to Flat 7 (Level 3)



Exova BM TRADA plug card.

Figure I.36: BM Trada Timber Fire Door certification designations



Figure I.37: Letterbox of Flat 8 on Level 3

I7 Maintenance and inspection of fire doors

I7.1 Requirements

I7.1.1 Statutory guidance

I7.1.2 ADB 2010 Section 0.13 states

“This Approved Document has been written on the assumption that the building concerned will be properly managed. Building Regulations do not impose any requirements on the management of a building.

However, in developing an appropriate fire safety design for a building it may be necessary to consider the way in which it will be managed. A design which relies on an unrealistic or unsustainable management regime cannot be considered to have met the requirements of the Regulations. Once the building is in use the management regime should be maintained and any variation in that regime should be the subject of a suitable risk assessment. Failure to take proper management responsibility may result in the prosecution of an employer, building owner or occupier under legislation such as the Regulatory Reform (Fire Safety) Order 2005.”

I7.1.3 The RR(FS)O:2005 section 9 states:

“9.— (1) The Responsible Person must make a suitable and sufficient assessment of the risks to which relevant persons are exposed for the purpose of identifying the general fire precautions he needs to take to comply with the requirements and prohibitions imposed on him by or under this Order.

(2) Where a dangerous substance is or is liable to be present in or on the premises, the risk assessment must include consideration of the matters set out in Part 1 of Schedule 1.

(3) Any such assessment must be reviewed by the Responsible Person regularly so as to keep it up to date and particularly if—

(a) there is reason to suspect that it is no longer valid; or

(b) there has been a significant change in the matters to which it relates including when the premises, special, technical and organisational measures, or organisation of the work undergo significant changes, extensions, or conversions, and where changes to an assessment are required as a result of any such review, the Responsible Person must make them.”

I7.1.4 No further guidance is given on the timescales or scope of inspections required.

I7.1.5 Non-statutory guidance

I7.1.6 BS 8412 (2008) Section 13.2.1 states:

“Door leaves and door frames should be examined at six-monthly intervals for superficial damage, structural damage and excessive bowing or deformation.”

I7.1.7 BS 8412 (2008) Section 13.3 states:

“The condition of all intumescent and smoke seals should be examined at not more than six-monthly intervals.”

I7.1.8 Part 1 of the DCLG guidance *Fire risk assessments in sleeping accommodation* Part 1 Section 3.4.6 states that monthly tests and checks should include:

“Check that all fire doors are in good working order and closing correctly and that the frames and seals are intact”

I7.1.9 The LGA guidance *Fire safety in purpose-built blocks of flats* page 124 states:

“Fire-resisting doors

82.3 Good practice is to inspect timber fire-resisting doorsets on a six-monthly basis as part of a programme of planned preventive maintenance. These inspections are aimed at identifying defects such as:

- *missing or ineffective self-closing devices*

- *damaged doors or frames*
- *removal of locks without suitable repairs to the integrity of the doors*
- *poorly fitting doors caused by distortion or shrinkage, or as a result of wear and tear*
- *newly fitted, but inappropriate, door furniture*
- *doors which have been replaced using non-fire-resisting types.*

82.4 Flat entrance doors should be included within this programme. Where leasehold flats are involved, this will only be possible if there is legal right of access, by means of a condition within the lease to carry this out. It is important that any new leases include such a condition.”

I7.1.10 The British Standard code of practice for fire doors (BS 8412 (2008)) and the Local Government Association guidance is in agreement that fire doors should be checked on a 6-monthly basis. However, the DCLG guidance suggests that doors should be checked more frequently, on a one-monthly basis.

I7.1.11 I have checked the TMO policy on fire door inspections against this guidance in Section I7.2

I7.2 TMO Fire safety policy

I7.2.1 Grenfell Tower is owned by the Royal Borough of Kensington and Chelsea (RBKC). The Kensington and Chelsea Tenant Management Organisation (TMO) has been responsible for the management of Grenfell Tower on behalf of RBKC since 1st April 1996³ including fire safety management.

I7.2.2 The fire safety management policy applied to Grenfell Tower is set out in the “TMO Fire Safety Strategy” of which we have received 5 versions; 4 dated November 2013 and 1 dated June 2017.

I7.2.3 The version dated June 2017 (TMO10047404) was in effect on the 14th June 2017 and has been used as the basis for assessing the compliance of TMO’s fire safety management policies with the requirements of the Regulatory Reform (Fire Safety) Order 2005.

I7.2.4 The TMO policy states:

“For the purposes of Fire Safety legislation, specifically the Regulatory Reform (Fire Safety) Order 2005 (FSO), RBKC and the TMO are considered to be “Responsible Persons” and as such must ensure that “suitable and sufficient” fire risk assessments are carried out in the communal areas of all

³ RBKC website: <https://www.rbkc.gov.uk/housing/social-housing/tenant-management/tenant-management-organisation>. Accessed 18/01/2018 by Susan Deeny

the residential blocks on a regular basis and that any significant findings and action plan identified in the assessment are progressed in a timely basis.”

I7.2.5 On the frequency of FRA reviews, the TMO policy states:

“14.3.4 The FRA will set out the timescale within which the regular review (lower level) will be required – generally for properties assessed by us as being “potentially high risk” this will be required on an annual basis and we would aim to carry out a new FRA on a 2-yearly basis.”

I7.2.6 Both the annual and two-yearly FRA inspections exceed the 6 month timescales recommended for checking fire doors as I have explained in Section I7.1.

I7.2.7 The TMO policy sets out its procedures on flat entrance doors in Section 17:

“17.1.1 Our Fire Risk Assessor is required to highlight any potentially non-compliant flat entrance doors for further assessment. In addition, access-permitting, he is required to assess a percentage of doors in each block to ensure that they are sufficiently fire-rated and self closing. In every case where the assessor cannot be confident that the flat entrance door meets the required fire safety standard or where he is unable to ascertain that any glazed transoms etc. are adequately fire rated he is required to highlight these locations in the Significant Findings & Action Plan. These doors effectively form part of the means of escape and so they are required to be self-closing and to provide 30 minutes of fire resistance (and any associated panels above or adjacent to the door are also required to provide 30 minutes’ fire resistance). A flat entrance door replacement programme was completed in 2013 when approximately 1200 doors were replaced with fire-rated door sets fully compliant with current legislation. Flat doors are replaced as part of other planned work programmes and also responsively on a day-to-day basis as necessary (where these become damaged due to fire, forced entry or other cause). A specification for a compliant self-closing, fire-rated front door (an “FD30s”) has been agreed with Repairs Direct and all replacement flat doors must meet these requirements.”

I7.2.8 The policy states that all new flat entrance doors should comply with the building regulations. Inspection of self-closing devices is addressed in section 17.1.2:

“The TMO has a variety of ongoing methods of ensuring that self-closing devices remain in place and remain operational. These include but are not confined to -

- Included in works to all void (empty) properties in advance of new tenant moving in*
- Included in six-monthly checks of all sheltered dwellings*
- Included in monthly inspections of all temporary accommodation*

• When undertaking comprehensive FRA reviews the assessor, access-permitting, will inspect a number of flat entrance doors and their self-closing devices”

- I7.2.9** The TMO deemed the flat entrance door of a leaseholder flat as demised to the leaseholder and therefore not in the control of the TMO or RBKC.
- I7.2.10** The flat entrance door is part of the general fire precautions for measures in relation to the means of escape from the premises (protection to the means of escape).
- I7.2.11** The TMO is therefore in my opinion required by Article 17 (2) and (3) to make arrangements with the occupier of other premises within the building to ensure the maintenance of facilities, equipment and devices necessary under the RRO are in an efficient state, in efficient working order and in good repair.
- I7.2.12** The TMO have addressed this duty within their fire safety policy (17.2)
- “All lessees whose doors are highlighted in the FRA as potentially non-compliant are contacted and initially asked to confirm that their door meets the required standard and to produce documentation to confirm this such as the FD30 certificate, photograph of the label on the door header or the door receipt. (To assist with this an information leaflet has been produced for leaseholders to clarify the standard their door is required to meet.) Where leaseholders do not have the necessary certification and are unclear whether their door is compliant we offer a free assessment of their door by our Assessor who produces a report clarifying his findings.”*
- I7.2.13** The TMO, RBKC and LFB appear to have been in dispute regarding the responsibilities for enforcement action for non-compliant leaseholder flat entrance doors in January 2013 as the Chief Executive’s update report of the TMO (TMO10001895) makes clear.

“Fire Door Update

7.0 The dispute between RBKC and the London Fire Brigade is continuing and is being escalated by both parties up to the Secretary of State for clarification as to where the responsibilities lie. Anthony Parkes and Dan Wood attended a meeting with Counsel organised by RBKC. It was Counsel’s opinion that the TMO had fulfilled its duties by carrying out the Fire Risk Assessments under the Regulatory Reform (Fire Safety) Order and informing the relevant authorities.

They were of the further opinion that until the dispute is resolved, the TMO Health & Safety team should continue to carry out Fire Risk Assessment work and in conjunction with the Home Ownership Team, who sent the letters to the leaseholders, assess which of the 68 doors noted as being a potential risk needs further inspection. The TMO should also continue to work with the Fire Risk Assessor to carry out the fire risk assessment work which involves liaising with leaseholders to assist them in their ensuring their doors are compliant.”

I7.2.14 However, the TMO fire safety policy in June of 2017 states that in lieu of LFB taking enforcement action against leaseholders with non-compliant flat entrance doors, TMO and RBKC had put in place a protocol to address non-compliant doors.

“3.2 safety enforcement in relation to RBKC properties will be undertaken by the LFB. (There remains a difference of view between the LFB and RBKC in relation to the enforcement of non-compliant leaseholder flat entrance doors. However, whilst RBKC reserves the right to challenge the LFB in the future in respect of its position, in view of the need to ensure the safety of residents, visitors, workers and others within the blocks in which there are non-compliant doors, the TMO and the Borough is taking steps to pursue leaseholders whose doors are non-compliant.)”

and

“17.2 ...

Where the door is confirmed as non-compliant and leaseholders are unwilling to fit a replacement the address is referred to RBKC Legal Services to explore a “before action” letter or where possible other enforcement options. (In particular, where the LFB has issued an Enforcement Notice against the landlord KCTMO Legal Services are able to use this as a means of persuading the leaseholder to upgrade the door.)”

I7.2.15 I note the LGA Guidance statement on the matter of doors in Leaseholder flats:

“In the case of many existing leasehold flats, the responsibility for maintenance of the flat entrance doors rests with the residents. In this case, the freeholder’s power to arrange for defects to be rectified may be limited or non-existent, making enforcement action on the freeholder inappropriate. Under these circumstances, the residents might be regarded as other persons having control of premises (as defined by Article 5(3) of the FSO), with a duty to ensure the adequacy of the flat entrance doors. However, use of powers under the Housing Act may be a more appropriate and better defined route to achieving compliance with the FSO. In new leases, ideally the freeholder should retain control over all flat entrance doors.”

I7.3 Actions taken regarding the maintenance and inspection of fire doors

I7.3.1 Multiple fire risk assessments have been undertaken in line with the TMO policy. Key findings related to Fire doors are presented below. Additionally, LFB undertook an audit and presented the findings to the TMO.

I7.3.2 The 2012 fire risk assessment (TMO00831859) states:

“The tenanted apartments within this building have recently had their flat entrance doors replace with new self closing 30-minute certified fire rated doors

...

The other flat entrance doors which have not been replaced are flush solid fire rated doors with perco self closing devices fitted on the ones looked at, these are the originally fitted doors."

I7.3.3 There is no statement on how the risk assessor Carl Stokes determined the tenanted apartment flat doors had 30-minute fire resistance.

I7.3.4 Further, the 2016 fire risk assessment (LFB00000066) states:

"The new timber doors in this building are according to documents seen fire rated doors, the glazing in them is fire rated glass but some doors do not have cold smoke seals fitted to them and on others the intumescent strips have been painted over.

...

The tenanted apartments within this building had a few years ago their flat entrance doors replace with new door sets. These door sets are self closing 30-minute certified fire rated doors which meet the requirements of the Building Regulations, if there is glazing in the new doors is fire rated.

The other flat entrance doors which have not been replaced are 44mm thick, flush timber fire rated doors fitted with perko, concealed self closing devices on the ones looked at, these are the originally fitted doors. These are close fitting doors."

I7.3.5 I note the flat entrance fire doors as explained herein were the subject of a replacement programme, but the doors provided were not fire doors as they are not constructed or installed in accordance with the test evidence upon which they apparently rely.

I7.3.6 I have found no information on the test evidence specific to the new timber fire doors provided throughout Level G – 3 in the refurbishment works. I note from my site inspections those doors were tagged as FD60 door leaves.

I7.3.7 However, the full door assembly cannot be assessed for compliance without the relevant certification reports.

I7.3.8 Two stair door defects were listed in the significant findings (TMO10017691) to the 2016 FRA (LFB00000066) fire risk assessment. These were:

"Some of the staircase doors are not being closed fully by the self closing devices fitted to the doors. These doors should be picked up during the caretaker's inspections of the doors.

The staircase door at the 16th floor level is damaged."

I7.3.9 I have found no evidence these defects were ever dealt with.

- I7.3.10** Additionally, no consideration of the fire resistance duration compliance of the stair doors, was ever made in the FRA.
- I7.3.11** The stair door defects noted in the 2016 FRA were still outstanding in the 2016 re-inspection Findings (TMO10045796).
- I7.3.12** No defects with the doors to the protected stair enclosure are listed in LFB Deficiency Notification 2016 issued to the TMO (TMO00832135). The only defects identified were that the entrance doors to Flats 44 and 153 did not self-close.
- I7.3.13** From the above, fire risk assessments/ audits were undertaken but did not fully capture all of the noncompliance with the main flat entrance fire doors or doors to the protected stair enclosure.

I8 Conclusions

- I8.1.1** The purpose of the review was to investigate and confirm where the evidence was available to allow me to do so:
- a) what fire doors were present the night of the fire – to the flats and to the protected stair,
 - b) who specified the doors as installed in Grenfell Tower,
 - c) whether the fire door performance specification in Grenfell Tower was compliant with the applicable statutory and non-statutory guidance at the time of installation,
 - d) if the onsite construction and installation of those fire doors were installed in accordance with the relevant test evidence,
 - e) if there was a compliant inspection and maintenance regime in place for fire doors, prior to the fire.
- I8.1.2** Based on review of the available fire strategy reports/ drawings, test evidence, door specifications, and site surveys for both the main flat entrance fire doors and stair fire doors I have concluded as presented in Table I.14, and Table I.15.

Table I.14: Compliance of Main Flat Entrance doors at the time of the fire

Construction milestone	No. fire doors of type in place on the night of the fire	Relevant Guidance	Performance requirement of main flat entrance fire door	Compliance of Main Flat Entrance doors on Levels 4-23 at the time of the fire
Construction (1972) /Flat door replacement (1985)	14	CP3 Chapter 4 part 1 (1971)	Self-closing 30 minutes' stability 20-minute integrity to BS 476-1:1953	<p>The original construction of the 120 flat doors is unknown therefore I cannot determine if they were compliant at the time of construction/ or the replacement in 1985.</p> <p>14 of the original 120 fire doors were not replaced in 2011 and were believed to be in place on the night of the fire.</p> <p>The fire performance of these 14 doors is therefore unknown.</p>
TMO Tenant door replacement (2011), Levels 4 - 23	106	DCLG <i>Fire safety risk assessments sleeping accommodation</i>	Self-closing fire door	As no performance set, it is not possible to state either way
		Local Government Association- <i>Fire safety in purpose built blocks of flats</i>	Self-closing Upgraded or replacement FD30S Fire door	No. Serious discrepancies between the relevant test evidence provided to support the fire performance for the main flat fire doors, and how they were actually constructed and how they were installed results in noncompliance with ADB 2010 ⁴ .
		ADB 2010	Self-closing FD30S Fire door	No. Serious discrepancies between the relevant test evidence provided to support the fire performance for the main flat fire doors and how they were actually

⁴ Note retroactive testing after the fire to BS EN 1634-1 shows that the Masterdor Suredoor only achieves 15 minutes integrity which is less than the required 30 minutes integrity for compliance with ADB 2010

Construction milestone	No. fire doors of type in place on the night of the fire	Relevant Guidance	Performance requirement of main flat entrance fire door	Compliance of Main Flat Entrance doors on Levels 4-23 at the time of the fire
				constructed and how they were installed results in noncompliance with ADB 2010.
Main Flat entrance fire doors installed to nine new flats, Levels 1- 3	9	ADB 2013	Self-closing FD30S Fire door	No relevant test evidence has been provided for the nine new flat entrance doors therefore the as built construction compliance cannot be determined. However, the Fire strategy specification of FD60S exceeds the ADB 2013 provisions and hence would be compliant (subject to relevant test evidence).

Table I.15 Compliance of door to the protected stair enclosure at the time of the fire

Construction milestone	Relevant Guidance	Performance requirement of main flat entrance fire door	Compliance of doors to the protected stair enclosure on levels 4-23 at the time of the fire
Construction (1972)	CP3 Chapter 4 part 1 (1971)	Self-closing 30 minutes' stability 30-minute integrity to BS 476-1:1953	No. Rebates measured on Stair door on level 6 do not comply with CP3 Chapter 4 part 1 (1971) requirements
RR(FS)O 2005 compliance post 2005 (G – 23?)	DCLG Fire safety risk assessments sleeping accommodation	Self-closing fire door	As no performance set, it is not possible to state either way
	Local Government Association- Fire safety in purpose built blocks of flats	Self-closing Upgraded or replacement FD30S Fire door Or FD60S for firefighting at the discretion of the fire and rescue service	No, based on my findings in Appendix M the original door could never achieve 30 minutes' integrity even if it was upgraded and there is no evidence the stair doors were ever replaced in their entirety. Door leaf was measured as 44mm thick onsite which would equate to FD 30 not FD 60 if FD60 was required for firefighting access.
	ADB 2013	Self-closing FD60S Fire door	No Door leave was measured as 44mm thick onsite which would equate to FD 30 not FD 60 if FD60 was required for firefighting access.
Level 1- level 3 Refurbishment	ADB 2013	Self-closing FD60S Fire door	The Exova fire strategy specification is for FD30S doors to the protected stair enclosure except where the wall forms part of the firefighting stair then FD60s is required. This would be compliant with ADB 2013. No test evidence has been disclosed for these doors therefore the as built compliance cannot be fully confirmed at this time. Further to this, one door to the protected stair is not shown on the Studio E as requiring any fire resistance duration and a further door is shown as FD30S where it is required to be FD60S as it is the door to the protected stair enclosure. Both of these are therefore noncompliant with ADB 2013.