

Title:

The fire resistance performance of a specimen of a symmetrical, non-loadbearing, partition wall assembly tested in accordance with BS 476: Part 22: 1987, Clause 5

Date Of Test:

28th September 2020

Issue No. 2

7th December 2020

WF Report No:

431114/R



Prepared for:

STS Ltd

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Ravens Park
Victoria Road
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Leeds
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0249

Test Specimen

Summary of Tested Specimen

The specimen had overall nominal dimensions of 3000 mm high by 3035 mm wide by 119 mm thick. The specimen was formed from 0.5 mm thick galvanized mild steel framework made up of vertical and horizontal studs with a cross sectional size of 92.9 mm wide by 34.5 mm deep. The studs were fixed at 600 mm centres. Nominally 100 mm thick mineral fibre-based insulation was friction fitted into the voids within the framework. The insulation had a nominal density of 45 kg/m³.

The framework was clad on both faces with a layer of 12 mm thick heavy-duty fibre cement board, referenced STS Construction Board.

Detailed drawings of the test specimen(s) and a comprehensive description of the test construction based on a detailed survey of the specimen(s) and information supplied by the sponsor of the test are included in the Test Specimen and Schedule of Components sections of this report.

Performance Criteria and Test Results

Test Results:		
Integrity	138 minutes	
	Cotton pad failure	
Insulation	67 minutes	
	Exceeded maximum temperature criteria	TC14

- Integrity: It is required that there is no collapse of the specimen, no sustained flaming on the unexposed surface and no loss of impermeability.
- Insulation: It is required that the mean temperature rise of the unexposed surface shall not be greater than 140°C and that the maximum temperature rise shall not be greater than 180°C. Insulation failure also occurs simultaneously with integrity failure.

The test was discontinued after a period of 180 minutes.

Date of Test 28th September 2020

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Approved

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* For and on behalf of **Warringtonfire**.Report Issued: 7th December 2020This report supersedes the test report 431114/R issued on the 3rd December 2020.

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Revision History

Issue No: 2	Re-issue Date: 7 th December 2020
Revised By: C. Sweeney	Approved By: W.Drazkiewicz
Reason for Revision: On page 1: the company prepared for title changed to STS Ltd from Specialist Tiling Supplies Ltd. On page 16: sealant manufacturer corrected to Specialist Tiling Supplies from Specified Tiling Supplies.	

Issue No:	Re-issue Date:
Revised By:	Approved By:
Reason for Revision:	

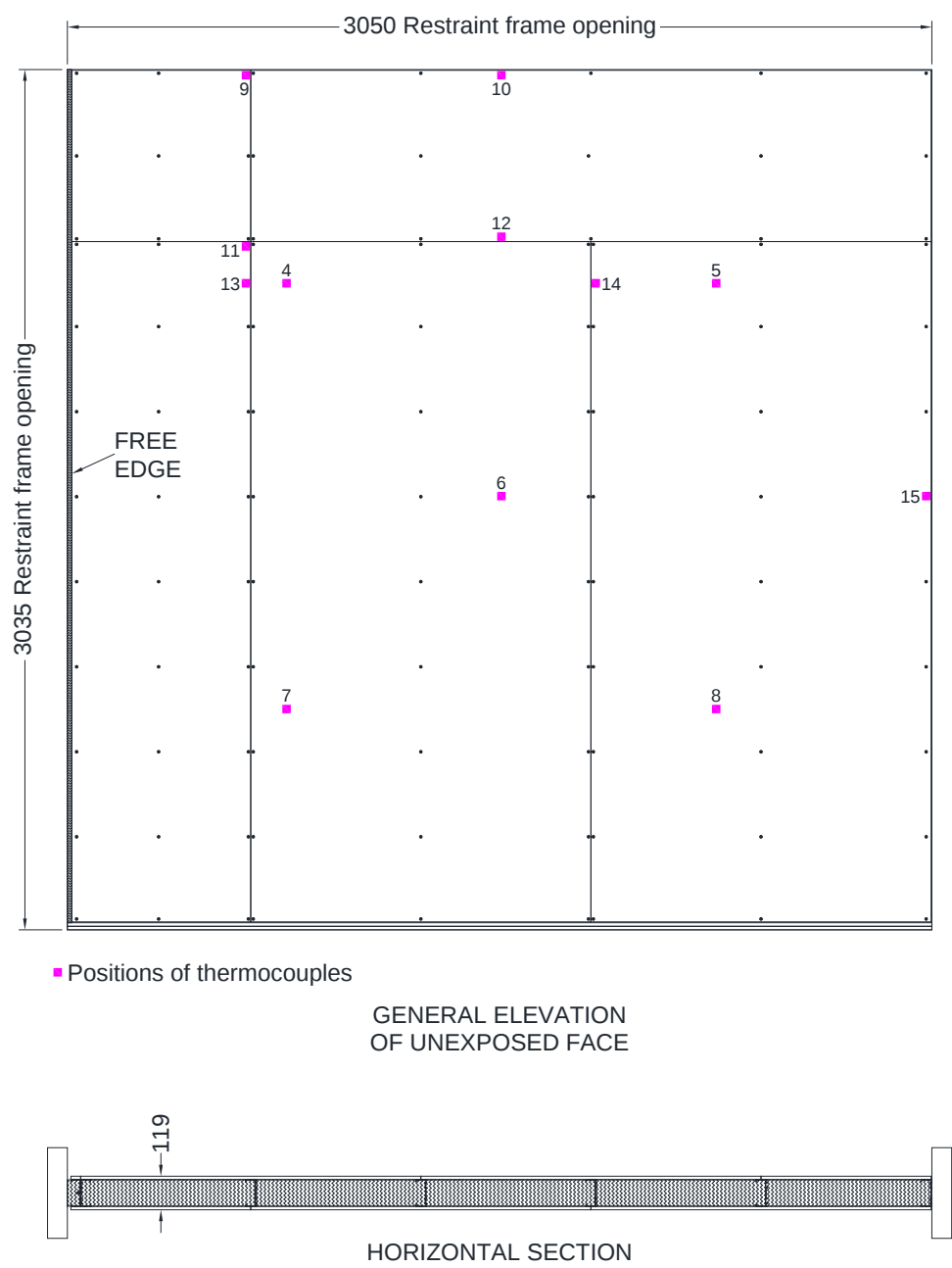
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Test Conditions

Standard	Clause 5 of BS 476: Part 22: 1987 'Methods for determination of the fire resistance of non-loadbearing elements of construction'.
Sampling	Warringtonfire was not involved in the sampling or selection of the tested specimen or any of the components. The results obtained during the test only apply to the test samples as provided by the test sponsor.
Installation	The specimen was received on the 22 nd September and installed into a refractory concrete lined steel restraint frame, with one vertical edge unrestrained, by representatives of the test sponsor between the 22 nd and 23 rd September 2020.
Conditioning	The specimen's storage, construction, and test preparation took place in the test laboratory over a total combined time of seven days. Throughout this period both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 13.5°C to 26°C and 35.5% to 71.5% respectively.
Instruction to Test	The test was conducted on the 28th September 2020, at the request of STS Ltd, the test sponsor. Mr. E. Burrowes, a representative of the test sponsor witnessed the test.
Ambient Temperature	The ambient air temperature in the vicinity of the test construction was 13°C at the start of the test with a maximum variation of +/-4°C during the test.
Furnace	The furnace was controlled so that its mean temperature complied with the requirements of BS 476: Part 20: 1987, Clause 3.1. using nine mineral insulated thermocouples distributed over a plane 100 mm from the surface of the test construction.
Thermocouples	Thermocouples were provided to monitor the unexposed surface of the specimen. The output of all instrumentation was recorded at no less than one minute intervals. The locations and reference numbers of the various unexposed surface thermocouples are shown in Figure 1.
Furnace Pressure	After the first five minutes of testing and for the remainder of the test, the furnace atmospheric pressure was controlled so that it complied with the requirements of BS 476: Part 20: 1987, Clause 3.2.2 (including allowance for transient occurrences in-line with Clause 12(I)). The calculated pressure differential relative to the laboratory atmosphere at the top of the assembly was 17 (±2) Pa equating to 0 Pa at a point 1m above the notional floor level.

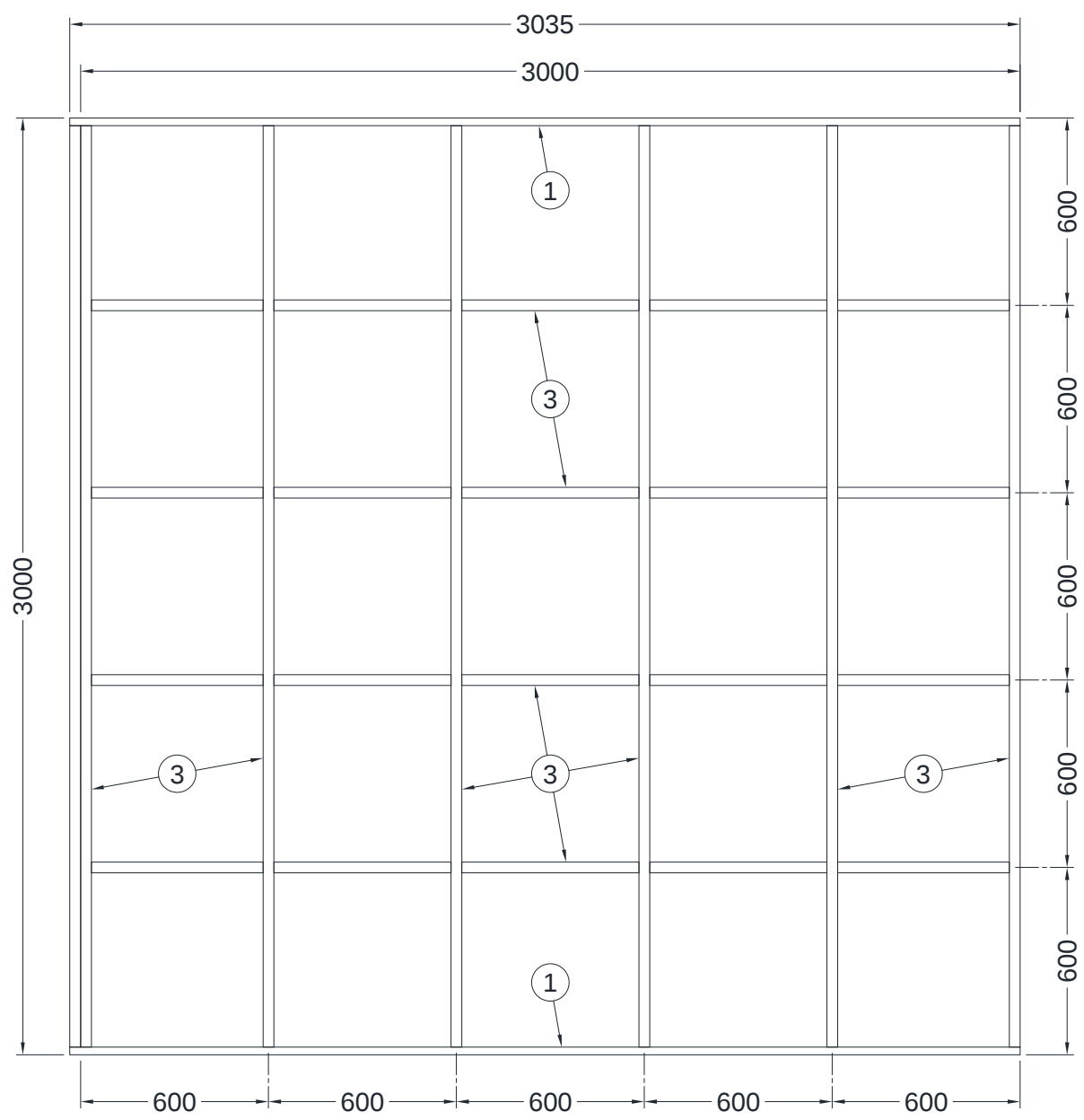
Test Construction

Figure 1- General Elevation of the Unexposed Face of the Test Construction



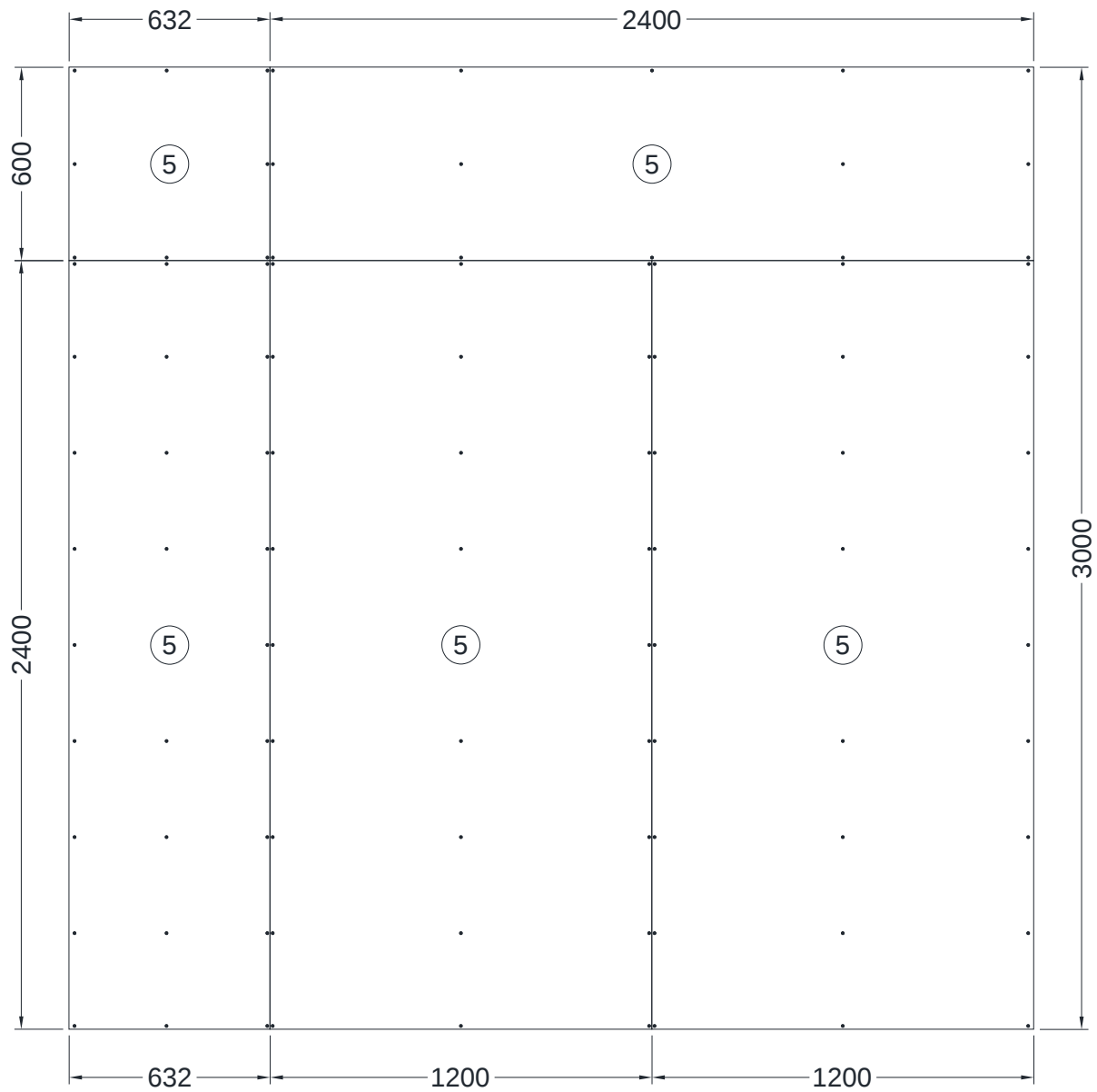
Do not scale. All dimensions are in mm

Figure 2 – Configuration of Internal Framework



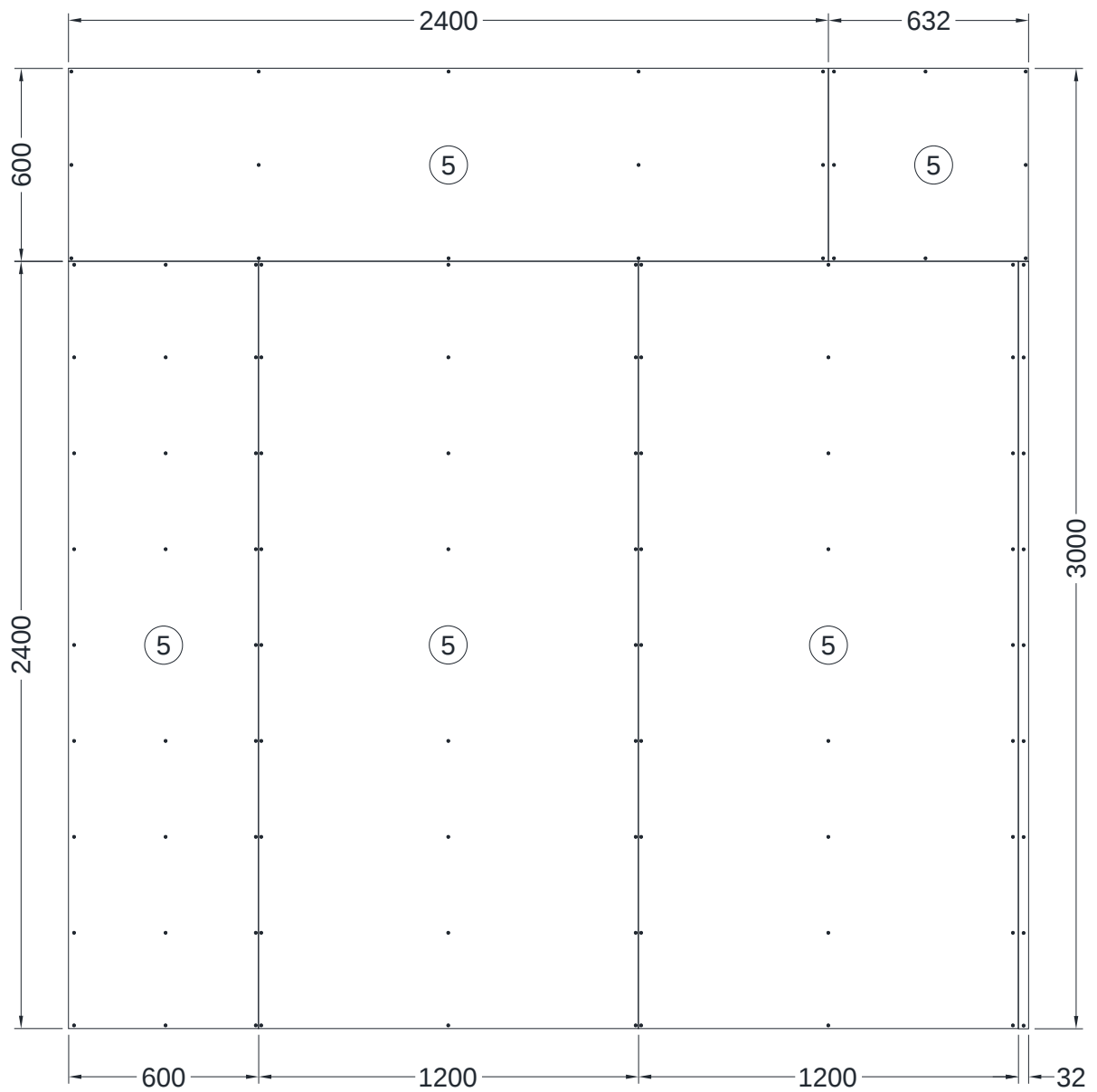
Do not scale. All dimensions are in mm

Figure 3 – Configuration of Cladding Boards to the Unexposed Face



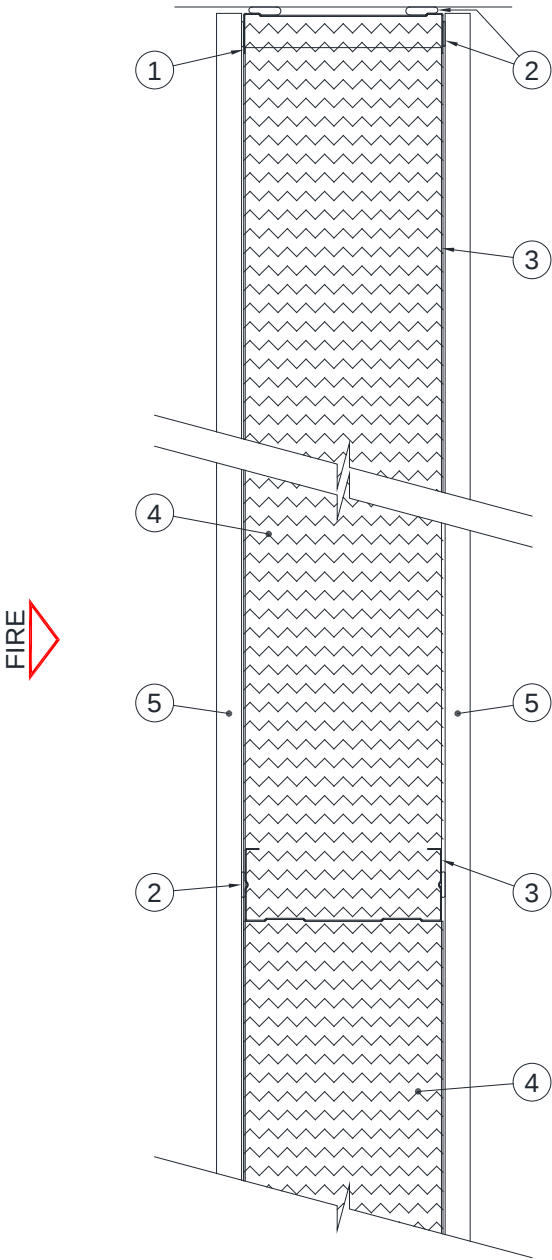
Do not scale. All dimensions are in mm

Figure 4 – Configuration of Cladding Boards to the Exposed Face



Do not scale. All dimensions are in mm

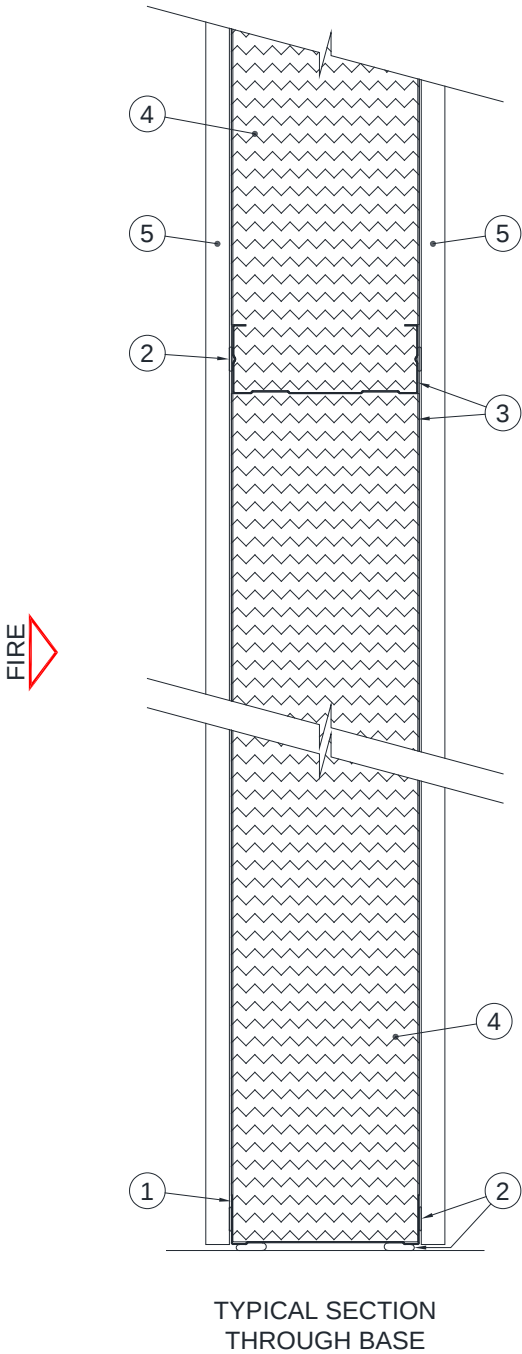
Figure 5 – Details of Partition



TYPICAL SECTION
THROUGH HEAD

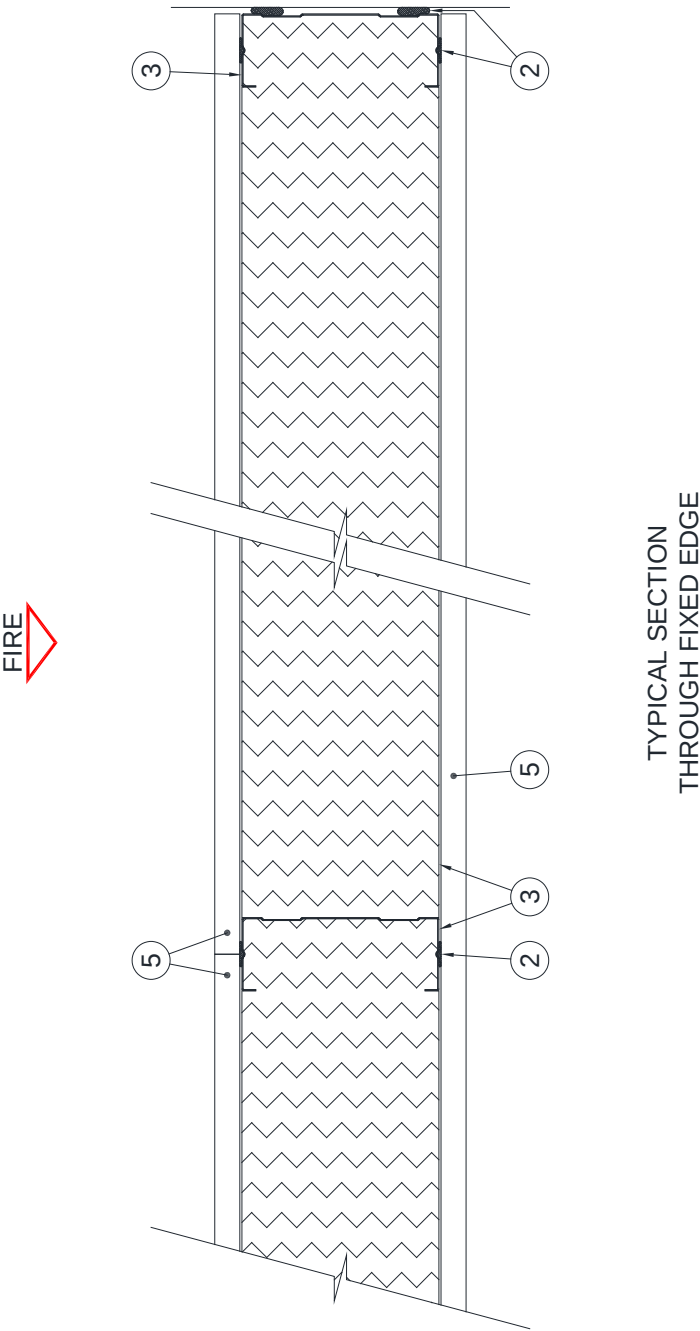
Do not scale. All dimensions are in mm

Figure 6 – Details of Partition



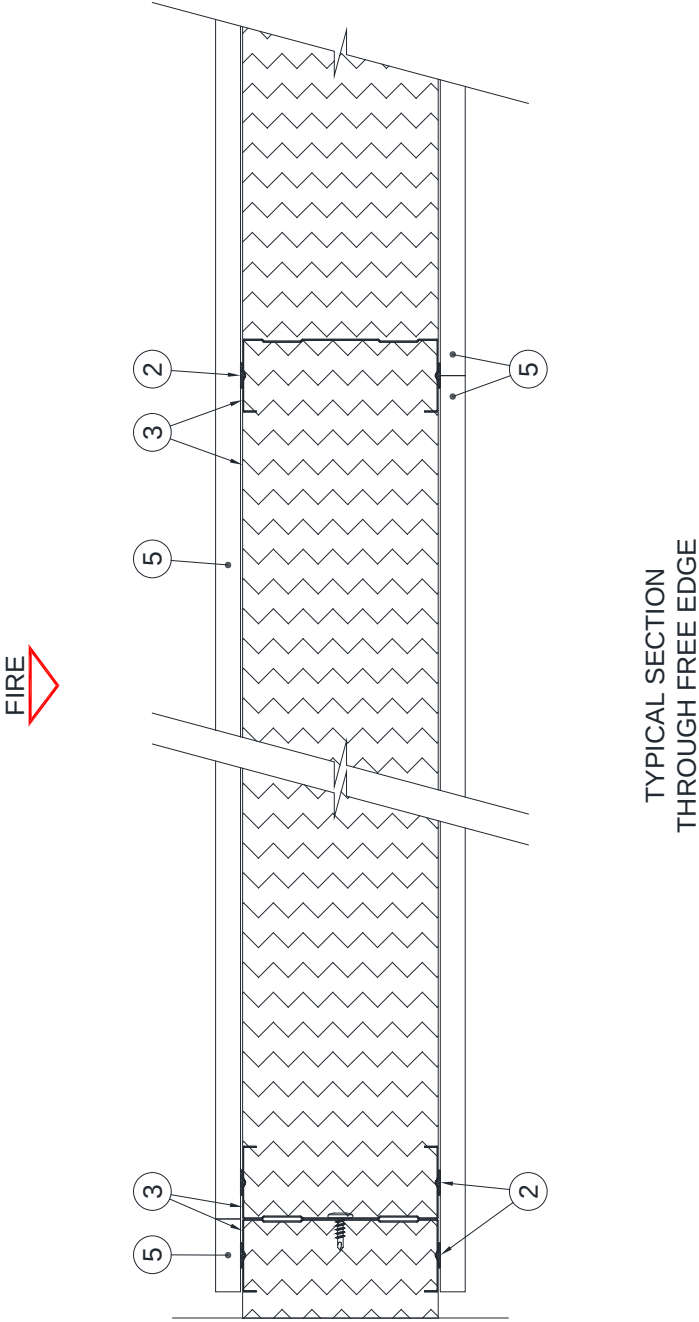
Do not scale. All dimensions are in mm

Figure 7 – Details of Partition



Do not scale. All dimensions are in mm

Figure 8 – Details of Partition



Do not scale. All dimensions are in mm

Schedule of Components

(Refer to Figures 1 to 8)

(All values are nominal unless stated otherwise)

(All other details are as stated by the sponsor)

<u>Item</u>	<u>Description</u>
1. Framework Track	
Manufacturer	: Galaxy Insulation and Dry Lining Limited
Reference	: TRACK094
Material	: Galvanised mild steel profile
Thickness	: 0.5 mm
Overall size	: 94.4 mm wide x 24.8 mm deep
Fixing method	: Bedded on beads of sealant, item 2, and through fixed across the head and base
Fixings	
i. manufacturer	: TimCo
ii. type	: Multi-Fix Screw
iii. material	: Brass plated steel
iv. reference	: 00100TCON
v. overall size	: 100 mm long x 7.8 mm diameter
vi. centres	: 600 mm
2. Sealant	
Manufacturer	: Specialist Tiling Supplies (STS) Ltd
Reference	: STS ISA462
Material	: Fire & Acoustic intumescent sealant
Application method	: Cartridge gunned
3. Framework Studs (Vertical & Horizontal)	
Manufacturer	: Galaxy Insulation and Dry Lining Limited
Reference	: CSTUD092x3000
Material	: Galvanised mild steel profile
Thickness	: 0.5 mm
Overall size	: 92.9 mm wide x 34.5 mm deep with 6.5 mm returned edges
Fixing methods	
i. vertical fixed edge	: Fitted into the head and base tracks, item 1, bedded on beads of sealant, item 2, and through fixed across the head and base
ii. vertical middle	: Fitted into the head and base tracks, item1, and fixed with wafer head screws at the base only, one on each face
iii. vertical free edge	: 2 off back to back, fitted into the head and base tracks, item1, and fixed together with wafer head screws. Also fixed with wafer head screws at the base only, one on each face
iv. horizontal middle	: Fitted between the vertical studs at centre shown in Figure 2, and fixed with wafer head screws at each end, one on each face

Item**Description****3. Framework Studs (Vertical & Horizontal)**

Fixings

- | | | |
|------------------|---|--------------------------------|
| i. manufacturer | : | Easy Drive |
| ii. type | : | Wafer head screws |
| iii. material | : | Steel |
| iv. overall size | : | 17.8 mm long x 4.8 mm diameter |

4. Insulation

- | | | |
|---------------|---|--|
| Manufacturer | : | Rockwool |
| Reference | : | RWA45 |
| Material | : | Mineral fibre based insulation |
| Thickness | : | 100 mm nominal, 95 mm measured |
| Density | : | 45 kg/m ³ nominal, 43.6 kg/m ³ measured, uncompressed |
| Fixing method | : | Friction fitted into voids within the framework construction and retained by the fixing of the cladding boards, item 5, on each face |

5. Cladding Boards

- | | | |
|---------------|---|---|
| Manufacturer | : | STS Ltd |
| Reference | : | STS Construction Board |
| Material | : | Heavy-duty fibre cement board |
| Thickness | : | 12 mm |
| Density | : | 1308.6 kg/m ³ , measured |
| Fixing method | : | Bedded on beads of sealant applied to framework sections, items 1 & 2 and through screwed |

Fixings

- | | | |
|------------------|---|--|
| i. manufacturer | : | STS Ltd |
| ii. type | : | T20-drive countersunk head, drill point screws |
| iii. material | : | Zinc plated hardened steel |
| iv. overall size | : | 38 mm long x 6.8 mm diameter |
| v. centres | : | 300 mm |

Test Observations

Time		All observations are from the unexposed face unless noted otherwise.
mins	secs	
00	00	The test commences.
06	00	The jointing adhesive has come away from the specimen on the exposed face exposing the joints between the boards.
11	10	The board on the exposed face has cracked into separate layers.
12	00	Steam/smoke release from the fixed edge at $\frac{3}{4}$ height.
15	00	Banging noises heard from the specimen.
20	00	Heavy flaming on the exposed face which looks like it is from the insulation. Large cracks on the exposed face board and more board has come away.
28	00	The specimen is starting to deflect towards the heating conditions in its centre.
32	00	The board on the exposed face is glowing bright red, the broken layers of board are slipping down. In some places complete sections of board are falling away and exposing the insulation.
32	00	Most of the central board on the exposed face has fallen exposing the insulation and framework.
33	00	Steam/smoke release from horizontal joint and the head of the specimen.
37	00	Vertical section of the framework beginning to distort, when viewed from the exposed face.
38	00	Steam/smoke release increases from the horizontal joint.
40	00	The horizontal joint is beginning to open as the boards have deflected at different rates.
52	00	Cotton pad applied over the horizontal joint where it has discoloured. No embers appear on the pad.
57	00	The exposed insulation on the exposed face of the specimen is glowing bright red.
62	00	Cracks appear in the top right corner of the central piece of board. There is steam/smoke release and discolouration across the horizontal joint.
67	00	The horizontal section of board has now fallen from the exposed face.
68	00	Glowing on the horizontal joint on the left-hand side.

Time		
mins	secs	
71	00	Cotton pad applied to the above-mentioned glowing area; no embers appear on the pad.
74	00	When viewed from the exposed face the vertical studs continue to distort, creating gaps between the studs and insulation.
77	00	Discolouration at the vertical stud position in the centre of the middle board.
82	00	Discolouration at all fixing positions.
85	00	Steam/smoke release from the centre of the left-hand vertical joint.
91	00	Discolouration continues around the joints.
98	00	Cracks appearing on the board at the stud positions, discolouration increases.
107	00	Cracks increasing in number and size in all boards.
138	00	A cotton pad is applied over cracks in the centre of the horizontal board. Glowing embers appear on the pad, integrity failure is deemed to occur.
144	00	Glowing across the head of the specimen.
173	00	Glowing up the fixed edge.
176	00	The board is now bowing away from the heating conditions in its centre.
180	00	Test discontinued at client request.

Test Photographs

The exposed face of the test specimen prior to testing



The unexposed face of the test specimen prior to testing



The unexposed face of the test specimen after 30 minutes of testing



The unexposed face of the test specimen after 60 minutes of testing



The unexposed face of the test specimen after 90 minutes of testing



The unexposed face of the test specimen after 120 minutes of testing



The unexposed face of the test specimen after 150 minutes of testing



The unexposed face of the test specimen after 180 minutes of testing



The exposed face
of the test
specimen
immediately after
the test



Temperature and Deflection Data

**Mean Furnace Temperature, Together With The Temperature/Time Relationship
Specified In The Standard BS 476-20: 1987**

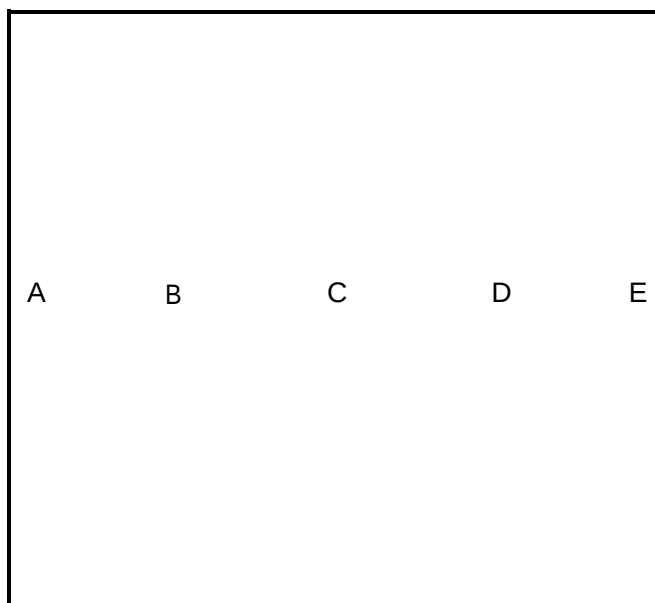
Time Mins	Specified Furnace Temperature Deg. C	Actual Furnace Temperature Deg. C
0	20	29
5	576	581
10	678	677
15	739	746
20	781	775
25	815	806
30	842	849
35	865	865
40	885	887
45	902	903
50	918	914
55	932	935
60	945	944
65	957	955
70	968	961
75	979	974
80	988	990
85	998	1003
90	1006	1011
95	1014	1019
100	1022	1024
105	1029	1031
110	1036	1035
115	1043	1042
120	1049	1046
125	1055	1049
130	1061	1068
135	1067	1059
140	1072	1078
145	1077	1085
150	1082	1089
155	1087	1094
160	1092	1097
165	1097	1101
170	1101	1104
175	1106	1105
180	1110	1107

Individual And Mean Temperatures Recorded On The Unexposed Surface

Time Mins	T/C Number 4 Deg. C	T/C Number 5 Deg. C	T/C Number 6 Deg. C	T/C Number 7 Deg. C	T/C Number 8 Deg. C	Mean Temp Deg. C
0	15	15	15	15	14	15
5	15	16	15	15	14	15
10	23	22	21	20	16	20
15	43	40	39	32	28	36
20	57	48	49	40	39	47
25	61	49	51	46	46	51
30	59	50	50	47	48	51
35	58	52	50	47	48	51
40	58	59	60	48	50	55
45	68	67	70	60	61	65
50	79	76	80	73	72	76
55	88	84	88	83	83	85
60	95	91	93	92	92	93
65	101	96	98	100	98	99
70	106	101	102	107	103	104
75	108	104	107	114	107	108
80	113	108	111	118	110	112
85	118	112	114	122	114	116
90	123	117	118	126	118	120
95	128	122	121	129	122	124
100	132	126	125	132	126	128
105	137	129	128	134	130	132
110	141	131	132	137	133	135
115	150	135	137	141	144	141
120	165	142	149	155	160	154
125	179	156	160	169	175	168
130	191	168	169	182	191	180
135	206	179	179	195	209	194
140	219	188	189	209	223	206
145	233	198	200	220	233	217
150	246	209	211	228	239	227
155	257	219	222	234	241	235
160	267	227	230	238	242	241
165	273	233	235	238	242	244
170	276	236	242	238	242	247
175	277	240	246	237	242	248
180	278	242	248	236	241	249

Individual Temperatures Recorded On The Unexposed Surface

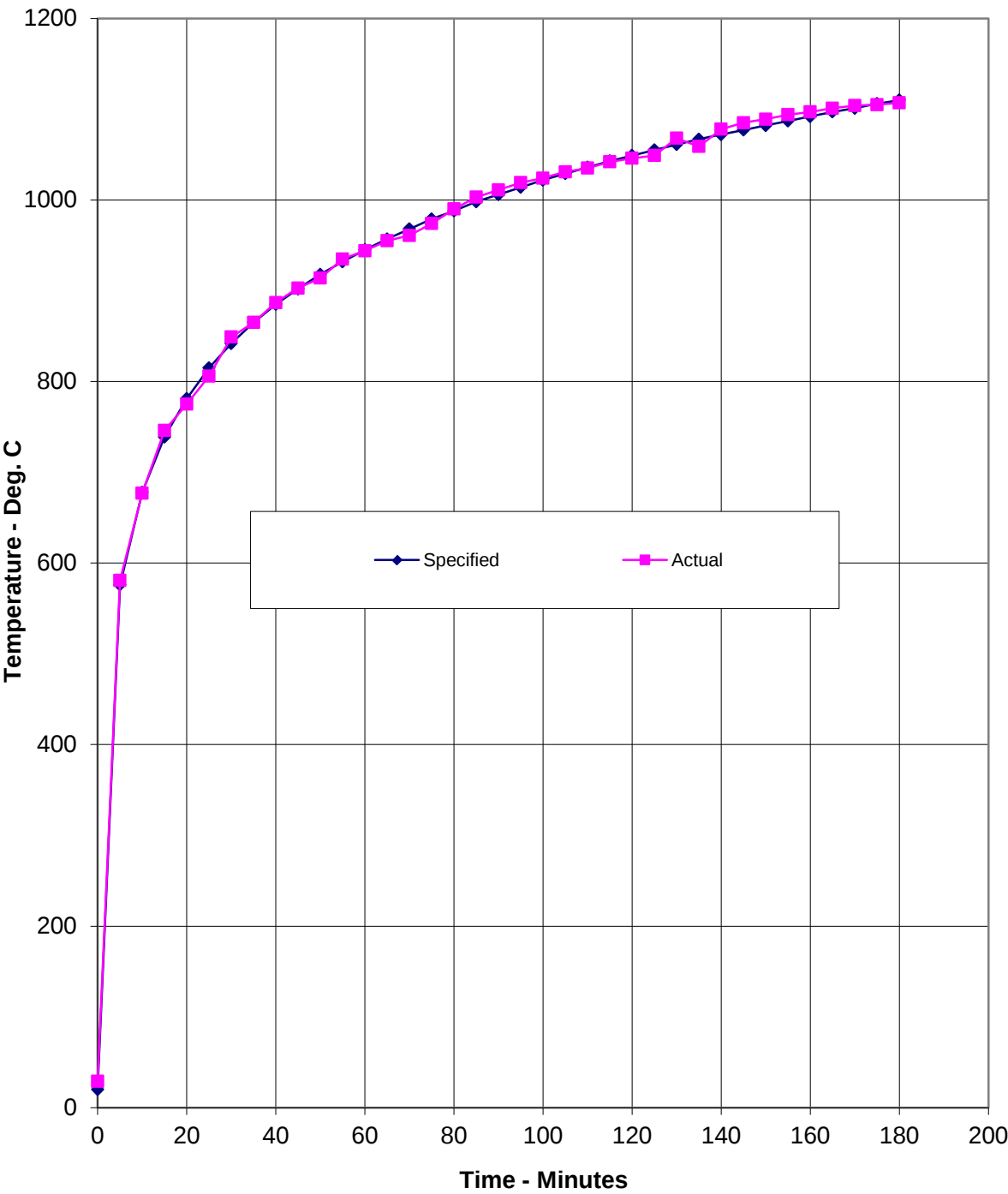
Time Mins	T/C Number 9 Deg. C	T/C Number 10 Deg. C	T/C Number 11 Deg. C	T/C Number 12 Deg. C	T/C Number 13 Deg. C	T/C Number 14 Deg. C	T/C Number 15 Deg. C
0	19	18	19	18	18	18	16
5	19	21	19	18	18	18	16
10	33	28	23	21	23	31	27
15	63	54	42	32	36	53	59
20	73	70	62	45	55	61	69
25	74	75	69	57	66	73	68
30	74	75	70	62	67	86	65
35	75	75	76	68	69	100	62
40	78	78	86	80	73	110	62
45	82	80	91	98	79	118	62
50	85	82	99	109	91	128	63
55	89	86	113	124	103	148	68
60	95	93	134	137	110	169	73
65	101	99	160	147	113	187	76
67	102	103	169	156	115	193	77
68	103	104	175	161	116	196	77
70	104	106	185	170	118	202	78
75	107	110	211	187	122	216	80
80	111	114	243	199	133	230	82
85	109	120	285	213	148	244	86
90	117	126	327	227	164	258	90
95	135	136	365	241	180	271	94
100	156	157	389	253	193	283	99
105	181	173	405	262	204	292	102
110	214	192	415	268	215	300	105
115	253	211	424	272	228	307	110
120	291	237	432	279	245	313	114
125	329	270	438	291	265	319	118
130	367	288	446	299	291	323	122
135	395	310	440	312	315	329	126
140	420	328	439	321	329	332	131
145	435	354	442	330	341	336	136
150	443	376	447	339	357	340	142
155	450	390	454	346	374	343	151
160	461	407	464	349	385	345	164
165	474	423	473	349	389	347	178
170	490	434	482	355	394	349	191
175	501	440	486	356	396	351	204
180	510	445	486	357	396	354	218

Deflections Of The Specimen During The Test

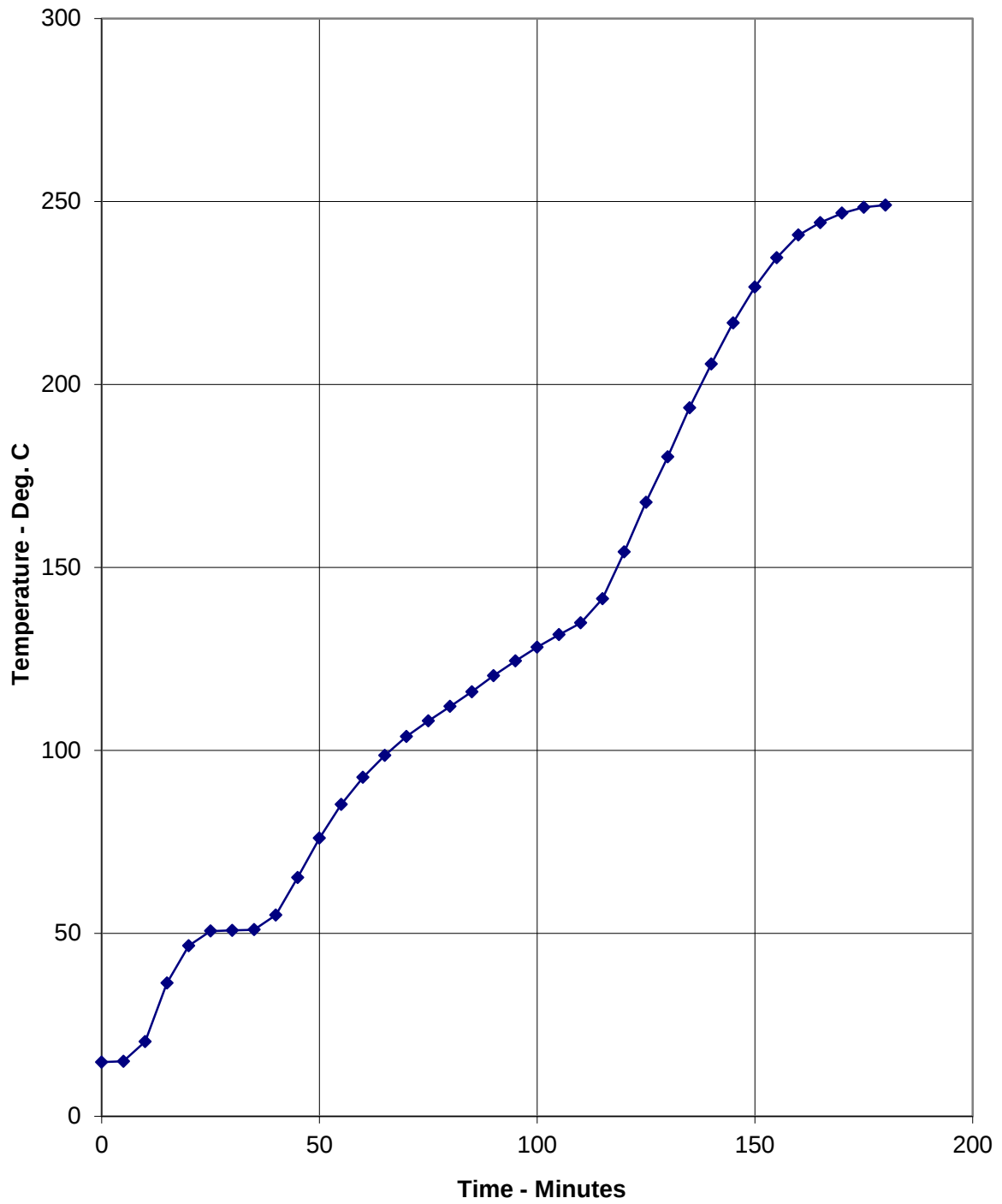
TIME mins	Deflections - mm				
	A	B	C	D	E
0	0	0	0	0	0
10	-1	4	10	5	3
20	15	21	32	28	5
30	35	53	54	38	4
40	37	44	43	27	5
50	34	43	38	28	-5
60	30	40	41	25	3
70	28	34	34	20	2
80	21	21	18	8	-1
90	16	1	-3	-7	-1
100	12	-8	-15	-14	-5
110	10	-13	-27	-19	-5
120	6	-19	-26	-24	-7
130	2	-33	-36	-35	-8
140	1	-30	-47	-38	-11
150	2	-40	-56	-53	-22
160	-18	-48	-61	-49	-25
170	-11	-48	-69	-49	-32

Positive values indicate a deflection towards the heating conditions of the test.
Measurements in mm

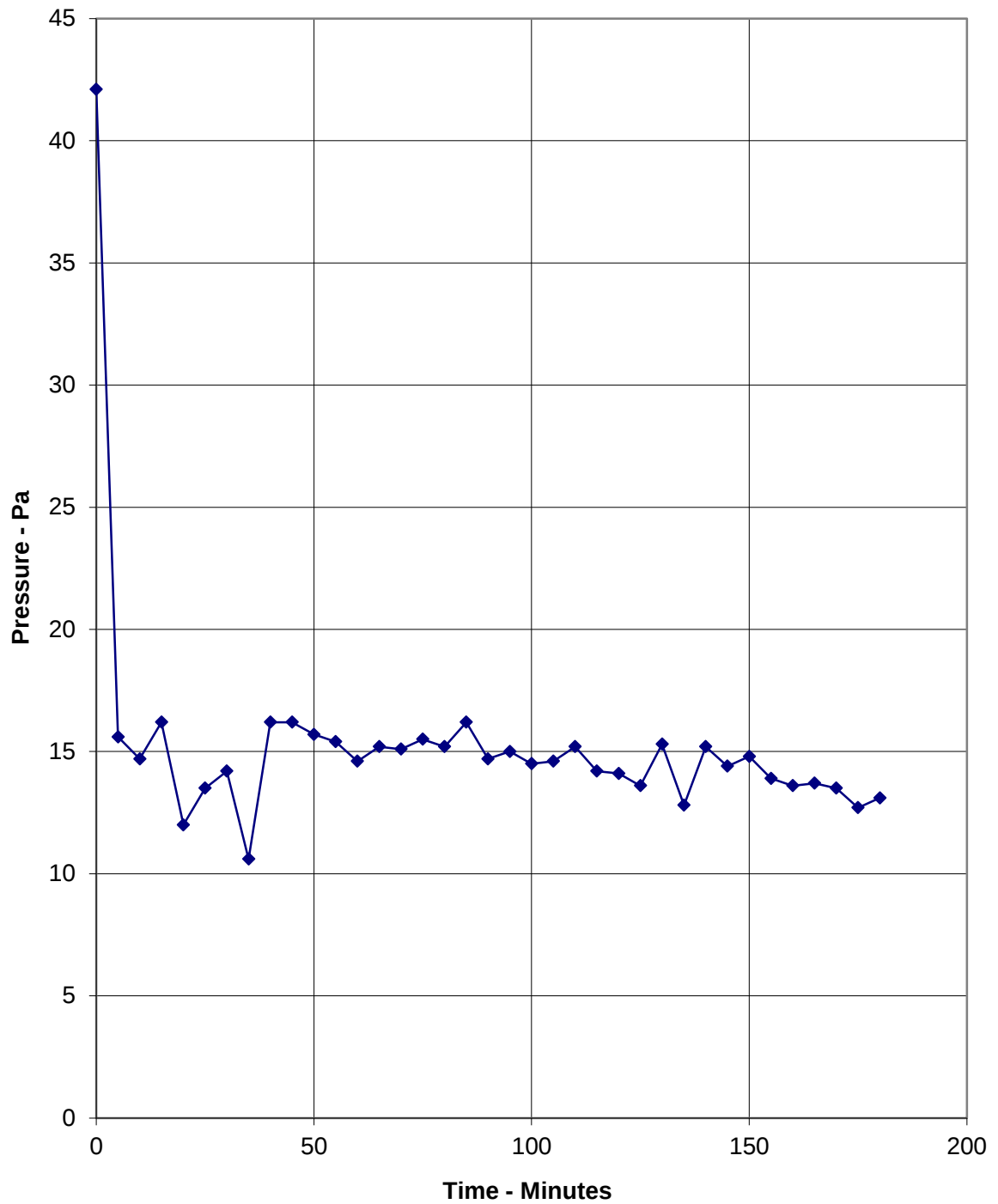
Graph Showing Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In BS 476-20: 1987



Graph Showing Mean Temperatures Recorded On The Unexposed Surface



Graph Showing The Recorded Pressure 300 mm Below The Head Of The Specimen



On-going Implications

Limitations

The results relate only to the behaviour of the specimen of the element of construction under the particular conditions of test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, nor do they reflect the actual behaviour in fires.

The test results relate only to the specimen tested. Appendix A of BS 476: Part 20: 1987 provides guidance information on the application of fire resistance tests and the interpretation of test data. Application of the results to assemblies of different dimensions or incorporating different components should be the subject of a design appraisal.

Review

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

Fire Test Study Group

Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group has identified a number of such areas and have agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Groups. Where such Resolutions are applicable to this test, they have been followed