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JINCHENG HARDWARE INDUSTRY CO.,LTD

TEST REPORT

SCOPE OF WORK
EN 1634-1:2014+A1:2018 TESTING ON HINGE, MODEL OF 4X3X3

REPORT NUMBER
191025003SHF-001

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2019-11-28

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2019-12-11

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24

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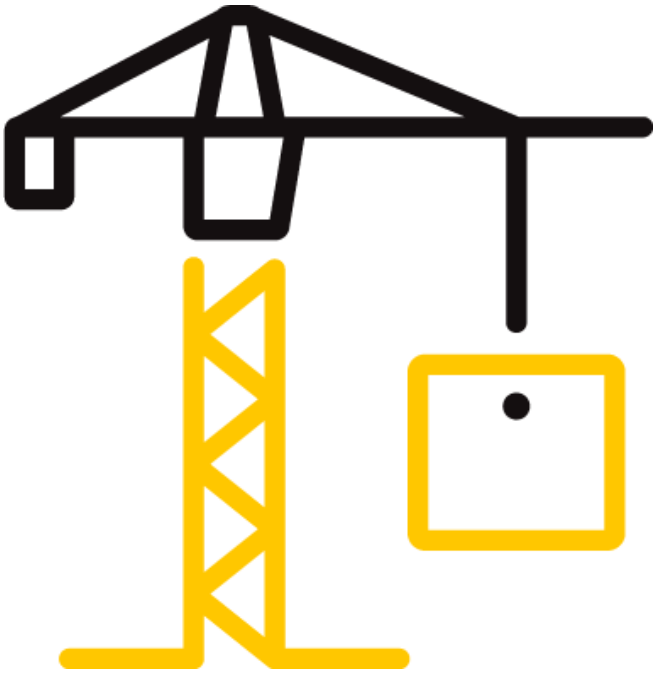

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Issue Date: 2019-12-11 Intertek Report No.: 191025003SHF-001

REPORT ISSUED TO

JINCHENG HARDWARE INDUSTRY CO.,LTD
No.191,Wudong Industrial Zone,Lile Town,Jiangmen City,Guangdong,China,529000

SECTION 1

SCOPE

Intertek has conducted an evaluation for JINCHENG HARDWARE INDUSTRY CO.,LTD to determine the fire resistance characteristics of Hinge, model of 4x3x3, in Single Leaf Single Action Swing Steel Fire Door. This test was designed to demonstrate evaluation on the Hinge of eleven types including Model 4×3×3, Model 4×3.5×3, Model 4×4×3, Model 4.5×3×3, Model 4.5×3.5×3, Model 4.5×4×3, Model 4.5×4.5×3, Model 5×3×3, Model 5×3.5×3, Model 5×4×3 and Model 5×4.5×3. This evaluation began on October 25, 2019 and was completed on December 06, 2019. The test was conducted on November 11, 2019.

The test was conducted in accordance with EN 1634-1:2014+A1:2018, Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Ivy Qiu	**REVIEWED BY:**	Harrison Li
TITLE:	Project Engineer – Building & Construction	**TITLE:**	Asst. Technical Manager – Building & Construction
SIGNATURE:		**SIGNATURE:**	
DATE:	2019-12-11	**DATE:**	2019-12-11

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SECTION 2
SUMMARY OF TEST RESULTS

Product Name: Hinge
Series/Model: 4×3×3, 4×3.5×3, 4×4×3, 4.5×3×3, 4.5×3.5×3, 4.5×4×3, 4.5×4.5×3, 5×3×3, 5×3.5×3, 5×4×3, 5×4.5×3

The test assembly satisfied the performance requirements for the following periods:

PERFORMANCE CRITERIA	RESULTS	
Integrity	Sustained flaming	260 minutes
	Gap gauge	260 minutes
	Cotton pad	260 minutes
Insulation		15 minutes

The test was discontinued after a period of 260 minutes at the request of the sponsor.

SECTION 3
TEST METHODS

The specimens were evaluated in accordance with the following:

EN 1634-1:2014+A1:2018, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows*

EN 1363-1:2012, *Fire resistance tests – Part 1: General Requirements*

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SECTION 4
MATERIAL SOURCE/INSTALLATION

Test specimens were provided to Intertek directly by the client and were not independently selected for testing. Test specimens were received at the Evaluation Center on October 25, 2019.

Hinge, Model of 4×3×3 was tested. The specification of test specimen was provided by the client.

TESTED ASSEMBLY DESCRIPTION		
Door	Type	Single Leaf Single Action Swing Steel Fire Door
	Nominal Size	836mm wide by 2040mm high by 45mm thick
	Main materials	Facing: 1.2 mm galvanized steel sheet, Q235A Door core: Aluminum silicate wool with the density of 120 kg/m^3
		Steel stiffener: 44 x 22 x 1.4mm, Galvanized steel sheet, Q235A Spacing: 155mm
		Edge channel steel: 44 x 22 x 3mm, Galvanized steel sheet, Q235A
Frame	Nominal Size	940 mm wide by 2117 mm high by 150 mm depth
	Material:	1.4 mm thick galvanized steel sheet, Q235A
Hardware	Lock	Mortise lock, model of ANAN/ZS -01
	Hinge	Model: 4 x 3 x 3, Stainless Steel, 304 Quality: Four Size: 4'' x 3'' x 3mm
	Door Closer	Model: TS68 Surface mounted standard installation on the pull side of door leaf

The sample ID number assigned by the test lab is S191025003SHF.001.

Documents and drawing of eleven types of Hinges, Model 4×3×3, 4×3.5×3, 4×4×3, 4.5×3×3, 4.5×3.5×3, 4.5×4×3, 4.5×4.5×3, 5×3×3, 5×3.5×3, 5×4×3 and 5×4.5×3 were checked and found that these types of hinges have the same fixed method, same material and same design but different choices on size. Model 4×3×3 with the smallest size was selected to be tested in a single leaf single swing steel fire door and covered the other models 4×3.5×3, 4×4×3, 4.5×3×3, 4.5×3.5×3, 4.5×4×3, 4.5×4.5×3, 5×3×3, 5×3.5×3, 5×4×3 and 5×4.5×3.

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The Document Register List, the drawings of the fire door assembly and test wall construction can be found in Section 6, 7 and 8 respectively.

The test assembly was installed in a steel restraint frame. The test assembly was built into a concrete masonry unit partition, with fully mortared joints. The test assembly was placed in front of the furnace for the fire exposure. Prior to the commencement of the EN 1634-1 fire test, the specimens to be test were checked for operability in the fire test frame by operating from fully closed to fully open, for 25 cycles. The test measurement data was shown in Section 9.

The test door was oriented to open away from the furnace.

The nominal dimension of the test wall was 3 m high by 2 m wide.

After positioning the assembly frame over the furnace opening, the burners were ignited, and the timer was started. Temperatures within the furnace were monitored using thermocouples and the data was recorded. The burners were controlled to keep the furnace temperatures within the allowable limits specified in the test standards. After 5 minutes, the furnace pressure was adjusted so that the neutral plane was established at approximately 500 mm above notional floor level. Periodic observations were made of the surfaces of the test assembly during the fire resistance test.

Door deflection relative to the frame, where applicable, was monitored throughout the test. Position for measurement of deflection and unexposed temperature were presented in the drawing of Section 9.

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SECTION 5
TEST RESULTS

Integrity

The assembly withstood the fire resistance test without passage of flame or gases hot enough to ignite cotton waste for 260 minutes. No through openings or penetrations were evident at this 260 minutes fire exposure portion of the test and the latch bolt remained engaged to the strike. During this 260 minutes fire exposure period no significant flaming was observed on the unexposed face of the assembly.

This assembly therefore met the criteria of the test standards for integrity performance of 260 minutes.

Insulation

Transmission of heat through the assembly during the fire resistance test of 15 minutes did not raise the average temperature on the unexposed surface by more than 140°C above its initial value and did not raise the maximum temperature on the unexposed surface by more than 180°C above the initial mean unexposed face temperature. In addition, the transmission of heat through the assembly did not raise the maximum temperature of the unexposed surface of the frame by more than 360°C for 15 minutes.

After exposed to the fire for a period of 15 minutes, the temperature of T2 on unexposed surface increased by more than 180°C, insulation failure was deemed to occur.

This assembly therefore met the criteria of the test standards for insulation performance of 15 minutes.

A full set of test data is included in Section 10, and photographs have been presented in Section 11.

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SECTION 6
DOCUMENT REGISTER LIST

Model No.	Document Ref.	Document Title	Issue	Date
4X3X3	4X3X3	General drawings and BOM list	20191019	20191019
4X3.5X3	4X3.5X3	General drawings and BOM list	20191019	20191019
4X4X3	4X4X3	General drawings and BOM list	20191019	20191019
4.5X3X3	4.5X3X3	General drawings and BOM list	20191019	20191019
4.5X3.5X3	4.5X3.5X3	General drawings and BOM list	20191019	20191019
4.5X4X3	4.5X4X3	General drawings and BOM list	20191019	20191019
4.5X4.5X3	4.5X4.5X3	General drawings and BOM list	20191019	20191019
5X3X3	5X3X3	General drawings and BOM list	20191019	20191019
5X3.5X3	5X3.5X3	General drawings and BOM list	20191019	20191019
5X4X3	5X4X3	General drawings and BOM list	20191019	20191019
5X4.5X3	5X4.5X3	General drawings and BOM list	20191019	20191019

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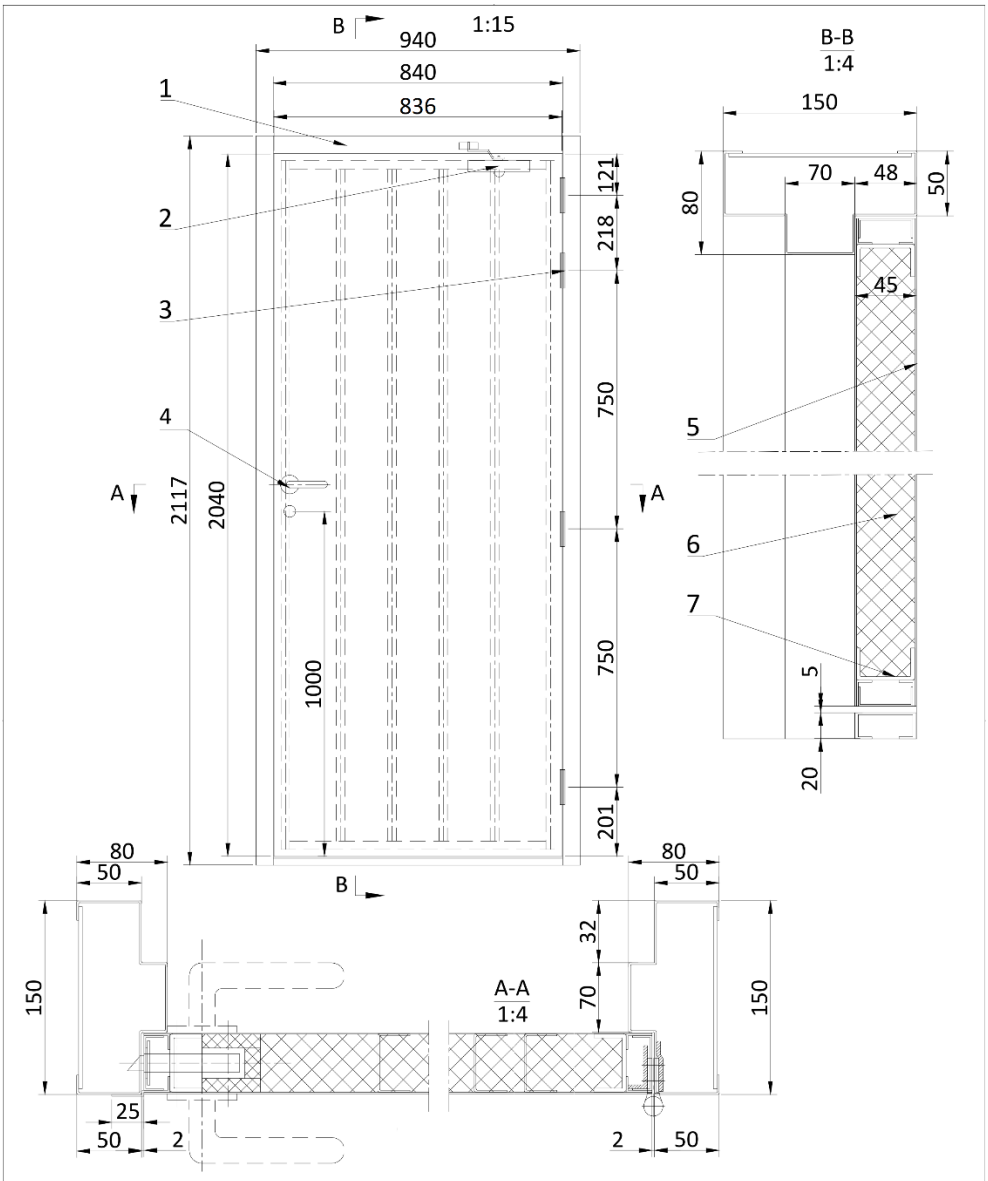
SECTION 7

FIRE DOOR ASSEMBLY DRAWING



NO.	Component	QTY	Specification
7	Stiffener	1	3.0mm/1.4mm Q235A Galvanized steel sheet
6	Aluminum silicate wool		120 kg/m^3
5	Facing	2	1.2mm Q235A Galvanized steel sheet
4	Lock	1	ANAN/ZS-01
3	Hinge	4	4X3X3，Stainless steel
2	Door closer	1	TS 68
1	Frame	1	1.4mm Q235A Galvanized steel sheet

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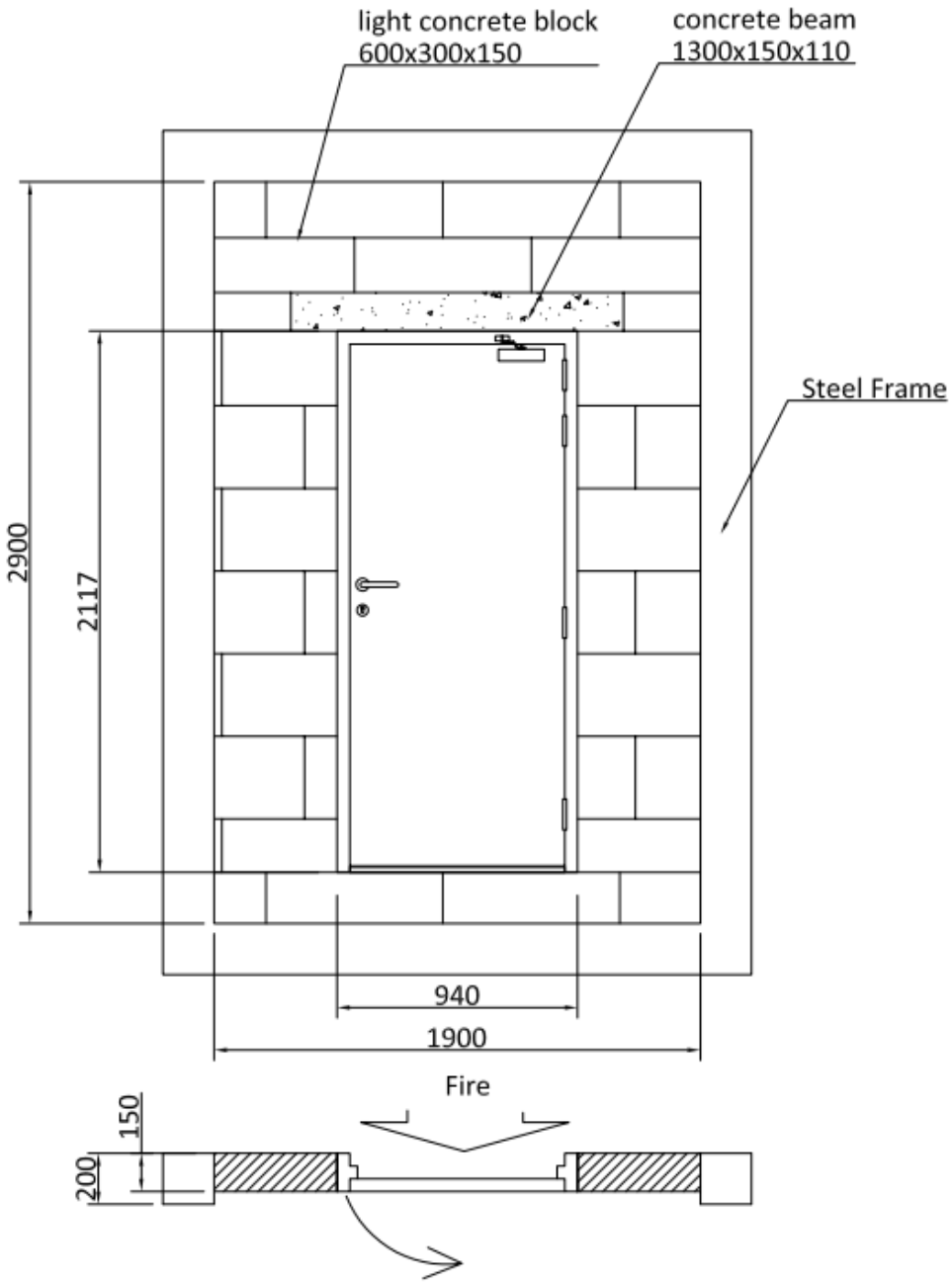
SECTION 8

TEST WALL CONSTRUCTION



UNEXPOSED SIDE

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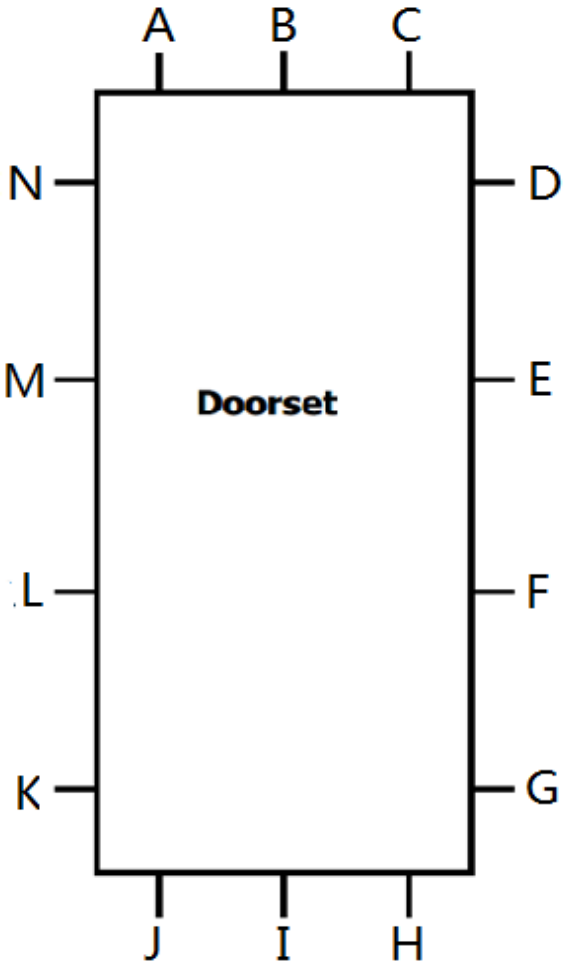
SECTION 9

TEST MEASUREMENT DATA



UNEXPOSED SIDE

Clearance dimension in mm at each position													
A	B	C	D	E	F	G	H	I	J	K	L	M	N
0.8	1.6	1.1	2.3	2.8	2.2	0.7	7.3	6.7	6.9	2.5	1.7	2.2	2.1

DO NOT SCALE

DOOR ASSEMBLY INITIAL CLEARANCES

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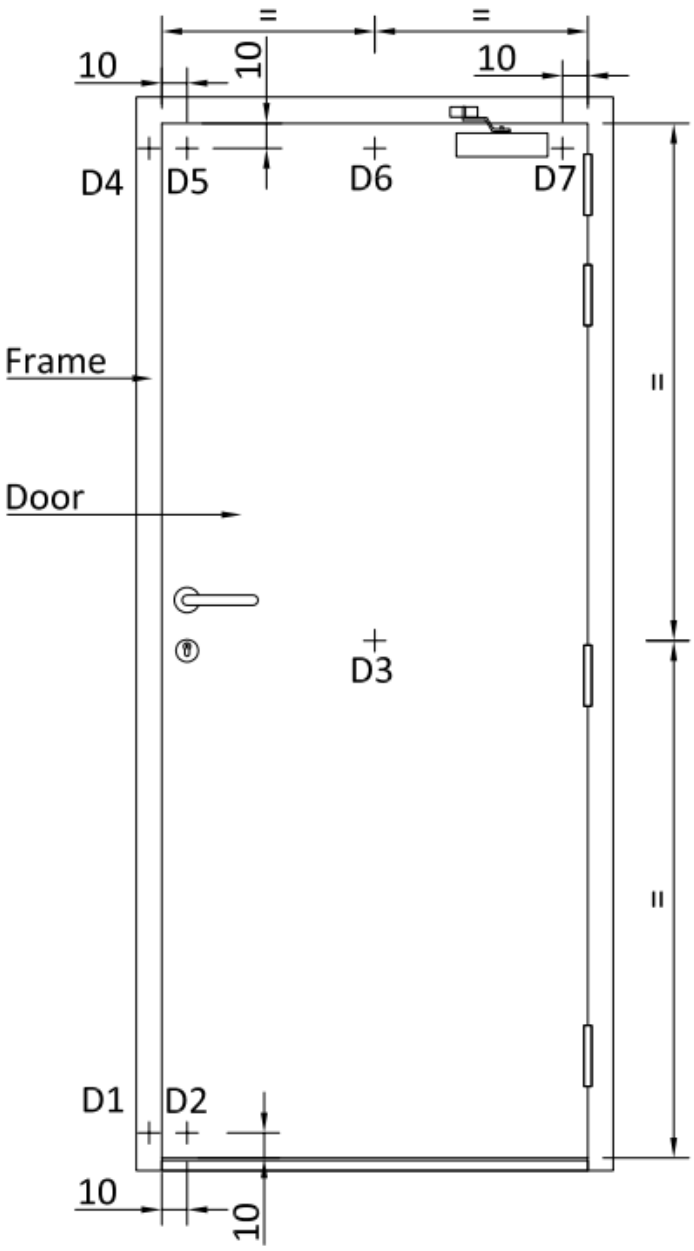

UNEXPOSED SIDE

POSITON FOR MEASUREMENT OF HORIZONTAL DEFLECTION

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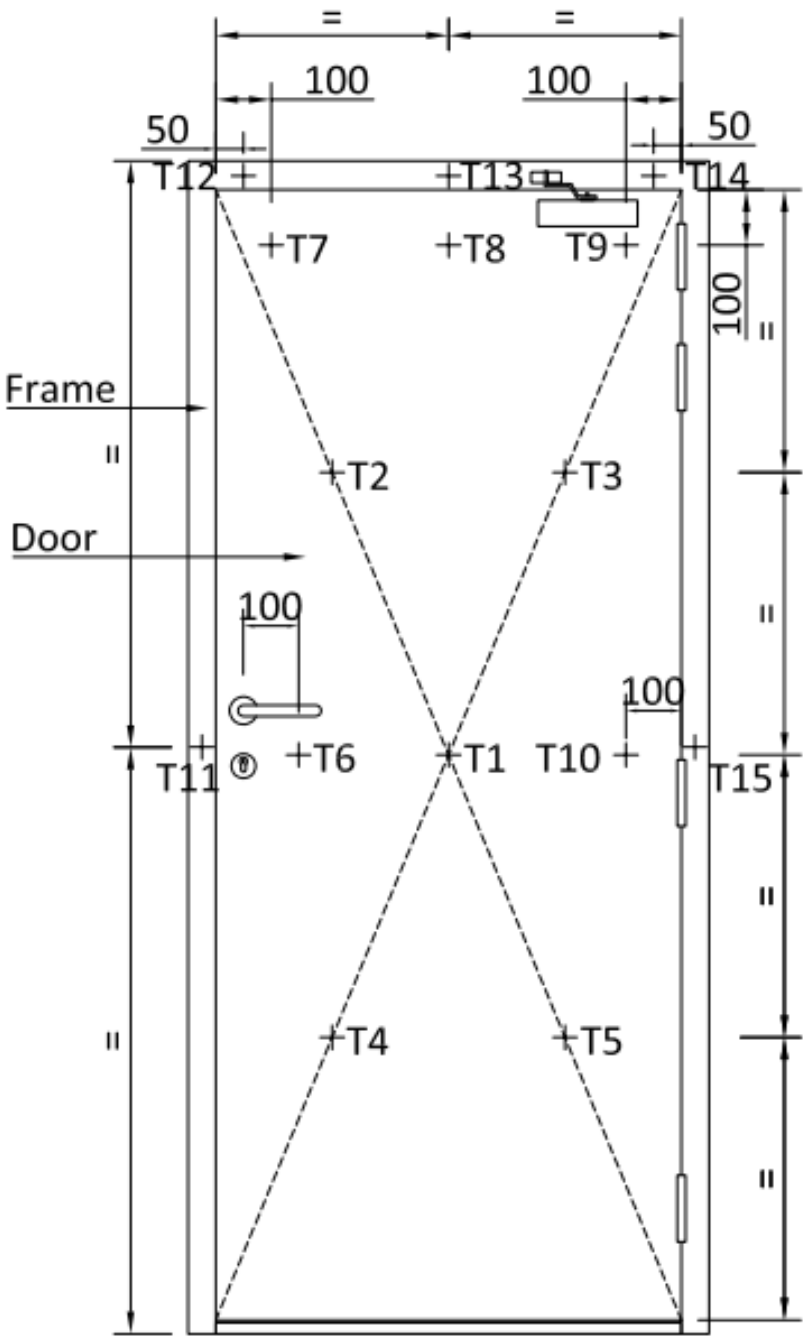

UNEXPOSED SIDE

POSITON FOR MEASUREMENT OF UNEXPOSED TEMPERATURE

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SECTION 10
TEST DATA

Standards: EN 1634-1:2014+A1:2018, Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows

Procedure: Part 1: Fire resistance test for door and shutter assemblies and openable windows

Conditioning: According to EN1363-1, Section 8

Equipment:

ITEM	ID
Vertical furnace	SH1098
Furnace pressure gauge	SH1097-15
Test Clock	SH1042
Furnace thermocouple	SH1097-4~6
Ambient temperature gauge	SH1097-11
Unexposed thermocouple	SH1097-12~14
Clearance Measurements	SH1057-1
Displacement Measurements	SH1163
Force Gauge	SH1066

Heating Conditions: According to EN 1363-1, Section 5.1
Pressure Conditions: According to EN1363-1, Section 5.2
Ambient Conditions: 10~40°C according to EN 1363-1, Section 5.6
Test Specimen: According to EN 1634-1, Section 6
Installation of test specimen: According to EN 1634-1, Section 7
Furnace Thermocouples: According to EN 1634-1, Section 9.1.1
Unexposed Face Thermocouples: According to EN 1634-1, Section 9.1.2
Thermocouple Pads: Length and width 30 mm, thickness 2.0 ± 0.5 mm, dry density 900 ± 90 kg/m^2
Pressure Measurements: According to EN 1634-1, Section 9.2
Deflection Measurements: According to EN 1634-1, Section 9.3
Pre-test Examination: According to EN 1634-1, Section 10.1
Test Procedure: According to EN 1634-1, Section 10.2

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Test Observations:

Time		All observations are from the unexposed face unless noted otherwise.
Mins	Secs	
00	00	Test started.
21	03	Smoke issued from cylinder position and hinge position.
27	28	Unidentified liquid leaked from the door closer position.
42	03	No significant change.
68	47	Thermocouple were removed due to the insulation failure.
96	03	No significant change.
141	15	No significant change.
170	23	No significant change.
208	12	No significant change.
240	19	No significant change.
257	13	A cotton pad was applied on the top hinge position of doorset. The pad was not ignited.
260	00	Test was discontinued at the request of the client.

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Temperature Data:
Mean furnace temperature together with temperature-time relationship specified in the standard

Time Mins	Specified Furnace Temperature (°C)	Furnace Mean Temperature (°C)
0	20	21
10	678	668
20	781	781
30	842	838
40	885	884
50	918	914
60	945	945
70	968	968
80	988	989
90	1006	1006
100	1022	1021
110	1036	1036
120	1049	1047
130	1061	1060
140	1072	1071
150	1082	1081
160	1092	1091
170	1101	1100
180	1110	1109
190	1118	1116
200	1126	1126
210	1133	1132
220	1140	1141
230	1146	1146
240	1153	1152
250	1159	1158
260	1165	1166

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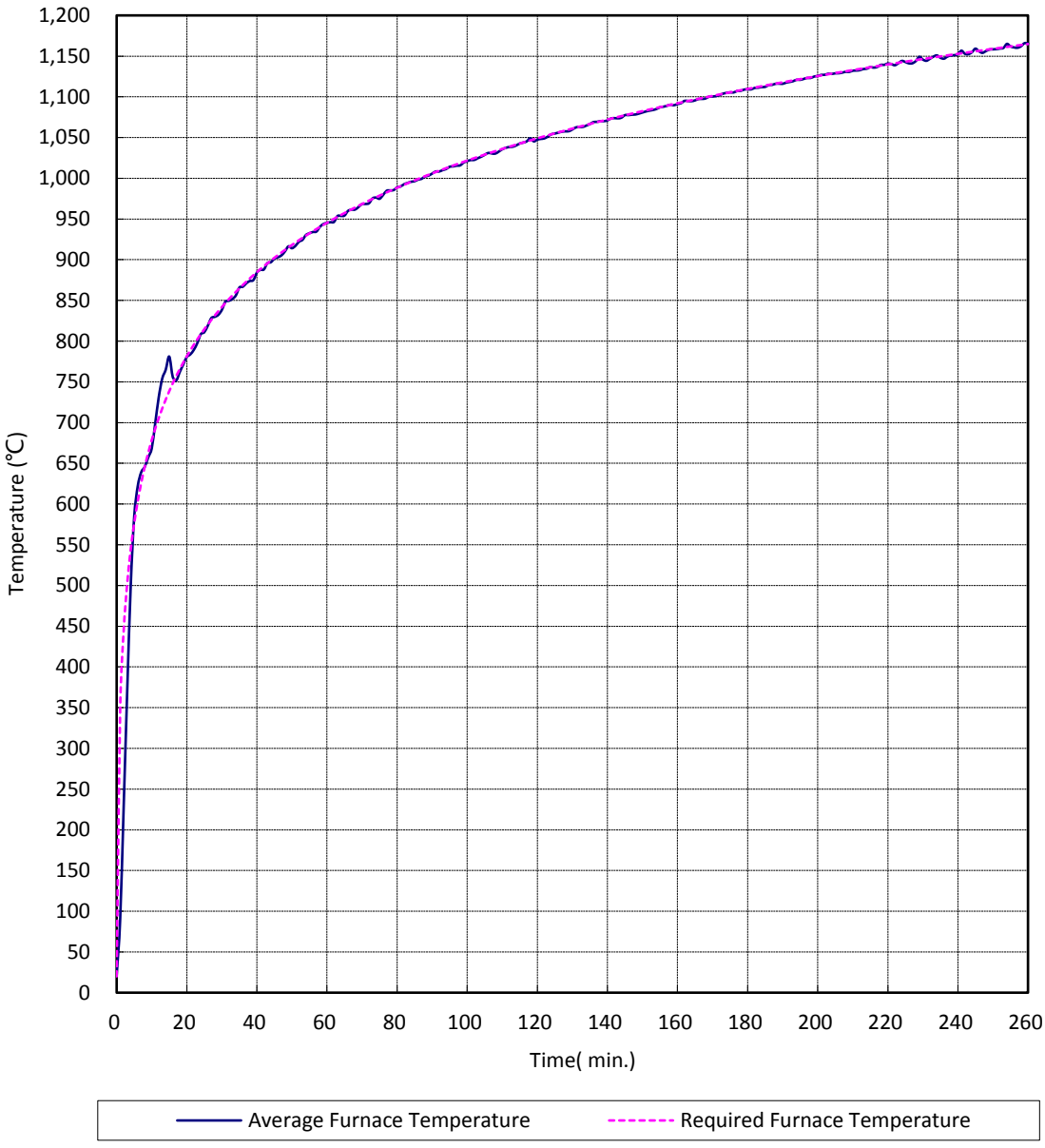
Graph for mean furnace temperature and temperature-time curve specified in the standard



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Unexposed surface temperatures

Time Mins	T1 (°C)	T2 (°C)	T3 (°C)	T4 (°C)	T5 (°C)	Mean Temperature (°C)
0	14	13	13	13	13	13
3	15	19	16	17	17	17
6	24	43	33	35	36	34
9	42	77	57	60	60	59
12	63	123	89	87	87	90
14	80	159	116	110	102	113
15	89	178	131	122	109	126
16	100	200	147	135	117	140
17	111	223	162	152	127	155
18	123	250	177	172	137	172
21	157	332	226	223	166	221
24	188	397	260	264	191	260
27	216	424	286	299	214	288
30	239	434	296	313	226	302
33	256	436	304	328	239	313
36	270	443	313	344	251	324
39	282	444	326	355	261	334
42	293	445	342	365	270	343
45	301	445	351	375	277	350
48	305	447	357	385	283	355
51	305	447	357	390	292	358
54	309	448	358	394	298	361
57	314	449	358	398	305	365
60	315	451	359	400	307	367
63	318	454	359	404	311	369
66	320	458	360	406	311	371
68	321	462	360	407	312	373

Note: After 68 minutes, all thermocouples were removed from unexposed surface due to insulation failure.

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Unexposed surface temperatures

Time Mins	T6 (°C)	T7 (°C)	T8 (°C)	T9 (°C)	T10 (°C)	T11 (°C)	T12 (°C)	T13 (°C)	T14 (°C)	T15 (°C)
0	13	13	14	13	13	11	12	12	12	11
3	15	17	15	19	14	13	15	13	20	15
6	27	36	23	34	23	16	24	18	30	23
9	49	58	40	53	38	22	46	26	43	31
12	74	81	61	78	55	33	76	34	56	41
15	99	108	89	108	76	72	92	44	72	57
18	123	137	125	142	102	90	100	55	90	77
21	156	164	157	174	130	93	101	68	103	92
24	190	190	186	201	157	96	103	87	112	105
27	223	213	211	223	180	98	109	101	116	117
30	252	233	234	238	198	103	116	104	126	128
33	275	250	251	251	214	109	123	112	140	140
36	295	264	266	261	228	117	130	122	151	153
39	312	278	279	272	242	127	140	132	163	166
42	320	291	292	282	252	137	151	145	175	180
45	329	303	303	293	264	150	163	158	186	194
48	342	316	310	302	275	163	176	172	198	208
51	352	323	313	307	322	178	190	187	210	222
54	358	333	314	309	295	193	203	202	221	235
57	364	341	319	310	307	208	217	217	233	248
60	367	345	323	310	329	222	231	231	245	260
63	372	351	327	314	330	237	244	246	256	271
66	376	353	328	316	336	251	256	259	265	281
68	378	355	330	318	342	259	262	266	272	287

Note: After 68 minutes, all thermocouples were removed from unexposed surface due to insulation failure.

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Horizontal Deflection (Positive values indicate movement into the furnace)

Time Mins	D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	D5 (mm)	D6 (mm)	D7 (mm)
0	0	0	0	0	0	0	0
10	0	-30	27	0	-1	3	1
20	0	-33	29	0	0	5	3
30	0	-35	25	0	0	6	3
40	0	-35	18	0	0	6	2
50	0	-37	8	0	0	6	2
60	0	-37	9	0	0	6	2
90	0	-40	-10	0	-2	2	1

Note: After 90 minutes, the measurement of deflection was stopped for safety concern.

Closing Force of Door Closer

Closing Force		
Highest gauge reading	Distance	Moment
(N)	(m)	(N.m)
52.5	0.75	39.0
50.2	0.75	
53.1	0.75	

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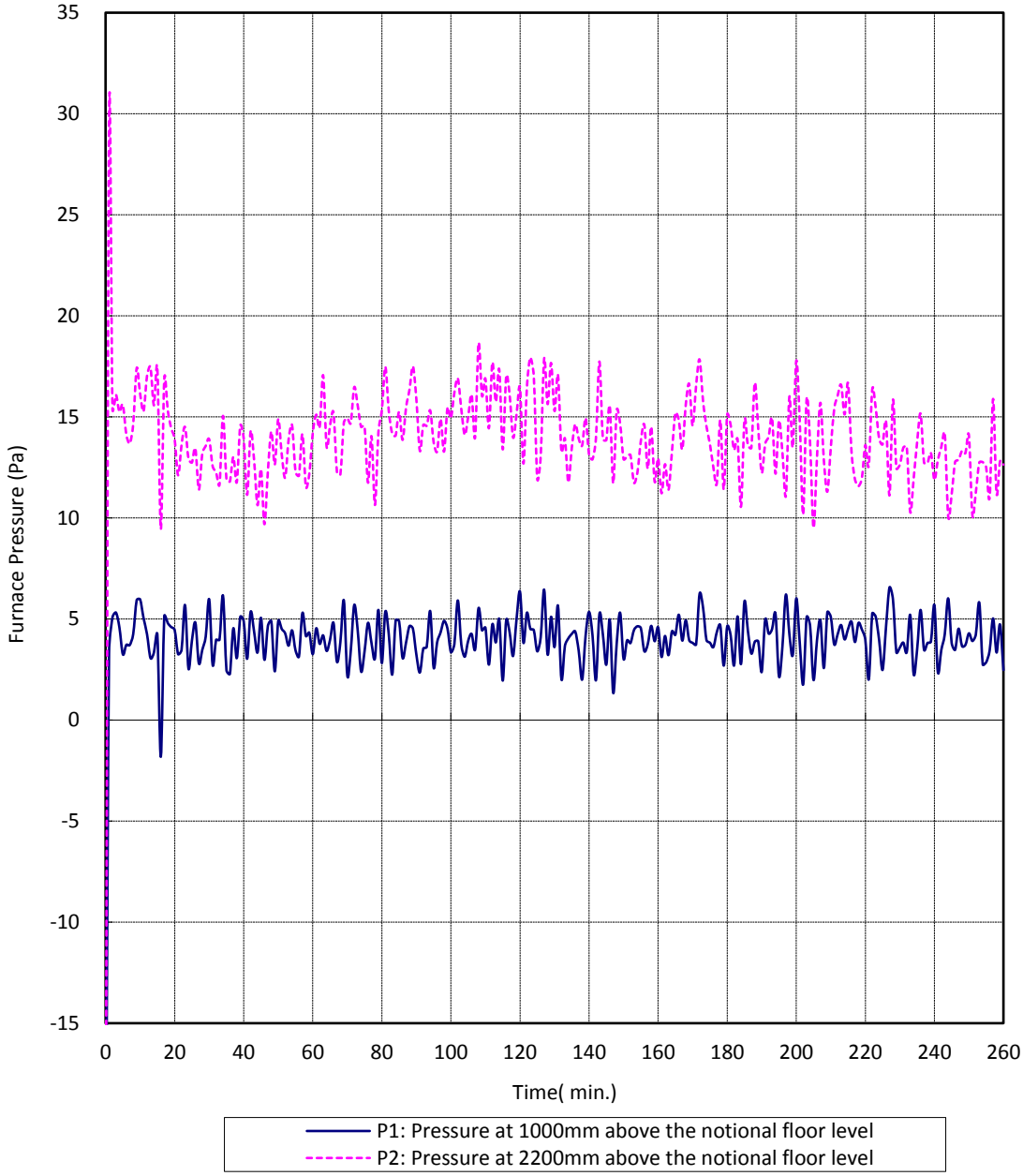
Furnace pressure



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SECTION 11
PHOTOGRAPHS

Fig. 1 Exposed Side Prior to the Fire Test

Fig. 2 Unexposed Side Prior to the Fire Test

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Fig. 3 Unexposed Side after 90 Minutes

Fig. 4 Unexposed Side after 180 Minutes

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Fig. 5 Cotton pad test after 257 Minutes

Fig. 6 Exposed Side after 260 Minutes

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SECTION 12
REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	2019-12-11	N/A	Original Report Issue