TEST REPORT

REPORT NUMBER: 140829012SHJ-BP-1
ORIGINAL ISSUE DATE: December 1, 2014

EVALUATION CENTER

Intertek Testing Services Ltd., Shanghai
Plant 7, No. 6958 Daye Road, Fengxian District, Shanghai
China 201405

RENDERED TO

ZHEJIANG JIAHUI DOORS CO., LTD.
NO. 6 JIAHUI ROAD GUMASHAN INDUSTRIAL ZONE WANGZHAI TOWN
WUYI

PRODUCT EVALUATED
Double Leaves Swing Steel Fire Door Assembly

EVALUATION PROPERTY
Fire Resistance

Report of Testing Double Leaves Swing Steel Fire Door Assembly for compliance with the applicable requirements of the following criteria: *BS 476-22:1987 Fire Tests on Building Materials and Structures – Part 22: Methods for Determination of the Fire Resistance of Non-loadbearing Elements of Construction.*

1 Table of Contents

2 Introduction

Intertek has conducted an evaluation for ZHEJIANG JIAHUI DOORS CO., LTD. to determine the fire resistance characteristics of the Double Leaves Swing Steel Fire Door Assembly. This evaluation began on November 20, 2014 and was completed on December 1, 2014. The test was conducted on November 24, 2014.

The test was conducted in accordance with BS 476-22:1987 “Fire Tests on Building Materials and Structures – Part 22: Methods for Determination of the Fire Resistance of Non-loadbearing Elements of Construction, Section 6: Determination of the Fire Resistance of Fully Insulated Doorsets and Shutter Assemblies”.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client. Samples were not independently selected for testing. Samples were received at the Evaluation Center on November 20, 2014.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Door	Type	Double Leaves Single Acting Swing Steel Fire Door Assembly
	Nominal Size	Inactive leaf: 1055.5 mm wide by 2232 mm high by 50 mm thick Active leaf: 1055.5 mm wide by 2232 mm high by 50 mm thick
	Surface Panel	1.0 mm Galvanized Steel
	Core	Material: Perlite Density: 340 kg/m^3±10%
	Stiffener	1.0 mm Galvanized Steel, rectangle cross section Three vertical pieces and four horizontal pieces in each leaf
	Astragal	1.0 mm Galvanized Steel
Frame	Nominal Size	2200 mm wide by 2300 mm high
	Material	1.5 mm Galvanized Steel
Hardware	Lock	Mortise lock, Model: 6072N Lock case size: 165 mm x 85 mm x 13 mm, Backset: 60 mm, Latch throw: 10 mm Latch operation: engaged
	Hinge	Steel hinge Size: 101.5 mm x 97 mm x 3 mm, Quality: 3 for each leaf
Intumescent Seal	Model: FPJ-A-24/15*2 Location: All around the door edges and under the astragal on push side.	

The sample ID number is S140829012SHJ-001.

The drawings of the Double Leaves Swing Steel Fire Door Assembly, hardware and test wall construction can be found in Appendices A, B, and C respectively. A comprehensive description of the Double Leaves Swing Steel Fire Door Assembly for certification is maintained on Intertek file.

4 Testing and Evaluation Methods

The test was conducted in accordance with BS 476-22:1987, and BS 476-20:1987.

The test assembly was installed in a steel restraint frame. The test samples were moved in front of the furnace for the fire exposure. The test door was oriented to open away from the furnace, and was built into a concrete masonry unit partition, with fully mortared joints. The nominal dimensions of the test wall were 3 m high by 3 m wide. The test measurement data was shown in Appendix D.

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 a maximum of 1000 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 was presented in the drawing of Appendix D.

5 Testing and Evaluation Results

5.1. INTEGRITY

The assembly withstood the fire resistance test without passage of flame or gases hot enough to ignite cotton waste for 165 minutes. No through openings or penetrations were evident at this 165 minutes fire exposure portion of the test and the door latch remained engaged to the strike. During this 165 minutes fire exposure period no significant flaming was observed on the unexposed face of the assembly.

After exposed to the fire for a period of 165 minutes, sustained flame appeared at the area around the meeting edges, integrity failure was deemed to occur. This assembly therefore met the criteria of the test standards for integrity performance of 165 minutes.

5.2. INSULATION

Transmission of heat through the assembly during the fire resistance test of 32 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. After exposed to the fire for 32 minutes, the maximum temperature on the unexposed surface raise by more than 180°C above its initial value, insulation failure was deemed to occur.

The assembly passed the insulation portion of the test of 32 minutes. A full set of test data is included in Appendix E, and photographs have been presented in Appendix F.

6 Conclusion

The Double Leaves Swing Steel Fire Door Assembly identified in this report has been tested in accordance with BS 476-22:1987 “Fire Tests on Building Materials and Structures – Part 22: Methods for Determination of the Fire Resistance of Non-loadbearing Elements of Construction, Section 6: Determination of the Fire Resistance of Fully Insulated Doorsets and Shutter Assemblies”.

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

Integrity	Sustained flaming	165 minutes
	Gap gauge	165 minutes
	Cotton pad	165 minutes
Insulation		32 minutes

The test was discontinued after a period of 180 minutes at the request of the sponsor.

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

INTERTEK

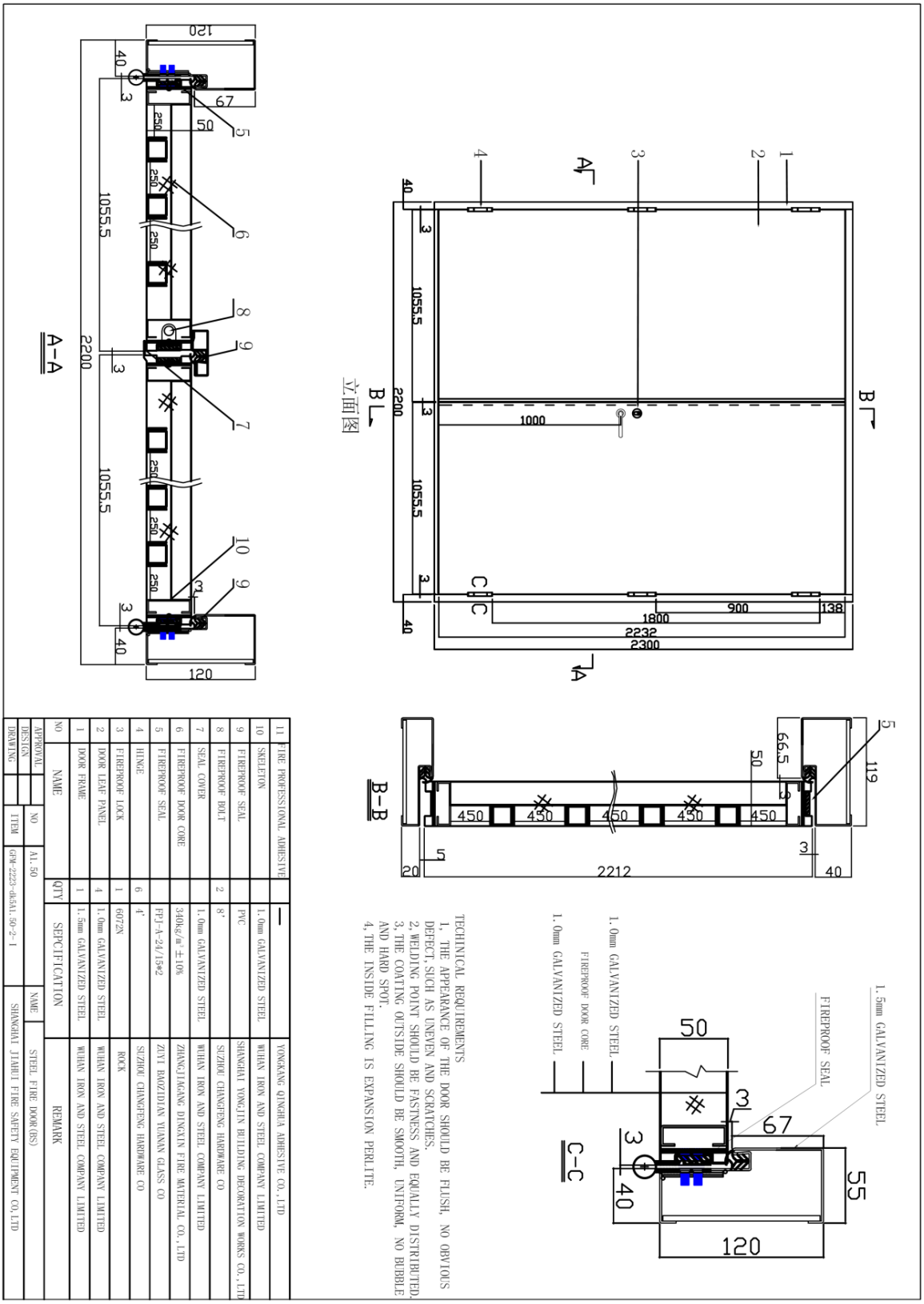
Reported by: Ping Rao

Ping Rao
Project Engineer, Building Products

Reviewed by: Harrison Li

Harrison Li
Senior Project Engineer, Building Products

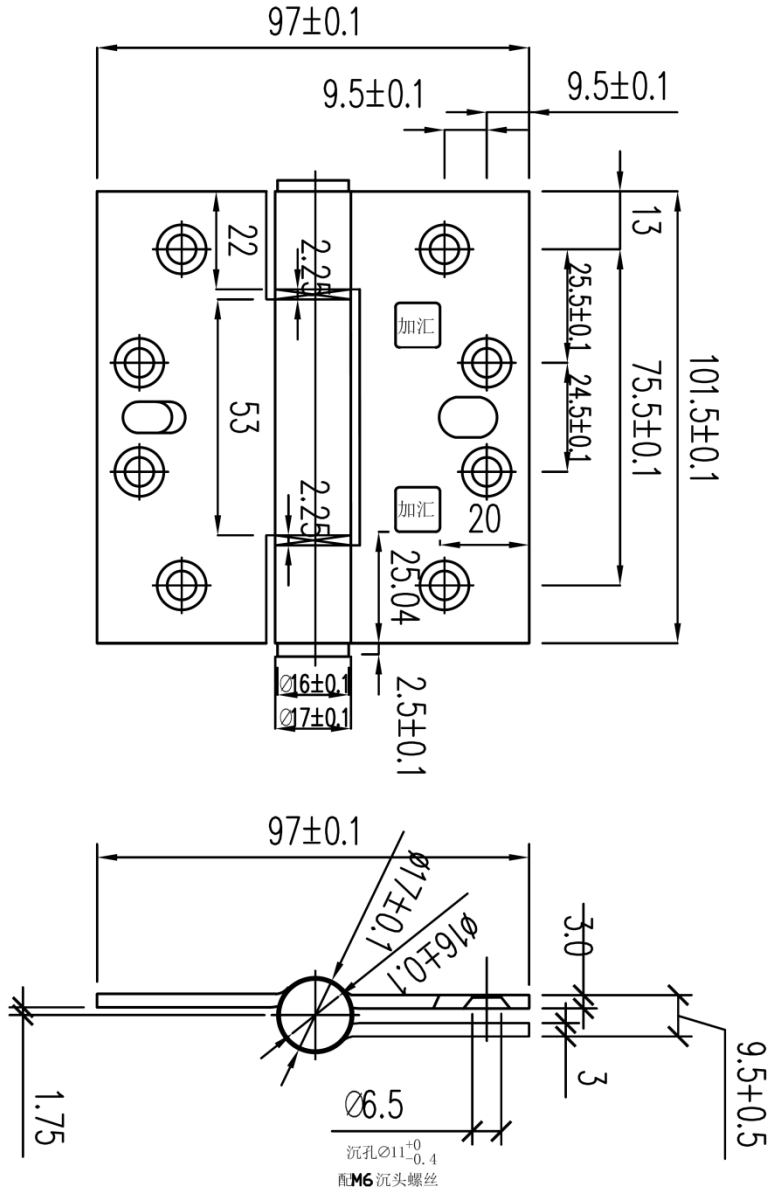
7 Appendix A: Fire Door Assembly Drawings



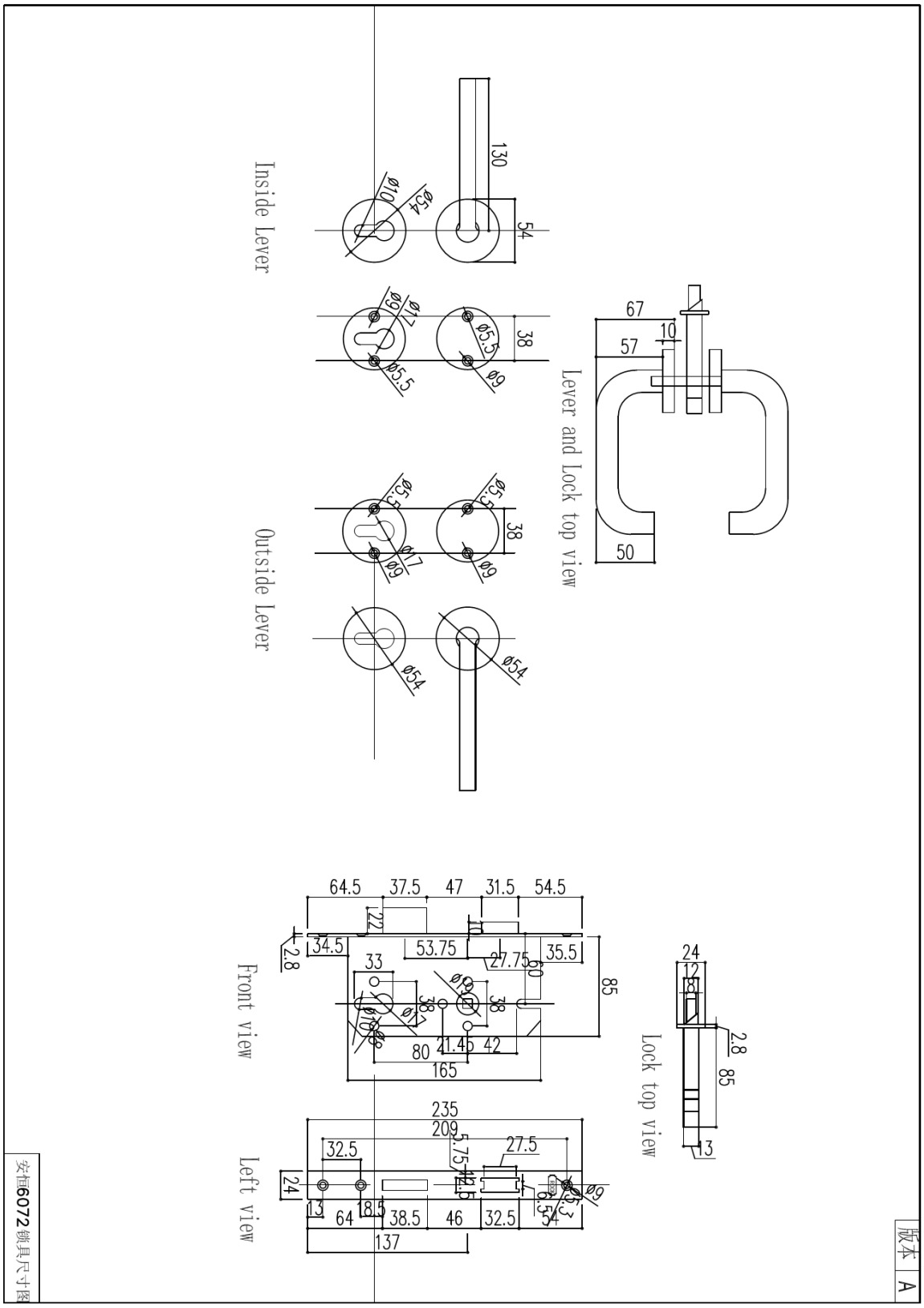
NO	NAME	QTY	SEPCIFICATION	REMARK
1	DOOR FRAME	1	1. 5mm GALVANIZED STEEL	WUHAN IRON AND STEEL COMPANY LIMITED
2	DOOR LEAF PANEL	4	1. 0mm GALVANIZED STEEL	WUHAN IRON AND STEEL COMPANY LIMITED
3	FIREPROOF LOCK	1	6072N	ROCK
4	HINGE	6	4'	SUZHOU CHANGFENG HARDWARE CO
5	FIREPROOF SEAL		FPJ-A-24/15*2	ZUYI BAOZIDIAN YUANAN GLASS CO
6	FIREPROOF DOOR CORE		340kg/m³ ±10%	ZHANGJIAGANG DINGXIN FIRE MATERIAL CO., LTD
7	SEAL COVER	2	1. 0mm GALVANIZED STEEL	WUHAN IRON AND STEEL COMPANY LIMITED
8	FIREPROOF BOLT	2	8'	SUZHOU CHANGFENG HARDWARE CO
9	FIREPROOF SEAL		PVC	SHANGHAI YONGJIN BUILDING DECORATION WORKS CO., LTD
10	SKELETON		1. 0mm GALVANIZED STEEL	WUHAN IRON AND STEEL COMPANY LIMITED
11	FIRE PROFESSIONAL ADHESIVE		—	YONGKANG QINGHUA ADHESIVE CO., LTD

ITEM	NO	ALL 50	NAME	STEEL FIRE DOOR(BS)
	APPROVAL			
GFM-2223-dk5A1-50*2-1	DESIGN		SHANGHAI JIAHUI FIRE SAFETY EQUIPMENT CO.,LTD	
	DRAWING			

8 Appendix B: Hardware Drawings

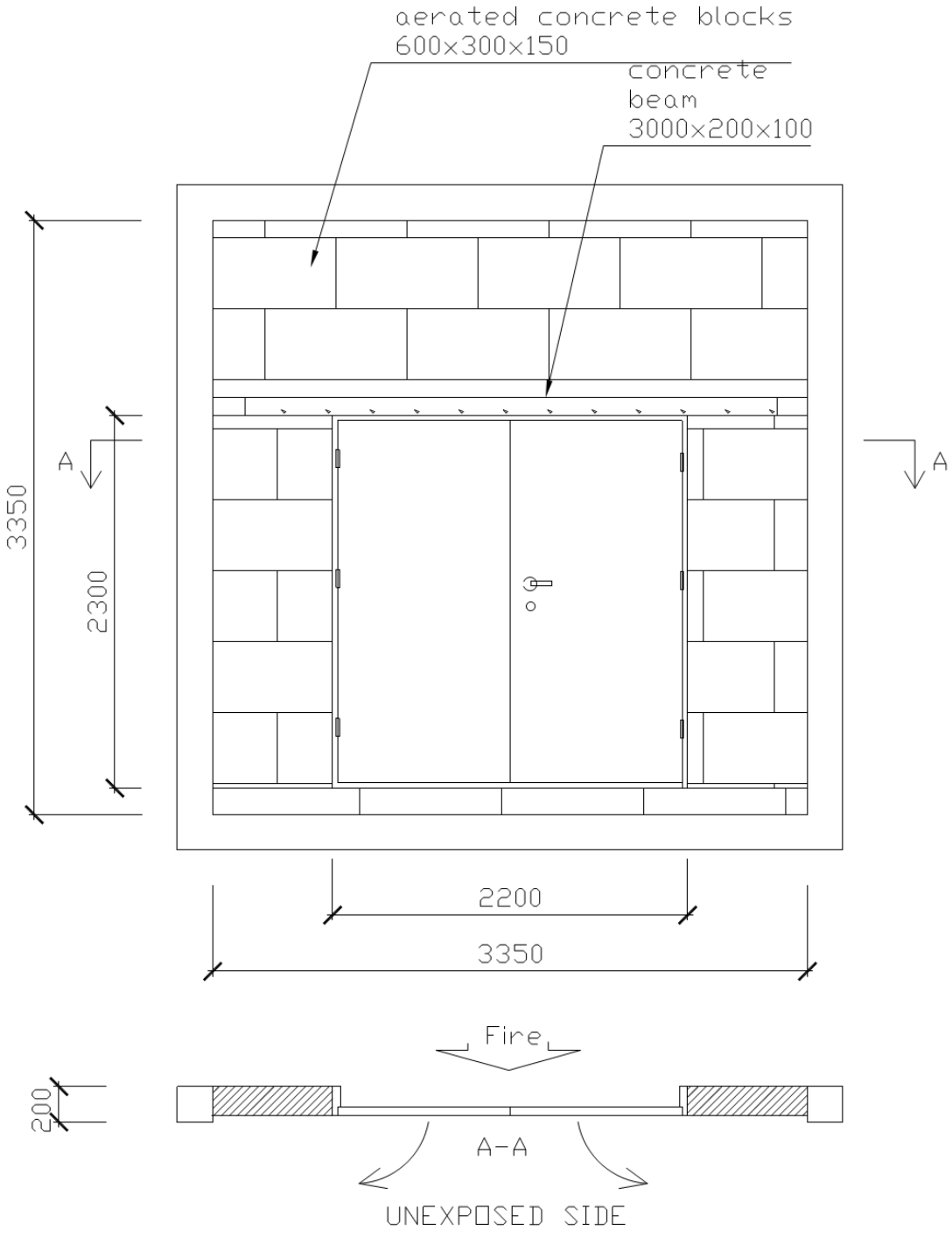


Hinge

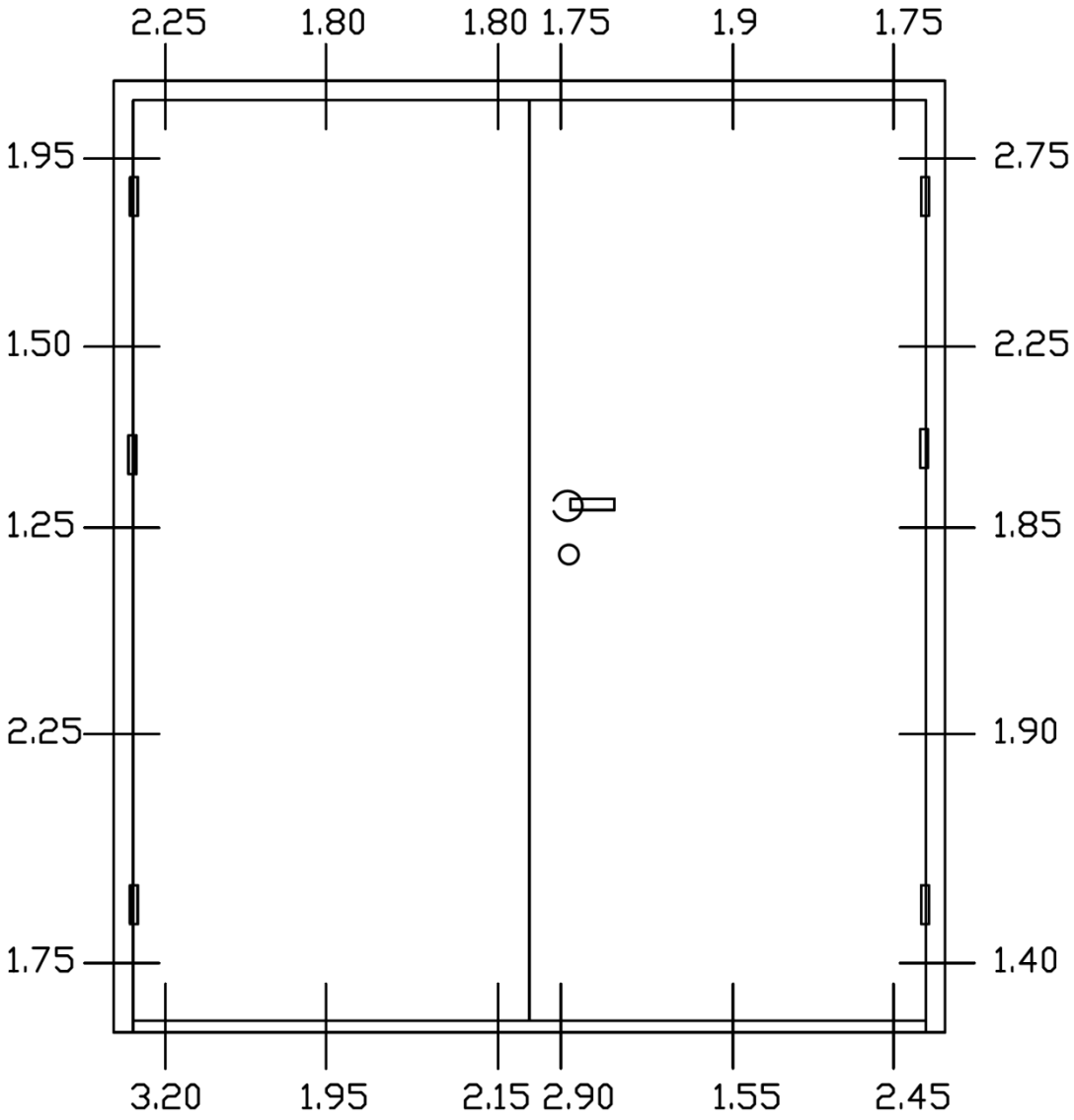


Mortise Lock

9 Appendix C: Test Wall Construction Drawing

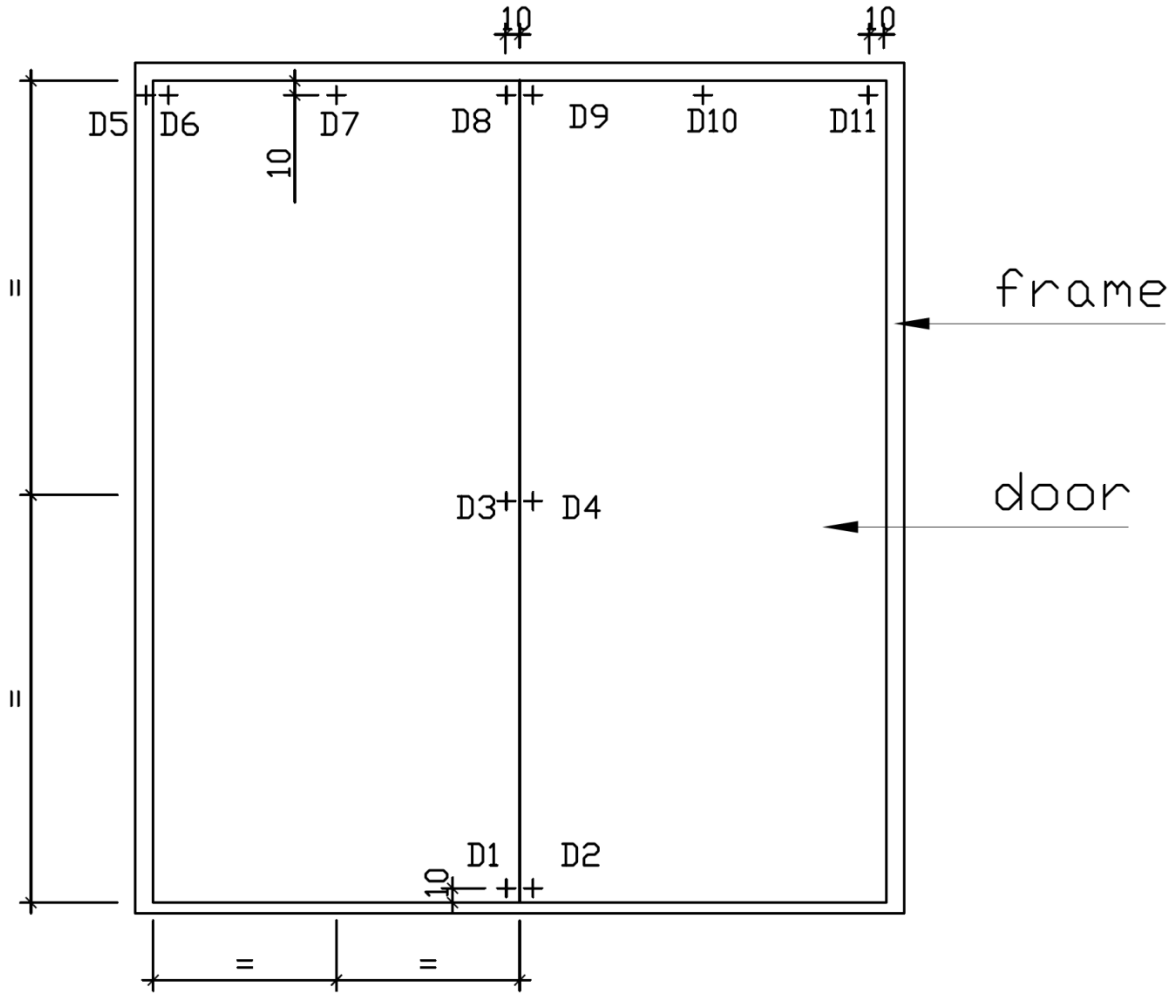


10 Appendix D: Test Measurement Data



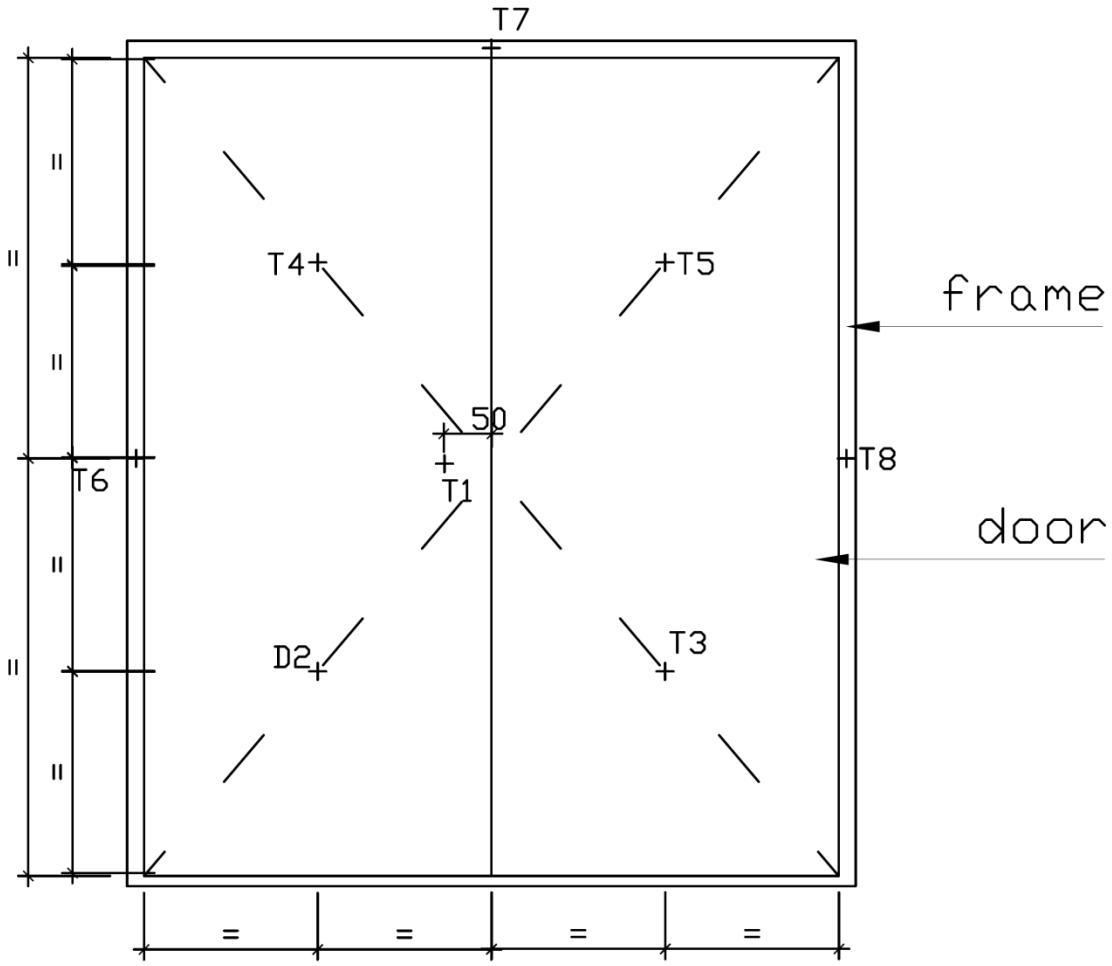
UNEXPOSED SIDE

DOOR ASSEMBLY INITIAL CLEARANCES



UNEXPOSED SIDE

POSITION FOR MEASUREMENT OF HORIZONTAL DEFLECTION



POSITION FOR MEASUREMENT OF UNEXPOSED TEMPERATURE

11 Appendix E: Test Data

Intertek

Reviewer: Harrison Li

Test:	Fire Resistance
Test Date:	2014.11.24
Job No:	140829012SHJ-BP
Client:	ZHEJIANG JIAHUI DOORS CO., LTD.
Sample:	Double Leaf Swing Steel Fire Door Assembly
Sample ID:	S140829012SHJ-1
Standards:	BS476-22:1987 Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction
Procedure:	According to BS 476-22, Section 6, 7, 8
Conditioning:	According to BS 476-20, Section 4.6

Eng/Tech: Ping Rao

Equipment:

Item	*ID*	*Cal Due Date*
Vertical furnace	SH1097	2015.4.28
Furnace pressure gauge	SH1097-15	2015.8.16
Test Clock	SH1042	2015.8.11
Furnace thermocouple	SH1097-7~9	2015.4.10
Ambient temperature gauge	SH1097-11	2015.4.19
Unexposed thermocouple	SH1097-12~14	2015.4.10
Clearance Measurements	SH1061	2016.2.27
Displacement Measurements	SH1034	2015.8.5

Heating Conditions:	According to BS 476-20, Section 3.1
Pressure Conditions:	According to BS 476-20, Section 3.2
Ambient Conditons:	5~35°C according to BS 476-20, Section 3.3
Test Specimen:	According to BS 476-22, Section 6.2, 7.2, 8.2
Installation of test specimen:	According to BS 476-22, Section 6.3, 7.3, 8.3
Furnace Thermocouples:	According to BS 476-22, Section 6.4.3, 7.4.3, 8.4.3
Unexposed Face	According to BS 476-22, Section 6.4.5, 7.4.5, 8.4.5
Thermocouple Pads:	Length and width 30 mm, thickness 2.0 ± 0.5 mm, dry density 900 ± 90 kg/m^2, thermal conductivity of 0.13 W/(m*K) ± 10% at 100 ℃
Pressure Measurements:	According to BS 476-22, Section 6.4.4, 7.4.4, 8.4.4
Deflection Measurements:	According to BS 476-22, Section 6.4.7, 7.4.7, 8.4.7
Test Procedure:	According to BS 476-22, Section 6.5, 7.5, 8.5

Intertek

Reviewer: Harrison Li

Test: Fire Resistance
Test Date: 2014.11.24
Job No: 140829012SHJ-BP
Client: ZHEJIANG JIAHUI DOORS CO., LTD.
Sample: Double Leaf Swing Steel Fire Door Assembly
Sample ID: S140829012SHJ-1
Standards: BS476-22:1987 Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction
Procedure: According to BS 476-22, Section 6, 7, 8
Performance Criteria: According to BS 476-22, Section 6.6, 7.6, 8.6
1) Integrity: Cotton pad
Gap gauges
Sustained flaming

Eng/Tech: Ping Rao

Time (min'sec")	Cotton Pad Check	6mm Gap Gauge Distance (mm)	25mm Gap Gauge "Pass Through"	Performance Observations
Initial	--	0	No "Pass Through"	The test commences.
4'10"	--	0	No "Pass Through"	Light smoke is observed at the middle joint of the door leaf.
6'33"	--	0	No "Pass Through"	Popping sounds from the door.
19'15"	--	0	No "Pass Through"	Smoke is evdient at the vertical and horizontal edges, and the middle joint of the door leaf.
30'28"	--	0	No "Pass Through"	Discolouration at the hinge postion turning into black in appearance.
64'41"	No ignition	0	No "Pass Through"	A cotton pad integrity test is performed at the middle joint, the pad is not ignited.
109'33"	--	0	No "Pass Through"	Smoke issues from the latch position.
165'0"	--	0	No "Pass Through"	Sustained flames issue from the middle joint of the door leaf. Integrity failure is deemed to occur.
180'0"	--	0	No "Pass Through"	The furnance is exinguished.
Requirement	No ignition	<150	No "Pass Through"	No excessive openings, sustained flaming, etc.

Intertek

Reviewer: Harrison Li

Test: Fire Resistance
Test Date: 2014.11.24
Job No: 140829012SHJ-BP
Eng/Tech: Ping Rao
Client: ZHEJIANG JIAHUI DOORS CO., LTD.
Sample: Double Leaf Swing Steel Fire Door Assembly
Sample ID: S140829012SHJ-1
Standards: BS476-22:1987 Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction
Procedure: According to BS 476-22, Section 6, 7, 8
Performance Criteria: According to BS 476-20, Section 10.4
2) Insulation: Mean temperature rise 140°C according to BS 476-20, Section 10.4. Maximum temperature rise 180°C according to BS 476-20, Section 10.4.

Time(Minutes)	Ambient (°C)	T1 (°C)	T2 (°C)	T3 (°C)	T4 (°C)	T5 (°C)	T6 (°C)	T7 (°C)	T8 (°C)
Initial	20	20	18	19	19	20	20	17	19
1	20	20	19	19	19	20	20	17	19
2	20	21	18	19	19	20	20	19	20
3	20	22	21	20	20	20	20	31	20
4	20	24	20	20	20	20	22	41	21
5	20	25	19	19	19	20	23	53	22
6	20	27	18	20	20	20	25	62	23
7	20	30	18	20	20	20	28	68	25
8	20	33	18	20	20	20	31	73	29
9	20	37	19	20	20	20	34	78	32
10	20	42	19	20	20	20	39	84	36
11	20	49	19	20	20	21	52	91	50
12	20	55	19	20	21	21	73	99	70
13	20	60	20	21	22	21	90	107	86
14	20	65	20	21	22	22	94	110	92
15	20	69	21	22	23	22	98	114	100
16	20	73	21	23	23	23	99	116	101
17	20	79	23	24	23	24	98	119	102
18	20	85	24	25	24	24	100	122	100
19	20	92	25	26	25	26	98	124	101
20	20	100	27	27	26	27	98	127	100
21	20	114	28	29	28	28	101	131	106
22	20	126	30	31	30	30	104	135	114
23	20	136	31	33	32	33	108	140	118
24	20	142	33	36	36	37	110	146	120
25	20	148	36	39	40	40	115	155	126
26	20	153	38	42	43	45	118	162	138
27	20	160	41	48	50	52	120	166	143
28	20	170	43	52	55	68	122	168	148
29	20	176	46	57	67	84	126	169	152
30	20	184	54	62	75	88	97	171	160
31	20	191	60	67	83	89	111	171	162
32	20	195	66	73	86	90	127	174	164
33	20	200	70	78	89	90	141	224	165
34	20	207	78	83	88	90	146	225	167
35	20	213	84	88	89	90	150	228	168
Temperature Rise (°C)		194	65	69	70	71	131	209	149

Average temperature rise at 35 min 94 °C
Maximum temperature rise at 35 min 194 °C
Maximum temperature rise at 35 min (Frame) 209 °C

Intertek

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Test Date:	2014.11.24
Job No:	140829012SHJ-BP
Client:	ZHEJIANG JIAHUI DOORS CO., LTD.
Sample:	Double Leaf Swing Steel Fire Door Assembly
Sample ID:	S140829012SHJ-1
Standards:	BS476-22:1987 Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction
Procedure:	According to BS 476-22, Section 6, 7, 8

Eng/Tech: Ping Rao

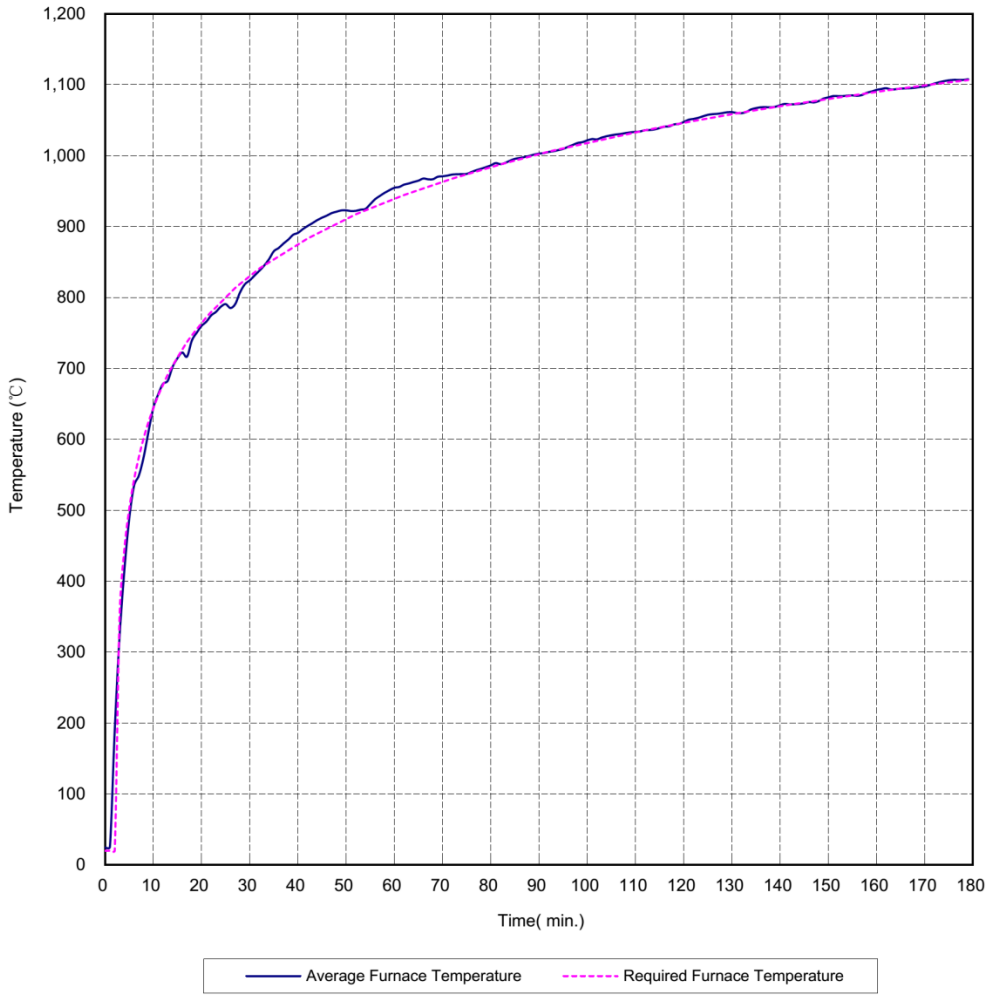
Time(Minutes)	Maximum perpendicular displacement where a positive measurement indicates movement towards the furnace (mm)						
	D1	D2	D3	D4	D5	D6	D7
Initial	0	0	0	0	0	0	0
10	3	4	22	19	0	-7	4
20	3	1	32	30	0	-7	2
30	-1	-3	43	43	0	-15	6
40	-4	-4	57	56	0	-16	9
50	-4	4	67	65	0	-16	0
60	-5	-4	77	80	0	-21	4
70	-3	-9	79	79	0	-21	4
80	-4	1	82	83	0	-23	1
90	-5	-6	78	78	0	-25	0
100	-5	-6	76	76	0	-27	-1
120	-2	-6	68	81	0	-29	1
135	-5	-6	84	82	0	-31	0
150	-4	-8	83	83	0	-30	-1
165	-5	-9	82	83	0	-31	-3

Time(Minutes)	Maximum perpendicular displacement where a positive measurement indicates movement towards the furnace (mm)			
	D8	D9	D10	D11
Initial	0	0	0	0
10	6	5	4	-4
20	9	5	8	-5
30	10	7	8	-6
40	7	7	8	-4
50	5	5	8	-6
60	5	5	10	-12
70	6	3	11	-9
80	5	0	8	-14
90	-26	1	8	-14
100	-27	2	8	-16
120	-9	-1	6	-15
135	3	2	7	-16
150	1	1	4	-18
165	0	-3	3	-14

Reviewer: Harrison Li

Test:	Fire Resistance
Test Date:	2014.11.24
Job No:	140829012SHJ-BP
Client:	ZHEJIANG JIAHUI DOORS CO., LTD.
Sample:	Double Leaf Swing Steel Fire Door Assembly
Sample ID:	S140829012SHJ-1
Standards:	BS476-22:1987 Part 22: Methods for determination of the fire resistance of non-loadbearing elements of construction
Procedure:	According to BS 476-22, Section 6, 7, 8
Measurement of Furnace Conditions:	Pressure and temperature according to BS 476-20, Section 3

Eng/Tech: Ping Rao



12 Appendix F: Test Photographs

Fig. 1 – Exposed Side Prior to the Fire Test

Fig. 2 – Unexposed Side Prior to the Fire Test

Fig. 3 – Unexposed Side after 20 Minutes

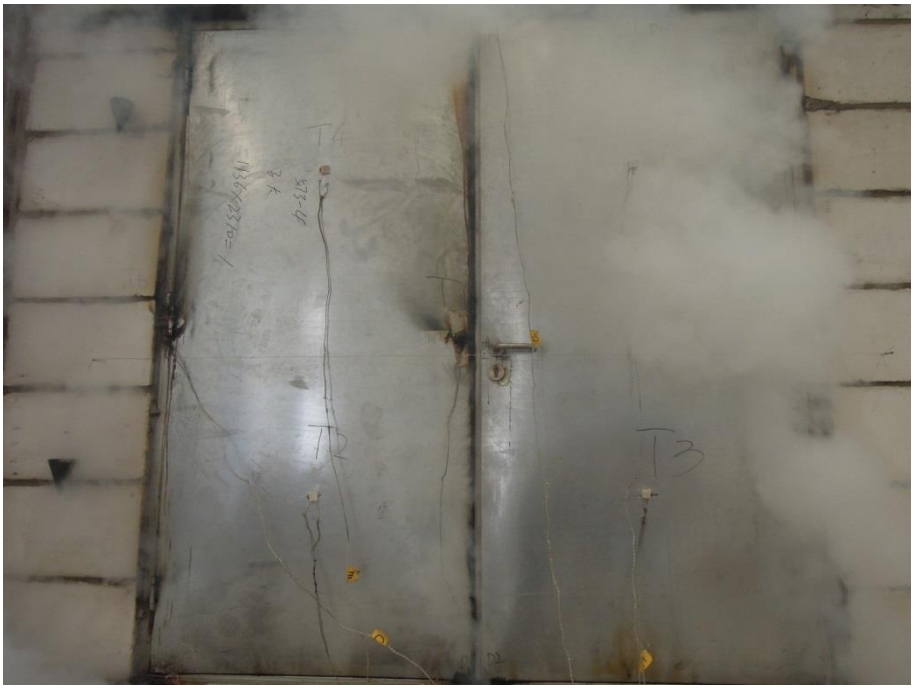


Fig. 4 – Unexposed Side after 40 Minutes

Fig. 5 – Unexposed Side after 60 Minutes

Fig. 6 – Unexposed Side after 107 Minutes

Fig. 7 – Unexposed Side after 150 Minutes

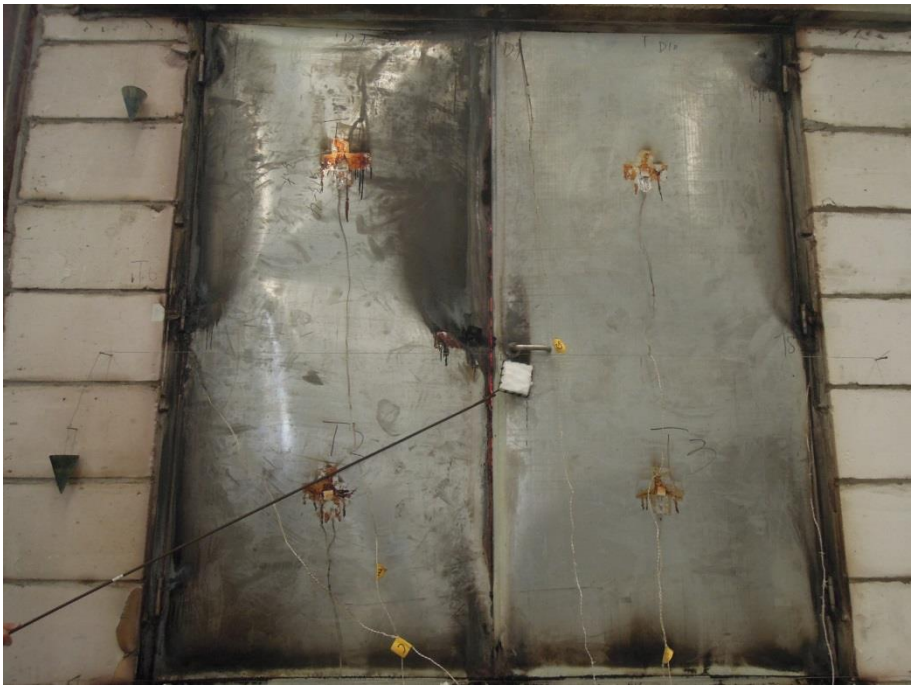


Fig. 8 – Unexposed Side after 165 Minutes

13 Revision Page

Revision No.	Date	Changes	Author	Reviewer
0	December 1, 2014	First issue	Ping Rao	Harrison Li

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