REPORT NUMBER: AU09054007-11
ORIGINAL ISSUE DATE: July 7, 2009

TEST REPORT

EVALUATION CENTER

Intertek Testing Services Ltd., Shanghai JinQiao Branch
Building T52-8, No. 1201 Gui Qiao Road,
Jinqiao Development Area, Pudong District
Shanghai, 201206

RENDERED TO

Bestko Precision Limited
Unit 303, Block A, Po Lung Centre, 11 Wang Chiu road,
Kowloon Bay, Hong Kong

PRODUCT EVALUATED:
2 Bearing Butt Hinge – 4x3x3–2BB

EVALUATION PROPERTY:
90 Minutes Fire Endurance

Report of 2 Bearing Butt Hinge – 4x3x3–2BB for compliance with the applicable requirements of the following criteria:

1) ***EN 1634-1:2000 Fire Resistance Tests for Door and Shutter Assemblies – Part 1***
2) ***BS 476-22:1987 Fire Tests on Building Materials and Structures***
3) ***BS 476-20:1987 Fire Tests on Building Materials and Structures***

1 Table of Contents

2 Introduction

Intertek Testing Services has conducted an evaluation for Bestko Precision Limited on 2 Bearing Butt Hinge – 4x3x3–2BB in a single swing wooden door assembly to determine the fire resistance characteristics for a 90 minutes rating. The test was carried out at an Intertek-approved testing facility. This evaluation began on June 12, 2009 and was completed on June 18, 2009.

The test was conducted in accordance with the following standards:

1) EN 1634-1: 2000 "Fire Resistance Tests for Door and Shutter Assemblies – Part 1: Fire Doors and Shutters"
2) 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: Fully Insulated Doorsets and Shutter Assemblies"
3) BS 476-20:1987 "Fire Tests on Building Materials and Structures – Part 20: Method for Determination of the Fire Resistance of Elements of Construction (General Principles)"

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 May 19, 2009.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Door	Type	Single Swing Wooden Door (Fully-insulated)
	Nominal Size	812mm wide by 2080mm high by 54mm thick
Frame	Nominal Size	906mm wide by 2130mm high
Hardware	Latch	Exit Device Lever Set Model Number: 2039AP
	Hinges	2 Bearing Butt Hinge Quantity: Three Model Number: 4 x 3 x 3 – 2BB

The drawings of the test wall construction, fire door assembly, and hardware can be found in Appendices A, B, and C respectively.

4 Test Installation and Procedures

The test was conducted in accordance with EN 1634-1:2000, EN 1363-1:1999, BS 476-22:1987, and BS 476-20:1987. The test parameters were selected from the standard that would provide a worst-case testing condition.

The test assembly was installed in a steel restraint frame. The restraint frame was suspended by chains with rollers on an overhead beam which allowed the sample to be moved in front of the furnace for the fire exposure. The test door was oriented to open into the furnace, and was built into a concrete masonry unit partition, with fully mortared joints. The nominal dimensions of the test wall were 3m high by 3m 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 when any of the furnace thermocouples exceeded 50°C. 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 500mm above notional floor level. Periodic observations were made of the surfaces of the test assembly during the fire endurance 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 endurance test without passage of flame or gases hot enough to ignite cotton waste for 90 minutes. No through openings or penetrations were evident at the conclusion of the fire exposure portion of the test and the door latch remained engaged to the strike. During the 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.

5.2. Insulation

Transmission of heat through the assembly during the fire endurance test did not raise the average temperature on the unexposed surface by more than 140°C, and did not raise the maximum temperature on the unexposed surface by more than 180°C. 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.

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

6 Conclusion

The 2 Bearing Butt Hinge – 4x3x3–2BB and single swing wooden door assembly identified in this report has been tested in accordance with following standards:

4) EN 1634-1: 2000 "Fire Resistance Tests for Door and Shutter Assemblies – Part 1: Fire Doors and Shutters"
5) 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: Fully Insulated Doorsets and Shutter Assemblies"
6) BS 476-20:1987 "Fire Tests on Building Materials and Structures – Part 20: Method for Determination of the Fire Resistance of Elements of Construction (General Principles)"

The test assembly met the requirements of the above standards for a 90 minutes exposure period.

The conclusions of this test report may not 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: _____

Sun Sun
Project Engineer, Building Products

Reviewed by _____

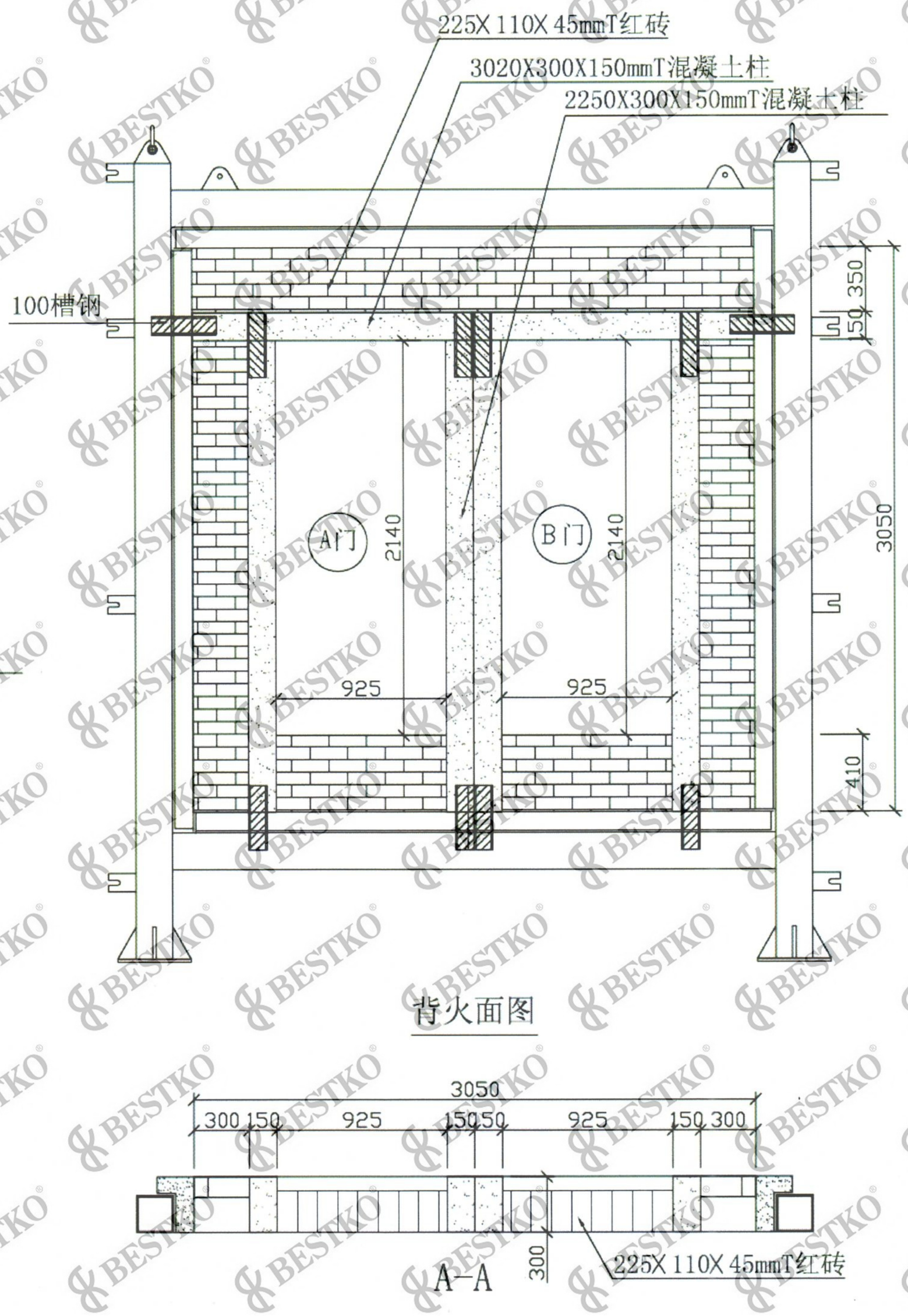
Craig Lawson
Technical Manager, Building Products

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX A: Test Wall Construction Drawing (1 page)



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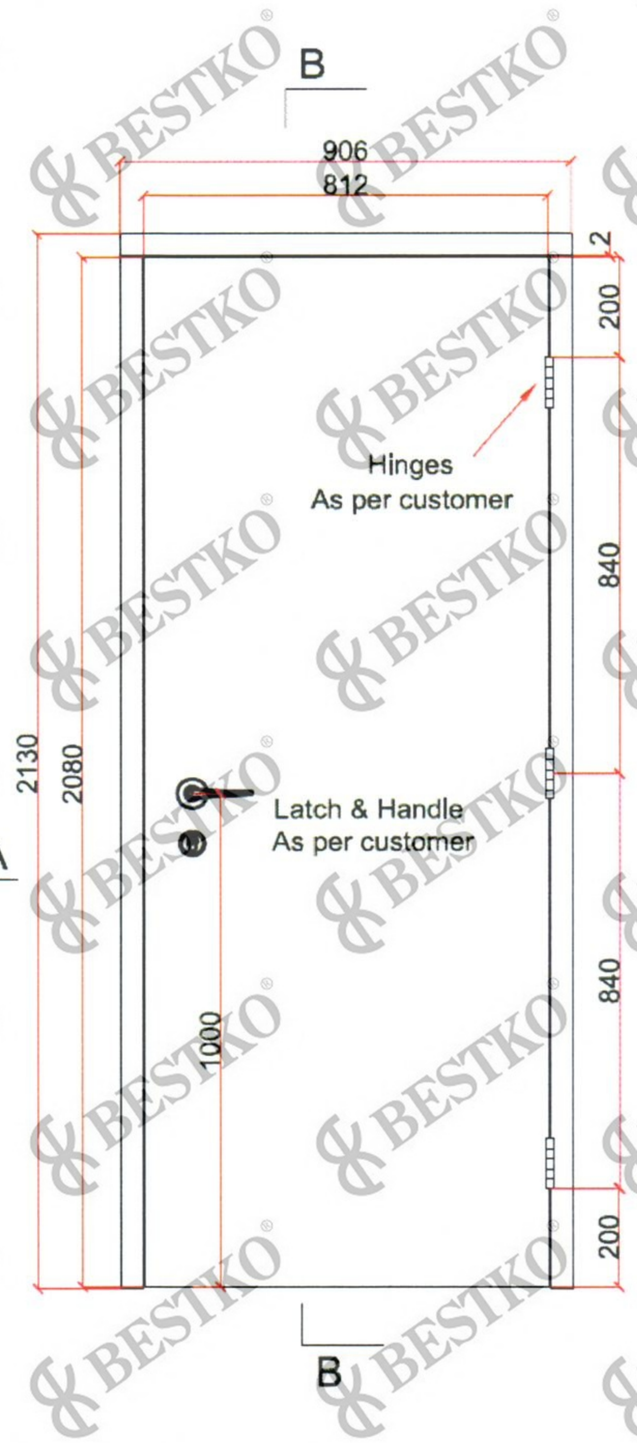
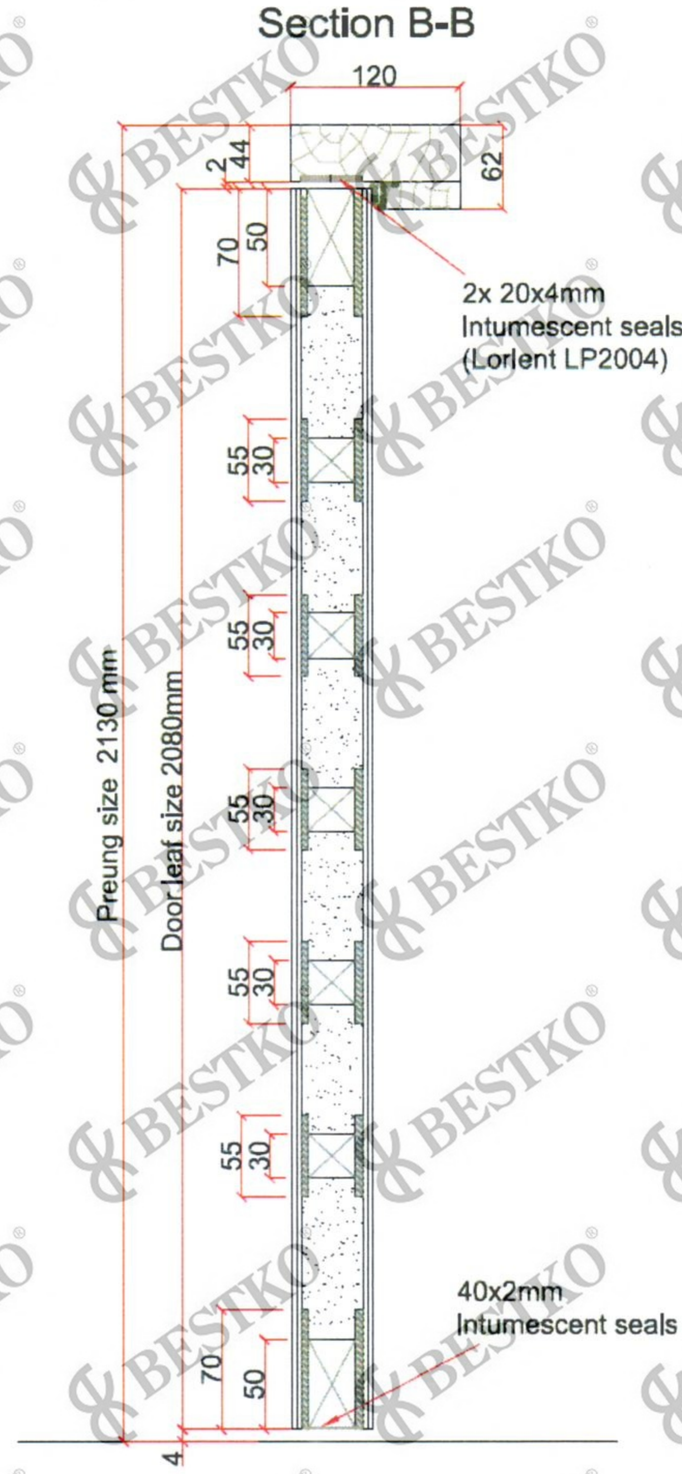
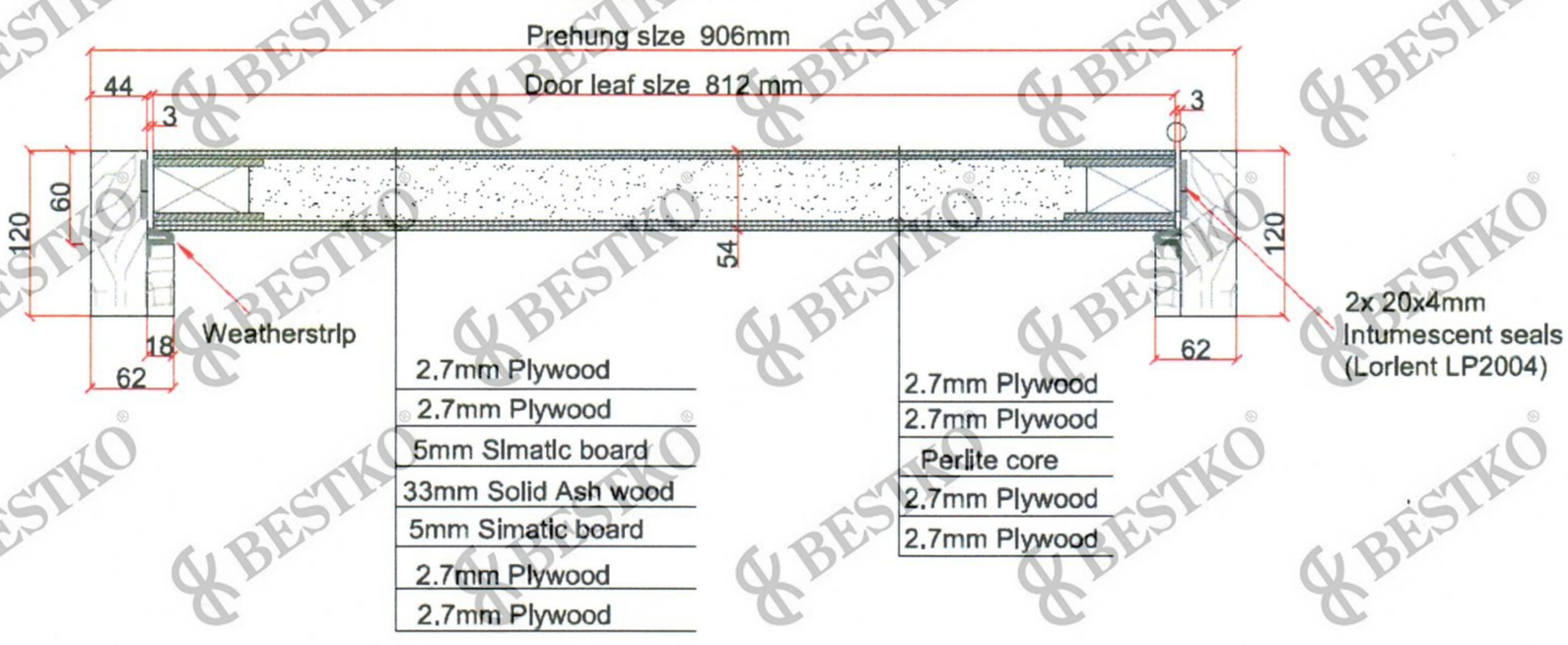
APPENDIX B: Fire Door Assembly Drawings (2 pages)



Section B-B



Section A-A



2.7mm Plywood
2.7mm Plywood
5mm Simatic board
33mm Solid Ash wood
5mm Simatic board
2.7mm Plywood
2.7mm Plywood

2.7mm Plywood
2.7mm Plywood
Perlite core
2.7mm Plywood
2.7mm Plywood

Note: 1 .Door frame&lipping using hardwood (Density ⩾640kg/m³, Moisture content⩽12%).

2 .Ironmongery itself must be beded on an intumescent gasket 2mm thk.(Intumescent seals Ltd).

3 .The use of adhesive between plywood is UF, for lipping is PVAC,while all the other place is PU.

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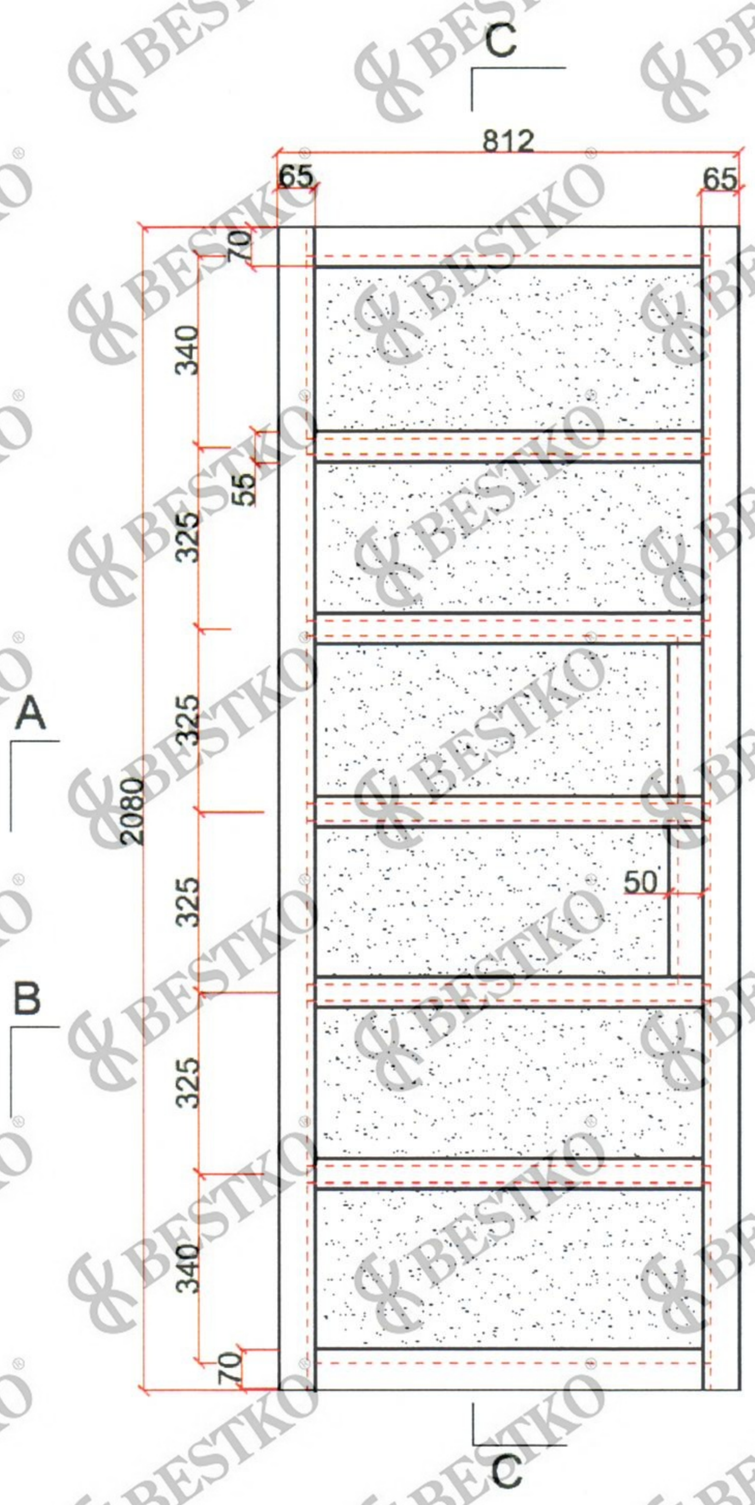

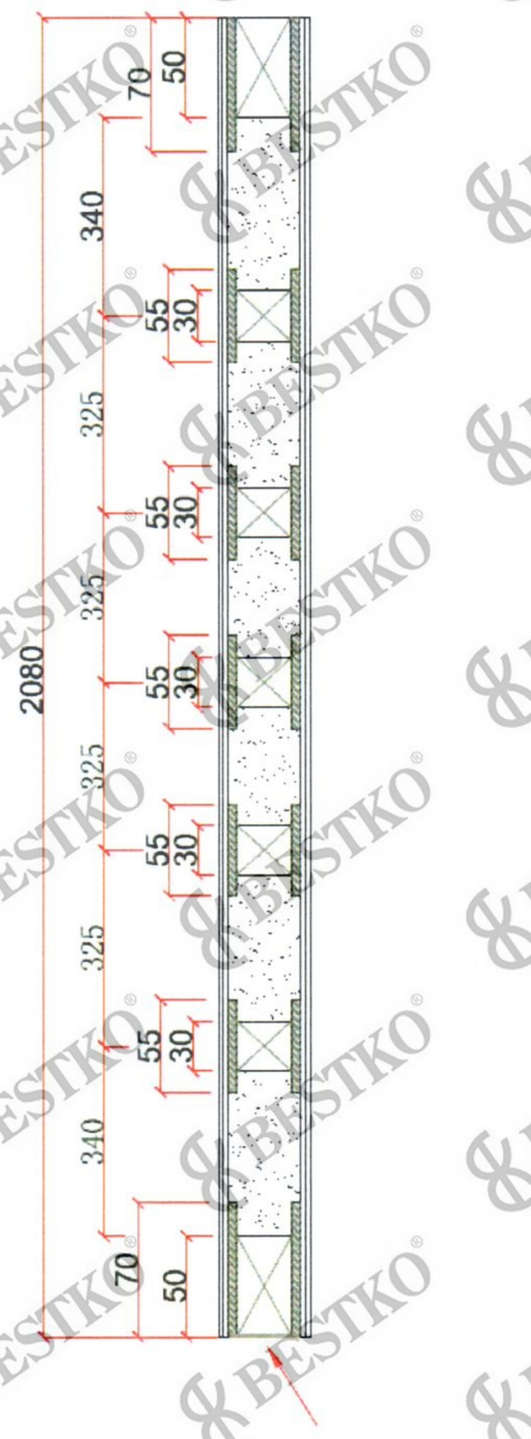

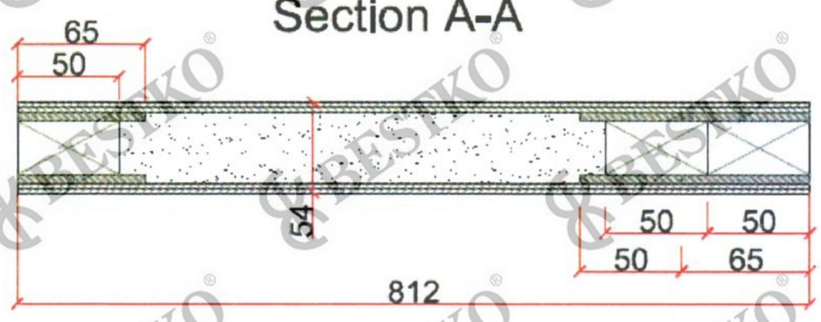

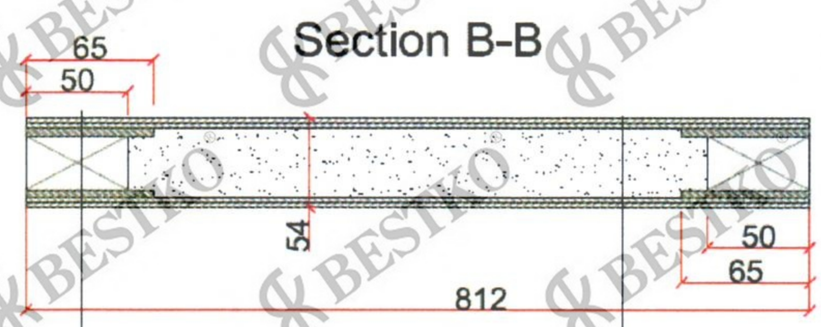

2.7mm Plywood
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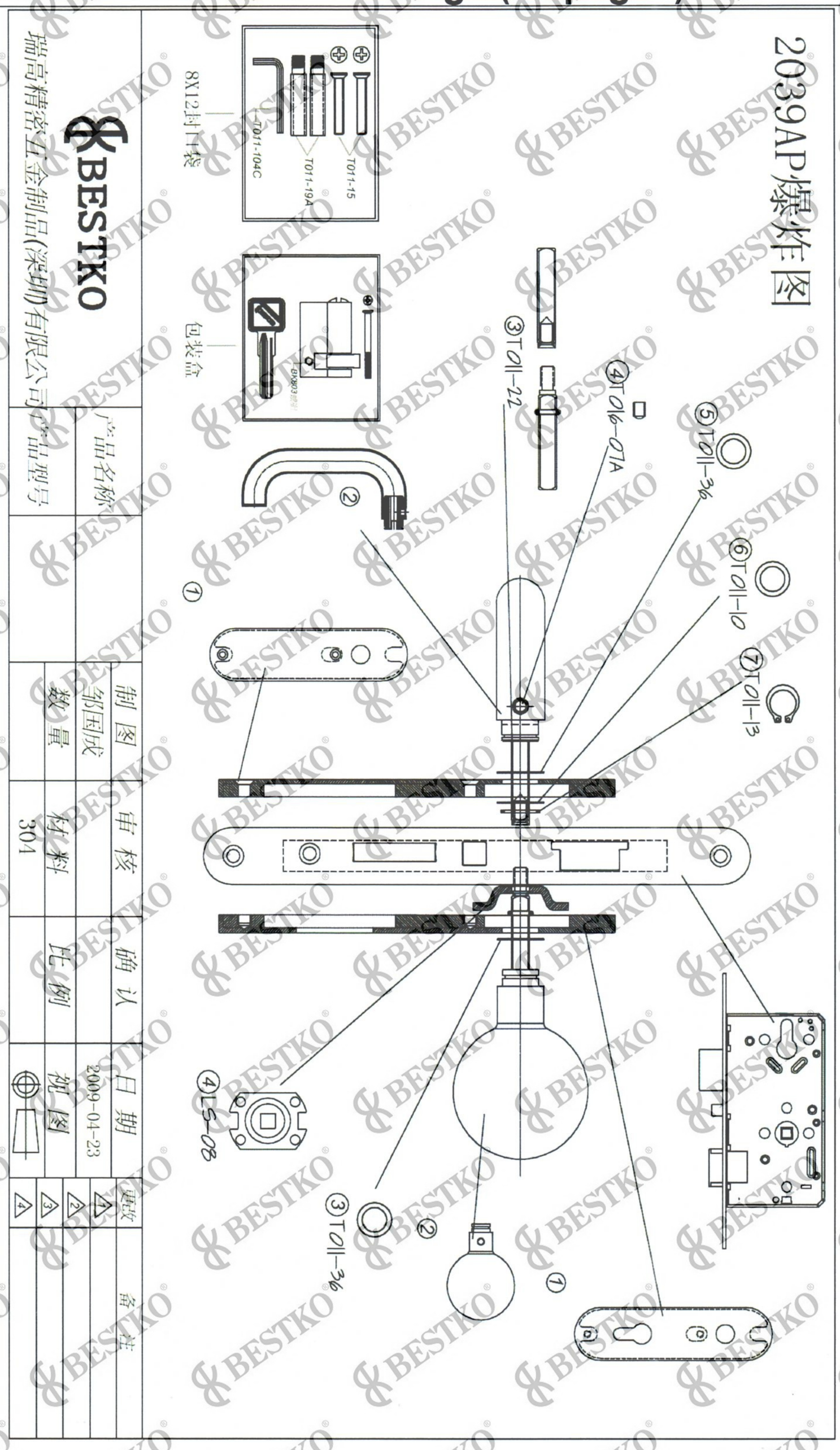
2.7mm Plywood

2.7mm Plywood
2.7mm Plywood
Perlite core
2.7mm Plywood
2.7mm Plywood

APPENDIX C: Hardware Drawings (10 pages)



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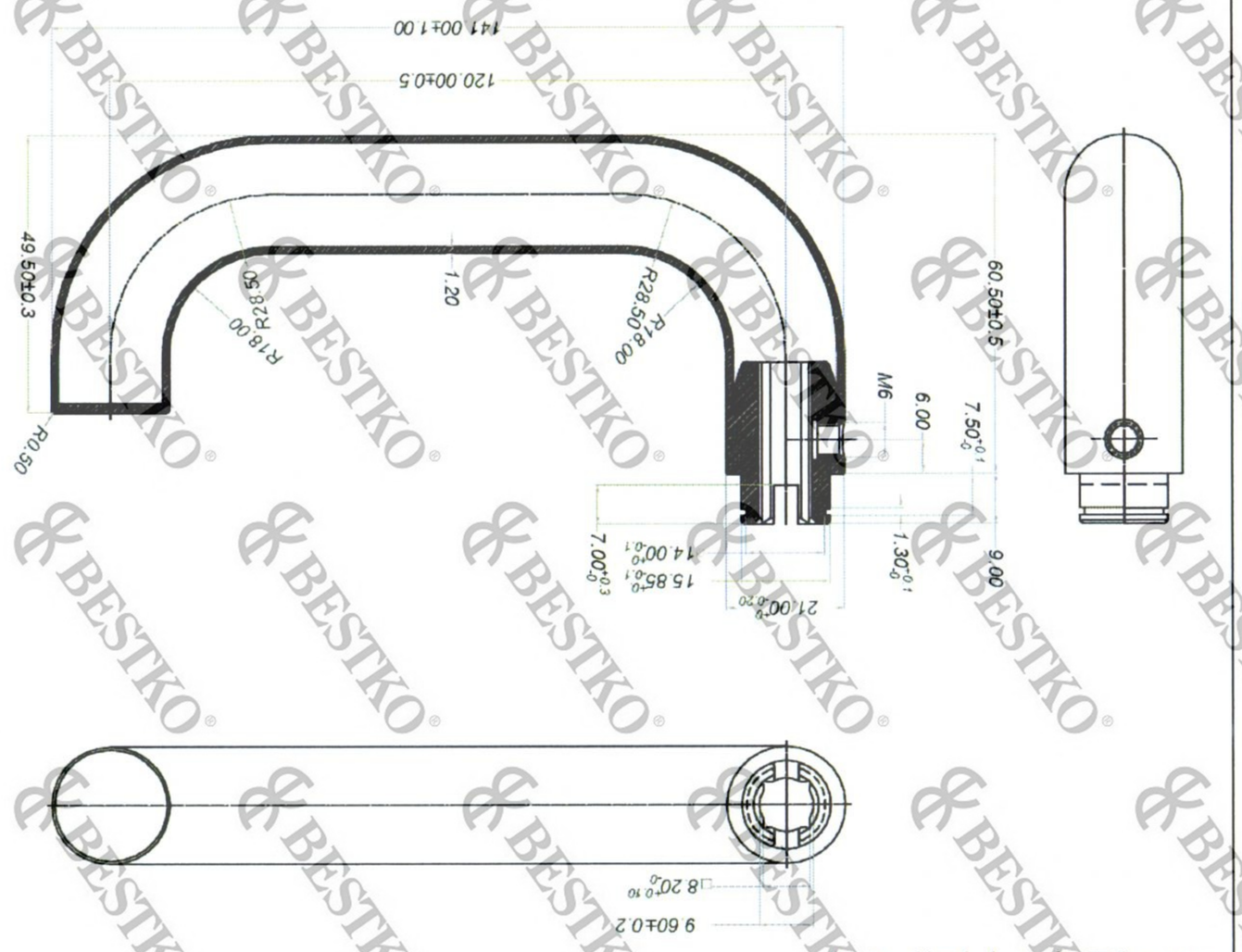
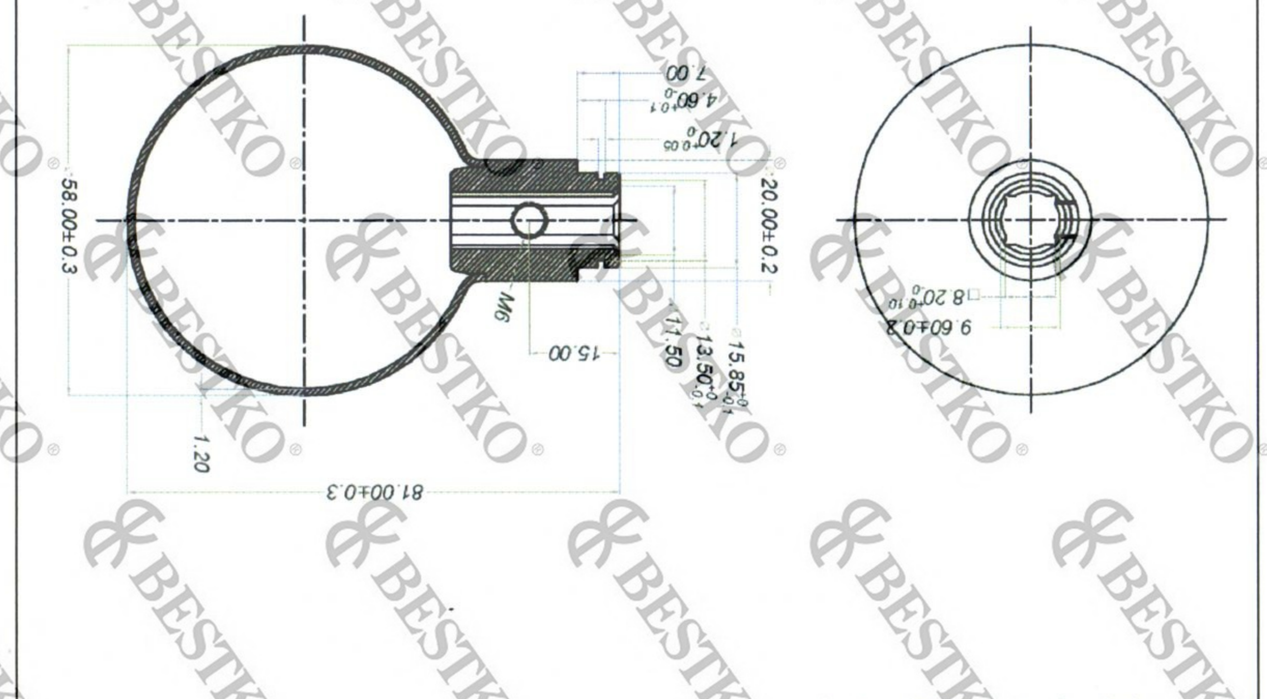
							④



K39把手外围尺寸



D10栓手外围尺寸

July 7, 2009

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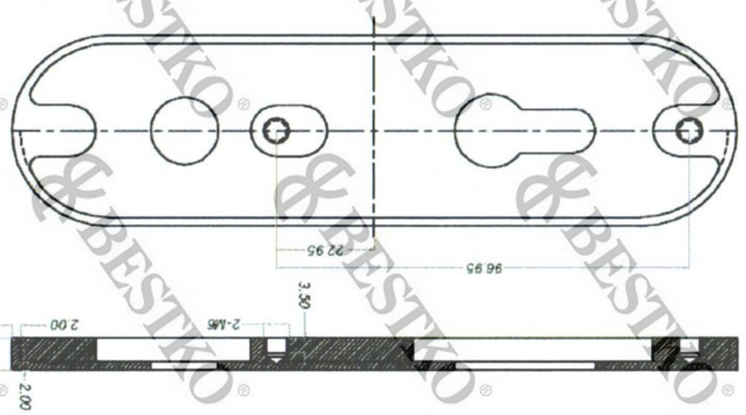
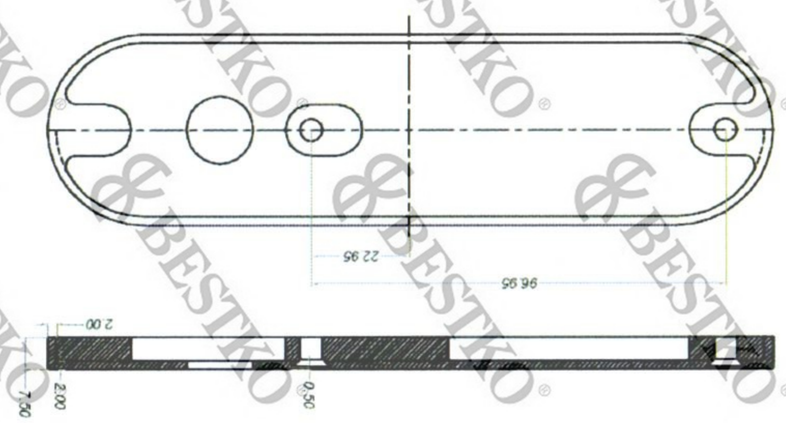
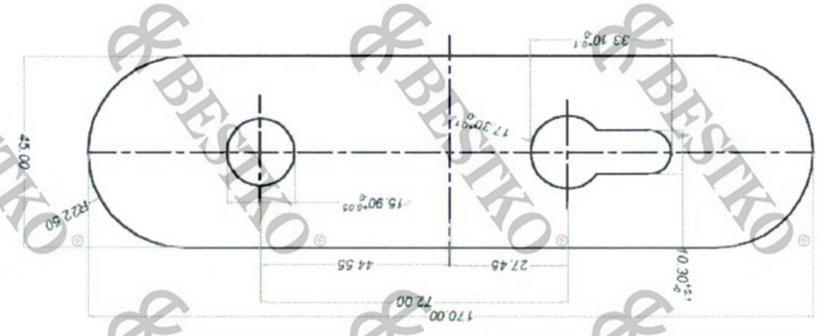
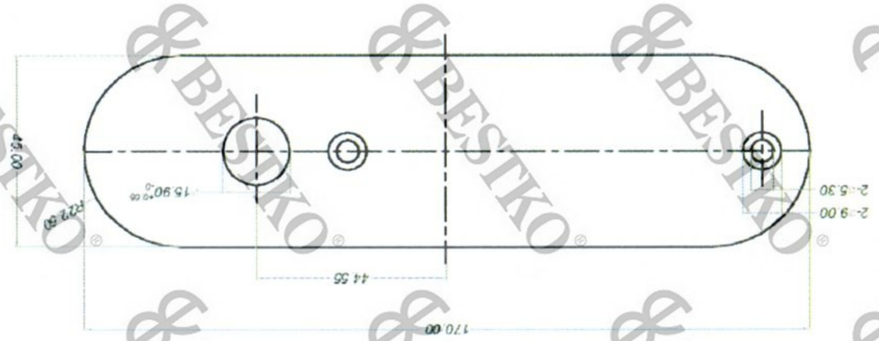




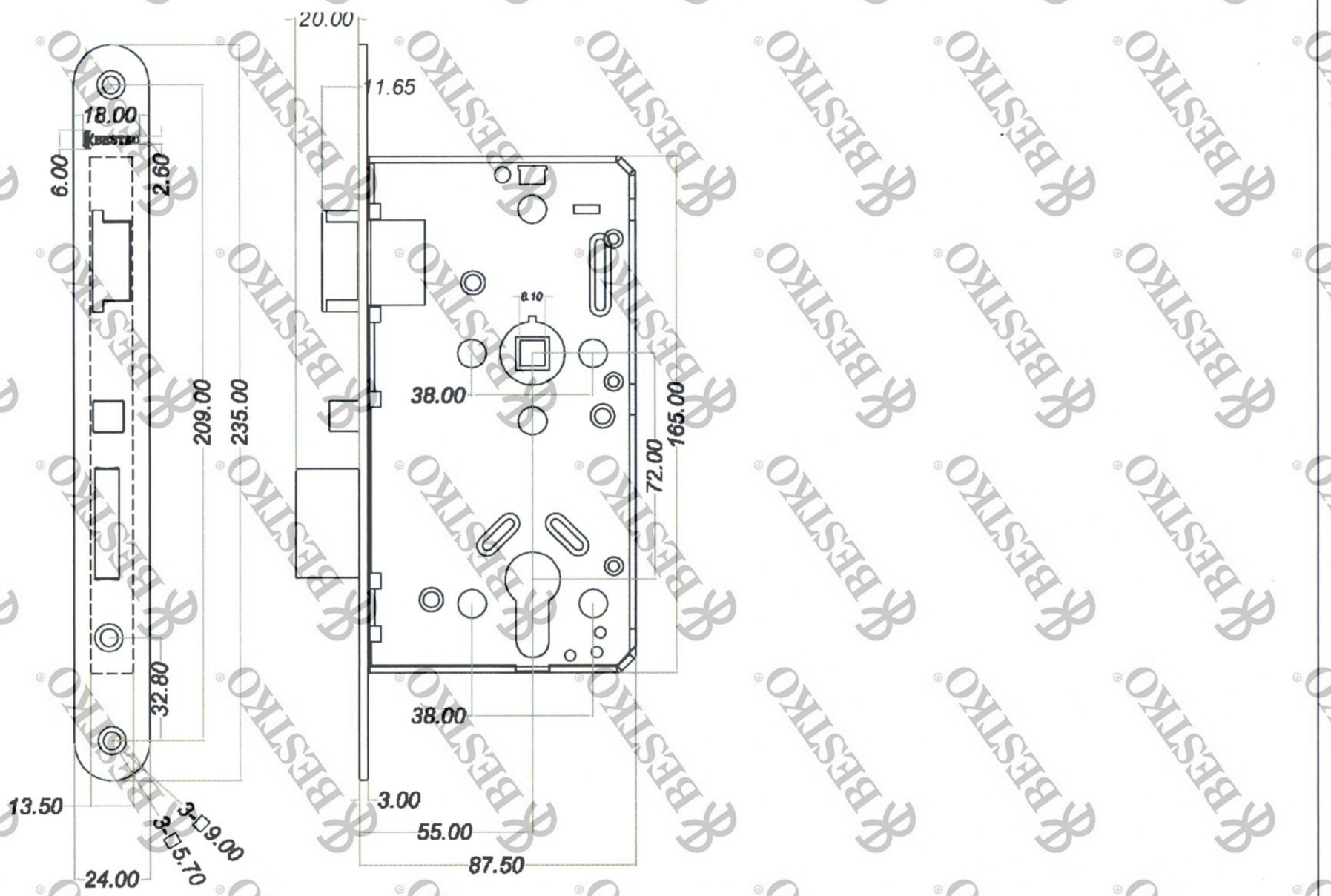




外围尺寸

July 7, 2009

5572AP三舌锁外围尺寸



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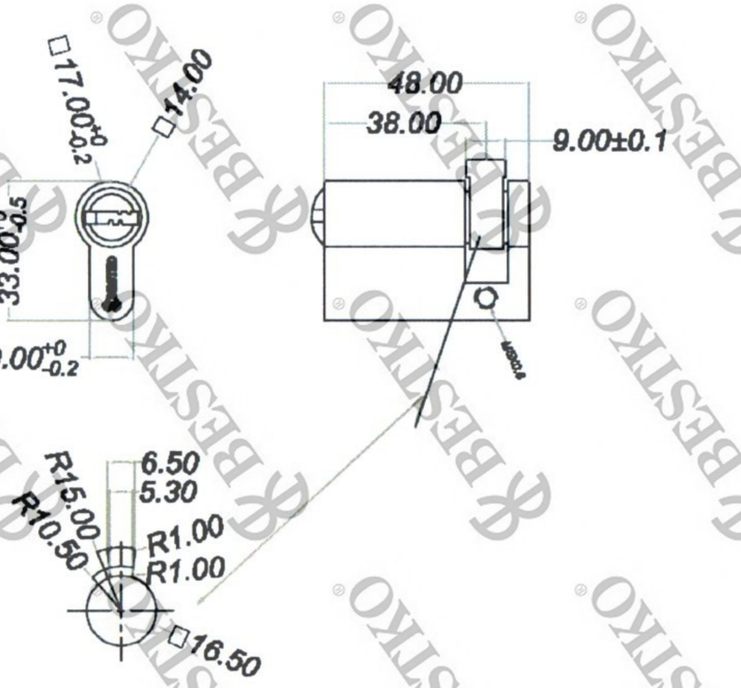

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Project No. AU09054007

BESTKO	产品名称		制 图		审 核		确 认		日 期		备 注
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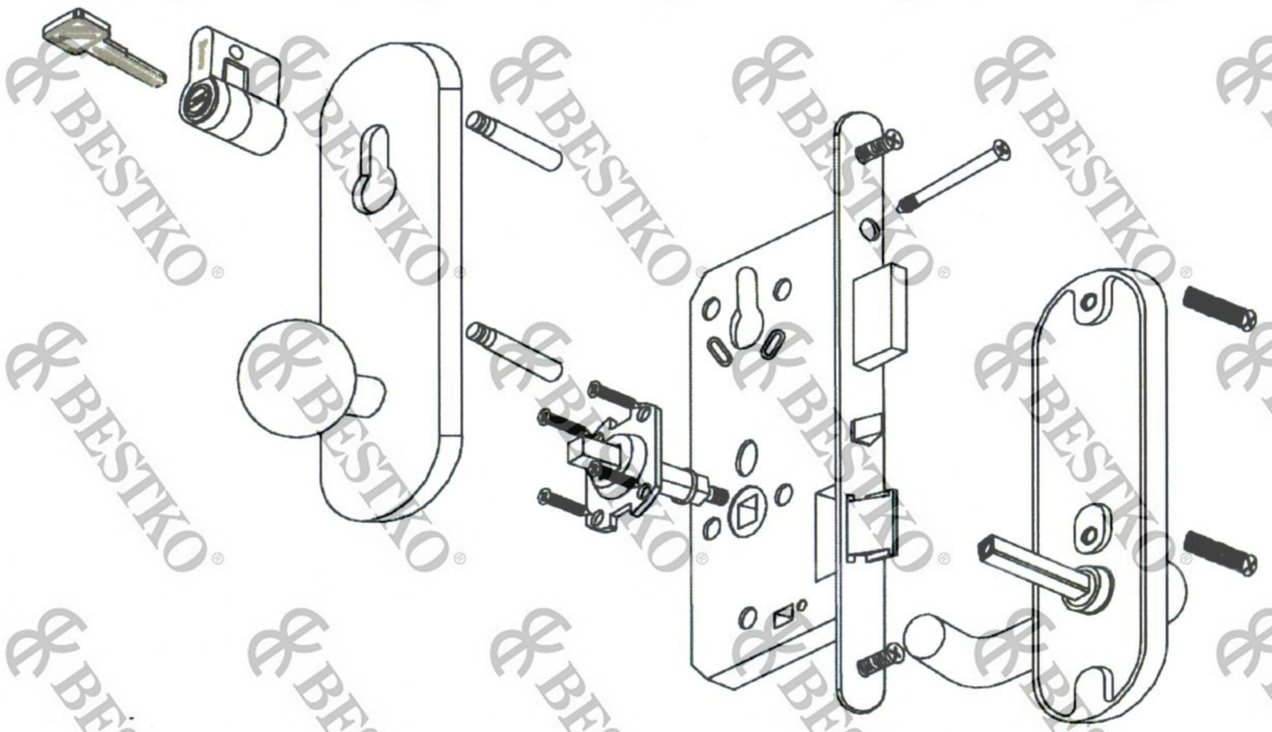

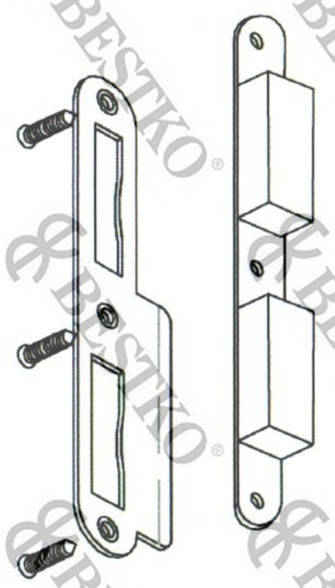

结构图

July 7, 2009

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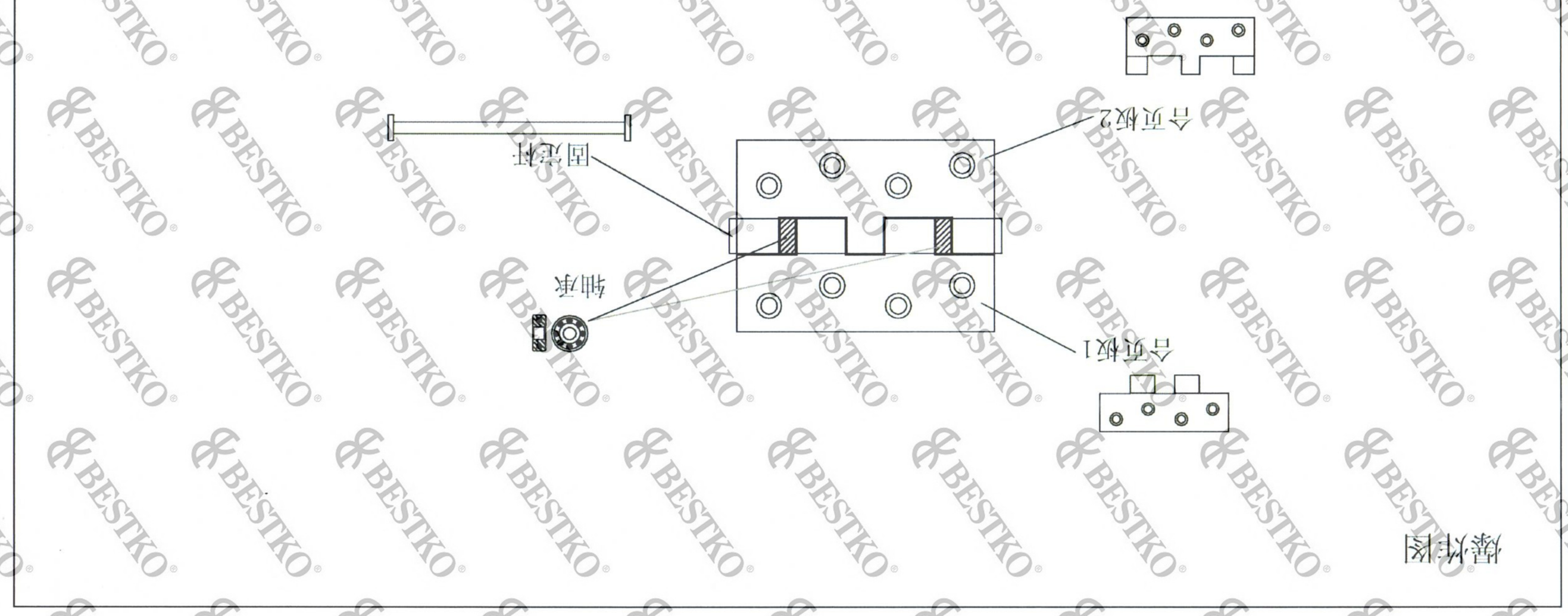
爆炸图



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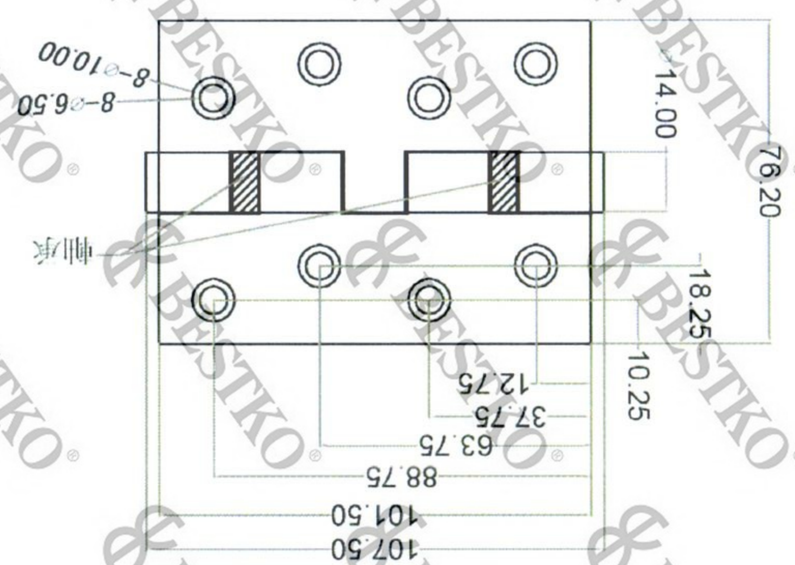

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Project No. AU09054007

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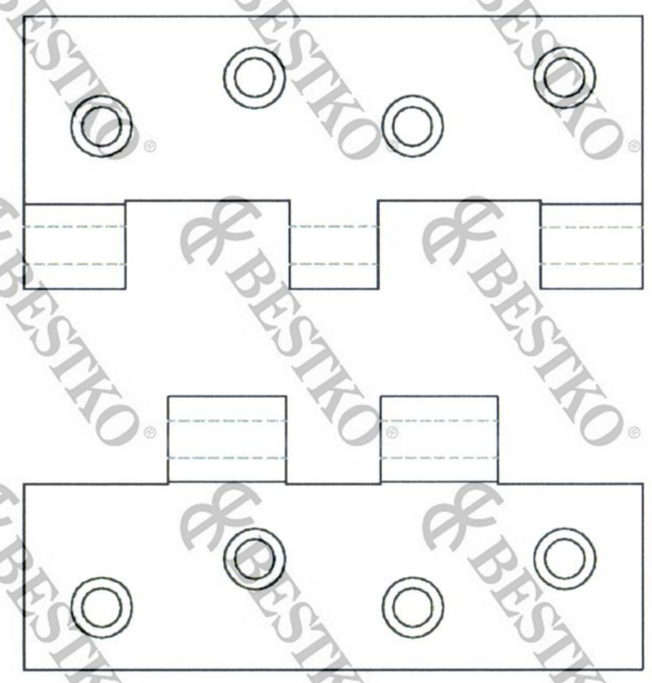
固定杆身直径尺寸

合页连接孔大径尺寸



July 7, 2009

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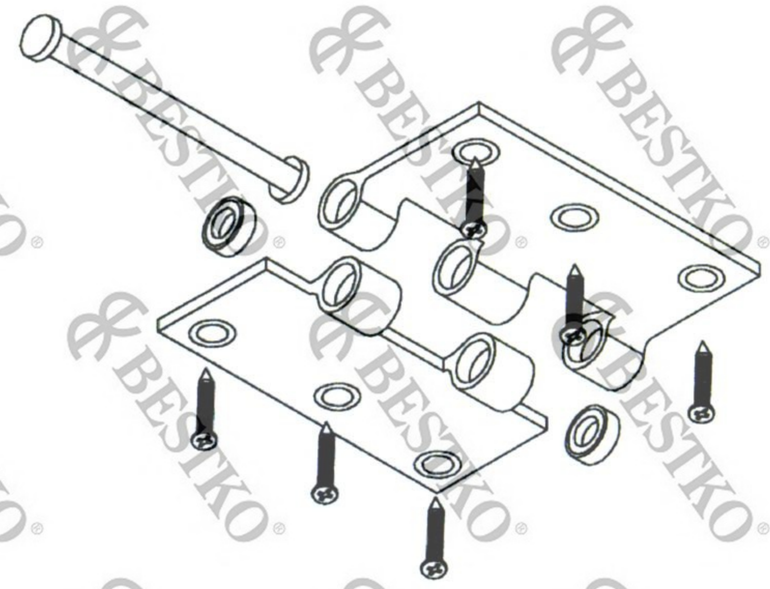

结构图

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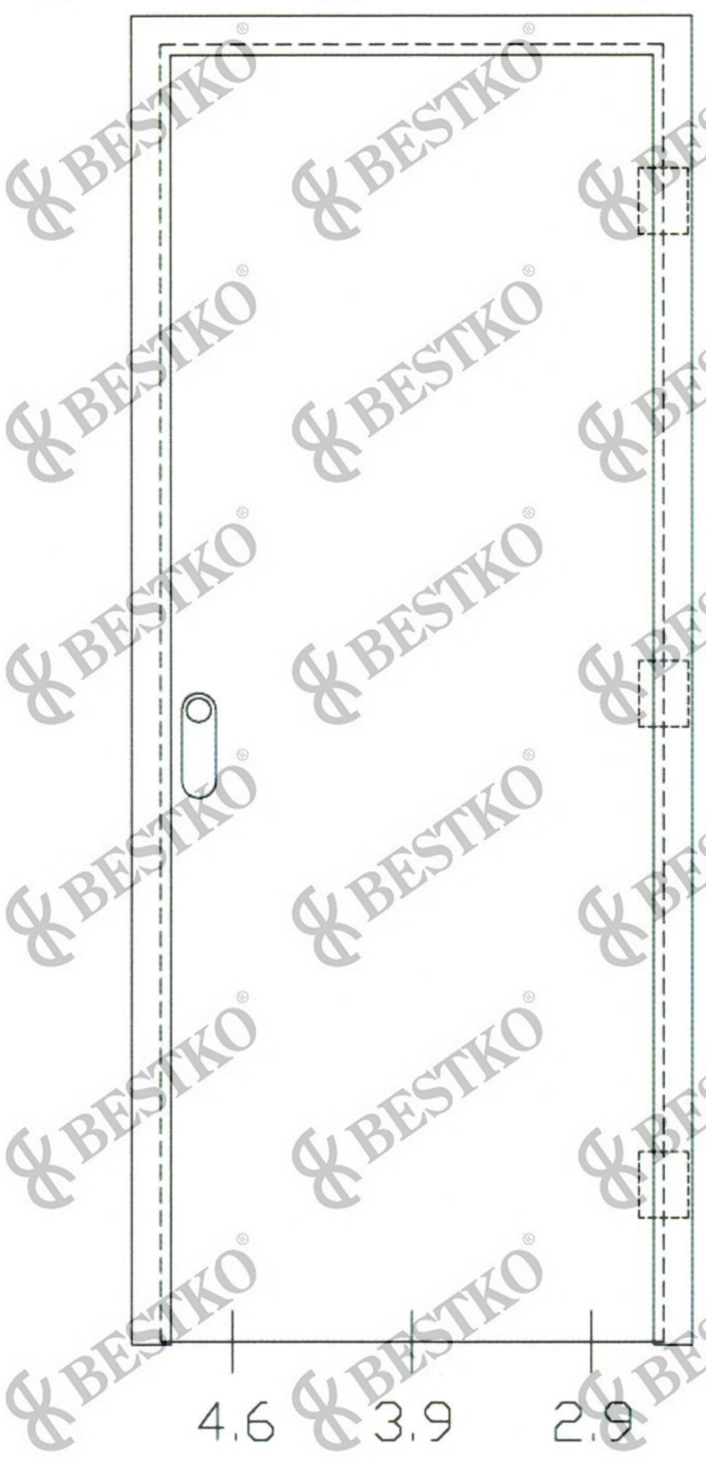
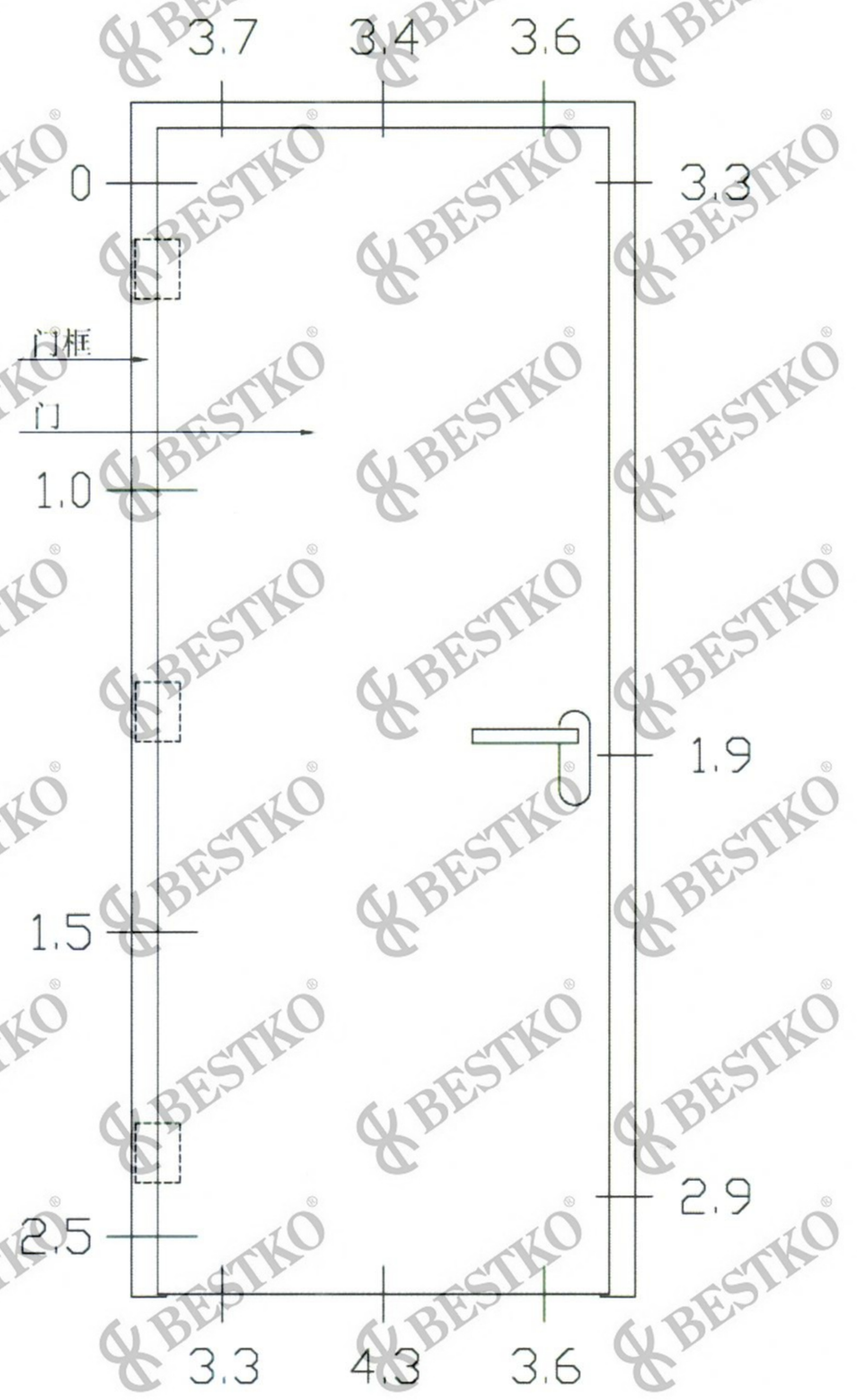
Project No. AU09054007

July 7, 2009

APPENDIX D: Test Measurement Data (3 pages)



Unexposed Side



Exposed Side

DOOR ASSEMBLY INITIAL CLEARANCES

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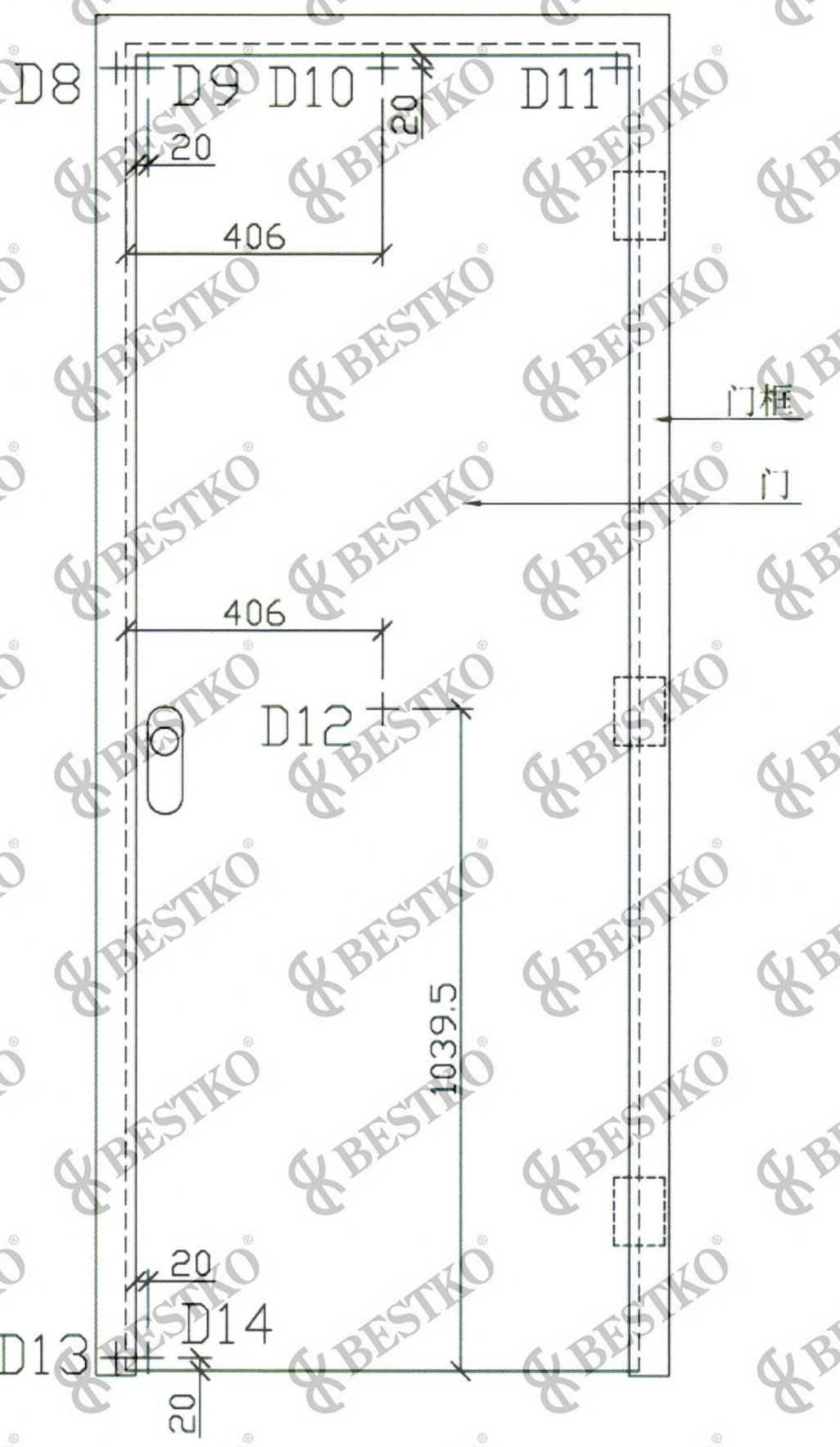
Project No. AU09054007

July 7, 2009



POSITION FOR MEASUREMENT OF HORIZONTAL DEFLECTION

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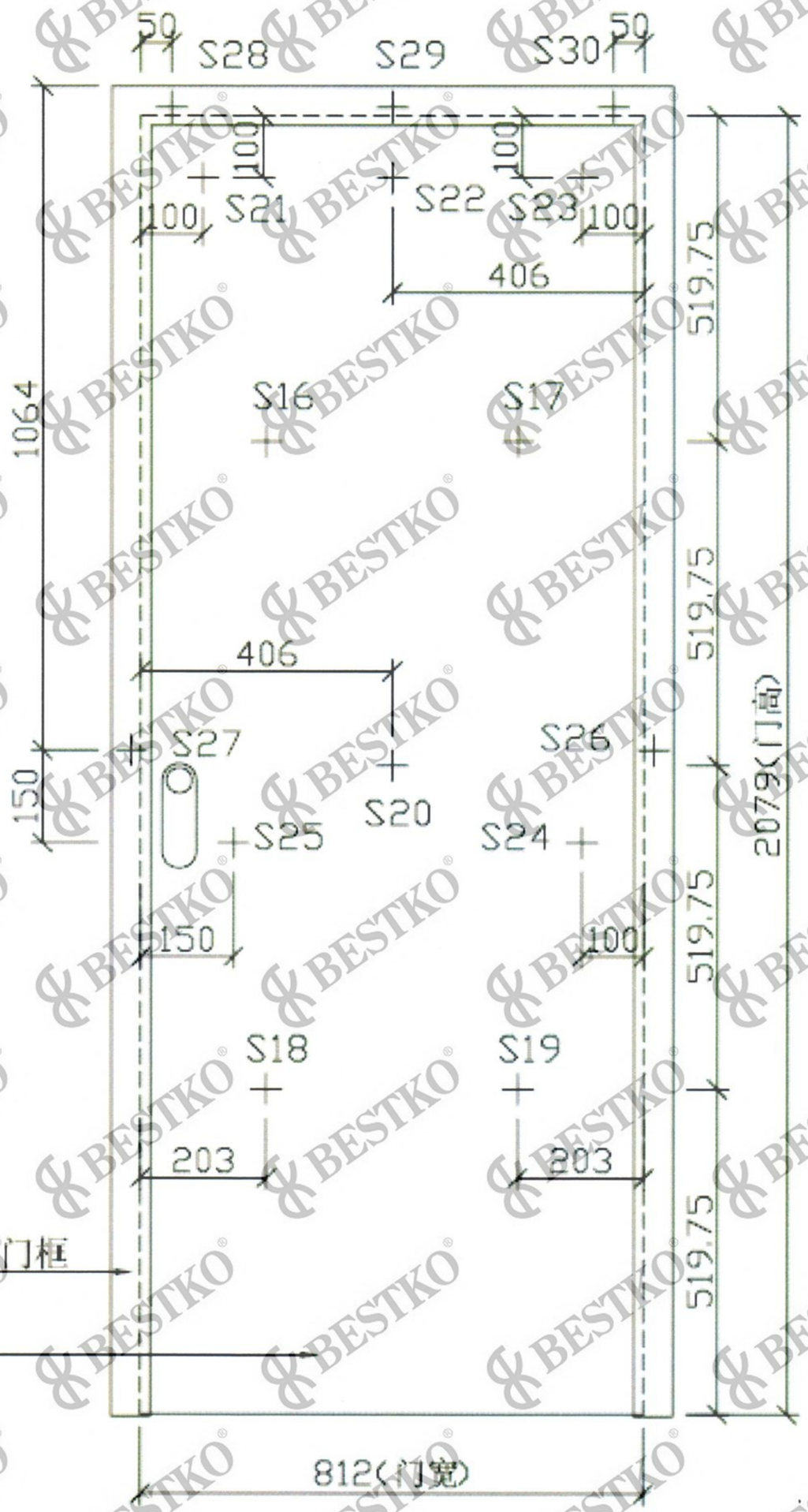
Project No. AU09054007

July 7, 2009



POSITION FOR MEASUREMENT OF UNEXPOSED TEMPERATURE

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX E: Test Data (6 pages)

Intertek

Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-5
Client: Bestko Precision Limited
Sample: 2 Bearing Butt Hinge
Sample ID: 4x3x3–2BB
Standards: EN1634-1:2000 Fire resistance tests for door and shutter assemblies
Procedure: Part 1: Fire doors and shutters
Conditioning: According to EN 1363-1, Section 8
Fire Rating: 90 minutes

Reviewer: Craig Lawson

Eng/Tech: Sun Sun

Pressure Rating: The neutral pressure plane shall be established 500mm above notional floor level
Equipment:

Item	*ID*	*Cal Due Date*
Furnace pressure gauge	*930100*	2009-7-22
Test Clock	*930104*	2009-6-18
Furnace thermocouple 1	*S1800/DW001H*	verified before use
Furnace thermocouple 2	*S1800/DW002H*	verified before use
Furnace thermocouple 3	*S1800/DW003H*	verified before use
Furnace thermocouple 4	*S1800/DW004H*	verified before use
Furnace thermocouple 5	*S1800/DW005H*	verified before use
Furnace thermocouple 6	*S1800/DW006H*	verified before use
Furnace thermocouple 7	*S1800/DW007H*	verified before use
Furnace thermocouple 8	*S1800/DW008H*	verified before use
Furnace thermocouple 9	*S1800/DW009H*	verified before use
Ambient temperature gauge	*930931*	2009-12-11
Unexposed thermocouple	*BSTHERMO001ef*	verified before use

Heating Conditions: According to EN 1363-1, Section 5.1
Pressure Conditions: According to EN 1363-1, Section 5.2
Ambient Conditions: 20 ± 10°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 Thermaocouples According to EN 1634-1, Section 9.1.2
Thermocouple Pads: Length and width 30 ± 0.5 mm, thickness 2.0 ± 0.5 mm, density 900 ± 100 kg/m^3
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

Intertek

Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-5
Client: Bestko Precision Limited
Sample: 2 Bearing Butt Hinge
Sample ID: 4x3x3–2BB
Standards: EN1634-1:2000 Fire resistance tests for door and shutter assemblies
Procedure: Part 1: Fire doors and shutters
Performance Criteria: According to EN 1634-1, Section 11.1

1) Integrity: Cotton pad according to 10.4.5.2 of EN 1363-1
Gap gauges per 10.4.5.3 of EN 1363-1
Flaming per 10.4.5.4 of EN 1363-1

Reviewer: Craig Lawson

Eng/Tech: Sun Sun

Time(min)	Cotton Pad Check	6mm Gap Gauge Distance (mm)	25mm Gap Gauge "Pass Through"	Performance Observations
Initial	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
10	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
20	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
30	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
40	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
50	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
60	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
70	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
80	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
90	No ignition	0	No Pass	No excessive openings, sustained flaming, etc
Requirement	No ignition	150	No "Pass Through"	No excessive openings, sustained flaming, etc

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

Intertek

Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-5
Client: Bestko Precision Limited
Sample: 2 Bearing Butt Hinge
Sample ID: 4x3x3–2BB
Standards: EN1634-1:2000 Fire resistance tests for door and shutter assemblies
Procedure: Part 1: Fire doors and shutters
Performance Criteria: According to EN 1634-1, Section 11.2

2) Insulation: Average temperature rise 140°C according to EN1363-1. Maximum temperature rise 180°C according to EN 1363-1, Section 11.3, and of the frame of the door or shutter assembly shall be 360°C according to EN 1634-1, Section 11.2.3. Unexposed temperatures according to EN 1634-1, Section 9.1.2.3, and and EN 1363-1, Section 9.1.2.3.

Reviewer: Craig Lawson
Eng/Tech: Sun Sun

Time(min)	Ambient (°C)	S16 (°C)	S17 (°C)	S18 (°C)	S19 (°C)	S20 (°C)	S21 (°C)	S22 (°C)
Initial	31.7	32.8	33.1	33.6	31.9	32.8	31.6	33.2
5	33.4	33.0	33.1	34.8	32.0	32.7	32.0	32.9
10	32.7	50.7	51.0	51.7	36.9	47.4	59.7	41.4
15	32.7	70.0	66.4	60.5	46.0	61.9	73.1	61.7
20	32.7	76.4	71.1	65.8	56.3	68.2	77.5	75.6
25	31.4	78.0	74.0	69.4	65.0	71.7	76.8	78.6
30	30.9	80.0	76.0	73.3	69.8	74.0	77.9	77.3
35	30.9	82.6	78.5	76.7	74.3	76.4	82.2	80.1
40	30.9	84.1	80.6	78.3	77.6	78.2	83.3	82.8
45	30.4	85.1	81.7	79.7	79.4	79.8	84.1	83.9
50	30.4	85.6	82.7	79.8	79.6	80.5	84.1	83.4
55	30.4	85.8	83.5	80.4	80.6	81.6	84.3	84.3
60	31.6	85.7	83.4	80.8	80.4	81.6	84.9	84.9
65	31.6	85.9	83.8	81.0	80.5	82.2	84.9	85.0
70	32.7	86.2	84.4	81.6	81.6	84.0	82.9	85.7
75	32.7	86.2	84.4	82.8	82.2	86.4	82.6	86.4
80	32.7	86.4	85.1	83.9	83.5	90.0	84.0	86.7
85	30.9	86.5	86.1	85.6	85.6	94.9	86.3	87.5
90	30.9	87.0	87.6	90.7	90.6	101.0	90.9	94.6
Requirement	10-30	140	140	140	140	140	180	180

Intertek

Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-5
Client: Bestko Precision Limited
Sample: 2 Bearing Butt Hinge
Sample ID: 4x3x3–2BB
Standards: EN1634-1:2000 Fire resistance tests for door and shutter assemblies
Procedure: Part 1: Fire doors and shutters
Performance Criteria: According to EN 1634-1, Section 11.2

2) Insulation: Average temperature rise 140°C according to EN1363-1. Maximum temperature rise 180°C according to EN 1363-1, Section 11.3, and of the frame of the door or shutter assembly shall be 360°C according to EN 1634-1, Section 11.2.3. Unexposed temperatures accor

Reviewer: Craig Lawson
Eng/Tech: Sun Sun

Time	S23 (°C)	S24 (°C)	S25 (°C)	S26 (°C)	S27 (°C)	S28 (°C)	S29 (°C)	S30 (°C)
Initial	31.9	32.4	33.0	32.5	35.9	34.0	33.2	32.9
5	32.3	32.5	33.4	32.3	34.9	34.3	33.1	33.2
10	55.5	58.7	54.7	32.4	34.0	34.3	33.6	33.8
15	71.1	72.7	69.1	33.1	33.8	33.4	34.4	34.8
20	76.2	76.2	73.7	33.5	34.8	32.0	33.2	35.3
25	78.0	75.4	75.0	34.4	34.6	31.2	33.0	35.6
30	80.2	78.6	75.6	37.2	35.2	29.9	34.3	36.0
35	82.0	81.1	76.6	34.7	35.2	28.9	34.1	36.5
40	83.2	78.9	78.7	34.8	35.4	29.1	32.8	37.1
45	84.7	80.7	80.6	35.9	36.5	27.9	33.0	37.6
50	86.1	81.3	81.3	35.0	36.4	30.0	34.7	39.1
55	84.4	81.3	81.6	35.6	36.8	29.3	35.6	42.9
60	83.7	82.2	82.0	36.7	38.2	28.2	36.1	44.1
65	81.5	81.7	82.2	36.6	38.2	27.1	36.2	44.0
70	83.7	82.5	82.7	37.8	38.8	41.4	35.5	44.9
75	85.7	82.9	83.7	39.1	40.3	42.2	37.9	46.1
80	88.9	84.4	84.8	39.8	41.1	43.0	38.7	46.8
85	95.3	86.3	86.1	40.7	42.4	44.9	39.9	46.9
90	102.2	88.7	89.9	42.2	43.7	47.5	41.8	52.6
Requirement	10-30	180	180	360	360	360	360	360

Intertek

Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-5
Client: Bestko Precision Limited
Sample: 2 Bearing Butt Hinge
Sample ID: 4x3x3–2BB
Standards: EN1634-1:2000 Fire resistance tests for door and shutter assemblies
Procedure: Part 1: Fire doors and shutters
Performance Criteria: According to EN 1634-1, Section 9.3
Deflection: Mandatory requirement, no performance criteria

Reviewer: Craig Lawson

Eng/Tech: Sun Sun

Time	Maximum perpendicular displacement where a positive measurement indicates movement towards the furnace (mm)							
	D8	D9	D10	D11	D12	D13	D14	
Initial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
10	0.0	0.0	0.0	0.0	2.0	-1.0	0.0	
20	2.0	4.0	2.0	0.0	3.0	1.0	-4.0	
30	4.0	6.0	4.0	1.0	4.0	1.0	-5.0	
40	3.0	11.0	7.0	5.0	7.0	2.0	-4.0	
50	4.0	13.0	10.0	7.0	12.0	2.0	-3.0	
60	5.0	10.0	10.0	8.0	13.0	1.0	-4.0	
70	5.0	11.0	12.0	8.0	14.0	2.0	-3.0	
80	4.0	14.0	17.0	12.0	16.0	1.0	-3.0	
90	4.0	14.0	18.0	10.0	14.0	2.0	-2.0	

Intertek

Bestko Precision Limited
Project No. AU09054007

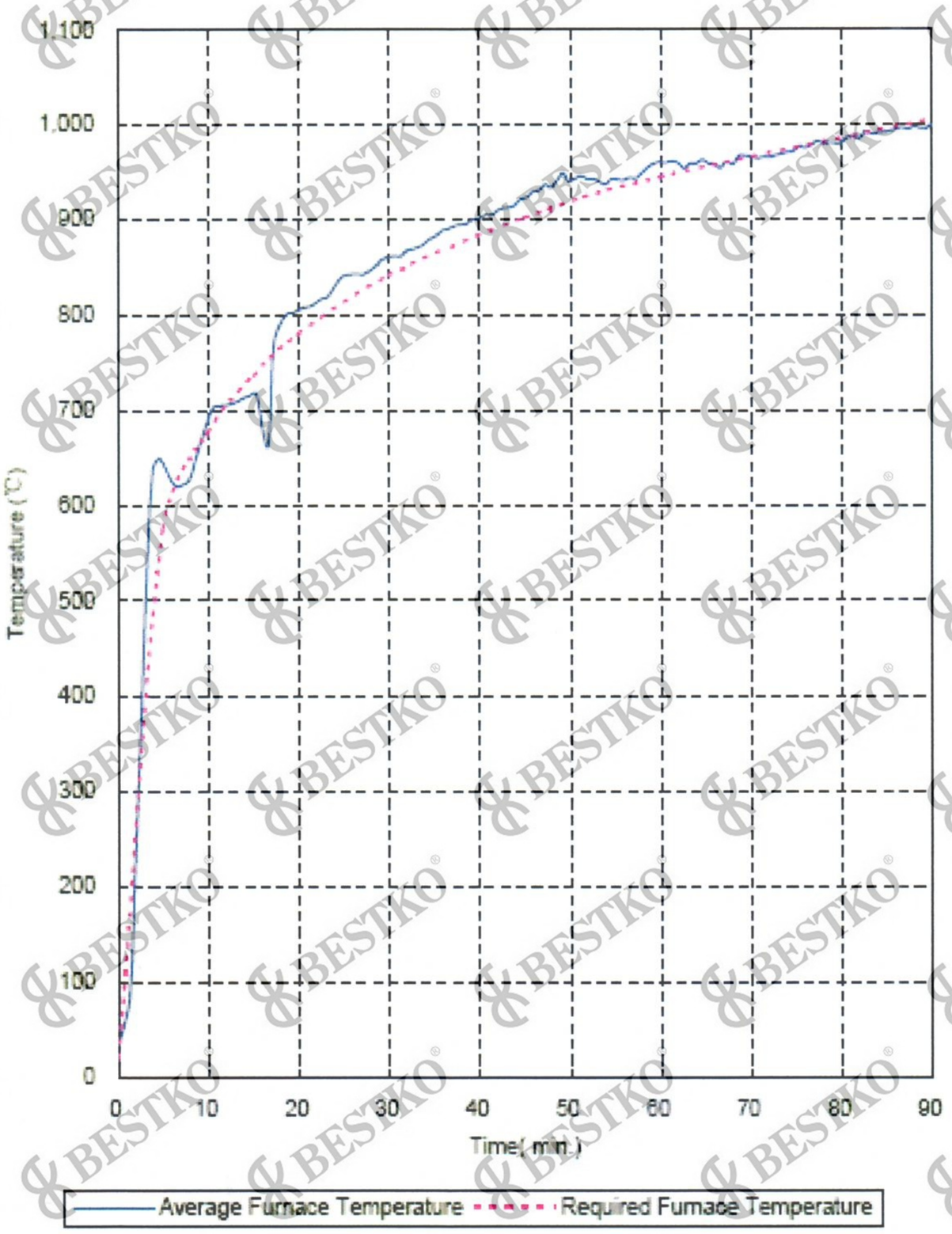
July 7, 2009

Intertek

Test:	Fire Resistance
Start Date:	2009-06-12
Target Date:	2009-06-18
Job No:	AU09054007-5
Client:	Bestko Precision Limited
Sample:	2 Bearing Butt Hinge
Sample ID:	4x3x3–2BB
Standards:	EN1634-1:2000 Fire resistance tests for door and shutter assemblies
Procedure:	Part 1: Fire doors and shutters
Measurement of Furnace Conditions:	Pressure and temperature according to EN 1363-1, Section 10.4.2 and 10.4.3

Reviewer: _____
Craig Lawson

Eng/Tech: _____
Sun Sun



APPENDIX F: Test Photographs (4 pages)

Fig 1 - Exposed Side Prior to the Fire Test

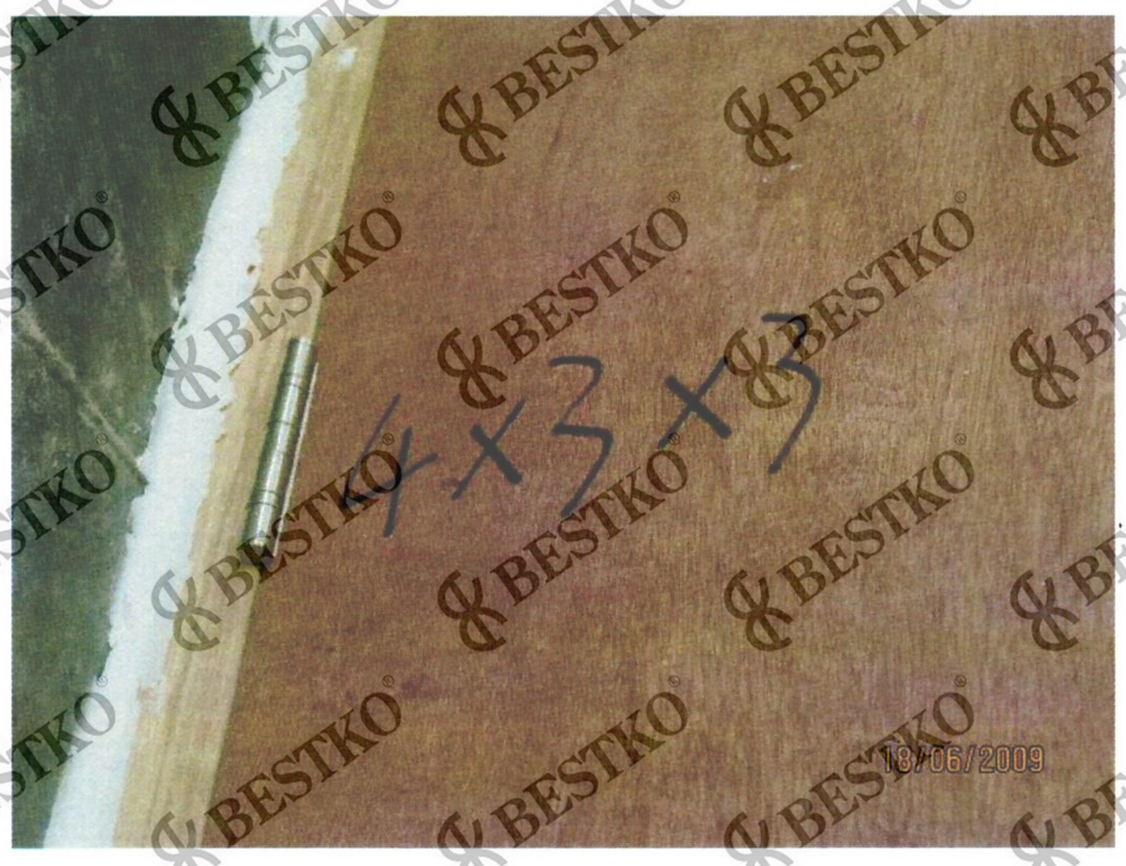


Fig 2 - Exposed Side Prior to the Fire Test

Fig 3 - Unexposed Side Prior to the Fire Test

Fig 4 – Unexposed Side after 56 Minutes

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Bestko Precision Limited
Project No. AU09054007

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Fig 5 – Unexposed Side after 87 Minutes

Fig 6 – Unexposed Side after 88 Minutes with Cotton Pad Check

Fig 7– Unexposed Side after 98 Minutes

Fig 8 - Exposed Side after the Fire Endurance Test

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

REVISION SUMMARY

DATE	SUMMARY
July 7, 2009	Initial report