

TEST REPORT

Intertek

REPORT NUMBER: AU09054007-12
ORIGINAL ISSUE DATE: July 7, 2009

EVALUATION CENTER

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

RNDERED TO

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

PRODUCT EVALUATED:
4 Bearing Butt Hinge – 5x4x3–4BB

EVALUATION PROPERTY:
90 Minutes Fire Endurance

Report of 4 Bearing Butt Hinge – 5x4x3–4BB 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

"This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program."

The test report only allows to be revised within the retention period unless further standard or the requirement was noticed.
Report Template Revision Date: 3th Feb. 2009



Bestko Precision Limited
Project No. AU09054007

July 7, 2009
Page 2 of 5

1 Table of Contents

1	Table of Contents	2
2	Introduction	3
3	Test Samples	3
3.1.	Sample Selection	3
3.2.	Sample and Assembly Description	3
4	Test Installation and Procedures	4
5	Testing and Evaluation Results	4
5.1.	Integrity	4
5.2.	Insulation	4
6	Conclusion	4
	Appendix A – Test Wall Construction Drawing	1 page
	Appendix B – Fire Door Assembly Drawings	2 pages
	Appendix C – Hardware Drawings	15 pages
	Appendix D – Test Measurement Data	3 pages
	Appendix E – Test Data	6 pages
	Appendix F – Test Photographs	5 pages
	Revision Summary	1 page

2 Introduction

Intertek Testing Services has conducted an evaluation for Bestko Precision Limited on 4 Bearing Butt Hinge – 5x4x3–4BB 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 64mm thick
Frame	Nominal Size	906mm wide by 2130mm high
	Latch	Deluxe Lockset Model Number: 9806
Hardware	Hinges	4 Bearing Butt Hinge Quantity: Three Model Number: 5x4x3–4BB

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.



Bestko Precision Limited
Project No. AU09054007

July 7, 2009
Page 5 of 5

6 Conclusion

The 4 Bearing Butt Hinge – 5x4x3–4BB 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:



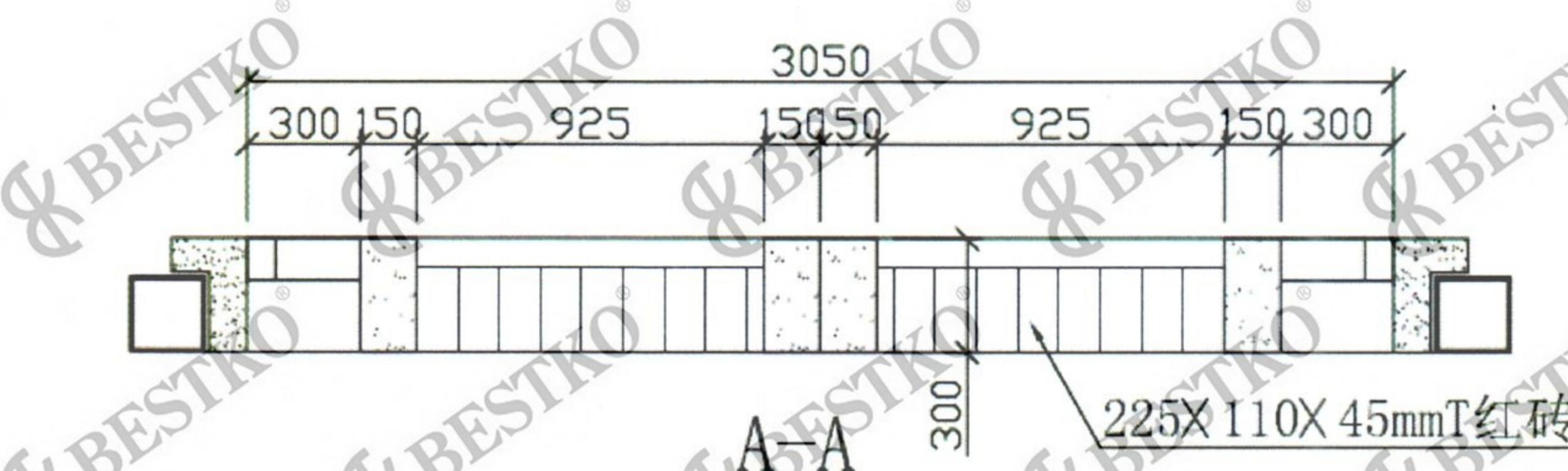
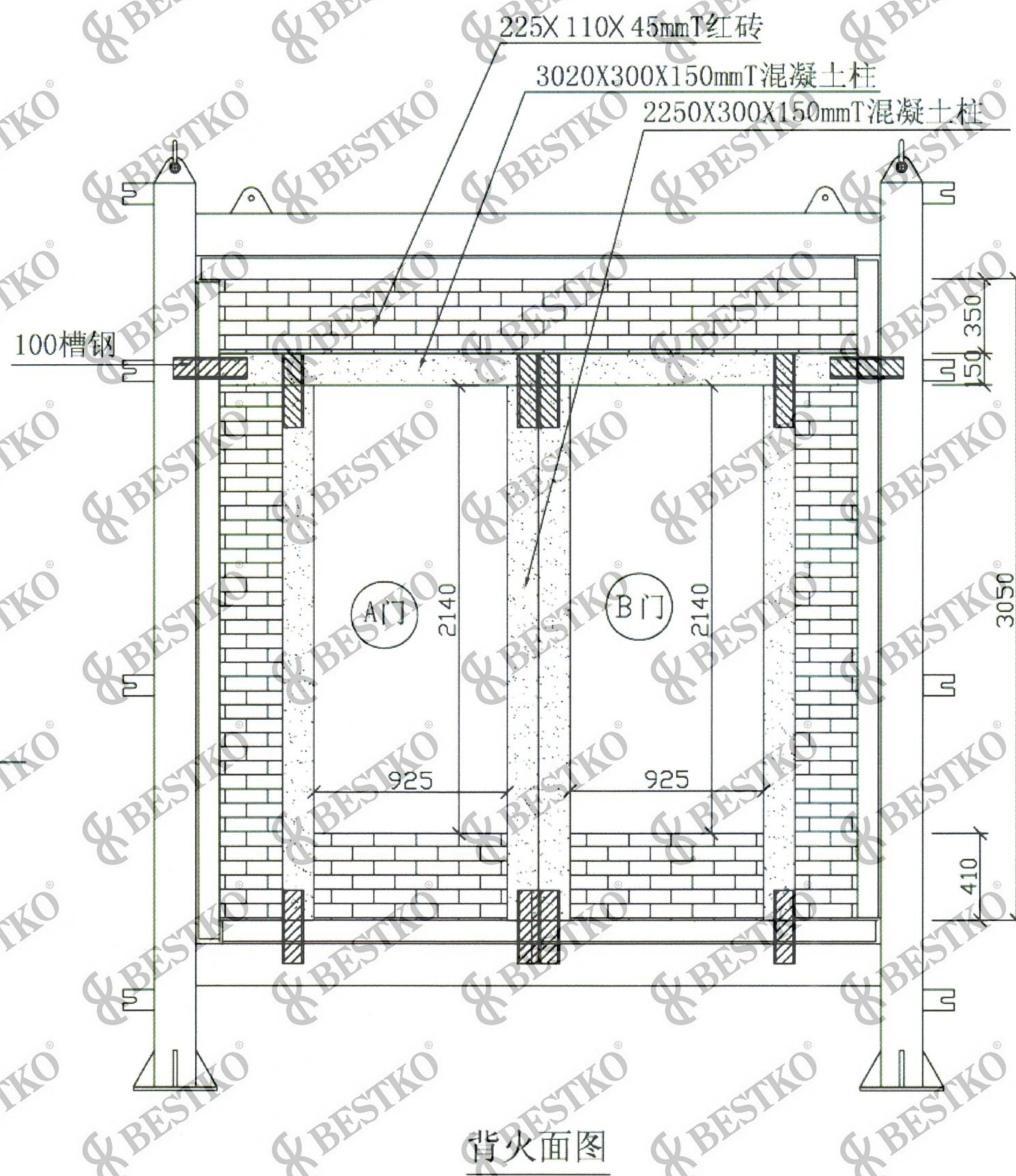
Craig Lawson
Technical Manager, Building Products

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX A: Test Wall Construction Drawing (1 page)

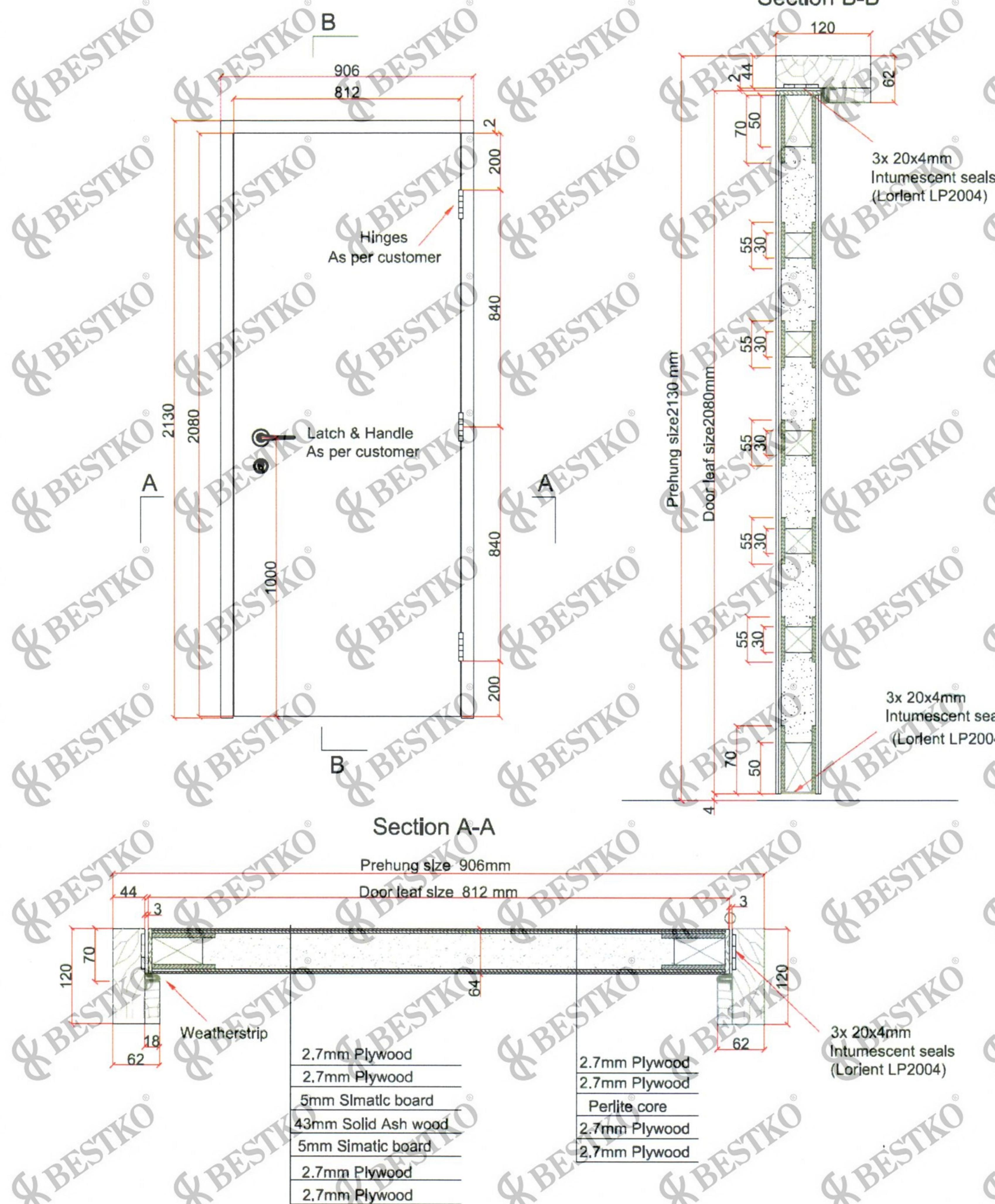




Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX B: Fire Door Assembly Drawings (2 pages)



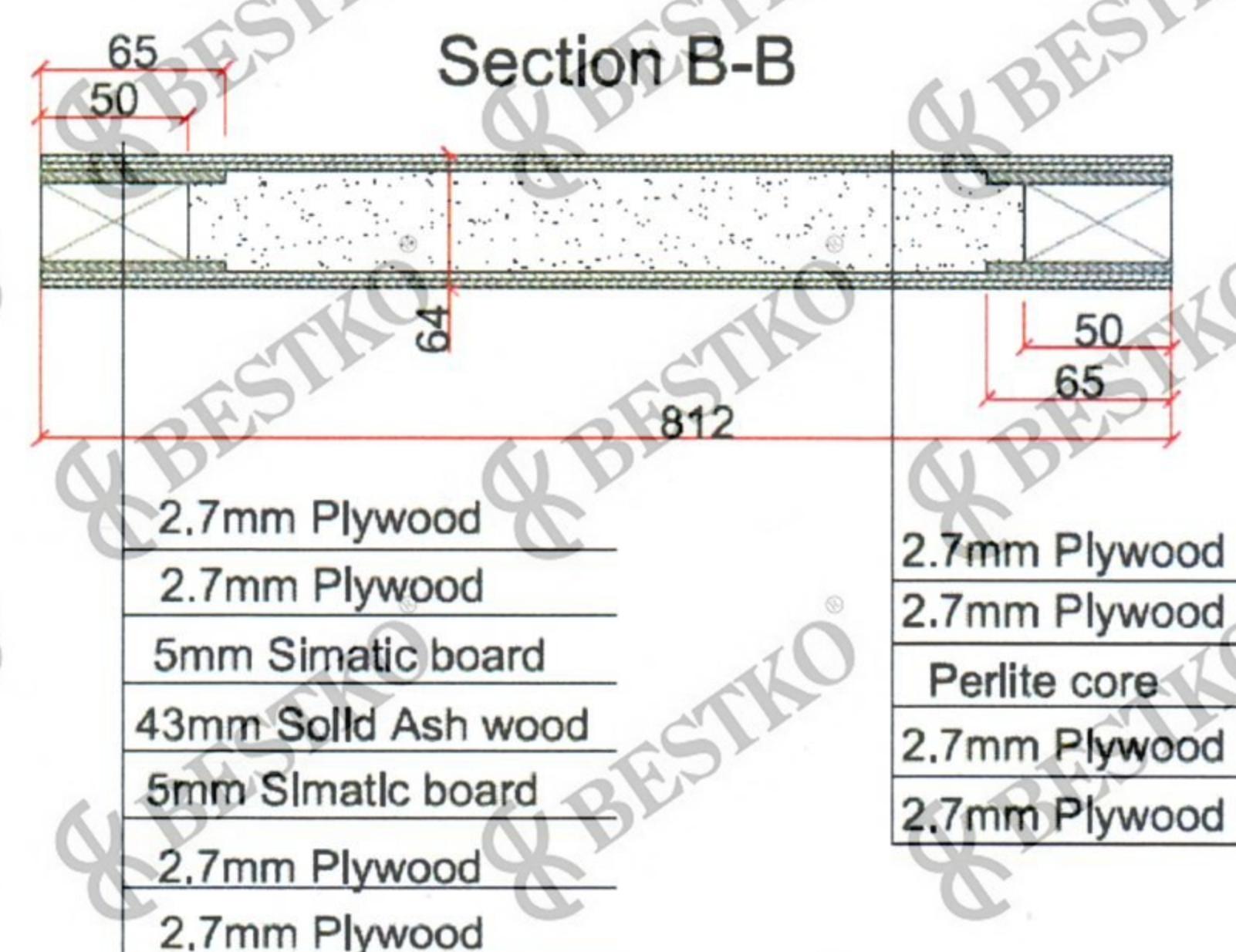
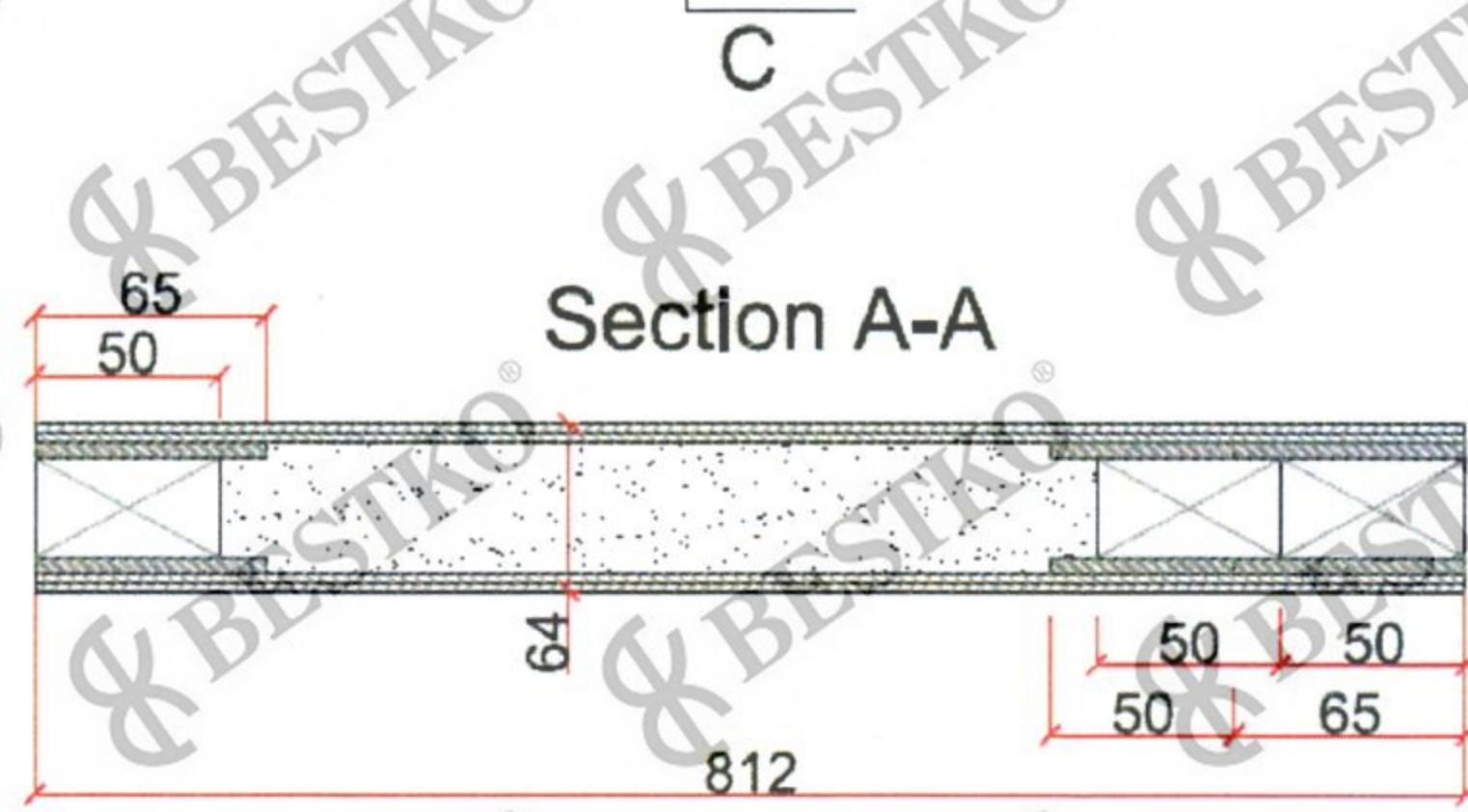
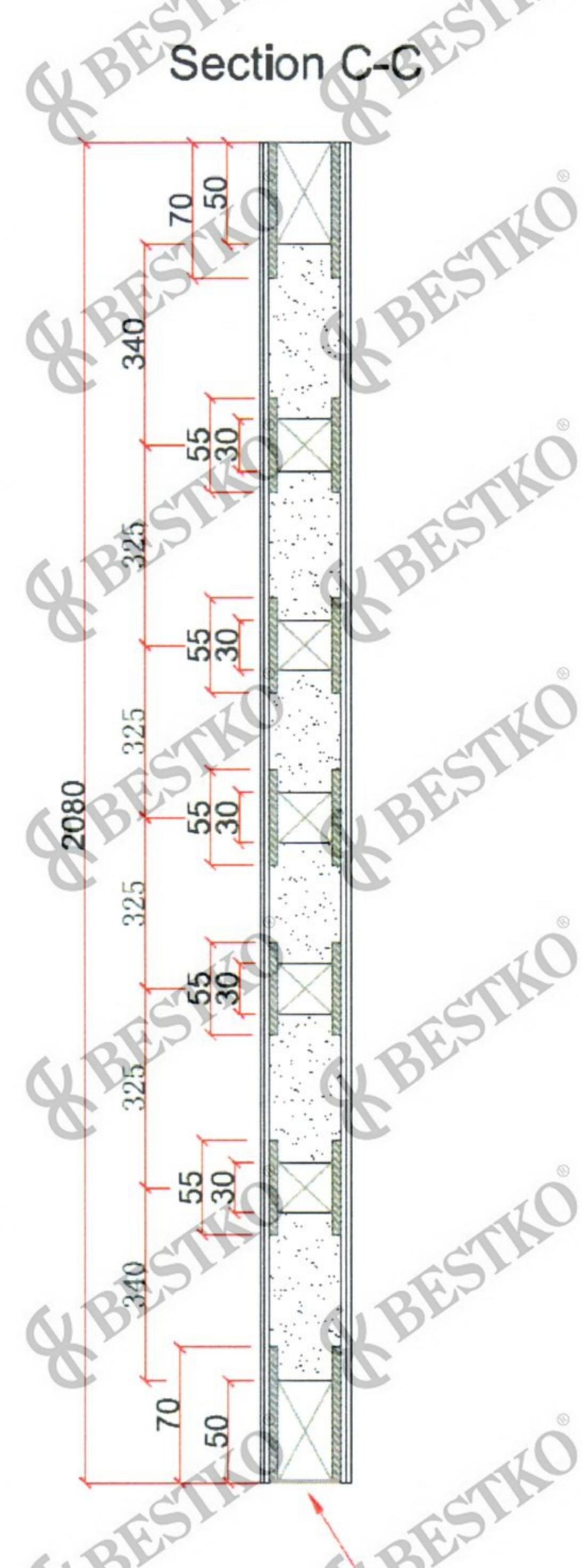
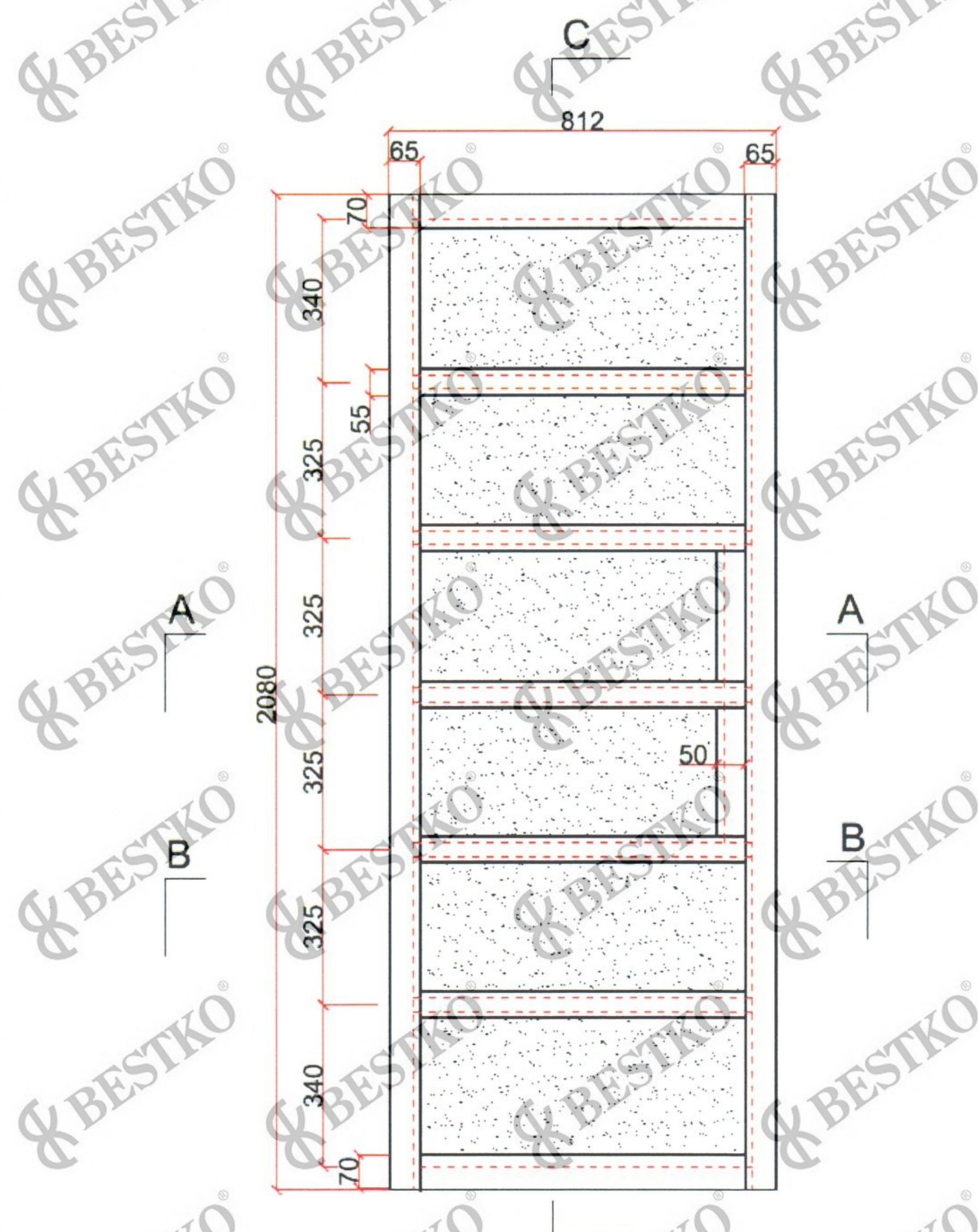
Note:

1. Door frame&lipping using hardwood (Density $\geq 640\text{kg/m}^3$, Moisture content $\leq 12\%$).
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.

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

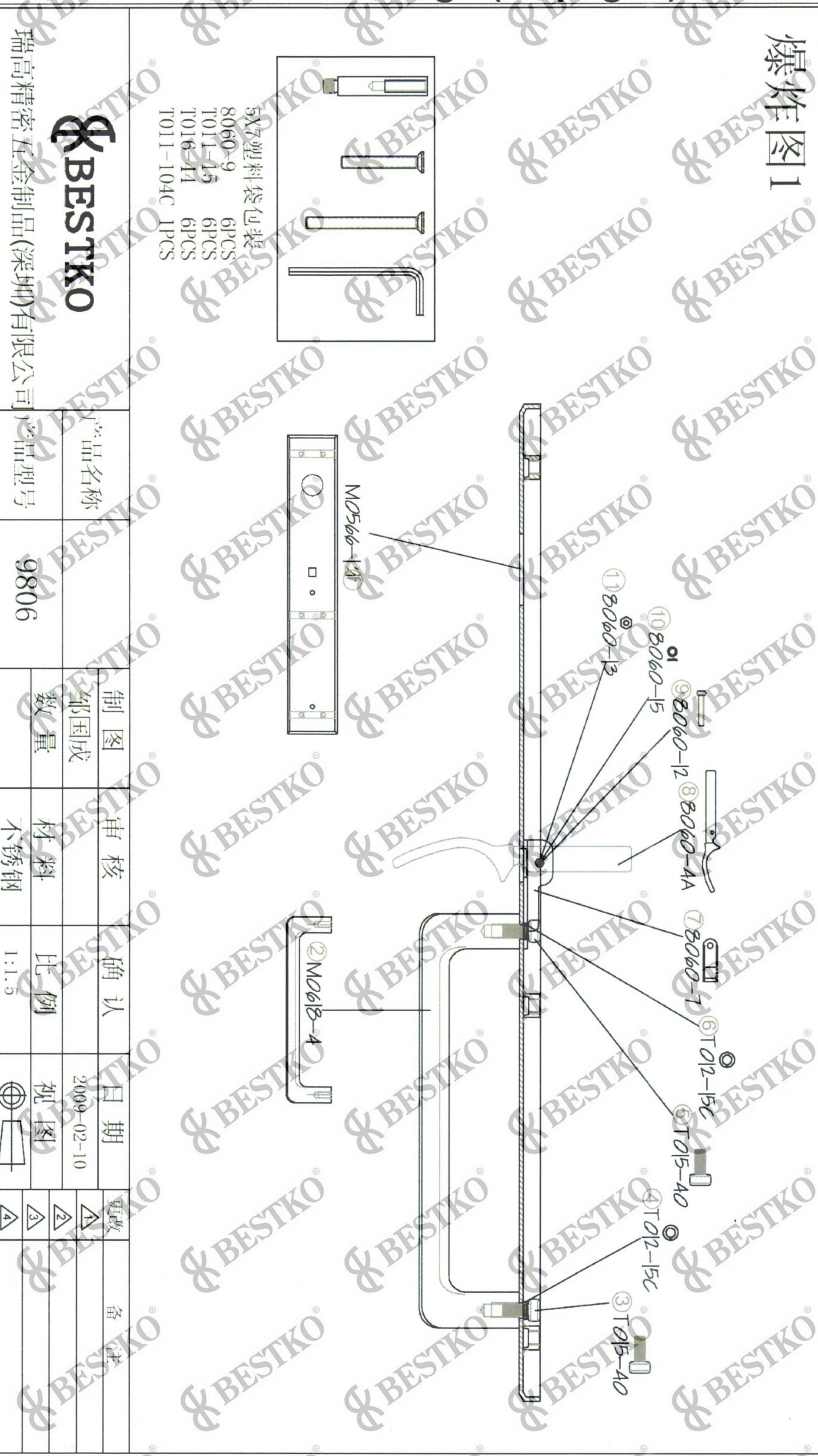


Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

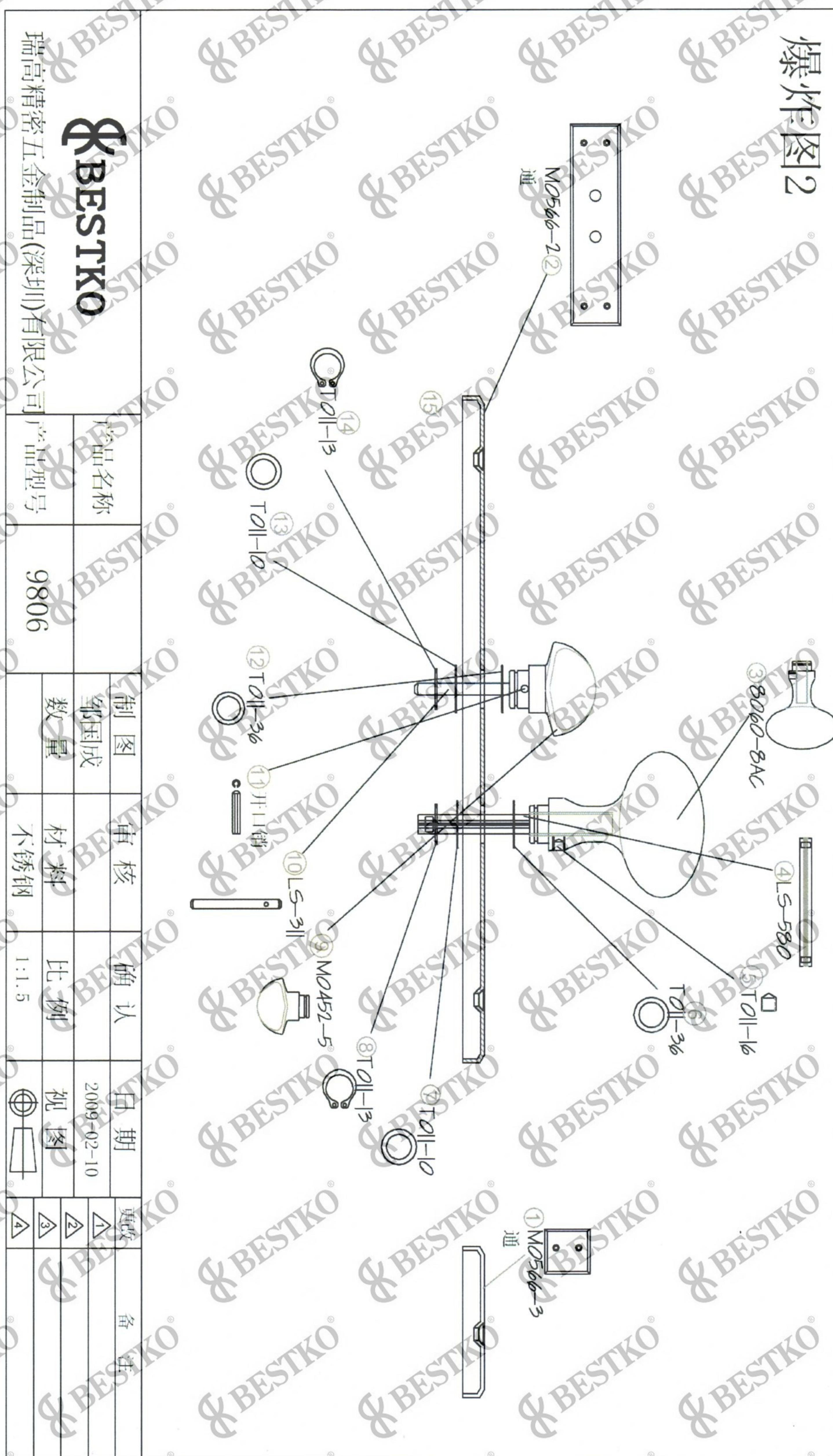
APPENDIX C: Hardware Drawings (15 pages)



Intertek

Bestko Precision Limited
Project No. AU09054007

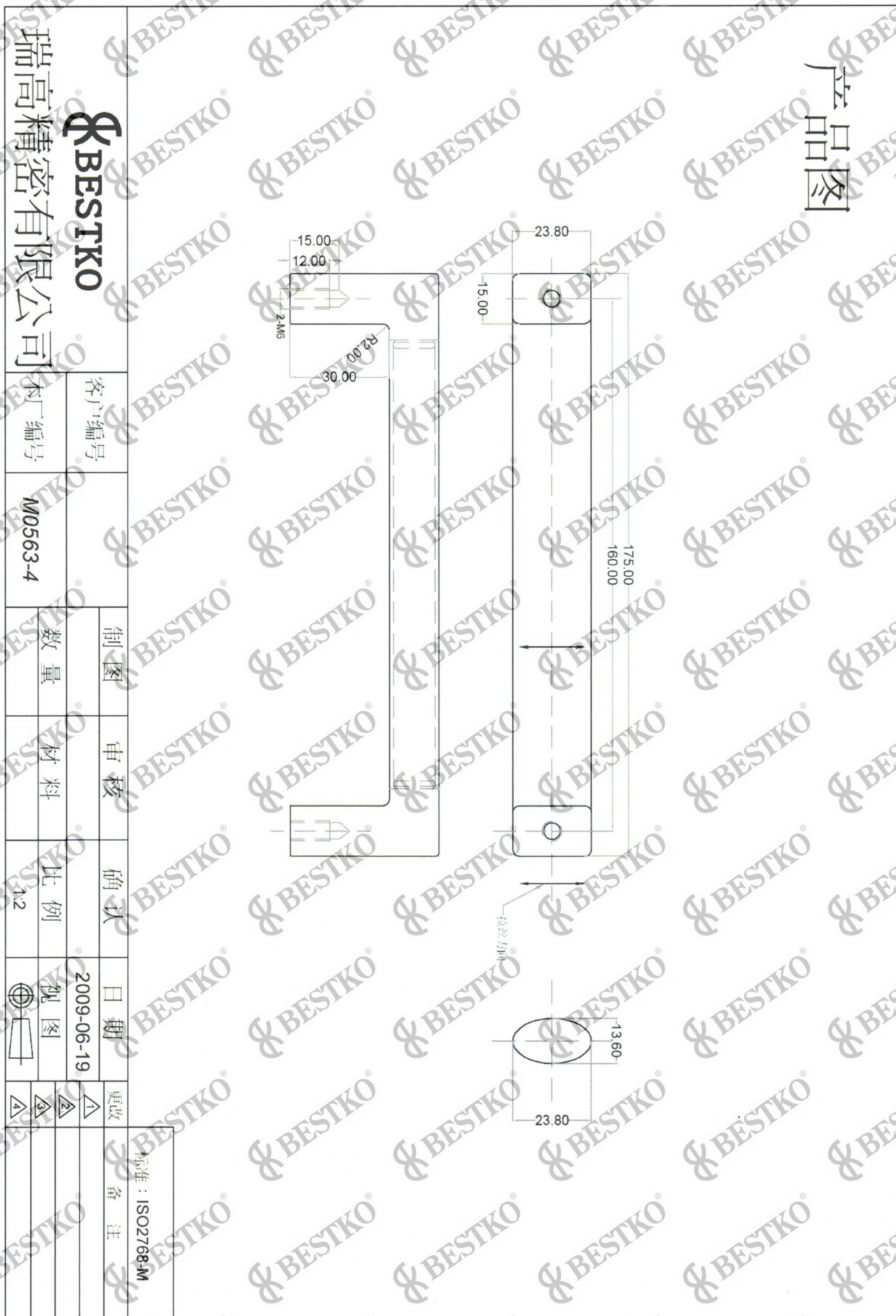
July 7, 2009



Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009





Bestko Precision Limited
Project No. AU09054007

July 7, 2009

产品图

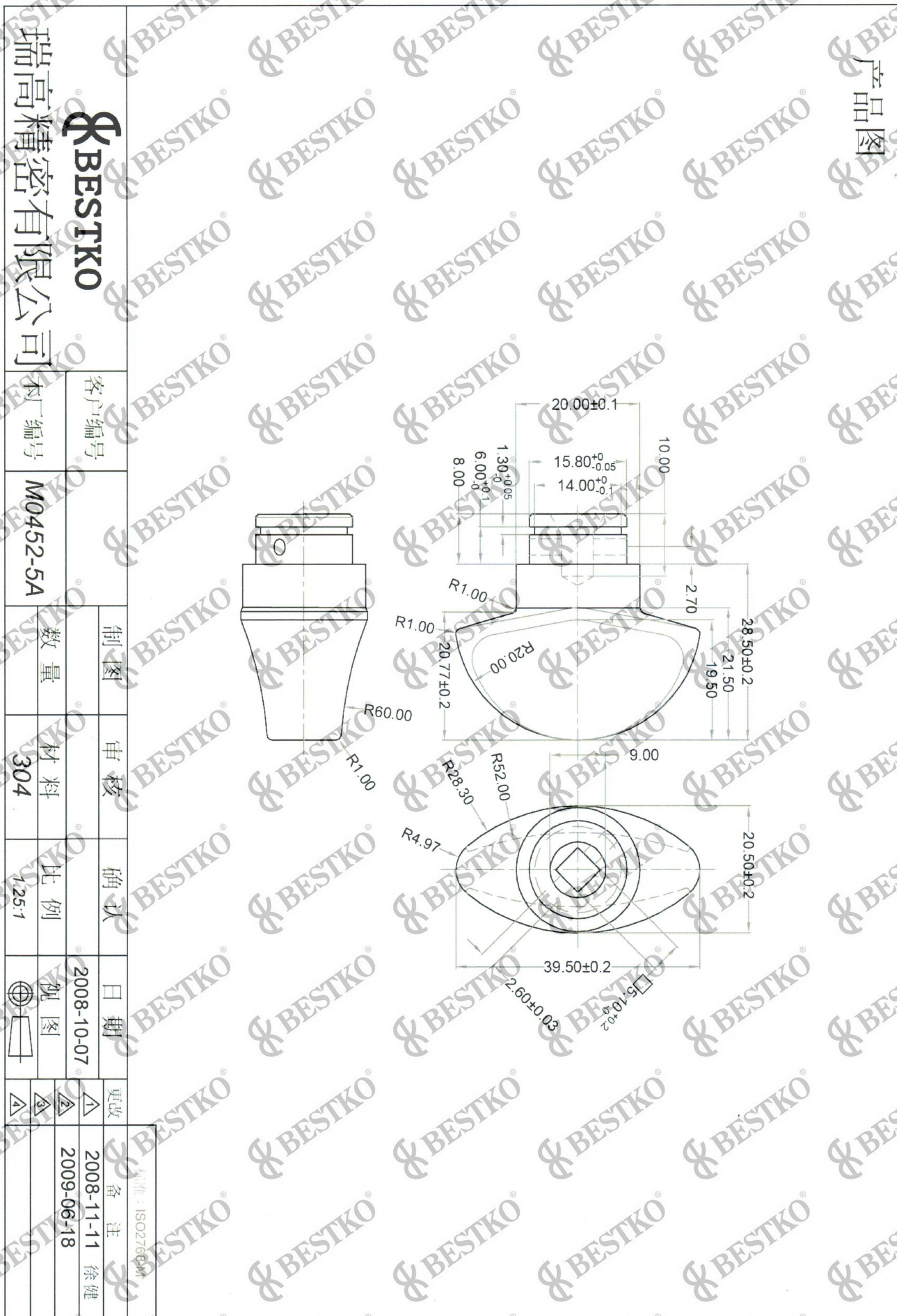
BESTKO	
客户编号	8060-4A
制图	审核
数量	确认
材料	日期
比例	2007-08-12
视图	更改 1 2009-06-18
标准: GB/T 10610-2008	

瑞高精密有限公司

Intertek

Bestko Precision Limited
Project No. AU09054007

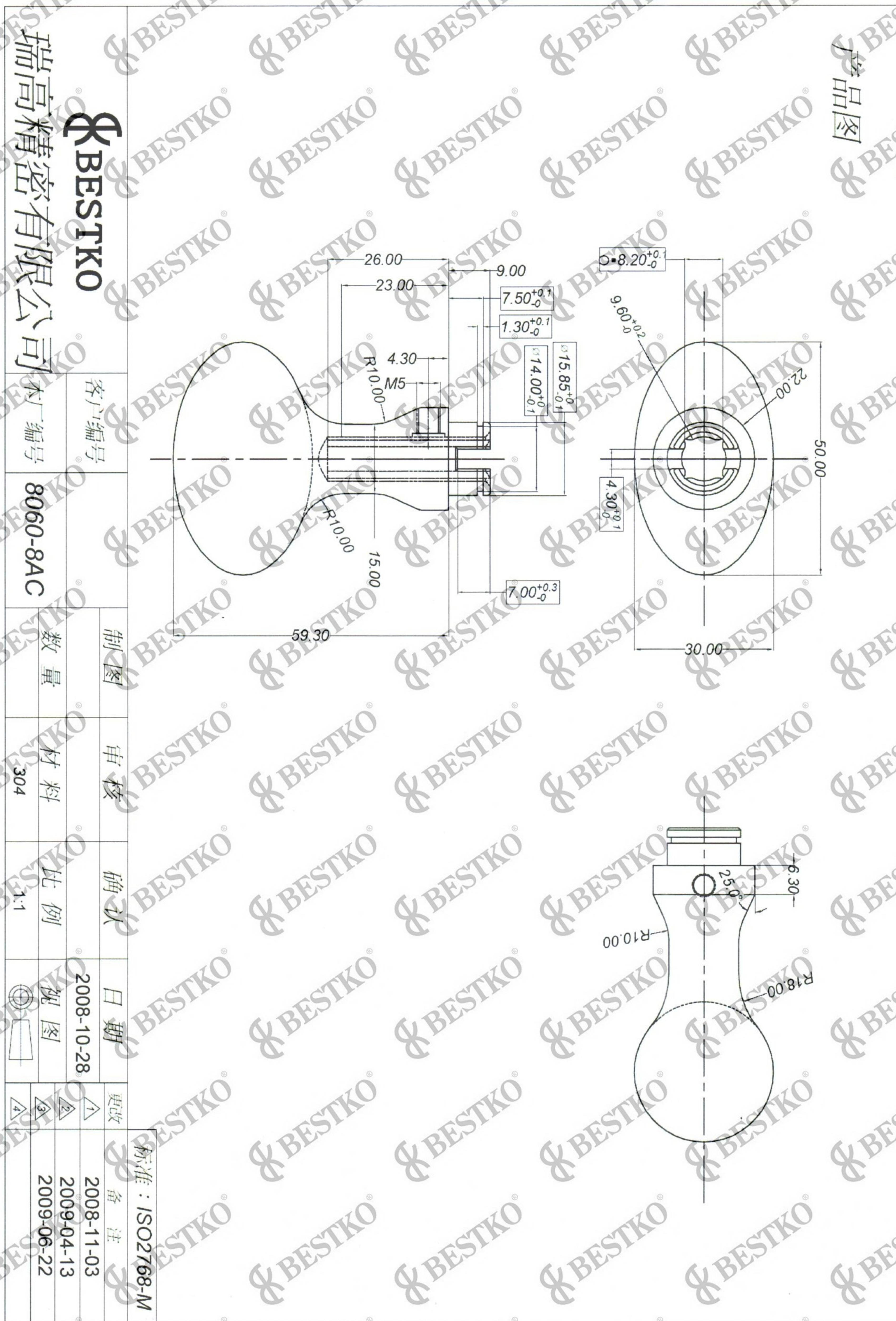
July 7, 2009



Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Intertek

Bestko Precision Limited
Project No. AU09054007

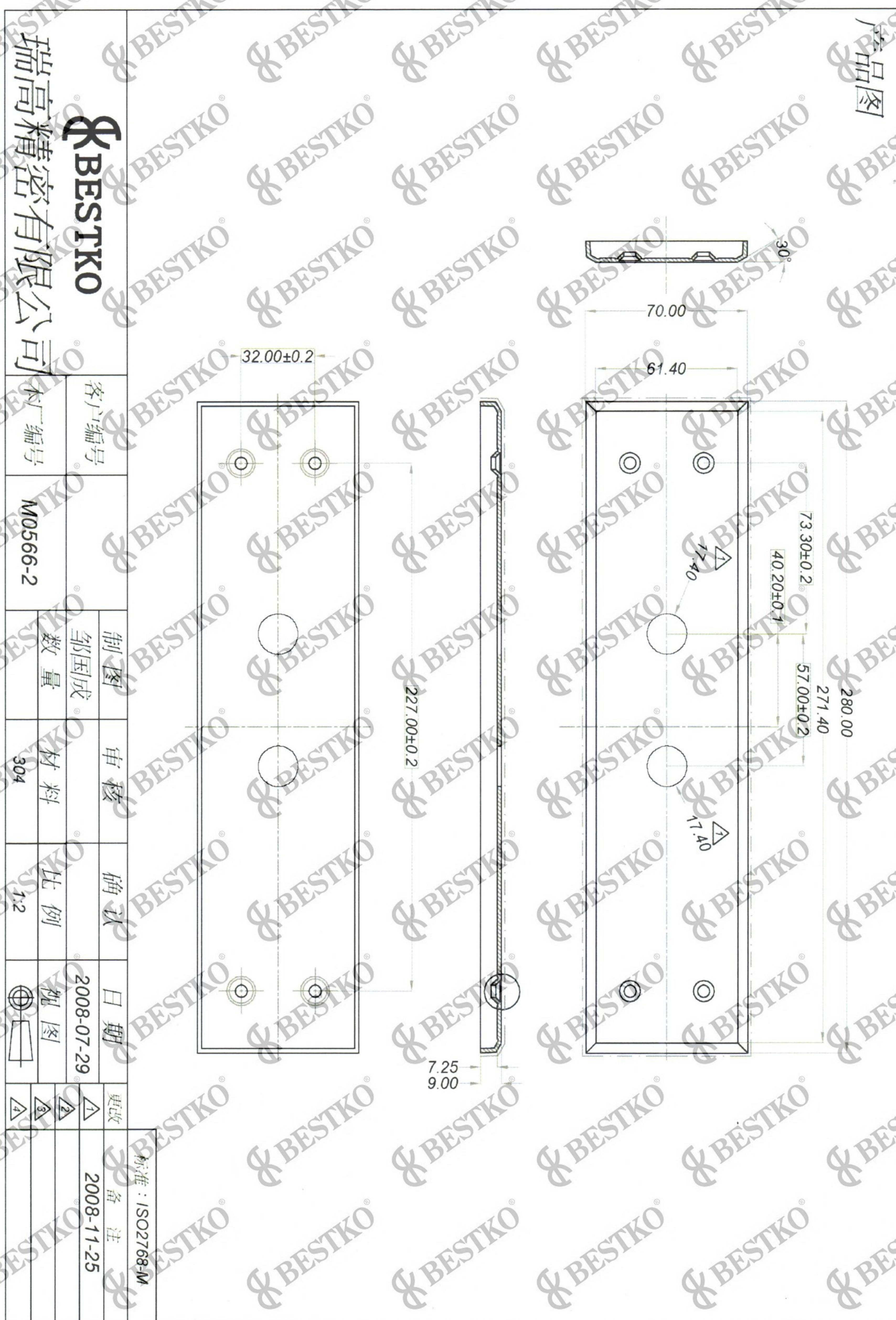
July 7, 2009



Intertek

Bestko Precision Limited
Project No. AU09054007

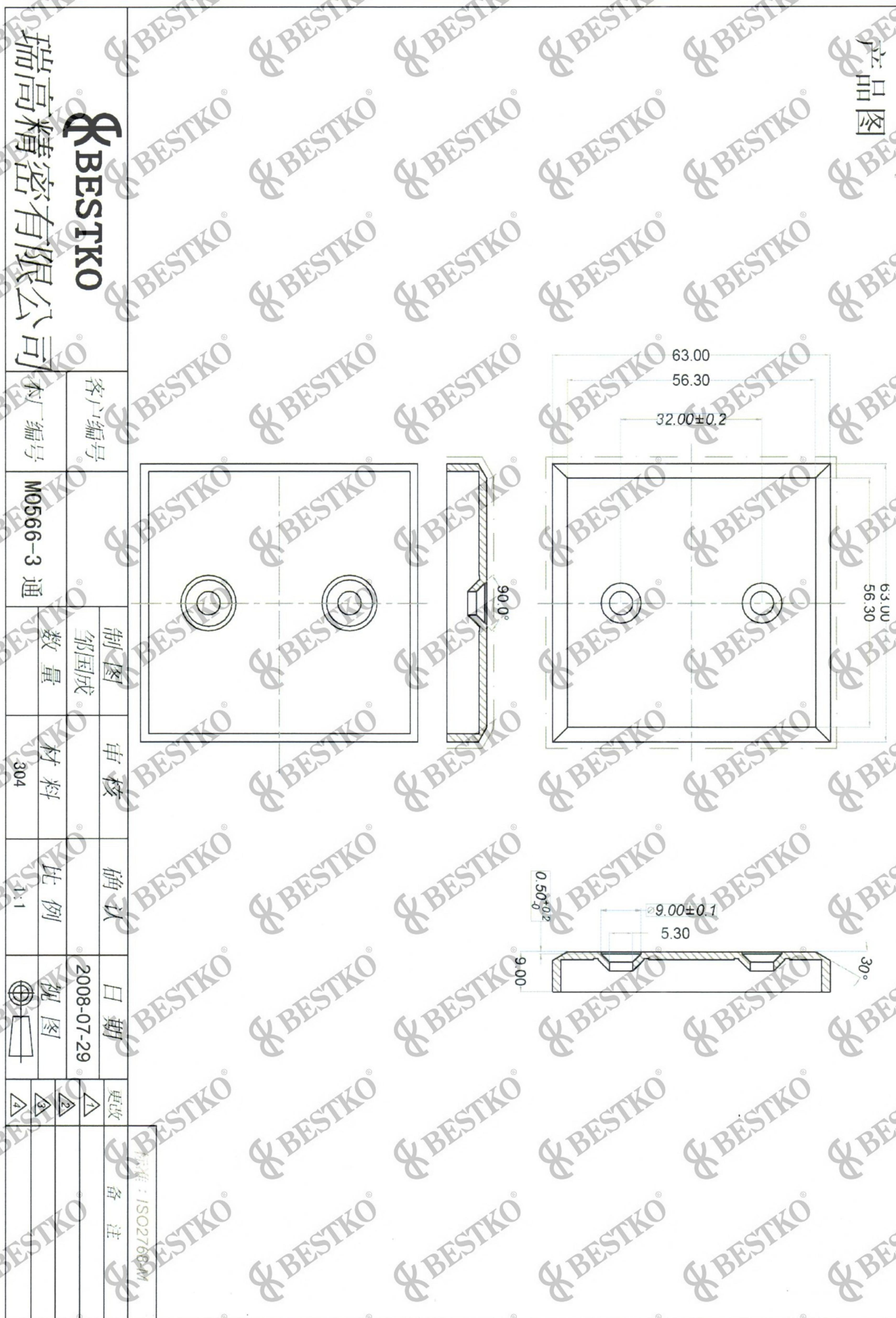
July 7, 2009



Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

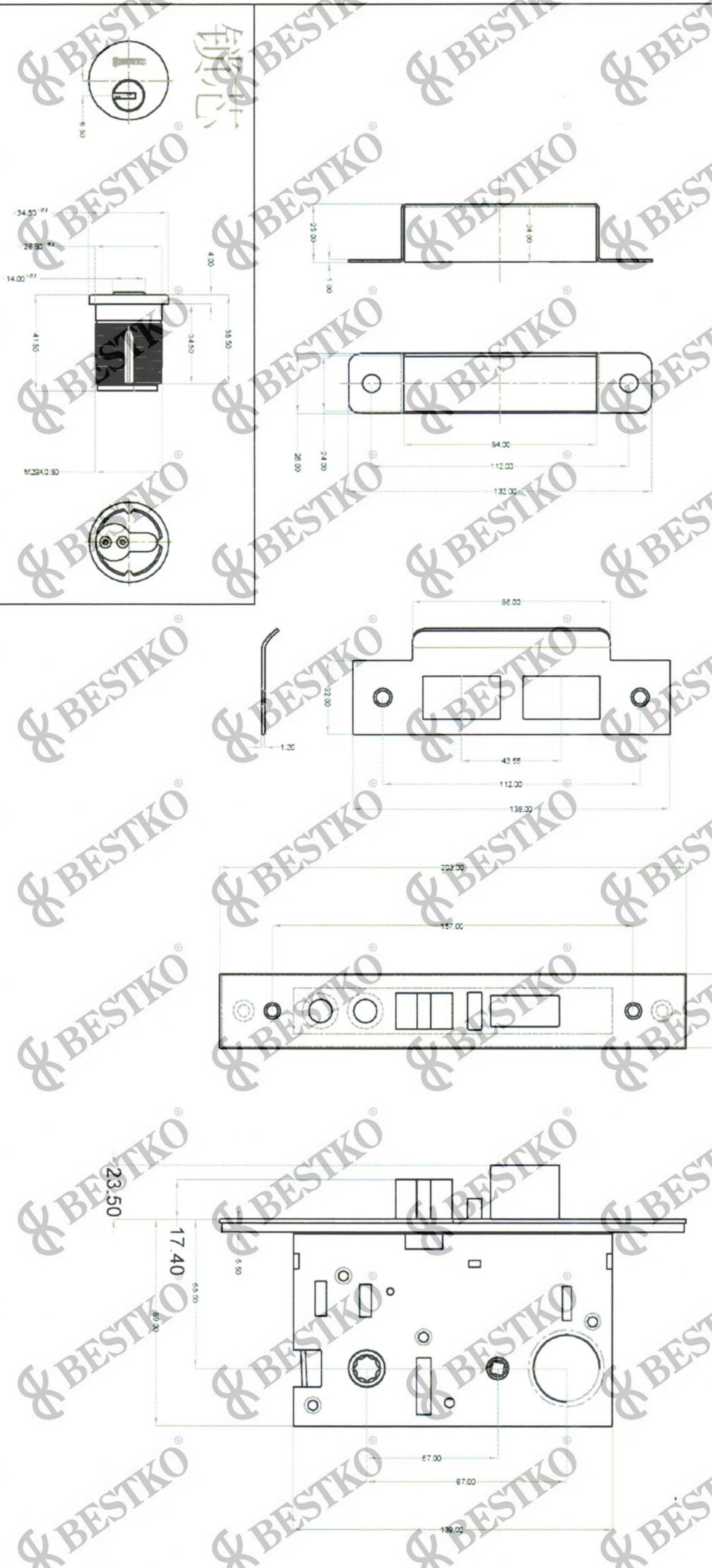




Bestko Precision Limited
Project No. AU09054007

July 7, 2009

BK6587 結构冬

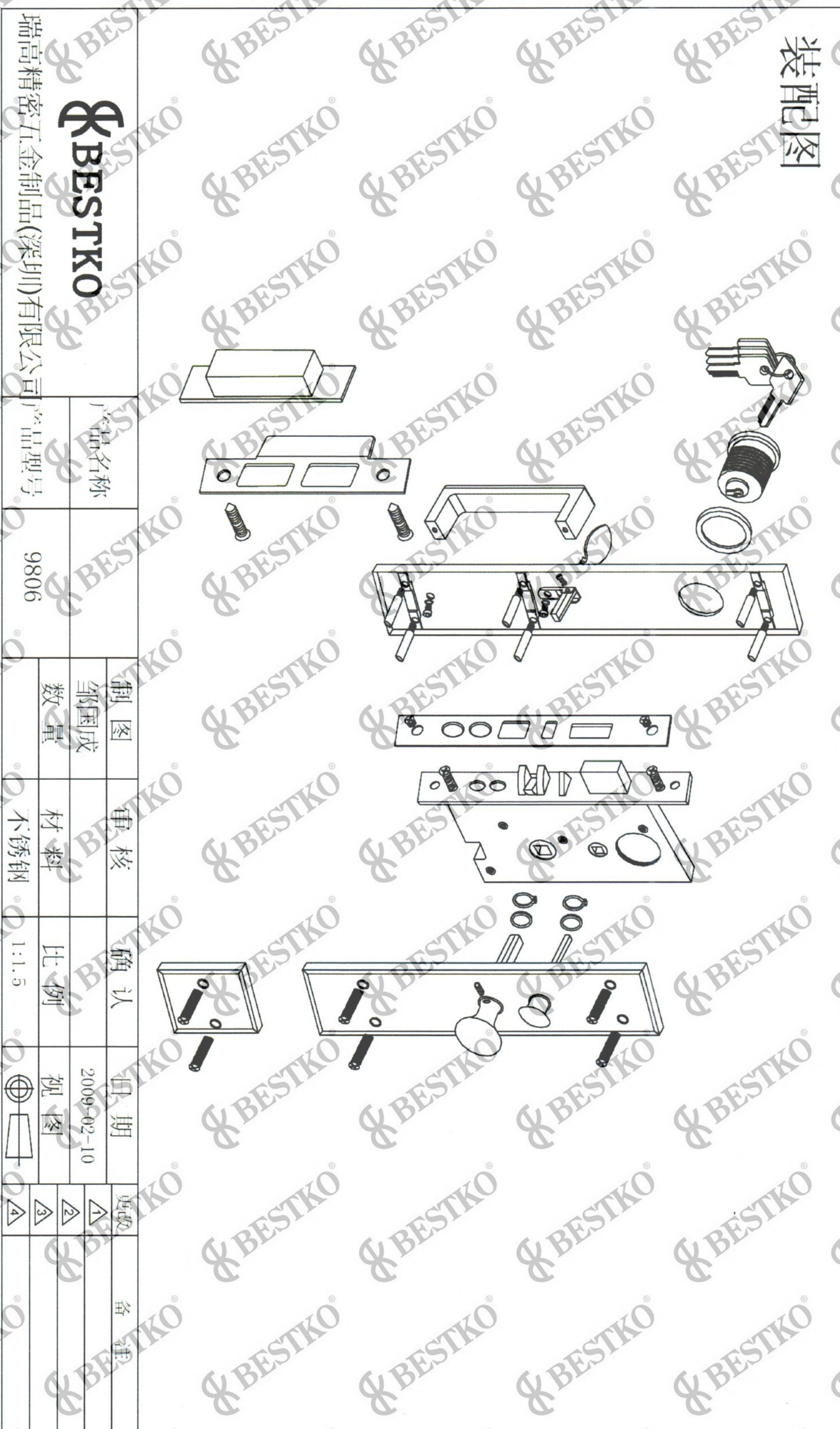


BESTKO	
制图	审核
产品名称	确认日期
邹国成	2009-02-10
数量	材料
6587	比例
不锈钢	视图
1:1.5	①
②	③
④	⑤

Intertek

Bestko Precision Limited
Project No. AU09054007

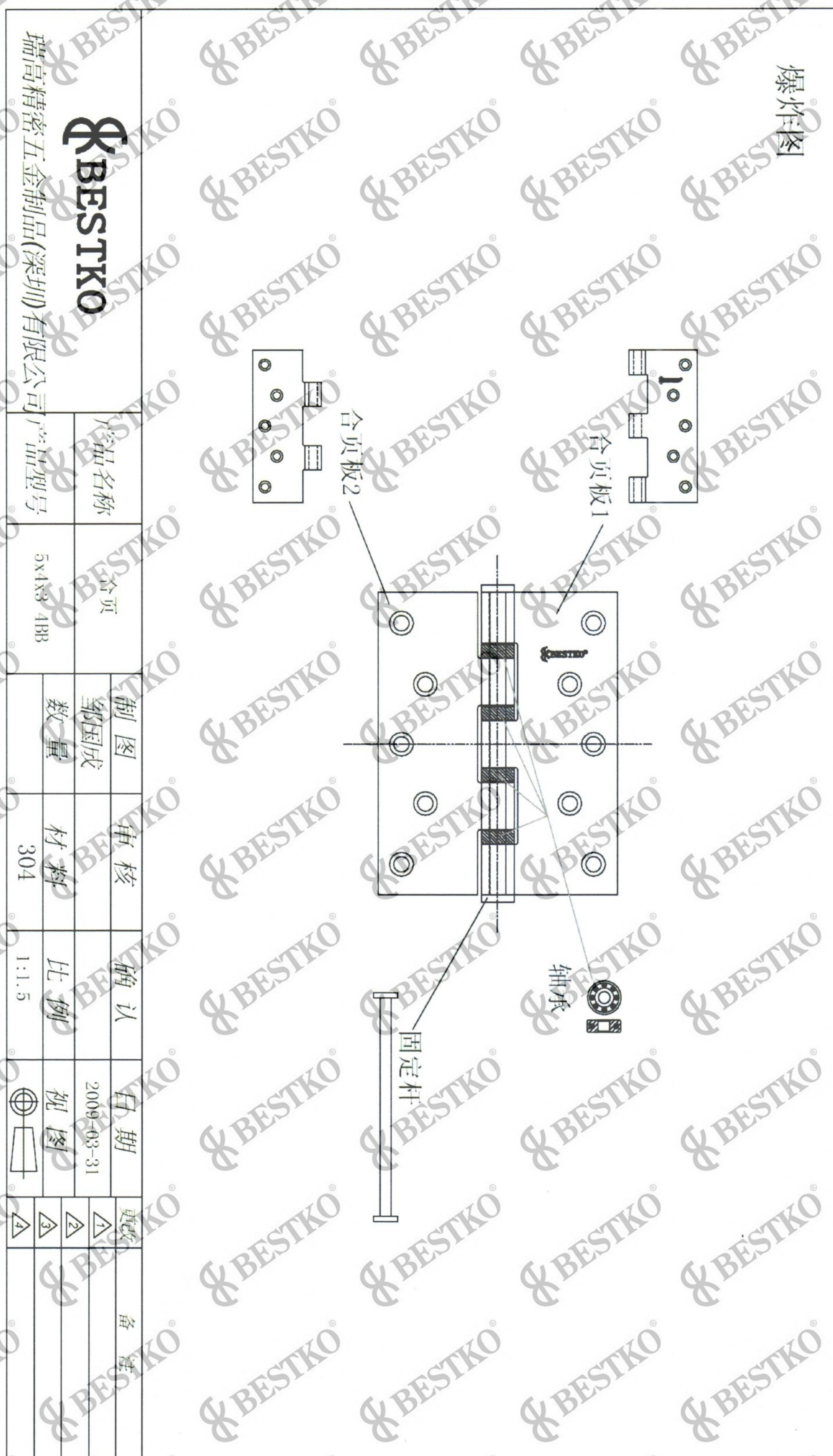
July 7, 2009





Bestko Precision Limited
Project No. AU09054007

July 7, 2009

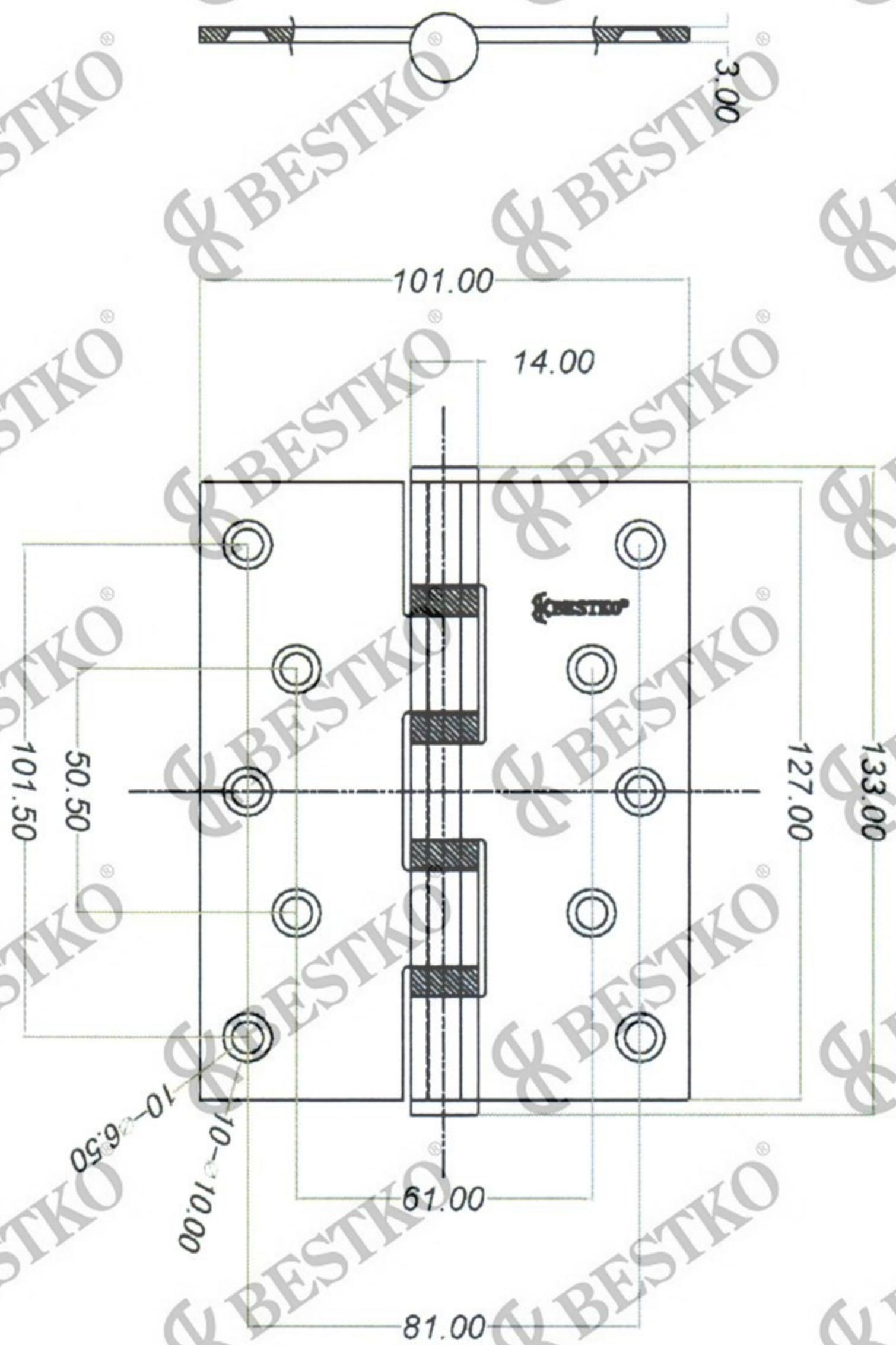


Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

外圍尺寸圖

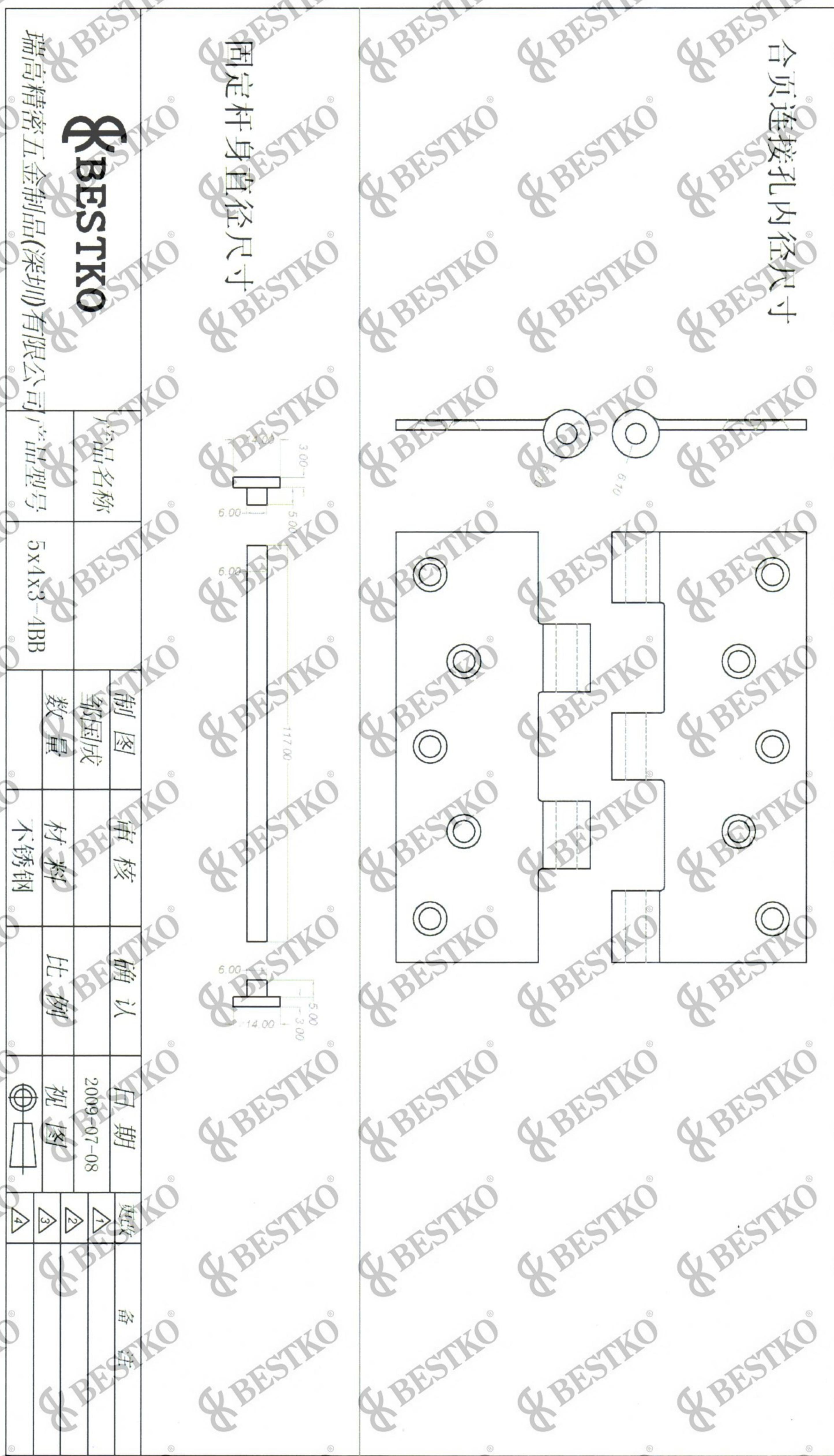


BESTKO	
瑞高精密五金制品(深圳)有限公司	
产品名称	金壳
型号	5x4x3 ABB
数量	材料
304	1:1.5
更改	备注

Intertek

Bestko Precision Limited
Project No. AU09054007

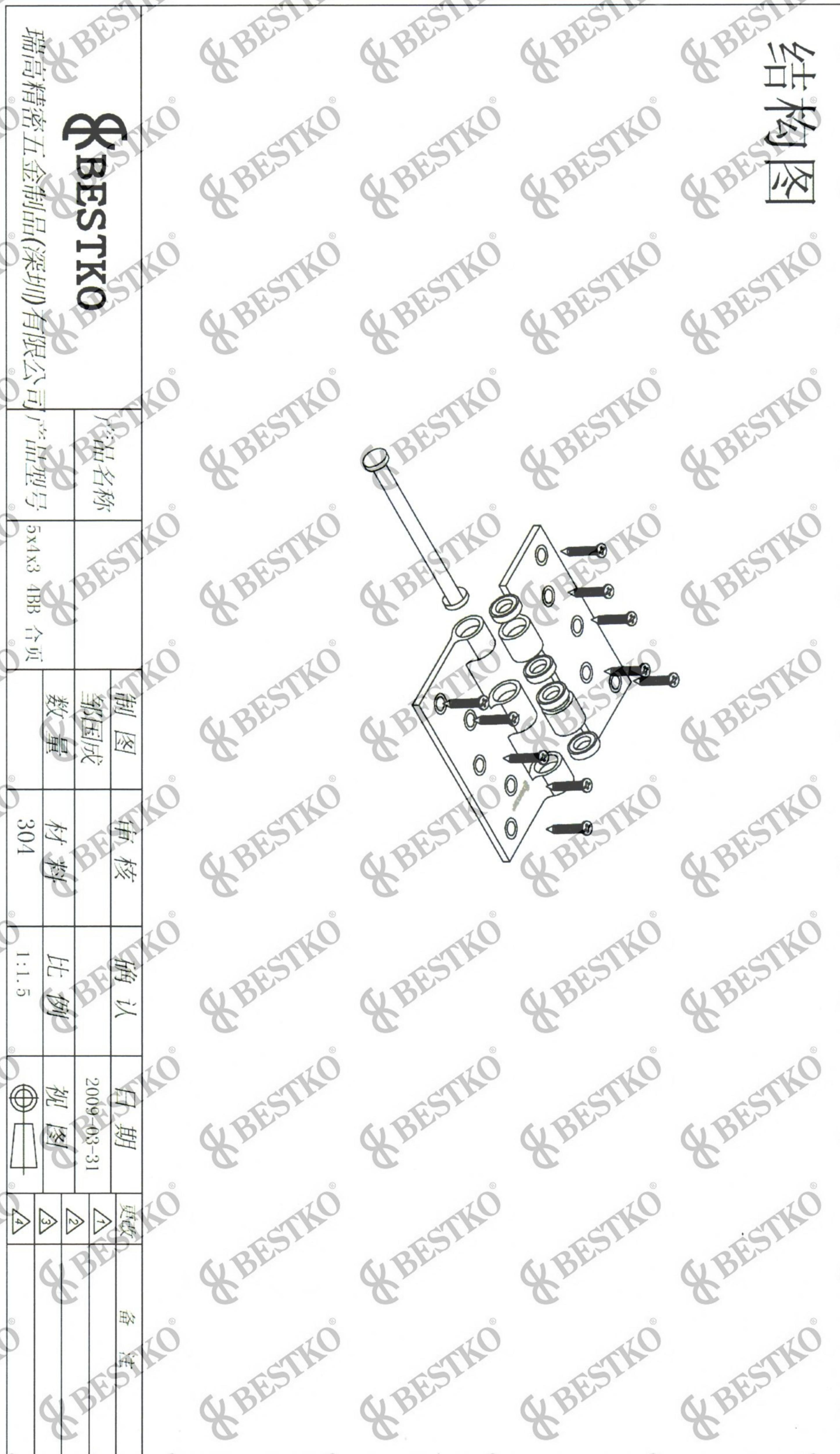
July 7, 2009



Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

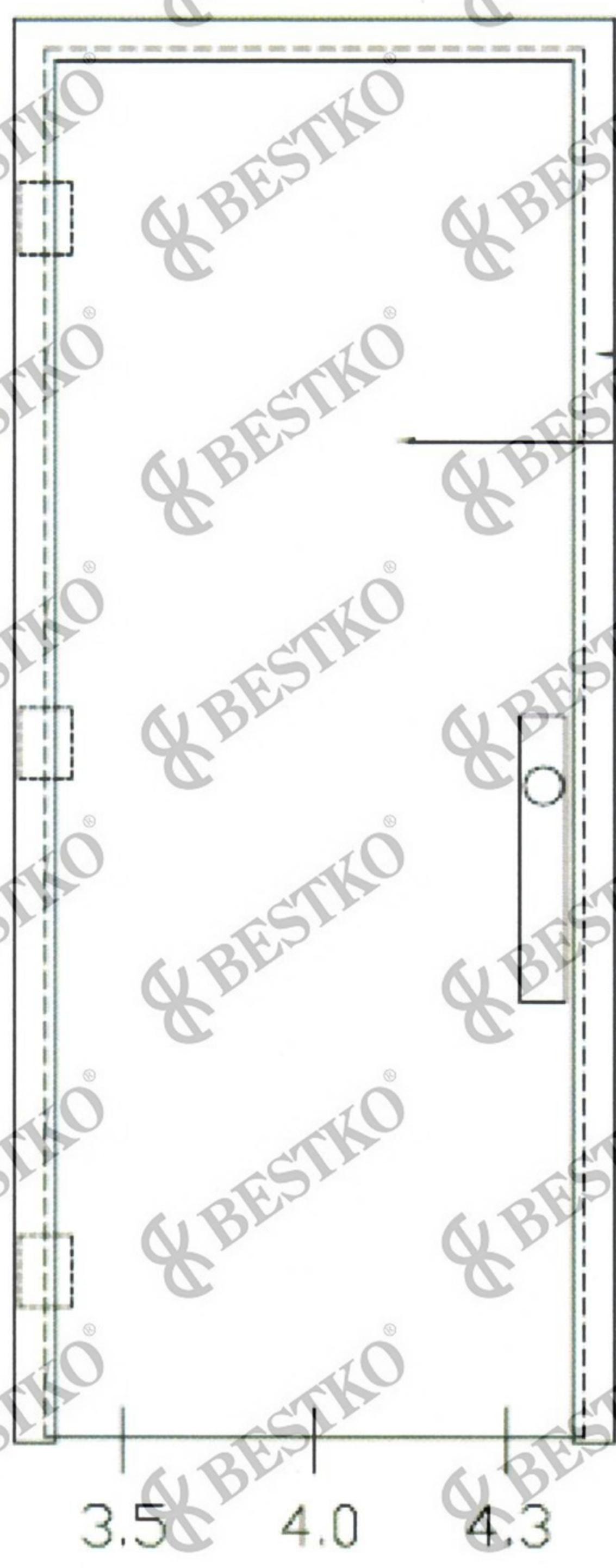




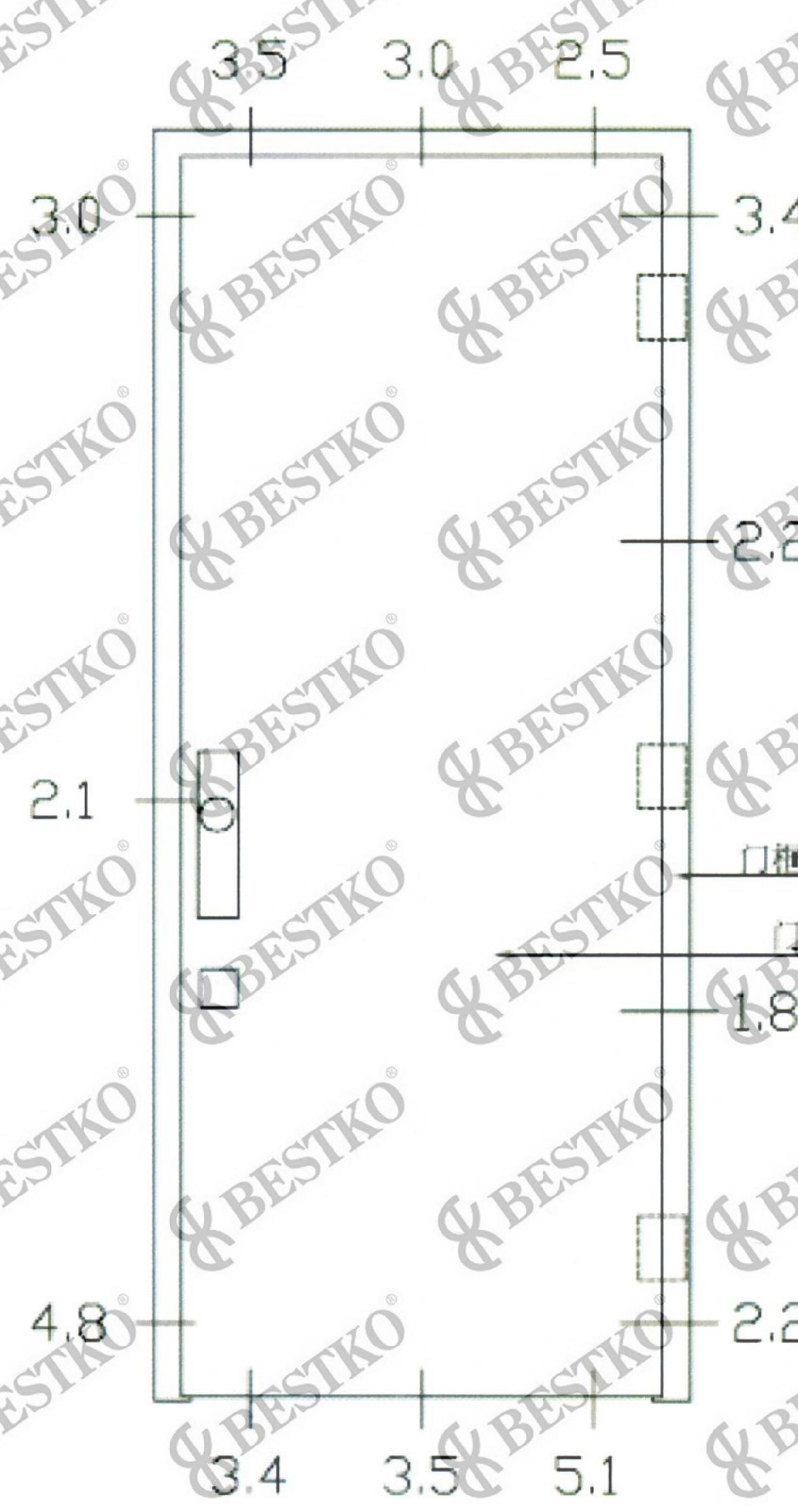
Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX D: Test Measurement Data (3 pages)



Unexposed Side



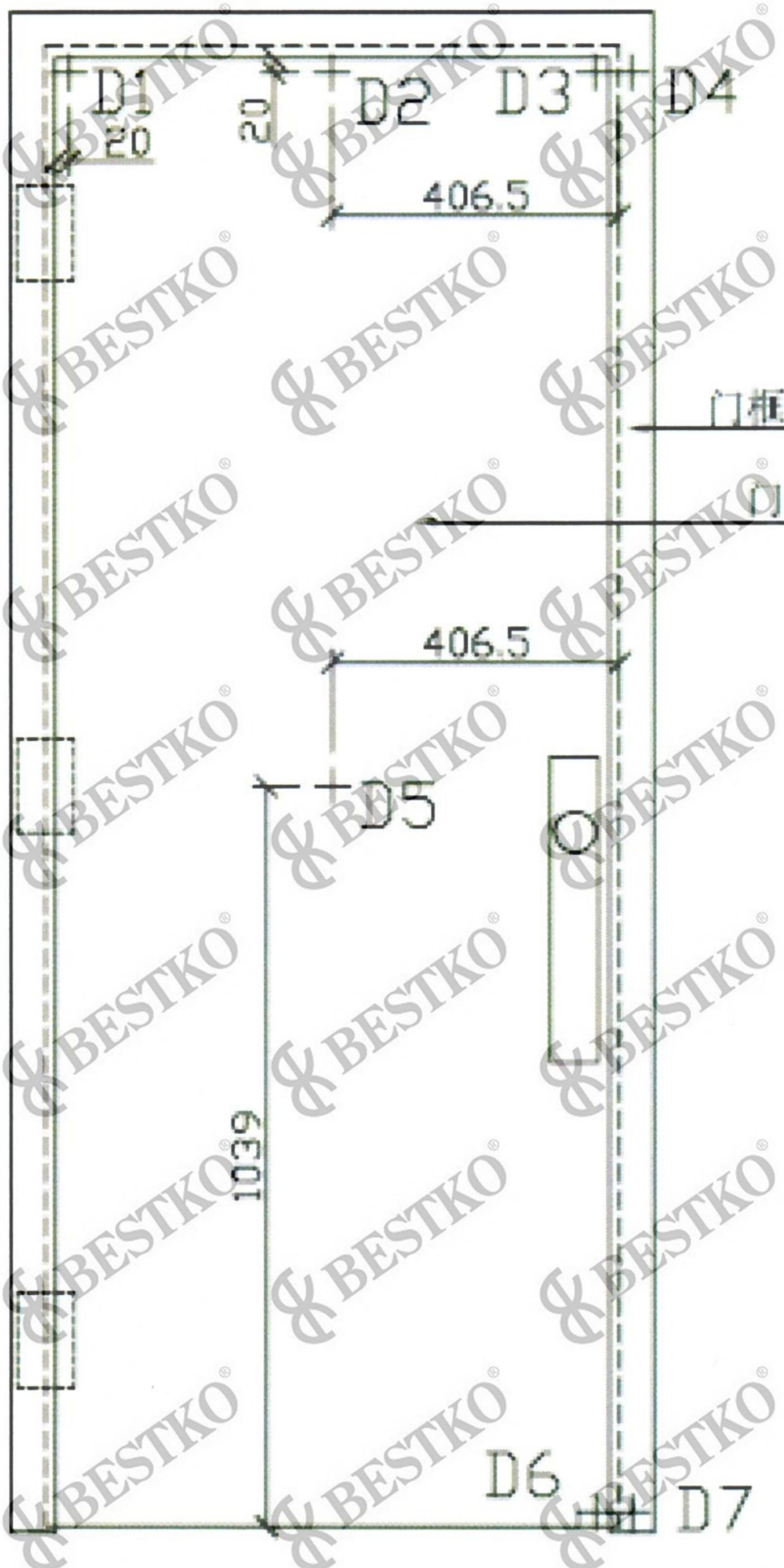
Exposed Side

DOOR ASSEMBLY INITIAL CLEARANCES

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

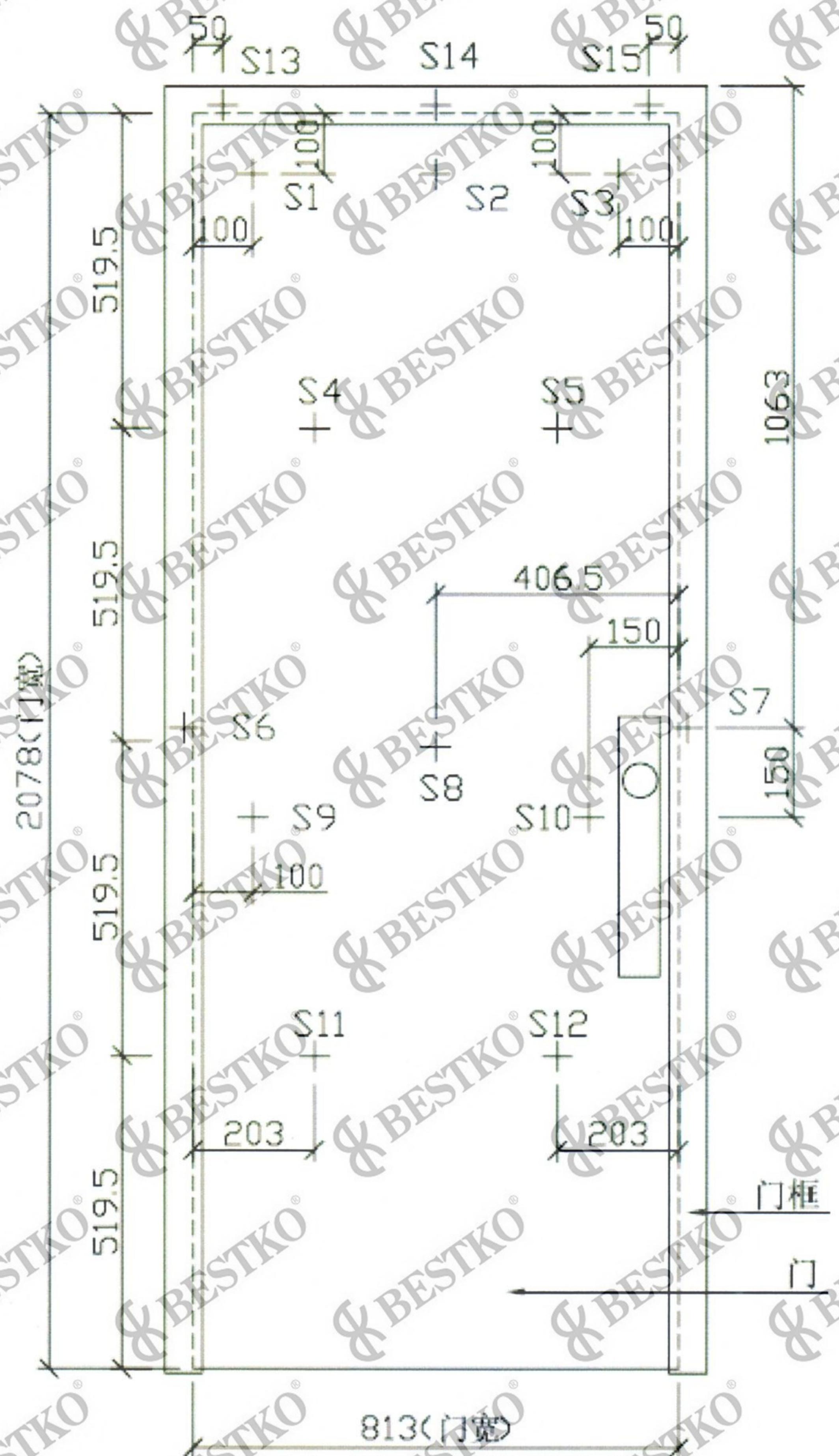


POSITION FOR MEASUREMENT OF HORIZONTAL DEFLECTION

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009



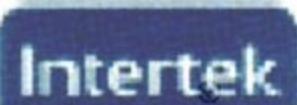
POSITION FOR MEASUREMENT OF UNEXPOSED TEMPERATURE



Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX E: Test Data (6 pages)



Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-6
Client: Bestko Precision Limited
Sample: 4 Bearing Butt Hinge
Sample ID: 5x4x3-4BB
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:

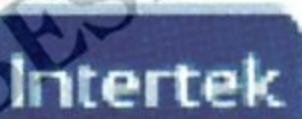
Item	ID	Cal Due Date
Furnace pressure gauge	930100	2009-7-22
Test Clock	930104	2009-6-18
Furnace thermocouple 1	S1800/DW001H	verified before use
Furnace thermocouple 2	S1800/DW002H	verified before use
Furnace thermocouple 3	S1800/DW003H	verified before use
Furnace thermocouple 4	S1800/DW004H	verified 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 Thermocouples 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/m³
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



Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-6
Client: Bestko Precision Limited
Sample: 4 Bearing Butt Hinge
Sample ID: 5x4x3-4BB
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

Reviewer: Craig Lawson
Eng/Tech: Sun Sun
Sun Sun

- 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

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



Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AUD9054007-6
Client: Bestko Precision Limited
Sample: 4 Bearing Butt Hinge
Sample ID: 5x4x3-48B
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

Reviewer: Craig Lawson
Eng/Tech: Sun Sun
Sun

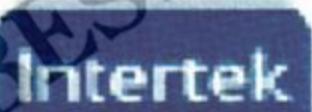
2) Insulation: Average temperature rise 140°C according to EN1363-1. Maximum temperature rise 180°C according to EN 1363-1, Section 11.3, and of the frame of the door or shutter assembly shall be 360°C according to EN 1634-1, Section 11.2.3. Unexposed temperatures according to EN 1634-1, Section 9.1.2.3,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

Time(min)	Ambient (°C)	S1 (°C)	S2 (°C)	S3 (°C)	S4 (°C)	S5 (°C)	S6 (°C)	S7 (°C)
Initial	31.7	32.3	32.0	32.1	32.8	33.1	34.3	32.5
5	33.4	32.1	31.8	31.8	32.7	33.1	34.9	32.5
10	32.7	35.3	33.5	39.6	34.1	39.7	35.3	32.8
15	32.7	69.1	48.9	70.1	42.3	60.0	35.2	33.4
20	32.7	75.6	66.9	73.9	49.5	69.0	35.3	33.5
25	31.4	77.2	69.8	76.0	57.8	71.4	35.2	33.8
30	30.9	78.2	72.9	77.1	67.0	72.2	34.9	33.9
35	30.9	77.7	73.7	76.3	73.3	72.3	34.5	34.3
40	30.9	77.7	74.5	78.0	76.5	73.7	34.3	34.8
45	30.4	78.5	75.9	79.8	78.4	75.0	33.8	35.3
50	30.4	79.5	77.2	81.8	79.0	76.0	33.5	36.1
55	30.4	80.6	78.7	82.1	81.7	76.5	33.2	36.9
60	31.6	80.6	79.9	82.0	82.0	78.1	32.4	37.4
65	31.6	81.0	81.0	82.5	80.3	79.7	31.8	37.8
70	32.7	81.1	82.1	82.7	80.4	80.2	30.8	38.8
75	32.7	82.5	81.6	82.9	82.7	80.7	29.6	39.7
80	32.7	82.6	82.0	83.7	82.3	80.0	28.6	40.7
85	30.9	82.7	82.6	82.8	81.0	81.2	27.7	41.8
90	30.9	83.2	81.8	84.6	80.6	80.9	27.1	42.9
Requirement	10-30	140	140	140	140	140	180	180



Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-6
Client: Bestko Precision Limited
Sample: 4 Bearing Butt Hinge
Sample ID: 5x4x3-4BB
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

Reviewer: Craig Lawson
Eng/Tech: Sun Sun
S

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

Time	S8 (°C)	S9 (°C)	S10 (°C)	S11 (°C)	S12 (°C)	S13 (°C)	S14 (°C)	S15 (°C)
Initial	33.1	32.8	32.9	33.3	32.7	32.5	32.3	32.4
5	33.1	32.8	33.0	33.6	33.0	32.3	32.1	32.2
10	44.8	33.9	35.8	35.0	35.4	32.4	32.4	33.0
15	62.6	50.9	50.2	39.7	43.5	33.5	33.1	32.9
20	67.0	68.5	63.7	44.4	49.2	34.2	33.8	34.0
25	69.4	70.5	71.1	42.8	52.9	35.0	34.7	35.7
30	71.5	72.4	73.4	42.1	56.0	35.3	35.3	35.8
35	73.6	75.2	73.9	43.2	58.7	36.1	33.0	36.9
40	75.3	77.9	73.4	45.7	62.6	37.2	36.1	37.5
45	76.8	80.1	73.6	49.5	68.7	37.3	37.6	38.1
50	77.0	80.3	73.8	51.3	71.2	38.6	37.6	38.7
55	77.1	81.3	76.2	53.8	74.2	39.4	40.8	38.8
60	76.9	81.4	77.1	54.7	76.1	40.2	38.3	38.1
65	77.6	81.6	78.8	55.1	77.8	41.1	40.5	38.2
70	78.5	82.3	80.3	56.0	79.3	42.7	42.5	39.3
75	79.7	82.6	81.3	58.1	80.8	44.2	44.9	40.8
80	80.3	82.5	82.0	59.0	81.6	45.9	44.1	42.2
85	80.7	81.8	82.5	60.6	82.2	47.8	47.7	44.0
90	81.0	82.7	82.2	63.4	82.6	48.7	48.2	44.9
Requirement	10-30	180	180	360	360	360	360	360



Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-6
Client: Bestko Precision Limited
Sample: 4 Bearing Butt Hinge
Sample ID: 5x4x3-4BB
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)						
	D1	D2	D3	D4	D5	D6	D7
Initial	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	-1.0	-2.0	1.0	-1.0	-1.0	0.0
20	1.0	-2.0	-1.0	2.0	-3.0	-1.0	0.0
30	2.0	2.0	2.0	2.0	-4.0	1.0	1.0
40	5.0	4.0	5.0	2.0	-2.0	1.0	1.0
50	4.0	6.0	7.0	2.0	0.0	1.0	2.0
60	8.0	7.0	7.0	3.0	0.0	1.0	2.0
70	10.0	8.0	8.0	4.0	4.0	1.0	2.0
80	11.0	9.0	8.0	2.0	5.0	2.0	2.0
90	11.0	9.0	7.0	2.0	5.0	2.0	2.0

Intertek

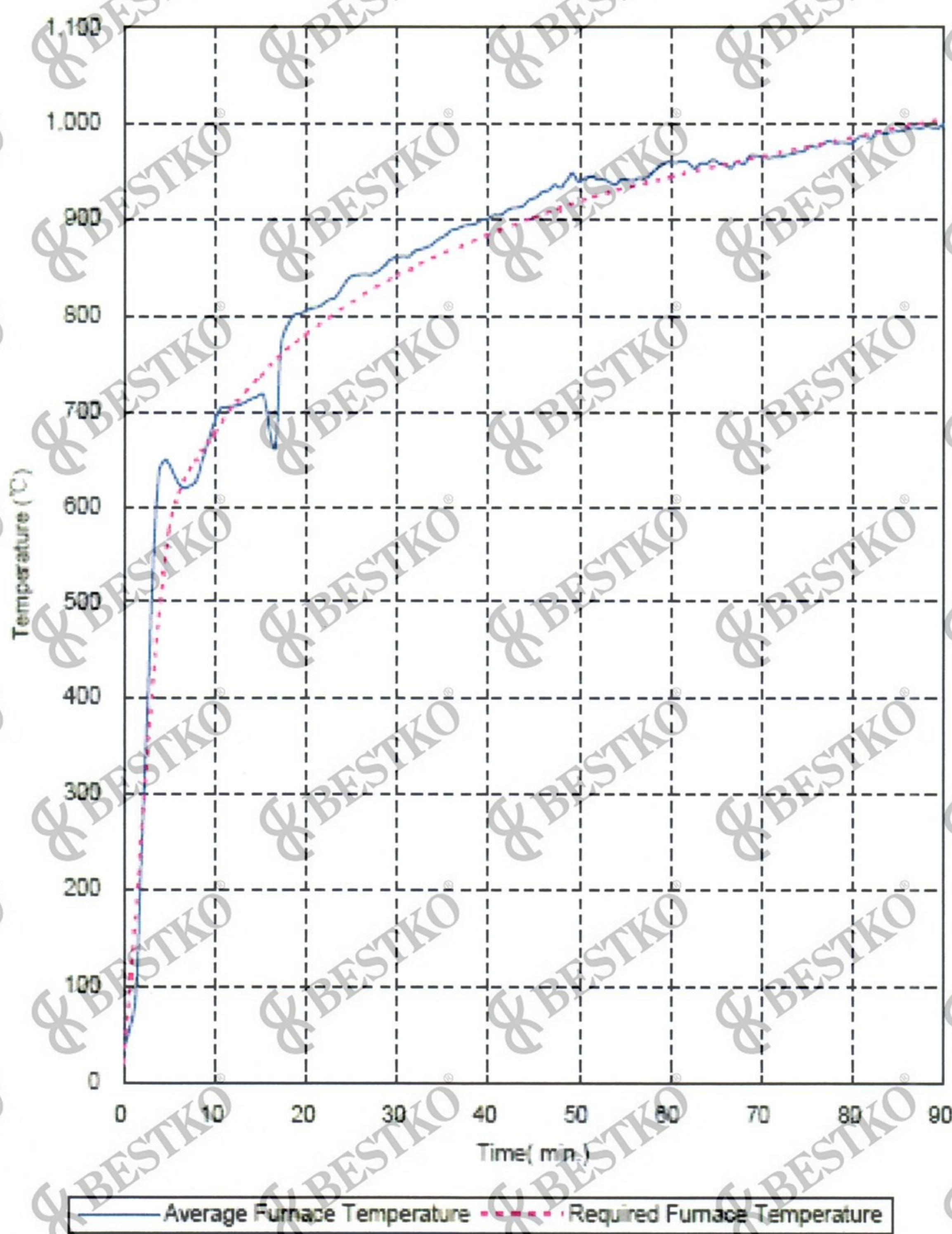
Bestko Precision Limited
Project No. AU09054007

July 7, 2009

Intertek

Test: Fire Resistance
Start Date: 2009-06-12
Target Date: 2009-06-18
Job No: AU09054007-6
Client: Bestko Precision Limited
Sample: 4 Bearing Butt Hinge
Sample ID: 5x4x3-4BB
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



Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009

APPENDIX F: Test Photographs (5 pages)



Fig 1 - Exposed Side Prior to the Fire Test

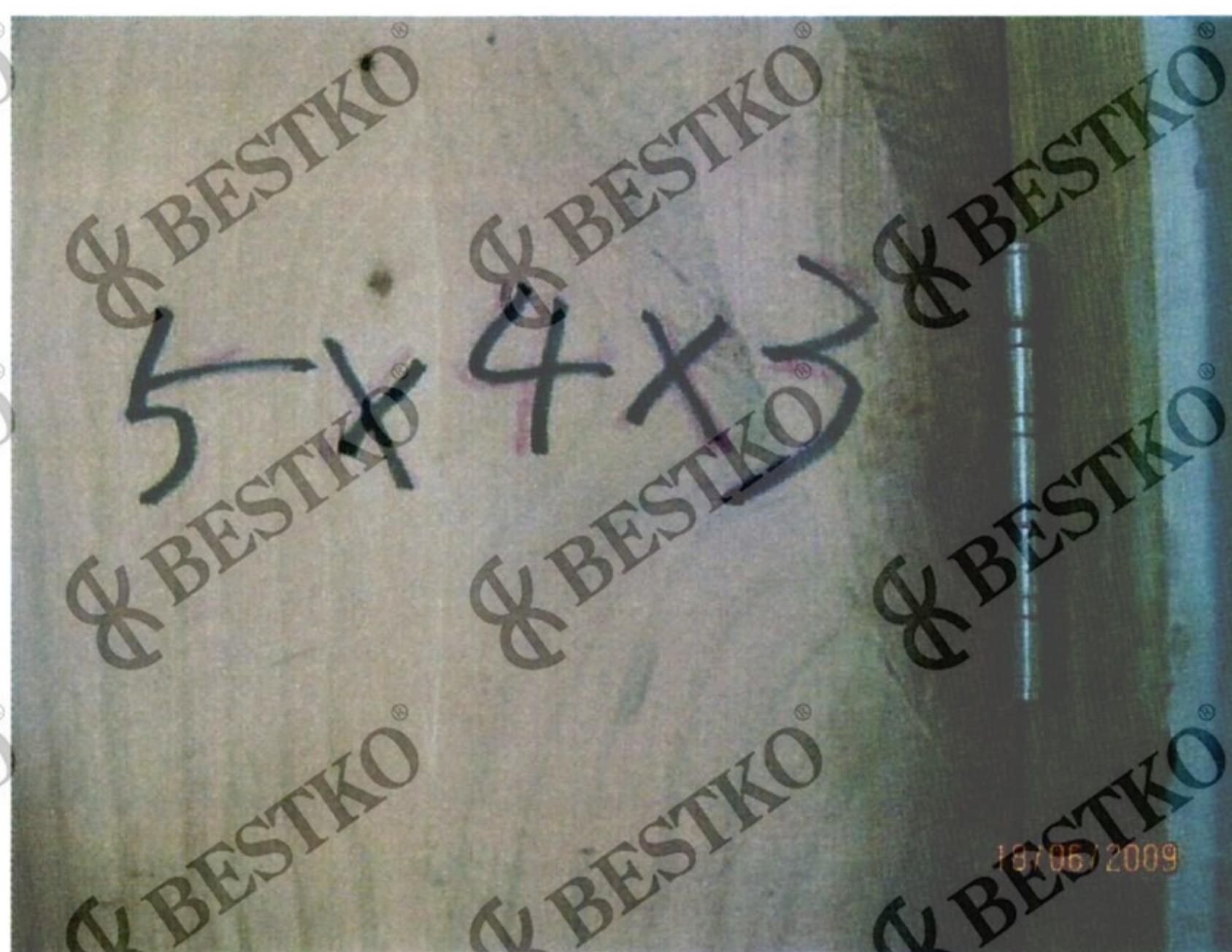


Fig 2 - Exposed Side Prior to the Fire Test

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Fig 3 - Unexposed Side Prior to the Fire Test



Fig 4 – Unexposed Side after 30 Minutes



Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Fig 5 – Unexposed Side after 56 Minutes



Fig 6 – Unexposed Side after 87 Minutes

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Fig 7 – Unexposed Side after 88 Minutes with Cotton Pad Check



Fig 8 - Unexposed Side after the Fire Endurance Test

Intertek

Bestko Precision Limited
Project No. AU09054007

July 7, 2009



Fig 9 - Exposed Side after the Fire Endurance Test



Fig 10 - Exposed Side after the Fire Endurance Test