



**TEST REPORT**

**REPORT NUMBER: 170327014GZU-002**  
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**EVALUATION CENTER**

Intertek Testing Services Shenzhen Ltd. Guangzhou Branch  
No. 9 Nan Xiang San Road, GETDD, Guangzhou, China

**RENDERED TO**

REGAL IDEAS INC.  
#150-7350 Wilson Ave. Delta, BC V4G 1H3

**PRODUCT EVALUATED**

Crystal stair railing application (Stair Horizontal [1])  
Crystal rail horizontal application-fixed to wall (Horizontal [1])

**EVALUATION PROPERTY**

Structural Performance

**Report of testing railing samples in according with specified test methods listed in Section 4 of this report.**

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## **1 Table of Contents**

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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	Testing and Evaluation Methods .....	5
4.1.	GENERAL .....	5
4.2.	CONDITIONING .....	5
4.3.	COMPONENTS .....	5
4.4.	LOAD.....	5
4.5.	VERTICAL UNIFORM LOAD .....	6
4.6.	HORIZONTAL UNIFORM LOAD.....	6
4.7.	VERTICAL CONCENTRATED LOAD .....	6
4.8.	HORIZONTAL CONCENTRATED LOAD .....	6
5	Testing and Evaluation Results .....	7
5.1.	RESULTS AND OBSERVATIONS.....	7
5.2.	STATEMENT OF MEASUREMENT UNCERTAINTY.....	9
6	Conclusion .....	10
7	Appendix A: Sample Information.....	11
8	Revision Page.....	24

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## 2 Introduction

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Intertek has conducted testing for REGAL IDEAS INC. on assembled Crystal Stair Railing Application (Stair Horizontal [1]) and Crystal Rail Horizontal Application-fixed to wall (Horizontal [1]) samples to evaluate structural performance. The testing was conducted in accordance with sections 1607.8.1 "Handrails and Guards" for the use of a residential building, 1709.3.1 "Test Procedure" of International Building Code 2015, section 4.5.1 "Load on Handrail and Guardrail Systems" of ASCE 7-10. The connection of the railing system to the structure was not evaluated. This evaluation began on March 27, 2017 and was completed at April 17, 2017.

## 3 Test Samples

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### 3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client. Samples were not independently selected for testing.

### 3.2. SAMPLE AND ASSEMBLY DESCRIPTION

Submitted samples include 5 models of railing systems, Crystal Stair Railing Application (Stair Horizontal [1]), Crystal Stair Railing Application (Stair Horizontal [2]), Crystal Stair Railing Application (Stair Horizontal [3]), Crystal Rail Horizontal Application-fixed to wall (Horizontal [1]), and Crystal Rail Horizontal Application-not fixed to wall (Horizontal [2]), refer to below Table 1~5 for detail information. The evaluation is based on Crystal Stair Railing Application (Stair Horizontal [1]) and Crystal Rail Horizontal Application-fixed to wall (Horizontal [1]) with professional assessment. Four samples of each evaluated railing system were prepared for testing. Components and assembly drawings can be referenced in Appendix A.

No	Name of commodity	Material	Drawing No.	QTY
1	Stair Horizontal Glass	tempering	ADA-H02	2
2	Crystal Rail Top Mount for Stairs (CRHS)	ADC12	CRH-S01	4
3	Handrail Mounting Bracket for 10mm Glass (HBG)	6063-T5	ADA-A11-1	4
4	Handrail 35° Elbow (HW35)	6063-T5	ADA-A14	1
5	8ft Round Hand/Stair Rail (HR8)	6063-T5	ADA-A06	2
6	Handrail Splice and Join cap (HSC)	6063-T5	ADA-A04-2	4
7	Handrail 90° Wall Return (HW90)	ADC12	ADA-X15-2	1
8	Handrail End Cap (HEC)	70G33L	ADA-PL05-2	1
9	Handrail Sleeve fitting (HSF)	6063-T5	ADA-A15-1	1
10	Handrail Epoxy Mount Bracket for 10mm Glass (HGC)	6063-T5	ADA-A21	2
11	Screw	1022A	RAIL-S02-5	25

Table 2. Crystal Stair Railing Application (Stair Horizontal [2])				
No	Name of commodity	Material	Drawing No.	QTY
1	Stair Horizontal Glass	tempering	ADA-H02	2
2	Crystal Rail Top Mount for Stairs (CRHS)	ADC12	CRH-S01	4
3	Handrail Mounting Bracket for 10mm Glass (HBG)	6063-T5	ADA-A11-1	4
4	Handrail 35°Elbow (HW35)	6063-T5	ADA-A14	1
5	8ft Round Hand/Stair Rail (HR8)	6063-T5	ADA-A06	2
6	Handrail Splice and Join cap (HSC)	6063-T5	ADA-A04-2	4
7	Handrail End Cap (HEC)	70G33L	ADA-PL05-2	1
8	Handrail Sleeve fitting (HSF)	6063-T5	ADA-A15-1	1
9	Handrail Epoxy Mount Bracket for 10mm Glass (HGC)	6063-T5	ADA-A21	2
10	Screw	1022A	RAIL-S02-5	25
11	Wall/Post Bracket (HBW)	6063-T5	HBW	1
12	Handrail Loop Return (HLR)	6063-T5	ADA-A13	1
13	Handrail wall/post return connector (HWC)	6063-T5	ADA-A10	1

Table 3. Crystal Stair Railing Application (Stair Horizontal [3])				
No	Name of commodity	Material	Drawing No.	QTY
1	Stair Horizontal Glass	tempering	ADA-H02	2
2	Crystal Rail Top Mount for Stairs (CRHS)	ADC12	CRH-S01	4
3	Handrail Mounting Bracket for 10mm Glass (HBG)	6063-T5	ADA-A11-1	4
4	Handrail 35°Elbow (HW35)	6063-T5	ADA-A14	1
5	8ft Round Hand/Stair Rail (HR8)	6063-T5	ADA-A06	2
6	Rail Splice and Cap (HSC)	6063-T5	ADA-A04-2	4
7	Handrail End Cap (HEC)	70G33L	ADA-PL05-2	1
8	Handrail Sleeve fitting (HSF)	6063-T5	ADA-A15-1	1
9	Handrail Epoxy Mount Bracket for 10mm Glass (HGC)	6063-T5	ADA-A21	2
10	Screw	1022A	RAIL-S02-5	25
11	Wall/Post Bracket (HBW)	6063-T5	HBW	1
12	Handrail Loop Return (HLR)	6063-T5	ADA-A13	1
13	Wall Return (HW90)	ADC12	ADA-X15-2	1

Table 4. Crystal Rail Horizontal Application-fixed to wall (Horizontal [1])				
No	Name of commodity	Material	Drawing No.	QTY
1	Horizontal Glass	tempering	ADA-H01	2
2	Crystal Rail Horizontal Top Mount (CRH)	ADC12	CRH-S01	4
3	Crystal Rail Wall Bracing Clip (CRBW)	ADC12	CRBW-X01	1
4	Crystal Rail Adjustable Angle and Line Clip(CRBA)	ADC12	CRBA-X01	1
5	Crystal Rail Support Post for End panels or Stairs (CRSP)	6063-T5	CRSP-A01	1
6	Screw	1022A	RAIL-S02-5	4

Table 5. Crystal Rail Horizontal Application-not fixed to wall Horizontal [2]				
No	Name of commodity	Material	Drawing No.	QTY
1	Horizontal Glass	tempering	ADA-H01	2
2	Crystal Rail Horizontal Top Mount (CRH)	ADC12	CRH-S01	4
4	Crystal Rail Adjustable Angle and Line Clip(CRBA)	ADC12	CRBA-X01	1
5	Crystal Rail Support Post for End panels or Stairs (CRSP)	6063-T5	CRSP-A01	2
6	Screw	1022A	RAIL-S02-5	4

## 4 Testing and Evaluation Methods

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### 4.1. GENERAL

The test specimen was loaded at a rate to achieve the specified loads between 10 seconds and 5 minutes. The specified test loads were held for one minute before the load was released.

### 4.2. CONDITIONING

The samples were tested in ambient conditions. No specific conditioning parameters were required before testing.

### 4.3. COMPONENTS

### 4.4. LOAD

A factored load of 125lbf (200lbf for glass) was applied over an area of 1 square foot to several points within the infill of the railing system of panel fillers in accordance with Section 1607.8.1.2 of IBC 2015 and Section 4.5.1 of ASCE 7-10. The factored load included a safety factor of 2.5 (4 for glass), as detailed in section 1709.3.1 (section 2407.1.1 for glass) of IBC 2015. After release of the load, the system was evaluated for failure, any evidence of disengagement of any component and visible cracks in any component.

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#### **4.5. VERTICAL UNIFORM LOAD**

The top rail of the system was subjected to a single test where a factored uniform load of 125lb/foot (200lb/foot for glass) was applied vertically, in accordance with Section 1607.8.1 of IBC 2015 and Section 4.5.1 of ASCE 7-10. The factored load included a safety factor of 2.5 (4 for glass), as detailed in section 1709.3.1 of IBC 2015. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

#### **4.6. HORIZONTAL UNIFORM LOAD**

The top rail of the system was subjected to a single test where a factored uniform load of 125lb/foot (200lb/foot for glass) was applied horizontally, in accordance with Section 1607.8.1 of IBC 2015 and Section 4.5.1 of ASCE 7-10. The factored load included a safety factor of 2.5 (4 for glass), as detailed in section 1709.3.1 (section 2407.1.1 for glass) of IBC 2015. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

#### **4.7. VERTICAL CONCENTRATED LOAD**

A concentrated factored load of 500lb (800lb for glass) was applied vertically to several points along the top of the railing system, in accordance with Section 1607.8.1.1 of IBC 2015 and Section 4.5.1 of ASCE 7-10. The factored load included a safety factor of 2.5 (4 for glass), as detailed in section 1709.3.1 of IBC 2015. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

#### **4.8. HORIZONTAL CONCENTRATED LOAD**

A concentrated factored load of 500lb (800lb for glass) was applied horizontally to several points along the top of the railing system, in accordance with Section 1607.8.1.1 of IBC 2015 and Section 4.5.1 of ASCE 7-10. The factored load included a safety factor of 2.5 (4 for glass), as detailed in section 1709.3.1 of IBC 2015. After release of the load, the system was evaluated for failure, any evidence of disengagements of any component and visible cracks in any component.

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## 5 Testing and Evaluation Results

### 5.1. RESULTS AND OBSERVATIONS

The sample test results are shown in Tables 6 to Table 7 below:

<b>Table 6. Average Test Results of Crystal Stair Railing Application (Stair Horizontal [1]) (Maximum Span: 7.431foot (2265mm); Test Height: 3.002foot (915mm))</b>						
Test	Design Load (lbf)	Factored Test Load (lbf)	Calculated Moment (lbf•foot)	Equivalent Quarter-Point Load (lbf)	Test Load (kN)	Pass/Fail
Component Horizontal Load	50	125	—	—	—	N/A
Midspan Horizontal Concentrated Load	200	500	—	—	500	Pass
Midspan Vertical Concentrated Load	200	500	—	—	500	Pass
Horizontal Concentrated Load on other than Midspan	200	500	—	—	500	Pass
Vertical Concentrated Load on other than Midspan	200	500	—	—	500	Pass
Vertical Uniform Load to Handrail (Per foot)	50	125	863	464	464 <sup>1)</sup>	Pass
Horizontal Outward Uniform Load to Handrail (Per foot)	50	125	863	464	464 <sup>1)</sup>	Pass

Note: 1). Quarter-point loading used.

<b>Table 7. Average Test Results of Crystal Rail Horizontal Application-fixed to wall            (Horizontal [1])            (Test Span: 5.000foot (1524mm, for single glass panel) and 10.361foot (3158mm, for            maximum span of supports); Test Height: 3.402foot (1073mm))</b>						
Test	Design Load (lbf)	Factored Test Load (lbf)	Calculated Moment (lbf•foot)	Equivalent Quarter-Point Load (lbf)	Test Load (lbf)	Pass/Fail
Component Horizontal Load	50	200	—	—	200	Pass
Horizontal Concentrated Load on the top edge of glass midspan	200	800	—	—	800	Pass
Horizontal Concentrated Load on the top edge of glass at the corner adjacent to wall	200	800	—	—	800	Pass
Horizontal Concentrated Load on the top edge of glass at the corner adjacent to horizontal connector	200	800	—	—	800	Pass
Vertical Concentrated Load on the top edge of glass midspan	200	800	—	—	800	Pass
Vertical Concentrated Load on the top edge of glass at the corner adjacent to wall	200	800	—	—	800	Pass
Vertical Concentrated Load on the top edge of glass at the corner adjacent to horizontal connector	200	800	—	—	800	Pass
Vertical Uniform Load for single glass panel (Per foot)	50	200	625	500	500 <sup>1)</sup>	Pass
Vertical Uniform Load for maximum span of supports (Per foot)	50	200	2684	1036	1036 <sup>1)</sup>	Pass
Horizontal Uniform Load for single glass panel (Per foot)	50	200	625	500	500 <sup>1)</sup>	Pass



<b>Table 7. Average Test Results of Crystal Rail Horizontal Application-fixed to wall            (Horizontal [1])            (Test Span: 5.000foot (1524mm, for single glass panel) and 10.361foot (3158mm, for            maximum span of supports); Test Height: 3.402foot (1073mm))</b>						
Test	Design Load (lbf)	Factored Test Load (lbf)	Calculated Moment (lbf•foot)	Equivalent Quarter-Point Load (lbf)	Test Load (lbf)	Pass/Fail
Horizontal Uniform Load for maximum span of supports (Per foot)	50	200	2684	1036	1036 <sup>1)</sup>	Pass

Note: 1). Quarter-point loading used.

## 5.2. STATEMENT OF MEASUREMENT UNCERTAINTY

When determining the test result, measurement uncertainty has been considered.

## 6 Conclusion

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The Crystal Stair Railing Application (Stair Horizontal [1]) and Crystal Rail Horizontal Application-fixed to wall (Horizontal [1]) samples identified in this test report has been evaluated and found to meet the live loads specified in Section 1607.8.1 "Handrails and Guards" for the use of a residential building of International Building Code 2015. The connection of the railing system to the structure was not evaluated. All test results are as presented in Section 5 of this test report.

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

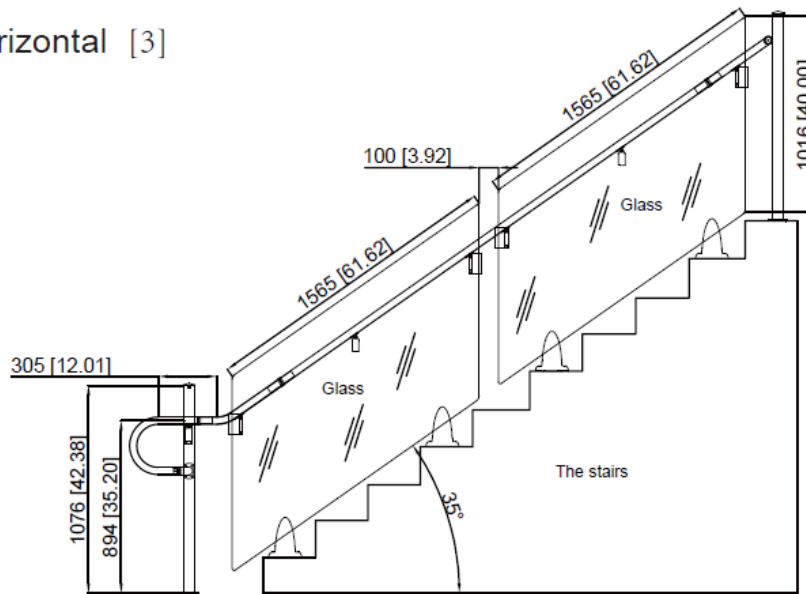
Reported by: Martin Guo  
Martin Guo  
Testing Engineer, Building & Construction

Reviewed by: Jeff Deng  
Jeff Deng  
Assistant Manager, Building & Construction

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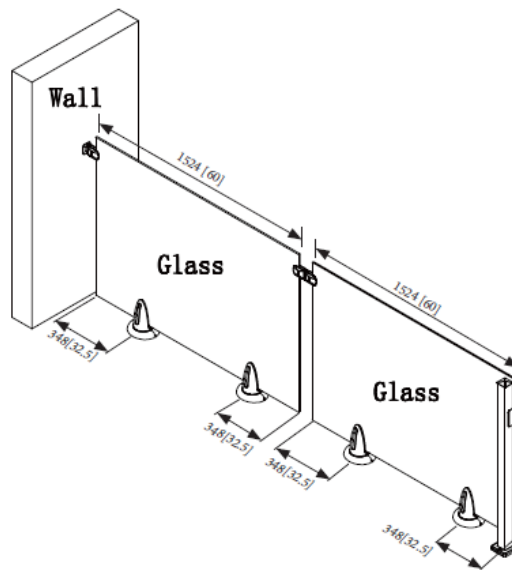


### Stair Horizontal [3]



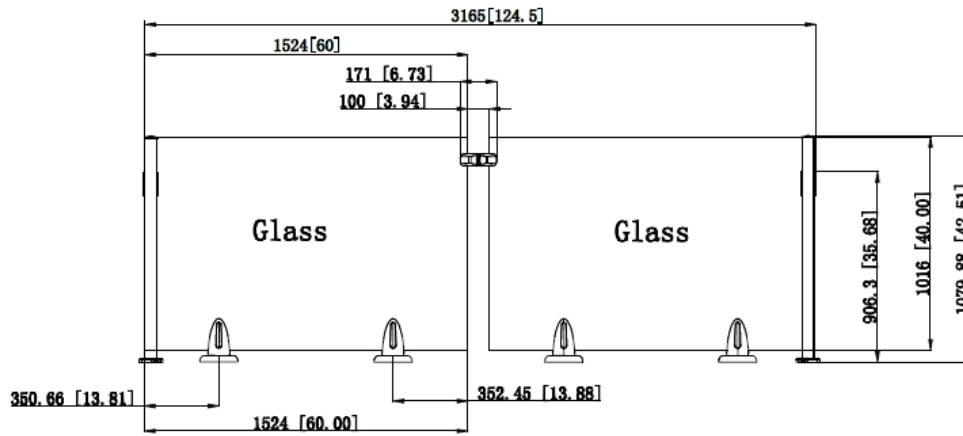
**A.3 Overall view of Crystal Stair Railing Application (Stair Horizontal [3])**

### Horizontal [1]

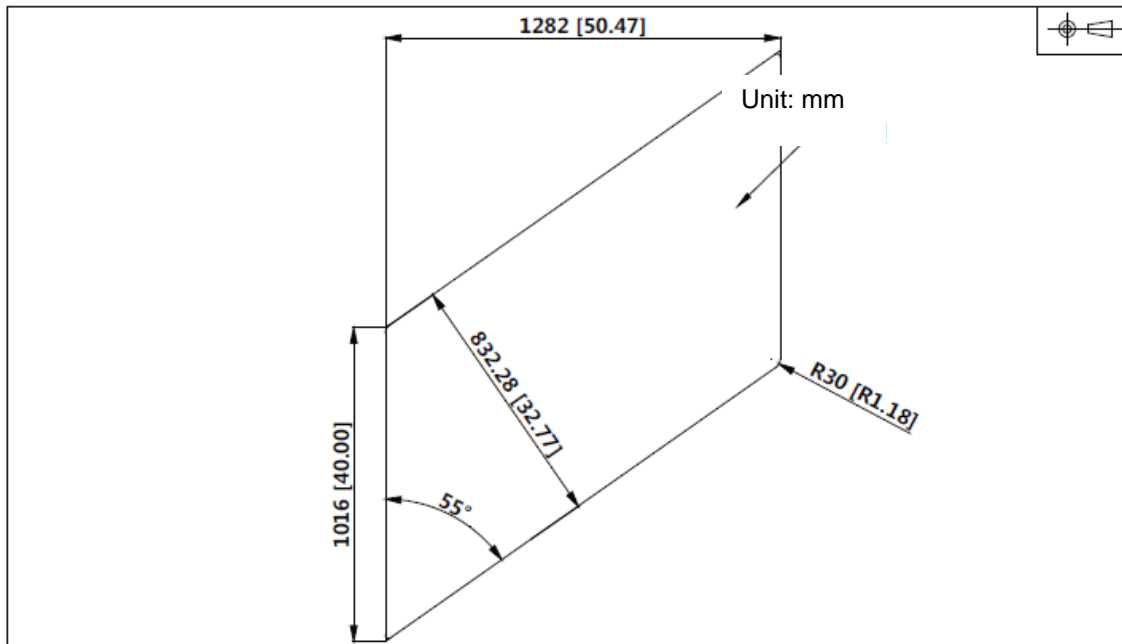


**A.4 Overall view of Crystal Rail Horizontal Application-fixed to wall (Horizontal [1])**

Horizontal [2]

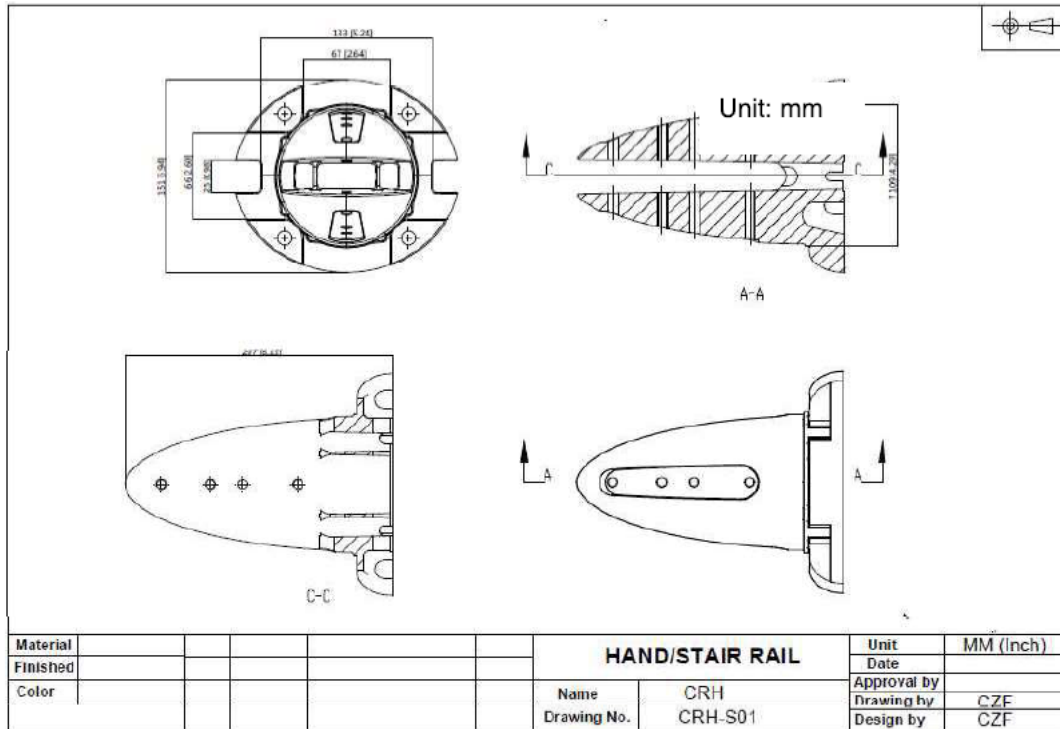


A.5 Overall view of Crystal Rail Horizontal Application-not fixed to wall Horizontal [2]

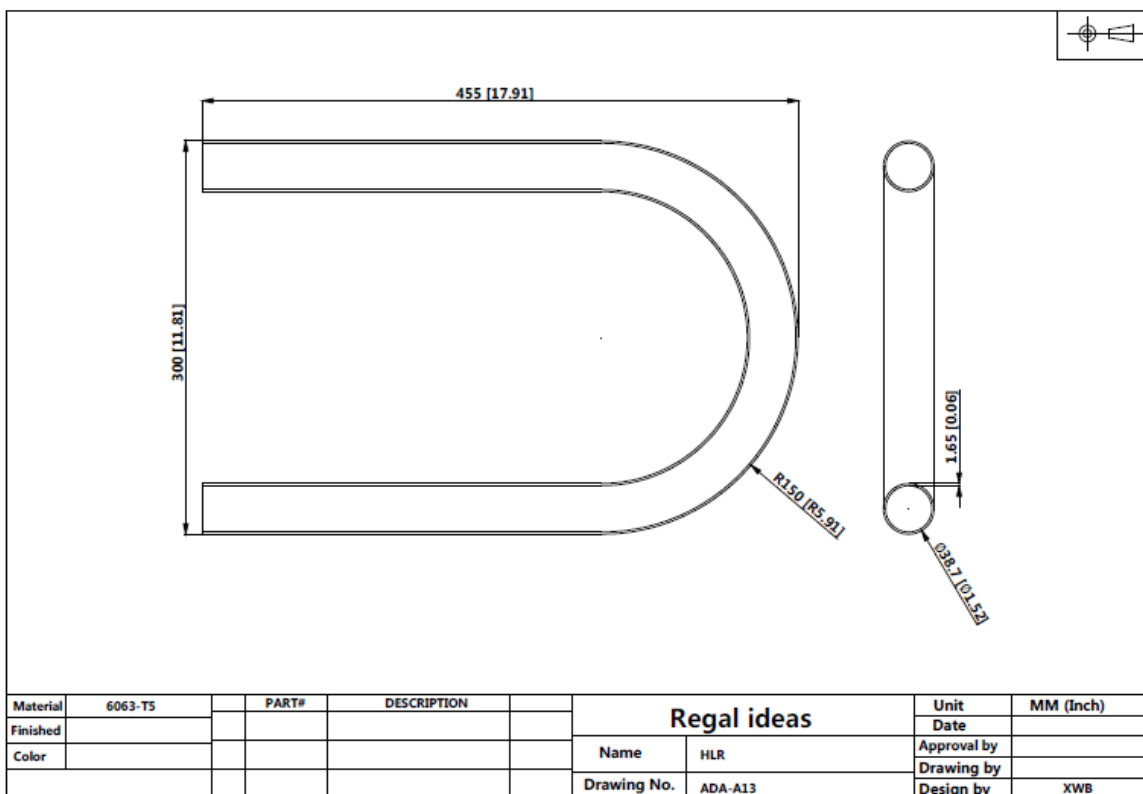


Material	PART#	DESCRIPTION	CRYSTAL RAILING		Unit	MM (Inch)
Finished			Name	CLASS	Date	
Color			Drawing No.	ADA-H02	Approval by	
					Drawing by	
					Design by	XWB

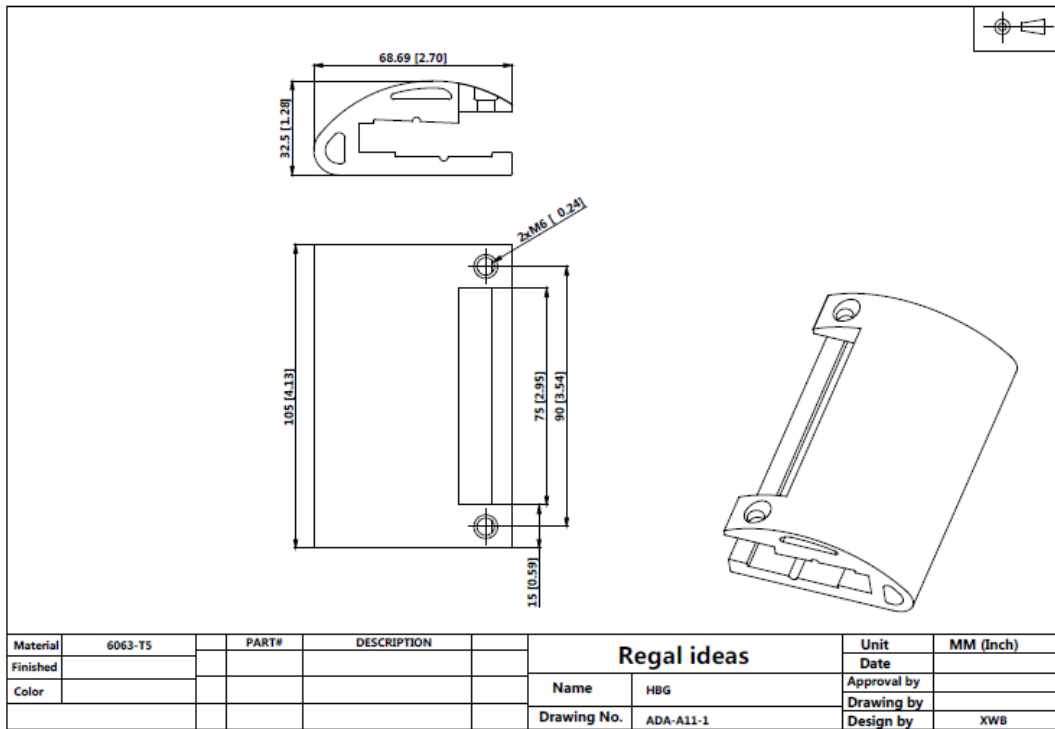
A.6 Drawing of ADA-H02



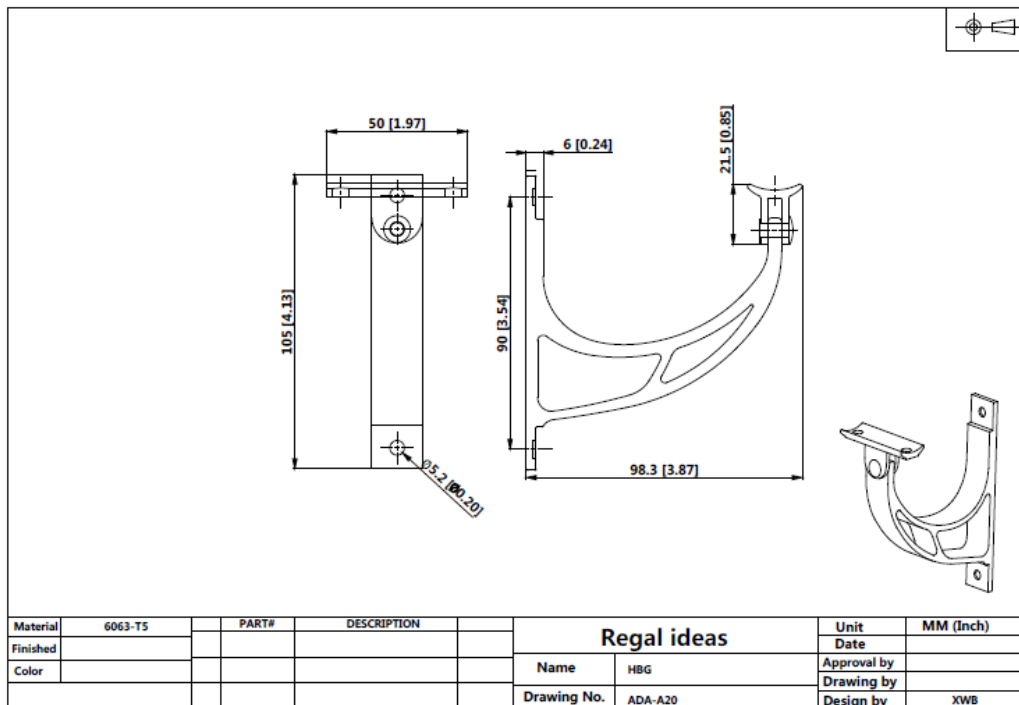
A.7 Drawing of CRH-S01



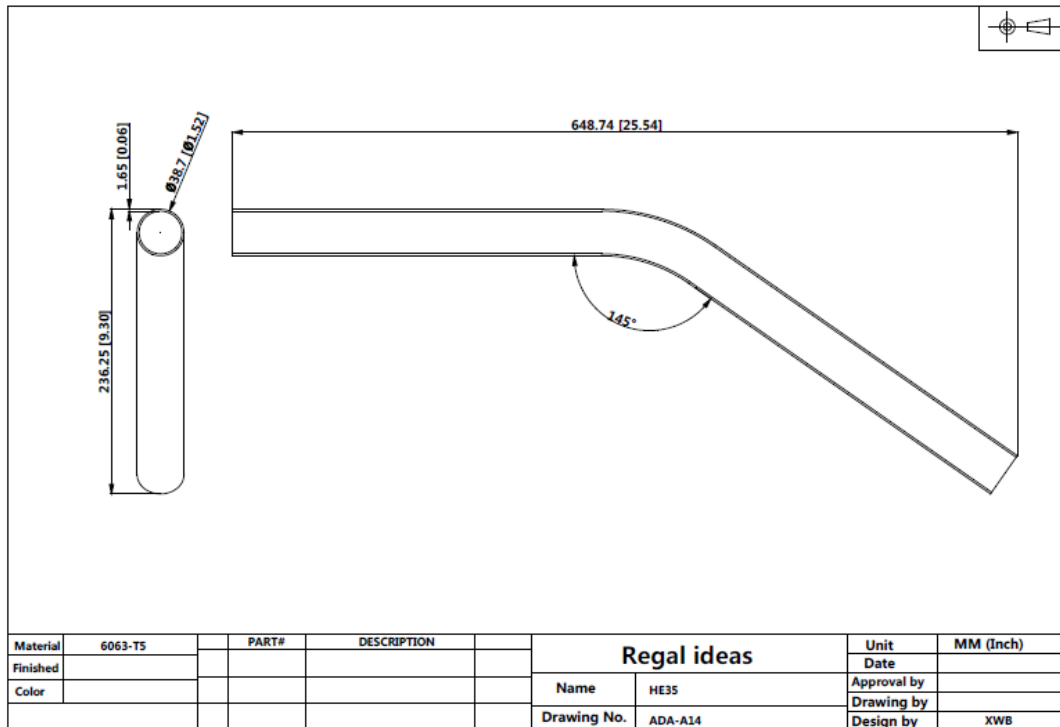
A.8 Drawing of ADA-A13



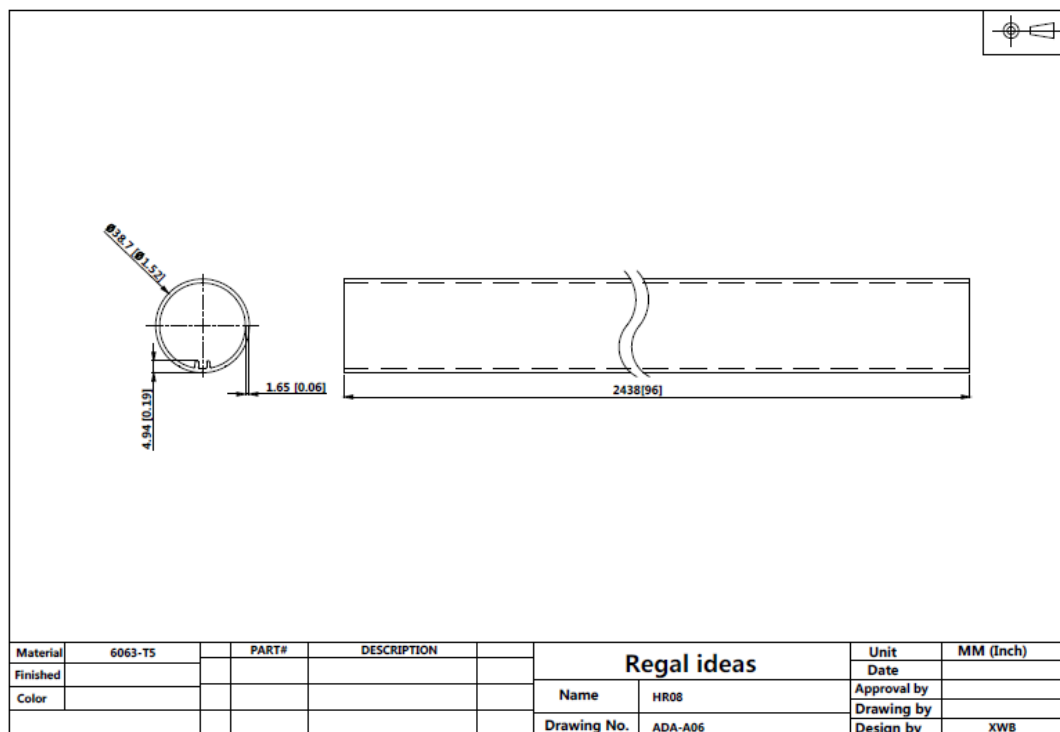
A.9 Drawing of ADA-A11-1



A.10 Drawing of ADA-A20

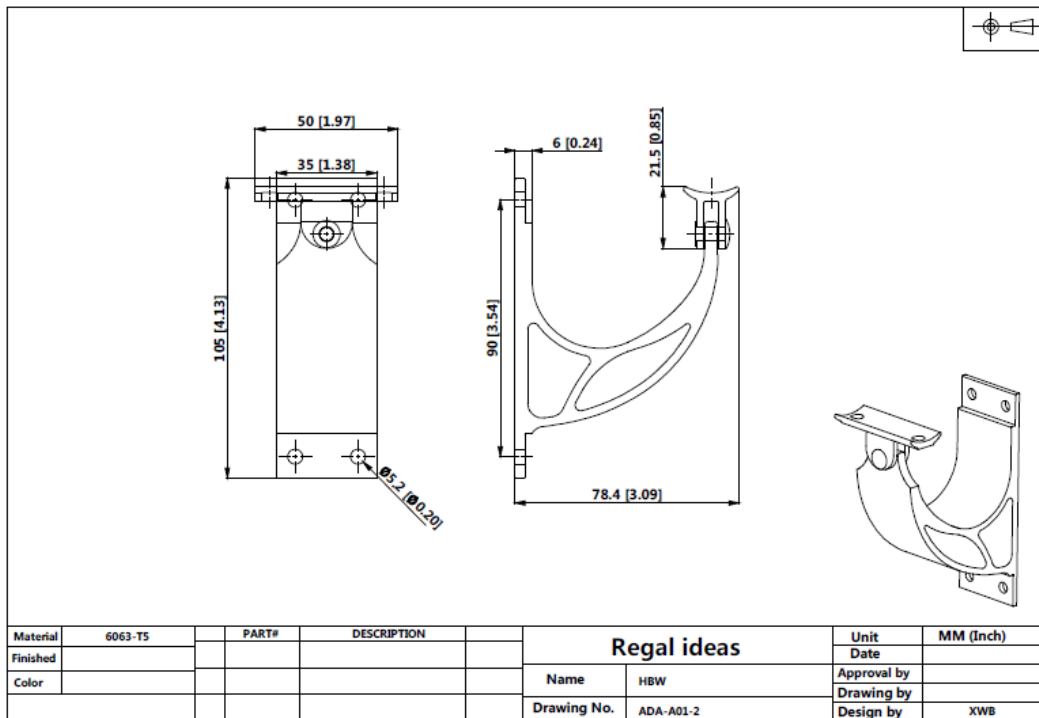


A.11 Drawing of ADA-A14

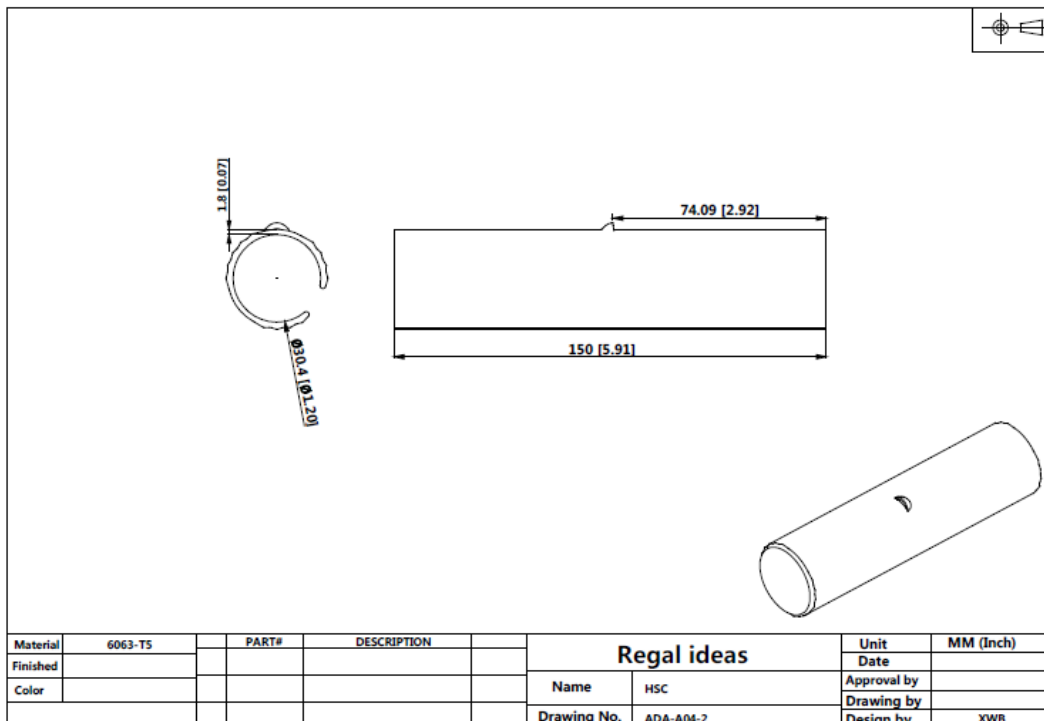


A.12 Drawing of ADA-A06

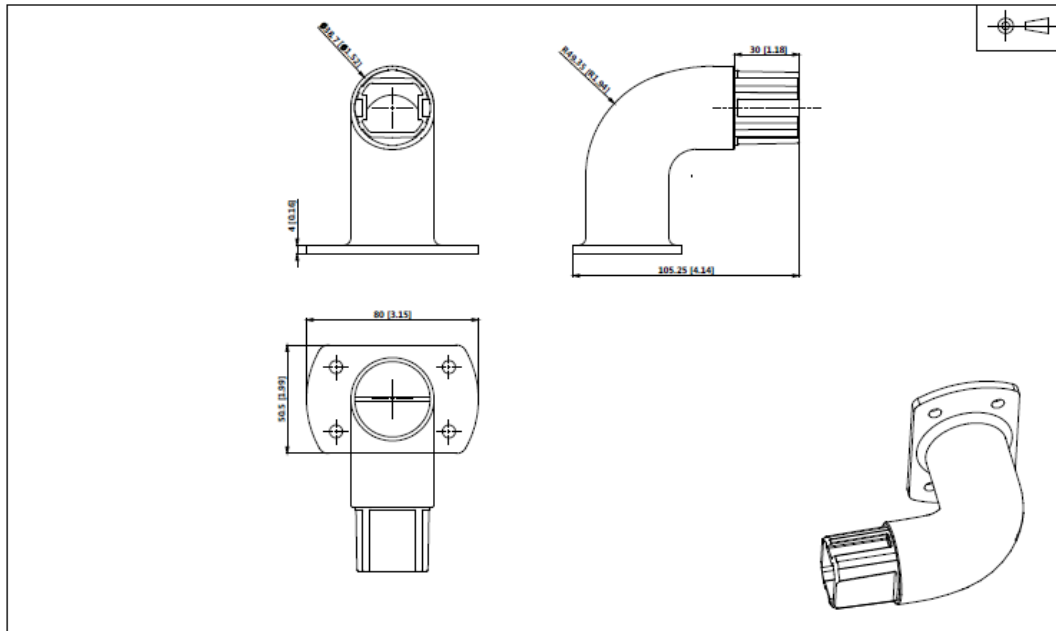




A.13 Drawing of ADA-SEC08(Same as ADA-A02-2)

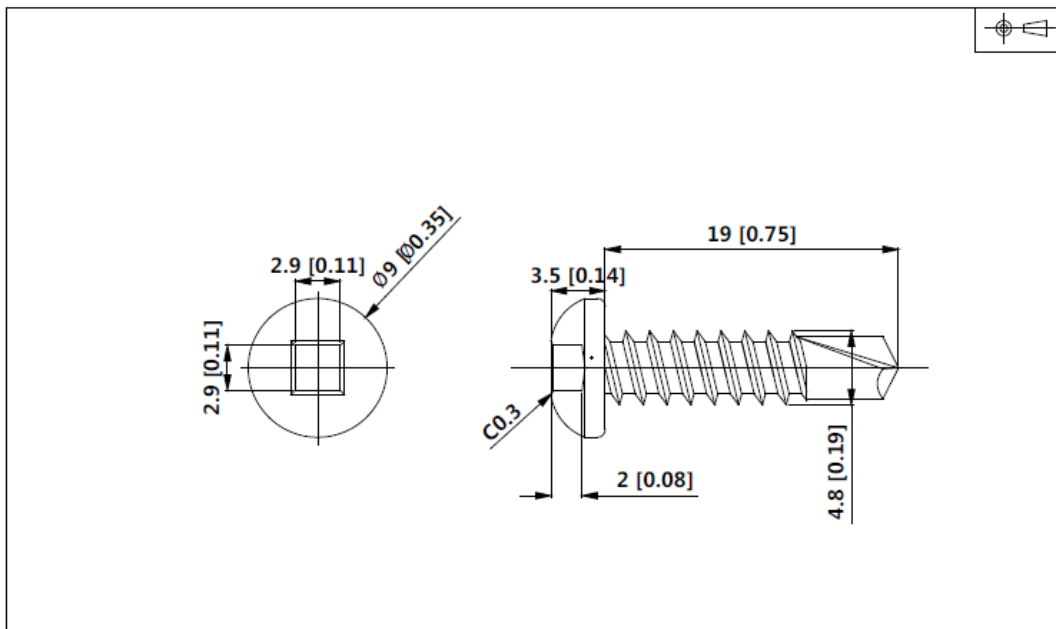


A.14 Drawing of ADA-A04-2



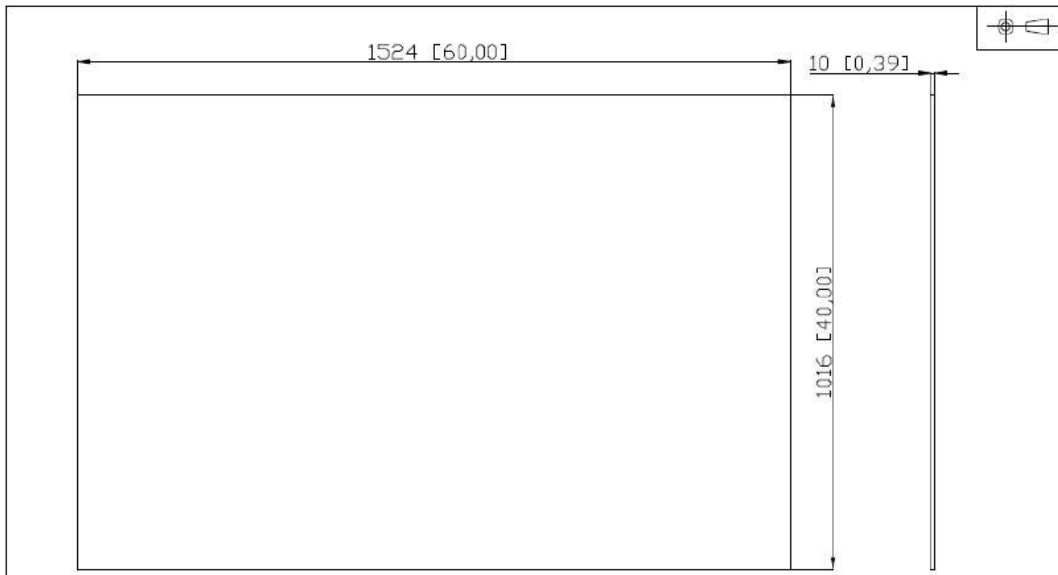
Material	ADC12	PART#	DESCRIPTION	Regal ideas		Unit	MM (Inch)
Finished				Name	HW90	Date	
Color				Drawing No.	ADA-X15-2	Approval by	
						Drawing by	
						Design by	XWB

A.15 Drawing of ADA-X15-2



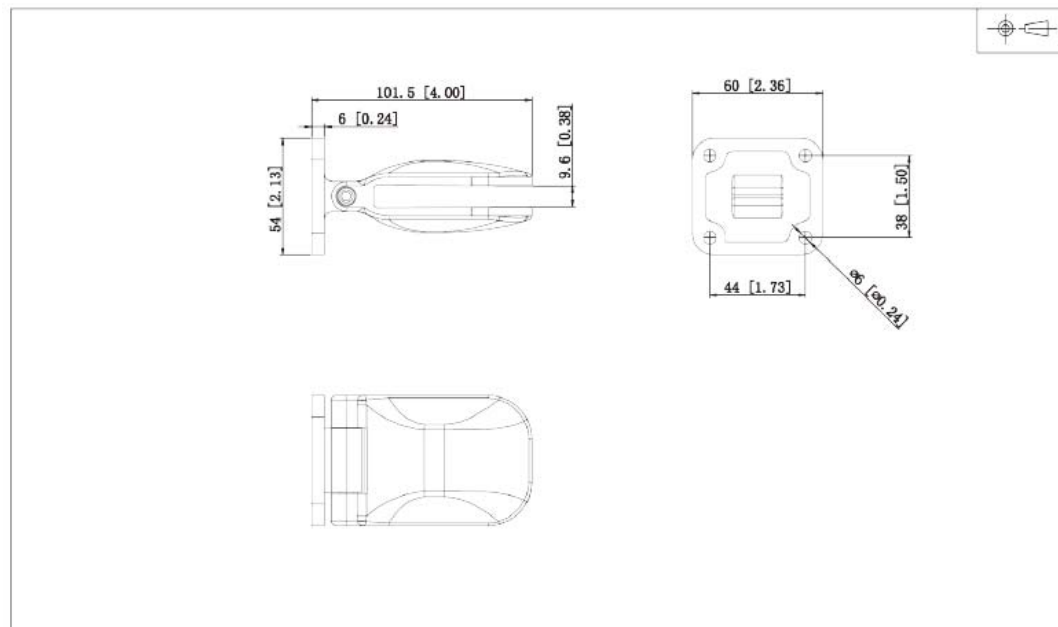
Material		PART#	DESCRIPTION	Regal ideas		Unit	MM (Inch)
Finished				Name	SCREW	Date	
Color				Drawing No.	RAIL-S02-5	Approval by	
						Drawing by	
						Design by	XWB

A.16 Drawing of RAIL-S02-5



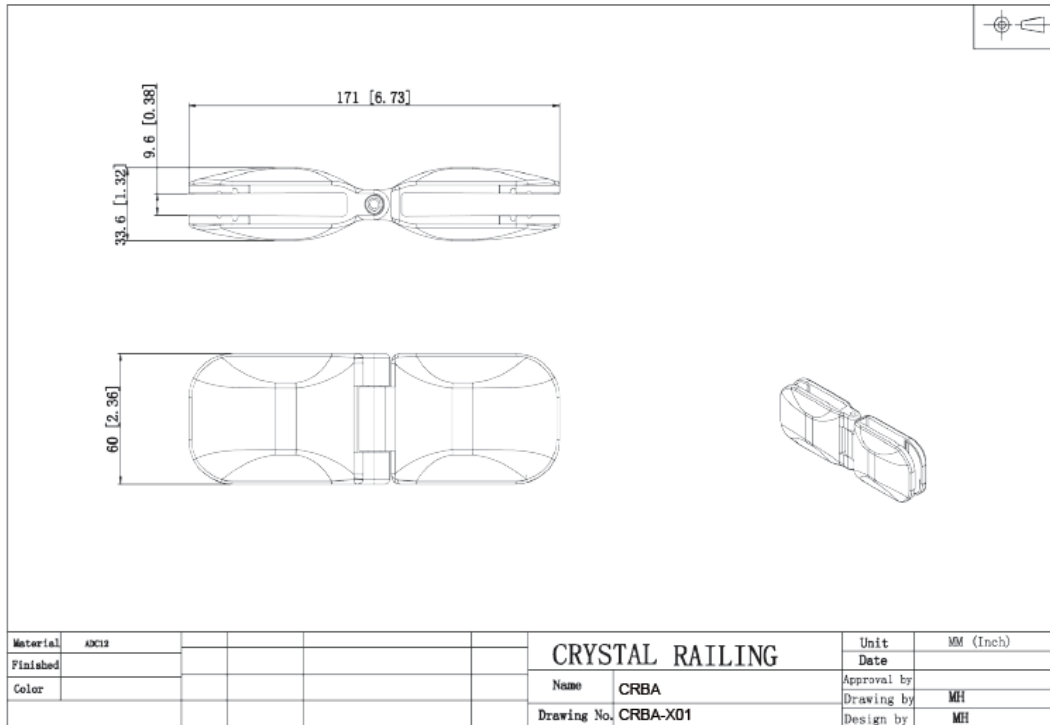
Material	Glass					CRYSTAL RAILING		Unit	MM (Inch)
Finished						Name	Stair Horizontal Glass	Date	
Color						Drawing No.	CRH-H01	Approval by	CZF
								Design by	CZF

**A.17 Drawing of CRH-H01**

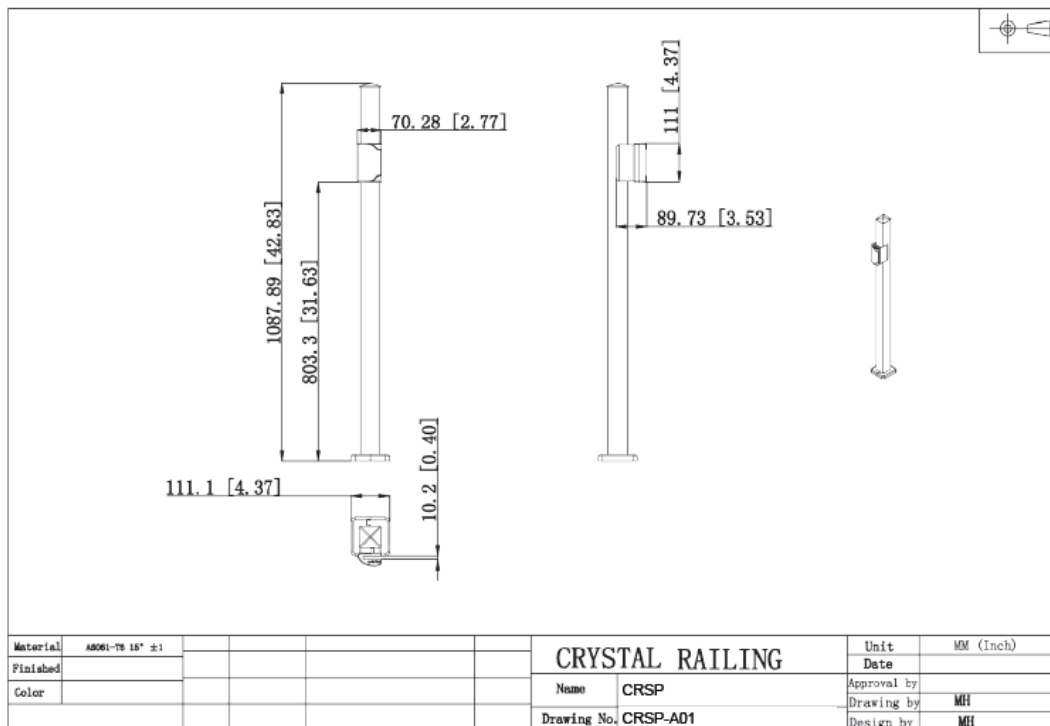


Material	ADC12					CRYSTAL RAILING		Unit	MM (Inch)
Finished						Name	CRBW	Date	
Color						Drawing No.	CRBW-X01	Approval by	MH
								Design by	MH

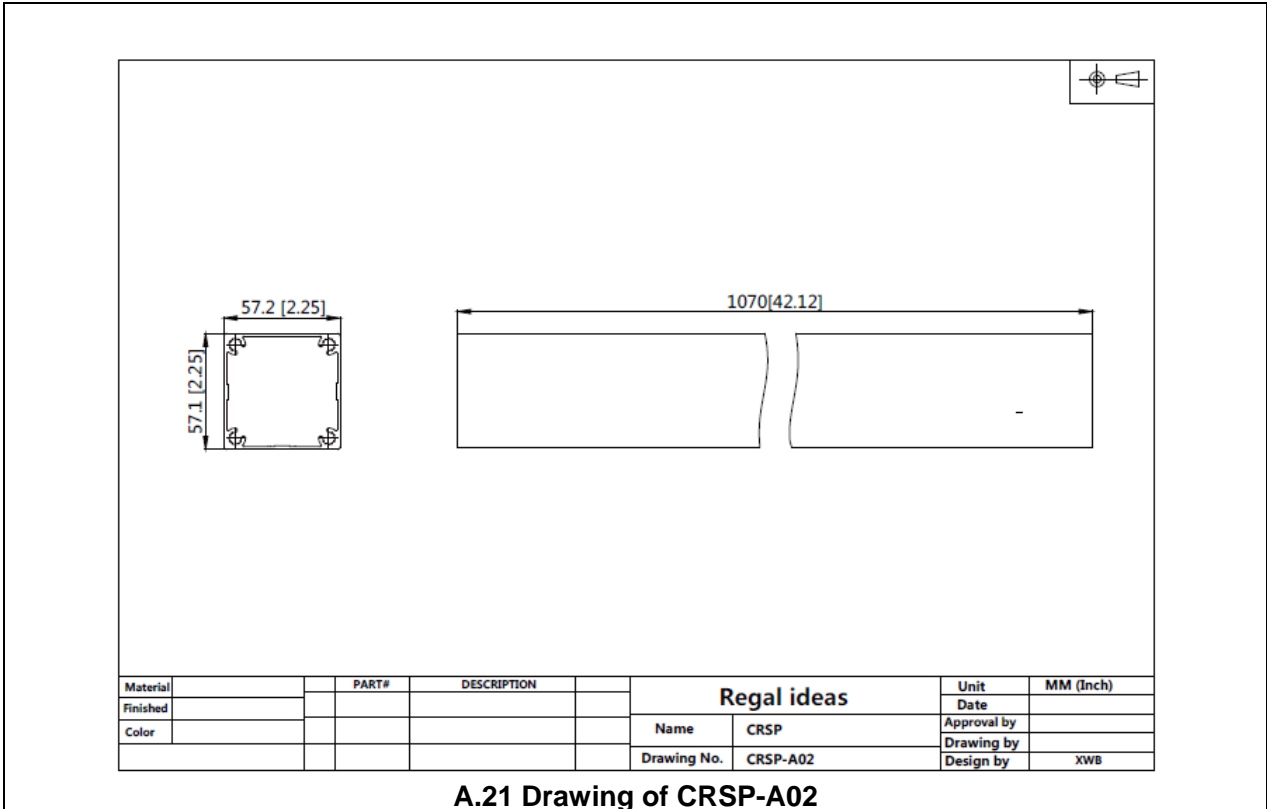
**A.18 Drawing of CRBW-X10**



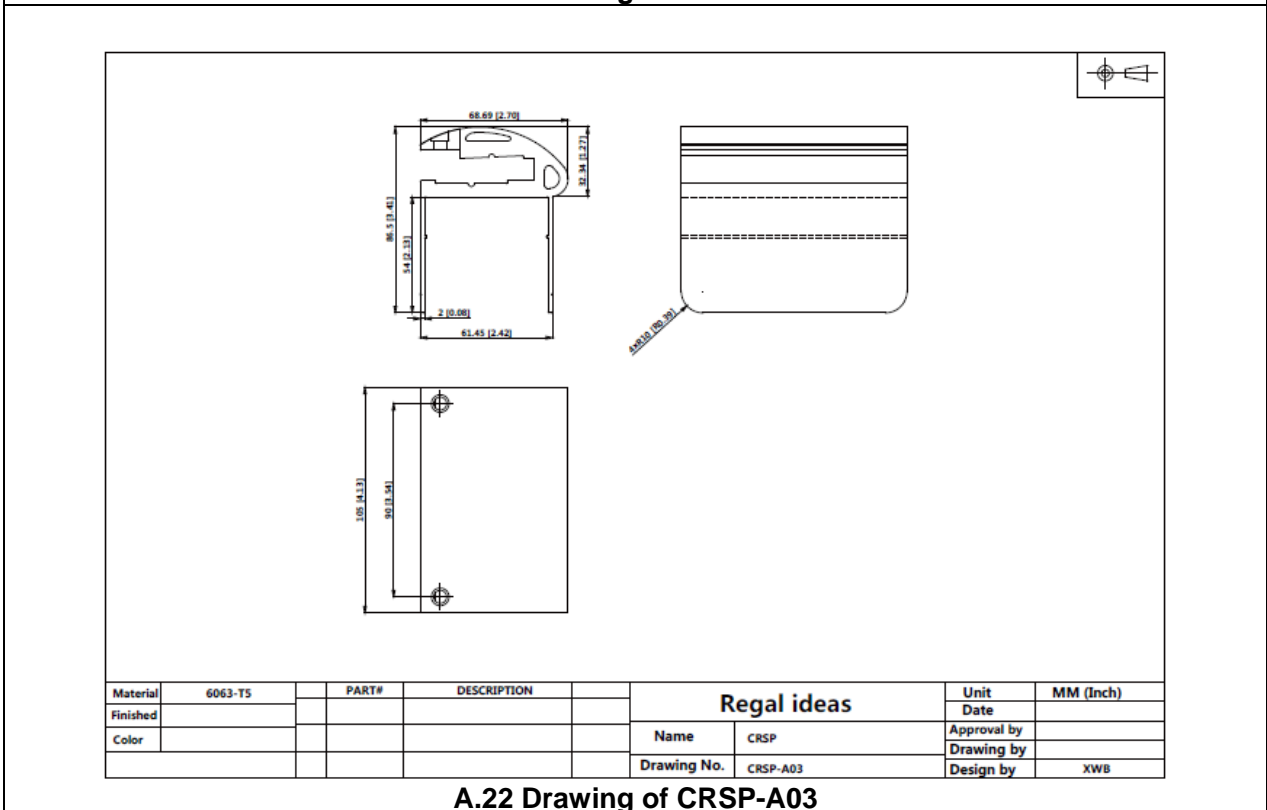
**A.19 Drawing of CRBA-X01**



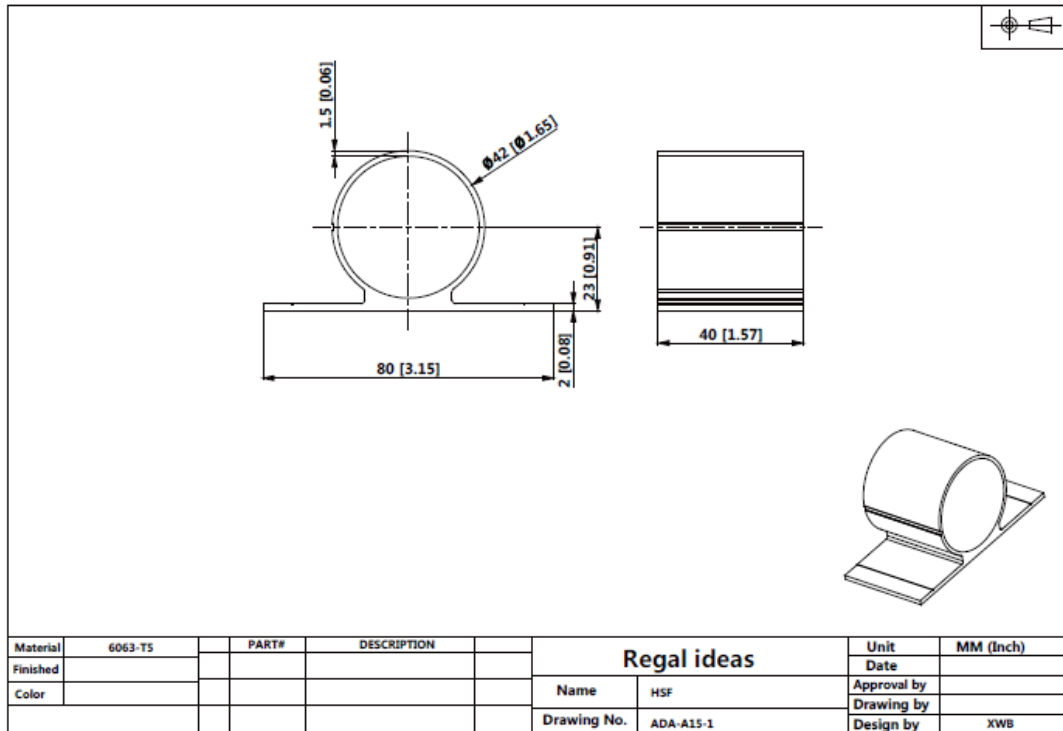
**A.20 Drawing of CRSP-A01**



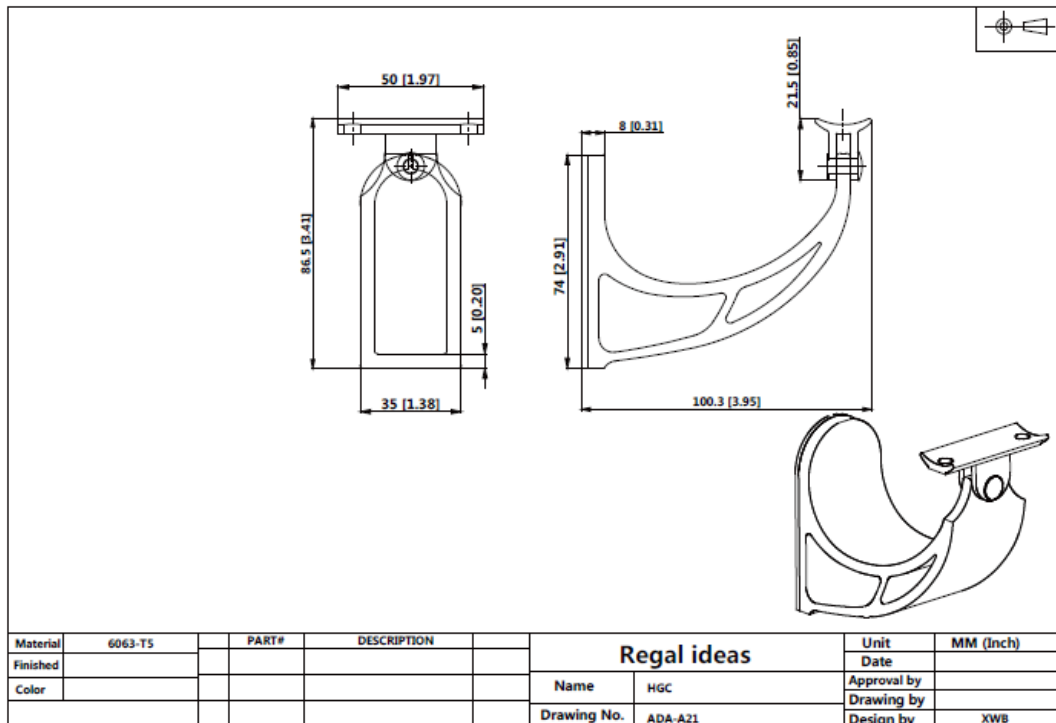
A.21 Drawing of CRSP-A02



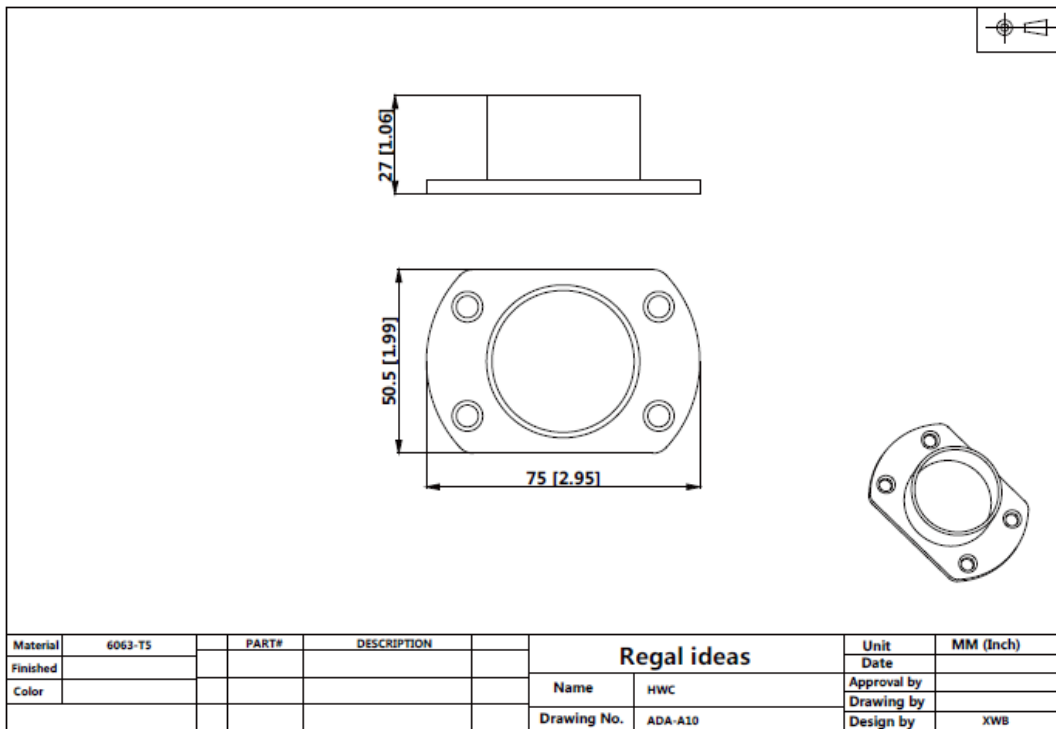
A.22 Drawing of CRSP-A03



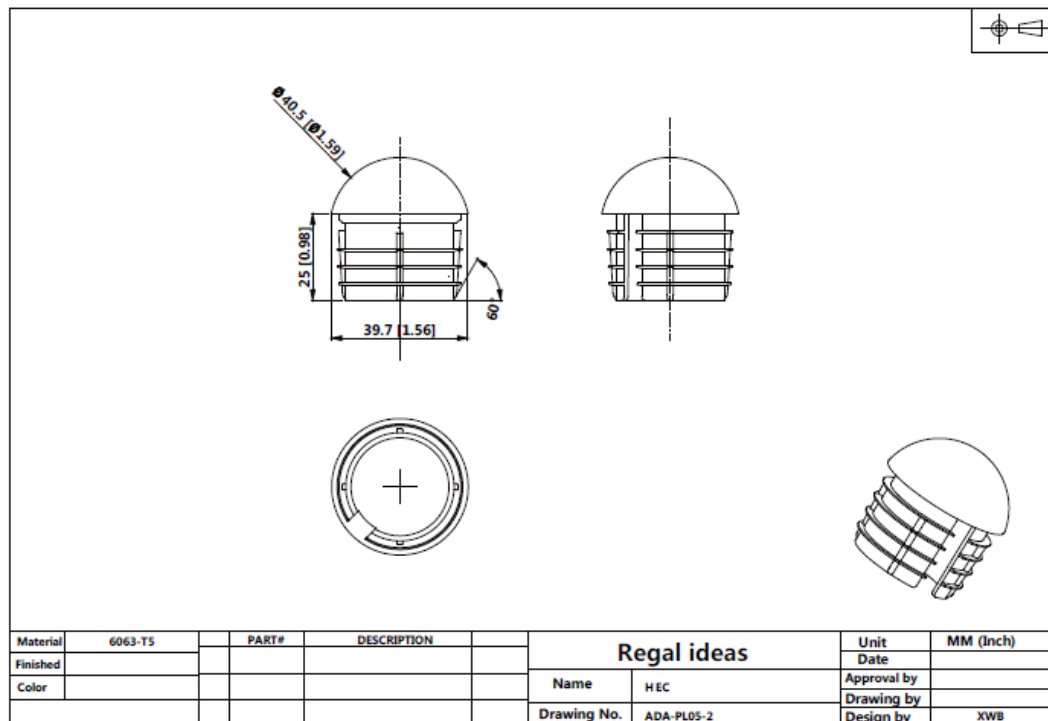
A.23 Drawing of ADA-A15-1



A.24 Drawing of ADA-A21



A.25 Drawing of ADA-A10



A.26 Drawing of ADA-A21

## 8 Revision Page

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<b>Revision No.</b>	<b>Date</b>	<b>Changes</b>	<b>Author</b>	<b>Reviewer</b>
0	2017-04-17	First issue	Martin Guo	Jeff Deng

**END OF DOCUMENT**

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