HARDY FALL PROTECTION SYSTEMS, INC.
HARDY ROOF OUTRIGGER DEVICE TEST REPORT
Specialized Testing Project No. STQA50764

I. TEST PROGRAM OBJECTIVE

The objective of the test program was to develop third-party load test data for the proprietary Hardy Fall Protection Systems Roof Outrigger system utilizing 2 HTB Anchors (HTB 24 Outrigger (Front anchor) and HTB Deck Under-mount (Rear Anchor)). The results of the test program are intended for internal use by Hardy Fall Protection Systems, Inc.

II. TEST DATES

1/17/2020, 1/20/2020, 1/21/2020 and 1/22/2020

III. LABORATORY OF RECORD

The tests were performed at the Santa Fe Springs, CA laboratory of Specialized Testing, Inc., dba Specialized Testing. Specialized Testing is a multi-accredited materials test laboratory including accreditation to ISO/IEC 17025 by the International Accreditation Service. Specialized Testing is accredited to perform mechanical tests on a wide range of construction related products.

IV. TEST SPECIMEN DESCRIPTION

The HTB Outrigger System consists of 1 (one) HTB 24 Outrigger Anchor, 1 (one) HTB Deck Undermount Anchor, and a 16' I-Beam.

The HTB 24 Outrigger Anchor device consists of a 3/4-in. thick x 18-1/2-in. x 18-1/2-in. base plate. The device has 4 (four) 1/4-in. thick x 9-1/4-in. long x 13-in. wide skirts below the 3/4-in. thick plate. The skirts have 8 (eight) holes on each of the sides of the skirts to facilitate 1/4-in. x 3-in. SDS screws and 4 (four) holes to facilitate 7/8-in. diameter bolts. A 4-in. diameter x 24-in. long steel post sits above the 3/4-in. base plate. A 1-in. thick forged eye bolt is welded to the top of the post. The skirts and tube steel post are welded to the 3/4-in. thick plate.

The HTB Deck Undermount Anchor consists of a 1/2-in. thick x 18-1/2-in. x 18-1/2-in. base plate. The device has 4 (four) 1/4-in. thick x 7-1/4-in. long x 13-in. wide skirts below the 1/2-in. thick plate. The skirts have 6 (six) holes on each of the sides of the skirts to facilitate 1/4-in. x 3-in. SDS screws and 2 (two) holes to facilitate 7/8-in. diameter bolts. A 5-in. diameter x 13-in. long steel post sits above the 1/2-in. base plate. The skirts and tube steel post are welded to the 1/2-in. thick plate.

There is a post that works with each of HTB Anchors, the HTB 24 Outrigger Anchor uses a 42" post that slides over the anchor and the HTB Deck Undermount uses a 60" post that slides inside the anchor (Post dimension and pictures are included in the Dimensional Sheets in **Attachment 2, Table 4**).

Included in the HTB Outrigger system is a 16' I-Beam (I-Beam dimension and pictures are included in the Dimensional Sheets in **Attachment 2, Table 5**).

Attachment 1 presents the Hardy Fall Protection Systems, Inc. photo for the laboratory tested specimen and a drawing of the set up.

V. TEST PROGRAM SCOPE

The test program scope was specified by Hardy Fall Protection Systems, Inc. as follows:

- Test three vertical (tension) proof load test. A 5,000-lbs. vertical proof load to be applied with 6' cantilever on the outrigger beam. Post supports are 9' on center, and bottom of outrigger beam is 5' from base.
- Three horizontal (lateral) 2,000-lbs proof load tests in each direction with the force applied at the top of the post, while a 2000-lbs vertical load at the end of the 6' cantilevered beam.

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VI. TEST EQUIPMENT

The test equipment consisted of structural steel reaction elements, test fixtures, a hydraulic pump with load pacing control (to ensure uniform loading), Tapered Roller Bearing (Used to Apply Load), a 10,000-lbs electronic load cell. The test fixtures connected the test equipment to the I-Beam of the Hardy Roof Outrigger device for the Vertical (tension) proof load test. Data was acquired with a PC based system utilizing LabView software by National Instruments. The data acquisition rate was 50 data points per second.
The load cell and the deflections instruments were calibrated by United Calibration Corp., an IAS accredited calibration laboratory.

VII. TEST SETUP

The setup for each test was specified by Hardy Fall Protection Systems, Inc, **Figure 1** presents a photograph of the vertical (tension) proof load test setup and **Figure 2** presents a photograph of the horizontal (lateral) proof load test setup (one of four directions).



Figure 1 – Vertical Proof Load Test Setup
1 = Load Reaction Member, 2 = Tapered Roller Bearing (Used to Apply Load), 3 = Load Cell

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Figure 2 – Vertical Proof Load Test Setup
1 = Load Reaction Frame, 2 = Tapered Roller Bearing (Used to Apply Load), 3 = Load Cell

The dimensional sheets are presented in **Attachment 2 Table 2 - 4**.

VIII. TEST PROCEDURE

The test procedure was specified by Hardy Fall Protections Systems, Inc.

A preload of 250-lbs. was applied to the system to bring all components into bearing and take the slack out of the system. The load was steadily imparted to the anchor until the minimum proof load was achieved. Displacement readings were recorded upon achieving the proof load and after holding the proof load for a minimum duration of 5-minutes. The load was released to the initial 250-lbs. and the final displacement readings were recorded. A visual inspection of the anchor was performed upon completion of the tests.

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IX. TEST RESULTS

Figure 1 presents a photograph of the vertical (tension) proof load test while holding 5000-lbs load. Aluminum Beam flexed approximately 4-in. and **Figure 2** presents Aluminum Beam after the 5,000-lbs load was release, showing the flexed beam returning to the original shape with no visual deformation.

Attachment 2 Table 1 presents a summary of the horizontal (lateral) and vertical (tension) proof load test results



Figure 1 – Vertical (Tension) Proof Load Test During 5,000-lbs Load Hold

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Figure 2 – Aluminum Beam After the Vertical (Tension) 5,000-lbs Proof Load was Released

X. SPECIALIZED TESTING PERSONELL

Following are the names of the Specialized Testing personnel who participated in this test program:

Scott Stevens – Test Report Author and Project Manager
Ricardo Flores – Test Technician
Mario Ayala – Test Technician

XI. SIGNED FOR THE LABORATORY

Scott Stevens

Scott Stevens
Specialized Testing, Inc.

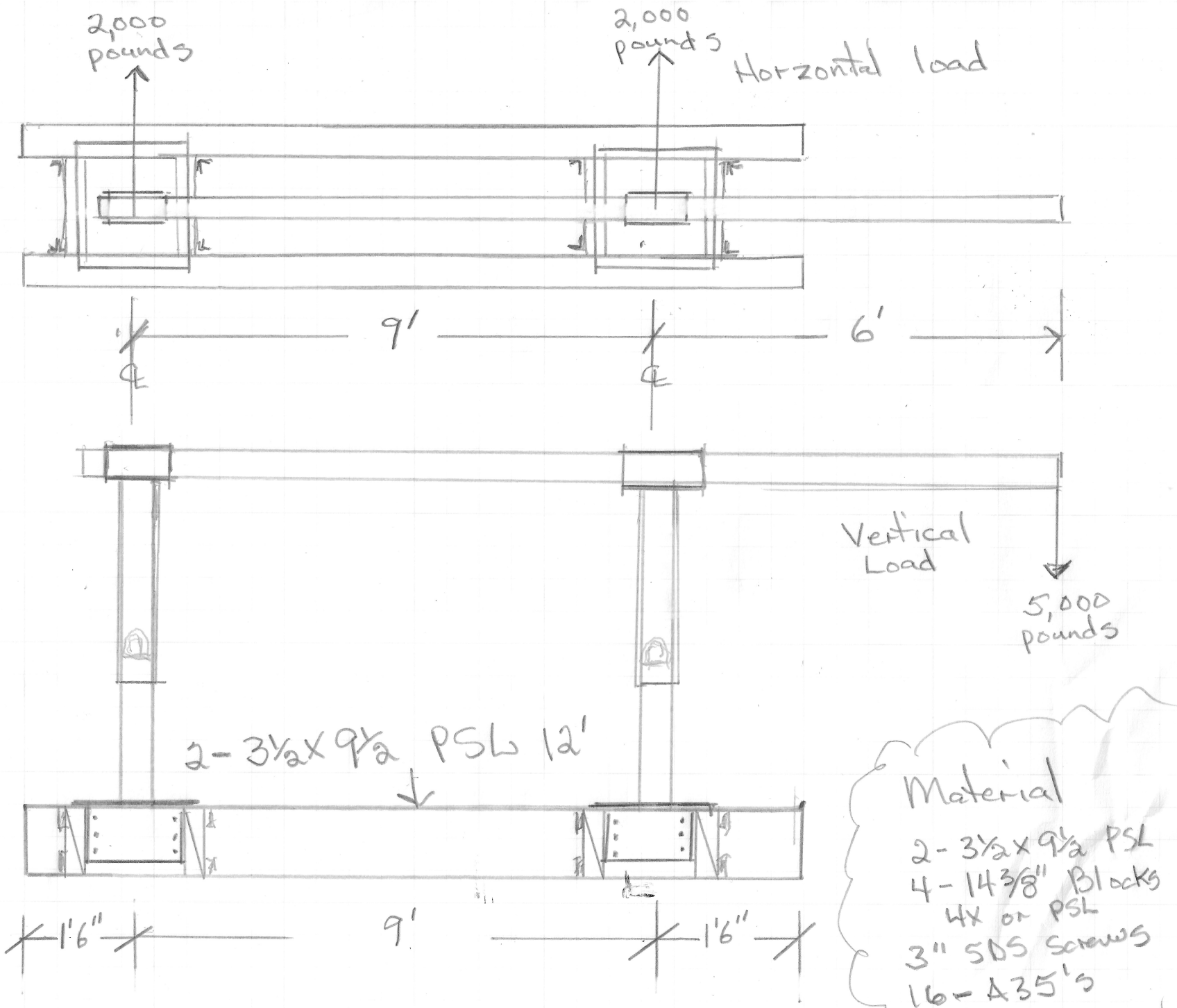
HARDY FALL PROTECTION SYSTEMS, INC.

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ATTACHMENT 1 – PHOTOS OF LABORATORY TESTED SPECEMEN AND SET UP DRAWNING





Material

- 2- 3½ x 9½ PSL
- 4- 14 3/8" Blocks 4X or PSL
- 3" SDS Screws
- 16- A35's

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ATTACHMENT 2 - LATERAL AND VERTICAL LOAD TESTS DATA SHEETS, PLUS DIMENSIONAL DATA SHEET

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HARDY FALL PROTECTION OUTRIGGER SYSTEM WITH 1 HTB24 OUTRIGGER (FRONT) AND 1 HTB DECK UNDERMOUNT (BACK) TEST REPORT
TABLE 1 - TEST RESULTS SUMMARY

Specialized Testing Report Number STQA50764

TEST SERIES	TEST NUMBER	TEST DIRECTION	TEST DESCRIPTION	PROOF LOAD FORCE (LBS)	LOAD AFTER 5-MIN LOAD HOLD	LOAD DROP % AFTER 5-MIN LOAD HOLD	COMMENTS
1	1	Straight Pull-down on Outrigger Beam	Hardy Fall Protection Outrigger System (Level on the Ground)	5,010	4865	2.89	The target load of 5,000-lbs and the 5-minute load hold were achieved. After releaseing the load, no visual evidence of failure or permanent deformation of the Outrigger System were observed.
1	2	Straight Pull-down on Outrigger Beam	Hardy Fall Protection Outrigger System (3" elevation increase on the back of the system)	5,022	4973	0.98	The target load of 5,000-lbs and the 5-minute load hold were achieved. After releaseing the load, no visual evidence of failure or permanent deformation of the Outrigger System were observed.
1	3	Straight Pull-down on Outrigger Beam	Hardy Fall Protection Outrigger System (3" elevation increase on the front of the system)	5,012	4955	1.14	The target load of 5,000-lbs and the 5-minute load hold were achieved. After releaseing the load, no visual evidence of failure or permanent deformation of the Outrigger System were observed.
1	4	Shear / Horizontal	Hardy Fall Protection HTB 24 Outrigger System (Shear test completed while a 2,000-lbs Tension load was applied to the end of the I-Beam)	2,040	2008	1.57	The target load of 2,000-lbs and the 5-minute load hold were achieved. After releaseing the load, no visual evidence of failure or permanent deformation of the Outrigger System were observed.
1	5	Shear / Horizontal (90 degress from test 4)	Hardy Fall Protection HTB 24 Outrigger System (Shear test completed while a 2,000-lbs Tension load was applied to the end of the I-Beam)	2,051	1980	3.46	The target load of 2,000-lbs and the 5-minute load hold were achieved. After releaseing the load, no visual evidence of failure or permanent deformation of the Outrigger System were observed.
1	6	Shear / Horizontal (Opposite direction from test 5)	Hardy Fall Protection HTB 24 Outrigger System (Shear test completed while a 2,000-lbs Tension load was applied to the end of the I-Beam)	2,021	1944	3.81	The target load of 2,000-lbs and the 5-minute load hold were achieved. After releaseing the load, no visual evidence of failure or permanent deformation of the Outrigger System were observed.

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DIMENSIONAL MEASUREMENT REPORT
HARDY FALL PROTECTION OUTRIGGER DEVICE

Date of Test	2/3/2020
Client Name	Hardy Fall Protection Systems, Inc.
Work Order Number	STQA50764
Product Name	Hardy Fall Protection HTB 24-OUTRIGGER Device (Anchor)
Technicians Name	Mario Ayala
Test Equipment	Mitutoyo Digital Calipers and Tape Measure
Test Standards	Client Specifications

Dimensions	Reading in.	Tolerance	Dimensions	Reading in.	Tolerance
Eye Bolt Thickness	1.040	1.038 - 1.041	**Skirt Thickness**	0.260	0.259 - 0.261
Eye Bolt Height	4.583	4.582 - 4.585	**Skirt Width 1**	12.940	12.937 - 13.066
Eye Bolt Hole Diameter	2.027	2.026 - 2.027	**Skirt Width 2**	12.960	
			Skirt Width 3	12.938	
Post Height	24.157	24.155 - 24.157	**Skirt Width 4**	13.064	
Post Diameter	4.032	4.031 - 4.033	**Skirt Height 1**	9.225	9.224 - 9.226
			Skirt Height 2	9.229	
Base Plate Thickness	0.760	0.759 - 0.760	**Skirt Height 3**	9.225	
Base Plate Width	18.444	18.442 - 18.446	**Skirt Height 4**	9.225	
Base Plate Length	18.465	18.464 - 18.466			
			Screw Hole Diam.	0.293	0.292 - 0.293
			Bolt Holes Diam.	0.924	0.923 - 0.925

Notes:



HTB 24 Outrigger



HTB 24 Outrigger w/post attached

Photograph of the Hardy HTB 24 Outrigger Device

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DIMENSIONAL MEASUREMENT REPORT
HARDY FALL PROTECTION OUTRIGGER DEVICE

Date of Test	2/3/2020
Client Name	Hardy Fall Protection Systems, Inc.
Work Order Number	STQA50764
Product Name	Hardy Fall Protection HTB Deck Undermount Outrigger Device (Anchor)
Technicians Name	Mario Ayala
Test Equipment	Mitutoyo Digital Calipers and Tape Measure
Test Standards	Client Specifications

Dimensions	Reading in.	Tolerance	Dimensions	Reading in.	Tolerance
Eye Bolt Thickness	N/A		**Skirt Thickness**	0.270	0.268 - 0.271
Eye Bolt Height	N/A		**Skirt Width 1**	12.876	12.857 - 12.919
Eye Bolt Hole Diameter	N/A		**Skirt Width 2**	12.858	
			Skirt Width 3	12.916	
Post Height	13.070	13.069 - 13.071	**Skirt Width 4**	12.868	
Post Diameter	5.006	5.004 - 5.007	**Skirt Height 1**	7.265	7.260 - 7.275
			Skirt Height 2	7.274	
Base Plate Thickness	0.507	0.506 - 0.508	**Skirt Height 3**	7.261	
Base Plate Width	18.513	18.511 - 18.515	**Skirt Height 4**	7.270	
Base Plate Length	18.568	18.567 - 18.569			
			Screw Hole Diam.	0.264	.263 - .264
			Bolt Holes Diam.	0.915	.914 - .916

Notes:



HTB Deck Undermount Outrigger



HTB Deck Undermount Outrigger w/ post installed

Photograph of the Hardy Deck Undermount Outrigger Device

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DIMENSIONAL MEASUREMENT REPORT
HARDY FALL PROTECTION OUTRIGGER DEVICE

Date of Test	2/3/2020
Client Name	Hardy Fall Protection Systems, Inc.
Work Order Number	STQA50764
Product Name	Hardy Fall Protection Outrigger Device (Posts)
Technicians Name	Mario Ayala
Test Equipment	Mitutoyo Digital Calipers and Tape Measure
Test Standards	Client Specifications

HTB 25 Outrigger Post			HTB Deck Undermount Outrigger Post		
Dimensions	**Reading in.**	**Tolerance**	**Dimensions**	**Reading in.**	**Tolerance**
Beam Holder Height	6.038	6.037 - 6.038	**Beam Holder Height**	6.021	6.02 - 6.022
Beam Holder Length	10.012	10.011 - 10.013	**Beam Holder Length**	10.003	10.002 - 10.005
Beam Holder Thickness	0.240	.244 - .245	**Beam Holder Thickness**	0.245	.244 - .245
Post Height	42.010	42.000 - 42.012	**Post Height**	60.012	60.00 - 60.013
Post Diameter	5.010	5.009 - 5.011	**Post Diameter**	4.038	4.038 - 4.039
Post Thickness	0.400	.399 - .401	**Post Thickness**	0.315	.314 - .316

Notes:





Photograph of the Hardy Outrigger Posts Device

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DIMENSIONAL MEASUREMENT REPORT
HARDY FALL PROTECTION OUTRIGGER DEVICE

Date of Test	2/3/2020
Client Name	Hardy Fall Protection Systems, Inc.
Work Order Number	STQA50764
Product Name	Hardy Fall Protection Outrigger Device (I-Beam)
Technicians Name	Mario Ayala
Test Equipment	Mitutoyo Digital Calipers and Tape Measure
Test Standards	Client Specifications

Dimensions	Reading in.	Tolerance	Dimensions	Reading in.	Tolerance
I-Beam Length	192.001	191.996 - 192.002			
I-Beam Height	5.000	4.997 - 5.001			
I-Beam Width	5.000	4.996 - 5.001			
I-Beam Edge Thickness	0.340	.339 - .341			
I-Beam Center Thickness	0.314	.313 - .314			

Notes:



Photograph of the Hardy Outrigger I-Beam Device

HARDY FALL PROTECTION SYSTEMS, INC.

HARDY ROOF OUTRIGGER DEVICE TEST REPORT

Specialized Testing Project No. STQA50764

ATTACHMENT 3 – Mill Certs for Aluminum I-Beam

KAISER ALUMINUM
FABRICATED PRODUCTS

CERTIFIED TEST REPORT

http://Online.KaiserAluminum.com

KAISER ALUMINUM
FABRICATED PRODUCTS, LLC
6250 EAST BANDINI BLVD
LOS ANGELES, CA 90040-3168

CUSTOMER PO NUMBER:	CUSTOMER PART NUMBER:	PRODUCT DESCRIPTION		
W3941-4	5H313	5.000 X 5.000 X .312 AS II BEAM		
KAISER ORDER NUMBER:	LINE ITEM:	SHIP DATE:	KAISER LOT NUMBER:	ALLOY:	TEMPER
5114474	004	11/22/2019	HI102-197	6061	T6
WEIGHT SHIPPED:	QUANTITY:	B/L NUMBER:	DIAM/DAF/THKNS:	WIDTH:	LENGTH:
1624.000 LB	10.000 PCS	541998			25.000 FT

SHIP TO:
SUMMIT STEEL
6362 STATION DRIVE
HUNTINGTON BEACH
CA 92648 (714) 898-3432

SOLD TO:
SUMMIT STEEL
6362 STATION DRIVE
HUNTINGTON BEACH
CA 92648 (714) 898-3432

Actual Physical Properties

REFERENCE	DASH#	SAMPLE#	UTS (KSI)	YTS (KSI)	ELONG%	HARDNESS	CONDUCT.	BEND
HI102-197	0001	0001	42.1	40.0	19.0	RE 95	N/A	N/A
HJ102-197	0001	0002	42.3	39.6	18.0	RE 96	N/A	N/A

Chemical Composition (wt%), Aluminum Remainder

LIMITS	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Pb	Bi	Zr	Ea	Tot
Maximum	0.8	0.70	0.40	0.15	1.2	0.35	0.25	0.15	NA	NA	NA	0.05	0.15
Minimum	0.40		0.15		0.8	0.04			NA	NA	NA		
042441	.68	.34	.20	.08	.92	.08	.04	.02	.00	.00	.00	.01	.03

Applicable Requirements:

ASTM-B308-10-STENCILED EXCEPT HARDNESS TESTING PER 10.2 TENSILE SAMPLING FREQ
ASTM-B221-14, AMS-QQ-A-200/8A AMS-QQ-A-200/16 UNS#A96061 ASME-SB221 2009 SECT II
Also conforms to EN 10204 3.1

Miscellaneous Notes

MANUFACTURED IN USA MELTED IN USA
MERCURY IS NOT UTILITZED BY KAISER ALUMINUM IN THE MANUFACTURE OF THIS MATERIAL.
STUCTURAL PIPE, TUBE AND HOLLOW PROFILES ARE NOT INTENDED FOR PRESSURE OR FLUID CARRYING APPLICATIONS PER ASTM B429. ANY EXCEPTIONS/CONDITIONS ON QUOTE AND ACKNOWLEDGMENT ARE INTEGRAL TO THIS MATERIAL CERT.
MATERIAL COMPLIES WITH FAR 52.225-1, BUY AMERICAN ACT-SUPPLIES, DFARS 252.225-7001 BUY AMERICAN ACT & BAL OF PAYMENTS PGM, AND FAR 52.225-5 TRADE AGREEMENTS.

Plant Serial: 00463840
Kaiser Order Number: 5114474
Line Item: 004

KAISER ALUMINUM
FABRICATED PRODUCTS

CERTIFIED TEST REPORT

http://Online.KaiserAluminum.com

KAISER ALUMINUM
FABRICATED PRODUCTS, LLC
6250 EAST BANDINI BLVD
LOS ANGELES, CA 90040-3168

CERTIFICATION

Kaiser Aluminum Fabricated Products, LLC hereby certifies that metal shipped under this order has been inspected and tested and found in conformance with applicable specifications forming a part of the description set forth in Kaiser's sales acknowledgement form. Any warranty is limited to that shown on Kaiser's general terms and conditions of sale. Test reports are on file, subject to examination.

Luis Myzel, Quality Supervisor

CUSTOMER _____

P.O. NO. _____

APPROVED _____ DATE _____

TITLE _____

Plant Serial: 00463840
Kaiser Order Number: 5114474
Line Item: 004