



L I P P E R T
C O M P O N E N T S™

Test Report No. 1000

Ice House Shackle Mount Testing

Test Date: October 24, 2014

Plant #: 19

Created by: Jennifer Welling
Report Date: October 24, 2014

2703 College Avenue-Goshen, IN 46528

Phone: (574)-535-1125

www.lci1.com

OBJECTIVE

Evaluate and compare strength between three ice house shackle mount weldment designs.

TEST SPECIMENS

- 2 – 361537 – Current production design
- 2 – 361537 – Current production design with proposed repairs
- 2 – 249859 – Past design

TEST FIXTURE / EQUIPMENT

Instron Universal Testing Machine

TEST OVERVIEW

Each of the six hanger weldment designs were attached to a special fixture in the Instron machine. The fixture was built so that the machine would only apply compression force to the shackle pin location on the shackle mounting block. The test fixture is shown in Figures 1 and 2. The load vs. position data was then collected from the machine for each design.

RESULTS

A quick summary of the results can be seen in Table 1 below.

Sample Description	Peak Load (lbf.)	Peak Position (in.)
Current Production Design #1	20,000	2.07
Current Production Design #2	19,416	2.36
Current Production Design with Proposed Repairs #1	32,417	1.53
Current Production Design with Proposed Repairs #2	33,511	1.61
Former Design #1	20,931	1.87
Former Design #2	19,981	1.70

Table 1: Results Summary

The graphs for each test can be seen in Figures 31-36 and the prints for the proposed repair kit can be seen in Figures 37-38.

Current Production Design #1 – (Figures 3-8)

The force applied to the shackle mount resulted in the weld starting to separate from the mount. The tube that the shackle mount is located on began pulling the frame rail and bending it at the location in question. The deformation continued until the jack mount contacted the Instron table ending the test.

Current Production Design #2 – (Figures 9-13)

The results for this sample closely mimic those from the first sample. A couple of the welds began to separate from the steel under the pressure of the load and the steel frame began to twist.

Current Production Design with Proposed Repairs #1 – (Figures 14-16)

The reinforced frame on this sample proved beneficial. The total load increased by 13,001 pounds, while the deflection decreased by approximately half an inch. The shackle mount was damaged by the load, and bent into the side of the frame. The material in question held together, no flaws.

Current Production Design with Proposed Repairs #2 – (Figures 17-22)

The results closely mimic those of sample three. In Figure 19, it can be seen where one of the welds connected to the shackle mount began to separate from the steel.

Former Design #1 – (Figures 23-27)

The welds at the material in question and the shackle mount began to separate. The entire "box" on this sample twisted under the pressure of the load, which is visible in Figure 27.

Former Design #2 – (Figures 28-30)

The weld to the material in question began to separate from the steel, same as in the last sample. Additionally, the twist in the "box" and in the frame is very prevalent as seen in Figure 30.

APPENDIX

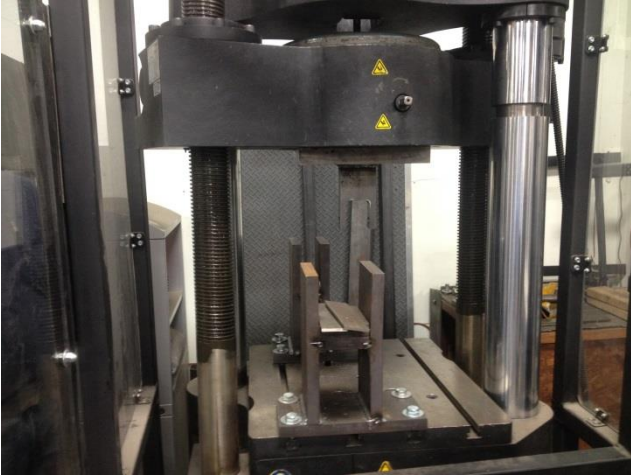


Figure 1: Test fixture

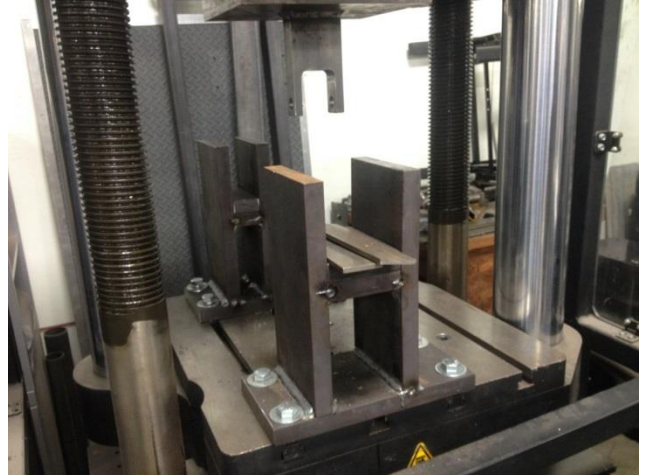


Figure 2: Test fixture

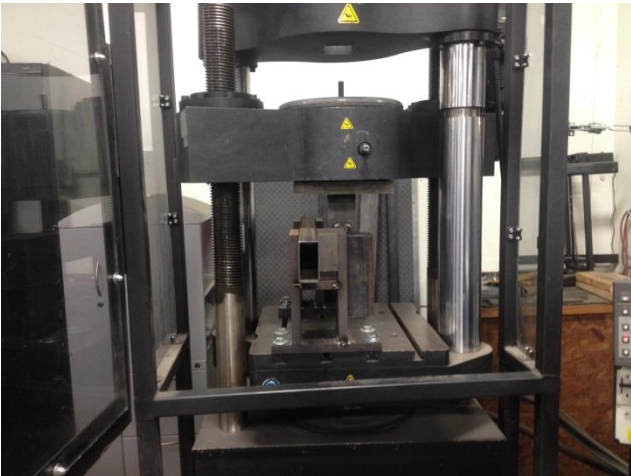


Figure 3: Current shackle mount #1 prior to testing



Figure 4: Current shackle mount #1 prior to testing



Figure 5: Current shackle mount #1 after testing



Figure 6: Current shackle mount #1 after testing



Figure 7: Current shackle mount #1 after testing



Figure 8: Current shackle mount #1 after testing



Figure 9: Current shackle mount #2 prior to testing



Figure 10: Current shackle mount #2 after testing



Figure 11: Current shackle mount #2 after testing



Figure 12: Current shackle mount #2 after testing



Figure 13: Current shackle mount #2 after testing



Figure 14: Proposed repair #1 after testing



Figure 15: Proposed repair #1 after testing



Figure 16: Proposed repair #1 after testing



Figure 17: Proposed repair #2 after testing



Figure 18: Proposed repair #2 after testing



Figure 19: Proposed repair #2 after testing



Figure 20: Proposed repair #2 after testing



Figure 21: Proposed repair #2 after testing



Figure 22: Proposed repair #2 after testing



Figure 23: Past design #1 prior to testing



Figure 24: Past design #1 prior to testing



Figure 25: Past design #1 after testing



Figure 26: Past design #1 after testing



Figure 27: Past design #1 after testing



Figure 28: Past design #2 prior to testing



Figure 29: Past design #2 after testing



Figure 30: Past design #2 after testing

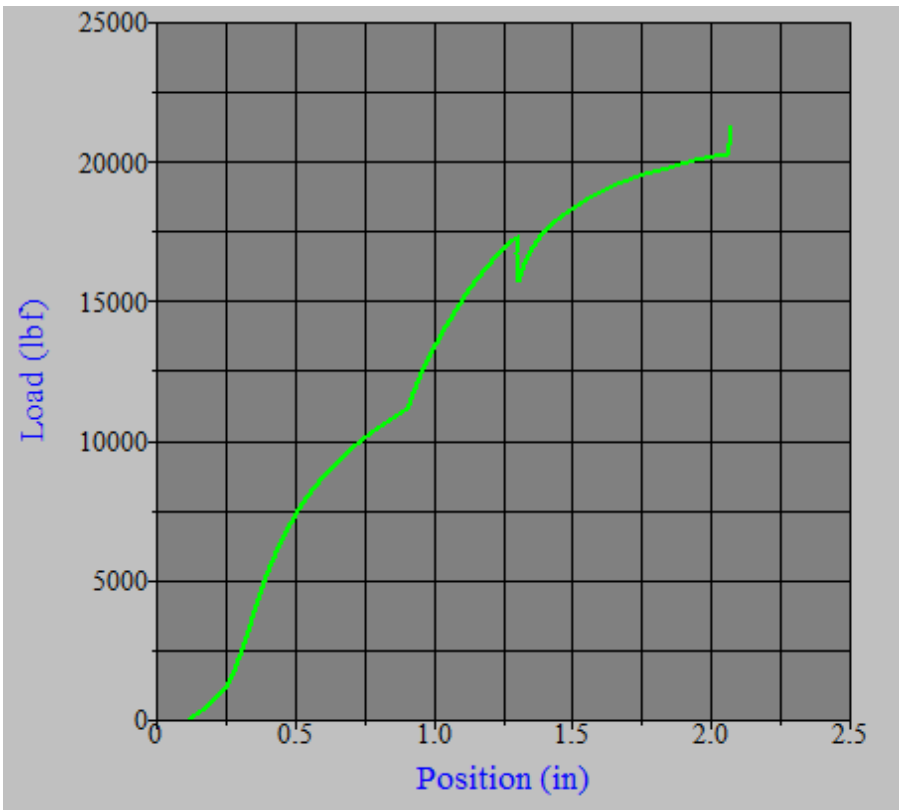


Figure 31: Current shackle mount #1

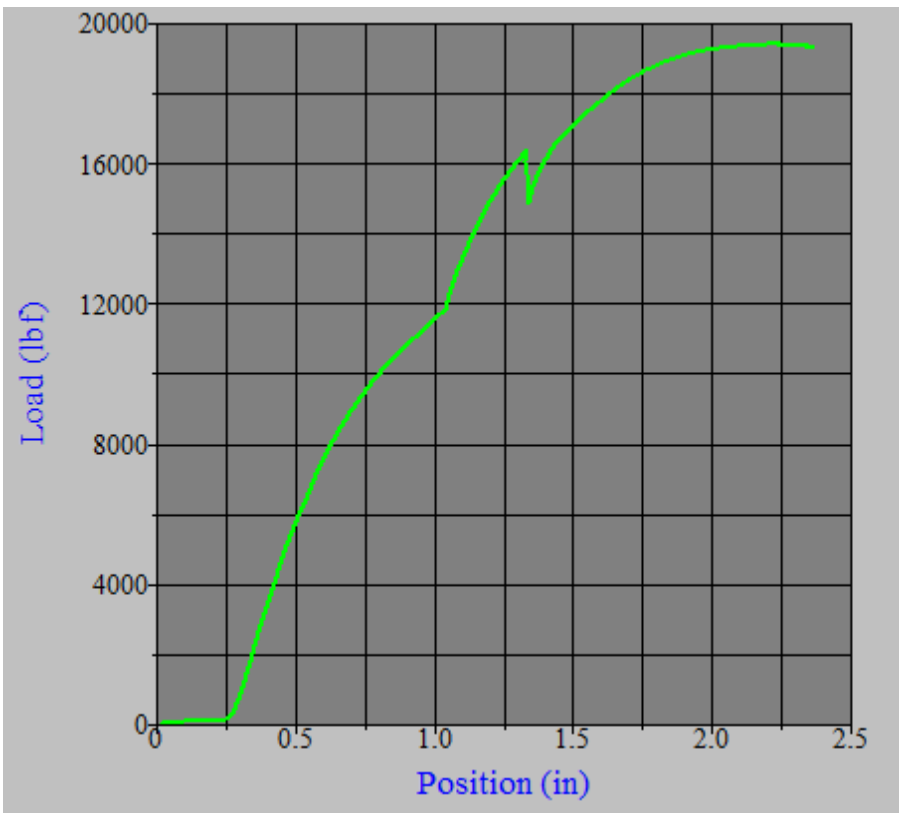


Figure 32: Current shackle mount #2

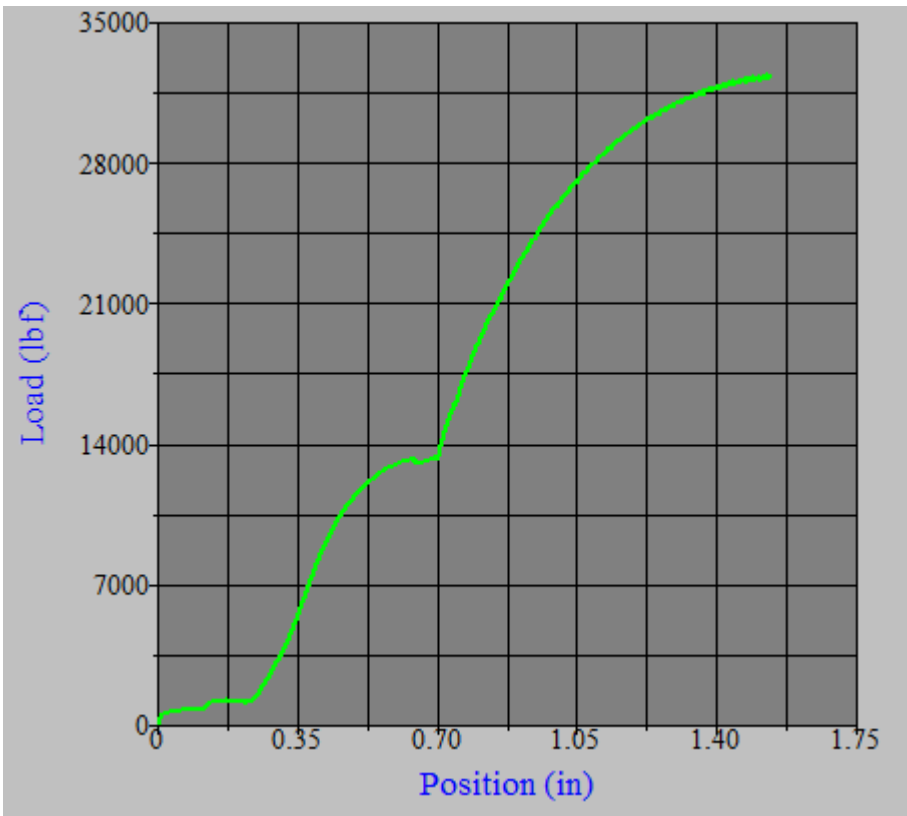


Figure 33: Proposed repair #1

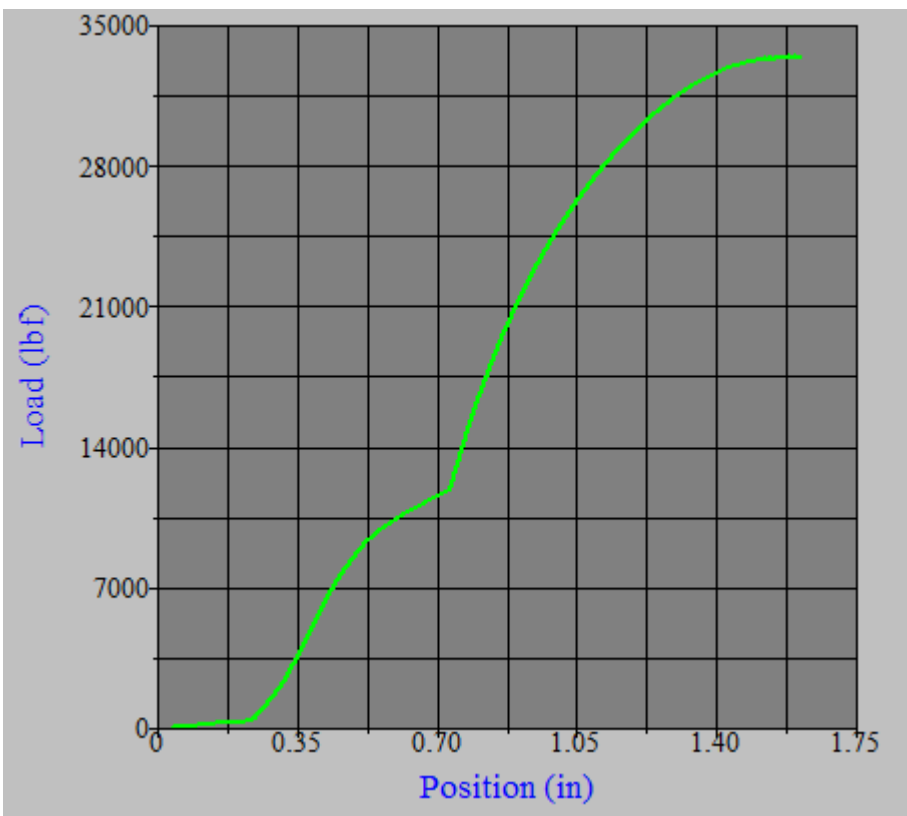


Figure 34: Proposed repair #2

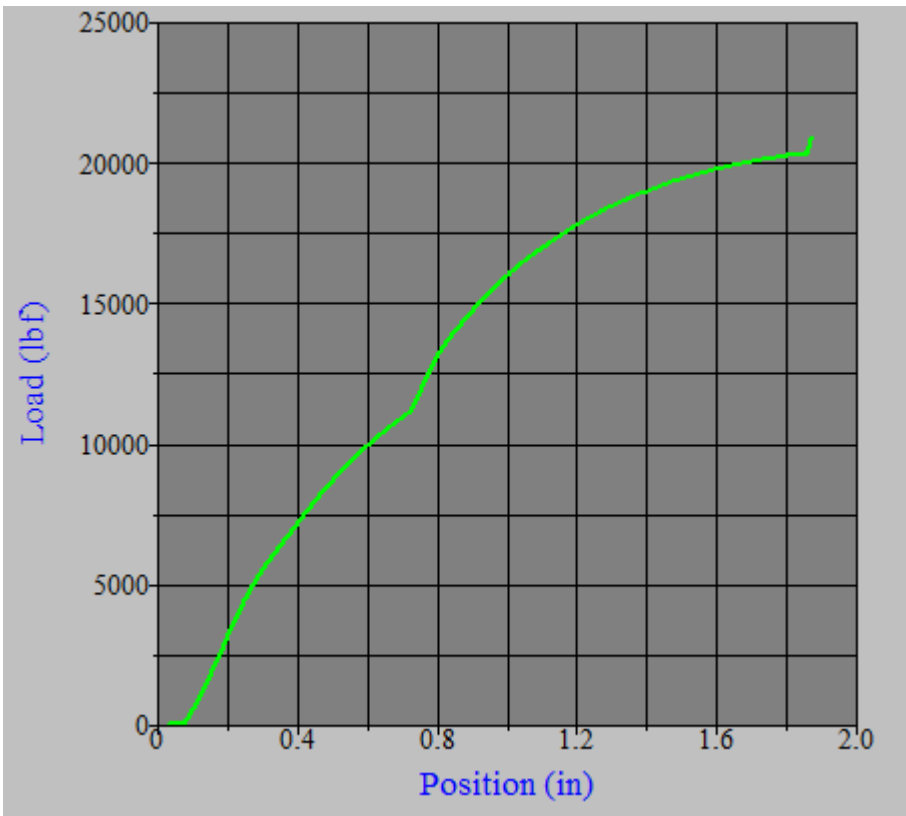


Figure 35: Past design #1

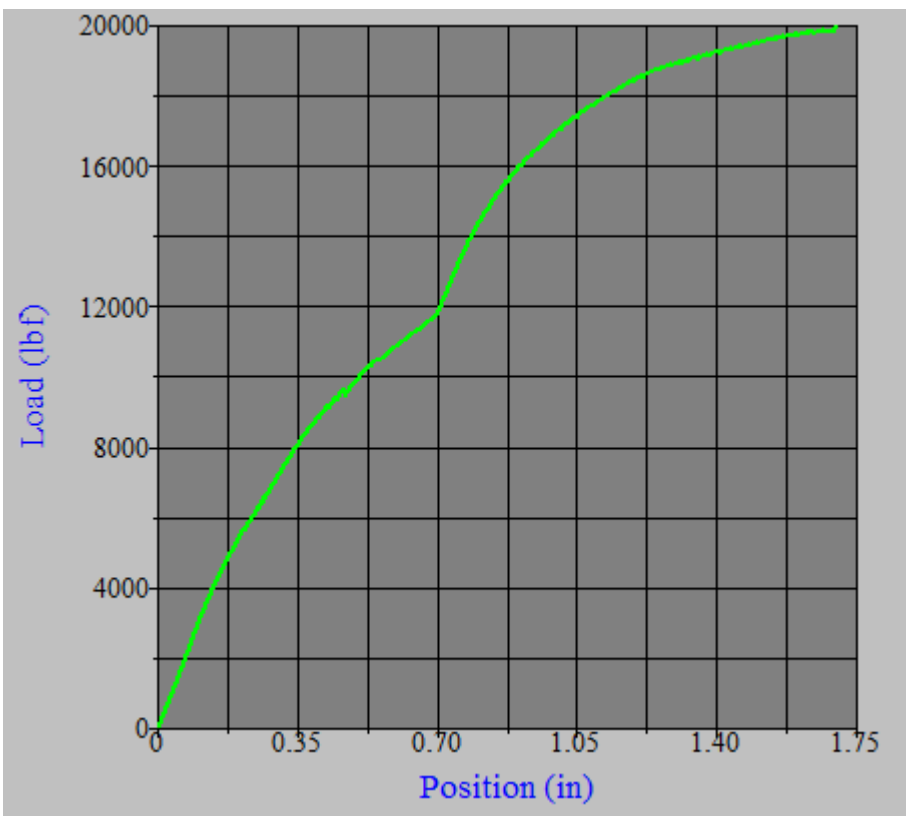


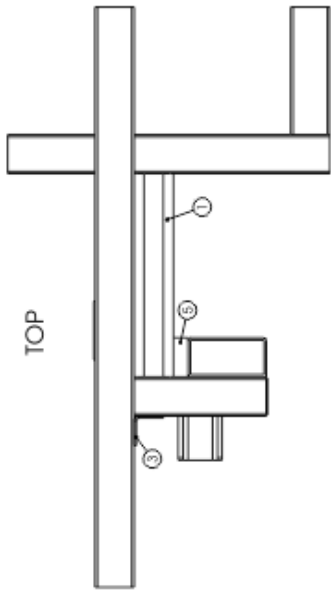
Figure 36: Past design #2

364228

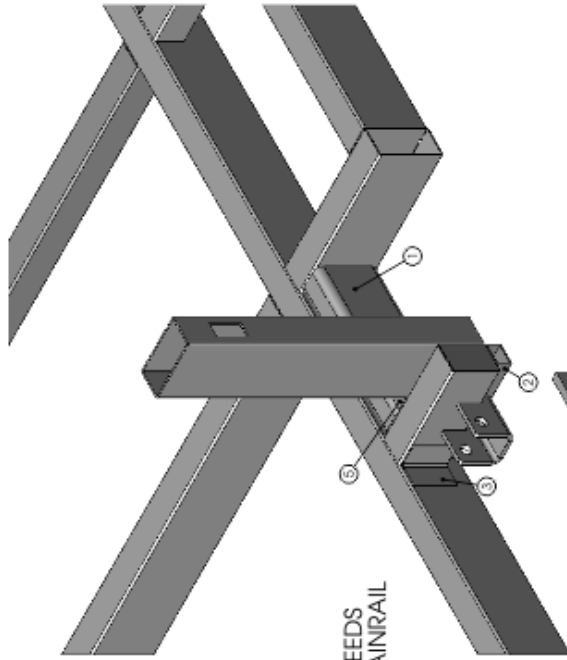
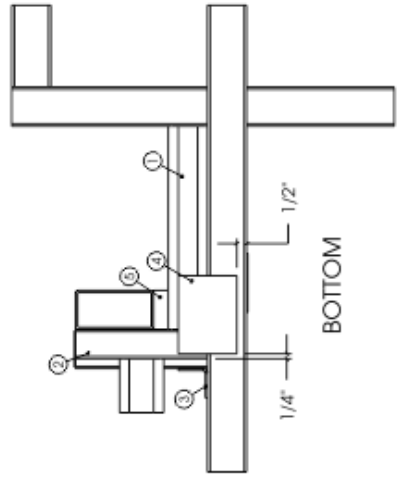
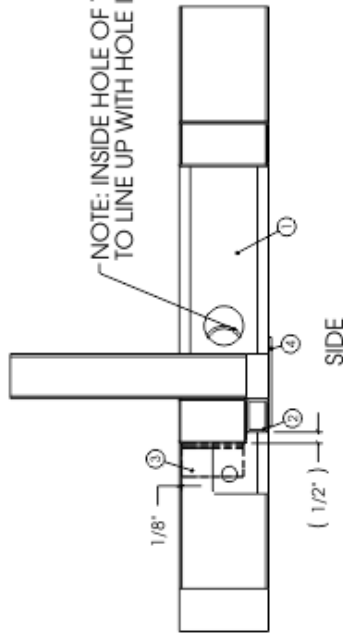
ICE CABIN AXLE REINFORCEMENT KIT; SA

NOTES:
SOME COMPONENTS HIDDEN FOR CLARITY
FIX APPLIES TO RS/CS

ITEM #	PART #	DESCRIPTION	Name	Gauge	Default/Qty:
1	364180	TUBE 2" X 4" X 1/4" X 10.318" FN	TUBE	-	2
2	121845	8" X 1" X 1/2" CHD DOWN NO. 8 SMT	TUBE	-	2
3	1174820	ANGLE 1 1/2" X 1 1/2" X .06013341 FN	ANG	12	2
4	164820	4" X 3"	PL	11	2
5	364171	4" X 2"	PL	24.6	2
6	328420	PL	PL	200	2



NOTE: INSIDE HOLE OF TUBE 364180 NEEDS TO LINE UP WITH HOLE IN EXISTING MAINRAIL



NOTE: IF GAP BETWEEN 2" X 4" TUBE AND RISER FOR LG IS 1/2" USE 328420 INSTEAD OF 364171

FR 6 ICE CABIN REINFORCEMENT KIT



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LIPPERT COMPONENTS
2703 College Ave.
Greenville, IN 46508
(574) 233-1125, Phone
(574) 534-8172 Fax

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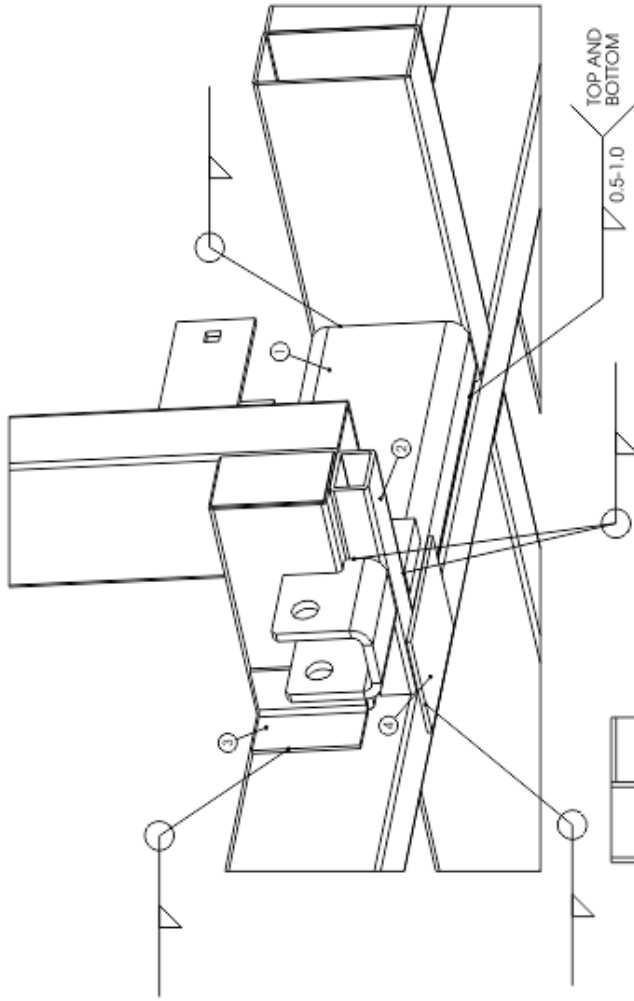
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Figure 37: Reinforcement kit print

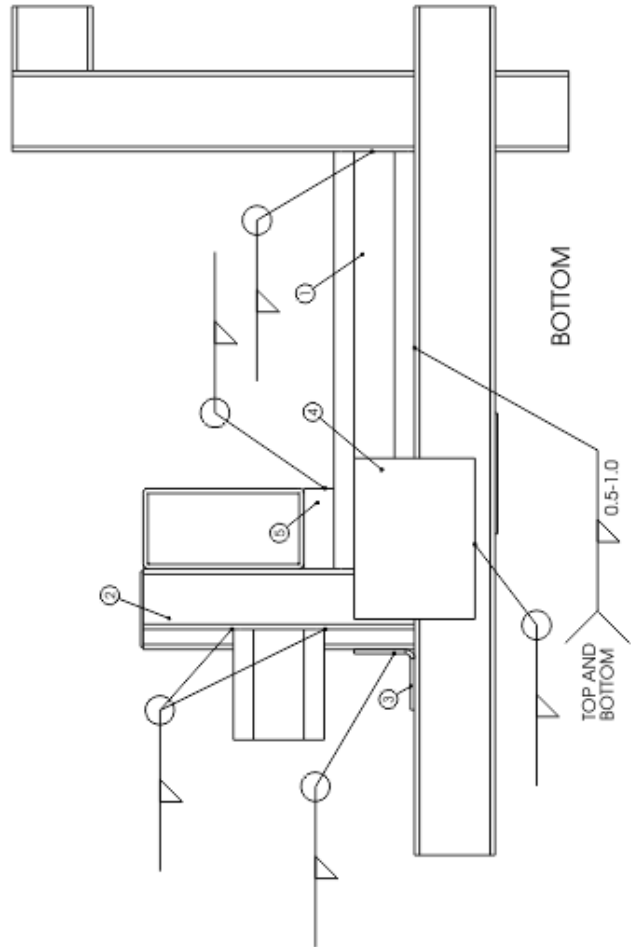
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ICE CABIN AXLE REINFORCEMENT KIT: SA

WELDMENTS



TOP AND BOTTOM



BOTTOM

TOP AND BOTTOM

FR 6 ICE CABIN REINFORCEMENT KIT

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2700 College Ave.
 Coeaten, In 46628
 (514)336-1125, Phone
 (514)336-8172, Fax

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Figure 38: Reinforcement kit print