ATTACHMENT A

SACHS, SALVATERRA & ASSOCIATES, INC.

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10 January 2011

TO: Richard Wilkinson
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SUBJECT: **DRAFT** Analysis of a Failed Lift Tower Turnbuckle Assembly (Our project number SUG-11100)

BACKGROUND: We received a failed turnbuckle assembly from Sugarloaf and were asked to analyze it to determine whether it failed in tension or compression.

SUMMARY: The major load on the failed weld was from tension. In addition, there was some bending involved.

FINDINGS: Below is a photo of the failed assembly as we received it.

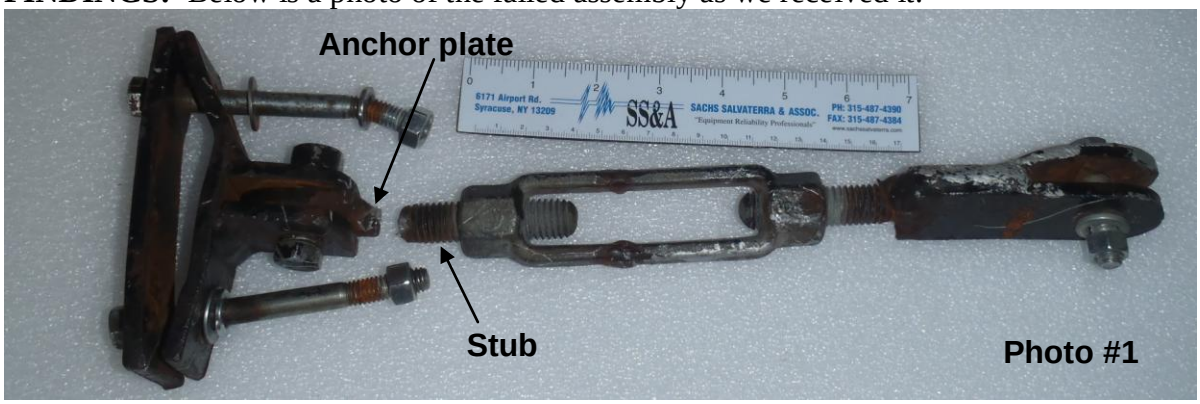

Photo #1

After the initial visual inspection, we cleaned the dust and light debris off the pieces with a soft brush, then inspected them using a binocular microscope.

As shown in ***Photo #1***, the failure occurred when the weld anchoring the stub to the anchor plate parted. ***Photo #2***, to the right, shows the pieces of the turnbuckle anchor bracket as it was disassembled.


Photo #2

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Photos #3 and ***#4*** are better views of the actual failure. ***#3*** is of the anchor bracket assembly, with the failed weld at the center, while ***#4*** is a close-up of the weld at the end of the anchor plate.

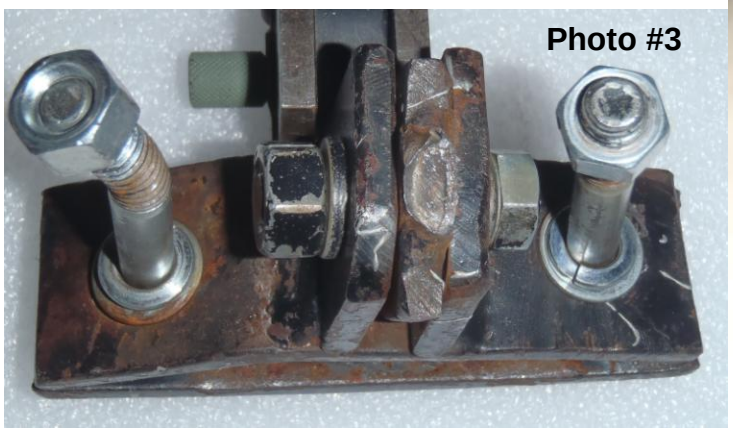
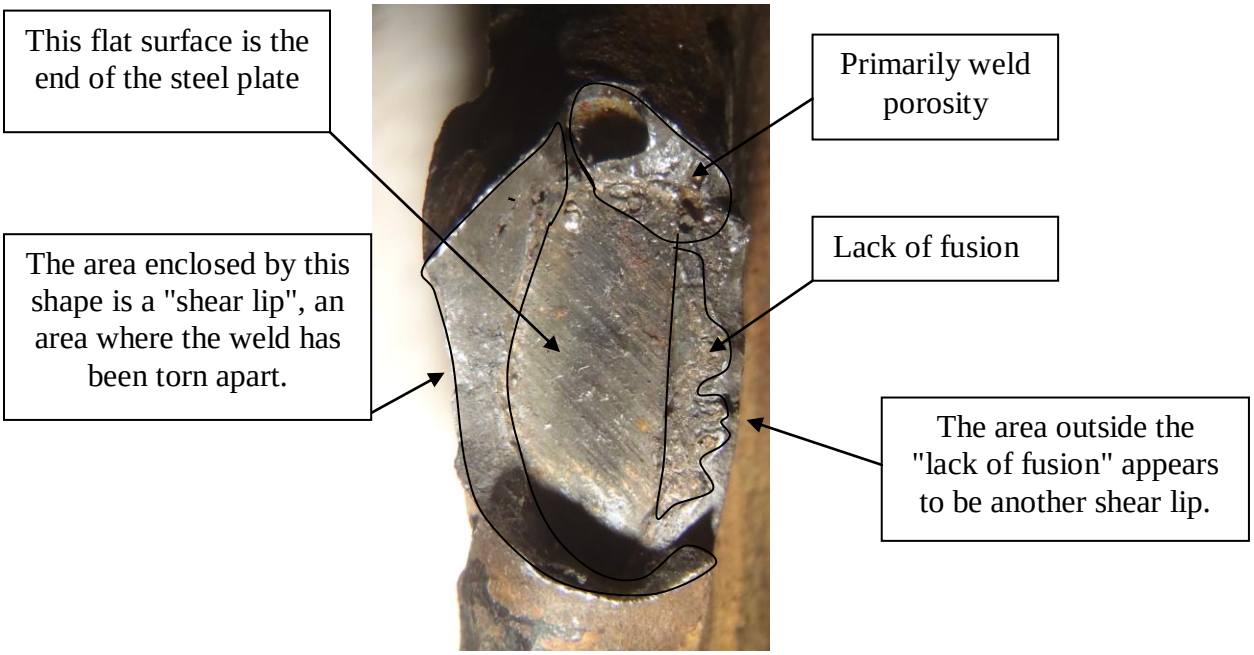


Photo #3

Photo #4

We looked at the fracture on the end of the anchor plate shown in ***Photo #4*** and expanding on it shows the failure details below.



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From the existence of the shear lips, it is apparent that the weld failed when it was heavily loaded in tension.

Further confirmation that the pieces were loaded in tension can be seen in the deformation of the bolt hole in the anchor plate and ***Photo #5*** shows it supported by a magnet. Inspection of the bolt hole shows the heaviest impression of the bolt threads in the bottom of the hole and at 90^0 to that. These thread impressions are also heavier to one side, suggesting a misalignment of the load, and they are almost nonexistent in the top of the hole.

In a similar manner, the holes in the two pieces welded to the bracket also show thread impressions that indicate a tension loading. However, confirming the misalignment, the indentations on the piece on the bolt head side are much heavier than those on the other (nut) side.

CONCLUSION: The weld failed from a tensile overload and it appears that the load was not well centered, i.e., there was some bending and/or misalignment involved. There are no obvious signs of repeated loads, i.e., fatigue, but a much more detailed analysis would have to be performed to confirm this.

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