SLAC Lifting Fixture Load-rating Form

(See page 2 for General Guidelines and Step-by-step Process)

Requester

Print name James Krebs Date 4/27/06

Brief Description of Lifting Fixture and object to be lifted
Corner Block Bolt Bins

SLAC Drawing number SK-HJK-022304
Copy of drawing or sketch must accompany this form.

1. Rated Capacity Calculation

Rated capacity 300 lbs.

Print name James Krebs Signature Date 4/27/06
Qualified engineer who performed calculations. Copy of calculations or vendor documentation must accompany this form.

2. Non-destructive testing of load-bearing welds (pre-2005 non-certified welds only)

Print name James Krebs Signature Date 4/27/06
Qualified engineer who supervised or contracted testing.

3. Review by Hoisting & Rigging Safety Committee

Print name Signature Date 4/1/06
Hoisting & Rigging Safety Committee Chair

4. Load testing – normally at 125% of rated capacity (see instructions).

Required test weight 375 Actual test weight 454 Successful completion (check)

Print name Scot Johnson Signature Date May 26, 2006
SLAC Rigging Department

5. Label fixture with rated capacity & S/N

Assigned S/N BBR-026 thru BBR-031
Crane Custodian or Line Supervisor responsible for fixture

Print name James Krebs Signature Date 4/27/06
Crane Custodian or Line Supervisor responsible for fixture

6. Final Inspection and Approval

Print name Signature Date
SLAC H&R Inspector

7. Permanent record keeping – retained for the life of the equipment (see instructions).
BABAR ENGINEERING NOTE
BARREL CORNER BLOCK BOLT BINS (BBR-026 thru BBR-031)
CALCULATIONS OF RIGGING LOADS

1.0 Loads:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt Bin</td>
<td>217</td>
</tr>
<tr>
<td>Total weight of bolts</td>
<td>220</td>
</tr>
<tr>
<td>Total</td>
<td>437</td>
</tr>
</tbody>
</table>

2.0 Background:

This device is used to carry the bolts that connect the corner blocks to the BaBar barrel steel. There are six identical devices to coincide with the six corner blocks on each side of the detector. These devices have been used several times prior to the writing of this document. The allowable loads and stress are those dictated by American Institute of Steel Construction, *Allowable Stress Design, 9th Edition*. A dynamic load factor of 50% is assumed.

3.0 Support Tube Weld Shear Stress:

This weld sees the weight of the bolts (220 lb) plus the weight of the tubes (29 lb). There are 8” of ¼” fillet weld at four locations. Hence, the shear stress in each weld is:

\[
\frac{(220 \text{ lb} + 29 \text{ lb}) \times 150\%}{8” \times 0.707 \times 1/4”} \div 4 = 66 \text{ psi}
\]

The sides are ASTM-A36 steel. The tubes are ASTM-A500, Grade B. The weakest material is the sides with a yield stress of 36 ksi. Therefore, the allowable shear stress is:

\[36,000 \text{ psi} \times 0.4 = 14,400 \text{ psi}\]

Hence, the factor of allowable redundancy is:

\[14,400 \text{ psi} / 66 \text{ psi} = 218.18\]

4.0 Shackle Pullout:

The worst case pullout occurs when using 2-ton capacity screw pin anchor shackles with .63” pin diameter. The side plate is 1/2” thick ASTM-A36 steel and the pin is in double shear. The pullout length is .96”. Hence, the pullout shear stress is:
\[
\frac{(217 \text{ lb} + 220 \text{ lb}) \times 150\%}{2 \times (1/2'' \times 0.96'')} / 4 = 171 \text{ psi}
\]

The factor of allowable redundancy is:

\[14,400 \text{ psi} / 171 \text{ psi} = 84.21\]

Prepared by: H. James Krebs

Signature: H. James Krebs Date: 4/19/06

Reviewed by: Zohrab Vassilian

Signature: Zohrab Vassilian Date: 4/19/06
<table>
<thead>
<tr>
<th>sides</th>
<th>bottom</th>
<th>tubes</th>
<th>angles</th>
<th>short bars</th>
<th>long bars</th>
<th>total weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>82.26275</td>
<td>43.04569</td>
<td>26.528</td>
<td>30.692</td>
<td>12.01275</td>
<td>20.70619</td>
<td>217.3474</td>
</tr>
</tbody>
</table>
2x 109 lbs

9x 3/8-16 SOCKET HEAD CAP SCREW x 2" LG., WITH WASHER AND NT" ON FARSIDE

3x SK-HJK0223C4-3

31.75x19.0x1/4 THK. BOTTOM PLATE, 1018 STEEL

SK-HJK022304-1

QTY: 6 REQ'D
MATT: LISTED ABOVE
ACCT #: 55-4448-0
Base Materials:
- [X] Carbon Steel - Specification, if known: ASTM-A36, ASTM-A500 Grade B
- [ ] Stainless Steel - Alloy, if known: 
- [ ] Aluminum - Alloy, if known: 

Weld Filler Materials:
- Weld Filler Alloy, if known: Unknown

Painted
- [X] 
- [ ] Unpainted

External surface condition of weld at time of inspection.

Comments:

Yes  No
- [X] Is surface corrosion within acceptable limits?
- [X] Does the weld appear to have good fusion?
- [X] Is the weld bead uniform?
- [X] Is weld bead and base material free of visible cracks?
- [X] Does the size of the weld match the engineering drawing?
- [X] Does the weld type (joint design) match the engineering drawing?
- [X] Is the weld joint a "prequalified" joint per AISC?
- [X] Is weld bead free of craters?
- [X] Is the weld profile acceptable?
- [X] Is the time of inspection appropriate?
- [X] Is undercut acceptable for material thickness and loading condition?
- [X] Is weld free of unacceptable porosity?
Below-the-Hook Lifting Device
Visual Structural Weld Inspection Worksheet

Serial Number BBR-027

Date of Inspection: 4/27/2006

Inspected By: H. James Krebs, M.E.

Base Materials:

☒ Carbon Steel - Specification, if known: ASTM-A36, ASTM-A500 Grade B
☐ Stainless Steel - Alloy, if known: 
☐ Aluminum - Alloy, if known: 

Weld Filler Materials:

Weld Filler Alloy, if known: Unknown

Painted

☑ External surface condition of weld at time of inspection.

Comments: 

Yes No

☒ Is surface corrosion within acceptable limits?

☒ Does the weld appear to have good fusion?

☒ Is the weld bead uniform?

☒ Is weld bead and base material free of visible cracks?

☒ Does the size of the weld match the engineering drawing?

☒ Does the weld type (joint design) match the engineering drawing?

☒ Is the weld joint a "prequalified" joint per AISC?

☒ Is weld bead free of craters?

☒ Is the weld profile acceptable?

☒ Is the time of inspection appropriate?

☒ Is undercut acceptable for material thickness and loading condition?

☒ Is weld free of unacceptable porosity?
Below-the-Hook Lifting Device
Visual Structural Weld Inspection Worksheet
Serial Number BBR-028

Date of Inspection: 4/27/2006

Base Materials:
- [X] Carbon Steel - Specification, if known: ASTM-A36, ASTM-A500 Grade B
- [ ] Stainless Steel - Alloy, if known:
- [ ] Aluminum - Alloy, if known:

Weld Filler Materials:
- Weld Filler Alloy, if known: Unknown

Painted
[X] Unpainted

External surface condition of weld at time of inspection.

Yes No
[ X] Is surface corrosion within acceptable limits?
[ X] Does the weld appear to have good fusion?
[ X] Is the weld bead uniform?
[ X] Is weld bead and base material free of visible cracks?
[ X] Does the size of the weld match the engineering drawing?
[ X] Does the weld type (joint design) match the engineering drawing?
[ X] Is the weld joint a "prequalified" joint per AISC?
[ X] Is weld bead free of craters?
[ X] Is the weld profile acceptable?
[ X] Is the time of inspection appropriate?
[ X] Is undercut acceptable for material thickness and loading condition?
[ X] Is weld free of unacceptable porosity?
**Below-the-Hook Lifting Device**  
**Visual Structural Weld Inspection Worksheet**  
**Serial Number BBR-029**  
**Date of Inspection:** 4/27/2006  
**Inspected By:** H. James Krebs, M.E.

### Base Materials:
- **X** Carbon Steel - Specification, if known: ASTM-A36, ASTM-A500 Grade B
- Stainless Steel - Alloy, if known:
- Aluminum - Alloy, if known:

### Weld Filler Materials:
- Weld Filler Alloy, if known: Unknown

### External Surface Condition of Weld at Time of Inspection:
- **X** Painted  
- **☐** Unpainted

### Questions:
- **X** Yes  
- **☐** No

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is surface corrosion within acceptable limits?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the weld appear to have good fusion?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is the weld bead uniform?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is weld bead and base material free of visible cracks?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the size of the weld match the engineering drawing?</td>
<td>Yes</td>
</tr>
<tr>
<td>Does the weld type (joint design) match the engineering drawing?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is the weld joint a &quot;prequalified&quot; joint per AISC?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is weld bead free of craters?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is the weld profile acceptable?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is the time of inspection appropriate?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is undercut acceptable for material thickness and loading condition?</td>
<td>Yes</td>
</tr>
<tr>
<td>Is weld free of unacceptable porosity?</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Below-the-Hook Lifting Device
Visual Structural Weld Inspection Worksheet
Serial Number BBR-030

Date of Inspection: 4/27/2006

Inspected By: H. James Krebs, M.E.

Base Materials:

[X] Carbon Steel - Specification, if known: ASTM-A36, ASTM-A500 Grade B

☐ Stainless Steel - Alloy, if known:

☐ Aluminum - Alloy, if known:

Weld Filler Materials:

Weld Filler Alloy, if known: Unknown

Painted

[X] Unpainted

Is surface corrosion within acceptable limits?

[X] Does the weld appear to have good fusion?

[X] Is the weld bead uniform?

[X] Is weld bead and base material free of visible cracks?

[X] Does the size of the weld match the engineering drawing?

[X] Does the weld type (joint design) match the engineering drawing?

[X] Is the weld joint a "prequalified" joint per AISC?

[X] Is weld bead free of craters?

[X] Is the weld profile acceptable?

[X] Is the time of inspection appropriate?

[X] Is undercut acceptable for material thickness and loading condition?

[X] Is weld free of unacceptable porosity?

External surface condition of weld at time of inspection.

Comments:

[Signature]
Below-the-Hook Lifting Device  
Visual Structural Weld Inspection Worksheet  
Serial Number BBR-031  
Inspected By: H. James Krebs, M.E.

Date of Inspection: 4/27/2006

Base Materials:
- [X] Carbon Steel - Specification, if known: ASTM-A36, ASTM-A500 Grade B
- [ ] Stainless Steel - Alloy, if known: __________________________
- [ ] Aluminum - Alloy, if known: __________________________

Weld Filler Materials:
- Weld Filler Alloy, if known: Unknown

Painted  [X]  Unpainted

[X] External surface condition of weld at time of inspection.

Comments: __________________________

Yes  No

[X] Is surface corrosion within acceptable limits?
[X] Does the weld appear to have good fusion?
[X] Is the weld bead uniform?
[X] Is weld bead and base material free of visible cracks?
[X] Does the size of the weld match the engineering drawing?
[X] Does the weld type (joint design) match the engineering design?
[X] Is the weld joint a "prequalified" joint per AISC?
[X] Is weld bead free of craters?
[X] Is the weld profile acceptable?
[X] Is the time of inspection appropriate?
[X] Is undercut acceptable for material thickness and loading condition?
[X] Is weld free of unacceptable porosity?
### Table 6.1
Visual Inspection Acceptance Criteria (see 6.9)

<table>
<thead>
<tr>
<th>Discontinuity Category and Inspection Criteria</th>
<th>Statically Loaded Nontubular Connections</th>
<th>Cyclically Loaded Nontubular Connections</th>
<th>Tubular Connections (All Loads)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(1) Crack Prohibition</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Any crack shall be unacceptable, regardless of size or location.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(2) Weld/Base-Metal Fusion</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Through fusion shall exist between adjacent layers of weld metal and between weld metal and base metal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(3) Crater Cross Section</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>All craters shall be filled to provide the specified weld size, except for the ends of intermittent fillet welds outside of their effective length.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(4) Weld Profiles</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Weld profiles shall be in conformance with 5.24.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(5) Time of Inspection</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Visual inspection of welds in all steels may begin immediately after the completed welds have cooled to ambient temperature. Acceptance criteria for ASTM A 514, A 517, and A 709 Grade 100 and 100 W steels shall be based on visual inspection performed not less than 48 hours after completion of the weld.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(6) Undersized Welds</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>The size of a fillet weld in any continuous weld may be less than the specified nominal size (L) without correction by the following amounts (U):</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| \[
| \text{specified nominal weld size, in. [mm]} & \text{allowable decrease from L, in. [mm]} \\
| \geq 5/16 [8] & \leq 1/8 [3] \\
| \]
| In all cases, the undersize portion of the weld shall not exceed 10% of the weld length. On web-to-flange welds on girders, undercut shall be prohibited at the ends for a length equal to twice the width of the flange. |
| **(7) Undercut**                              | X                                      | X                                      | X                                |
| (A) For material less than 1 in. [25 mm] thick, undercut shall not exceed 1/32 in. [1 mm], with the following exception: undercut shall not exceed 1/16 in. [2 mm] for any accumulated length up to 2 in. [50 mm] in any 12 in. [300 mm]. For material equal to or greater than 1 in. thick, undercut shall not exceed 1/16 in. [2 mm] for any length of weld. |
| (B) In primary members, undercut shall be no more than 0.01 in. [0.25 mm] deep when the weld is transverse to tensile stress under any design loading condition. Undercut shall be no more than 1/32 in. [1 mm] deep for all other cases. |
| **(8) Porosity**                              | X                                      | X                                      | X                                |
| (A) CJP groove welds in butt joints transverse to the direction of computed tensile stress shall have no visible piping porosity. For all other groove welds and for fillet welds, the sum of the visible piping porosity 1/32 in. [1 mm] or greater in diameter shall not exceed 3/8 in. [10 mm] in any linear inch of weld and shall not exceed 3/4 in. [20 mm] in any 12 in. [300 mm] length of weld. |
| (B) The frequency of piping porosity in fillet welds shall not exceed one in each 4 in. [100 mm] of weld length and the maximum diameter shall not exceed 3/32 in. [2.5 mm]. Exception: for fillet welds connecting stiffeners to web, the sum of the diameters of piping porosity shall not exceed 3/8 in. [10 mm] in any linear inch of weld and shall not exceed 3/4 in. [20 mm] in any 12 in. [300 mm] length of weld. |
| (C) CJP groove welds in butt joints transverse to the direction of computed tensile stress shall have no piping porosity. For all other groove welds, the frequency of piping porosity shall not exceed one in each 4 in. [100 mm] of length and the maximum diameter shall not exceed 3/32 in. [2.5 mm]. |

General Note: An “X” indicates applicability for the connection type; a shaded area indicates non-applicability.