SLAC Lifting Fixture Load-rating Form
(See page 2 for General Guidelines and Step-by-step Process)

Requester
Print name H. James Krebs Date 4/28/06

Brief Description of Lifting Fixture and object to be lifted
End Door Flux Bar & Corner Block Lift Pads

SLAC Drawing number SK-HIK-091301
Copy of drawing or sketch must accompany this form.

1. Rated Capacity Calculation
Rated capacity 4,500 lbs.
Print name H. James Krebs Signature H. James Krebs Date 4/28/06
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 N/A Signature Date
Qualified engineer who supervised or contracted testing. Copy of report must accompany this form.

3. Review by Hoisting & Rigging Safety Committee
Print name Signature Date
H&R Safety Committee Chair

4. Load testing – normally at 125% of rated capacity (see instructions).
Required test weight 5,625 lbs. Actual test weight 5,800 lbs. 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-035 thru BBR-038
Crane Custodian or Line Supervisor responsible for fixture
Print name H. James Krebs Signature H. James Krebs Date 4/28/06
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
END DOOR FLUX BAR & CORNER BLOCK LIFT PAD (BBR-035 thru BBR-038)
CALCULATIONS OF RIGGING LOADS

1.0  Loads:

End Door Flux Bar
or
Upper or Lower Corner Block

6,350 lbs

4,314 lbs

2.0  Background:

Two of these lift pads are used to lift a corner block in a vertical orientation and four lift pads are used to lift an end door flux bar. Each lift pad has a 10,000 lb capacity swivel hoist ring bolted to it. Each pad is bolted to the load using four 7/8-9UNC Grade 8 AISI bolts. 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  Bolt Loads:

Tension: When lifting a corner block in the vertical orientation, the bolts are in tension. For purposes of assumption, the allowable bolt loads for a Grade 8 AISI bolt equal that of ASTM A490. According to the AISC Manual of Steel Construction, Allowable Stress Design, Ninth Edition, Section 4-3, the allowable tensile load per bolt is 32.5 kips. The actual load per bolt is:

\[(4,314 \text{ lbs} \times 150\%) / 2 \text{ pads} / 4 \text{ bolts per pad} = 809 \text{ lbs per bolt}\]

Therefore, the factor of allowable redundancy is:

\[32,500 \text{ lbs} / 809 \text{ lbs} = 40.20\]

Shear: When lifting the end door flux bar, there is a shear load on the bolts. The allowable shear load per bolt is 16.8 kips. This is based on a bearing type connection with the bolt threads included in the shear plane. The shear load on each bolt is:

\[(6,350 \text{ lb} \times 150\%) / 4 \text{ pads} / 4 \text{ bolts per pad} = 595 \text{ lb}\]

Therefore, the factor of allowable redundancy is:

\[16,800 \text{ lbs} / 595 \text{ lbs} = 28.24\]
4.0 Lift Pad Shearing Load:

The material of the lift pad is ASTM-A36 steel which has a 36 ksi yield. The shear area of the lift pad is:

\[ 0.625'' \times 3'' \times \pi = 5.891 \text{ in}^2 \]

If one assumes the entire load is taken in shear, the shear stress in the lift pad equals:

\[ \frac{6,350 \text{ lbs} \times 150\%}{4 \times 5.891 \text{ in}^2} = 404 \text{ psi} \]

According to the AISC Manual of Steel Construction, Allowable Stress Design, Ninth Edition, Section 5-49, the allowable shear load is 0.40 $F_y$. Therefore, the factor of redundancy is:

\[ 36,000 \text{ psi} \times 0.40 / 404 \text{ psi} = 35.64 \]

5.0 Swivel Hoist Ring Load:

Each swivel hoist ring is rated for 10,000 lb. The maximum load on each swivel hoist ring occurs when lifting the corner block. Its magnitude is:

\[ \frac{4,314 \text{ lb} \times 150\%}{2} = 2,157 \text{ lb} \]

Therefore, the factor of allowable redundancy is:

\[ 10,000 \text{ lb} / 2,157 \text{ lb} = 4.64 \]
SK-HJK-091301  SIDE FLUX BAR EAR

MATL: 1018 COLD FINISHED STEEL ROUND
QTY: 4