



Ship Production Rigging Catalog Update
Ship Production Process Technology Panel
(Planning Production Process & Facilities Panel)
April 2011

Rigging Catalog 2.0

- To Support Shipyard Rigging Engineers Require
 - Guidance
 - Standards
 - Solid Relevant References
- Some Shipyard items lack Guidance or what is available is not very comprehensive.
 - Flounder Plates and Equalizer Bars
 - High Capacity Roundslings



Documentation Update



2009 CATALOG

Detailed description of rigging items

Capacities

Integration

Manufacture Data



CATALOG 2.0

High Capacity Synthetic Round Slings

Flounder Plates and Equalizer Beams

Hooks

Flounder Plates

- Traditionally used on single crane lifts
 - Used to equalize sling tensions and distribute load
- Also used in pairs on spreader beams
 - Statically indeterminate lift arrangement with four sling attached to load.

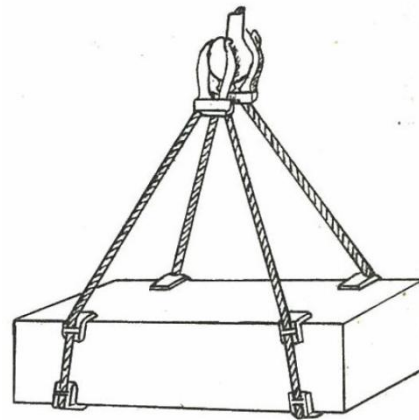
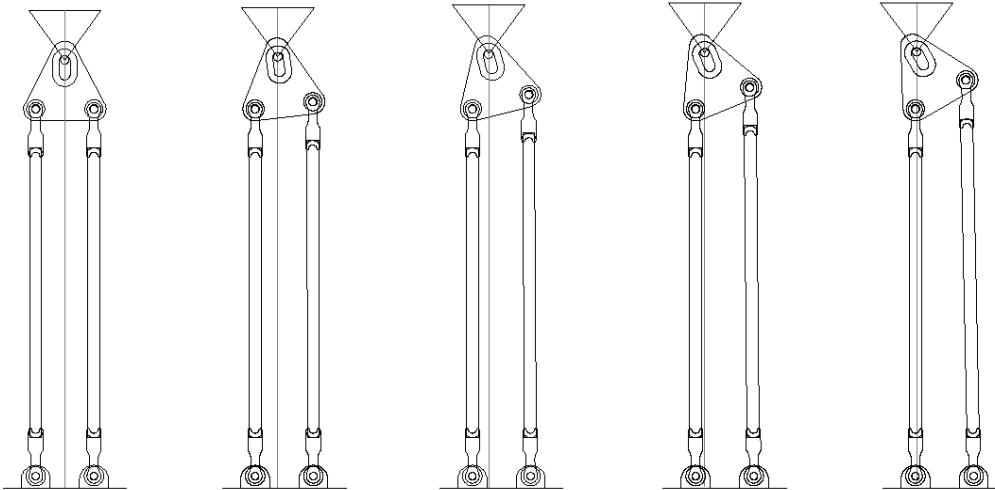


FIG. 154-A —
Two-part Equalizing Sling



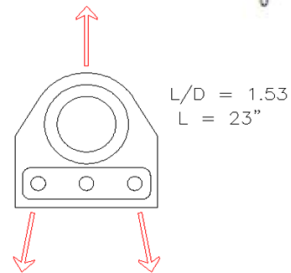
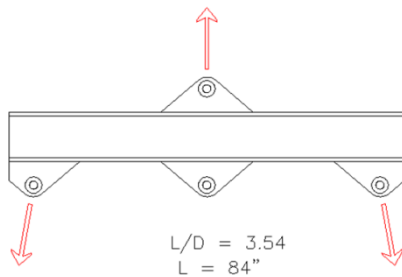
Flounder Plates

- When used on spreader beams
 - Used to equalize sling tensions and distribute load
 - Partially makes up for unequal sling lengths to help balance or equalize the load



Parametric Study

- Flounder
 - Small and Squat
- Equalizer
 - larger width than height
 - Generally larger overall size



Flounder Plates

- How well do they share the load? This depends on:
 - Aspect Ratio,
 - Size,
 - Sling length and elasticity
 - Base Spread
- Non-Dimensionalized Analysis
 - Parametric study of devices used by industry Load Sharing Devices
 - Longer sling length better.
 - Longer spread at base will share load more. (larger DB)
 - High aspect ratio flounder will share load better. (L/D is big)

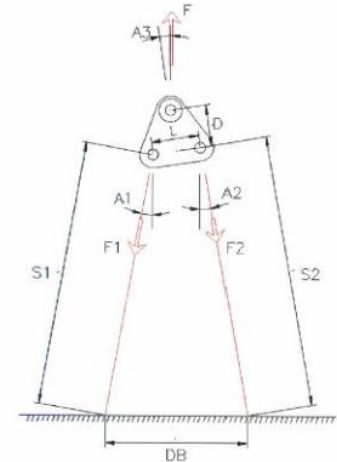
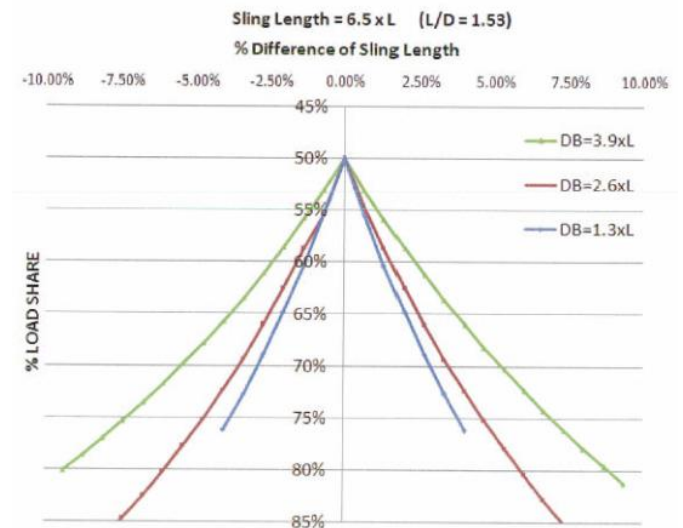
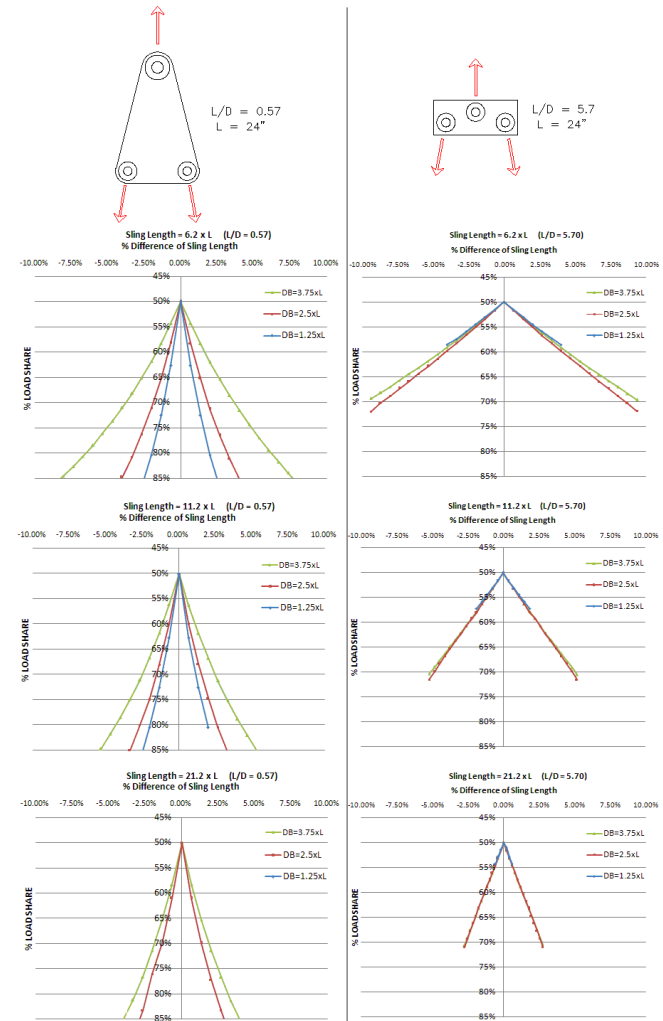


Figure 6. Free Body of Load Share Problem



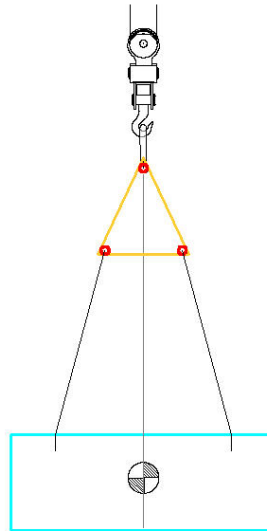
Flounder Plates

- Tables produced for full range of common sizes.
- When used with Spreader beam:
 - High aspect ratio flounder will share load better. (L/D is big)
 - Longer spread at base will share load more. (larger DB)
 - Longer sling length better.

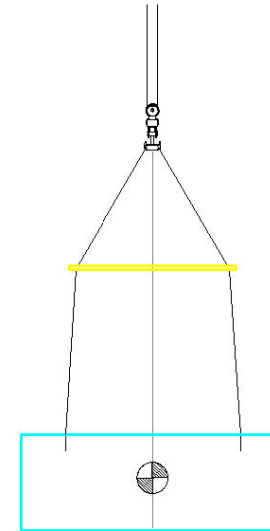


Flounder

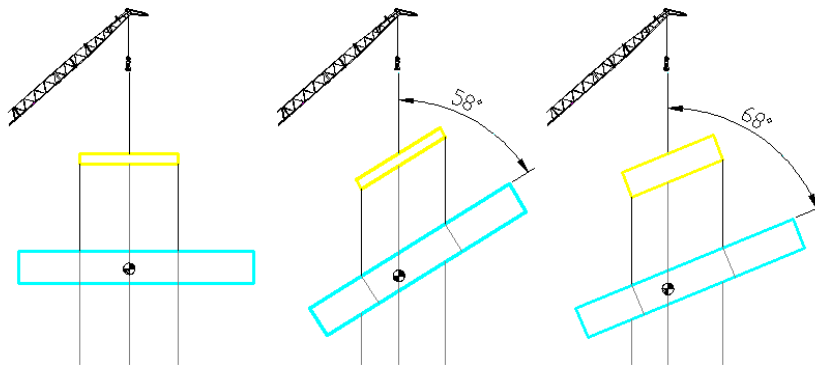
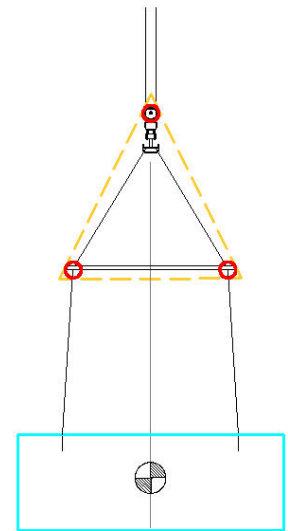
- Single Crane Lifts are Opposite!
 - Low aspect ratio lead to more stable arrangement.



TYPICAL FLOUNDER
PLATE ARRANGEMENT

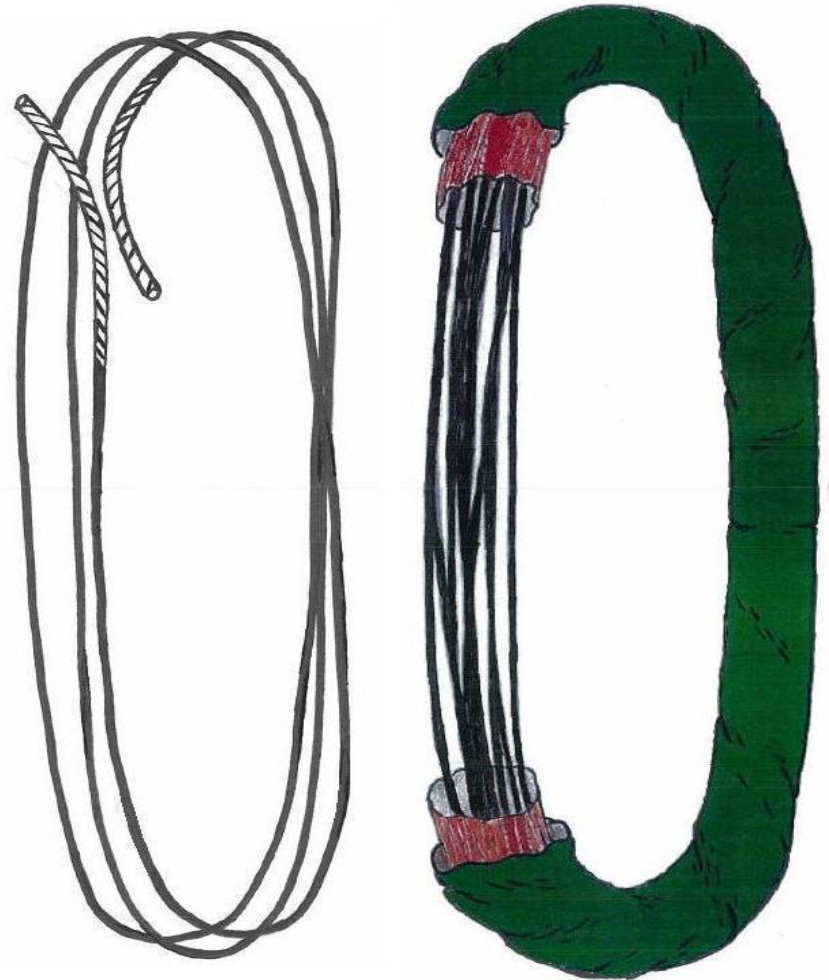


TYPICAL SPREADER
BEAM ARRANGEMENT



Guidance Documentation

- **What are Twin-Path Slings?**
 - Roundsling
 - Two load paths
 - K-Spec Fiber
- **How are they different?**
 - Roundsling vs. Web
 - Multipath
 - Plastic Fibers
 - 10% the weight of Wire-Rope sling
- **Different Considerations.**
 - What Guidance is there?



Guidance Documentation

- **OSHA's section of the CFR has not been updated in many years,**
- **OSHA's website does have information for their use and for the most part defaults to ASME recommendations, but one should always check guidance of manufacturer.**
- **ASME B30.9 2010 Chapter 6, Synthetic Polyester Roundslings**
 - **B30.9 Sling standard oriented towards Polyester roundslings**
 - **Scope, Training, Materials, Fabrication, Design Factor, Rated Load, Proof Testing, Identification, Environment, Inspection Removal & Repair,**
 - **9-6-10 Operating Practices (1 page)**
 - **Do not use damaged slings, overload, shock load, twist, subject to chemicals, knot or shorten, drag on ground,**
 - **"Shall" be Protected from Sharp Corners or Edges**

Guidance Documentation

- Standards and Guidance
- ASME
 - B30.9 Sling standard oriented towards Polyester roundslings
- WSTDA
 - Has Polyester Roundslings Standard
 - Has done extensive testing
- Cordage Institute
 - Has standard for all roundslings
- NAVFAC P307
 - Roundsling section 14.7.4.3 (1 page)



Naval Facilities Engineering Command
Navy Crane Center

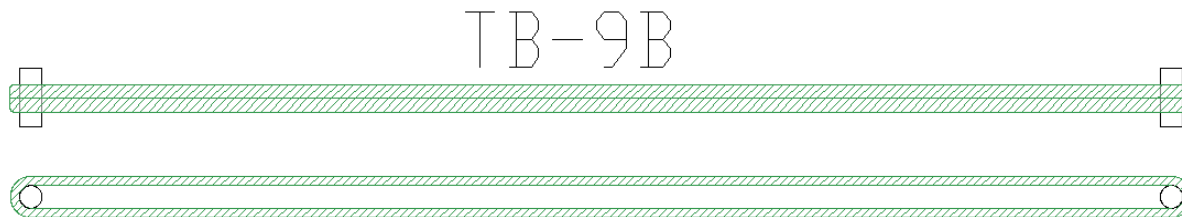
Guidance Documentation

- **A Typical Grand Block Erection of 500 ton ship unit will use 16x 40' slings.**
 - **Critical part of Rigging equipment.**
- **What is expected lifespan?**
 - **How can one promote long life?**
 - **How do you know when your slings useful life is up?**
- **Most Synthetic sling failures occur from cutting!**
 - **Abrasion attributes to Cover wear.**
 - **Bearing?**



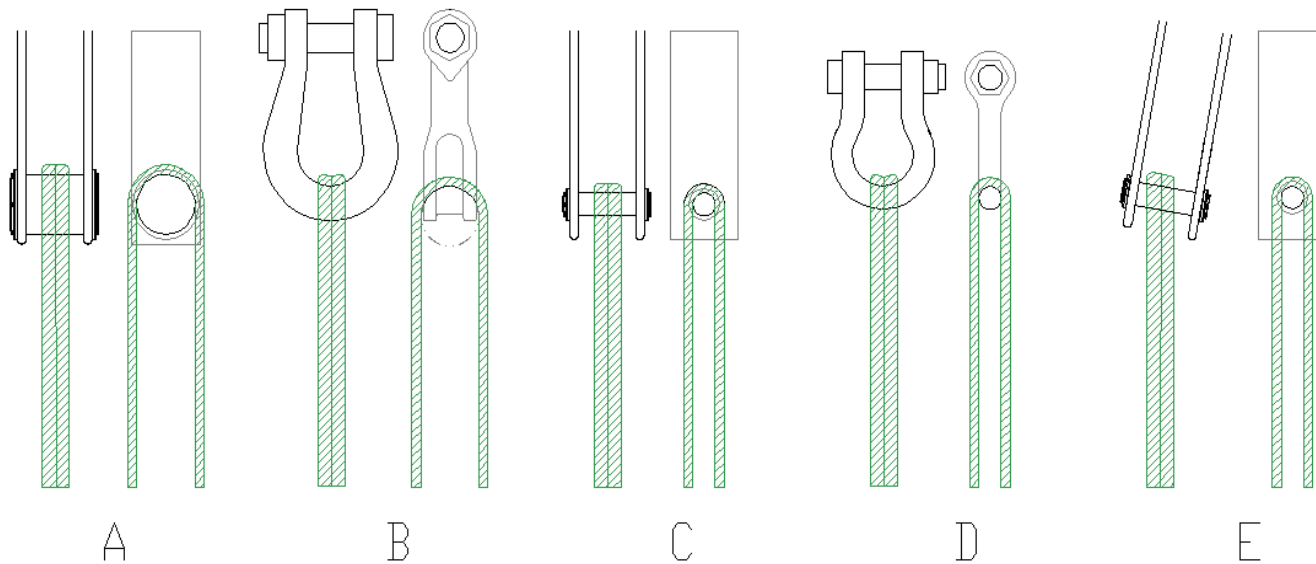
Data Available

- SlingMax Technical Bulletins
- Technical bulletin 9A and 9B describe destructive tests done in 1997 and 2006.
 - Crosby 9a, Tension member Technology 9b
 - 50,000 Load cycles of 150% design load.
 - @ 15 times a day this represents 9 years of service!



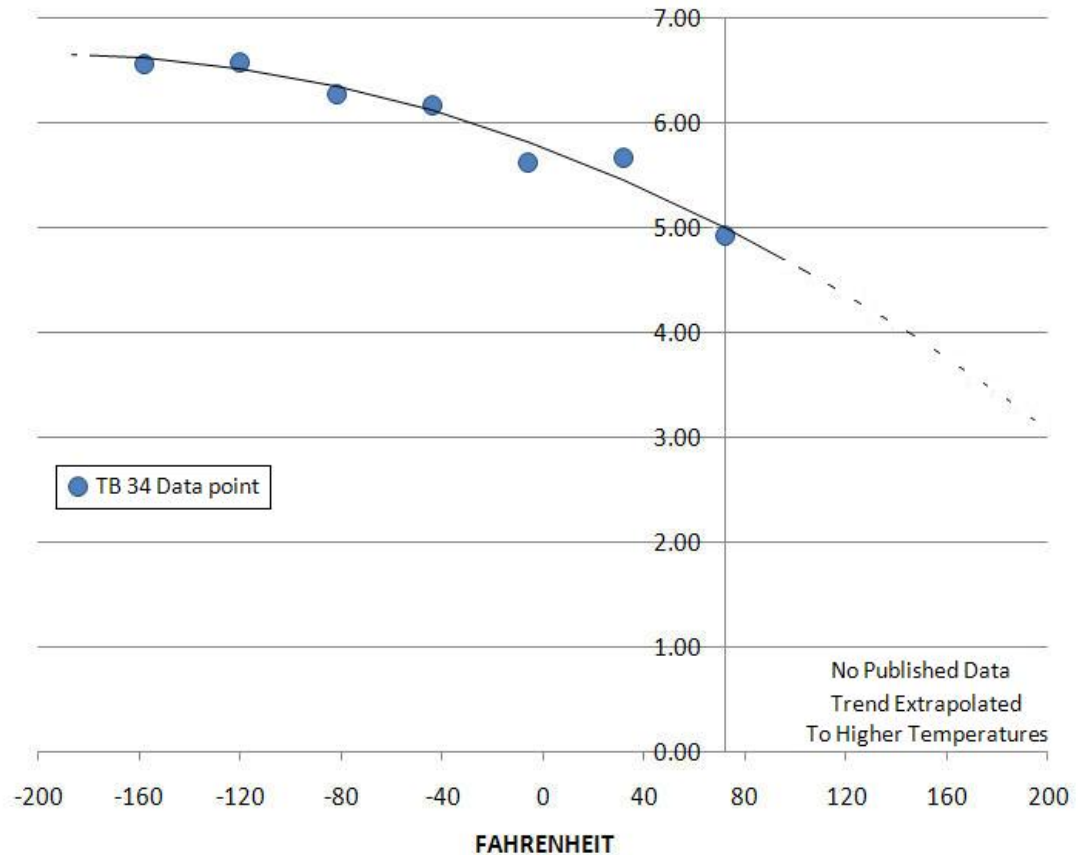
Bearing Surface

- Loading may affect lifespan.
- Low bearing pressures, uniform clean surface, straight pull, ideal.
- Side loading, high bearing pressures, curved bow shackles not as good.



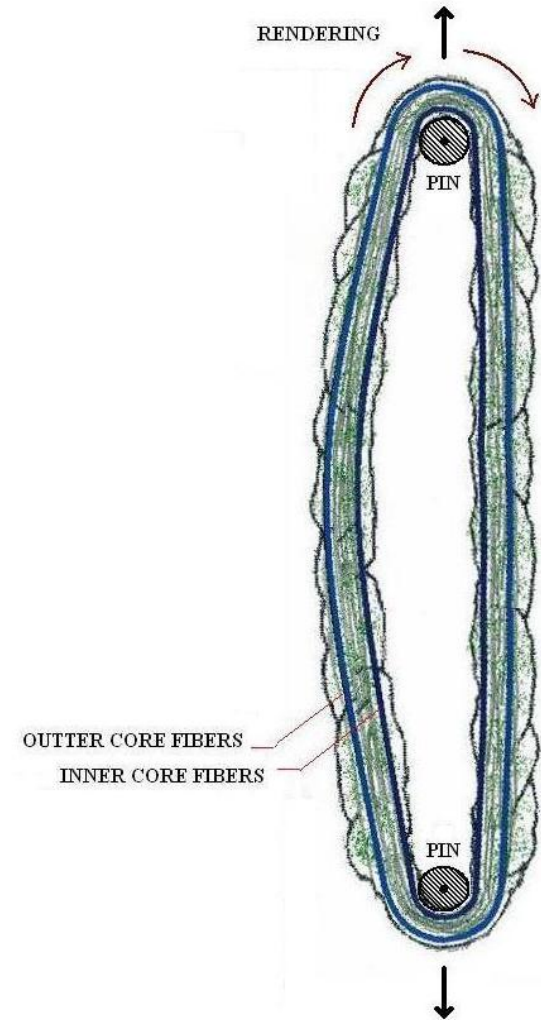
Temperature Range

- Many Plastics become stronger but brittle at cold temperatures
- K-Spec fiber retains its strength at lower temperatures
- Quoted maximum safe operating temperature is 180 F
Tested @ 150 F (or less) and retained strength
Melt point @ 320 F



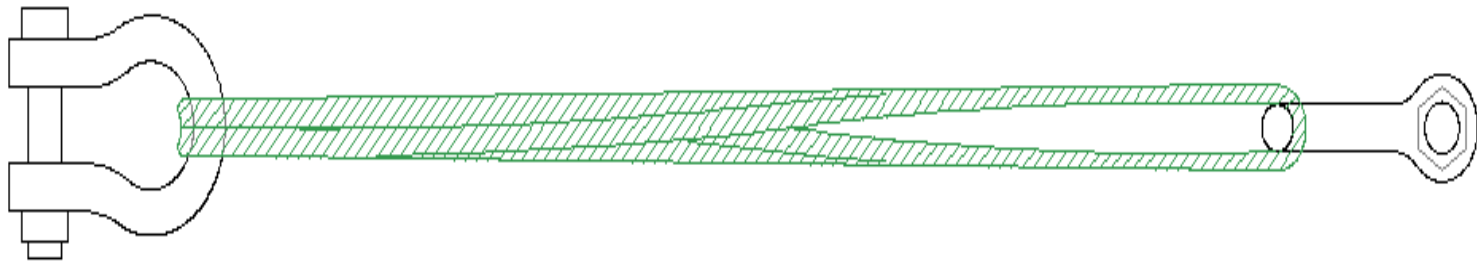
Rendering

- Rendering is One Common Cause of Damage and Tears.
 - When rigging is initialized things are never perfect.
 - Adjustments occur as a result of large forces.
 - Resulting friction on not smooth bearing surface will gouge cover
- Dyneema
 - Sleeve sewn on
 - Significantly better cover protection



Twisting

- Most standards state that Twisting should be avoided:
 - ASME: Twisting shall be avoided
 - WSTDA: Roundslings shall not be twisted
 - CORDAGE: Sling should not be twisted
 - NAVFAC P307...
- US Navy noticed slings accidentally twisting during use and requested test, which indicated limited twisting seems to be ok, even making slings stronger up to a point.
- Limited twisting as shown should be acceptable.



Thanks

- Questions?

