

Abrasion & Cut Protection for Synthetic Slings
AWRF Convention Program, San Diego, CA
Written by: Dennis St. Germain

Any material can be cut when exposed to enough pressure and a sharp edge. Diamonds, the hardest substance known, can be split into smaller parts by skilled diamond cutters. Steel is known to be a hard substance, but there are many methods and tools used to cut steel into nearly any shape. Materials used for the fabrication of slings include steel wire rope, chain, and synthetics such as nylon and polyester. All of these materials are candidates for premature wear and cutting if protection proves inadequate.

The protection of slings used in overhead rigging to prevent cutting and premature failure is a subject that has enormous safety implications. It is imperative that only the very best means be used to keep slings from abrasion and cutting by contact with an unprotected edge.

This subject has been studied by many people with a corresponding number of solutions. Various types of animal, synthetic, steel and aluminum configurations have been tried with limited degrees of success. Cow hide, shark skin, nylon, polyester and Kevlar® pads are popular choices. Steel protection that forms to the load and aluminum shapes that fit the application can be made to keep the sling from shearing.

A recently concluded study of various types of synthetic sling wear and the appropriate protection available to prevent abrasion and cutting was conducted at the I&I Sling Inc. facility in Kernersville, North Carolina. During the course of this study, two separate and distinct areas were isolated as the main culprits in synthetic sling damage.

1. Sling damage from contact with rough surfaces such as concrete beams and structures referred to as abrasion damage.
2. Sling damage from contact with sharp corners such as concrete and steel beams. This is referred to as cutting damage.

A considerable amount of time and effort was expended to develop a wear pad that would protect slings against both abrasion and cutting. Actually, these are two very different and mutually exclusive injuries that require different solutions. Since there is a difference in the requirements, a single pad material will not fix both problems. In fact, the solution calls for different materials and shapes as will be disclosed.

Abrasion protection necessitates a pad that is large enough to protect the sling area in contact with the load. Exposure of the sling to a corner or edge requires a pad that is not susceptible to cutting because of inherent toughness or zero contact.

After isolating the difference in possible sling injury it was apparent a pad that was adequate for protection in abrasive situations may lack the ability to withstand damage from edges or corners. The latter contact the sling in a small defined area concentrating the pressure and enhancing the chance of penetration or cutting.

Steel protection in the form of half-pipes or wire mesh inserted into nylon tubes prevented cutting and allowed synthetic slings to reach their full breaking strength. However, these heavy cumbersome devices could fall on a job-site creating other hazards for the workers.

Another method that precluded penetration of the sling by exposure to edges was the change in geometric shape of the edge itself. This was accomplished by riggers when they would place a wooden 2" x 4" on either side of the edge thus causing the sling to pass by the edge without making contact.

Newer devices such as the CornerMax® pad change the geometric shape of the load edge and actually prevent sling contact up to 25,000 lbs per inch of width.

Testing of all types of material on a steel edge showed that the best could withstand cutting only to 11,400 lbs. This is short of the required 25,000 lbs per inch of width and falls short of minimum requirements of 12,500 lbs per inch of width.

It is up to individual sling suppliers to verify protection for abrasion and edge protection. This is one area where field trials are not a good idea. In fact, if you do not have tests to show that your methods of cut protection actually meet the requirements of your synthetic slings you could be in real trouble in a product liability lawsuit.

An EN2-901 nylon web endless sling has a rated capacity of 12,200 lbs in a vertical basket hitch. If the customer asks for edge protection and you supply anything other than CornerMax® pads or a steel protector, you will lose a law suit if the sling fails from cutting. Every material we have tested exposed to an edge will fail below 12,200 lbs per inch of width except the CornerMax® pad or some form of steel protection.

Dennis St. Germain

SLING PROTECTION

Most synthetic sling accidents are caused by cutting. There are many kinds of protective sleeves and pads available, but only two synthetic protectors provide adequate cut protection: CornerMax® pads and CornerMax® sleeves. They have been engineered and tested to provide 25,000 lbs. of protection per inch of sling width (4464 kg per centimeter of sling width). CornerMax® pads are designed for 90° straight edges. CornerMax® sleeves are for other edges – curved, rough, or irregular – and are the protection of choice for I-beams. For synthetic slings, the most critical decision is whether cut protection is needed.

Cut Protection – Engineered Softeners

CornerMax® pads are shown in the right two photos. The pad creates a “tunnel” of cut protection – a no-touch zone. Therefore, the edge does not come in contact with the pad or sling. Note that the sides of the pads must be completely supported in order to create and maintain the “tunnel”.



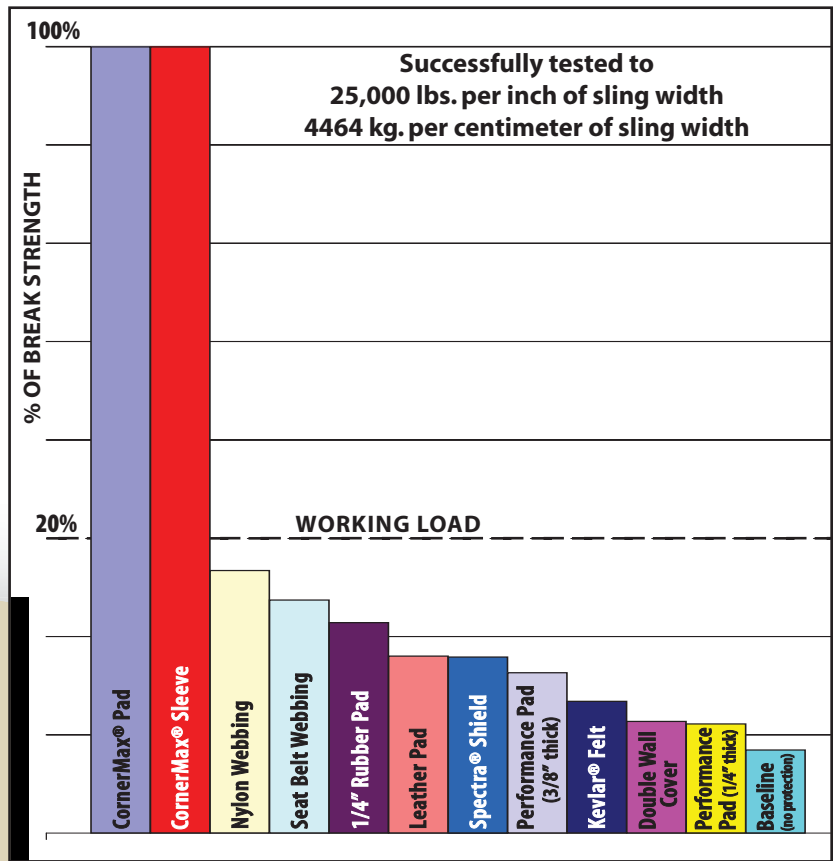
CornerMax® sleeves may look like traditional protection sleeves, but ours are made of Dyneema® fiber that is specially woven to provide cut protection for a variety of edges and surfaces. Most commonly used sleeve material cannot stop an edge from cutting the sleeve and possibly the sling too. For test results, see the chart on the reverse side.



Call your Slingmax Rigging Solutions dealer for assistance in making the right choice for protecting your rigging.



This chart shows the results of testing slings protected by 12 different synthetic materials that are often used for sling protection. In our tests, ten of the most commonly used materials do not allow a sling to reach its working load before the sling is cut and fails. The CornerMax® pad and sleeve allow the synthetic sling to meet its working load with no damage to the sling or the protection.



Other Sling Protection...



Sometimes cut protection is not needed. We have a full line of engineered softeners that are excellent for abrasion protection or for protecting a load surface. The Shackle Pin pad is designed to prevent a synthetic sling from damage when a sling is seated on the pin side of a shackle.



Your Slingmax Rigging Solutions dealer can help you make the right choice for protecting your rigging. Call today!



⚠️ WARNING

Damaged or misused protection can result in sling damage or failure. Inspect before each use for cuts, tears, or damage that may prevent protection of the sling. Ensure that protection is the correct size and type to protect the sling. Prevent the sling and its protection from sliding across the load edge. DEATH or INJURY can occur from improper use, maintenance, or inspection.
MAXIMUM LOADING: 25,000 lb. per inch of sling width (4464 kg/cm of sling width).



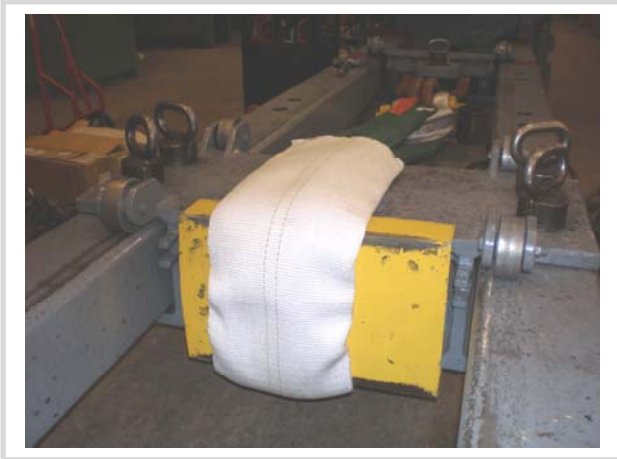
SLINGMAX® and CornerMax® trademarks are the property of Slingmax, Inc. Dyneema® trademark is the property of DSM N.V.

P.O. BOX 2423 • ASTON, PA 19014-2423 USA

TEL: 800-874-3539 • 610-485-8500 FAX: 610-494-5835

www.slingmax.com

Testing of 10-inch Cornermax[®]/Dyneema[®] Sleeve
02/01/2010



The 10" Cornermax[®]/Dyneema[®] Sleeve was placed over a TPXC 15,000 and pulled over the 90° edges of a sharpened steel plate.

The 8" wide sling was then pulled to its basket capacity of 300,000 lbs., which exerted 37,500 lbs. of pressure per inch of sling width.



No damage was found on the Cornermax[®]/Dyneema[®] Sleeve after this test.
NOTE: The 10-inch Cornermax[®]/Dyneema[®] Sleeve is rated and tested for a maximum of 25,000 lbs. per inch of sling width.

MAXIMUM LOADING: Do NOT exceed 25,000 lbs. per inch of sling.