

Commonly Overlooked Sling Inspection Items

Minor damage could mean major trouble if ignored

Riggers who are committed to using slings correctly and efficiently never overlook the importance of learning about available sling types, their correct usage, and inspection processes. Too often sling users and inspectors underestimate how critical a small area of damage can be. Each type of sling has its own “Achilles heel,” which is particular to the type of sling. What may be considered minor damage, could mean major trouble, if ignored. The following are examples of damage that is often overlooked during an inspection of alloy chain, wire rope, synthetic web and synthetic roundslings.

Alloy chain slings

Alloy chain slings are often used in severe conditions, such as high operating temperatures. They are flexible, durable, long-lasting, ductile, and adhere to the contours of the load. Another advantage to these slings is the ability

to repair damaged components or links and restore them to useful condition. Repaired slings must be proof tested.

According to ANSI B30.9-1.9.4, “An alloy chain sling shall be removed from service if conditions such as the following are present: Excessive wear... Minimum thickness on chain links shall not be below the values listed in Table 9-1.9.4.1” (above).

Wear normally happens at the side barrel of chain links or at interlink bearing points. Wear at interlink bearing points is more difficult to recognize and therefore is often overlooked. When wear is detected the sling

MINIMUM ALLOWABLE THICKNESS AT ANY POINT ON A LINK			
Chain Size (Inches)	Minimum allowable thickness (Inches)	Chain Size (Inches)	Minimum allowable thickness (Inches)
9/32	0.189	3/4	0.687
3/8	0.342	7/8	0.750
1/2	0.443	1	0.887
5/8	0.546	1-1/4	1.091

should be removed from service until the amount of metal loss can be verified. To determine loss, one can measure the questionable area with calipers or no-go gauges. When using no-go gauges, make sure that the chain manufacturer’s gauges are being used. It does not take much wear, beyond the minimum wear dimension, to cause a severe reduction of the chain sling’s ultimate strength.



Mike Riggs is president of Rigging Institute, Knoxville, Tenn. He is a training professional with 35 years’ experience in the crane and rigging industry. Rigging Institute was established in 2010 by the founders of I&I Sling and Slingmax Rigging Solutions, for whom Riggs worked as a subject matter expert and manager since 1997. He is a past president of the Association of Crane & Rigging Professionals and is author of The Complete Rigger’s Reference Handbook. This article is excerpted from a presentation he made on the subject at the CRC/ICHC conferences held in May in New Orleans, La.

Wire rope slings

One benefit wire rope slings offer is the ability be rigged in a number of sling configurations. They are a strong, dependable, and economical solution for load handling.

Wire rope slings in use today are generally manufactured with a mechanical splice. This is accomplished in two ways. The most common is known as a flemished eye mechanical splice. In this process, the wire rope is spliced into an eye before a steel or aluminum sleeve is slid over the end wires of the splice. Then, the end wires are pressed with mechanical force to provide a finish that prevents the

wire from unraveling or pulling apart. The second method is a turnback splice. In an eye formed by this method, the wire rope is simply folded over itself. After the wire rope is folded, a steel or aluminum sleeve is pulled over the wire connection and is mechanically pressed together, forming the eye.



Flemished Eye



Turnback Eye

Both the flemished and turnback spliced slings have the same rating. However, the flemished eye splice has an advantage. If the sling is improperly spliced or the sleeve is damaged, the user will still have protection from injury due to the 60 percent plus of ultimate strength of the splice that remains with an incorrectly functioning sleeve. However, if a turnback splice has a damaged or improperly pressed sleeve it will fail completely leaving no back-up splice in the wire rope to protect the user from possible injury or death.

For this reason, users and inspectors must closely and carefully inspect the turnback sleeve before and after every use. ANSI B30.9-2 requires a 200 percent proof test of every newly fabricated turnback spliced sling.



Flemished Eye
Eye Maintained



Turnback Eye - Eye Failed

Nylon web slings

Web slings are often selected when the load to be lifted is expensive, highly polished, fragile, or delicate, because web slings are less likely to damage the surface of the load. Inherent to their design is a certain amount of flexibility, which assures a secure grip around the item being lifted. An added benefit is that they are very lightweight to handle. If the environment contains chemicals, users should be aware that nylon web slings may be okay to use with some chemicals, but not others. For example, if acids or bleaching agents are present, nylon web slings are not a good choice. High operating temperatures may also affect the performance of nylon web slings.

Web slings have the ability to elongate, absorbing and minimizing the effects of heavy shock loads. Removal criteria in ANSI B30.9-5.9.4 states: "A synthetic webbing sling shall be removed

from service if conditions such as the following are present:...(d) holes, tears, cuts, or snags..."

The guideline does not specify how large a hole, tear, snag, or cut can be. There is a very good reason for this. It does not take much damage to create a significant loss of strength in a nylon web sling. The following is one of many tests I've conducted on cut webbing.

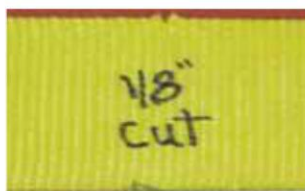


Vertical Rated Capacity 4,800 pounds
Minimum Break (Min.) Strength: 24,000 pounds
Actual Break-Base Line (BL): 27,510 pounds

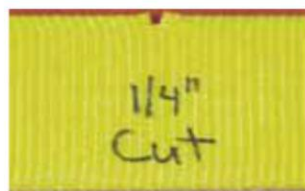
of the sling versus the minimum breaking strength of the sling. Of the remaining four slings, each were damaged by making a cut on one edge of the sling body. The cuts made measured 1/8", 1/4", 3/8", and 1/2". After the cuts were made, the slings were pulled to destruction. As you can see below, the results indicate a dramatic loss of ultimate strength. If you see a cut of any size in a web sling, remove the sling from service.

For this test five new single-ply, 3-inch wide by 6-foot long nylon web slings were pulled to destruction. One sling had no damage; it represents the baseline for the ultimate or actual strength

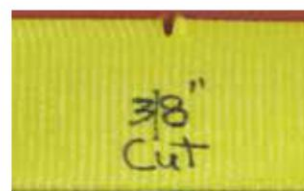
MINIMUM BREAK STRENGTH: 24,000 POUNDS



Actual Break: 21,910 pounds
Loss from BL Break: 20%
Loss from Min. Break: 9%



Actual Break: 17,670 pounds
Loss from BL Break: 36%
Loss from Min. Break: 26%



Actual Break: 15,800 pounds
Loss from BL Break: 43%
Loss from Min. Break: 34%



Actual Break: 14,000 pounds
Loss from BL Break: 49%
Loss from Min. Break: 42%

Synthetic roundslings

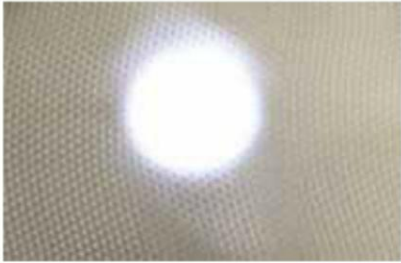

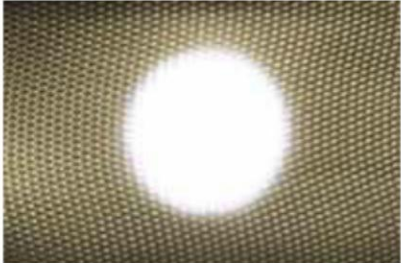



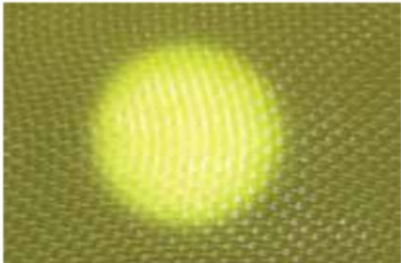

Roundslings are often selected when high strength-to-weight ratio is important to the selection of the rigging gear. Like web slings, they cause less damage to the surface of the load than wire rope or chain slings. But the flip side of that is that the slings may require protection when rigged around load edges.

When inspecting roundslings, one critical item that should be given attention is not listed in the removal criteria of ANSI B30.9-6.9.4 "UV degradation". However, paragraph (k), which states, "other conditions, including visible damage, that may cause doubt as to the continued use of the sling," can be used for justification for removal. The Web Sling and Tie-Down Association (WSTDA) is more aggressive when it comes to UV degradation of polyester roundslings. It states in WSTDA RS-1 4.4.1 that "Polyester roundslings should be stored in a cool, dry and



dark place to prevent loss of strength when not in use through exposure to ultra-violet rays." The key observation guideline for the inspector is, when a roundsling's color is not identifiable, remove it from service as ultraviolet light has had an opportunity to weaken the sling.

Based on testing and information from three manufacturers, the textile industry, and my dermatologist, the best protection from UV damage of sling fiber and your skin is dark, thick, tight-knit material. Roundslings with light-colored jackets can lose up to 40 percent of their ultimate strength over a six-month period in continuous Florida, California, or Tennessee sun. In the roundsling color spectrum, white, tan, gray, and yellow are the least protective covers, while red, dark brown, dark green, and black offer the best protection against UV damage. The more light that can shine through the sling's protective cover, the more quickly UV damage is realized. ■

LEAST PROTECTIVE COVERS		COVERS WITH BEST PROTECTION	
	White		Red
	Tan		Dark Brown
	Gray		Dark Green
	Yellow		Black