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# GUIDELINES FOR RETIREMENT OF TWIN-PATH® SLINGS

Sling inspection throughout the rigging industry has been known to be somewhat subjective. Individuals performing these inspections range from end users to independent "safety" contractors to the sling manufacturers themselves. The individual inspectors have varying levels of experience, knowledge, training and skill. The location of sling inspections can be anywhere from the jobsite, to a manufacturer's shop or even the bed of a pickup truck. Often the damage is obvious and the inspector confidently renders the sling "out of service". The customer is offered the option of a newly manufactured sling as replacement. There are "grey areas" however, and most would agree that inspection of tension members is more of an art than a science. Every day, training classrooms are filled with students learning the "art" of sling inspection.

Recently at Slingmax HQ, we have received an increasing amount of repair vs. replace questions from our dealers. Dealers send photos of Twin-Path® slings with suspected damage to the cover and/or core yarn. Our opinion is sought as to whether the sling should be removed from service and our general advice remains consistent: "When in doubt, take it out!". That means, if ANY damage to the core yarn is realized, the roundsling shall be removed from service and ultimately destroyed to prevent inadvertent use.

However, our Slingmax® dealers deserve more than a catchy cliché. Therefore, we decided to write this summary to share our experiential knowledge and to document the relevant standards pertaining to the repair of synthetic roundslings. This is a safety-related subject that each of the 45 Slingmax® fabrication and repair locations should review to ensure their inspectors are adequately trained and their inspection process is consistent with the relevant standards.

For this document, the following standards were referenced regarding inspection criteria for roundslings:

1) ASME B30.9, 2014: (American Society of Mechanical Engineers)
2) BS EN1492-2.2, Version A1, 2008: (British Standard)
3) CI 1905-14, May 2014: (Cordage Institute)
4) WSTDA-RS-1HP, 2016: (Web Sling & Tie Down Association)

These standards all read a little differently, but they are congruent in that ***damage to the load bearing cores*** is a determining factor to remove a roundsling from service. The exact verbiage for the relative standards is as follows; "**Roundslings shall be removed from service if any of the following damage is indicated during inspection"**:

(ASME B.30.9) - "*Broken or damaged core yarns*"

(CI 1905-14) - "*Roundslings that suffer damage to the load bearing cores must be removed from service, as they are not repairable*"

(WSTDA-RS-1HP) - "*Any evidence of a broken core yarn(s) present in the form of a substantial reduction of core yarn within any area of the roundsling and / or by a substantial accumulation of core bundle within any section of the roundsling*"

(BS EN1492-2.2) – Basically provides examples of cover damage that could indicate possible core damage. For instance, "*Exposed core*" is referenced as a reason to remove a roundsling from service.

Regarding Twin-Path® slings, the most common questions we receive from dealers and end users are: "What exactly is core yarn damage and what are the causes?" The sling inspector must ultimately determine whether a condition exists that could compromise the integrity of the sling.

Per the standards, here are the common conditions for removal of a roundsling from service:

1) Missing or illegible sling identification
2) Surface chafing (localized)
3) Acid, chemical or caustic attack
4) Evidence of heat or friction damage
5) Holes, tears, cuts, abrasive wear, or snags that expose the core yarns
6) Broken or damaged core yarns
7) Weld splatter that exposes core yarns
8) Any other conditions that cause doubt as to the integrity of the sling

When Twin-Path® roundslings suffer damage to the cover, it is possible they can be repaired and recertified. However, they also may have reached the end of their usable life. This guideline

contains examples to help illustrate and explain certain types of damage, but it does not include all possible types of damage. If any evidence of core yarn damage is found, the sling must be retired and destroyed to prevent inadvertent use.

Time, as an independent variable, is not necessarily the dictating factor in removing a sling from service. Life spans of Twin-Path® roundslings are affected by many factors and their longevity can be impacted by environmental exposure, unknown overloads, and general wear and tear of the roundsling, among other factors.

Visual inspection of the roundsling is the most common method to detect damage. However, due to the roundsling's construction, it is not always possible to visually inspect all the core fibers throughout the entire length of the sling. This is one reason why standards mandate that repaired roundslings be proof tested to twice their rated capacity. Proof testing the repaired roundsling provides a secondary level of assurance.

If there are severely damaged strands undetected by the initial visual inspection, it is likely they will fail during proof testing. When proof testing roundslings as part of the inspection process, it is important to pay attention to signs that could indicate core yarn damage. One of these signs is a sudden drop in load, as measured on a calibrated test machine. Another sign to pay attention to is the sound of core fiber "popping", which can indicate a damaged strand breaking. Proof testing of roundslings shall be performed at a minimum of twice the rated capacity, in accordance with the appropriate standards.

# EXAMPLES OF NON-REPAIRABLE DAMAGE

***(Must be REMOVED from service)***

## YARN-ON-YARN ABRASION

**Severe degradation from yarn-on-yarn abrasion. The coating on the fibers shows wear and tear and individual fibers have broken. Besides abrasion, exposure to heat can also contribute to this effect.**

**Often found in repetitive lifting applications, such as general manufacturing environments like automotive stamping plants.**

## YARN-ON-YARN ABRASION (CONTINUED)

**Extreme abrasion between the core yarns, to the point where the fibers have started to separate. This example contains an aramid fiber which is more susceptible to yarn-on-yarn abrasion vs. HMPE.**

**Often found where the sling is subjected to repeated movement over a surface, such as vibratory hammer applications.**

# SNAGGING

**The cover of the roundsling was torn and pulled open, exposing the core yarns and pulling them out of the cover. Most likely caused by the sling sliding over a rough or gouged bearing point.**

**Often found where roundslings contact unprotected steel edges, such as construction or demolition sites or gouged crane hooks.**

# SNAGGING (CONTINUED)

**The roundsling was snagged on a sharp object that penetrated the cover. The core yarns were pulled out of the cover for inspection, whereby several fibers in multiple strands were found to be cut.**

**Often found where slings have been pulled from under an object or placed on a contact surface such as a hook or trunnion with nicks and gouges.**

# HEAT OR FRICTION

**The core yarns have fused together because of heat buildup. This is most likely at a location where the bearing point of the sling was never changed or rotated or a small D/d ratio.**

**Often found in automotive stamping and vibratory hammer applications.**

# HEAT OR FRICTION (CONTINUED)

**Note the discoloration of the core yarns. Several of the core yarns have also started to fuse together at the contact point of the heat source.**

**Often found in areas with a high ambient temperature, such as steel mills or on blacktop pavement on hot, sunny days.**

**Also found in slings that are stored in high temperature containers.**

# CUTTING

**The roundsling jacket and multiple core fibers were cut due to lack of protection around a contact surface.**

**Often found in harsh environments such as construction sites or mining applications where the roundsling contacts unprotected load edges.**

# CUTTING (CONTINUED)

**Partially abraded/cut core yarn (left) and heat/abrasion damage (right) from contact with a 'sharp' edge. The roundsling was pulled around an edge without proper protection.**

**Often found in applications such as steel coil lifting, steel milling environments and construction H-beams being lifted without proper sling protection.**

Additional knowledge as to the integrity of a used Twin-Path® sling can be gained by occasionally break testing a sling in question and noting the results. Keep in mind that according to the referenced standards, the required design factor is based on a "*new*" roundsling.

In conclusion, if there is any doubt as to the integrity of a Twin-Path® roundsling, it must be removed from service. If there is ambiguity, which seems to happen more often with field inspections, a second person inspection can be performed by a qualified Slingmax® Twin-Path technician at the manufacturing and testing facility. If the core yarn displays visual damage or warning signs are realized during proof testing, the sling must be removed from service to prevent inadvertent use.

Submitted by:

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