



eBook

Sling Protection:

Synthetic Sling in One Hand, Sling Protection in the Other



TRAINING | FIELD SERVICES | CERTIFICATION | BOOKSTORE | WEBINARS | E-LEARNING | WORKSHOPS

Cranes • Rigging • Lift Planning • Inspection



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Who We Are

A World Leader in Crane and Rigging Training



IT Training




ITI conducts the majority of its crane training and rigging training courses at client locations in North America and around the world. In addition, many clients choose to send key personnel to open-enrollment courses offered at ITI Training Centers in the USA and Canada. Online learning courses are also available for various subjects. Find the courses that you are interested and learn about the different course delivery methods.

iti.com/training



IT Field Services




Educated minds and experienced hands have always been the foundation of the ITI Field Services and Training staffs. These traits are the reasons why many customers request the following services:

- Accident Investigation
- Expert Witness Testimony
- Crane & Rigging Audits
- Critical Lift Planning
- Lift Director Services
- Manual Development

iti.com/fieldservices



IT Bookstore




The ITI Bookstore is the most comprehensive and complete marketplace for books, reference and training materials, and field tools for those conducting crane, rigging, and lifting activities. ITI Bookstore is a Division of Industrial Training International, a world leader in crane, rigging, and lifting training and consulting.

iti.com/bookstore



IT Workshops

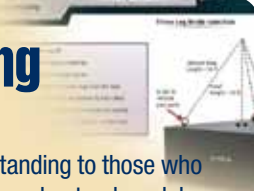


ITI has been conducting crane, rigging, and lifting open-enrollment educational events since 1986. Notice, these are not “conferences”. ITI Workshops are single-track, interactive learning events that bring ITI course content to a specific region, tailored to a specific industry, with a few special guest speakers. Find the lineup for upcoming Lifting Workshops.

iti.com/workshops



IT E-Learning




Delivering knowledge and understanding to those who use cranes and rigging in easy-to-understand modules for beginners and veterans alike, accompanied by open-enrollment, hands-on learning opportunities. E-Learning courses can be taken in part as prep courses for several instructor-led courses as well as stand-alone when taken in full. When you call in to register – ask for the Training Center Student Discount.

iti.com/elearning



IT Webinars



















Each month ITI President and CEO Mike Parnell hosts a free webinar presentation for you to learn and discuss crane, rigging, and lifting matters important to your organization. Also, check out the lineup of upcoming Training Modules delivered live by ITI Instructors. Learn right from your computer and earn ITI CEUs.

iti.com/webinars

Who We Are

We serve a variety of industries:

	Aerospace		Nuclear Energy
	Construction		Oil & Gas
	Defense Departments		Power Distribution
	Energy Departments		Pulp & Paper
	Hydro Power		Railroad
	Manufacturing		Shipbuilding
	Maritime		Utilities
	Mining		Wind Energy

Our Mission

We commit all of our resources and our fullest energy to provide world-class crane and rigging training and consulting solutions to industries and organizations conducting lifting activities.



our customers

The world's greatest organizations trust ITI's expertise with their crane and rigging operations.



Resources



Showcase Webinar Series

A free, monthly training webinar to help improve your organization's lifting activities

- 10 Audit Points for Your Crane & Rigging Operations: An HSE Perspective
- Tackling the Challenges of Training Site Supervisors, Lift Directors, and Other Leaders
- 4 Major Lifting Considerations in Power Gen Environments



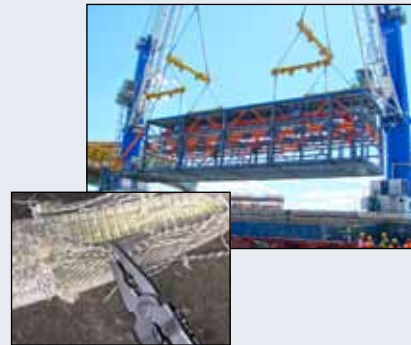
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Webinar Training Courses

Instructor-led webinar training courses airing actual ITI course curriculum.

- Lift Director & Site Supervisor
- Critical Lift Planning
- Rigging Gear Inspection for Supervisors
- Advanced Rigging: Load Distribution & Center-of-Gravity
- Advanced Rigging: Multi-Crane Lifts & Load Turns



iti.com/webinars



Workshops

Regional, industry-specific training events for the purpose of improving lifting operations by educating organizational leaders.



iti.com/workshops



ITI Blogs

Keep up with industry news and trends by reading our blogs. 3 Different blogs highlight 3 different facets of the industry. **The ProRigger** highlights technical issues, **Crane & Rigging Success from the ITI Team** gives personal viewpoints, and **Industry Insights** focuses on industry news. If you missed any of these past articles, you can still find them at iti.com/blogs:

ProRigger: Crane Assembly & Disassembly Director - What is that?

ProRigger: 10 Tips for Better Mobile Crane Operations

C&R Success from the ITI Team: Qualities That Make a Successful Rigging Gear Inspector

Industry Insights: LEEA Issues New Guidance on Using Hand Chain Blocks



iti.com/crane-rigging-blogs



Mike Parnell - About the Author

- Technical Director, President/CEO, ITI
- Vice Chairman, ASME B30 (Cranes & Rigging Standards Main Committee)
- Chairman, ASME P30 (Lift Planning Standard)
- Associate Member, CSA Z150 Technical Committee on Mobile Cranes

Mike holds 33 years of progressive experience in wire rope, rigging, and crane operations in various industries including mining, maritime, electric utility, pulp and paper, manufacturing, nuclear, oil & gas, and construction. He has developed innovative training techniques, resource materials, workbooks, videos and reference cards which are widely used in the rigging industry today. Through ITI Field Services, Mike and his team provide consulting, accident investigation, and expert witness services.

Rigging Advice: Sling Protection is Critical!

Crane and rigging accidents can generally be tracked back to a collection of events all arriving at the same place in time. Here at ITI Field Services, we have investigated the cause of eight fatalities in the last three years. The leading reason for the fatalities can be tracked back to a lack of sling protection. In most cases, synthetic slings had been properly selected but not well protected. Web slings and roundslings can be quickly damaged from cutting and friction.

In ASME B30.9 Slings it states, “Slings in contact with edges, corners, protrusions, or abrasive surfaces shall be protected with a material of sufficient strength, thickness, and construction to prevent damage”. A key reminder is that the sling protection material needs to be able to hold the sling away from the load edge and significant contact points, even when under severe



pressure. We encourage everyone to help save lives and loads, by using robust and dependable cut-proof sling protection. ■

Synthetic slings vs. Harsh Hooks

A variety of industries use synthetic slings to move equipment and product on a daily basis. Like most other sling types, synthetic web slings and synthetic roundslings serve to help provide acceptable rigging methods for load handling. In the same locations, loads may be rigged using steel slings made from wire rope and alloy chain. Spreader bars and lifting beams get used on certain loads to help avoid sling-to-load contact, and increase sling angles thereby lessening the individual sling tensions.

Especially when a mix of rigging equipment is used at one location, the rigger should pay special attention to the crane hooks in use. Multiple lifts (hundreds and thousands) with steel rigging can result in peening, gouging and displacement of the material in the hook bowl or saddle. Though not exceeding the removal criteria established by the hook manufacturer, this phenomenon can result in sharp edges towards the outer face of the hook.

If synthetic slings are placed directly into a peened hook bowl, the edges can act like a razor and sever the sling during the rigging and lifting process. This same type of event can occur when rough shackles that are regularly used with steel rigging, are placed into service with synthetic slings.

Always look at the contact point to which synthetic rigging is connected. Sling protection used along the body can prevent friction or cutting damage. However, a peened hook or shackle can cause just as much devastation.

Inspect the contact points used with all rigging. If hardware or connection devices can cause damage or severing of a sling while under tension, tag out the component and get it repaired or replaced. Certain hardware manufacturers allow for hand filing and buffing of their components to help maintain smooth surfaces. Follow the manufacturer’s instructions about repair and maximum allowable loss of cross-section criteria when considering hardware repair. ■



Engineered Sling Protection - Oh, the Variety!

Engineered Sling Protection Companies in a variety of industries use different types of rigging equipment to handle loads of all shapes and sizes. Certain loads require the use of a specific type of sling. Often, employees in steel manufacturing and welding/fabrication use chain slings to rig and move ingots, slabs, plate, pipe and finished products. The work environment is rough and tumble, often at elevated temperatures which require rigging that will withstand the affects of corners and edges of materials in a dependable manner.

Other industries that depend on chain slings as the material of choice include stevedoring, shipbuilding, and heavy construction. Metal mesh slings are generally restricted to manufacturing where dipping and product cleaning is practiced. These flexible slings handle objects that may be in bundles or in-process lengths. They are fairly dependable in limited heat and chemical applications and are typically used in pairs from the ends of a lifting beam in choker or basket hitches. They are resistant to load corners to a degree and can be coated with synthetic rubber-like material to provide friction when handling smooth objects. Wire rope slings are flexible and reasonably durable, but have a “memory” often taking on the contour of the load they are rigged to. Because of wire rope’s round shape, very few protectors have been developed for defending the wires and strands from load edges. Wires are often ripped or shredded resulting in some loss of strength and this condition can present a hazard to employees who handle the slings.

The construction world often uses wire rope slings when utility loads such as steel beams, rebar, concrete or steel pipe, and wood or concrete piling are picked and handled on a repetitive basis. Newco Manufacturing makes a host of wire rope sling protectors to help defend the wires/strands during lifting (photo 1).

Also, Interfron from Italy offers an aluminum “hinged” magnetically connecting device with a large groove to help form an arc, for the wire rope to bear against at load corners (photo 2).

Synthetic rigging such as flat web slings, synthetic roundslings and synthetic rope slings are common in many industries. They are flexible and lightweight when compared to their counterparts and easy to store. The volume of synthetic rigging in toolrooms and gang boxes has grown substantially since the 1960’s and will continue to do so in the foreseeable future. By nature of the material, they are susceptible to cutting and friction damage against load edges and surfaces.



PHOTO 1



PHOTO 2

Of the 60 crane and rigging accident cases investigated by ITI in the last 25 years, 30 have been related to sling damage/failure and 30 were associated with rigging hardware, wire rope (crane operating ropes) and crane/rigging procedures. Of the sling related accidents, 87% involved synthetic web slings or synthetic roundslings. During our investigations, no synthetic slings failed due to improper manufacture or fabrication. To date, we have not found any cases yet where loads at high temperatures (1800+F) were the primary cause of failure. A handful of accidents involved ultraviolet ray degradation that caused significant loss of tensile strength resulting in a dropped load. In the lion’s share of cases, the cause of failure could be directly tied to external abuse. Load edges and super rough surfaces often created localized friction or cutting damage to the synthetic sling muscle, whether web fibers or core yarns. A significant contributor to synthetic sling damage is sling sliding, which can often melt or cut through even engineered sling protectors.



PHOTO 3



PHOTO 4

In Photo 3 (above), note that sling sliding resulted in a failure that produced a fatality, due to heat generated between the load edge and web protector/enclosed web sling. As a general rule there are two basic rigging methods. The first method involves slings rigged directly between the crane hook and load shackles at the load. The slings touch only selected rigging hardware. The hardware needs to be “clean”, meaning no burrs, scoring or surfaces that can cause cutting of the synthetic slings. The second method generally involves rigging the slings directly to the load via basket or choker hitches. During the “direct contact” type applications we need to incorporate sling protection that will hold the sling away from edges or locations that can cause cutting damage. “Old school” practices allowed for sling protection to be made from retired slings (cut in 12” pieces), old fire hose or leather.

We as users must start employing a more serious grade of sling protection, especially for synthetic slings. The material must be able to push or hold the sling away from the load edge during the lifting activity. A new type of rated and engineered sling protection in the marketplace is made by Linton Rigging Gear Supply. The patent pending design involves a piece of high density plastic round stock that is machined with a 90° notch designed to hug the load corner by lightly connecting with magnets.

Also available is a style that fits to the flange of an I-beam (photos 4 and 5).



PHOTO 5



PHOTO 6

The Meshguard by Lift-It Manufacturing incorporates metal mesh belting in a webbing sandwich (photo 6).

With contact pressures in the tens of thousands/ lbs/inch/wide, the sling protection must be substantial and have the structural integrity to withstand the exerted force at the contact point. Often, the more important consideration may be the capacity of the engineered sling protection as the limiting factor, if it less than the sling in use. An important consideration is the overall width of the sling protection and its allowable loading per inch of width, when compared to the anticipated sling loading per bearing inch of width. Scott St. Germain of Slingmax notes that the Cornermax Pad has, “internal spacers that create a “tunnel” of cut protection, separating the pad and the sling from contacting the 900 load edge” (photo 7).



PHOTO 7

This protection is designed with encased plastic rods that help create a barrier between the sling and load. Some sling protectors are made from super high density synthetic fibers sleeves (photo 8), which provide exceptional resistance to cutting.



PHOTO 8

Other materials in the marketplace that are intended to provide resistance to abrasion and can be made from a radiator hose like material, steel-belted flat rubber, reinforced rubber conveyor belting or heavy duty webbing (photo 9).

Slings can also be coated with neoprene or a rubberized compound to help fight abrasion and repel foreign matter like metal shavings. The owner/user of the synthetic rigging needs to investigate a variety of options and determine the best selection for their various applications. When employees grab synthetic slings for a job, a new axiom should come to mind, “Slings in the right hand, sling protection in the left hand”.



PHOTO 9

Website addresses for the protection items noted throughout this article.

- Photo 1 www.newcomfg.com
- Photo 2 www.interfron.it
- Photo 3 Damaged sling protector
(no web address)
- Photo 4 & 5 www.lrgsupplies.com
- Photo 6, 7, 9 www.lift-it.com
- Photo 8 www.slingmax.com ■

Sling Protection Poster

Available at the ITI Bookstore: iti.com/bookstore | 888.567.8472



Sling Protection



1

Here synthetic rods are encased in webbing material. They physically hold the roundsling away from the load edge. Outer Velcro® straps help contain the sling during lifting and lowering.



2

A section of metal mesh is encased in cut resistant synthetic material, which provides a wall between the sling body and load edge.



3

Heavy synthetic webbing is wrapped around the roundsling body to provide resistance to damage from abrasive and rough load surfaces.



4

Machined high capacity plastic maintains solid barrier between sling and load edge. The "corner round" has magnets embedded on inner faces to help it temporarily attach to the steel load.



5

Super cut-resistant synthetic material is proven against steel coil edges at extreme psi values. Exceptional cut protection for synthetic web slings and roundslings.



6

Flexible synthetic material helps protect against cutting and abrasion with high coefficient of friction to hold its position between the sling and the load surface.



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