

Crane Tech Newsletter

If you are not receiving Tech Tips directly you can register to receive this free publication. Go to www.cranetech.com and click the "click here to subscribe" link in the upper left panel.

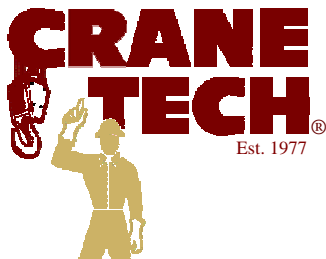
CRANE TECH

December 2006

2007 Training Dates are listed on our web site. Save time by enrolling on-line.

Enroll 2 & 3rd is Free

Did you know that when you enroll two students in select Crane Tech seminars the third student is free? Students attending the same class on same dates save 33%.



Safety Through Education

Since 1977

Tampa
Houston
Southern Louisiana

4951 Adamo Drive
Suite 238
Tampa, FL 33605

Phone: 813-248-4800
800-521-7669

Fax: 813-248-4820

Web: www.cranetech.com

Tech Tips[©]

Material Handling Safety

Sling Strength and Design Factors

As many in the crane and rigging field are aware, all rigging gear is supplied with a working load limit (WLL) that is based, in part, on a design factor. This Tech Tip is provided to explain "design factor" and to help users better understand how it applies to everyday lifting.

The ASME B30.9 standard titled "Slings" defines design factor as "a ratio between nominal or minimum breaking strength and the rated capacity of the sling." Simply put, dividing the breaking strength of a sling by the designated design factor results in the WLL. Another term from the definition of design factor is "nominal strength." Note how the term nominal strength is used in conjunction with "minimum breaking strength." Nominal is a term that relates to breaking strengths published by the Wire Rope Technical Board. This is the minimum breaking strength that a wire rope can have. Any manufacturer's wire rope can break at a value greater than nominal, but never less.

So, design factor is a number that when divided into the least amount of force required to break a sling results in the WLL for that sling.

Now let's move to a subject that is of constant concern, sling failure. When and how does a sling fail? As many know, there are numerous ways that a sling can fail. Cuts, crushing, heat, caustics, excess loading, are just a few of the more common ways to damage and/or cause a sling to fail. So then, how does a sling fail when the applied load is less than the WLL? It may seem obvious, but the answer really lies in our knowledge of the design factor.

Since the use of a sling causes it to no longer be new, one can only assume that the values assigned to WLL only apply to a new sling, right? Wrong! The WLL of a sling never changes, and the design factor never changes. What changes is the sling's breaking strength.

Although it would be a serious mistake to reduce a sling's WLL because of existing damage, users must diligently inspect slings prior to use to make sure the sling is fit for service. Breaking strength reduces with each minor damaging occurrence.

Tech Tip Continued:

The objective is to remove slings from service long before breaking strength is reduced to the amount of load applied.

ASME B30.9 provides several removal criteria for wire rope slings. One of the more easily interpreted criteria relates to broken wires, where it is stated; "for strand laid wire rope slings, when there are ten randomly distributed broken wires in one rope lay or five broken wires in one strand of a rope lay" the rope has met removal criteria. A user's inspection finds a few broken wires, some crushing damage, a couple of kinks, and abrasion—what's the user to do? The question is more accurately asked, how much strength remains in the sling?

Some companies send their slings out for proof testing to make sure the slings are fit for service. Not that this is a bad practice, but testing is just one step in the quality assurance equation. A scenario may look like this; Your slings are delivered to the testing facility, placed in a test bed and pulled to two-times the vertical rating (in accordance with ASME B30.9 testing standards). Slings that don't fail are supplied back ready for service, right? We hope not! What if damage to the sling has reduced the breaking strength to a factor of 3:1, or 2.1:1? The pull test won't tell you that. What if existing damage is exacerbated by the excessive test load? How assured are you that future shock loads won't cause the sling to fail during use? Your only hope is that testing was preceded by a thorough inspection by a knowledgeable inspector.

In a perfect world every sling that met rejection criteria would have exactly the right number of broken wires as stated in ASME B30.9. But, other damage takes its toll and must be accounted for during inspection. Users must recognize where their knowledge ends and should remove suspect slings for inspection by a qualified person. This is the only way to keep fingers, toes, arms, legs, and life intact.

Every sling is new only once. From that point forward it's a test of the user's knowledge and prudence to remove slings from service.

Don't get caught thinking your slings have more strength than they actually have. Proper inspection methods coupled with the assurance that slings are not overloaded are the keys to rigging safety.