

## RECOMMENDED OPERATING AND INSPECTION GUIDELINE

Mechanical Guidelines | Handling | Inspection | Exposure



A specific procedure for the inspection of synthetic slings is your best safeguard against sling damage and abuse. We recommend that you employ a three stage level of inspection as outlined in ASME B30.9. Note that there are no Canadian Standards for slings however, some Provinces and Ministries of Labour have issued specific inspection and removal criteria depending on where the slings are used (construction or industrial use). Consult your local authorities. In Ontario consult the O.H.S.A. Another source of information is the IHSA - Infrastructure Health & Safety Association.

### Initial Inspection

This inspection is done at the time the product is first received to ensure that damage has not occurred during shipment. Also verify that the goods are in compliance with the specification of the purchase order.

### Frequent Inspection

This level of visual inspection should be done by the person handling the sling, or other specifically designated personnel. Records are not required.

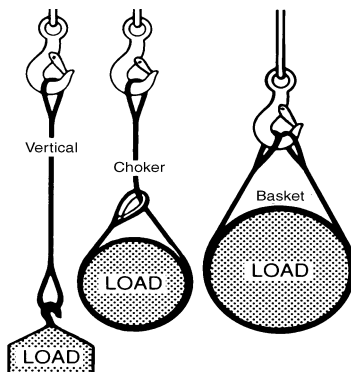
- a) Normal service - daily when in use
- b) Severe service - each use
- c) Special or infrequent service - as recommended by a qualified person before and after each use.

### Periodic Inspection

The periodic level of inspection is done by designated personnel at regular intervals. The interval is based upon the frequency of use, severity of service conditions, and information derived through the inspection process. Recommendations to prevent damage must be evaluated to improve the service life of the replacement slings. Written records must be kept.

## Basic Factors concerning the use of Synthetic Slings

1. **RATED CAPACITY** (Rated Load; WLL) of a sling is based upon the Nominal Breaking Strength of the material used in the sling, AND FACTORS which affect the overall strength of a sling. These factors include ATTACHMENT or FABRICATION EFFICIENCY, the number of plies in a web sling, type of hitch (see below), LOAD SHAPE AROUND WHICH THE BODY OF THE SLING IS POSITIONED, and the shape of the hardware which the sling is rigged with to the crane or lifting device.
2. **RATED CAPACITY** of a sling is different for each of the three basic methods of rigging (see below). These rated capacities are listed in this catalogue. The RATED CAPACITIES apply to slings made by UNIROPE ONLY and are indicated on capacity tags.
3. **NEVER "SHOCK LOAD"** a sling. There is no practical way to estimate the actual force applied by shock loading. The rated capacity of a sling can easily be exceeded by a sudden application of force, and damage can occur to the sling. The sudden release of a load can also damage a sling.
4. The **BODY** of a sling **MUST** be protected with corner protectors, blocking or padding against damage by sharp edges or corners of a load being lifted. Sharp bends that distort or cut the sling body will result in sling failure.
5. **ANY ANGLE** other than vertical at which the sling is rigged, increases the loading (tension) on the sling.
6. A sling should be given a **VISUAL INSPECTION BEFORE EACH LIFT OR USAGE** to determine if it is capable of safely making the intended lift.
7. An inspection should include such things as:
  - Acid or Caustic Burns
  - Melting or charring of any part of the sling
  - Holes, tears, cuts, or snags
  - Broken or worn stitching in load bearing splices
  - Abrasive Wear
  - Knots in any part of the sling
  - Damage to end fittings
  - Other visible damage that causes doubt as to the strength of the sling
8. Whenever a sling is found to be deficient, the eyes must be cut, or other end attachments or fittings removed to prevent further use, and the sling body discarded.
9. Synthetic Slings should be stored in a cool, dry, and dark place. Slings should also be kept free of dirt and foreign material. Mild soap and water can be used to clean slings.



## Every Lift uses 1 of 3 Basic Hitches

**VERTICAL**, or straight, attachment is simply using a sling to connect a lifting hook or other device to a load. Full rated load of the sling may be used, but never exceeded. A tagline should be used on such a lift to prevent rotation which can damage the sling.

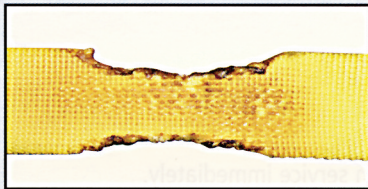
**CHOKER** hitches reduce lifting capacity of a sling, since this method of rigging affects the ability of the sling to adjust dur-

ing the lift, places angular loading on the body of the sling, and creates a small diameter bend in the sling at the choke point.

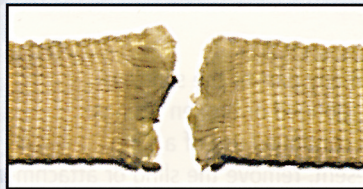
**BASKET** hitches distribute the load equally between the two legs of a sling, within limitations imposed by the angles at which legs are rigged to the load.

**Remove if you detect these damages**

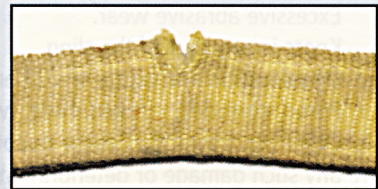
(Note that for educational and graphic purposes these examples are overly explicit. In service remove for much less obvious or explicit damages)



**ACID OR CAUSTIC BURNS**



**CUT**



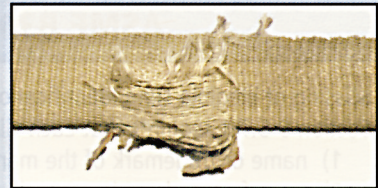
**EDGE CUT**



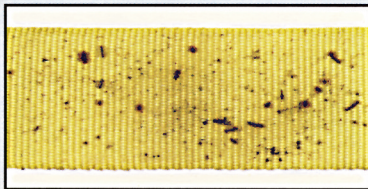
**MELTING OR CHARRING**



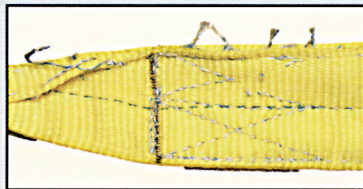
**ABRASIONS**



**PUNCTURE**



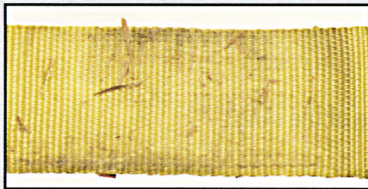
**WELD SPATTER**



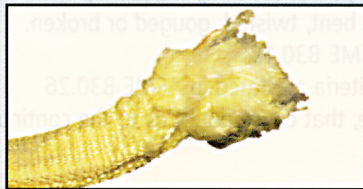
**BROKEN OR WORN STITCHES**



**DAMAGED EYE**



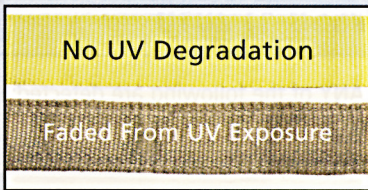
**EMBEDDED MATERIALS**



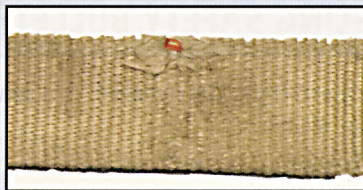
**TENSILE BREAK**



**MISSING OR ILLEGIBLE TAG**



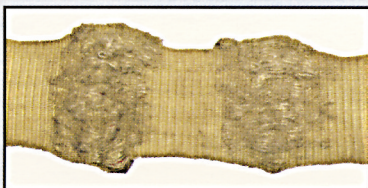
**UV DEGRADATION**



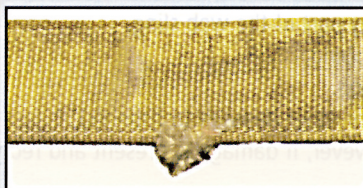
**RED CORE YARN**



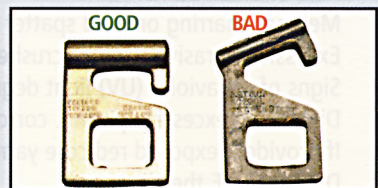
**KNOT**



**CRUSHED WEBBING**



**SNAG**



**DAMAGED HARDWARE**

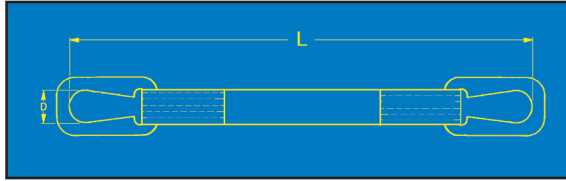


All slings made & tested in Canada by  
UNIROPE®

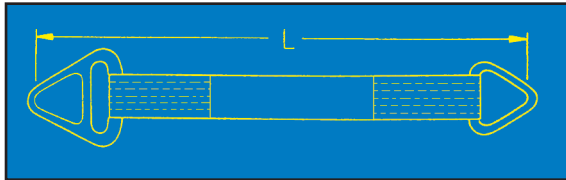
**Basic Sling Types**

**Hitches**

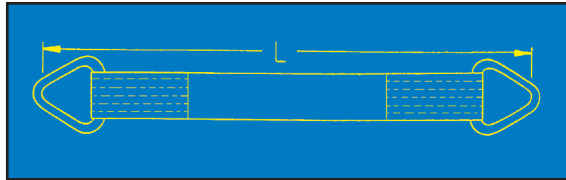
**Type 1 UNI-LINK®**  
The UNI-LINK® Web Fitting functions both as a triangle and choker. No more need to position the sling before choking the load. Fits larger crane hooks than TC and TT sling fittings.



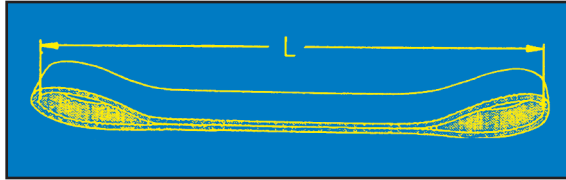
**Type 1 TC Slings**  
Slings with a triangle on one end and with a slotted triangle (the choker) on the other end. Choice of lightweight aluminum or durable steel fittings.



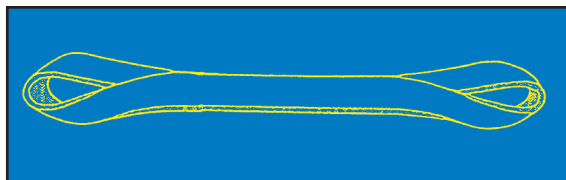
**Type 2 TT Slings**  
Slings with a triangle at both ends. Used in vertical and basket hitches only. Choice of lightweight aluminum or durable steel fittings.



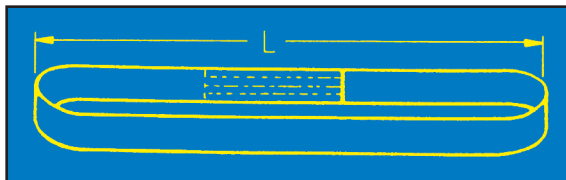
**Type 3 EE Slings**  
Slings with an eye at both ends. Choice of straight or tapered eyes (Tapered eyes are standard for 3" web-width and up)



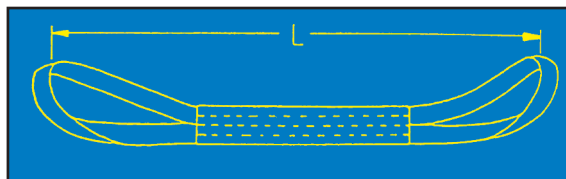
**Type 4 EE Slings**  
Same basic type as Type 3 but eyes are twisted to a right angle to the sling body. (Tapered eyes are standard for 2" web-width and up)



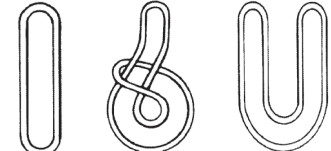
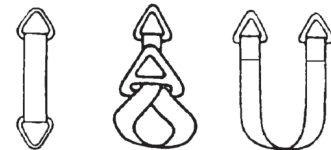
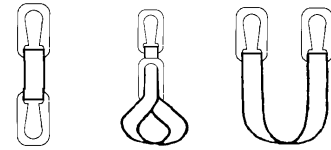
**Type 5 EN Slings**  
Endless slings, sometimes also referred to as grommet slings. The most versatile sling.



**Type 6 RE Slings**  
Return eye sling, also referred to as reversed eye sling. Sling body is formed by 2 parts of webbing sewn side by side using a cordura tube which protects not only the sling edges, but the entire sling body.

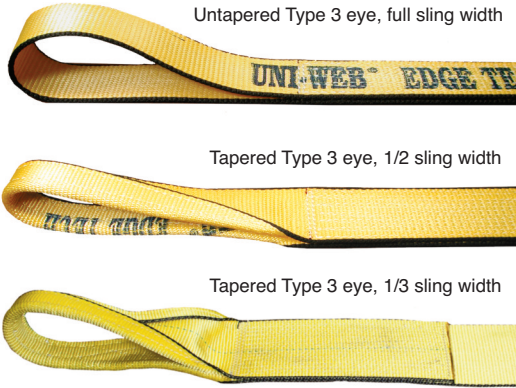


Vertical Choker Basket

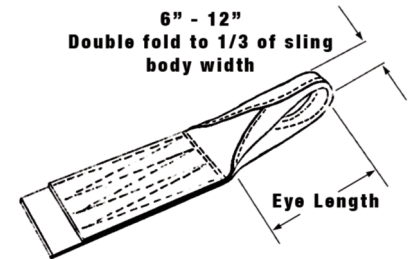
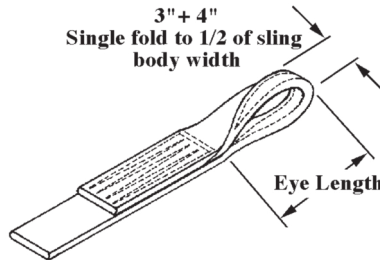
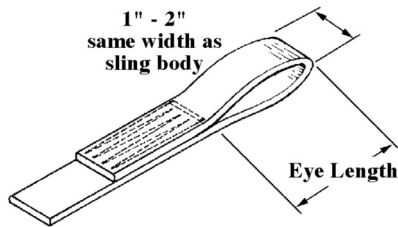


For detailed sling information go to [www.unirop.com](http://www.unirop.com)

### Eye Dimension for Type 3 Slings



UR Stock Code No.	UR Stock Code No.	Sling width inch	Type 3 Eye Length inch	Type 3 Eye Width
EE1-901-3	EE2-901-3	1	10	Full sling width
EE1-902-3	EE2-902-3	2	10	Full sling width
EE1-903-3	EE2-903-3	3	12	1/2 sling width
EE1-904-3	EE2-904-3	4	15	1/2 sling width
EE1-906-3	EE2-906-3	6	21	1/3 sling width
EE1-908-3	EE2-908-3	8	24	1/3 sling width
EE1-910-3	EE2-910-3	10	30	1/3 sling width
EE1-912-3	EE2-912-3	12	36	1/3 sling width

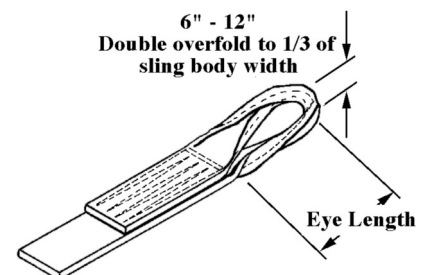
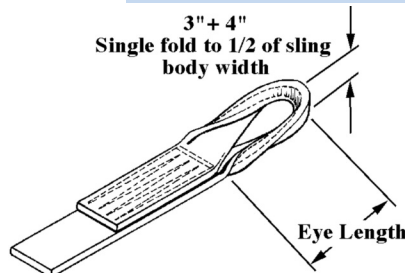
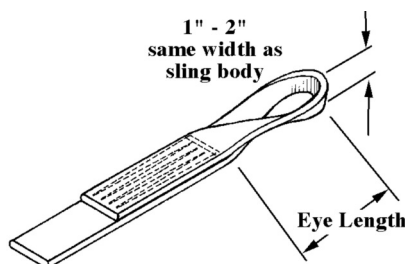


A sling eye should always be 3x as long as the hook width or the pin diameter. Uni-Web slings have extra long eyes to avoid damage due to undersized hooks or bolts.

### Eye Dimension for Type 4 Slings



UR Stock Code No.	UR Stock Code No.	Sling width inch	Type 4 Eye Length inch	Type 4 Eye Width
EE1-901-4	EE2-901-4	1	10	Full sling width
EE1-902-4	EE2-902-4	2	10	Full sling width
EE1-903-4	EE2-903-4	3	12	1/2 sling width
EE1-904-4	EE2-904-4	4	15	1/2 sling width
EE1-906-4	EE2-906-4	6	21	1/3 sling width
EE1-908-4	EE2-908-4	8	24	1/3 sling width
EE1-910-4	EE2-910-4	10	30	1/3 sling width
EE1-912-4	EE2-912-4	12	36	1/3 sling width



## MECHANICAL CONSIDERATIONS

- 1.1 Web slings in contact with edges, corners, protrusions or abrasive surfaces SHALL ALWAYS be protected with materials of sufficient strength and construction to prevent sling damage.
- 1.2 Web slings should be protected from abrasive surfaces.
- 1.3 Determine the weight of the load. Web slings shall not be loaded in excess of the rated capacity. Consideration shall be given to the sling angle, which affects rated capacity.
- 1.4 Select web slings having suitable characteristics for the type of load, hitch and environment.
- 1.5 Web slings that are used in a choker hitch shall be of sufficient length to ensure that the choke point should always be on the sling body—not on the sling eye, fitting, base of the eye or fitting, load bearing splice or tag.
- 1.6 Web slings used in a basket hitch shall have the load balanced to prevent slippage and maintain control of the load.
- 1.7 The openings in fittings shall be the proper shape and size to ensure that the fittings will seat properly on the web sling, crane hook or other attachments.
- 1.8 Web slings should not be dragged on the floor or over an abrasive surface.
- 1.9 Web slings shall not be twisted, shortened, lengthened, tied into knots or joined by knotting. Web slings shall be shortened, lengthened or adjusted only by methods approved by the manufacturer.
- 1.10 Web slings should not be pulled from under loads when the load is resting on the web sling. Loads resting on web slings could damage the sling.
- 1.11 Web slings shall not be used for pulling against stuck, snagged or restrained objects if loading conditions are unknown.
- 1.12 If a sling is used for non-lifting applications under known loading circumstances and within the rated sling capacity, it may be returned to lifting service.
- 1.13 Marking Slings for Dedicated Applications - Slings that are used for pulling against stuck, snagged or restrained objects in loading conditions that are unknown shall not be used for ANY lifting application. These Dedicated Application slings shall be marked “Not For Lifting”.
- 1.14 Do not drop web slings equipped with metal fittings.
- 1.15 Web slings that appear to be damaged shall not be used unless inspected and accepted as usable by a qualified person.

- 1.16 Web slings shall be hitched in a manner providing control of the load.
- 1.17 Personnel shall not stand under, on or next to suspended loads or rigging that is under tension.
- 1.18 All portions of the human body shall be kept from being placed between the web sling and the load and from between the web sling and handling or lifting device.
- 1.19 Personnel shall not ride web slings or loads suspended by web slings. Web slings shall not be used as bridles on suspended personnel platforms.
- 1.20 Shock loading shall be avoided.
- 1.22 Load applied to a hook shall be centered in the bowl of the hook to prevent point loading.
- 1.23 During use, personnel shall be alert for possible snagging.
- 1.24 The web sling legs (branches) shall contain or support the load from the sides above the center of gravity when using a basket hitch.
- 1.25 Tags and labels should be kept away from the load, hook and point of choke.
- 1.26 Web slings should not be constricted or bunched between the ears of a clevis, shackle or in a hook. When a web sling is used with a shackle, it is recommended that it be used (rigged) in the bow of the shackle. When this is not possible, protect the sling eyes or connection points from damage.
- 1.27 Place blocks under load prior to setting down the load to allow removal of the web sling, if applicable.
- 1.28 For multiple-leg slings used with nonsymmetrical loads, an analysis by a qualified person should be performed to prevent overloading of any leg.
- 1.29 **Do not machine- or power spray wash and do not dry-clean web slings as a loss of strength is possible due to mechanical/chemical damage.**  
If web slings have to be cleaned use mild soaps and soft brushes which do not damage the sling fibres.

## ENVIRONMENTAL CONSIDERATIONS

Environmental factors such as an exposure to sunlight, dirt or gritty-type matter and cyclical changes in temperature and humidity can result in an accelerated deterioration of web slings. The rate of this deterioration will vary with the level of exposure to these conditions and with the thickness of the sling material.

For example, single ply slings will generally degrade more rapidly with this exposure than multiple ply slings. All web sling slings that are exposed to these conditions should be highly scrutinized during their inspections.

- 2.1 Web slings, when not in use, should be stored in a cool, dry and dark place to prevent loss of strength from exposure to sources of ultraviolet light. Web slings shall not be stored in chemically active areas and/or in areas where mechanical and/or environmental damage could occur.
- 2.2 Chemically active environments can affect the strength of web slings in varying degrees ranging from little to total degradation. The web sling manufacturer, or a qualified person, should be consulted before web slings are used in a chemically active environment. In addition, water absorption can decrease the strength of nylon web slings by as much as 10-15%. Sling strength returns when the sling dries completely.
- 2.3 Each chemical application shall be evaluated, taking into consideration the following:
  - A. Type of acid or alkalis
  - B. Exposure conditions, i.e., liquid, vapor, mist
  - C. Concentration
  - D. Temperature
  - E. Duration of exposure
- 2.4 **ACIDS**
  - > Nylon is subject to degradation in acids, ranging from little to total degradation.
  - > Polyester is resistant to many acids, but is subject to degradation, ranging from little to moderate in some acids.
- 2.5 **ALKALIS**
  - > Polyester is subject to degradation in alkalis, ranging from little to total degradation.
  - > Nylon is resistant to many alkalis, but is subject to degradation, ranging from little to moderate in some alkalis.
- 2.6 Nylon and polyester slings shall not be used in contact with objects or used at temperatures in excess of 194°F (90°C) or at temperatures below minus 40°F (40°C).
- 2.7 Web slings incorporating aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of alkalis and/or acids are present, unless material compatibility is verified.



- 2.8 Environments in which synthetic web slings are continuously exposed to sources of ultraviolet light can affect the strength of synthetic web slings in varying degrees, ranging from slight to total degradation.

## **WARNING**

Slings used in environments where they are subjected to continuous exposure to sunlight or ultraviolet light shall be proof tested to twice the rated capacity semi-annually or more frequently depending on severity of exposure.

**Web slings that are used outdoors regularly should generally be permanently removed from service within a period of 1 to 3 years.**

## **CAUTION**

**Degradation can take place without visible indications**

**A. Factors which affect the degree of strength loss are:**

1. Length of time of continuous exposure.
2. Web sling construction and design.
3. Other environmental factors such as weather conditions and geographic location.

**B. Suggested procedures to minimize the effects of sunlight or ultraviolet light:**

1. When not in use, store web slings in a cool, dry, dark location free of mechanical and environmental damage.

**C. Some visual indications of environmental degradation are:**

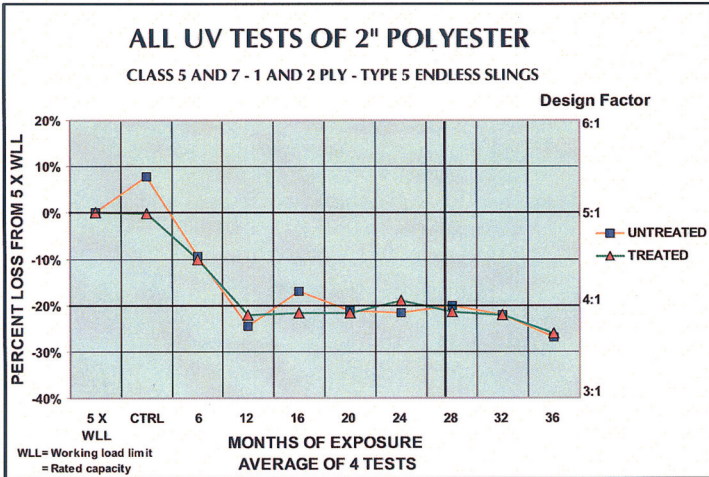
1. Fading of webbing color.
2. Uneven or disoriented surface yarn of the webbing.
3. Shortening of the sling length.
4. Reduction in elasticity and strength of the sling material due to an exposure to sunlight, often evident by an accelerated abrasive damage to the surface yarn of the sling.
5. Breakage or damage to yarn fibers, often evident by fuzzy appearance of the web.
6. Stiffening of the web, which can become particularly evident when web slings are exposed to outdoor conditions without being used or cyclically tensioned.

## **REPAIRS**

- 3.1 There shall be no repairs of sling webbing or stitching.



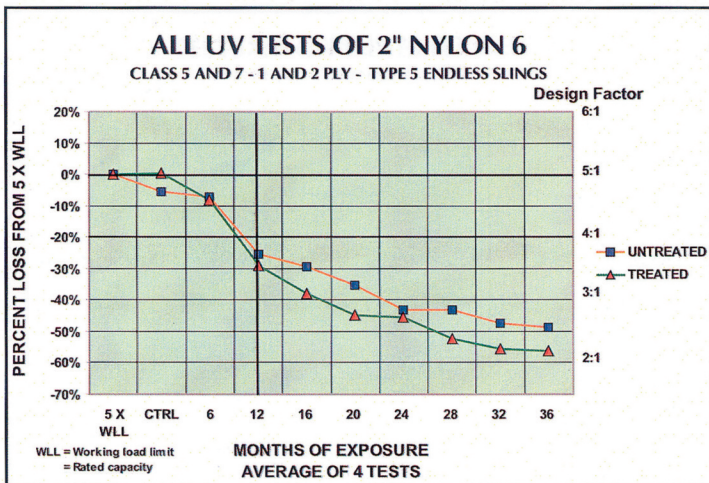
Web Sling & Tie Down Association



The 'Web Sling and Tie-Down Association' conducted two long time exposure test studies on the degradation effects of polyester- versus nylon web sling when exposed to sunlight. The first test was done in 1981, and the second test series was done between 1997 to 2004. The full test report is published by WSTDA, a copy of which can be obtained through Unirope.

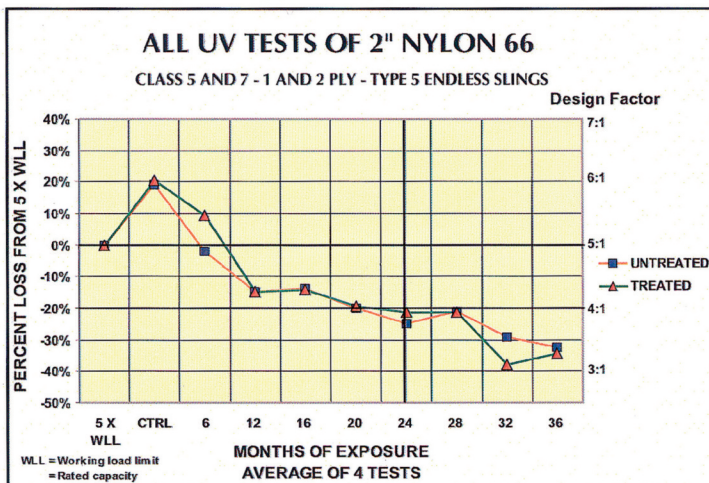
One of the main conclusions reached by WSTDA:

*"The polyester samples tended to undergo most of their strength loss during the first twelve months of exposure and then leveled off approximately a 30% loss in strength. The nylon 6 and nylon 6.6 sample showed a general trend of consistent strength loss over the entire 36 months exposure period, with strength loss levels approaching fifty to sixty percent after 36 months for some sample tests.*



However, it must be noted that, although Polyester webbing seems less affected, even polyester slings will undergo a significant strength loss leading to a DECREASE in strength. Consequently, the DESIGN FACTOR for such slings will DROP from a 5:1 value to at least a value of 4:1 !

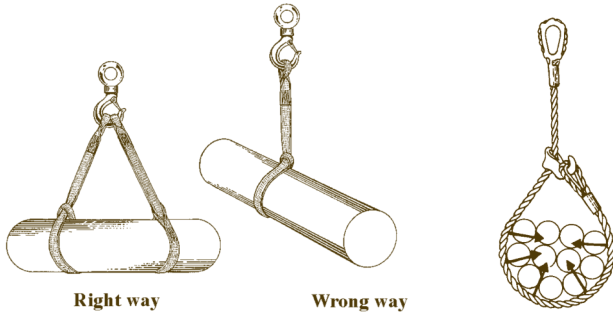
**See Section 2.8 in this document**



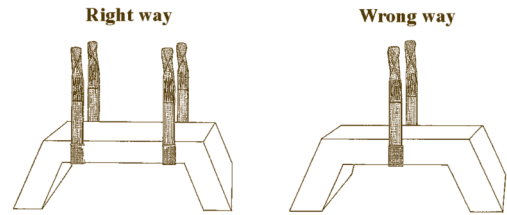
The sling should be rigged in a manner that provides proper load control. It is dangerous to use only one sling to lift a load which tends to shift and slide out.

Be sure to lift over the center of gravity. Raise the load carefully. If the load is unbalanced, lower and correct the position of the slings until the balance point is achieved. Be sure to account for the sling-to-load angle and employ wear and edge protection to prevent the sling from being cut.

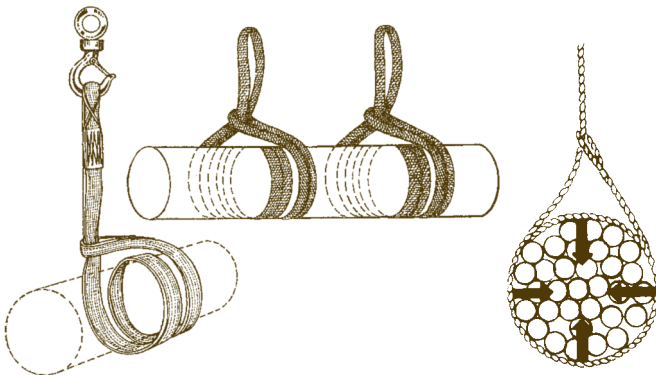
Standard choker hitches compress the load from 3 side only.



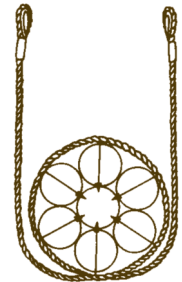
Extra care should be taken when using slings in a basket hitch to balance the load to prevent slippage. It is not good rigging practice to use one sling only in a simple basket hitch. If practical, take a full wrap around the load to grip it firmly.



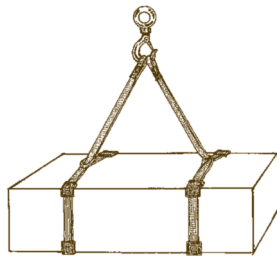
A better way to do the same lift. Use a double wrap choker hitch and for long loads use 2 slings. The double wrap compresses the load on all 4 sides and provides far better load control.



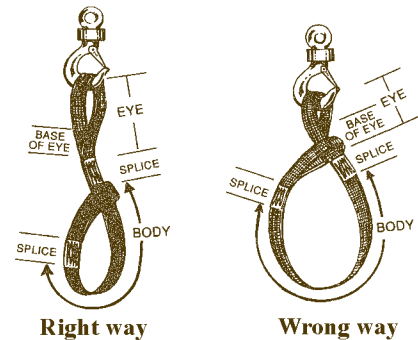
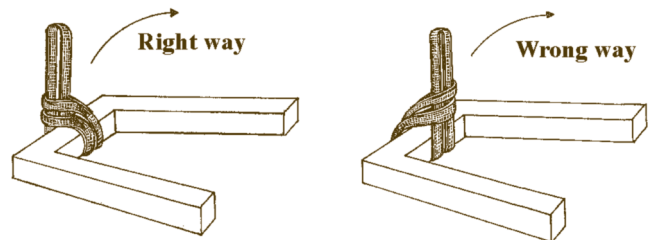
Here we use a plain double wrap hitch. The double wrap compresses the load on all 4 sides. Both sling eyes are placed into the load hook. You do not have to consider choker hitch reduction factors but when the load gets wider you have to consider to reduce the sling capacity due the angularity factor.



The choke hitch should always be pulled tight before the lift is made, not pulled down during the actual lift; you will damage the sling. Consideration must be given to the angle of choke (see page 3). Choke the eyes on opposing sites of the load.



Always use a choker hitch when turning a load. If the sling is not rigged properly, the turning action will loosen the hitch resulting in a load slippage. Basket hitches should not be used to turn a load. Observe the choker reduction factors on page 3.



The Sling should be of sufficient length to assure that the choke action is on the sling body - never on the sling splice, fittings, eye or at the base of the sling eye or fitting.

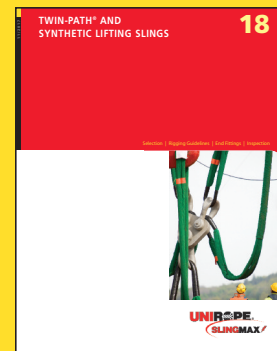


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