



## SYNTHETIC ROUNDSLING SAFETY BULLETIN

### Synthetic Roundsling Safety Bulletin

#### **⚠ WARNING**



This bulletin contains important safety information about the use of synthetic roundslings. However, it **DOES NOT** contain all the information you need to know about handling, lifting and manipulating materials and loads safely. Sling use is only one part of a lifting system and it is your responsibility to consider all risk factors prior to using any rigging device or product. Failure to do this may result in severe **INJURY** or **DEATH** due to sling failure and/or loss of load.

The following six points briefly summarize some important safety issues:

- 1 All users must be trained** in sling selection, use and inspection, cautions to personnel, environmental effects and rigging practices.
- 2 Inspect sling for damage** regularly, if the sling is damaged, remove it from service.
- 3 Protect sling from damage.** ALWAYS protect slings in contact with edges, corners, protrusions, or abrasive surfaces with materials of sufficient strength, thickness and construction to prevent damage.
- 4 Do not exceed a sling's rated capacity.** Always consider the effect of sling angle and tension on the sling's rated capacity.
- 5 Do not stand on, under or near a load** with the sling under tension. All personnel should be alert to danger of falling and/or uncontrolled load, sling tension and the potential for snagging.
- 6 Maintain and store roundslings properly.** Slings should be protected from mechanical, chemical and environmental damage.

#### **1. All Sling Users Must be Trained and Knowledgeable**

All roundsling users must be trained on the proper use of roundslings. The American Society of Mechanical Engineers, Safety Standard for Slings (ASME B30.9) states:

*"Synthetic roundsling users shall be trained in the selection, inspection, cautions to personnel, effects of the environment and rigging practices as covered" by Chapter 9-6.*

OSHA Guidance on Safe Sling Use (29 CFR 1910.184) states that a "qualified person" is one:

*"who, by possession of a recognized degree or certificate of professional standing in an applicable field, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work."*

It is important that all sling users be trained and knowledgeable about the safe and proper use and application of slings and be thoroughly familiar with the manufacturer's recommendations and safety materials provided with each product. In addition, all sling users need to be aware of their responsibilities as outlined in all applicable standards and regulations.

If you are unsure whether you are properly knowledgeable or trained, or if you are unsure of what the standards and regulations require of you, ask your employer for information and/or training—**DO NOT** use roundslings until you are absolutely sure of what you are doing. Remember, when it comes to using roundslings, lack of skill, knowledge and care can result in severe **INJURY** or **DEATH** to you and others.

#### **2. Slings Must Be Regularly and Properly Inspected**

Even seemingly "minor" damage to a roundsling can significantly reduce its capacity to hold or lift objects and increases the chance that the sling will fail during use. Therefore, it is very important that roundslings are regularly and properly inspected. In reality, there simply is no such thing as "minor" damage. If you are not sure whether a sling is damaged, **DO NOT USE IT**.

#### **2a. How to inspect slings**

Generally, damage to roundslings can be detected visually. In some instances, internal load yarn damage can occur and not be visible. To detect possible damage, you should perform a visual inspection of the entire sling and also feel along its entire length, as some damage may be felt more than seen. You should look and feel for any of the types of conditions listed in Table 1. Table 2 shows examples of some of these types of damage, but note that they are relatively extreme examples provided for illustration purposes only.

#### **2b. What to do if you identify damage in a sling**

If you identify ANY of these types of damage in a sling, **remove it from service immediately** even if the damage you feel or see is not as extensive as shown in the pictures in Table 2. Slings that are removed from service must be destroyed and rendered completely unusable unless they can be repaired and proof-tested by the sling's manufacturer or other qualified person. You should never ignore sling damage or attempt to perform temporary field repairs of damaged slings (e.g., tie knots in the sling, etc.).

**Table 1.** Roundsling removal from service criteria

The entire roundsling must be **inspected regularly** and it shall be **removed from service** if ANY of the following are detected:

- If roundsling identification tag is missing or not readable.
- Holes, tears, cuts, embedded materials, excessive abrasive wear, or snags that expose the core yarn of the roundsling.
- Broken or damaged core yarn.
- If roundsling has been tied into one or more knots.
- Acid or caustic burns of the roundsling.
- Melting, charring or weld spatter of any part of the roundsling.
- Distortion, excessive pitting, corrosion or other damage to fitting(s).
- Broken or worn stitching in the cover which exposes the core yarn.
- Any conditions which cause doubt as to the strength of the roundsling.



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### 2c. How often to inspect slings

A three-stage procedure is recommended to help ensure that slings are inspected with appropriate frequency.

**Initial Inspection**—Whenever a sling is initially received, it must be inspected by a designated person to help ensure that the correct sling has been received and is undamaged, and that the sling meets applicable requirements for its intended use.

**Frequent Inspection**—The entire sling must be **inspected before each shift or day in Normal service and before each use in Severe service applications.**

**Periodic Inspection**—Every sling must be inspected "periodically" by a qualified and designated person. In order to validate the frequent level of inspection, the periodic inspection should be performed by someone other than the individual(s) who most commonly performs the frequent inspection. The frequency of periodic inspections is based on the sling's actual or expected frequency of use, severity of service conditions, the nature of the work performed with the sling and experience gained during the inspection of other slings used in similar circumstances. General guidelines for the frequency of periodic inspections are:

Normal service—yearly

Severe service—monthly to quarterly

Special service—as recommended by a qualified person

Periodic inspections intervals must not exceed one year.

Written records are not required for frequent inspections, but WSTDA RS-1 and ASME B30.9 require that a written record of the most recent periodic inspection be maintained. See WSTDA RS-1 for more information about definitions of Normal, Severe and Special service conditions.

## 3. Slings Must be Adequately Protected From Damage

### 3a. Avoid actions that cause damage to slings

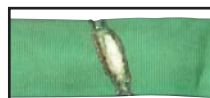
You should always avoid any action that causes the types of damage identified in the previous section of the Safety Bulletin, including (but not limited to):

- Dropping or dragging slings on the ground, floor or over abrasive surfaces.
- Pulling slings from under loads when the load is resting on the sling—place blocks under the load if feasible.
- Shortening or adjusting sling using methods not approved by the sling manufacturer or qualified person.
- Twisting, kinking, or knotting the sling.
- Exposing slings to damaging acids or alkalis.
- Exposing slings to sources of heat damage or weld spatter.
- Using slings or allowing exposure to temperatures above 194°F (90°C) or below -40°F (-40°C).

**Table 2.** Types of damage you should look and feel for in roundslings



Holes/tears/cuts in cover; exposed/damaged yarns



Melting or charring



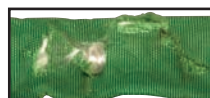
Weld spatter



Knots



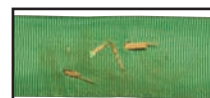
Acid/alkali burns



Snags/punctures



Bunched/wadded yarns



Embedded materials

- "Tip loading" a sling on a hook instead of centering it in the base or "bowl" of the hook.
- Using hooks, shackles or other hardware that have edges or surfaces that could damage sling.
- Running/driving over slings with a vehicle or other equipment.

Synthetic slings are affected by some chemicals ranging from little to total degradation. Time, temperature and concentration factors affect the degradation. For specific applications, consult the manufacturer.

### 3b. Safeguard slings with sufficient protection

Synthetic slings can be damaged, abraded or cut as tension and compression between the sling, the connection points and the cargo develops. Surfaces in contact with the sling do not have to be very abrasive or have "razor" sharp edges in order to create the conditions for sling failure. Therefore, **roundslings must ALWAYS be protected from being cut or damaged by corners, protrusions, or from contact with edges that are not smooth or well rounded with materials sufficient for the intended purpose.**

Roundslings should be protected from abrasive surfaces.

There are a variety of types of ways to protect slings from such damage. A qualified person might select and use appropriately engineered protectors/softeners—commercially available products (e.g., sleeves, wear pads, corner protectors, etc.) specifically designed to protect slings from damage. A qualified person might also design and construct their own methods of protection so long as the sling is adequately protected from and/or kept off of the damaging edge surface.

Regardless of the particular method chosen, the goal is to ensure that the sling, under tension, maintains its ability to securely lift the load while avoiding contact with damaging or abrasive surfaces under tension. A qualified person must carefully consider the most appropriate means to accomplish this goal. The protection used should not be makeshift (i.e., selecting and using cardboard, work gloves or other such items based solely on convenience or availability).

Regardless of the approach taken, a qualified person must ensure that the protection method chosen is appropriate for the types of damage to which the slings will be exposed. For instance, some protection provides abrasion resistance, but offers virtually no protection against cuts. Several "test" lifts, done in a non-consequence setting, may be necessary to determine the suitability of the protection device(s). After each "test" lift, the protection device(s) and sling(s) need to be inspected for damage and suitability. You should keep in mind that no protection is "cut proof" and you should always operate within the specified limits of the sling and its accessories (e.g., fixtures, hardware, protection, etc.).

Roundslings must always be protected from coming into direct contact with any edges unless the contacting edges meet both of the following criteria:

- The edges must be smooth and well-rounded. Edges that are chamfered or flattened at an angle do not meet this criteria.
- The size of the edge radii must be adequately large. Table 3 shows the minimum edge radii suitable for contact with unprotected polyester roundslings.



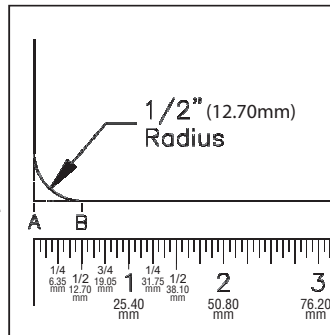
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One way to measure an edge radius is to measure the distance between the leading edge of the radius that is being measured (Point A) and the point where the radius initiates from the bottom edge of the surface (Point B) (see Figure 1).

In order to protect the roundsling, it is also necessary to select and use proper connection hardware. Connection hardware should be selected so that either:

- it conforms to the size requirements listed in Table 4 (choker and vertical hitches) or Table 5 (basket hitch)
- the bearing stress value at the connection does not exceed 7,000 lbs./in<sup>2</sup> during sling loading (see WSTDA RS-1, Section 4.7 for the procedure for calculating bearing stress)

Figure 1



(\*) The radii values apply to roundslings that are fully tensioned to their rated capacity regardless of the hitch.

When roundslings are tensioned to lower force values, the minimum radius values will reduce accordingly. (See WSTDA - RS-1 Appendix 1)

Fractional inches are rounded up to the nearest 1/16" (1.58mm).

Table 3. Minimum edge radii suitable for contact with unprotected polyester roundslings\*

Sling Size	Vertical Rated Capacity		Minimum Edge Radii		Minimum Edge Radii		Sling Width at Load	
	lbs.	kgs.	inch	mm	inch	mm	inch	mm
1	2,600	1,200	0.14	3.55	3/16	4.76	.97	24.63
2	5,300	2,400	0.21	5.33	1/4	6.35	1.29	32.76
3	8,400	3,800	0.26	6.60	5/16	7.93	1.66	42.16
4	10,600	4,800	0.30	7.62	5/16	7.93	1.78	45.21
5	13,200	6,000	0.33	8.38	3/8	9.52	2.00	50.80
6	16,800	7,600	0.40	10.16	7/16	11.11	2.13	54.10
7	21,200	9,600	0.41	10.41	7/16	11.11	2.62	66.54
8	25,000	11,400	0.44	11.17	7/16	11.11	2.85	72.39
9	31,000	14,100	0.50	12.70	1/2	12.70	3.15	80.01
10	40,000	18,200	0.56	14.22	9/16	14.28	3.57	90.67
11	53,000	24,100	0.67	17.01	11/16	17.46	4.00	101.60
12	66,000	30,000	0.72	18.28	3/4	19.05	4.60	116.84
13	90,000	40,900	0.87	22.09	7/8	22.22	5.22	132.58

Table 4. Suitable connection hardware for polyester roundslings when used in choker and vertical hitches

Sling Size	Roundsling		Minimum Hardware Size							
	Rated Cap. lbs.	Vert. Hitch kgs.	Stock Diameter or Thickness				Effective Contact Width			
			inch	mm	inch	mm	inch	mm	inch	mm
1	2,600	1,200	.39	9.90	7/16	11.11	.97	24.63	1	25.40
2	5,300	2,400	.59	14.98	5/8	15.87	1.29	32.76	1 3/8	34.92
3	8,400	3,800	.72	18.28	3/4	19.05	1.66	42.16	1 3/4	44.45
4	10,600	4,800	.85	21.59	7/8	22.22	1.78	45.21	1 7/8	47.62
5	13,200	6,000	.95	24.13	1	25.40	2.00	50.80	2	50.80
6	16,800	7,600	1.12	28.44	1 1/8	28.57	2.13	54.10	2 1/8	53.97
7	21,200	9,600	1.15	29.21	1 3/16	30.16	2.62	66.54	2 3/8	66.67
8	25,000	11,400	1.25	31.75	1 1/4	31.75	2.85	72.39	2 7/8	73.02
9	31,000	14,100	1.41	35.81	1 1/2	38.10	3.15	80.01	3 1/4	82.55
10	40,000	18,200	1.60	40.64	1 5/8	41.27	3.57	90.67	3 7/8	92.07
11	53,000	24,100	1.90	48.26	2	50.80	4.00	101.60	4	101.60
12	66,000	30,000	2.05	52.07	2 1/8	53.97	4.60	116.84	4 7/8	117.47
13	90,000	40,900	2.46	62.48	2 1/2	63.50	5.22	132.58	5 1/4	133.35

### 4. Always Use Slings Properly

When lifting loads, a trained, qualified and knowledgeable user must take into account the factors and issues addressed in this bulletin, as well as considering any other relevant factors not addressed herein (see Table 6). Among the factors related specifically to roundslings, users must perform several activities, including (but not limited to) those discussed in the following subsections.

#### 4a. Assess the load

Determine the weight of the load and make sure it does not exceed the sling's rated capacity or the capacity of any of the components of the rigging system. Users must also determine the load's center of gravity (CG) to make sure the rigging system used will be able to retain and control the load once lifted.

#### 4b. Select an appropriate sling/configuration

Select a sling having suitable characteristics for the type, size and weight of the load, the type of hitch (see Table 7) and the environment. The sling must be securely attached to the load and rigged in a manner to provide for load control to prevent slipping, sliding and/or loss of the load. A trained, qualified and knowledgeable user must determine the most appropriate method of rigging to help ensure a safe lift and control of the load.

Another important consideration is the sling-to-load angle—the angle between a horizontal line and the sling leg or body. This angle is very important and can have a dramatic effect on the rated capacity of the sling. When the sling-to-load angle decreases, the load on each leg increases. This principle applies in a number of conditions, including when one sling is used to lift at an angle and when a basket hitch or multi-legged bridle sling is used. Table 8 provides information about increased tension as a function of sling-to-load angle (assuming equally loaded sling legs. Sling angles of less than 30 degrees are not recommended.

Similarly, when the angle of choke is less than 120 degrees, the sling choker hitch capacity decreases. To determine the actual sling capacity at a given angle of choke, multiply the sling capacity rating (for a choker hitch) by the appropriate reduction factor determined from Table 9.

#### 4c. Do not misuse the sling

Avoid accelerating or decelerating the load too quickly (i.e. "shock loading"). Do not use slings to pull on stuck or snagged objects and do not use slings for towing purposes. A roundsling should only be used for lifting loads.

### 5. Make Sure All Personnel are Clear of Loads and Alert to Risks

Even if you account for all of the factors/issues discussed in this Safety Bulletin, things can still go wrong. Therefore, all personnel must stand clear of the lifted loads and never be under, on or near suspended loads.

When using slings, no part of the body should be placed between the sling and load, or between the sling and lifting hook. In addition, personnel must be alert to the potential for the sling to become snagged during a lift. Never use a roundsling to pull on objects in a snagged or constrained condition.



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### 6. Properly Store and Maintain Slings

In order to prevent damage to slings when not in use, you should store slings in a cool, dry and dark location. Slings should be stored in an area free from environmental or mechanical sources of damage, such as: weld spatter, splinters from grinding or machining, heat sources, chemical exposure, etc. Also, keep slings clean and free of dirt, grime and foreign materials.

If roundslings are cleaned, use only mild soap and water. Rinse sling thoroughly and allow to dry completely before placing the sling back into storage or use. Do not machine wash slings. Machine washing results in significant loss of sling strength.

**Table 5.** Suitable connection hardware sizes for polyester roundslings when used in a basket hitch




Sling Size	Roundsling		Hardware Size - Single Hook or Connection Point							
	Rated Cap. Basket Hitch		Minimum Stock Diameter or Thickness				Minimum Effective Contact Width			
	lbs.	kgs.	inch	mm	inch	mm	inch	mm	inch	mm
1	5,200	2,400	.54	13.71	9/16	14.28	1.37	34.79	1 3/8	34.92
2	10,600	4,800	.83	21.08	7/8	22.22	1.82	46.22	1 7/8	47.62
3	16,800	7,600	1.02	25.90	1 1/16	26.98	2.34	59.43	2 3/8	60.32
4	21,200	9,600	1.20	30.48	1 1/4	31.75	2.52	64.00	2 1/2	63.50
5	26,400	12,000	1.35	34.29	1 3/8	34.92	2.80	71.12	2 7/8	73.02
6	33,600	15,200	1.59	40.38	1 5/8	41.27	3.00	76.20	3	76.20
7	42,400	19,200	1.63	41.40	1 5/8	41.27	3.71	94.23	3 3/4	95.25
8	50,000	22,800	1.77	44.95	1 7/8	47.62	4.00	101.60	4	101.60
9	62,000	28,200	2.00	50.80	2	50.80	4.45	113.03	4 1/2	114.30
10	80,000	36,400	2.26	57.40	2 3/8	60.32	5.06	128.52	5	127.00
11	106,000	48,200	2.69	68.32	2 3/4	69.85	5.62	142.74	5 5/8	142.87
12	132,000	60,000	2.90	73.66	3	76.20	6.50	165.10	6 1/2	165.10
13	180,000	81,800	3.50	88.90	3 1/2	88.90	7.38	187.45	7 3/8	187.32

**Table 6.** Issues and Factors to consider when handling, lifting and manipulating materials and loads

Safe handling, lifting and manipulation of materials and loads requires consideration of a number of factors and issues, including (but not limited to):

Categories	A Number of Issues/Factors to Consider		
<b>Environment</b>	Wind Weather Visibility	Environmental temperature Object temperature Chemical conditions and exposure	Ground stability Underground installations
<b>Load</b>	Weight Dimensions Center of Gravity (CG)	Attachment point integrity Susceptibility to crushing/compression Loose parts that could fall from load	Combination loads Damaging surfaces/edges Structural stability (bend/flex)
<b>Equipment/Lift</b>	Single/multiple cranes/hoists Maximum/planned operating radius Allowable load Ratio of lift to allowable load	Clearance to surrounding facilities Power lines and other environmental hazards Clearance between boom and lift Emergency/contingency set down area	Equipment inspection Ensure a clear load path
<b>Rigging</b>	Sling selection Load control Lift point (over the CG) Positive sling-to-load engagement	Coefficient of friction: Sling-to-load Appropriate hitch (for CG and load control) Load is free to move and is not snagged Coordination of multiple slings	Suitable wear protection Sling capacity is adequate for angle and tension
<b>Personnel</b>	Area clear of unnecessary personnel Personnel are trained and qualified	Signals: Visual, audible, electronic, etc. Personnel away from load and other dangers	Pre-lift plan and meeting Tag lines/spotter requirements

**Table 7.** Common types of sling hitches

Hitch	Comments
<b>Vertical Hitch</b> 	One end is placed on the hook, while the other end is attached directly to the load. A tagline should be used to prevent load rotation.
<b>Choker Hitch</b> 	Sling passes through one end around the load and the other end is placed on the hook. Rated capacity is normally 80% of that for a vertical hitch. Load control is a potential problem with only one sling rigged in a choker hitch. Also, the choke point should always be on the sling body—not on the fittings, base of the fitting or tag.
<b>Basket Hitch</b> 	The sling cradles the load while both ends are attached overhead. The rated capacity for a basket hitch is twice that for a vertical hitch. As with the choker hitch, more than one sling rigged in a basket hitch (or some other means) may be necessary to help ensure load control.

**Table 8.** Increased sling tension as a function of sling-to-load angle

Angle "A" in degrees from horizontal	Tension Multiplier
90	1.000
85	1.004
80	1.015
75	1.035
70	1.064
65	1.104
60	1.155
55	1.221
50	1.305
45	1.414
40	1.555
35	1.742
30	2.000



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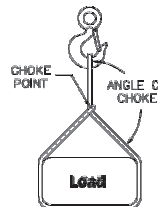


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**Table 9.** Reductions in rated capacity as a function of angle of choke

Angle of Choke (degrees)		Angle of Choke Reduction Factor
= or >	<	
120	180	1.000
105	120	0.82
90	105	0.71
60	90	0.58
0	60	0.50

Actual Sling Capacity =  
Rated Capacity x Reduction Factor



**Multiply the load weight (per leg) by the tension factor to determine the increased tension on the sling leg(s)**

### Where to Find Additional Information

This bulletin does not provide you with all the information you need to know in order to be considered trained and knowledgeable about rigging and lifting loads, but it does provide important information about the use of roundslings within a rigging system. If you need more information about roundslings and rigging practices or your responsibilities according to regulations and standards, talk to your employer. You and your employer can consult a number of sources of information to help ensure that you are properly trained and knowledgeable when using roundslings, including (but not limited to):

- WSTDA-RS-1—Recommended Standard Specification for Synthetic Polyester Roundslings
- WSTDA-RS-2—Recommended Operating and Inspection Manual for Synthetic Roundslings
- ASME B30.9—Synthetic Roundslings: Selection, Use, and Maintenance
- OSHA Guidance on Safe Sling Use [http://www.osha.gov/dsg/guidance/slings/synth-round.html]
- OSHA 29 CFR 1910.184-Slings
- Rigging handbooks
- Manufacturer's catalog, manual, website, bulletins, etc.
- Formal training provided by manufacturers or other entities

WSTDA-RSSB-1 2010



## BOLETÍN DE SEGURIDAD DE LAS ESLINGAS SINTÉTICAS REDONDAS

### BOLETÍN DE SEGURIDAD DE LAS ESLINGAS SINTÉTICAS REDONDAS

#### ! ADVERTENCIA



Este boletín contiene importante información acerca del uso de las eslingas sintéticas redondas. No obstante, **NO CONTIENE** toda la información que usted necesita para poder manejar, elevar y manipular con seguridad los materiales y cargas. El uso de la eslinga sólo es una parte de un sistema de elevación, y es su responsabilidad considerar todos los factores de riesgo antes de emplear cualquier dispositivo o producto de aparejo. El no hacer esto podría resultar en **LESIONES** graves o **MUERTE** debido a una falla de la eslinga o pérdida de la carga.

Los seis puntos a continuación dan un resumen breve de importantes consideraciones de seguridad:

- 1 Es necesario capacitar a todos** los usuarios en la selección, el uso y la manera de inspeccionar la eslinga, así como en las precauciones al personal, los efectos ambientales y las prácticas de aparejo.
- 2 Inspeccionar la eslinga** con regularidad para detectar daños, y si se descubren, retirar la eslinga de servicio.
- 3 Proteger la eslinga de daño.** SIEMPRE proteja las eslingas en contacto con bordes, esquinas, salientes o superficies abrasivas con materiales dotados de suficiente resistencia y espesor, al igual que una construcción adecuada para prevenir el daño.
- 4 No sobrepasar la capacidad nominal** de la eslinga. Siempre tenga en cuenta el efecto del ángulo de la eslinga y la tensión de la misma sobre su capacidad nominal.
- 5 No pararse encima, debajo** o cerca de una carga con la eslinga bajo tensión. Se debe informar a todo el personal de posibles daños por caídas y/o el descontrol de cargas, la tensión de eslinga y la posibilidad de enganchones.
- 6 Mantener y almacenar las eslingas** correctamente. Se debe proteger las eslingas de daños mecánicos, químicos y ambientales.

#### 1. Todos los usuarios de eslingas deben ser capacitados y poseer los conocimientos necesarios

Todos los usuarios de eslingas redondas deben ser capacitados en el uso apropiado de las mismas. La Sociedad Americana de Ingenieros Mecánicos en sus Normas de Seguridad para Eslingas (ASME B30.9), dice lo siguiente:

"Se capacitarán a los usuarios de eslingas sintéticas redondas en la selección, inspección, precauciones para el personal, efectos del medio ambiente y prácticas de aparejo según se cubran" en el Capítulo 9-6.

En las recomendaciones de la Administración de Salud y Seguridad Ocupacional (OSHA) sobre el Uso Seguro de las Eslingas (29 CFR 1910.184) se hace constar que una "persona calificada" es:

"quien, en virtud de poseer un título reconocido o certificado de profesionalismo en un campo aplicable, o quien, por sus amplios conocimientos, capacitación y experiencia, ha demostrado con éxito la capacidad de resolver problemas relacionados con la temática y el trabajo".

Es importante que todos los usuarios de eslingas tengan conocimientos sobre el uso seguro y correcto y la aplicación de las eslingas, y que estén totalmente familiarizados con las recomendaciones del fabricante y los materiales de seguridad provistos con cada producto. Además, todos los usuarios de eslingas necesitan estar conscientes de sus responsabilidades según su delineación en todas las normas y reglamentos aplicables.

Si usted no está seguro si está correctamente capacitado con los conocimientos necesarios, o si no está seguro de lo que le requieren las normas y reglamentos, pídale información y/o capacitación a su empleador— **NO UTILICE** las eslingas redondas hasta que esté absolutamente seguro de lo que está haciendo. Recuerde, cuando se trata del uso de las eslingas redondas, la falta de habilidad, conocimientos y cuidado puede resultar en **LESIONES** graves o **MUERTE** para usted y otras personas.

#### 2. Se debe inspeccionar las eslingas adecuadamente y con regularidad

Hasta los daños aparentemente "menores" o leves sufridos por una eslinga redonda pueden reducir significativamente su capacidad de sujetar o elevar los objetos, y así se aumenta la posibilidad de que la eslinga se caiga durante el uso. Por eso, es muy importante que se inspeccionen las eslingas sintéticas con regularidad y en la forma apropiada. No existen en realidad daños "menores". Si usted no está seguro si una eslinga está dañada, **NO LA USE**.

#### 2a. Manera de inspeccionar las eslingas

Por regla general, se puede detectar visualmente el daño a una eslinga redonda. En algunos casos, puede suceder sin ser visible el daño interior al hilo producido por la carga. Para detectar posibles daños, se debe realizar una inspección tanto visual como táctil de toda la eslinga, puesto que algunos daños se perciben más por el tacto que por la vista. Inspeccione y toque la eslinga para detectar la presencia de cualquier tipo de condiciones que figuran en la Tabla 1. La Tabla 2 presenta ejemplos de cualquier tipo de daños, pero cabe notar que son ejemplos relativamente extremos que damos únicamente a modo de ilustración.

#### 2b. ¿Qué es lo que se hace si se identifica algún daño en una eslinga?

Si descubre CUALQUIERA de estos tipos de daños en una eslinga, **retírela de servicio inmediatamente**, aún si el daño que usted siente o ve no es tan extensivo como el de las fotografías en la Tabla 2. Se debe destruir o inutilizar por completo el uso posterior de cualquier eslinga retirada de servicio, a no ser que su fabricante u otra persona calificada pueda repararla y realizar las pruebas necesarias para poder usarla de nuevo. Nunca permita que se pase por alto el daño de una eslinga, ni tampoco trate de realizarle reparaciones provisionales en campo (p. ej., hacer nudos en la malla, etc.).

Tabla 1. Criterios para el retiro del servicio de una eslinga sintética.

Toda la eslinga redonda debe **inspeccionarse con regularidad** y hay que **retírela de servicio** si se descubre CUALQUIERA de los siguientes problemas:

- Si falta el albarán o la etiqueta de identificación de la eslinga, o si es ilegible.
- Agujeros, roturas, cortes, materiales incrustados, excesivo desgaste abrasivo o enganchones que dejan al descubierto el hilo de núcleo de la eslinga redonda.
- Hilo de núcleo roto o dañado.
- Nudos en cualquier parte de la malla de la eslinga redonda.
- Quemaduras ácidas o alcalinas cáusticas de la eslinga redonda.
- Derretimiento, carbonización o salpicaduras de la soldadura en cualquier parte de la eslinga redonda.
- Deformación, picaduras en exceso, corrosión u otros daños a los accesorios.
- Costuras rotas o gastadas en la envoltura, dejando el hilo de núcleo al descubierto.
- Cualquier condición que haga dudar de la resistencia de la eslinga redonda.



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**2c. Frecuencia de inspección de las eslingas**

Se recomienda un procedimiento de tres etapas para estar seguro de que se inspeccionan las eslingas con la debida frecuencia.

**Inspección inicial** — A la recepción inicial de una eslinga, la persona designada debe inspeccionarla para poder asegurarse que se ha recibido la eslinga correcta y sin daños, y que ésta satisface los requisitos aplicables para el uso destinado.

**Inspección frecuente** — Se debe inspeccionar toda la eslinga antes de cada turno o día de servicio normal y antes de usarse bajo condiciones de servicio intensivo.

**Inspección periódica** — Una persona designada y calificada debe realizar la inspección "periódica" de cada eslinga. Para validar la frecuencia de inspección, la inspección periódica debe llevarse a cabo por una persona que no sea el individuo más comúnmente encargado de la inspección frecuente. La frecuencia de las inspecciones periódicas se basa en la frecuencia de uso real o anticipada, la intensidad de las condiciones de servicio, la naturaleza del trabajo realizado con la eslinga y la experiencia obtenida durante la inspección de otras eslingas empleadas en circunstancias semejantes. A continuación se presentan las directrices generales sobre la frecuencia de las inspecciones periódicas:

- Servicio normal—anualmente
- Servicio bajo condiciones intensivas— mensual a trimestralmente
- Servicio especial—según las recomendaciones de una persona calificada

Los intervalos de inspección periódica no deben de exceder un año.

No hace falta tener constancias de las inspecciones frecuentes, pero la norma WSTDA RS-1 y la ASME B30.9 requieren que se guarde constancia de la inspección periódica más reciente. Ver la norma WSTDA RS-1 para más información sobre definiciones de lo que significa Normal, Intensivo y Especial en el contexto de condiciones de servicio.

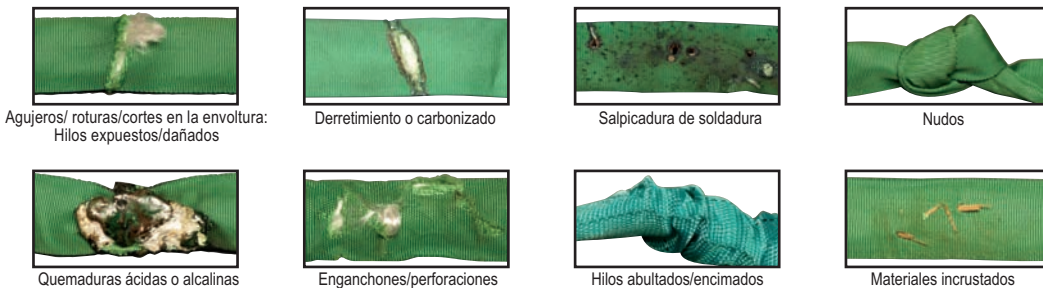
**3. Se debe proteger las eslingas adecuadamente de cualquier daño**

**3a. Evitar acciones capaces de dañar las eslingas**

Se debe evitar siempre acciones que produzcan las clases de daños identificados en la sección anterior de este Boletín de Seguridad, incluyendo (pero sin limitarse a):

- Dejar caer o arrastrar las eslingas en el suelo, piso o superficies rugosas.
- Estirar a la fuerza aquellas eslingas debajo de una carga, cuando ésta descansa sobre la eslinga; de ser factible, colocar bloques debajo de la carga
- Acortar o ajustar la eslinga, usándose métodos no aprobados por el fabricante de la eslinga o una persona calificada.
- Torcer, enredar o hacer nudos en la eslinga.
- Exponer las eslingas a ácidos o álcalis con el daño concomitante.
- Exponer las eslingas a fuentes de calor o salpicaduras de soldadura con el daño concomitante.
- Usar las eslingas o permitir que se usen cuando la temperatura sube por encima de 194°F (90°C) o baja por debajo de -40°F (-40°C).

**Tabla 2.** Esté alerta a estos tipos de daños durante una inspección visual y táctil de las eslingas redondas.



- "Cargar sobre la punta" significa que el peso de la eslinga recae sobre la punta de enganche en lugar de centrarse sobre la base o "asiento" del gancho.
- Usar ganchos, cadenas u otros accesorios con bordes o superficies que podrían dañar la eslinga.
- Conducir o pasar por encima de las eslingas con un vehículo u otro equipo.

Debido a algunos productos químicos que entran en contacto con las eslingas sintéticas, éstas experimentan desde un leve deterioro hasta una degradación total. Los factores de tiempo, temperatura y grado de concentración afectan el deterioro. Para usos específicos, comuníquese con el fabricante.

**3b. Medidas de seguridad para las eslingas**

Las eslingas sintéticas se pueden dañar, desgastar o cortar al desarrollarse la tensión y compresión entre la eslinga, los puntos de unión y la carga. Las superficies en contacto con la eslinga no necesitan ser muy abrasivas o tener bordes muy filosos (parecidos al filo de una navaja) para crear las condiciones de falla de la eslinga. Por lo tanto, **las eslingas redondas SIEMPRE se deben proteger contra daños causados por esquinas, salientes, o el contacto con bordes que no sean lisos ni bien redondeados con suficiente material para el propósito destinado.**

Las eslingas redondas se deben proteger de superficies abrasivas.

Existe una variedad de maneras para proteger las eslingas de los daños mencionados. Una persona calificada podría escoger y utilizar los protectores/suavizadores técnicos apropiados, o sea, productos comercialmente disponibles (p.ej. mangas protectoras para eslingas planas y tubulares, almohadillas contra el desgaste, cantoneras, envolturas del cuerpo, esquineras, etc.), los cuales han sido diseñados específicamente para proteger las eslingas contra daños. Asimismo, una persona calificada podría diseñar y construir sus propios métodos de protección siempre y cuando la eslinga esté protegida adecuadamente y alejada de la superficie del borde dañado.

Independientemente del método elegido en particular, la meta es la de asegurar que la eslinga bajo tensión mantiene la capacidad de elevar la carga en forma segura mientras evita el contacto con las superficies dañinas o abrasivas bajo tensión. Una persona calificada debe considerar con cuidado la manera más apropiada de lograr esta meta. La protección utilizada no debe ser precaria, p.ej., la selección y utilización de cartón, guantes industriales u otros artículos afines, basándose únicamente en consideraciones de comodidad o disponibilidad.

Independientemente del método elegido, una persona calificada debe asegurar que el método de protección elegido sea apropiado para los tipos de daños a los que estarán expuestas las eslingas. Por ejemplo, cierta protección brinda resistencia a la abrasión aunque virtualmente no brinda protección alguna contra cortes. Varias "pruebas" de elevación efectuadas en un entorno sin consecuencias adversas tal vez sean necesarias para determinar la idoneidad del dispositivo(s) de protección. Hace falta inspeccionar el dispositivo(s) de protección y la eslinga(s) para detectar daños y determinar el grado de adecuación después de cada "prueba" de elevación. Se debe tener en cuenta que no existe protección total "a prueba de cortes", por lo que se debe operar siempre dentro de los límites específicos de la eslinga y sus accesorios (p.ej., dispositivos, piezas y protección, etc.).

Se debe proteger las eslingas redondas contra el contacto directo con cualquier borde, a menos que los bordes en contacto cumplan con los siguientes criterios:

- Los bordes deben ser lisos y bien redondeados. No cumplen con estos criterios los bordes achaflanados o aplanados en ángulo.
- El tamaño de los radios de los bordes debe ser suficientemente grande. La Tabla 3 presenta los radios de borde mínimos que sean apropiados para contacto con las eslingas de poliéster redondas sin protección.

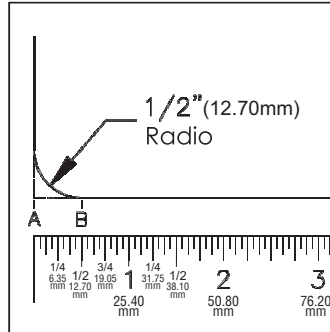
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Una manera de medir un radio de borde consiste en medir la distancia entre el borde de ataque del radio que está siendo medido (Punto A) y el punto en donde el radio comienza desde el borde inferior de la superficie (Punto B) (ver la Figura 1).

Para proteger la eslinga redonda, también es necesario seleccionar y usar los accesorios de conexión indicados. Los accesorios de conexión deben seleccionarse para que:

- Estén en conformidad con los requisitos de tamaño de la Tabla 4 (enganches verticales y tipo vuelta de estrangulación) o la Tabla 5 (enganche de cesta)
- El valor del esfuerzo de apoyo en la conexión no exceda 7,000 libras/pulgada<sup>2</sup> durante la carga de la eslinga (ver WSTDA RS-1, Sección 4.7 para el procedimiento de calcular el esfuerzo de apoyo)

**Figura 1**



(\*) Los valores de radio se aplican a las eslingas redondas completamente tensadas a capacidad nominal, independientemente del enganche.

Al tensar las eslingas redondas a valores de fuerza mínima, los valores mínimos de radio se reducen como corresponde. (Ver WSTDA -RS-1 Apéndice 1)

Las fracciones de pulgada están redondeadas al 1/16" (1.58mm) más próximo.

**Tabla 3.** Medidas mínimas de radio apropiadas para contacto con las eslingas redondas de poliéster no protegidas\*

Tamaño de eslinga	Capacidad Nominal Vertical		Radios de Borde Mínimos		Radios de Borde Mínimos		Ancho de Eslinga con Carga	
	libras	kgs.	pulgadas	mm	pulgadas	mm	pulgadas	mm
1	2,600	1,200	0.14	3.55	3/16	4.76	.97	24.63
2	5,300	2,400	0.21	5.33	1/4	6.35	1.29	32.76
3	8,400	3,800	0.26	6.60	5/16	7.93	1.66	42.16
4	10,600	4,800	0.30	7.62	5/16	7.93	1.78	45.21
5	13,200	6,000	0.33	8.38	3/8	9.52	2.00	50.80
6	16,800	7,600	0.40	10.16	7/16	11.11	2.13	54.10
7	21,200	9,600	0.41	10.41	7/16	11.11	2.62	66.54
8	25,000	11,400	0.44	11.17	7/16	11.11	2.85	72.39
9	31,000	14,100	0.50	12.70	1/2	12.70	3.15	80.01
10	40,000	18,200	0.56	14.22	9/16	14.28	3.57	90.67
11	53,000	24,100	0.67	17.01	11/16	17.46	4.00	101.60
12	66,000	30,000	0.72	18.28	3/4	19.05	4.60	116.84
13	90,000	40,900	0.87	22.09	7/8	22.22	5.22	132.58

**Tabla 4.** Accesorios de conexión apropiados para las eslingas redondas de poliéster cuando se usan con enganches verticales y una vuelta de estrangulación

Tamaño de eslinga	Eslinga Redonda		Tamaño Mínimo - Accesorios							
			Capacidad Nominal Enganche Vertical				Ancho Efectivo de Contacto			
	libras	kgs.	pulgadas	mm	pulgadas	mm	pulgadas	mm	pulgadas	mm
1	2,600	1,200	.39	9.90	7/16	11.11	.97	24.63	1	25.40
2	5,300	2,400	.59	14.98	5/8	15.87	1.29	32.76	1 3/8	34.92
3	8,400	3,800	.72	18.28	3/4	19.05	1.66	42.16	1 3/4	44.45
4	10,600	4,800	.85	21.59	7/8	22.22	1.78	45.21	1 7/8	47.62
5	13,200	6,000	.95	24.13	1	25.40	2.00	50.80	2	50.80
6	16,800	7,600	1.12	28.44	1 1/8	28.57	2.13	54.10	2 1/8	53.97
7	21,200	9,600	1.15	29.21	1 3/16	30.16	2.62	66.54	2 3/8	66.67
8	25,000	11,400	1.25	31.75	1 1/4	31.75	2.85	72.39	2 7/8	73.02
9	31,000	14,100	1.41	35.81	1 1/2	38.10	3.15	80.01	3 1/4	82.55
10	40,000	18,200	1.60	40.64	1 5/8	41.27	3.57	90.67	3 7/8	92.07
11	53,000	24,100	1.90	48.26	2	50.80	4.00	101.60	4	101.60
12	66,000	30,000	2.05	52.07	2 1/8	53.97	4.60	116.84	4 5/8	117.47
13	90,000	40,900	2.46	62.48	2 1/2	63.50	5.22	132.58	5 1/4	133.35

### 4. Siempre usar las eslingas correctamente

En las operaciones de levantar las cargas, un usuario calificado y capacitado con los conocimientos necesarios debe tomar en cuenta los temas, problemas y factores tratados en este boletín, al igual que cualesquier otros factores pertinentes no tratados en el presente (ver la Tabla 6). Entre los factores especialmente pertinentes a las eslingas redondas, los usuarios deben realizar varias actividades, incluyendo (pero sin limitarse a) aquellas tratadas en los siguientes apartados.

#### 4a. Evaluar la carga

Es necesario determinar el peso de la carga y luego asegurarse que no excede la capacidad nominal de la eslinga ni tampoco la de cualquier componente del sistema de aparejo. Los usuarios también deben determinar el centro de gravedad (CG) de la carga para asegurar que el sistema de aparejo empleado es capaz de retener y controlar la carga después de elevarla.

#### 4b. Seleccionar una eslinga/configuración apropiada

Seleccione una eslinga con las características apropiadas para el tipo, tamaño y peso de la carga, el tipo de enganche (ver la Tabla 7) y el entorno. Se debe unir la eslinga con seguridad y cuidado a la carga y aparejarla de tal forma que permita controlar la carga y evitar el desplazamiento, el deslizamiento y/o la pérdida de la carga. Un usuario calificado, capacitado y con los conocimientos necesarios debe determinar el método más apropiado de aparejo para lograr el levantamiento seguro y el buen control de la carga.

Otra consideración importante es el ángulo eslinga-carga, o sea, el ángulo formado entre una línea horizontal y la pata o cuerpo de la eslinga. Este ángulo es muy importante y puede tener un efecto dramático sobre la capacidad nominal de la eslinga. Una disminución en el ángulo eslinga-carga produce un aumento de carga sobre cada pata. Este principio se aplica a numerosas condiciones, incluyendo el uso de una eslinga para elevar en ángulo o con enganche de cesta o brida multipatas. La Tabla 8 brinda información acerca de un aumento de tensión como función del ángulo eslinga-carga (se supone una distribución uniforme de la carga sobre cada pata de la eslinga). No se recomiendan ángulos de eslinga menores de 30 grados.

Así también, cuando el ángulo de estrangulación es menor de 120 grados, se reduce la capacidad de resistencia de la vuelta estranguladora. Para determinar la capacidad real de la eslinga a un ángulo dado de estrangulación, multiplicar la capacidad nominal de la eslinga (para vuelta de estrangulación) por el factor de reducción apropiado, usándose la Tabla 9 para determinarlo.

#### 4c. No someter la eslinga a usos indebidos

Procure no acelerar ni desacelerar la carga con demasiada rapidez (acción denominada "carga de choque"). No use las eslingas para arrastrar ni para estirar objetos trabados o enganchados; tampoco use las eslingas para el remolque. Una eslinga redonda sólo debe usarse para levantar cargas.

### 5. Asegurar que todo el personal esté alejado de las cargas y alerta a los riesgos

Aun teniendo en cuenta todos los factores, temas o situaciones que se han tratado en este Boletín de Seguridad, pueden presentarse problemas. Por eso, todo el personal debe alejarse de las cargas levantadas y nunca ponerse encima, debajo ni cerca de ellas.

Cuando se usa la eslinga, ninguna parte del cuerpo humano debe colocarse entre la carga y la eslinga, ni entre ésta y el gancho de elevar. Además, el personal debe estar alerta a la posibilidad de que la eslinga se enganche durante la elevación. Nunca utilice una eslinga sintética para estirar o arrastrar los objetos enganchados o de otra manera difíciles de levantar.



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**6. Manera correcta de almacenar y mantener las eslingas**

Para prevenir el daño a las eslingas cuando no se usan, hay que almacenarlas en un lugar fresco, seco y oscuro. Las eslingas deben almacenarse en un área libre de fuentes de daño ambiental o mecánico, tales como: salpicaduras de soldadura, astillas de esmerilado o fresado, fuentes de calor, exposiciones a productos químicos, etc. Así también, mantenga las eslingas limpias sin suciedad, residuos y materiales extraños.

Si hace falta limpiar las eslingas redondas, solamente utilice agua y un jabón suave. Enjuague bien la eslinga y déjela secar completamente antes de usarla o almacenarla de nuevo. No lave las eslingas a máquina. El lavado a máquina resulta en una pérdida significativa de resistencia de la eslinga.

**Tabla 5.** Tamaño apropiado de los accesorios de conexión al usar las eslingas redondas de poliéster con el enganche de cesta.

Tamaño de Eslinga	Eslinga Redonda		Tamaño Accesorios - Gancho Sencillo o Punto de Conexión							
	Capacidad Nominal Enganche de Cesta		Diámetro o Espesor Mínimo en Existencia				Ancho Efectivo Mínimo de Contacto			
	libras	kgs.	pulgadas	mm	pulgadas	mm	pulgadas	mm	pulgadas	mm
1	5,200	2,400	.54	13.71	9/16	14.28	1.37	34.79	1 3/8	34.92
2	10,600	4,800	.83	21.08	7/8	22.22	1.82	46.22	1 7/8	47.62
3	16,800	7,600	1.02	25.90	1 1/16	26.98	2.34	59.43	2 3/8	60.32
4	21,200	9,600	1.20	30.48	1 1/4	31.75	2.52	64.00	2 1/2	63.50
5	26,400	12,000	1.35	34.29	1 3/8	34.92	2.80	71.12	2 7/8	73.02
6	33,600	15,200	1.59	40.38	1 5/8	41.27	3.00	76.20	3	76.20
7	42,400	19,200	1.63	41.40	1 5/8	41.27	3.71	94.23	3 3/4	95.25
8	50,000	22,800	1.77	44.95	1 7/8	47.62	4.00	101.60	4	101.60
9	62,000	28,200	2.00	50.80	2	50.80	4.45	113.03	4 1/2	114.30
10	80,000	36,400	2.26	57.40	2 3/8	60.32	5.06	128.52	5	127.00
11	106,000	48,200	2.69	68.32	2 3/4	69.85	5.62	142.74	5 5/8	142.87
12	132,000	60,000	2.90	73.66	3	76.20	6.50	165.10	6 1/2	165.10
13	180,000	81,800	3.50	88.90	3 1/2	88.90	7.38	187.45	7 3/8	187.32

**Tabla 6.** El manejo, levantamiento y manipulación seguros de los materiales y las cargas requieren que se considere un número de temas, problemas y factores

Categorías	Un Número de Temas, Problemas y Factores a Tener en Cuenta		
<b>Ambiente</b>	Viento Clima Visibilidad	Temperatura ambiente. Temperatura objeto. Condiciones y exposición químicas.	Estabilidad del suelo. Instalaciones subterráneas.
<b>Carga</b>	Peso Dimensiones Centro de Gravedad (CG)	Integridad del punto de unión. Susceptibilidad a aplastamiento/compresión. Piezas sueltas que podrían caerse de la carga.	Cargas mixtas. Superficies/bordes dañinos. Estabilidad estructural (dobladura/flexión).
<b>Equipo/ Elevación</b>	Grúas/malacates Sencillos/múltiples Radio de operación máxima/planeada Carga permisible Relación de elevación a carga permisible	Paso libre a edificios adyacentes. Peligros a líneas de distribución y otros peligros ambientales. Espacio entre la pluma y equipo elevador. Área de colocación de emergencia/contingencia.	Inspección de equipo. Asegurar un trayecto despejado para la carga.
<b>Aparejo</b>	Selección de eslinga Control de carga Centro de elevación (sobre el CG) Dinámica positiva eslinga-carga	Coefficiente de fricción eslinga-carga. Enganche apropiado (control de CG y carga). Movimiento libre sin enganchones de la carga. Coordinación de eslingas múltiples.	Ropa de protección adecuada. Capacidad de eslinga adecuada para ángulo y tensión.
<b>Personal</b>	Área libre de personal innecesario Personal capacitado y calificado	Señales: visuales, audibles, electrónicas, etc. Personal alejado de la carga y otros daños.	Reunión y plan de elevación previos. Requisitos para vigilar el trayecto y la carga/ cable de maniobra.



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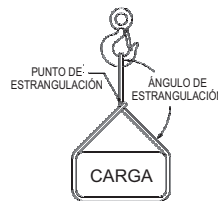


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**Tabla 9.** Reducción en la capacidad nominal en función del ángulo de estrangulación

Ángulo de Estrangulación (grados)	Ángulo de Estrangulación		Factor de reducción
	= 0 >	<	
120	180		1.000
105	120		0.82
90	105		0.71
60	90		0.58
0	60		0.50

Capacidad real de eslinga =  
Capacidad Nominal x  
Factor de Reducción



**Tabla 7.** Tipos comunes de enganches de eslinga

Enganche	Observaciones
<b>Enganche Vertical</b>	Se coloca un extremo en el gancho mientras que se une el otro extremo directamente a la carga. Se debe usar un cable de maniobra para prevenir la rotación de la carga.
<b>Enganche de Estrangulación</b>	La eslinga pasa por un extremo, alrededor de la carga, y el otro extremo se coloca en el gancho. La capacidad nominal normalmente es del 80% de aquella usada para un enganche vertical. El control de la carga es un problema potencial con sólo una eslinga aparejada en un enganche de estrangulación. Así también, el punto de estrangulación siempre debe estar en el cuerpo de la eslinga—no en los accesorios, la base del accesorio o albarán o etiqueta.
<b>Enganche de Cesta</b>	La eslinga actúa como cuna para la carga mientras que se sujetan ambos extremos por encima. La capacidad nominal para un enganche de cesta es dos veces la de un enganche vertical. Al igual que con el enganche de estrangulación, es posible que sea necesaria más de una eslinga aparejada en un enganche de cesta (o por algún otro medio) para asegurar el control de la carga.

**Tabla 8.** Aumento en la tensión de eslinga en función del ángulo eslinga-carga

Ángulo "A" en grados desde horizontal	Multiplicador de Tensión
90	1.000
85	1.004
80	1.015
75	1.035
70	1.064
65	1.104
60	1.155
55	1.221
50	1.305
45	1.414
40	1.555
35	1.742
30	2.000

Se multiplica el peso de carga (por pata) por el factor de tensión para determinar el aumento de la tensión sobre la pata o patas de la eslinga.

**Dónde Encontrar Información Adicional**

Este boletín no pretende darle toda la información que necesita saber para considerarse capacitado y con los conocimientos necesarios sobre aparejos y elevación de cargas, pero si presenta información importante sobre el uso de las eslingas redondas dentro de un sistema de aparejo. En caso de necesitar más información sobre las eslingas redondas y las prácticas de aparejo o sus responsabilidades según los reglamentos y normativas, consulte con su empleador. Usted y su empleador pueden consultar un número de fuentes informativas para poder asegurarse que usted ha sido correctamente capacitado y con los conocimientos necesarios para el uso de las eslingas redondas, incluyendo (pero sin limitarse a):

- WSTDA-RS-1 – Especificación normalizada recomendada para eslingas sintéticas redondas de poliéster
- ASME B30.9 – Eslingas sintéticas redondas: selección, uso y mantenimiento
- OSHA 29 CFR 1910.184-Eslingas
- WSTDA-RS-2 – Manual de operación e inspección recomendado para eslingas sintéticas redondas
- Recomendaciones de OSHA sobre el uso seguro de las eslingas (<http://www.osha.gov/dsg/guidance/slings/synth-round.html>)
- Manuales de aparejos
- Catálogo, manual, sitio web, boletines, etc. del fabricante
- Capacitación formal provista por los fabricantes u otras entidades





**⚠️ WARNING** Read and understand the important, safety information that follows and the information contained in this publication and follow OSHA, ASME, Association, Industry and Manufacturer guidelines. Rigging and manipulating loads involves more than attaching equipment and raising the load. There are certain hazards that cannot be mitigated by engineered features, but only by the exercise of intelligence, care, common sense and experience in anticipating the effects and results of rigging any load with any type of equipment. Use this guidance in conjunction with the warnings, cautions and safety instructions supplied with all products. If you do not receive this information, contact us for additional copies or visit [www.lift-it.com](http://www.lift-it.com)

**Lift-Planning & Evaluation: Page 16**  
**Purchase & Use Considerations: Pages 17-18**  
**Hitches, Angles and Tension: Pages 19-22**  
**Chemical Information: Pages 41-42**  
**Sling Protection: Pages 43-52**  
**Rigging & Hitch Information: Pages 23-24**  
**Sling Inspection Systems: Page 33**

**Examples of Sling Damage: Page 102**  
**Repair and Testing: Page 37**  
**Sling Care and Storage: Page 37**  
**Sling Training: Pages 5-10**  
**Environmental Considerations: Page 38**  
**Mechanical Considerations: Pages 39-40**  
**Recommended Diameters: Pages 104 and 106**

**⚠️ WARNING** All Products provided by Lift-It® Manufacturing Co. Inc. are sold with the express understanding that the purchaser and user are thoroughly familiar with the safe and proper use and application of the product. The user has the responsibility for proper use and application as outlined in all applicable standards and regulations.

Use by untrained persons is hazardous. It is important that all sling and rigging users be thoroughly familiar with the manufacturer's recommendations and safety information that accompany the products. The user must have sufficient training and knowledge of all applicable standards to responsibly use our products. If you are unsure whether you are properly trained and knowledgeable, or if you are unsure of what the standards and regulations require of you, ask your employer for information and/or training. **DO NOT** use any sling or rigging device until you are absolutely sure of what you are doing. Remember, when it comes to using slings and rigging devices, lack of skill, knowledge and care can result in severe INJURY or DEATH to you and others.

**⚠️ WARNING** Our Catalog **DOES NOT** contain all the information you need to know about handling and manipulating materials and loads safely. Sling use is only one part of a lifting system and it is your responsibility to consider all risk factors prior to using any rigging device or product. Failure to do this may result in severe INJURY or DEATH due to sling or equipment failure and/or loss of the load.

**⚠️ WARNING** Failure to follow proper use, care and inspection criteria could result in severe personal injury or death. Slings and Rigging products will fail if damaged, abused, misused, overused or improperly maintained. Regular inspection must be conducted to determine if any product can be used at the assigned Work Load Limit (WLL) or whether the product shall be removed from service. OSHA and ASME stipulate that a visual inspection of the sling must be made daily or before each shift in **Normal** service conditions. In addition, Web Sling and Tie Down Association recommends that slings be inspected prior to each use in **Severe** service conditions. If you are unsure if the required inspection has been done for either service condition, take the time to inspect slings prior to use. Slings that are damaged or determined to be unsafe shall not be used for any application.

**⚠️ WARNING** All Work Load Limits (WLL) indicated in our catalog are applicable only to new or "in as new" condition products. The Work Load Limits indicate the greatest force or load a device can carry under normal circumstances. Work Load Limits are based upon destruction testing, done in controlled, laboratory conditions, which will never be duplicated during actual usage. Any instantaneous change (sudden drops or rapid acceleration) constitutes hazardous shock loading and THE WORK LOAD LIMITS AS STATED, DO NOT APPLY. Shock loading, side loading and extraordinary or unique conditions must be taken into account when using any device in a rigging system.

**⚠️ WARNING** Our Products may contain chemicals known to cause cancer, birth defects and/or other reproductive harm.

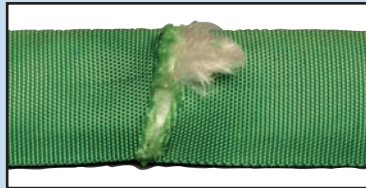
Please note that information developed by the Web Sling and Tie Down Association (WSTDA) relative to warnings is included in our catalog with the permission of the WSTDA. This information is © WSTDA-2010.



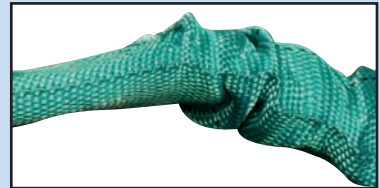
**⚠ WARNING** If any damage such as the following is visible, the sling shall be removed from service immediately. Photos depict examples of sling damage, but note they are extreme examples provided for illustration purposes only.



**ACID OR CAUSTIC BURNS**



**CUT OR DAMAGED YARNS**



**BUNCHED OR WADED YARNS**



**MELTING OR CHARRING**



**MISSING OR ILLEGIBLE TAG**



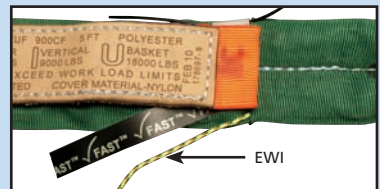
**FIBER OPTIC**  
(Lack of light transfer - Sling Fails)



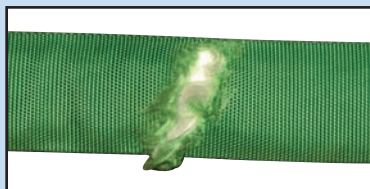
**DISTORTED HARDWARE**



**KNOTS**



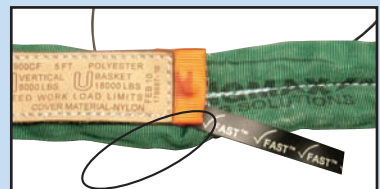
**EXTERNAL WARNING INDICATOR**  
✓ CHECK FAST® EWI PRESENT  
(Sling passes ✓ Check Fast® Criteria)



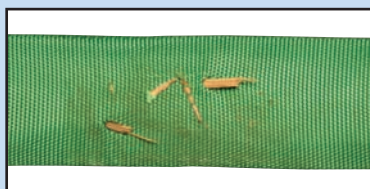
**YARN VISIBILITY**



**BROKEN STITCHES**



**EWI MISSING**  
(Sling fails ✓ Check Fast® Criteria)



**EMBEDDED MATERIALS**



**SNAGS / PUNCTURES**



**TATTLE TAIL MISSING**  
(Sling fails)



# Roundsling Protection Considerations

Slings can be damaged, abraded or cut as tension and compression between the sling, the connection points and the load develops. Surfaces in contact with the sling do not have to be very abrasive or have “razor” sharp edges in order to create the conditions for sling failure. Therefore, roundslings must ALWAYS be protected from being cut or damaged by corners, protrusions or from contact with edges that are not smooth or well-rounded with materials sufficient for the intended purpose.

There are a variety of ways to protect slings from such damage. A qualified person might select and use appropriately engineered protectors/softeners, commercially available products (i.e., sleeves, wear pads, corner protectors, etc.), specifically designed to protect slings from damage. A qualified person might also design and construct methods of protection so long as the sling is adequately protected from and/or kept off of the damaging edge surface.

Regardless of the particular method chosen, the goal is to ensure that the sling, under tension, maintains its ability to securely lift the load while avoiding contact with damaging or abrasive surfaces under tension. A qualified person must carefully consider the most appropriate means to accomplish this goal. The protection used should not be makeshift (i.e., selecting and using cardboard, work gloves or other such items based solely on convenience or availability).

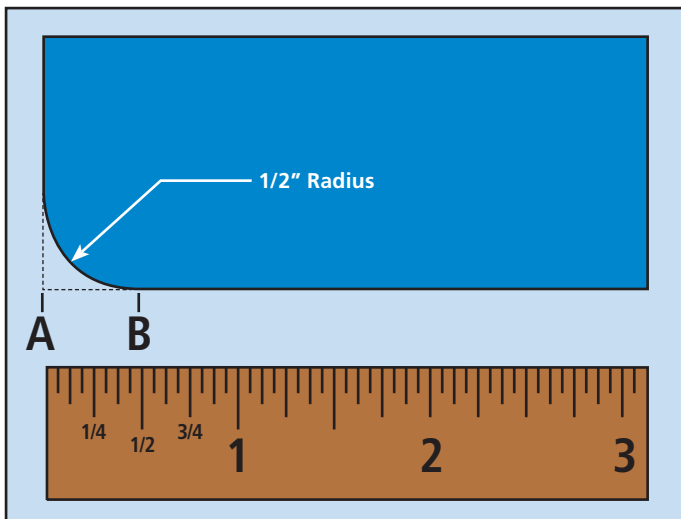
Regardless of the approach taken, a qualified person must ensure that the protection method chosen is appropriate for the types of damage to which the slings will be exposed. For instance, some protection provides abrasion resistance, but offers virtually no protection against cuts. Several “test” lifts, done in a non-consequence setting, may be necessary to determine the suitability of the protection device(s). After each “test” lift, the protection device(s) and sling(s) need to be inspected for damage and suitability. You should keep in mind that no protection is “cut proof” and you should always operate within the specified limits of the sling and its accessories (i.e., fixtures, hardware, protection, etc.).

The Web Sling and Tie Down Association has conducted testing to determine the effects of edge curvature on three sizes of roundslings over different radii. Hundreds of slings from five different manufacturers were pulled to destruction resulting in recommendations for minimum edge radii suitable for contact with unprotected polyester roundslings. Please consider that the testing was done in laboratory conditions under controlled circumstances, with full, perpendicular contact made between the sling and the simulated edge. If roundslings are used at angles where full, 90 degree, perpendicular contact between the load edge and sling is not made; the suggested recommendations may not apply. If there is any doubt, use protection and evaluate as specified above.

Roundslings must always be protected from coming into direct contact with any edges unless the contacting edges meet both of the following criteria:

- The edges must be smooth and well-rounded.  
Edges that are chamfered or flattened at an angle do not meet this criterion.
- The size of the edge radii must be adequately large.  
The following table shows the minimum edge radii suitable for contact with unprotected polyester roundslings.

One way to determine an edge radius is to measure the distance between the leading edge of the radius (Point A) and the point where the radius initiates from the bottom edge of the surface (Point B).



Sling Stock Number	Vertical WLL (Lbs.)	Choker, Vertical and Basket Minimum Edge Radii (Inches)	
		Decimal	Fractional
RS 30	2,650	.14	3/16
RS 50	4,000	.21	1/4
RS 60	5,300	.21	1/4
RS 90	8,400	.26	5/16
RS 120	10,600	.30	5/16
RS 150	13,200	.33	3/8
RS 180	16,800	.40	7/16
RS 240	21,200	.41	7/16
RS 360	31,000	.50	1/2
RS 400	40,000	.56	9/16
RS 600	53,000	.67	11/16
RS 800	66,000	.72	3/4
RS 1000	90,000	.87	7/8

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Fractional Inches rounded up to the nearest 1/16”.  
Note: Values apply to roundslings that are fully loaded to their Work Load Limits.



In order to protect the roundsling, it is necessary to select and use proper connection hardware. Connection hardware should be selected so that either:

- It conforms to the size requirements listed in the roundsling product specifications. (See page 106).
- The bearing stress value at the connection does not exceed 7,000 lbs. PSI during sling loading.

Lift-It® Roundsling product specifications reflect minimum hardware diameters for polyester roundslings. These recommendations are the result of testing and analysis done by the Roundsling Technical Committee, Web Sling and Tie Down Association. Minimum diameter recommendations and other important information can be found in the Recommended Standard Specification for Synthetic Polyester Roundslings (WSTDA- RS-1).

Another approach to determine the correct relationship between roundslings and connection hardware is also found in the abovementioned specification. This method establishes a maximum bearing stress at 7000 PSI and provides instruction in calculating bearing stress.

Slings are subjected to compression and tension during loading. Lower compressive forces result in higher sling breaking strengths. Likewise, higher compressive forces result in lower sling breaking strengths.

Damage at sling connection points is a result of pressures exceeding the maximum allowable compression limit per square unit of exposed surface area.

The first step to determine the bearing stress is to calculate the LOAD BEARING AREA. To accomplish this, the effective contact width must be calculated. The effective contact width for straight bearing surfaces equals 100% of the actual inside width of the connection point. The effective contact width for curved bearing surfaces is 75% of the overall inside width of the connection point.

Next multiply the effective contact width by the fitting diameter. The product obtained is the LOAD BEARING AREA. Once the LOAD BEARING AREA has been calculated, divide the APPLIED FORCE by the LOAD BEARING AREA to determine the BEARING STRESS.

A roundsling with a vertical Work Load of 8400 lbs. is connected to a round bow 5/8" anchor shackle. The shackle has an overall inside width of 2 inches and a diameter of .625.

The sling will be loaded (applied force) to 6,000 lbs.

Will the shackle be suitable, with a bearing stress less than 7,000 PSI?

### 1. Calculate Effective Contact Width

$$\begin{array}{rcccl} \text{Overall Inside Width} & & \text{Curved Adjustment} & = & \text{Effective Contact Width} \\ 2.0 \text{ Inch} & \times & .75 & & 1.5 \text{ Inch} \end{array}$$

### 2. Calculate Load Bearing Area

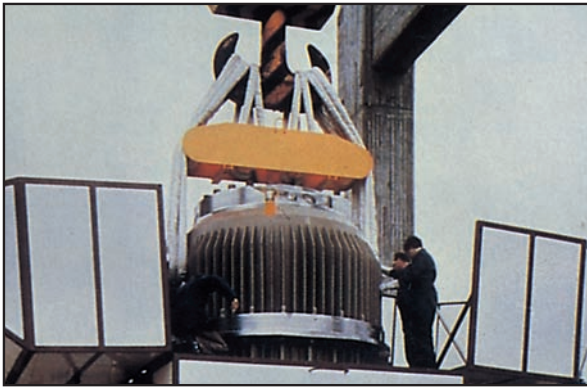
$$\begin{array}{rcccl} \text{Effective Contact Width} & & \text{Hardware Diameter} & = & \text{Load Bearing Area} \\ 1.5 \text{ Inch} & \times & .62 & & .93 \end{array}$$

### 3. Calculate Bearing Stress

$$\begin{array}{rcccl} \text{Applied Force} & & \text{Load Bearing Area} & = & \text{Bearing Stress} \\ 6000 \text{ lbs.} & \div & .93 & & 6,451 \text{ PSI} \end{array}$$



# Roundslings



## LIFT-IT® ROUNDSLING CONSTRUCTION AND FEATURES

Lift-It® Polyester Roundslings are made of polyester core yarn covered by a seamless, tubular cover. The seamless construction and tubular design of the cover helps to eliminate the premature rupturing of covers, characteristic of seamed roundslings.

Since the core yarns are not directly in contact with the load there is no loss of strength from abrasion to the sling cover.

Endless configurations enable the user to rotate hook and load contact points, resulting in increased sling longevity.

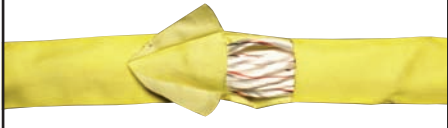
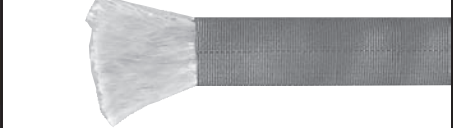


Because the sling body is soft and pliable, it will not choke lock, hindering removal.

Multiple polyester roundslings are manufactured simultaneously, resulting in increased production efficiency and cost savings, when compared to equivalent strength web slings.

It's important in a global economy to remain competitive without compromising safety. To that end we have established relationships with foreign partners and offer our import line of roundslings. Available with Double Polyester covers our imported roundslings are made to the same specifications and standards as our domestic products. On site management and supervision at our foreign facility, coupled with testing at our US locations ensures quality and cost efficiency for your bottom line. Our import line will feature the same tagging, tracability, unique serial numbers and all other features that you have come to expect as standard procedures at Lift-It®. One striking difference between us and others is that we will not sell you an import masquerading as a domestic product. Stock numbers indicate an imported product, i.e., RS90I.

## LIFT-IT® ROUNDSLING COVER SELECTIONS

Depending upon your application, different, seamless, tubular covers are available.

<p>Double Polyester - Stock No. RS 90</p> 	<p>Single Bulked Nylon - Stock No. RS 90C</p> 	<p>Double Contrasting - Stock No. RS 90DC</p> 	
<p>Polyester covers are suitable for many uses and applications.</p>	<p>Bulked Nylon is four times more abrasion resistant than polyester.</p>	<p>Outer Cover-Bulked Nylon Inner Cover-Polyester</p>	
<p><b>SUPERTECHLON™</b></p> <p>Super Techlon Stock No. RS 90ST</p>	<p>Super Techlon covers utilize a reinforced, monofilament yarn combined with an innovative weave design. This combination results in a roundsling cover that is significantly more abrasion resistant than standard, polyester covers.</p>	 <p>Dyneema® Stock No. RS 90DS</p>	<p>Dyneema® covers utilize specialty yarns that are extremely abrasion and cut resistant. Dimensions reflected in product specifications do not apply to DS Roundslings.</p>

## HOW TO ORDER

All orders must specify:

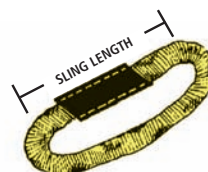
**1. COMPLETE STOCK NUMBER**

**2. SLING LENGTH:** Unless otherwise specified: Sling lengths are measured as bearing to bearing lengths. Assembly lengths are measured as bearing hardware.

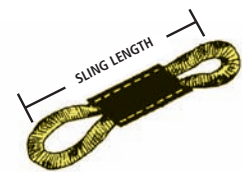
**3. FITTING DESCRIPTION**

**4. SLING PROTECTION:**

Description, quantity and length of sling protection. (See pages 43-52).



One strand sleeve (non-removable)



Two strand sleeve (removable)



## ENDLESS CONFIGURATION

STOCK NUMBER	RS30	RS50	RS60	RS90	RS120	RS150	RS180	RS240
COLOR CODE	PURPLE	BLACK	GREEN	YELLOW	TAN	RED	WHITE	BLUE
CHOKER (WLL - LBS.)	2,120	3,200	4,240	6,720	8,500	10,560	13,400	17,000
VERTICAL (WLL - LBS.)	2,650	4,000	5,300	8,400	10,600	13,200	16,800	21,200
BASKET (WLL - LBS.) AT 90°	5,300	8,000	10,600	16,800	21,200	26,400	33,600	42,400
BASKET (WLL - LBS.) AT 60°	4,500	6,900	9,100	14,500	18,300	22,800	29,000	36,700
BASKET (WLL - LBS.) AT 45°	3,600	5,600	7,400	11,800	14,900	18,600	23,750	29,900
MINIMUM LENGTH	18"	18"	18"	3 Ft.	3 Ft.	3 Ft.	3 Ft.	3 Ft.
MINIMUM CONNECTION DIA. CHOKER or VERTICAL (Inches)	.50	.50	.62	.75	.87	1.00	1.00	1.38
MINIMUM CONNECTION DIAMETER BASKET (Inches)	.62	.62	.88	1.00	1.25	1.38	1.62	1.75
WEIGHT-LBS PER FOOT (BEARING to BEARING) (Inches)	.21	.30	.32	.45	.55	.60	.75	.90
BODY DIAMETER (RELAXED) (Inches)	1.04	1.11	1.11	1.27	1.32	1.43	1.59	1.75
THICKNESS WHEN LOADED (Inches)	.20	.25	.25	.30	.38	.38	.40	.50
WIDTH WHEN LOADED (Inches)	2.00	2.00	2.00	2.75	3.00	3.00	3.00	4.00

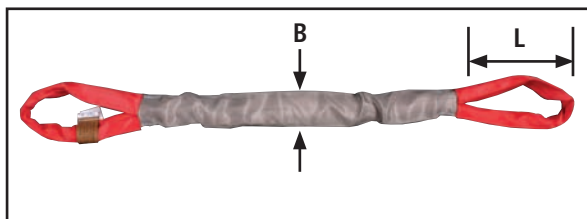
STOCK NUMBER	RS360DC	RS400DC	RS600DC	RS800DC	RS1000DC
COLOR CODE	GRAY	GRAY	GRAY	GRAY	GRAY
CHOKER (WLL - LBS.)	24,800	32,000	43,000	52,800	72,000
VERTICAL (WLL - LBS.)	31,000	40,000	53,000	66,000	90,000
BASKET (WLL - LBS.) AT 90°	62,000	80,000	106,000	132,000	180,000
BASKET (WLL - LBS.) AT 60°	53,600	69,280	91,796	114,312	155,880
BASKET (WLL - LBS.) AT 45°	43,800	56,568	74,942	93,324	127,260
MINIMUM LENGTH	3 Ft.	4 Ft.	4 Ft.	4 Ft.	6 Ft.
MINIMUM CONNECTION DIA. CHOKER or VERTICAL (Inches)	1.62	2.25	2.40	2.40	3.00
MINIMUM CONNECTION DIAMETER BASKET (Inches)	2.00	2.38	2.75	3.00	3.50
WEIGHT-LBS PER FOOT (BEARING to BEARING) (Inches)	1.50	2.00	2.85	3.60	4.60
BODY DIAMETER (RELAXED) (Inches)	2.39	2.55	3.03	3.50	3.82
THICKNESS WHEN LOADED (Inches)	.50	.75	.80	1.00	1.10
WIDTH WHEN LOADED (Inches)	4.25	5.00	5.25	6.00	8.00

### WARNING

Polyester is adversely affected by aldehydes, ethers, concentrated sulfuric acid and alkalis at elevated temperatures. Nylon is adversely affected by acids and bleaching agents. RS360 and larger capacity roundslings feature a bulked nylon cover and polyester load yarns. In active chemical environments, where exposure could be deleterious to one or both yarn types, the sling user or competent person must make a hazard assessment.

Always refer to the sling tag for sling capacities and do not rely on color codification to determine sling strength.

## EYE & EYE CONFIGURATION



Lift-It® Eye & Eye Round Slings are supplied with polyester, outer sleeves to encapsulate the strands of the endless sling. Polyester, Eye Sleeves are also furnished. For use in choker, vertical and basket hitches.

PLEASE NOTE: Bulked Nylon, Double Cover (DC) and single cover, Bulked Nylon (C) Eye and Eye Round Slings are gray in color. A color coded, tag patch is attached, adjacent to the Work Load Limit tag to signify color coded capacities. Always refer to sling tag for sling capacities.

Stock Number	Color Code	WORK LOAD LIMITS (Lbs.)			Minimum Length	DIMENSIONAL DATA and INFORMATION		
		Vertical	Choker	90° Basket		Weight Lbs./Ft.	"B" Body Width (Loaded)	"L" Std. Eye Length
RS30EE	PURPLE	2,650	2,120	5,300	4 Ft.	.4	2-1/4"	10"
RS60EE	GREEN	5,300	4,240	10,600	4 Ft.	.5	2-1/2"	10"
RS90EE	YELLOW	8,400	6,720	16,800	4 Ft.	.7	2-3/4"	12"
RS120EE	TAN	10,600	8,500	21,200	5 Ft.	1.0	3-1/2"	12"
RS150EE	RED	13,200	10,560	26,400	5 Ft.	1.2	3-1/2"	14"
RS180EE	WHITE	16,800	13,400	33,600	7 Ft.	1.7	3-1/2"	16"
RS240EE	BLUE	21,200	17,000	42,400	7 Ft.	1.9	4-1/4"	16"