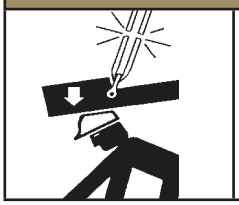
SYNTHETIC ROUND SLING SAFETY BULLETIN

⚠ 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 round-slings. 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 severeINJURY orDEATH 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 beinspected 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.

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 ofinspection, 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 iffeasible.
- 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).
- "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, temperatureand 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).

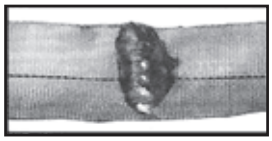
Regardless of the approach taken, a qualified person must ensure that the protection method chosen is appropriate for the types of damage to which the slings will be exposed. For instance, some protection provides abrasion resistance, but offers virtually no protection against cuts. Several "test" lifts, 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:

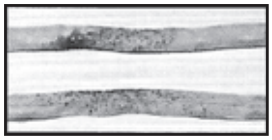
- The edges must be smooth and well-rounded. Edges that are chamfered or flattened at an angle do not meet this criteria.
- The size of the edge radii must be adequately large. Table 3 shows the minimum edge radii suitable for contact with unprotected polyester roundslings.

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

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

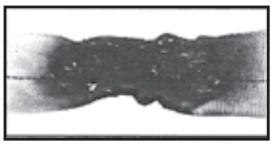


Melting or charring



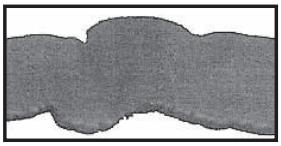
Weld spatter

Knots



Acid/alkali burns

Snags/punctures



Bunched/wadded yarns

Embedded materials

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

Roundsling			Hardware Size - Single Hook or Connection Point							
Sling Size	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 7. Common types of sling hitches

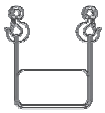
Hitch	Comments
Vertical Hitch 	One end is placed on the hook, while the other end is attached directly to the load. A tagline should be used to prevent load rotation.
Choker Hitch 	Sling passes through one end around the load and the other end is placed on the hook. Rated capacity is normally 80% of 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.
Basket Hitch 	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.

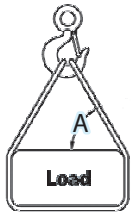
Table 6. Issues and Factors to consider when handling, lifting and manipulating materials and loads

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		
Environment	Wind Weather Visibility	Environmental temperature Object temperature Chemical conditions and exposure	Ground stability Underground installations
Load	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)
Equipment/Lift	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
Rigging	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
Personnel	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 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

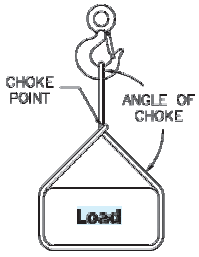


Multiply the load weight (per leg) by the tension factor to determine the increased tension on the sling leg(s)

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



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 ofinformation to help ensure that you are properly trained and knowledgeable when using roundslings, including (but not limited to):

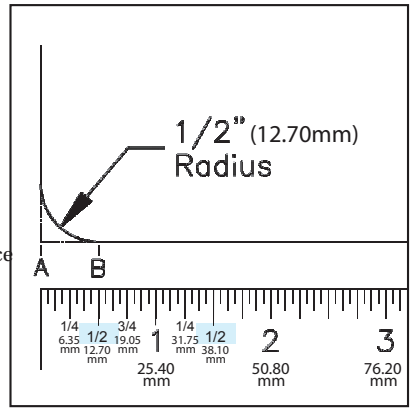
- WSTDA-RS-1—Recommended Standard Specification for Synthetic Polyester Roundslings
- WSTDA–RS-2—Recommended Operating and Inspection Manual for Synthetic Roundslings
- ASME B30.9—Synthetic Roundslings: Selection, Use, and Maintenance
- OSHA Guidance on Safe Sling Use [http://www.osha.gov/dsg/guidance/slings/synth-round.html]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

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 stressvalue at the connection does not exceed 7,000 lbs./in² 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 lbs.	kgs.	Minimum Edge Radii inch	mm	Minimum Edge Radii inch	mm	Sling Width at Load 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

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 ofless 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.

Roundsling			Minimum Hardware Size							
Sling Size	Rated Cap. Vert. Hitch		Stock Diameter or Thickness				Effective Contact Width			
	lbs.	kgs.	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 5/8	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 5/8	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

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