

WIRE ROPE END FITTINGS

SECTION 7

APPLICATIONS & WARNINGS



Scope

This procedure is provided to give instructions for installation of wire rope into the Crosby® SB-427B Spelter Button using WIRELOCK® socketing material, or zinc socketing material. **Additionally, instructions regarding the reuse of spelter buttons are included.** The spelter button is part of a socket assembly that includes a socket basket, pin, cotter pin and button. If there are any questions regarding these instructions, please contact The Crosby Group LLC at (918) 834-4611 and request technical assistance.

NOTE: Many high performance ropes require special attention to prevent rope damage during cutting, seizing and brooming in preparation for the speltering operation. Attention to the special instructions is required to ensure proper termination efficiency. Consult rope manufacturer for specific details.

Installation

Install button on the rope so that the live end of the rope extends out of small inside diameter of the button. Broomed end of rope should be pulled into button and placed completely to the "MAX FILL" line marked on the button to ensure correct length of engagement with socketing material.

Socketing using WIRELOCK® Resin Material

Seizing, cleaning, brooming and preparation of wire rope and pouring of WIRELOCK® is to be carried out per instructions provided in the *Wire Rope End Terminations User's Manual*, and *WIRELOCK® Warnings and Application Instructions* located on the WIRELOCK® Product or in the Crosby General Catalog.

Socketing Using Zinc Spelter Material

Seizing, cleaning, brooming and preparation of the wire rope, and pouring of zinc is to be carried out in accordance with recommendations of the Crosby® *Wire Rope End Terminations Manual* or other approved procedures.

Note: Before operation of the wire rope assembly, it is recommended that all poured sockets, whether with zinc or resin, be proof loaded to seat the cone.

Reuse Of Crosby® Spelter Buttons

The following are general guidelines for the reuse of a Crosby® SB-427B Button. The use and inspection of used buttons are the responsibility of the user.

Procedure For Removing Spelter Cone

- Cut the rope close ($\frac{1}{2}$ ") to the nose end of the button and press the cone out of the button.
- For metallurgical, medical and environmental reasons, we do not recommend the use of heat to remove the spelter cone.
- However, if this is the only means available for removing the zinc cone, care should be taken not to exceed 450°C (850°F) surface temperature. The preferred method would be a slow heat in a temperature controlled oven. If a torch (rosebud) is used, the heated area shall be monitored with a Tempil stick or a temperature indicator to prevent localized heating from exceeding the 450°C (850°F) limit.
- To remove a WIRELOCK® cone, heat the surface of the button to 177°C (350°F) (do not exceed the 450°C (850°F) limit for any localized hot spot). Leave for 5-10 minutes, then drive the cone out with a hammer and drift.

Selection Of Buttons For Reuse

- Use only buttons that:
 - Do not show discoloration from excessive heating.
 - Do not show any signs of welding.
 - Select only buttons that have been cleaned and have passed a Magnetic Particle Inspection by a qualified technician (level II ASNT-SNT-TC-1A-88) per ASTM E709. Acceptance criteria shall be per ASTM E125, Types II-VIII, Degree 1. No cracks are acceptable.
 - Select only buttons that do not show any signs of overloading or wear.
 - Select buttons that are free from nicks, gouges and abrasions. Indications may be repaired by lightly grinding until surfaces are smooth, provided they do not reduce the dimensions by more than 10% of the nominal catalog dimension.
 - Select buttons that are not distorted, bent or deformed.

NOTE: Buttons having any of the indications as outlined above shall not be reused.

CROSBY® FORGED WIRE ROPE CLIP WARNINGS & APPLICATION INSTRUCTIONS

G-450
(Red-U-Bolt®)



WARNING

- Failure to read, understand, and follow these instructions may cause death or serious injury.
- Read and understand these instructions before using clips.
- Match the same size clip to the same size wire rope.
- Prepare wire rope end termination only as instructed.
- Do not use with plastic coated wire rope.
- Apply first load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and retighten nuts to recommended torque (See Table 1).
- The reuse of clips is discouraged. As recommended by Crosby, have qualified personnel inspect product before use.

Efficiency ratings for wire rope end terminations are based upon the minimum breaking force of wire rope. The efficiency rating of a properly prepared loop or thimble-eye termination for clip sizes 1/8" through 7/8" is 80%, and for sizes 1" through 3-1/2" is 90%.

The number of clips shown (see Table 1) is based upon using RRL or RLL wire rope, 6 x 19 or 6 x 37 Class, FC or IWRC; IPS or XIP, XXIP. If Seale construction or similar large outer wire type construction in the 6 x 19 Class is to be used for sizes 1 inch and larger, add one additional clip. If a pulley (sheave) is used for turning back the wire rope, add one additional clip.

The number of clips shown also applies to rotation-resistant RRL wire rope, 8 x 19 Class, IPS, XIP, XXIP sizes 1-1/2 inch and smaller; and to rotation-resistant RRL wire rope, 19 x 7 Class, IPS, XIP, XXIP sizes 1-1/2 inch and smaller.

For other wire rope manufacture designs not mentioned above, we recommend contacting Crosby Engineering at the address or telephone number on the back cover to ensure the desired efficiency rating.

The style of wire rope termination used for any application is the obligation of the user.

For OSHA (Construction) applications, see OSHA 1926.251.

1. Refer to Table 1 following these instructions.



Figure 1

Turn back specified amount of rope from thimble or loop. Apply first clip one base width from dead end of rope. Apply U-Bolt over dead end of wire rope – live end rests in saddle (Never saddle a dead horse!). Use torque wrench to tighten nuts evenly, alternate from one nut to the other until reaching the recommended torque (See Figure 1).

2. When two clips are required, apply the second clip as near the loop or thimble as possible.



Figure 2

Use torque wrench to tighten nuts evenly, alternating until reaching the recommended torque. When more than two clips are required, apply the second clip as near the loop or thimble as possible, turn nuts on second clip firmly, but do not tighten. (See Figure 2)

3. When three or more clips are required, space additional clips equally between first two – take up rope slack – use torque wrench to tighten



Figure 3

nuts on each clip evenly, alternating from one nut to the other until reaching recommended torque (See Figure 3).

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4. If a pulley (sheave) is used in place of a thimble, add one additional clip. Clip spacing should be as shown.

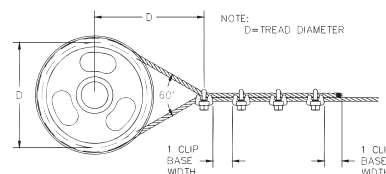


Figure 4

(See Figure 4)

5. WIRE ROPE SPLICING PROCEDURES:

The preferred method of splicing two wire ropes together is to use inter-locking turnback eyes with thimbles, using the recommended number of clips on each eye



Figure 5

(See Figure 5).

An alternate method is to use twice the number of clips as used for a turnback termination. The rope ends are placed parallel to each other,

overlapping by twice the turnback amount shown in the application instructions. The minimum number of clips should be installed on each dead end

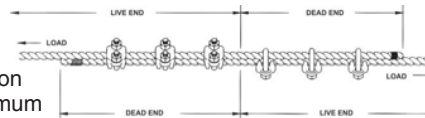


Figure 6

(See Figure 6). Spacing, installation torque, and other instructions still apply.

6. IMPORTANT

Apply first load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and use torque wrench to retighten nuts to recommended torque.

In accordance with good rigging and maintenance practices, the wire rope end termination should be inspected periodically for wear, abuse, and general adequacy.

Table 1

Clip Size/ Rope Size (in)	(mm)	Minimum No. of Clips	Amount of Rope to Turn Back in mm	* Torque in Nm
3/16	5	2	95	10.2
1/4	6-7	2	120	20.3
5/16	8	2	133	40.7
3/8	9-10	2	165	61.0
7/16	11-12	2	178	68
1/2	13	3	292	88
9/16	14-15	3	305	129
5/8	16	3	305	129
3/4	18-20	4	460	176
7/8	22	4	480	305
1	24-25	5	660	305
1-1/8	28-30	6	860	305
1-1/4	33-34	7	1120	488
1-3/8	36	7	1120	488
1-1/2	38-40	8	1370	488
1-5/8	41-42	8	1470	583
1-3/4	44-46	8	1550	800
2	48-52	8	1800	1017
2-1/4	56-58	8	1850	1017
2-1/2	62-65	9	2130	1017
2-3/4	68-72	10	2540	1017
3	75-78	10	2690	1627
3-1/2	85-90	12	3780	1627

If a pulley (sheave) is used for turning back the wire rope, add one additional clip. See Figure 4.

If a greater number of clips are used than shown in the table, the amount of turnback should be increased proportionately.

*The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

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APPLICATIONS & WARNINGS

CROSBY® FIST GRIP® CLIPS

WARNINGS & APPLICATION INSTRUCTIONS



New Style Fist Grip®
3/16" - 5/8"



Fist Grip® Clips
3/4" - 1-1/2"

WARNING

- Failure to read, understand, and follow these instructions may cause death or serious injury.
- Read and understand these instructions before using clips.
- Match the same size clip to the same size wire rope.
- Do not mismatch Crosby clips with other manufacturer's clips.
- Prepare wire rope end termination only as instructed.
- Do not use with plastic coated wire rope.
- Apply first load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and retighten nuts to recommended torque (See Table 1).
- The reuse of clips is discouraged. As recommended by Crosby, have qualified personnel inspect product before use.

Efficiency ratings for wire rope end terminations are based upon the minimum breaking force of wire rope. The efficiency rating of a properly prepared loop or thimble-eye termination for clip sizes 1/8" through 7/8" is 80%, and for sizes 1" through 3-1/2" is 90%.

The number of clips shown (see Table 1) is based upon using RRL or RLL wire rope, 6 x 19 or 6 x 37 Class, FC or IWRC; IPS or XIP, XXIP. If Seale construction or similar large outer wire type construction in the 6 x 19 Class is to be used for sizes 1 inch and larger, add one additional clip. If a pulley (sheave) is used for turning back the wire rope, add one additional clip.

The number of clips shown also applies to rotation-resistant RRL wire rope, 8 x 19 Class, IPS, XIP, XXIP sizes 1-1/2 inch and smaller; and to rotation-resistant RRL wire rope, 19 x 7 Class, IPS, XIP, XXIP sizes 1-1/2 inch and smaller.

For other wire rope manufacture designs not mentioned above, we recommend contacting Crosby Engineering at the address or telephone number on the back cover to ensure the desired efficiency rating.

The style of wire rope termination used for any application is the obligation of the user.

For OSHA (Construction) applications, see OSHA 1926.251.

1. Refer to Table 1 in following these instructions.

Turn back specified amount of rope from thimble or loop. Apply first clip one base width from dead end of rope. Use torque wrench to tighten nuts evenly, alternating from one nut to the other until reaching the recommended torque (See Figure 1).

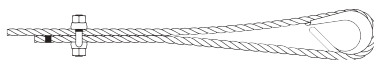


Figure 1

2. When two clips are required, apply the second clip as near the loop or thimble as possible. Use torque wrench to tighten nuts evenly, alternating until reaching the recommended torque.

When more than two clips are required, apply the second clip as near the loop or thimble as possible, turn nuts on second clip firmly, but do not tighten. (See Figure 2)



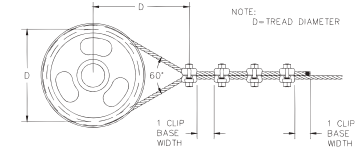
Figure 2

3. When three or more clips are required, space additional clips equally between first two – take up rope slack – use torque wrench to tighten nuts on each clip evenly, alternating from one nut to the other until reaching recommended torque (See Figure 3).



Figure 3

4. If a pulley (sheave) is used in place of a thimble, add one additional Fist Grip. Fist Grip spacing should be as shown. (See Figure 4)



IF A PULLEY (SHEAVE) IS USED, IN PLACE OF A THIMBLE, ADD ONE ADDITIONAL CLIP. CLIP SPACING SHOULD BE AS SHOWN.

Figure 4

5. WIRE ROPE SPLICING PROCEDURES:

The preferred method of splicing two wire ropes together is to use inter-locking turnback eyes with thimbles, using the recommended number of clips on each eye (See Figure 5).



Figure 5

An alternate method is to use twice the number of clips as used for a turnback termination. The rope ends are placed parallel to each other, overlapping by twice the turnback amount shown in the application instructions.

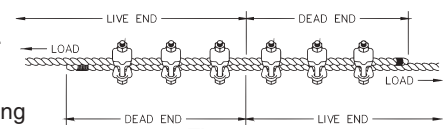


Figure 6

The minimum number of clips should be installed on each dead end (See Figure 6). Spacing, installation torque, and other instructions still apply.

6. IMPORTANT

Apply first load to test the assembly. This load should be of equal or greater weight than loads expected in use. Next, check and use torque wrench to retighten nuts to recommended torque.

In accordance with good rigging and maintenance practices, the wire rope end termination should be inspected periodically for wear, abuse, and general adequacy.

Clip Size/ Rope Size (in)	(mm)	Minimum No. of Clips	Amount of Rope to Turn Back in mm	* Torque in Nm
1/4	6-7	2	100	40.7
5/16	8	2	127	40.7
3/8	9-10	2	133	61.0
7/16	11-12	2	165	88.1
1/2	13	3	279	88.1
9/16	14-15	3	323	176
5/8	16	3	342	176
3/4	18-20	3	406	305
7/8	22	4	660	305
1	24-25	5	940	305
1-1/8	28-30	5	1040	488
1-1/4	32-34	6	1400	488
1-3/8	36	6	1400	488
1-1/2	38-40	7	1980	678

If a pulley (sheave) is used for turning back the wire rope, add one additional clip. See Figure 4.

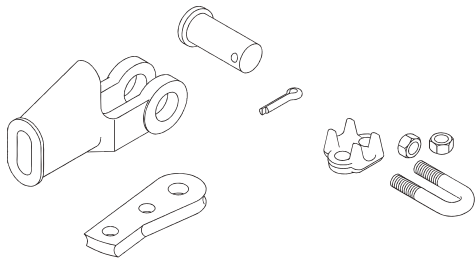
If a greater number of clips are used than shown in the table, the amount of turnback should be increased proportionately.

*The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

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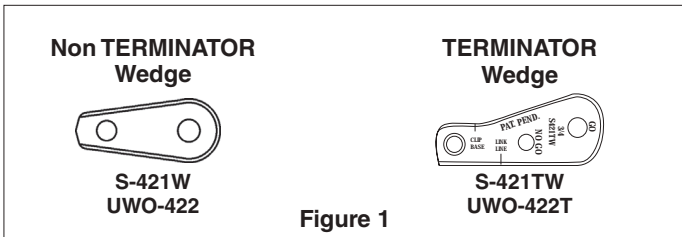
CROSBY TERMINATOR

WARNINGS & APPLICATION INSTRUCTIONS



**S-421T / US-422T
"TERMINATOR"**

NOTE: The design of the basket for the S-421T 1-1/4" TERMINATOR Wedge Socket does not allow proper fit to the old style Crosby S-421W wedge (see Fig. 1). **Do not assemble or use.** The design of the basket for each US-422T TERMINATOR® Wedge Socket does not allow proper fit to the old style UWO-422 wedge (See Fig. 1). **Do not assemble or use.** All S-421T and US-422T TERMINATOR baskets are marked with a capital "T" or TERMINATOR.



QUIC-CHECK® "Go" and "No-Go" features cast into wedge. The proper size wire rope is determined when the following criteria are met:
1. The wire rope shall pass thru the "Go" hole in the wedge.
2. The wire rope shall NOT pass thru the "No-Go" hole in the wedge.



Important Safety Information – Read and Follow Inspection/Maintenance Safety

- Always inspect socket, wedge and pin before using.
- Do not use part showing cracks.
- Do not use modified or substitute parts.
- Repair minor nicks or gouges to socket or pin by lightly grinding until surfaces are smooth. Do not reduce original dimension more than 10%. Do not repair by welding.
- Inspect permanent assemblies annually, or more often in severe operating conditions.
- Do not mix and match wedges or pins between models or sizes.
- Always select the proper wedge and socket for the wire rope size.

Assembly Safety

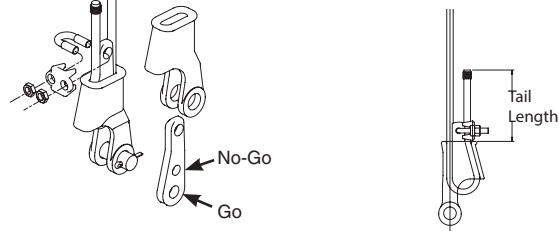
- Use only with standard 6 to 8 strand wire rope of designated size. For intermediate size rope, use next larger size socket. For example: When using 9/16" diameter wire rope use a 5/8" size Wedge Socket Assembly. Welding of the tail on standard wire rope is not recommended. Seizing of the tail is preferred following the recommended practices of the wire rope manufacturer. The tail length of the dead end should be a minimum of 6 rope diameters but not less than 150 mm (See Figure 2).
- **To use with Rotation Resistant wire rope** (special wire rope constructions with 8 or more outer strands), ensure that the dead end is welded, brazed or seized before inserting the wire rope into the wedge socket to prevent core slippage or loss of rope lay. Seizing of the tail is preferred following the recommended practices of the wire rope manufacturer. The tail length of the dead end should be a minimum of 20 rope diameters but not less than 150 mm (See Figure 2).
- Properly match socket, wedge and clip (See Table 1) to wire rope size.

- Align live end of rope, with center line of pin. (See Figure 2)
- Secure dead end section of rope. (See Figure 2)
- Tighten nuts on clip to recommended torque. (See Table 1)
- Do not attach dead end to live end or install wedge backwards (See Fig. 3).
- Use a hammer to seat Wedge and Rope as deep into socket as possible before applying first load.

WARNING

- Loads may slip or fall if the Wedge Socket is not properly installed.
- Load misapplied in direct contact with the wedge can dislodge the wedge and cause loss of load.
- A falling load can seriously injure or kill.
- Read and understand these instructions before installing the Wedge Socket.
- Do not side load the Wedge Socket.
- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Do not interchange wedges between S-421T and US422T or between sizes.
- Do not assemble an old style 30-32mm (1-1/4") S-421W wedge into an S-421T 30-32mm (1-1/4") TERMINATOR basket.
- Do not assemble an old style UWO-422 wedge into a US-422T TERMINATOR basket.
- The reuse of clips is discouraged. As recommended by Crosby, have qualified personnel inspect product before use.

Figure 2



*Tail Length	
Standard 6 to 8 Strand Wire Rope	Rotation Resistant Wire Rope
A minimum of 6 rope diameters, but not less than 150mm.	A minimum of 20 rope diameters, but not less than 150mm.

TABLE 1

Rope Size (mm)	9-10	11-13	14-16	18-19	20-22	24-26	28	32
Clip Size (in)	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4
* Torque NM	61	88	129	176	305	305	305	488

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

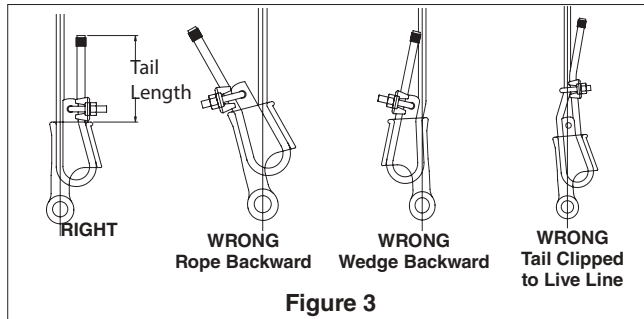


Figure 3

Operating Safety

- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Efficiency rating of the Wedge Socket termination is based upon the catalog breaking strength of Wire Rope. The efficiency of a properly assembled Wedge Socket is 80%.
- During use, do not strike the dead end section or wedge with any other elements of the rigging (Called two blocking).
- Do not allow a direct load to contact the wedge.

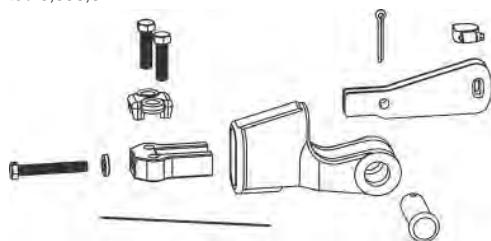
WIRE ROPE END FITTINGS

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SUPER TERMINATOR WEDGE SOCKET

WARNINGS & APPLICATION INSTRUCTIONS

US Patented 6,898,827.



S-423T SUPER TERMINATOR

The intended purpose of the SUPER TERMINATOR is to offer a Wedge Socket termination, which when assembled properly with high performance, high strength, compacted strand, rotation resistant wire rope will achieve an 80% termination efficiency. Due to the unique construction of these ropes, Crosby cannot make a broad general statement that all current and future designed ropes, when properly assembled with a SUPER TERMINATOR, will achieve a minimum 80% termination efficiency. (To determine the efficiency rating for a specific rope, contact Crosby Engineering at 918-834-4611.)

The SUPER TERMINATOR may be purchased as a complete Wedge Socket assembly or the Wedge assembly may be purchased for retrofit onto your Crosby S-421TW wedge socket basket.

The Crosby S-423TW SUPER TERMINATOR Wedge is designed to be assembled only into the Crosby S-421T socket basket. For the 30-32mm S-423T, assemble only on to S-421T basket marked TERMINATOR.

Important Safety Information - Read and Understand Inspection/Maintenance Safety

- Always inspect socket, wedge and pin before using.
- Do not use part showing cracks.
- Do not use modified or substitute parts.
- Repair minor nicks or gouges to socket or pin by lightly grinding until surfaces are smooth. Do not reduce original dimension more than 10%. Do not repair by welding.
- Inspect permanent assemblies annually, or more often in severe operating conditions.
- Do not mix and match wedges or pins between models or sizes.
- Always select the proper wedge and socket for the wire rope size.

Assembly Safety

- Properly match socket and wedge assembly to wire rope size.
- Ensure the dead end is properly seized before inserting the wire rope into the wedge socket basket. High performance, high strength, compacted strand, rotation resistant wire ropes are sensitive to seizing methods. For specific seizing procedures, contact the wire rope manufacturer.
- The tail length of the dead end should be a minimum of 20 rope diameters but not less than 254mm (See Figure 1).
- Mount wedge socket basket in vice.
- Insert live end of wire rope into wedge basket, aligning live end of rope with center line of pin. Make a loop and return. (See Figure 2).
- Pull on live line to remove excess out of loop, leaving enough room to properly insert wedge into basket. (See Figure 3).
- Secure rope to SUPER TERMINATOR Wedge with clamp (See Figure 4).
- Pull Wedge and rope into basket until tensioner bolt, with washers properly applied, can engage threads in nose of wedge. Auxillary power may be required to fully pull wedge and rope into basket. (See Figure 5).
- Use torque wrench to tighten tensioner bolt to recommended torque value, properly seating wedge and rope into basket. Reference Table 1 for recommended Torque in N-m.
- Secure dead end section of rope with clip base. Tighten bolts to recommended torque values (See Table 1).
- Properly install wire to securely lock tensioner bolt to tensioner. (See Figure 6).
- Do not attach dead end to live end or install wedge backwards. (See Figure 7).

Operating Safety

- Proper application of the Super TERMINATOR eliminates the "first load" requirement of conventional wedge socket terminations.
- Efficiency rating of the Wedge Socket termination is based upon the catalog breaking strength of Wire Rope. The efficiency of a properly

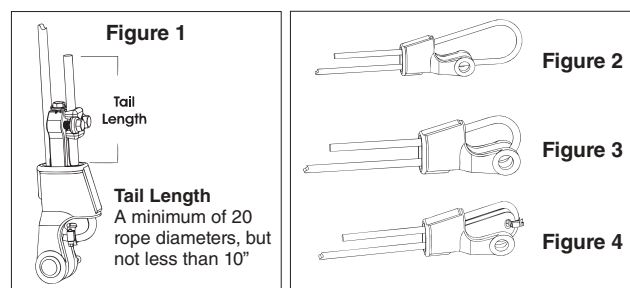
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assembled Super Terminator on most high performance, high strength, compacted strand, rotation resistant ropes will achieve 80% of catalog breaking strength of rope, depending on the unique construction of these ropes. (To determine the efficiency rating for a specific rope, contact Crosby Engineering at 918-834-4611.)

- During use, do not strike the dead end section or wedge with any other elements of the rigging (Called two blocking).
- The SUPER TERMINATOR wedge socket may also be used with standard 6 to 8 strand and rotation resistant wire rope (special wire rope constructions with 8 or more strands).
- Do not allow direct load to contact the wedge.

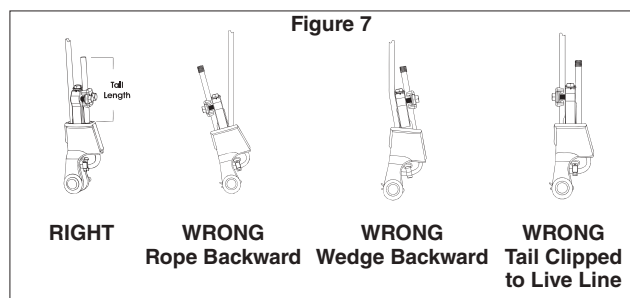
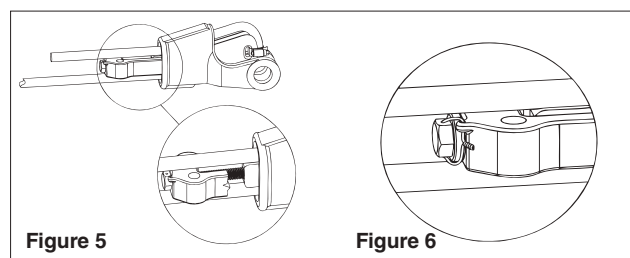
WARNING

- Loads may slip or fall if the Wedge Socket is not properly installed.
- A falling load can seriously injure or kill.
- Load misapplied in direct contact with the wedge can dislodge the wedge and cause loss of load.
- Read and understand these instructions before installing the Wedge Socket.
- Do not side load the Wedge Socket.
- Apply recommended torque to tensioner and clip bolts, and properly install wire to securely lock tensioner bolt to tensioner.
- Do not assemble the S-423 Wedge in any brand or model socket basket other than the Crosby S-421T TERMINATOR.
- The size is marked on the socket basket and wedge, do not interchange wedge between sizes.
- The reuse of clips is discouraged. As recommended by Crosby, have qualified personnel inspect product before use.



Wedge Size (mm)	Tensioner Bolt Torque Nm*	Clip Bolts Torque Nm*
15.9	149	129
19.1	203	176
22.2	515	305
25.4	515	305
28.6	814	305
31.8	1220	488

* The tightening torque values shown are based upon the threads being clean, dry, and free of lubrication.

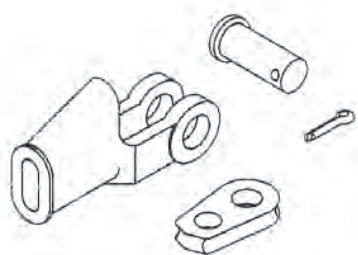


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WEDGE SOCKET

WARNINGS & APPLICATION INSTRUCTIONS



S-421 / US-422

Important Safety Information - Read and Follow Inspection/Maintenance Safety

- Always inspect socket, wedge and pin before using.
- Do not use part showing cracks.
- Do not modify or substitute parts.
- Repair minor nicks or gouges to socket or pin by lightly grinding until surface are smooth. Do not reduce original dimension more than 10%. Do not repair by welding.
- Inspect permanent assemblies annually, or more often in severe operating conditions.
- Do not mix and match wedges or pins between models or sizes.
- Always select the wedge and socket for the wire rope size.

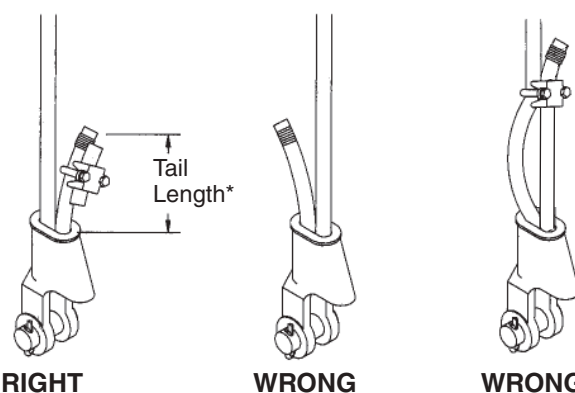
Assembly Safety

- Use only with standard 6 to 8 strand wire rope of designated size. For intermediate size rope, use next larger size socket. For example: When using 14 mm diameter wire rope use a 16 mm size Wedge Socket Assembly. Welding of the tail on standard wire rope is not recommended. Seizing of the tail is preferred following the recommended practices of the wire rope manufacturer. The tail length of the dead end should be a minimum of 6 rope diameters but not less than 150 mm.
- Align live end of rope, with center line of pin. (See Figure 1)
- Secure dead end section of rope. (See Figure 1)
- DO NOT ATTACH DEAD END TO LIVE END. (See Figure 1)
- Use a hammer to seat Wedge and Rope as deep into socket as possible before applying first load.
- To use with Rotation Resistant wire rope (special wire rope constructions with 8 or more outer strands) ensure that the dead end is welded, brazed or seized before inserting the wire rope into wedge socket to prevent core slippage or loss of rope lay. The tail length of the dead end should be a minimum of 20 rope diameters but not less than 150mm. (Figure 1)

⚠ WARNING

- Loads may slip or fall if the Wedge Socket is not properly installed.
- Load misapplied in direct contact with the wedge can dislodge the wedge and cause loss of load.
- A falling load can seriously injure or kill.
- Read and understand these instructions before installing the Wedge Socket.
- Do not side load the Wedge Socket.
- Do not interchange Crosby wedge socket, wedge or pin with non Crosby Wedge socket, wedge or pin.
- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Do not interchange wedge between S-421 and US-422 or between sizes.
- The reuse of clips is discouraged. As recommended by Crosby, have qualified personnel inspect product before use.

Figure 1



*Tail Length

Standard 6 to 8 strand wire rope

A minimum of 6 rope diameters, but not less than 150mm
(i.e. - For 25mm rope: Tail Length = 25mm x 6 = 150mm)

Rotation Resistant Wire Rope

A minimum of 20 rope diameters, but not less than 150mm
(i.e. - For 25mm rope: Tail Length = 25mm x 20 = 500mm)

Operating Safety

- Apply first load to fully seat the Wedge and Wire Rope in the socket. This load should be of equal or greater weight than loads expected in use.
- Efficiency rating of the Wedge Socket termination is based upon the catalog breaking strength of Wire Rope. The efficiency of properly assembled Wedge Socket is 80%.
- During use, do not strike the dead end section with any other elements of the rigging (Called two-blocking).
- Do not allow a direct load to contact the wedge.

WIRE ROPE END FITTINGS

SECTION 7

APPLICATIONS & WARNINGS

WIRELOCK®

WARNINGS & APPLICATION INSTRUCTIONS

⚠ WARNING

- WIRELOCK® should be stored in a cool dry place (10°C to 24°C/ 50°F to 75°F)
- Incorrect use of WIRELOCK® can result in an unsafe termination which may lead to serious injury, death, or property damage.
- Do not use WIRELOCK® with stainless steel rope in salt water environment applications.
- Use only soft annealed iron wire for seizing.
- Do not use any other wire (copper, brass, stainless, etc.) for seizing.
- Never use an assembly until the WIRELOCK® has gelled and cured.
- Remove any non-metallic coating from the broomed area.
- Non Crosby sockets with large grooves need to have those grooves filled before use with WIRELOCK®.
- Read, understand, and follow these instructions and those on product containers before using WIRELOCK®.

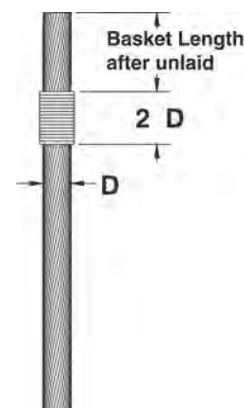
The following simplified, step-by-step instructions should be used only as a guide for experienced, trained users. *For full information, consult the Wire Rope End Terminations Manual, API (American Petroleum Institute) Recommended Practice 9B, ISO Standards, Wire Rope Manufacturers Catalogs, and Wire Rope Sling Users Manual.*

STEP 1 – SOCKET SELECTION

1. WIRELOCK® is recommended for use with Crosby 416-417 Spelter Sockets. Structural strand requires a socket with the basket length approximately 5 times the strand diameter or fifty (50) times the wire diameter, whichever is greater, to achieve 100% efficiency. Consult The Wire Rope End Terminations Manual for proper selection of Wire Rope or Structural Strand sockets.
2. For use with sockets other than Crosby 416-417 consult the socket manufacturer or Crosby Engineering.
3. Sockets used with WIRELOCK® shall comply with Federal or International (CEN, ISO) Standards.
4. WIRELOCK®, as with all socketing media, depends upon the wedging action of the cone within the socket basket to develop full efficiency. A rough finish inside the socket may increase the load at which seating will occur. Seating is required to develop the wedging action.

STEP 2 – MEASURE AND SEIZE

The rope ends to be socketed should be of sufficient length so that the end of the unlaied wires (from the strands) will be at the top of the socket basket. Seizing should be placed at a distance from the end equal to the length of the basket of the socket.



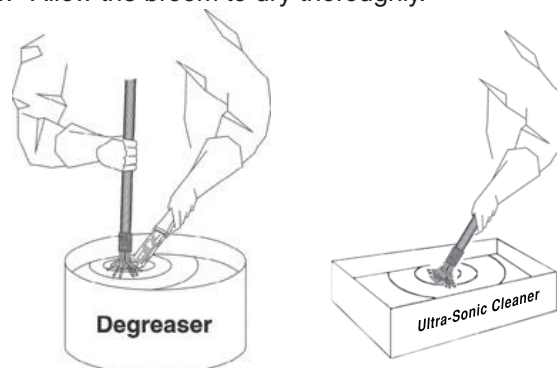
STEP 3 – BROOMING

1. Unlay the individual strands and fully broom out the wires of the wire rope and IWRC as far as the seizing. The wires should be separated but not straightened.
2. Cut out any fiber core.
3. Unlay the individual wires from each strand, including the IWRC, completely, down to the seizing.
4. Remove any plastic material from broomed area.



STEP 4 – CLEANING

1. The method of cleaning will depend on the lubricant and/or coating on the wire.
2. The methods and materials used for cleaning should comply with the current EPA or local regulations.
3. Consult your Wire Rope supplier or Wire Rope manufacturer for recommended material and methods. Follow the solvent supplier's recommendations for cleaning the broomed end.
4. Allow the broom to dry thoroughly.

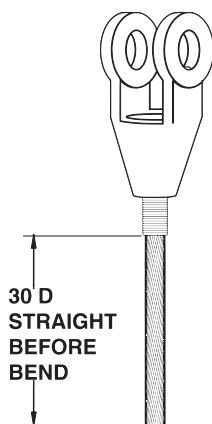


WIRE ROPE END FITTINGS

SECTION 7

STEP 5 – POSITIONING OF SOCKET

1. Position socket over the broom until it reaches the seizing on the wire rope. The wires should be LEVEL with the top of the socket basket.
2. Clamp rope and socket vertically ensuring alignment of their axes.
3. **CAUTION: DO NOT USE OVERSIZED SOCKETS FOR WIRE ROPE.**



STEP 6 – SEAL SOCKET

Seal the base of the socket with putty or plasticine to prevent leakage of the **WIRELOCK®**.



STEP 7 – WIRELOCK® KITS

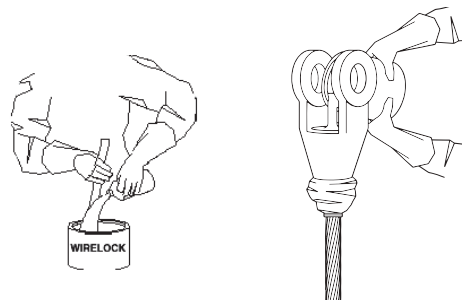
1. **WIRELOCK®** kits are pre-measured and consist of two (2) containers – one (1) with resin and one (1) with granular compound.
2. Use the complete kit – **NEVER MIX LESS THAN THE TOTAL CONTENTS OF BOTH CONTAINERS.**
3. Each kit has a shelf life clearly marked on each container and this must be observed. **NEVER USE OUT-OF-DATE KITS.**

CAUTION

- **WIRELOCK® resin, in liquid state, is flammable.**
- **Chemicals used in this product can give off toxic fumes and can burn eyes and skin.**
- **Never use out-of-date material.**
- **Use only in well-ventilated work areas.**
- **Never breathe fumes directly or for extended time.**
- **Always wear safety glasses to protect eyes.**
- **Always wear gloves to protect hands.**
- **Avoid direct contact with skin anywhere.**

STEP 8 – MIXING AND POURING

1. Mix and pour **WIRELOCK®** within the temperature range of 48° to 110° F. Booster kits are available for reduced temperatures.
2. Wirelock is set up to gel in 20 minutes at 65° F. For every 18° F rise in temperature the gel time will halve. At 83° F the gel time will be 10 minutes and at 101° F it will be 5 minutes. To give extra working time of pot life it is worth considering refrigerating the kits for two hours prior to mixing and pouring. The socket should also be as cool as possible - out of direct sunlight, as an example.
3. Pour all the resin into a container containing all the granular compound and mix thoroughly for two (2) minutes with a flat paddle.
4. The **WIRELOCK®** will turn a green blue color. If it does not turn a green blue after mixing, **DO NOT USE.**
5. Immediately after mixing, slowly pour the mixture down one side of the socket until the socket basket is full.
6. Check for leakage at nose of socket, add putty if required.



STEP 9 – CURING

1. **WIRELOCK®** will gel in approximately 20 minutes, in a temperature range 65° F (18° C) to 75° F (24° C).
2. The socket must remain undisturbed in the vertical position for an additional ten (10) minutes after gel is complete.
3. The socket will be ready for service 60 minutes after gelling.
4. Never heat sockets to accelerate gel or curing.



STEP 10 – RE-LUBRICATION

Re-lubricate wire rope as required.

STEP 11 – PROOF LOADING

Whenever possible, the assembly should be proof loaded. In accordance with ASME B30.9.

ALTERNATE SEIZING AND BROOMING METHOD

Reference the *Wire Rope End Terminations User's Manual* from Crosby for an alternative socketing method.

WIRE ROPE END FITTINGS

SECTION 7

APPLICATIONS & WARNINGS

NATIONAL DIE INFORMATION

⚠ CAUTION

- **Improper die selection could result in significant loss of efficiency in the termination.**

National dies and die holders are made solely for swaging properly designed fittings on wire rope, and any other uses are prohibited.

The swaging operation results in a high degree of cold metal flow. The movement that occurs between the fitting and the dies will cause wear of the dies. Therefore, to prolong the life of the dies, it is important to always lubricate die faces and cavities between each pass with a light weight oil or high pressure grease.

When scores appear in the die cavities, the dies should be removed from service.

NEVER EXCEED THE WORKING LOAD LIMIT OF DIES OR DIE HOLDERS.

All National Standard dies 1/4" through 1" include an open channel die cavity and a tapered die cavity in the same die block.

Dies for S-505 Standard Steel Sleeves (Flemish Eyes)

Die sizes for 1/4" through 1"

Swaging 1/4" through 1" Standard Steel S-505 sleeves on Flemish Eye terminations requires the use of the taper cavity only. Refer to page 24 of the *Wire Rope End Termination User's Manual* for proper die selection.

Die sizes for 1-1/8" and above

Swaging 1-1/8" and larger Standard Steel S-505 sleeves on Flemish Eye terminations requires using 2 sets of open channel dies (1st stage and 2nd stage) for each size. Beginning with the 1st stage die and finishing with the 2nd stage die will achieve proper after swage dimensions. Dies for S-505 Sleeves 1-1/8" and larger are single cavity with open channel. Refer to page 24 of the *Wire Rope End Termination User's Manual* for proper die selection.

Using S-505 Sleeves with Metric Ropes

Although Crosby National S-505 Standard Steel sleeves are designed to be used with most metric ropes, there are selected "intermediate" sizes of metric ropes that when swaged in standard National dies utilizing Crosby National S-505 sleeves do not achieve required after swage dimensions and efficiencies. To ensure all S-505 sleeves achieve the required efficiency when used with metric ropes, Crosby provides special National swaging dies to be used in conjunction with selected size metric ropes. These new dies will produce the required efficiencies and after swage dimensions.

The table found on page 46 of this catalog or page 25 of the *Wire Rope End Termination User's Manual* identifies the new dies that are required to properly swage the selected intermediate size wire ropes not covered in the standard product offering found on page 45 of this catalog or page 24 of the manual.

Dies for 6mm through 26mm (except 12mm, 20mm and 24mm)

Swaging on 6mm through 26mm metric ropes for Flemish Eye slings requires the selection of the proper S-505 Standard Steel sleeve and the use of the tapered cavity only. Refer to page 24 of the *Wire Rope End Termination User's Manual* for proper sleeve and die selection.

Dies for 12mm, 20mm and 24mm

Swaging on 12mm, 20mm and 24mm metric ropes for Flemish Eye slings requires the selection of the proper S-505 Standard Steel sleeve and the use of both the open cavity and tapered cavity in special dies. Refer to page 25 of the *Wire Rope End Termination User's Manual* for proper sleeve and die selection.

Dies for 28mm and larger

Swaging on 28mm and larger metric ropes for Flemish Eye slings requires the selection of the proper S-505 Standard Steel sleeve and the use of 2 sets of open channel dies (1st stage and 2nd stage) for each size. Beginning with the 1st stage die and finishing with the 2nd stage die will achieve proper after swage dimensions. Dies for S-505 sleeves 28mm and larger are single cavity with open channel. Refer to page 24 of the *Wire Rope End Termination User's Manual* for proper sleeve and die selection.

Important: If the specific size metric rope required is not listed on page 24 of the *Wire Rope End Termination User's Manual* refer to Intermediate Metric Die Chart on page 25 of the manual for proper sleeve and die selection.

Dies for QUIC-PASS® Swaging System – 1/4" through 1-1/2"

The QUIC-PASS® swaging system allows "Flemish style" wire rope terminations to be swaged in only two passes. This is accomplished while maintaining currently published efficiency ratings and utilizing National Swage S-505 Standard "COLD TUFF"® Steel Sleeves.

The special design of the QUIC-PASS® dies allows the swaging process to be completed in just two passes, resulting in a 50-75% reduction in the number of passes required with conventional swaging systems. Unlike standard round dies, the QUIC-PASS® dies close completely with each pass, resulting in an increase in overall swaging process efficiencies (the job can be performed quicker), a reduction in the complexity of swaging (the concern for excess flashing between dies has been eliminated) and a reduction in training time needed for operators (more user friendly).

The finished sleeve has a "Hex" appearance that provides a QUIC-CHECK® look to determine if the termination has been swaged and provides a flat surface that allows for ease of I.D. stamping on the finished sleeve. Refer to page 24 of the *Wire Rope End Termination User's Manual* for proper die selection.

WIRE ROPE END FITTINGS

SECTION 7

Dies for S-501 & S-502 Swage Sockets

Swaging all S-501 & S-502 Swage Sockets requires the use of single cavity die. This is a special die designed with a relief for swage sockets and extra length to swage the full length of the shank. Refer to pages 36 and 37 of the *Wire Rope End Termination User's Manual* for proper die selection.

Swage Sockets for Spiral Strand Rope

Our tests indicate that if the spiral strand is 1 x 19 or greater, and the ultimate strength does not exceed Table 1 of ASTM A586, you can use dies for size swage sockets up to the 1-1/4". For sizes greater than 1-1/4" the following will apply:

1. Closed S-502 Sockets: One (1) socket size larger with shank modified for actual strand diameter 1-3/8" through 2".
2. Open S-501 Sockets: One (1) socket size larger with shank modified for actual strand diameter 1-3/8" through 2".
3. If the strand is of greater strength than Table 1 of ASTM A586 or has less metallic area, we must recalculate the design and test for adequacy.

Dies for S-506 Turnback Sleeves

Turnback eye terminations using 5/16" through 1" S-506 Sleeves utilize the S-505 Standard Steel Sleeve die (1st Stage open channel die only). The 1-1/4" S-506 Sleeve utilizes the 1-3/8" socket (S-501 and S-502) die. Refer to page 46 of the *Wire Rope End Termination User's Manual* for proper die selection.

Dies for S-409 Buttons

Buttons are swaged in open channel dies. Refer to page 42 of the *Wire Rope End Termination User's Manual* or on page 47 of this catalog for proper die selection.

Specific recommended swaging practices can be found in each product section of this catalog. The proper die selection and the recommended maximum after swage dimensions are referenced in the section of this catalog that contains the product you are swaging. This information can also be found in the National Swage Die Guide, or by referring to the National Swage Die Chart.

Dies and die adapters to fit other type swaging machines are available upon request (Refer to page 19 of the *Wire Rope End Termination User's Manual*).



Single Cavity Die



Two Cavity Die



Never use dies that are cracked, worn or abraided (galled).

WIRE ROPE END FITTINGS

SECTION 7

APPLICATIONS & WARNINGS

After Swage Inspection Procedures

⚠ WARNING

- Read, understand, and follow these instructions before using the National QUIC-PASS® Swaging System.
- Improper after swage dimensions can result in sling failure resulting in property damage, serious injury or death.
- Always gauge or measure the after swage dimensions to ensure proper sling performance.
- Using National Swaging System with ropes and termination styles other than shown in these procedures may reduce the performance of the termination and lead to premature failure.
- When using rope constructions other than shown in this procedure, the termination must be destructive tested and documented to prove adequacy of the assembly to be manufactured.
- The QUIC-PASS® Swaging System is designed only for "Flemish Eye" terminations using National S-505 Standard Steel Sleeves.
- The QUIC-PASS® Swaging System is not designed for Cable-Laid wire rope slings.

Checking Swaging Dimensions

One of the important considerations in producing a quality termination is the overall diameter of the fitting after the swaging process is complete. Since all dies wear, and the swaged fitting used in terminations has spring back, the results of swaging should be checked periodically to determine the wear condition of the die as well as to ensure the fitting is swaged to proper dimensions.

Key Facts About After Swage Dimensions:

1. In addition to worn dies, not achieving the proper after swage dimension can also be due to the die not being fully closed during swaging. Dies showing excessive wear should be replaced.
2. The effective swaging that dies can accomplish stops when the die lands touch each other. Any continued swaging adds needless wear and strain on the dies and swaging machine.
3. By placing a light oil on the die faces and in the cavity, the dies will be lubricated as well as protected.
4. The oozing of the oil from the faces of the dies as they touch will indicate when the dies have closed. At this point, stop the swaging cycle.
5. Additional swaging adds needless wear and strain to the dies and swaging machine.
6. Never use dies that are cracked, worn or abraded (galled).
7. The Crosby Group does not recommend the checking of die dimensions as an acceptable method of determining the quality of a swage sleeve, button, ferrule, or socket.
8. It is our recommendation that the checking of the after swage dimension of the swaged fitting is the most accurate indicator of a properly swaged termination. Measuring the die cavity only is not an acceptable process control check.
9. If the die cavity wears, the dies are not closed completely during swaging. If an inadequate number of presses are used, it could be quickly identified by checking the after swage dimension of the part.
10. Swaging Machine not producing sufficient tonnage will affect after swage dimensions.

No-Go Gauge Information

To assist in checking the after swage dimensions of the fitting, the Crosby Group provides the National No-Go Gauges. When used correctly the National No-Go Gauges can determine if the fittings were swaged to the proper diameter. We would recommend that all Crosby products or product swaged in Crosby dies be checked with the proper gauge to determine the acceptability of the swaging process.

- Gauges are made of hardened alloy steel and machined to strict tolerances.
- Gauge can be used to verify that all fittings have been swaged properly.
- After swage dimensions not within the maximum limits may result from worn dies or improper swaging techniques.
- Other type gauges are available upon request.
- National No-Go Gauges are available for a variety of products (See Table 1).
- **No-Go Gauges and QUIC-PASS® No-Go Gauges are not interchangeable.**

Table 1 - Standard Round No-Go Gauges

Fitting	Size	Part No.
505 Sleeve	1/4 - 7/8	1095512
505 Sleeve	1 - 1-1/2	1095521
505 Sleeve	1-3/4	1095530
505 Sleeve	2	1095549
505 Sleeve	2-1/4	1095558
505 Sleeve	2-1/2	1095567
505 Sleeve	2-3/4	1095576
505 Sleeve	3	1095585
505 Sleeve	3-1/2	1095594
505 Sleeve	3-3/4	1095601
505 Sleeve	4	1095610
501/502 Socket	1/4 - 1	1095647
501/502 Socket	1-1/8 - 1-3/4	1095656
501/502 Socket	2	1095665

Using No-Go Gauges

When swaged properly, the gauge will go up and down (see Figure 1) and around the full length of the fitting (see Figure 2).

For the proper after swage dimensions, see the section in this publication for the specific product you are swaging.

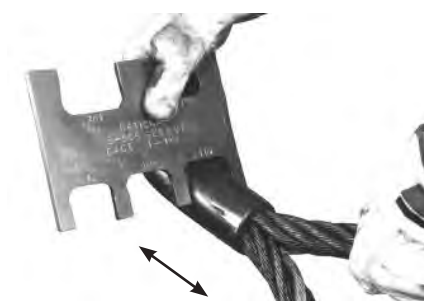


Figure 1



Figure 2

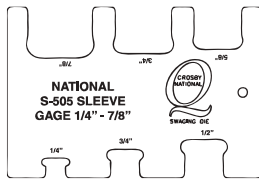
WIRE ROPE END FITTINGS
SECTION 7

QUIC-PASS® No-Go Gauges

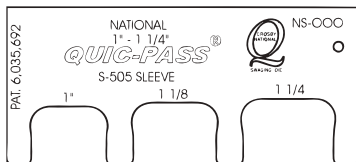
As a further aid, QUIC-PASS® No-Go gauges are available for checking the sleeve's dimensions after swaging is complete.

- Gauges are made of hardened alloy steel and machined to strict tolerances.
- Gauge can be used to verify that all sleeves have been swaged properly.
- "After Swage" dimensions not within the maximum limits may result from worn dies or improper swaging techniques.
- **No-Go Gauges and QUIC-PASS® No-Go Gauges are not interchangeable.**

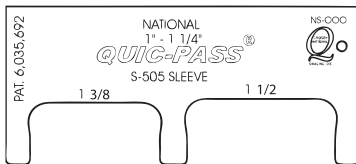
QUIC-PASS® No-Go Gauges	
Sleeve and Size	Stock No.
No-Go Gauge for S-505 1/4" - 7/8"	1923705
No-Go Gauge for S-505 1" - 1-1/4"	1923712
No-Go Gauge for S-505 1-3/8" - 1-1/2"	1923714



Stock No.
1923705

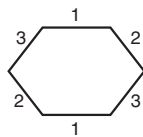


Stock No.
1923712



Stock No.
1923714

Use a National QUIC-PASS® No-Go Gauge to check the after swage dimensions to ensure that it has been swaged to the proper dimension. When swaged properly, the gauge will slide up and down the full length of the sleeve on all three sets of opposing flats.



QUIC-PASS®
Maximum After Swage Dimensions

Size (in)	Maximum "After Swage" Dimension (in)
1/4	0.565
5/16 - 3/8	0.769
7/16 - 1/2	1.016
9/16 - 5/8	1.247
3/4	1.475
7/8	1.738
1	1.955
1-1/8	2.170
1-1/4	2.405
1-3/8	2.610
1-1/2	2.835

Important Safety Information

- **Crosby does not recommend** a "Texas Tuck" style termination with Crosby National S-505 "COLD TUFF®" Standard Steel Sleeves.
- Only Crosby National S-505 "COLD TUFF®" Standard Steel Sleeves are recommended when using the QUIC-PASS® Swaging System.
- National S-505 Standard Steel Sleeves, when used with the QUIC-PASS® Swaging System, are only recommended for use with one (1) part 6 X 19 or 6 X 37, IPS or XIP (EIP), XXIP (EEIP), RRL, IWRC rope.
- The condition of the swaging machine can cause sleeve "After Swage" size not to be within the proper dimensions. Example: worn bushings, loose tie rods, loose die holders, misaligned platens, worn pins, worn linkage, etc.
- Swaging dies being worn, damaged, misused, or undersized can cause sleeve "After Swage" size not to be within the proper dimension.
- Swaging die holders excessively worn, damaged, misused or loose can cause sleeve "After Swage" size not to be within the proper dimension. Only use QUIC-PASS® dies and die holders inspected and properly secured in National swaging machines.
- Always refer to Warning and Application information found in this catalog and *Wire Rope End Terminations User's Manual*.

WIRE ROPE END FITTINGS
SECTION 7

APPLICATIONS & WARNINGS

CROSBY® THIMBLE EYE BUNDLE CLIPS

WARNING & APPLICATION INSTRUCTIONS



G-461

The Bundle Clip is utilized in a choker hitch application to maintain the shape of bundled packages after a load is placed. The Bundle Clip is attached to live line of choker hitch, but it is never to be used as a button or ferrule to carry a load in the primary load path.

Certain conditions (such as extreme variation of the choke size) or improper installation may cause the eye of the choke hitch to disengage from the Bundle Clip and allow the eye to seat away from or below the Bundle Clip (see Figure 3). If this occurs, the Bundle Clip must be removed and installed in the proper position.

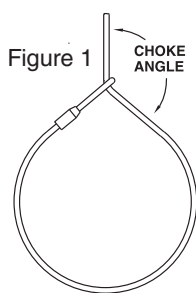
The Bundle Clip is sized to provide a grip to the live rope without reducing the efficiency of a choker hitch. This grip is adequate to keep the bundle clip in position.

These instructions are for use with thimble eyes formed with RRL or RLL wire rope, 6 x 19 or 6 x 36 Class, FC or IWRC; IPS or XIP, XXIP, and a Crosby Thimble. For other classes of wire rope not mentioned above, we recommend contacting Crosby Engineering.

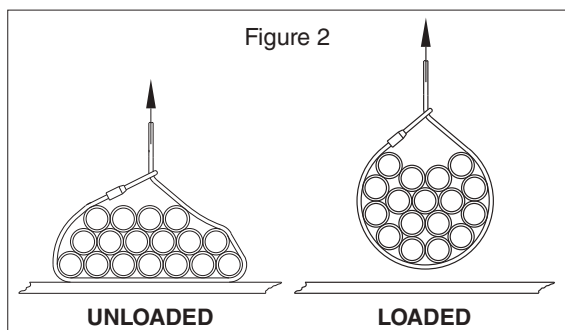
For Soft Eye applications see the Crosby G-460 Soft Eye Bundle Clip.

For OSHA (Construction) applications, see OSHA 1926.251.

1. The eye of the sling must be in the choked position (around live line). Choker hitch applications should comply with the requirements of ASME B30.9 Slings. Install the choker hitch to provide a minimum choke angle of 120 degrees (See Figure 1). Refer to ASME B30.9 for required de-rating of the sling if choke angle is less than 120 degrees.



2. Before installing Bundle Clip, apply initial load by lifting the bundle and clearing the support, producing a tight choke. Repeat as necessary until the bundle package is in the most compact position (See figure 2, Loaded). **Keep hands and feet from under load.**



⚠ WARNING

- Failure to read, understand, and follow these instructions may cause death or serious injury.
- A falling load may seriously injure or kill.
- Read and understand these instructions before using clips.
- Failure to properly position the Bundle Clip may allow the load to slip and fall.
- Match the same size clip to the same size wire rope.
- Install Bundle Clip only as instructed.
- Do not use with plastic coated wire rope.
- Do not use for lifting personnel.

3. After initial loading, install the Bundle Clip. The orientation of the Bundle Clip on the live line is not an important consideration, as the assembly is of adequate size to prevent passage through proper size Crosby Thimble and next larger size Thimble. Insert U-bolt through the Bundle Clip. Properly position the clip base over the U-bolt and install nuts (See Figure 3). Use torque wrench to tighten evenly, alternating from one nut to the other until the bundle stop bottoms out on the clip base, and the recommended torque is reached (See Table 1).

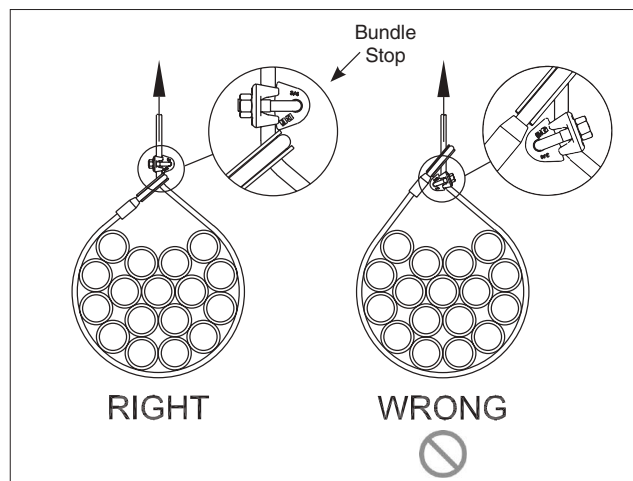


Figure 3

Table 1 – Recommended Torque

Clip Size	Rope Size (mm)	Torque (Nm)
5/8	16	129
3/4	19	176
7/8	22	305

4. Before each lift, check to ensure that the choke eye has not slipped from the Bundle Clip. Repeat Step 3 if necessary.
5. When disconnecting, the load should be clear of the stable support (See figure 2, Loaded). Remove Bundle Clip. Stay clear of the load as the bundle is lowered and the load is removed from the sling.

In accordance with good rigging and maintenance, the wire rope sling should be inspected periodically for wear, abuse, and general adequacy.

CROSBY® SOFT EYE BUNDLE CLIPS

WARNING & APPLICATION INSTRUCTIONS



G-460

The Bundle Clip is utilized in a choker hitch application to maintain the shape of bundled packages after a load is placed. The Bundle Clip is attached to live line of choker hitch, but it is never to be used as a button or ferrule to carry a load in the primary load path.

Certain conditions (such as extreme variation of the choke size) or improper installation may cause the eye of the choke hitch to disengage from the Bundle Clip and allow the eye to seat away from or below the Bundle Clip (see Figure 3). If this occurs, the Bundle Clip must be removed and installed in the proper position.

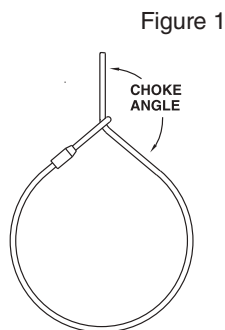
The Bundle Clip is sized to provide a grip to the live rope without reducing the efficiency of a choker hitch. This grip is adequate to keep the bundle clip in position. The eye may pull free of the Bundle Clip if not positioned properly.

These instructions are for use with soft eyes (no thimble) formed with RRL or RLL wire rope, 6 x 19 or 6 x 36 Class, FC or IWRC; IPS or XIP, XXIP. For other classes of wire rope not mentioned above, we recommend contacting Crosby Engineering.

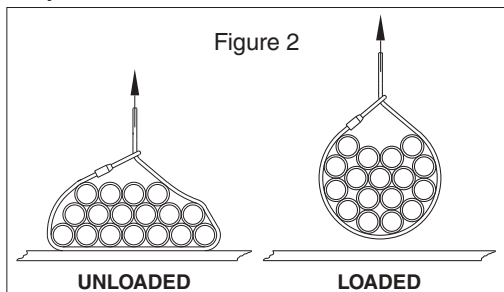
For Thimble Eye applications see the Crosby G-461 Thimble Eye Bundle Clip.

For OSHA (Construction) applications, see OSHA 1926.251.

1. The eye of the sling must be in the choked position (around live line). Choker hitch applications should comply with the requirements of ASME B30.9 Slings. Install the choker hitch to provide a minimum choke angle of 120 degrees (See Figure 1). Refer to ASME B30.9 for required de-rating of the sling if choke angle is less than 120 degrees.



2. Before installing Bundle Clip, apply initial load by lifting the bundle and clearing the support, producing a tight choke. Repeat as necessary until the bundle package is in the most compact position (See figure 2, Loaded). **Keep hands and feet from under load.**



WIRE ROPE END FITTINGS SECTION 7

WARNING

- Failure to read, understand, and follow these instructions may cause death or serious injury.
- A falling load may seriously injure or kill.
- Read and understand these instructions before using clips.
- Failure to properly position the Bundle Clip may allow the load to slip and fall.
- Do not use the Bundle Clip to form the choke hitch (See Figure 3).
- Match the same size clip to the same size wire rope.
- Install Bundle Clip only as instructed.
- Do not use with plastic coated wire rope.
- Do not use for lifting personnel.

3. After initial loading, install the Bundle Clip in proper orientation, with curved portion (Bundle Clip tip) over the eye of the sling. Insert U-bolt through the Bundle Clip. Properly position the clip base over the U-bolt and install nuts (See Figure 3). Use torque wrench to tighten evenly, alternating from one nut to the other until the curved portion bottoms out on the clip base, and the recommended torque is reached (See Table 1).

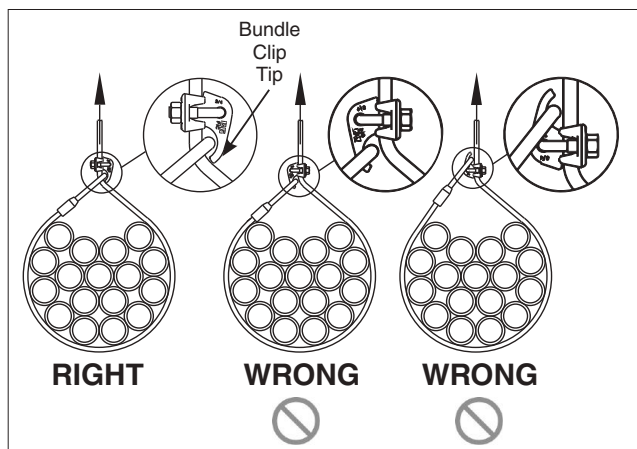


Figure 3

Clip Size	Rope Size (mm)	Torque (Nm)
5/8	16	129
3/4	19	176
7/8	22	305

4. Before each lift, check to ensure that the choke eye has not slipped from the Bundle Clip tip. Repeat Step 3 if necessary.
5. When disconnecting, the load should be clear of the stable support (See figure 2, Loaded). Remove Bundle Clip. Stay clear of the load as the bundle is lowered and the load is removed from the sling.

In accordance with good rigging and maintenance, the wire rope sling should be inspected periodically for wear, abuse, and general adequacy.

ROV
SECTION 8

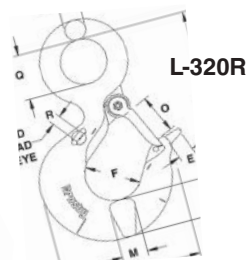
APPLICATIONS & WARNINGS

Crosby® ROV HOOKS

WARNINGS & APPLICATION INSTRUCTIONS



L-562A



L-320R

QUIC-CHECK® Hoist hooks incorporate markings forged into the product which address two (2) **QUIC-CHECK®** features:



Deformation Indicators – Two strategically placed marks, one just below the shank or eye and the other on the hook tip, which allows for a **QUIC-CHECK®** measurement to determine if the throat opening has changed, thus indicating abuse or overload.

To check, use a measuring device (i.e., tape measure) to measure the distance between the marks. The marks should align to either an inch or half-inch increment on the measuring device. If the measurement does not meet criteria, the hook should be inspected further for possible damage.

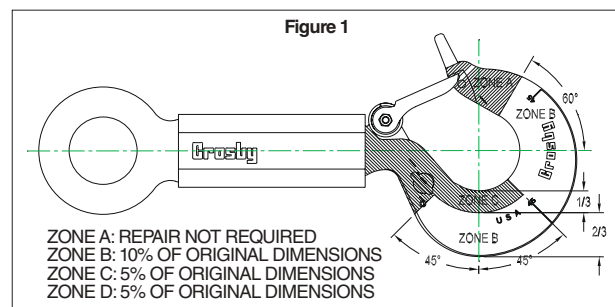
Angle Indicators – Indicates the maximum included angle which is allowed between two (2) sling legs in the hook. These indicators also provide the opportunity to approximate other included angles between two sling legs.

IMPORTANT SAFETY INFORMATION - READ & FOLLOW

- A visual periodic inspection for cracks, nicks, wear, gouges and deformation as part of a comprehensive documented inspection program, should be conducted by trained personnel in compliance with the schedule in ASME B30.10 and/or regulations governing your industry or jurisdiction.
- For ROV hooks used in frequent load cycles or pulsating loads, the ROV hook components (hoist hook, eye bolt and hexagon body) and their threads should be periodically inspected by Magnetic Particle or Dye Penetrant (Disassembly will be required).
- Disassemble the eye bolt and shank hook from hexagon body (sizes up to and including 31.5t WLL). This requires removing the 2 spiral pins and unscrewing the eye bolt and hoist hook.
- Always use new spiral pins when re-assembling the ROV Hook.
- After reassembly, Crosby recommends a proof test equal to 2 times the ROV hook's stated WLL.
- Never use a hoist hook whose throat opening has been increased, or whose tip has been bent more than 10 degrees out of plane from the hook body, or is in any other way distorted or bent. Note: A latch will not work properly on a hook with a bent or worn tip.
- Never use a hoist hook that is worn beyond the limits shown in Figure 1.
- Remove from service any hoist hook with a crack, nick or gouge. Hoist hooks with a nick or gouge shall be repaired

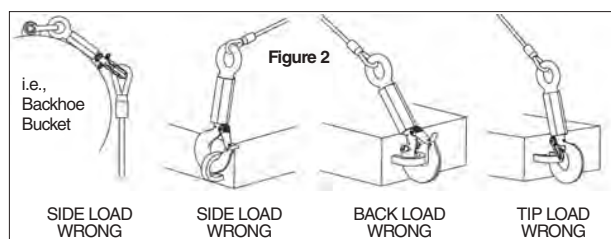
⚠ WARNING

- Loads may disengage from hook if proper procedures are not followed.
- A falling load may cause serious injury or death.
- Hook must always support the load. The load must never be supported by the latch.
- Read and understand these instructions before using hook and latch.



by grinding lengthwise, following the contour of the hook, provided that the reduced dimension is within the limits shown in Figure 1. Contact Crosby Engineering to evaluate any cracks.

- Never repair, alter, rework, or reshape an ROV hook by welding, heating, burning, or bending.
- Remove from service a hoist hook or eye bolt which has threads corroded more than 20% of the hexagon body engagement length.
- Never side load, back load, or tip load the hoist hook, eye bolt or hexagon body. (Side loading, back loading and tip loading are conditions that damage and reduce the capacity of the ROV hook). (See Figure 2.)
- The use of a latch may be mandatory by regulations or safety codes. Follow the regulations governing your industry or jurisdiction.



- Always make sure the hook supports the load. The latch must never support the load.
- When placing two (2) sling legs in hook, make sure the angle from the vertical to the outermost leg is not greater than 45 degrees, and the included angle between the legs does not exceed 90 degrees.
- See ANSI/ASME B30.10 "Hooks" for additional information.
- Remove from service any eye bolt with a crack, nick or gouge. Eye bolt with a nick or gouge shall be repaired by grinding lengthwise, following the contour of the eye bolt, provided that the reduced dimension is no greater than 5% of original dimension. Contact Crosby Engineering to evaluate any cracks.

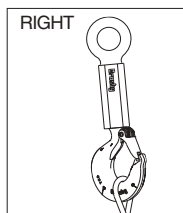
ROV
 SECTION 8


Figure 3

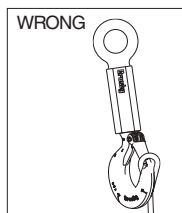


Figure 4

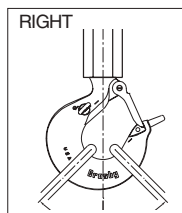


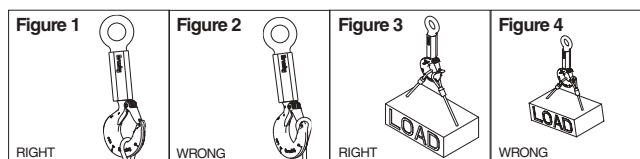
Figure 5

- Never use an eye bolt if eye or shank is bent or elongated.
- Remove from service the hexagon body if internal threads are corroded beyond 20% of the eye bolt or hoist hook shank's threaded engagement lengths.
- Hexagon body with nicks or gouges may be repaired by grinding lengthwise.
- Inspect the spiral pin holes on the hoist hook, hexagon body and eye bolt. At assembly, the spiral pin must engage with a press fit.

Warning and Application Instructions for Crosby® Hook Latch

Important Safety Information – Read & Follow

- Always inspect hook and latch before using.
- Never use a latch that is distorted or bent.
- Always make sure spring will force the latch against the tip of the hook.
- Always make sure hook supports the load. The latch must never support the load. (See Figures 1 & 2)
- When placing two (2) sling legs in hooks, make sure the angle between the legs is less than 90° and if the hook or load is tilted, nothing bears against the bottom of this latch. (See Figures 3 & 4)
- Latches are intended to retain loose sling or devices under slack conditions.
- Latches are not intended to be an anti-fouling device.



⚠ WARNING

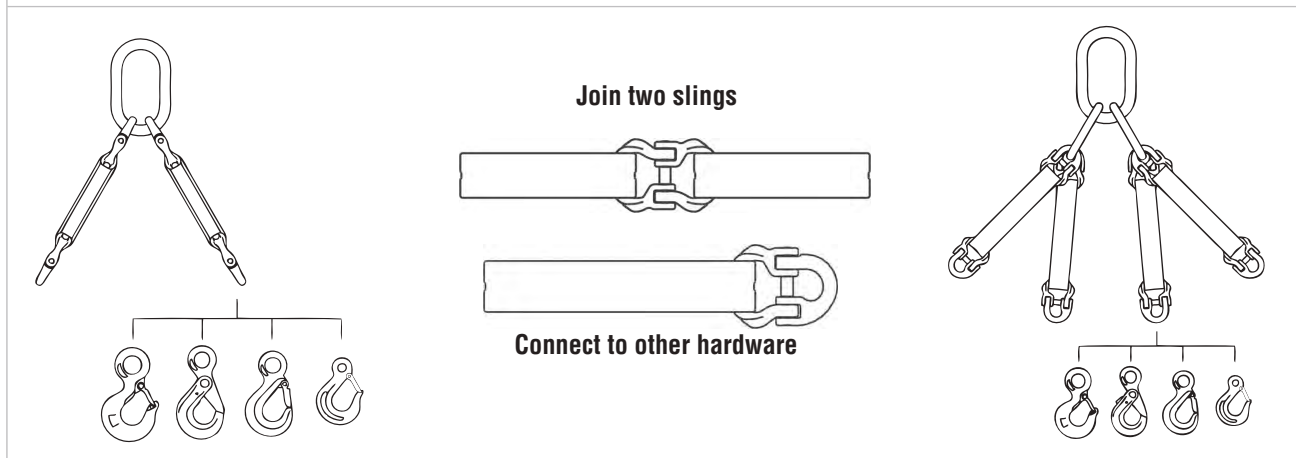
- Loads may disengage from hook if proper procedures are not followed.
- A falling load may cause serious injury or death.
- See OSHA Rule 1926.550 (g)(4)(iv)(B) for personnel hoisting for cranes and derricks. Only a Crosby or McKissick hook with a PL Latch attached and secured with bolt, nut and cotter (or Crosby Toggle Pin) or a Crosby hook with a S-4320 Latch attached and secured with a cotter pin, or a Crosby SHUR-LOC® hook in the locked position may be used for any personnel hoisting. A hook with a Crosby SS-4055 latch attached shall NOT be used for personnel lifting.
- Hook must always support the load. The load must never be supported by the latch.
- Read and understand these instructions before using hook and latch.

SYNTHETIC SLING FITTINGS
SECTION 9

APPLICATIONS & WARNINGS

Typical Application

The S-237 and S-238 connectors have been designed to easily adapt to other Crosby fittings to develop complete systems for high performance Synthetic Slings.

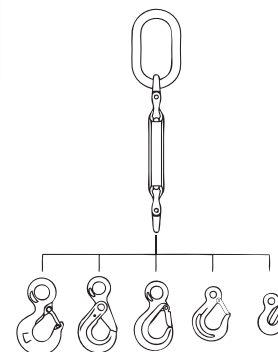


These easy-to-use charts are designed to allow you to quickly determine the Crosby Fitting required for your high performance sling.

Single Leg Sling

S-237 Frame	Working Load Limit		A-1337 Lok-A-Loy (mm)	A-342 (mm)	A-344 (mm)	L-320A L-320AN†		S-1316 (mm)	S-315A (mm)	L-1327 (mm)
	4:1 (kg)*	5:1 (kg)*				(t)	Frame			
5	2834	2268	10	25	22	†7	JA	16	16	16
10	5670	4536	16	25	22	†7	JA	16	16	16
15	8505	6804	20	32	25	†11	KA	19	-	19
25	14175	11340	22	38	32	†15	LA	22	-	22
30	17010	13607	22	38	32	†15	LA	22	-	22
40	22680	18145	25	44	-	†22	NA	25	-	-
60	34020	27215	32	51	-	30	OA	-	-	-

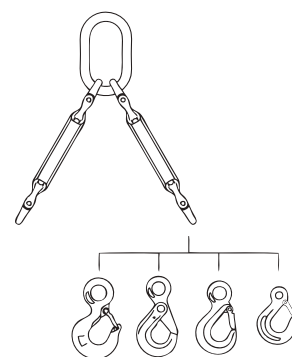
* Ultimate load is 5 times the Working Load Limit. † L-320AN Style Hook.



Double Leg Sling

S-237 Frame	Working Load Limit		A-1337 Lok-A-Loy (mm)	A-342 (mm)	A-344 (mm)	L-320A L-320AN†		S-1316 (mm)	S-315A (mm)	L-1327 (mm)
	4:1 (kg)*	5:1 (kg)*				(t)	Frame			
5	2834	2268	10	32	32	†7	JA	16	16	16
10	5670	4536	16	32	32	†7	JA	16	16	16
15	8505	6804	20	38	-	†11	KA	19	-	19
25	14175	11340	22	44	-	†15	LA	22	-	22
30	17010	13607	22	44	-	†15	LA	22	-	22
40	22680	18145	25	51	-	†22	NA	25	-	-
60	34020	27215	32	57	-	30	OA	-	-	-

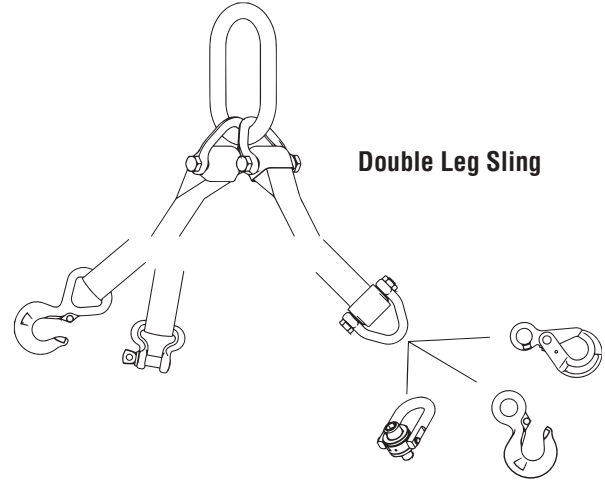
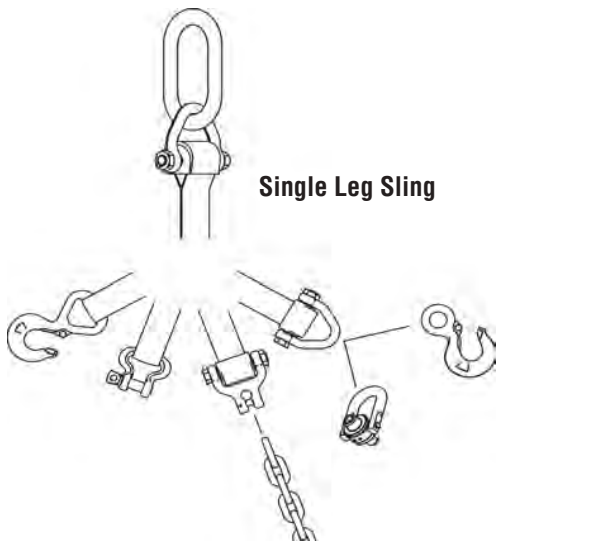
* Ultimate load is 5 times the Working Load Limit. † L-320AN Style Hook.



For Triple and Quad leg slings, contact Crosby Engineering at (918) 834-4611

SYNTHETIC SLING FITTINGS
SECTION 9

APPLICATIONS & WARNINGS



These easy-to-use charts are designed to allow you to quickly determine the fitting required to create the Web Sling or Round Sling you need.

Single and Double Leg Slings Component Recommendations based on Type III, (Eye & Eye), Class 7, 2 Ply web slings.

S-280 Web Connector S-281 Web Sling Shackle				S-280 Web Connector								
Web Sling												
Round Sling Size (No.)	Web Width (mm)	Eye Width (mm)	Ply.	S-280 S-281 Working Load Limit (t)	Web Sling Hook WSL-320 (t)	Spectrum 8® Chain Size (in) – (mm)	Eye Hoist Hook L-320AN (t)	Eye SHUR-LOC® S-1316 (mm)	Swivel Hoist Ring HR-125 (kg)	Master Link A-342 Single Leg (mm)	Master Link A-342 Double Leg (mm)	
1 & 2	50	50	2	2.95	3	3/8 - 10	3.2	13	3000	16	19	
3	75	35	2	4.08	5	1/2 - 13	5.4	16	4200	19	25	
4	100	50	2	5.67	—	5/8 - 16	8	16	7000	25	25	
5 & 6	150	75	2	7.70	—	—	11.5	—	11000	25	32	

Triple and Quad Leg Slings Component Recommendations based on Type III, (Eye & Eye), Class 7, 2 Ply web slings.

S-280 Web Connector S-281 Web Sling Shackle				S-280 Web Connector								
Web Sling												
Round Sling Size (No.)	Web Width (mm)	Eye Width (mm)	Ply.	S-280 S-281 Working Load Limit (t)	Web Sling Hook WSL-320 (t)	Spectrum 8® Chain Size (in) – (mm)	Eye Hoist Hook L-320AN (t)	Eye SHUR-LOC® S-1316 (mm)	Swivel Hoist Ring HR-125 (kg)	Master Link A-342 Triple Leg (mm)	Master Link A-342 Quad Leg (mm)	
1 & 2	50	50	2	2.95	3	3/8 - 10	3.2	13	3000	25	25	
3	75	35	2	4.08	5	1/2 - 13	5.4	16	4200	25	32	
4	100	50	2	5.67	—	5/8 - 16	8	16	7000	32	38	
5 & 6	150	75	2	7.70	—	—	11.5	—	11000	38	44	

SYNTHETIC SLING FITTINGS
SECTION 9

APPLICATIONS & WARNINGS

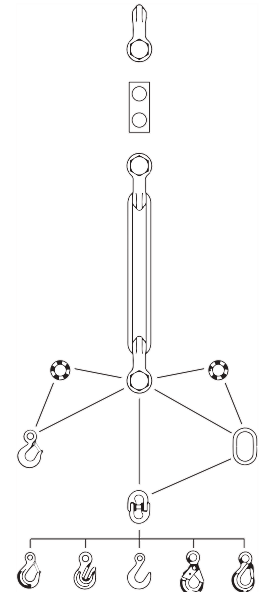
Easily Integrated into Synthetic Sling System

The Synthetic Sling Saver shackles line has been designed to easily adapt Crosby Sling fittings in the development of complete systems for synthetic slings.

Single Leg Slings

Sling Saver Shackle		Sling Saver Shackle		Eye Hoist Hook		Alloy Master Link		Master Link Assy.		LOK-A-LOY® Link* A-1337				
Web Sling Eye Width (mm)	Working Load Limit (t)	Sling Saver Shackle Spool S-255 (mm)	Sling Saver Shackle Link Plate S-256 (mm)	Eye Hoist Hook L-320AN† L-320A	Alloy Master Link A-342 (mm)	Master Link Assy. A-345 (mm)	Sling Hook L-1327 (mm)	Eye Grab Hook A-1328 (mm)	Eye Foundry Hook A-1329 (mm)	Eye SHUR-LOC® S-1316A (mm)	Eye Latching S-315A (mm)			
25	3-1/4	25	25	†5.4	19	—	10	10	10	10	10			
35	6-1/2	35	35	†8	25	—	16	16	16	16	16			
50	8-3/4	50	50	†11.5	25	—	16	16	16	16	16			
75	12-1/2	75	75	†16	32	—	19	19	19	—	19			
100	20-1/2	100	100	†22	44	—	—	19	—	19	—			
125	35	125	125	37	51	—	—	19	—	—	—			
150	50	150	150	60	57	—	—	19	—	—	—			

* LOK-A-LOY® size same as hook size. † New 320N Eye Hook.

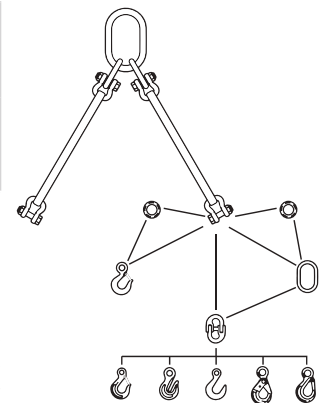


Single Leg Sling

Double Leg Slings

Sling Saver Shackle		Sling Saver Shackle		Eye Hoist Hook		Alloy Master Link		Master Link Assy.		LOK-A-LOY® Link* A-1337				
Web Sling Eye Width (mm)	Working Load Limit (t)	Sling Saver Shackle Spool S-255 (mm)	Sling Saver Shackle Link Plate S-256 (mm)	Eye Hoist Hook L-320AN† L-320A	Alloy Master Link A-342 (mm)	Master Link Assy. A-345 (mm)	Sling Hook L-1327 (mm)	Eye Grab Hook A-1328 (mm)	Eye Foundry Hook A-1329 (mm)	Eye SHUR-LOC® S-1316A (mm)	Eye Latching S-315A (mm)			
25	3-1/4	25	25	†5.4	19	25	10	10	10	10	10			
35	6-1/2	35	35	†8	25	32	16	16	16	16	16			
50	8-3/4	50	50	†11.5	25	32	16	16	16	16	16			
75	12-1/2	75	75	†16	32	38	19	19	19	—	19			
100	20-1/2	100	100	†22	44	44	—	—	—	—	—			
125	35	125	125	37	51	—	—	—	—	—	—			
150	50	150	150	60	57	—	—	—	—	—	—			

* LOK-A-LOY size same as hook size. † New 320N Eye Hook.



Double Leg Sling

SYNTHETIC SLING FITTINGS
SECTION 9

Sling Saver® Inspection Information

APPLICATIONS & WARNINGS

WEB SLINGS

Shall not be constricted or bunched between the ears of a clevis or shackle, or in a hook.

ROUND SLINGS

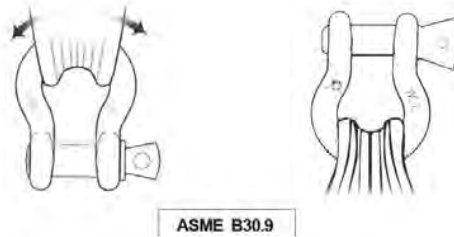
Shall not be constricted or bunched between the ears of a clevis or shackle, or in a hook.

The opening of fittings shall be proper shape and size to ensure that the fitting will seat properly on the round sling.

When a round sling is used with a shackle, it is recommended that it be used (rigged) in the bow of the shackle.

SYNTHETIC SLINGS RATED LOAD

Folding, bunching or pinching of synthetic slings, which occurs when used with shackles, hooks or other application will reduce the rated load.



When connecting Web or Round Slings, use conventional fittings with:

1. Large Radius.
2. Straight Pins.
3. Pads or use special fittings designed for Synthetic Slings.

SYNTHETIC SLING CONNECTIONS AND HITCHES

WEB SLING IDENTIFICATION INCLUDES:

SLING TYPE:

- TC – TRIANGLE CHOKER
- TT – TRIANGLE TRIANGLE
- EE – EYE AND EYE
- EN – ENDLESS

NUMBER OF PLYS: 1 OR 2

WEBBING GRADE: 9 OR 6

SLING WIDTH (INCH)

SLING LENGTH (INCH)



ROUND SLING IDENTIFICATION INCLUDES:

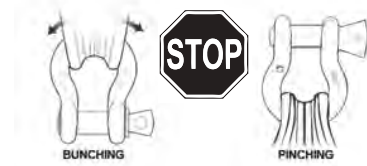
SLING NUMBER: 1-13

Sling numbers are for reference only. some round slings have different ratings.

SLING COLOR: PURPLE, GREEN, YELLOW, TAN, RED, WHITE, BLUE, ORANGE

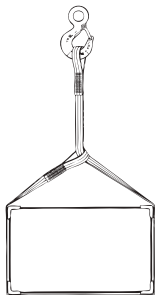
Sling color is not followed by all manufacturers, and some colors have more than one rated load.

Folding, bunching or pinching of synthetic slings, which occurs when used with shackles, hooks or other applications will reduce the rated load.



CHOKER CAPACITY

A choker hitch has 80% of the capacity of a single leg sling only if the angle of choke is 120 degrees or greater. a choke angle less than 120 degrees will result in a capacity as low as 40% of the single leg.



BASKET HITCH CAPACITY

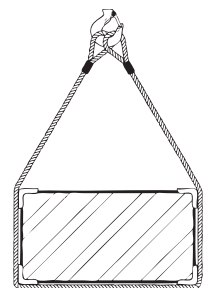
HORIZON-TAL ANGLE	CAPACITY % OF SINGLE LEG
90	200%
60	170%
45	140%
30	100%

A true basket hitch has twice the capacity of a single leg only if the legs are vertical.

MULTIPLE LEG SLINGS

TRIPLE LEG SLINGS have 50% more capacity than double leg slings (at same sling angle) only if the center of gravity is in the center of connection points and legs adjusted properly (they must have an equal share of the load).

QUAD (4-LEG) SLINGS offer improved stability but provide increased capacity only if all legs share an equal share of the load.



ALWAYS SELECT AND USE WEB SLINGS AND ROUND SLINGS BY THE RATED LOAD SHOWN ON THE SLING IDENTIFICATION TAG, NEVER BY WIDTH, COLOR OR SLING NUMBER.