ALLOY STEEL CHAIN SLINGS AND CROSBY ELIMINATOR®

Warning, Selection, Use and Maintenance Information

⚠ WARNING

- **Loads may disengage from sling if proper rigging procedures and inspection are not followed.**
- **A falling load may cause serious injury or death.**
- **Inspect sling for damage before each use.**
- **Do not attempt to use sling above rated load and angle upon which it is based.**
- **Consult sling load chart for capacity reduction due to sling angle or type of hitch used.**
- **Read and understand these instructions before using sling.**

IMPORTANT SAFETY INFORMATION
Read and Follow

These warnings and instructions are applicable to alloy chain slings produced from Crosby Grade 8 (80) and Grade 10 (100) chain and components.

- Only alloy chain, grade 80 (Crosby Spectrum 8®), or grade 100 (Crosby Spectrum 10®), should be used for overhead lifting applications.
- Working Load Limit (WLL) is the maximum load in pounds which should ever be applied to chain, when the chain is new or in "as new" condition, and when the load is uniformly applied in direct tension to a straight length of chain.
- Working Load Limit (WLL) is the maximum working load for a specific minimum sling angle, measured from the horizontal plane. The minimum sling angle and Working Load Limit is identified on the sling.
- The Working Load Limit or Design factor may be affected by wear, misuse, overloading, corrosion, deformation, intentional alterations, sharp corner cutting action diameter of curvature over which the sling is used (D/d) and other use conditions.
- Shock loading and extraordinary conditions must be taken into account when selecting alloy chain slings.
- See OSHA Regulation for Slings 1910.184, ASME B30.9-"SLINGS", ASME B30.10-"HOOKS", and ASME B30.26 "RIGGING HARDWARE" for additional information.

ASME B30.9 requires a designated person inspect each new sling and attachments prior to initial use, as well as the user or other designated person perform a visual inspection on a sling each day it is used. In addition, a periodic inspection shall be performed by a designated person at least annually, and shall maintain a record of the last inspection. For further inspection information, see Chain Inspection section of this document, or refer to ASME B30.9-1.9.

CAUSE FOR REMOVAL FROM SERVICE

A sling shall be removed from service if any of the following are visible on chain or attachments:

- Wear, nicks, cracks, breaks, gouges, stretch, bend, weld splatter, discoloration from excessive temperature, and throat openings of hooks.
- Chain links and attachments that do not hinge freely to adjacent links.
- Latches on hooks, if present, that do not hinge freely, seat properly or show evidence of permanent distortion.
- Excessive pitting or corrosion
- Missing or illegible sling identification
- Makeshift fasteners, hooks, or links formed from bolts, rods, etc.
- Mechanical coupling links in the body of the chain
- Other damage that would cause a doubt as to the strength of the chain.

OPERATING PRACTICES

- The weight of the load must be known, calculated, estimated or measured. The loading on the slings will depend on where the center of gravity is located.
- Select sling having suitable characteristics for the type of load, hitch and environment.
- Slings shall not be loaded in excess of the rated capacity.
- Consideration shall be given to the sling load angle which affects rated capacity. (See load chart Table 4 for Grade 100 (SPECTRUM 10®) and Table 5 for Grade 80 (SPECTRUM 8®).
- Never rig a sling with an angle less than 30 degrees to horizontal.
- Slings in a basket hitch should have the load balanced to prevent slippage.
- The sling shall be hitched in a manner providing control of the load.
- Never side load, back load, or tip load a hook.
- Always make sure the hook supports the load. The latch must never support the load.
- Read and understand Crosby hook and hook latch Warnings and Application Instructions.
- For two legged slings with angles greater than 90 degrees, use an intermediate link such as a master link or bolt type shackle to collect the legs of the slings. The intermediate link can be placed over the hook to provide an in-line load on the hook. This approach must also be used when using slings with three or more legs.
- When using chain slings in choker applications, the Working Load Limit must be reduced by 20%. Crosby recommends a minimum angle of choke of 120 degrees (see Figure 1). Consult the manufacturer when planning to use an angle of choke less than 120 degrees. If Crosby A-1338 Cradle Grab hooks are used at the minimum angle of choke of 120 degrees, the full sling rated WLL can be utilized.

Figure 1

- When using chain slings in basket applications where the D/d (see figure 2) is less than 6, the rated load must be reduced by the values given in Table 1. This reduction does not eliminate the need to protect chain slings against damage caused by contact with edges, corners, or protrusions. Do no use a chain sling with a D/d that is less than two.

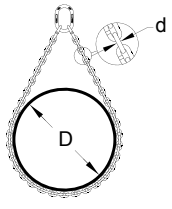

Figure 2

- In shortening applications, a 20% reduction of the Working Load Limit is required except when using the Crosby A-1338 Cradle Grab Hooks, S-1311 Chain Shortener Link, the A-1355 Chain Choker Hook in-conjunction with the S-1325 Chain Coupler Link, or the Crosby ELIMINATOR® shortener link. They can be used without any reduction to the Working Load Limit.

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- Slings should always be protected from being damaged by sharp corners.
- Slings should not be dragged on the floor or over abrasive surface.
- Chain sling links should not be twisted or kinked.
- Slings should not be pulled from under loads if the load is nesting on the sling.
- Slings that appear to be damaged should not be used. unless inspected and accepted by designated person.
- Personnel, including portions of the human body, should be kept from between the sling and the load, and from between the sling and the crane hook or hoist hook.
- Personnel shall stand clear of the suspended load.
- Personnel shall not ride the sling.
- Shock loading should be avoided.
- Twisting or kinking the legs (branches) should be avoided.
- During lifting, with or without the load, personnel should be alert for possible snagging.
- When using a basket hitch, the legs of the sling should contain or support the load from the sides, above the center of gravity, so that the load remains under control.
- Sling shall be long enough so that the rated capacity of the sling is adequate when the angle of the legs (branches) is taken into consideration. (See Table 4 for Grade 100 Chain and Table 5 for Grade 80 Chain).

General Usage

It must be recognized that certain factors in the usage of chain and attachments can be abusive and lessen the load that the chain or attachments can withstand. Some examples are twisting of the chain; disfigurement; deterioration by straining, usage, weathering and corrosion; rapid application of load or jerking; applying excessive loads; sharp corner cutting, D/d, action and non-symmetrical loading effects.

Environmental Effects

- Excessive high or low temperatures or exposure to chemically active environments such as acid or corrosive liquids or fumes can reduce the performance of the chain and components.
- Extreme temperature will reduce the performance of alloy steel chain slings.
- Normal operating temperature is –40°F to 400°F (-40°C to 204°C).
- Reference temperature exposure chart to determine reduction of WLL due to operating at, and after exposure to, elevated temperatures (see Table 1 for Grade 80 Chain and Table 2 for Grade 100 chain).
- Chemically active environments can have detrimental affects on the performance of chain. The effects can be both visible loss of material and undetectable material degradation causing significant loss of strength.

Special Surface Coating/Plating/Galvanizing

- Chain should not be subjected to galvanizing, or any plating process. If it is suspected the chain has been exposed to chemically active environment, remove from service.

Table 1
Use of Crosby Chain with Diameter of Curvature Less Than 6

D/d	Reduction of Basket Hitch Rated Load
2	40%
3	30%
4	20%
5	10%
6 and above	none

Table 2
Use of Crosby Grade 80 Chain At Elevated Temperatures

Temperature of Chain (F°)	Temperature of Chain (C°)	Temporary Reduction of Rated Load at Elevated Temperature	Permanent Reduction of Rated Load After Exposure to Temperature**
Below 400	Below 204	None	None
400	204	10%	None
500	260	15%	None
600	316	20%	5%
700	371	30%	10%
800	427	40%	15%
900	482	50%	20%
1000	538	60%	25%
Over 1000	Over 538	OSHA 1910.184 requires all slings exposed to temperatures over 1000° F to be removed from service.	

* Crosby does not recommend the use of Alloy Chain at temperatures above 800° F.
** When chain is used at room temperature after being heated to temperatures shown in the first column.

Table 3
Use of Crosby Grade 100 Chain At Elevated Tempertures

Temperature (F°)	Temperature (C°)	Temporary Reduction of Rated Load at Elevated Temperature*	Permanent Reduction of Rated Load After Exposure to Temperature**
Below 400	Below 204	None	None
400	204	15%	None
500	260	25%	5%
600	316	30%	15%
700	371	40%	20%
800	427	50%	25%
900	482	60%	30%
1000	538	70%	35%
Over 1000	Over 538	OSHA 1910.184 requires all slings exposed to temperatures over 1000 F to be removed from service.	

* Crosby does not recommend the use of Alloy Chain at temperatures above 800° F.
** When chain is used at room temperature after being heated to temperatures shown in the first column.

CHAIN INSPECTION INSPECTION AND REMOVAL FROM SERVICE PER ASME B30.9

Refer to ASME B30.9-1.9 for further information

Frequent Inspection

a. A visual inspection for damage shall be performed by the user or designated person each day the sling is used.
b. Conditions such as those listed in ASME B30.9-1.9.4 Removal Criteria, or any other condition that may result in a hazard, shall cause the sling to be removed from service. Slings shall not be returned to service until approved by a qualified person.
c. Written records are not required for frequent inspections.

Periodic Inspection

a. A complete inspection for damage of sling shall be periodically performed by a designated person. Each link and component shall be examined individually, taking care to expose and examine all surfaces including the inner link surface. The sling shall be examined for conditions such as those listed in ASME B30.9-1.9.4 Removal Criteria, and a determination made as to whether they constitute a hazard.
b. Periodic Inspection Frequency: Periodic inspection intervals shall not exceed one year. The frequency of periodic inspections should be based on:
   1. Frequency of sling use
   2. Severity of service conditions
   3. Nature of lifts being made
   4. Experience gained on the service life of slings used in similar circumstances.

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Guidelines for the interval are:

1. Normal Service – yearly
2. Severe Service – monthly to quarterly
3. Special Service – as recommended by a qualified person

c. Written records of the most recent periodic inspection shall be maintained, and shall include the condition of the sling.

Removal Criteria

An alloy sling chain shall be removed from service if conditions such as the following are present:

a. Missing or illegible sling identification.
b. Cracks or breaks
c. Excessive wear, nicks, or gouges. Minimum thickness on chain link shall not be below the values listed in Table 6.
d. Stretched chain links or components.
e. Bent, twisted, or deformed chain links or components
f. Evidence of heat damage.
g. Excessive pitting or corrosion.
h. Lack of ability of chain or components to hinge (articulate) freely.
i. Weld spatter.
j. For hooks, removal criteria as stated in ASME B30.10
k. Other conditions, including visible damage, that cause doubt as to the continued use of the sling.

Repair

a. Slings shall be repaired only by the sling manufacturer or a qualified person.
b. A repaired sling shall be marked to identify the repairing agency per ASME B30.9 Section 9-1.7.
c. Chain and components used for sling repair shall comply with the provisions of ASME B30.9.
d. Repair of hooks shall comply with ASME B30.10.
e. Cracked, broken or bent chain links or components other than hooks shall not be repaired; they shall be replaced.
f. Mechanical coupling links shall not be used within the body of an alloy chain sling to connect two pieces of chain.
g. Modifications or alterations to the sling or components shall be considered as repairs and shall conform to all other provisions of ASME B30.9.
h. All repairs shall comply with the proof test requirements of ASME B30.9 Section 9-1.6.

Table 6
Minimum Allowable Chain Link Thickness at Any Point

Nominal Chain Size		Minimum Thickness	
(in.)	(mm)	(in.)	(mm)
7/32	5.5	0.189	4.80
9/32	7	0.239	6.07
5/16	8	0.273	6.93
3/8	10	0.342	8.69
1/2	13	0.443	11.26
5/8	16	0.546	13.87
3/4	20	0.687	17.45
7/8	22	0.750	19.05
1	26	0.887	22.53
1-1/4	32	1.091	27.71
Refer to ASME B30.9			

Table 4
Grade 100 (Spectrum 10®) Alloy Chain Working Load Limit – 4 to 1 Design Factor

Spectrum 10® Alloy Chain Size		90°	60°	45°	30°	60°	45°	30°
(in.)	(mm)	Single Leg	Double Leg / Single Basket			Triple and Quad Leg / Double Basket		
—	6	3200	5500	4500	3200	8300	6800	4800
1/4 (9/32)	7	4300	7400	6100	4300	11200	9100	6400
5/16	8	5700	9900	8100	5700	14800	12100	8500
3/8	10	8800	15200	12400	8800	22900	18700	13200
1/2	13	15000	26000	21200	15000	39000	31800	22500
5/8	16	22600	39100	32000	22600	58700	47900	33900
3/4	20	35300	61100	49900	35300	91700	74900	52950
7/8	22	42700	74000	60400	42700	110900	90600	64000
1	26	59700	103400	84400	59700	155100	12600	89550
1-1/4	32	90400	156600	127800	90400	234900	191700	135600

* For choker applications, the Working Load Limit must be reduced by 20%. The Crosby A-1338 cradle grab hook and S1311N chain shortener link do not require any reduction of the Working Load Limit. The design factor of 4 to 1 on Spectrum® 10 Alloy Chain agrees with the design factor used by the International Standards Organization (I.S.O.) and ANSI B30.9 and is the preferred set of Working Load Limit values to be used. Do not use sling angles of less than 30°.

Table 5
Grade 80 (Spectrum 8®) Alloy Chain Working Load Limit – 4 to 1 Design Factor

Spectrum 8® Alloy Chain Size		90°	60°	45°	30°	60°	45°	30°
(in.)	(mm)	Single Leg	Double Leg / Single Basket			Triple and Quad Leg / Double Basket		
—	6	2500	3600	3000	2500	6500	5300	3750
1/4 (9/32)	7	3500	6100	4900	3500	9100	7400	5200
5/16	8	4500	7800	6400	4500	11700	9500	6800
3/8	10	7100	12300	10000	7100	18400	15100	10600
1/2	13	12000	20800	17000	12000	31200	25500	18000
5/8	16	18100	31300	25600	18100	47000	38400	27100
3/4	20	28300	49000	40000	28300	73500	60000	42400
7/8	22	34200	59200	48400	34200	88900	72500	51300
1	26	47700	82600	67400	47700	123900	101200	71500
1-1/4	32	72300	125200	102200	72300	187800	153400	108400

* For choker applications, the Working Load Limit must be reduced by 20%. The Crosby A-1338 cradle grab hook and S1311N chain shortener link do not require any reduction of the Working Load Limit. The design factor of 4 to 1 on Spectrum® 8 Alloy Chain agrees with the design factor used by the International Standards Organization (I.S.O.) and ANSI B30.9 and is the preferred set of Working Load Limit values to be used. Do not use sling angles of less than 30°.

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