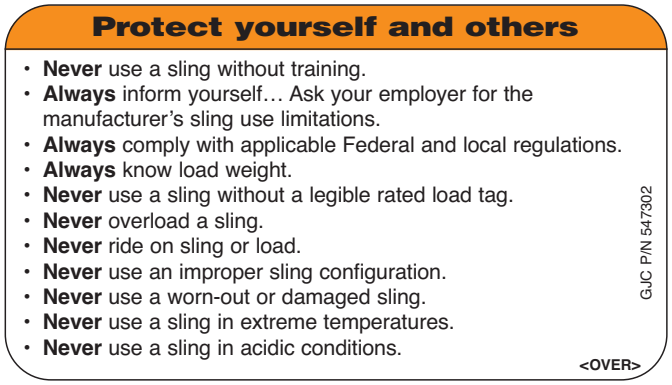
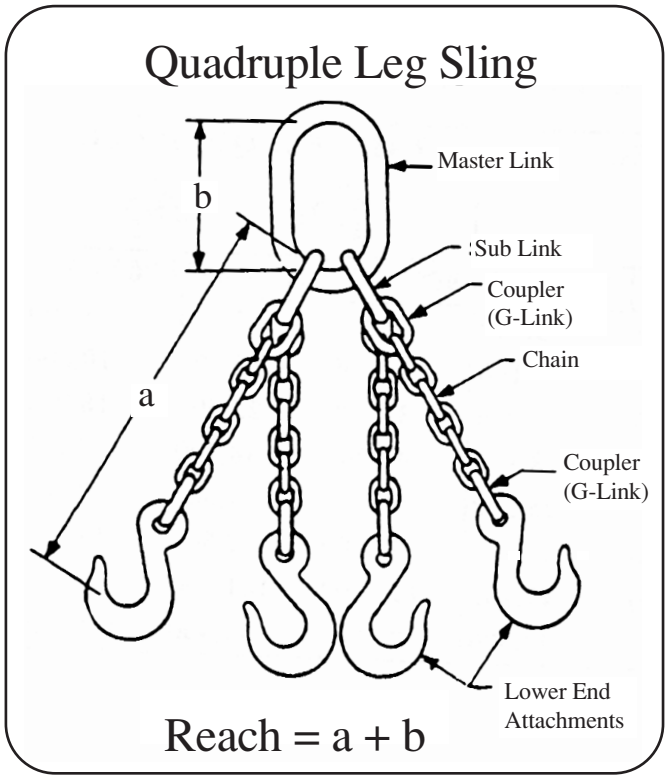
Alloy Steel Chain Sling Warnings and Use Limitations

This document contains warnings and use limitation information applicable to Gunnebo Lifting Grade 80 & Grade 100 Alloy Steel Chain Slings and components and is furnished with all Gunnebo Johnson Corporation shipments. Component distributors and lift system manufacturers must pass on this information in their warnings and use limitation literature where Gunnebo Lifting components are involved.





- **Never use a sling without training ...** OSHA regulation requires responsible work practice.

  "The employer shall permit only those employees qualified by training or experience to operate equipment and machinery" - OSHA 1926.20 (b) (4).

  Employee training should include information given in OSHA training literature, ASME B30.9 - 2003 "Slings" and ASME B30.10 -2005 "Hooks" safety standards and this document.

- **Always inform yourself ...** Ask your employer for chain sling safe use instruction.

  "The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury" - OSHA 1926.21 (b) (2).

- **Always comply with applicable Federal and local regulations ...** Federal and local regulations govern worksite activity.

  Understand all governing laws and safety standards before use of chain slings. OSHA 1910.184 regulates chain sling safe operating practices, product identification, inspection requirements, and use limitations. ASME B 30.9-2003 "Sling" safety standard provides additional recommendations for chain sling use.

  "If a particular standard is specifically applicable to a condition, practice, means, method, operation, or process, it shall prevail over any different general standard..." - OSHA 1910.5 (c) (1).

  Contact OSHA at (800) 321-6742, or www.OSHA.gov and ASME at (800) 843-2763, or www.ASME.org for reference assistance.

- **Always know load weight ..** Avoid sling failure.

  "The rated load of the sling shall not be exceeded." ASME B30.9-1.10.1 (c).

  Weight of the load to be lifted must be known for determination of proper sling configuration and working load limit.

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- **Never use a sling without a legible identification tag ...** Sling identification is required to insure proper sling application.

  "Alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity, and reach." – OSHA 1910.184 (e) (1)

  "Hooks, rings ... or other attachments shall have a rated capacity at least equal to that of the alloy steel chain with which they are used or the **sling shall not be used in excess of the rated capacity of the weakest component...** – OSHA 1910.184 (e) (2) (i)

  "Makeshift links or fasteners ... shall not be used." – OSHA 1910.184 (e) (2) (ii)

  Gunnebo Johnson Corporation provides a blank identification tag, attached by a coupler, to be stamped with sling WLL, minimum working range angle, serial number, chain size, grade, reach, type and manufacturer. Order 547303 for replacement.

  Grade of component with the **lowest breaking strength** shall be specified on the identification tag. Nonstandard grades shall be designated by "NS".

  Working Load Limit (WLL) is the maximum working load for a specified working range. Sling working range includes sling leg angles from 90° to a specified minimum. The specified minimum working range angle is given on the identification tag.

  Working load is to be applied vertically to a sling assembly having symmetric leg angles. WLL applies to loads lifted vertically and does not include torsional, binding, shock or non-symmetrical load effects.

Gunnebo Lifting Grade 80 & Grade 100 Alloy Steel Chain Straight Leg and Basket Sling Working Load Limits for selected working ranges of symmetric sling leg angles are listed in pounds and given in TABLE 1A & 1B. No chain sling shall be rigged with a leg angle less than 30° from the horizontal.

"Slings containing any Grade 80 components shall be rated at Grade 80 WLL's." ASTM A906/A 906M – 02-9.2.

Double Leg and Single Basket Sling WLL for an alternate working range of symmetric sling leg angles equals (=) 2 × TABLE 1A or 1B single leg WLL × sine of the minimum working range angle.

Triple and Quadruple leg and Double Basket Sling WLL for an alternate working range of symmetric sling leg angles equals (=) 3 × TABLE 1A or 1B single leg WLL × sine of the minumum working range angle.

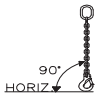
TABLE 2 lists for convenience sine values for selected sling leg angles.

TABLE 2

Angle	Sine	Angle	Sine	Angle	Sine
85	0.9962	70	0.9397	50	0.7660
80	0.9848	65	0.9063	40	0.6428
75	0.9659	55	0.8192	35	0.5736

Multi Leg and Basket Sling WLL for non-symmetrical loading can only be determined by engineering analysis of the specific rigging condition. In the absence of an engineering analysis, WLL shall be equal to single leg sling WLL given in TABLE 1A or 1B.

TABLE 1A - G80 ALLOY STEEL CHAIN SLING WORKING LOAD LIMITS*
IN POUNDS - DESIGN FACTOR OF 4

GUNNEBO LIFTING G80 CHAIN SIZE		SINGLE LEG 	DOUBLE LEG			TRIPLE & QUAD LEG		
MM	**IN**	**90°**	**90° - 60°**	**90° - 45°**	**90° - 30°**	**90° - 60°**	**90° - 45°**	**90° - 30°**
6	7/32	2,100	3,600	3,000	2,100	5,450	4,450	3,150
7	9/32	3,500	6,100	4,900	3,500	9,100	7,400	5,200
8	5/16	4,500	7,800	6,400	4,500	11,700	9,500	6,800
10	3/8	7,100	12,300	10,000	7,100	18,400	15,100	10,600
13	1/2	12,000	20,800	17,000	12,000	31,200	25,500	18,000
16	5/8	18,100	31,300	25,600	18,100	47,000	38,400	27,100
19	3/4	25,500	44,100	36,000	25,500	66,200	54,000	38,200
20	3/4	28,300	49,000	40,000	28,300	73,500	60,000	42,400
22	7/8	34,200	59,200	48,400	34,200	88,900	72,500	51,300
26	1	47,700	82,600	67,400	47,700	123,900	101,200	71,500
32	1 1/4	72,300	125,200	102,200	72,300	187,800	153,400	108,400

*Working Load Limits are valid between temperatures of -40°F and 400°F

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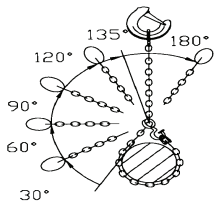
**TABLE 1B - G100 ALLOY STEEL CHAIN SLING WORKING LOAD LIMITS*
IN POUNDS - DESIGN FACTOR OF 4**

GUNNEBO LIFTING G80 CHAIN SIZE		SINGLE LEG	DOUBLE LEG			TRIPLE & QUAD LEG		
MM	IN	90°	90° - 60°	90° - 45°	90° - 30°	90° - 60°	90° - 45°	90° - 30°
5.5	7/32	2,700	4,700	3,800	2,700	7,000	5,700	4,000
7	9/32	4,300	7,400	6,100	4,300	11,200	9,100	6,400
8	5/16	5,700	9,900	8,100	5,700	14,800	12,100	8,500
10	3/8	8,800	15,200	12,400	8,800	22,900	18,700	13,200
13	1/2	15,000	26,000	21,200	15,000	39,000	31,800	22,500
16	5/8	22,600	39,100	32,000	22,600	58,700	47,900	33,900
20	3/4	35,300	61,100	49,900	35,300	91,700	74,900	53,000
22	7/8	42,700	74,000	60,400	42,700	110,900	90,600	64,000

*Working Load Limits are valid between temperatures of -40°F and 400°F

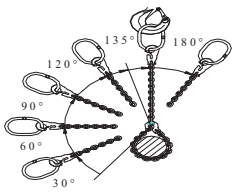
Choked chain sling WLL is affected by choke angle. TABLE 3A & 3B illustrates choke angle and gives Choked WLL's as a percentage of TABLE 1A & 1B WLL for full range of choke angles.

TABLE 3A GR 80



Choke Angle	Percentage Of TABLE 1A WLL
120 - 180	100%
90 – 119	87%
60 – 89	74%
30 – 59	62%
0 – 29	49%

TABLE 3B GR 100



Choke Angle	Percentage Of TABLE 1B WLL
120 - 180	80%
90 – 119	70%
60 – 89	60%
30 – 59	50%
0 – 29	40%

Choked Endless Chain Sling WLL's for selected Gunnebo Lifting Grade 80 and Grade 100 chain leg angles are listed in TABLE 4A and 4B.

TABLE 4A G80 - CHOKED ENDLESS CHAIN SLING WORKING LOAD LIMITS* IN POUNDS - DESIGN FACTOR 4

	GUNNEBO LIFTING G 80		CHOKED		
	CHAIN SIZE		ENDLESS		
	MM	IN	90°	90° - 60°	90° - 45°
	6	7/32	3150	2700	2250
	7	9/32	5250	4575	3675
	8	5/16	6750	5850	4800
	10	3/8	10600	9200	7500
	13	1/2	18000	15600	12700
	16	5/8	27100	23400	19200
	19	3/4	38200	33000	27000
	20	3/4	42400	36700	30000
	22	7/8	51300	44400	36300
	26	1	71500	61900	50500
	32	1 1/4	108400	93900	76600

**Working Load Limits are valid between temperatures of -40° and 400°F*

TABLE 4B G100 - CHOKED ENDLESS CHAIN SLING WORKING LOAD LIMITS* IN POUNDS - DESIGN FACTOR 4

	GUNNEBO LIFTING G 100		CHOKED		
	CHAIN SIZE		ENDLESS		
	MM	IN	90°	90° - 60°	90° - 45°
	5.5	7/32	4000	3500	2800
	7	9/32	6400	5500	4600
	8	5/16	8500	7400	6100
	10	3/8	13200	11400	9300
	13	1/2	22500	19500	15900
	16	5/8	33900	29300	24000
	20	3/4	52900	45800	37400
	22	7/8	64000	55500	45300

**Working Load Limits are valid between temperatures of -40° and 400°F*

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- **Never overload a sling** ... Understand Working Load Limits.

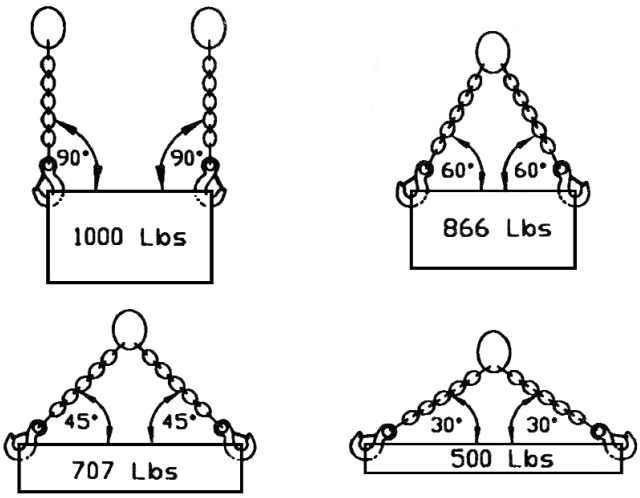
  "Slings shall not be loaded in excess of their rated capacities." - OSHA 1910.184 (c) (4).

  "The design factor for alloy steel chain slings shall be a minimum of 4." ASME B30.9-1.4.

  Standard Gunnebo Lifting Working Load Limits (WLL) are based on a 4 design factor. Lift dynamics, duty cycle and hitch type may require an increased design factor, hence a reduced WLL. Inattention to required design factor can result in sling overload. Contact Gunnebo Johnson Corporation Service Department for assistance at (800) 331.5460.

  Sling WLL depends on sling leg angle. The WLL for a sling is reduced as the sling leg angle with the horizontal gets smaller. This fact applies to all multi-leg and basket slings and must not be ignored.

  The following diagram illustrates the effect of sling leg angle on the WLL for a single basket and 2-leg sling.

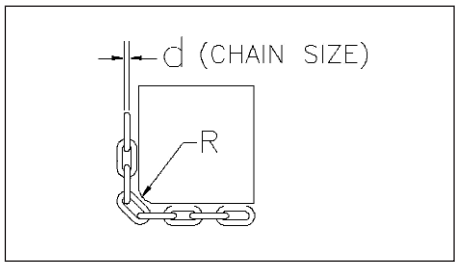


  The WLL of a sling with a 30° leg angle is 50% of the WLL for the same sling with a 90° leg angle. Inattention to the effect of sling leg angle can result in sling overload.

  Chain sling WLL is to be reduced in accordance with TABLE 5 when chain is rigged over an edge radius (R) less than two (2) × the chain rod diameter (d).

  Reduced WLL equals chain sling WLL from identification tag × reduction factor.

TABLE 5 GR80 AND GR100



Edge Radius	R > 2 x Chain d	R > Chain d	R < Chain d
Reduction Factor	1.0	0.7	0.5

- **Never ride on sling or load** ... Avoid death or injury.

  Sling use regulation requires: "All employees shall be kept clear of loads about to be lifted and of suspended loads." - OSHA 1910.184 (c) (9).

  General worksite regulations require "No hoisting, lowering, swinging or traveling shall be done while anyone is on the load or hook assembly." – OSHA 1910.180 (h) (3) (v).

  Construction worksite regulation stipulates: "The use of a crane or derrick to hoist employees on a personnel platform is *prohibited, except* when the erection, use, and dismantling, of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be *more hazardous* or is *not possible* because of structural design or worksite conditions." - OSHA 1926.550 (g) (2).

  Alloy steel chain slings shall not be used to rig personnel platforms.

- **Never rig a sling to a load improperly ...** Avoid dropped loads and sling damage.

  "Safe operating practices ..." - OSHA 1910.184 (c)
  "Operating practices ..." - ASME B30.9-1.10.

  - Sling leg angle shall not be less than 30° from the horizontal.
  - Slings shall be shortened with a shortening hook only and not with knots or bolts or other makeshift devices.
  - Sling legs shall not be kinked or twisted.
  - Sling hooks shall not be point loaded.
  - Sling hook latch may be mandatory by regulation, safety codes, or insurance.
  - Slings used in a basket hitch shall have the loads balanced to prevent slipping.
  - Slings shall be securely attached to their loads.
  - Slings shall be padded or protected from the edges of their loads when the edge radius is less than .5 of the chain rod diameter (d). See TABLE 5
  - Sling shall be rigged to prevent chain from sliding over a load edge radius while lifting.

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- **Never use a worn-out or damaged sling.**

"Each day before being used, the sling and all fastenings and attachments shall be inspected for damage or defects by a competent person designated by the employer. Additional inspections shall be performed during sling use where service conditions warrant. Damaged or defective slings shall be immediately removed from service" - OSHA 1910.184 (d).

"In addition to the inspection required by paragraph 1910.184 (d), a thorough periodic inspection shall be made on a regular basis, to be determined on the basis of (A) frequency of sling use; (B) severity of service conditions; (C) nature of lifts being made; and (D) experience gained on the service life of slings used in similar circumstances. Such inspections shall in no event be at intervals greater than once every 12 months." - OSHA 1910.184 (e) (3) (i).

"The thorough inspection of alloy steel chain slings shall be performed by a competent person designated by the employer, and shall include a thorough inspection for wear, defective welds, deformation and increase in length. Where such defects or deterioration are present, the sling shall be immediately removed from service." – OSHA 1910.184 (e) (3) (iii)

"Worn or damaged alloy steel chain slings or attachments shall not be used until repaired." – OSHA 1910.184 (e) (7) (i).

Chain sling with reach longer than given on identification tag shall be immediately removed from service and evaluated for wear and material stretch.

Chain link wear is limited by minimum cross-sectional dimesions given in TABLE 6. Chain worn below the given limits shall be removed from service.

Chain Sling connector or attachment with wear greater than 10 percent of the original dimension for any cross-section shall be removed from service.

Chain sling coupler, chain, G-link, master ring, sub-link, hook or attachment that is broken, cracked, bent, stretched or twisted shall be removed from service and shall not be repaired.

Chain sling with a coupler, chain, G-link, master ring, sub-link, hook or attachment nicked or gouged or lapped shall be removed from service and shall not be returned to service unless properly repaired.

Hook latch, when required, shall be fully functional and properly seated.

TABLE 6 G80 AND G100

Nominal Chain or Coupling Link Size		Minimum Cross-Section Dimensional Limit	
mm.	in.	mm.	in.
6	7/32	5.2	.205
7	9/32	5.9	.239
8	5/16	6.9	.273
10	3/8	8.7	.342
13	1/2	11.3	.443
16	5/8	13.9	.546
19	3/4	16.3	.643
20	3/4	16.9	.665
22	7/8	19.0	.750
26	1	22.5	.887
32	1 1/4	27.7	1.091

- **Never use a sling in extreme temperatures.**

"...alloy steel chain slings shall be permanently removed from service if they are heated above 1000°F..." - OSHA 1910.184 (e) (6).

Alloy steel chain slings shall not be used while heated above 1000°F or cooled below -40°F.

Alloy steel chain sling Working Load Limits (WLL) given in TABLE 1A or 1B are valid between temperatures of -40°F and 400°F.

Alloy steel chain sling WLL shall be reduced in accordance with TABLE 7A and 7B when heated between 400°F and 1000°F.

Permanent WLL reduction shall be made in accordance with TABLE 7A and 7B for chain slings heated over temperatures indicated. Identification tag shall be replaced and the new tag shall have the reduced WLL.

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TABLE 7A G80

Sling Component Temperature	Percentage of TABLE 1A and 4A WLL	
	During Exposure	After Exposure
-40°F to 400°F	None	None
>400°F to 500°F	95%	None
>500°F to 600°F	90%	None
>600°F to 700°F	82%	None
>700°F to 800°F	75%	90%
>800°F to 900°F	65%	75%
>900°F to 1000°F	60%	70%

TABLE 7B G100

Sling Component Temperature	Percentage of TABLE 1B and 4B WLL	
	During Exposure	After Exposure
-40°F to 400°F	None	None
>400°F to 500°F	95%	95%
>500°F to 600°F	90%	90%
>600°F to 700°F	82%	85%
>700°F to 800°F	75%	80%
>800°F to 900°F	65%	75%
>900°F to 1000°F	60%	70%

- **Never use a sling in alkaline or acidic conditions.**

  Gunnebo Lifting Grade 80 & Grade 100 alloy steel chain and components shall not be used in alkaline or acidic conditions. Resulting metal embrittlement and accelerated corrosion can causse sudden sling failure. Hot dip galvanizing and electro-zinc plating of alloy steel chain and components shall be done only by Gunnebo Lifting.

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