

CHAINS

Chain begins as a continuous wire. This wire must meet both specific physical and chemical properties before it is used. Once testing has verified the required properties are met the wire is drawn into a specific diameter. From this wire proper size wire 'slugs' are cut into an exact length. These slugs are then formed into a link and welded into a continuous chain sling. On the chain link itself information is embossed. This information typically includes the grade, manufacturer code, and production date code. If needed, the chain can be traced to the steel mill where it was produced.

Once the chain is formed it is *proof tested* according to an industry standard. Each link is tested to twice the WLL at this time.

After proof testing, samples of each production lot are again tested by pulling to failure. This test is a controlled laboratory evaluation. The testing figure is four times the WLL. If the sample fails to meet the specified value the entire production lot is considered to have failed.

A wide variety of chains are available. The National Association of Chain Manufacturers has developed a system for identifying chain. This system uses a letter and number. The letter identifies the manufacturer, and the number represents the chain's grade. Chains should generally be marked on the link approximately every foot. Rescuers shouldn't use a chain without a grade indication. Although there are several grades of chains available, there are three recommended for rescue operations, Grades 8 (80), 10 (100), and 12 (120). These are the minimum grades used for overhead lifting according to OSHA regulations.

NEVER EXCEED THE WORKING LOAD LIMIT OF YOUR CHAINS!

Different grades of chain use different load design factors; Grade 4 (43) uses a 3:1 while Grades 7+ (70) uses 4:1. A 3/8" Grade 8 (80) chain has a UL of 28,400#. Using the UL we divide by the load design factor, thus Grade 8 (80) yields a WLL of 7,100#. When considering chain investments, consider the capacity versus cost.

Grade 3 (30)-

Proof Coil is a general-purpose low carbon steel chain. It is not heat treated and not rated for overhead lifting.

Grade 4 (43)-

High Test, a carbon steel chain that has high tensile strength and excellent wear and abrasion resistance. It isn't rated for overhead lifting.

Grade 7 (70)-

Transport chain is made from heat-treated steel widely used for load binding. It isn't rated for overhead lifting.

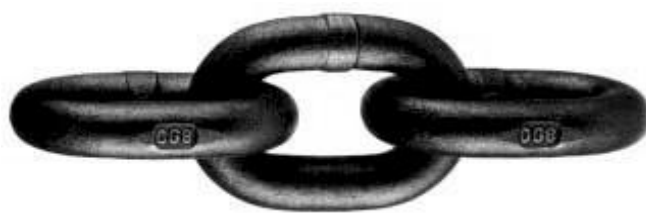
Grade 8 (80)-

Alloy Steel chain rated for overhead lifting and rigging. It possesses a high strength to weight ratio, and is the minimum grade preferred for rescue operations.

*A 5/8" Grade 8 (80) chain is preferred for heavy recovery, 1/2" Grade 8 (80) chain for medium recovery, and 3/8" Grade 8 (80) chain for light recovery.

Grade 10 (100) & Grade 12 (120)-

Alloy Steel chain rated for overhead lifting and rigging.



Chain Grade Markings

CHAIN INSPECTION-

It is vitally important that a competent person inspect all chains according to all Federal, State OSHA and any other applicable regulations. These inspections must be documented fully and records kept on file for inspection.

1. Examine each link of chain looking for defects such as wear, stretch, distortion, nicks, gouges, discoloration, and cracks. Wear will generally be found at the ends of the links where they rub against one another. Each link should be lifted and the cross section measured. Remove the chain from service if a worn link is 10% less than original new diameter. Look for binding of links indicating collapse of a link due to stretch.
2. Look for any rust and thoroughly clean the chain. Lubricate as suggested by the manufacturer. Store the chain in a clean dry location, hanging vertically.
3. Measure the entire length (reach) of the chain when new. Record this measurement for future reference. During inspection measure the entire length of the chain to determine any stretch. Consult the manufacturer for advice regarding replacement.
4. Make certain that ALL connectors, hooks, and any attachment carry the same WLL rating as the chain.
5. Make certain that the certification tag supplied by the manufacturer is attached and legible.
6. Ensure that all hook latches (if required) are in place and operate freely and are properly aligned.

CHAIN USE-

1. **NEVER** exceed the WLL of a chain!
2. Properly inspect every chain as specified by any applicable rule, regulation, or manufacturer recommendation. Document every inspection!
3. Don't 'knot' a chain to shorten or join two chains.
4. Don't 'shock load' any chain, wire rope, fitting, or sling.
5. Use only chain slings with a legible certification tag attached
6. Don't repair chains by welding.
7. Don't expose chains to high or low temperatures.
8. If a chain is repaired, it must proof tested by a manufacturer or supplier. The same applies if the chain is exposed to high or low temperatures.
9. Replace the chain as necessary.
10. Don't drag a chain along any surface.
11. Use only Grade 8 (80) or greater chain for rescue operations.
12. Use only those attachments meeting the grade of the chain itself, with a proper application method.
13. Destroy unusable chain. Don't use it for training.
14. Properly seat the chain link into a hook; never 'tip load' or 'side load' a hook.
15. The use of a chain in a 'choker hitch' with a *standard grab hook* derates the WLL of the chain by 20% or more. Example: A grade 8 (80) chain with a WLL of 7,100# rigged in a 'choker hitch' should be used to pull/lift a load of 5,680#.
16. Use cribbing pieces or 'padding' when passing a chain over a sharp edge. If a chain passes over a sharp edge (Radius of corner [edge] < link diameter) results in a 50% reduction of chain's WLL. Radius of corner [edge] > link diameter, however < 2X link diameter results in a 30% reduction in chain's WLL. Radius of corner [edge] is > 2X link diameter allows WLL of chain sling to be achieved.)
17. Take all slack out of a chain before applying any force.
18. Remove any kinks or twists from a chain before applying force. Keep the chain straight.
19. Don't paint a chain or attachment. It may hide a crack or discoloration.

WORKING LOAD LIMITS FOR CHAIN
AS PUBLISHED BY THE
NATIONAL ASSOCIATION OF CHAIN MANUFACTURERS

Nominal Chain Size	Grade 30 Proof Coil <i>Not for overhead lifting</i>	Grade 43 High Test <i>Not for overhead lifting</i>	Grade 70 Transport <i>Not for overhead lifting</i>	Grade 80 Alloy <i>May be used for over head lifting</i>	Grade 100 Alloy <i>May be used for over head lifting</i>
1/4"	1,300#	2,600#	3,150#	-	-
7/32"	-	-	-	2,100#	2,700#
9/32"	-	-	-	3,500#	4,300#
5/16"	1,900#	3,900#	4,700#	4,500#	5,700#
3/8"	2,650#	5,400#	6,600#	7,100#	8,800#
7/16"	3,700#	7,200#	8,750#	-	-
1/2"	4,500#	9,200#	11,300#	12,000#	15,000#
5/8"	6,900#	9,200#	11,300#	18,100#	22,600#
3/4"	10,600#	20,200#	24,700#	28,300#	35,300#
7/8"	12,800#	24,500#	-	34,200#	42,700#
1"	17,900#	-	-	47,700#	59,700#
1 1/4"	-	-	-	72,300#	90,400#

**EFFECT OF ELEVATED TEMPERATURE ON THE
WORKING LOAD LIMIT OF ALLOY CHAIN
AS PUBLISHED BY THE
NATIONAL ASSOCIATION OF CHAIN MANUFACTURERS**

Temperature (F)	Reduction of WLL WHILE AT temperature	Reduction of WLL AFTER EXPOSURE to temperature	Reduction of WLL WHILE AT temperature	Reduction of WLL AFTER EXPOSURE to temperature
	Grade 80	Grade 80	Grade 100	Grade 100
<400	0%	0%	0%	0%
400-499	10%	0%	15%	0%
500-599	15%	0%	25%	5%
600-699	20%	5%	30%	15%
700-799	30%	10%	40%	20%
800-899	40%	15%	50%	25%
900-999	50%	20%	60%	30%

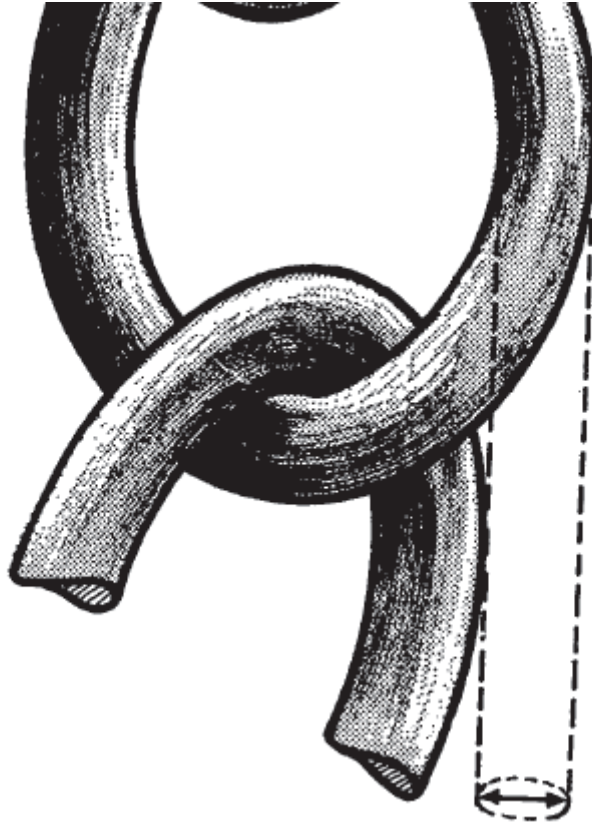
OSHA 1910.184 requires all slings exposed to temperatures over 1000 degrees be removed from service.

**MAXIMUM ALLOWABLE WEAR AT ANY POINT OF CHAIN
LINK**

Grade 80 and 100 chain

<i>Normal Chain or Coupling Link size (Inches)</i>	<i>Minimum Allowable Thickness at any Point on Link (Inches)</i>
9/32"	0.239
3/8"	0.342
1/2"	0.443
5/8"	0.546
3/4"	0.687
7/8"	0.750
1"	0.887
1 1/4"	1.091

Measurement of Chain Link Diameter



The diameter of a chain is the diameter of the stock from which the chain links are made.