



Wire Rope Clips



Introduction

In a counterweight rigging system, lift lines attached to the battens holding the load pass through the **head block**, changing direction back to a vertical position, and terminating at the top of the arbor. These lines should be terminated with swage sleeves or **wire rope clips**. These clips are used to form a load bearing eye at the end of the cable or to connect two cables together. It is important to have a solid understanding of this integral part of your rigging system, and to cycle your cables and check the clips on a regular basis.

PRO TIP: It is important to cycle your cables and tighten your clips on a regular basis. If you need to replace a clip, purchase only high-quality clips from a respected manufacturer. Remember that “great deal” you found online may not be so great in the long run.

Installing a Wire Rope Clip

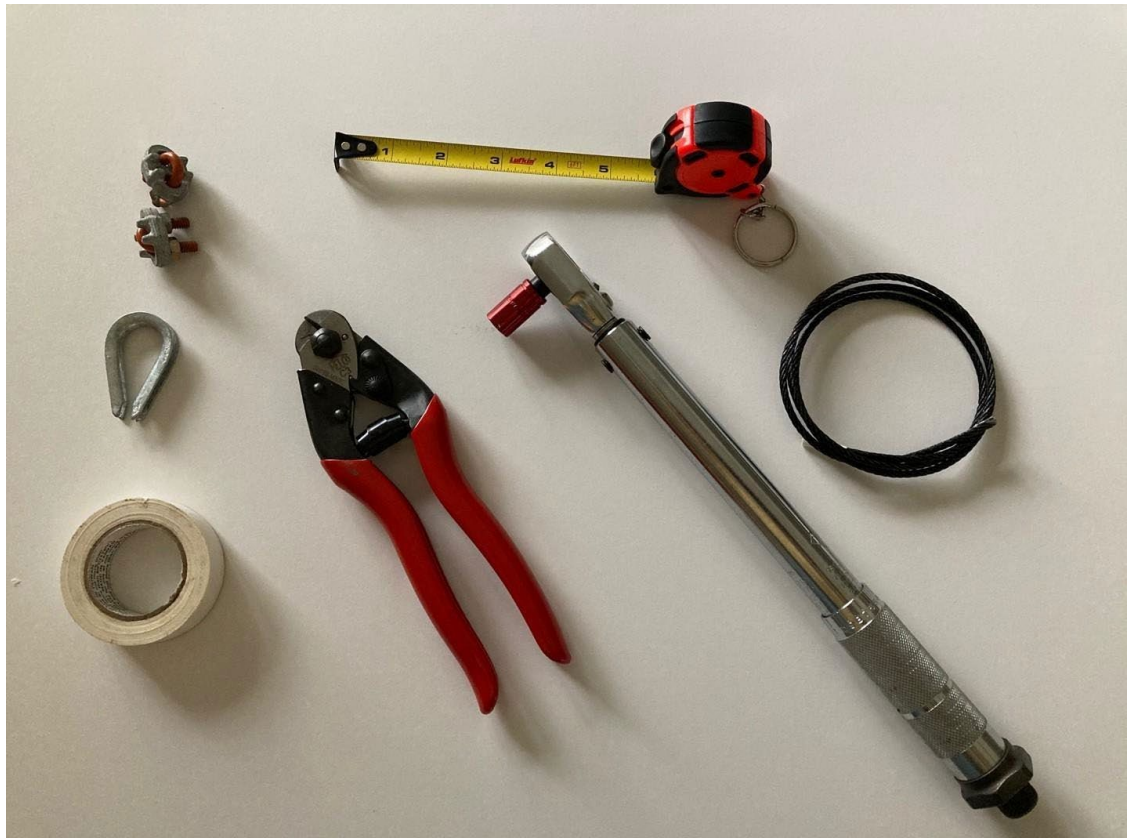
We are going to look at creating an eye assembly using 1/8” 7x19 Galvanized Aircraft Cable (GAC) and 1/8” drop forged wire rope clips.

PRO TIP: When applied correctly, wire rope clips have an 80% efficiency rating. Failure to make termination in accordance with instructions or failure to check recommended torque periodically and retighten will cause a reduction in the efficiency rating of the clips.

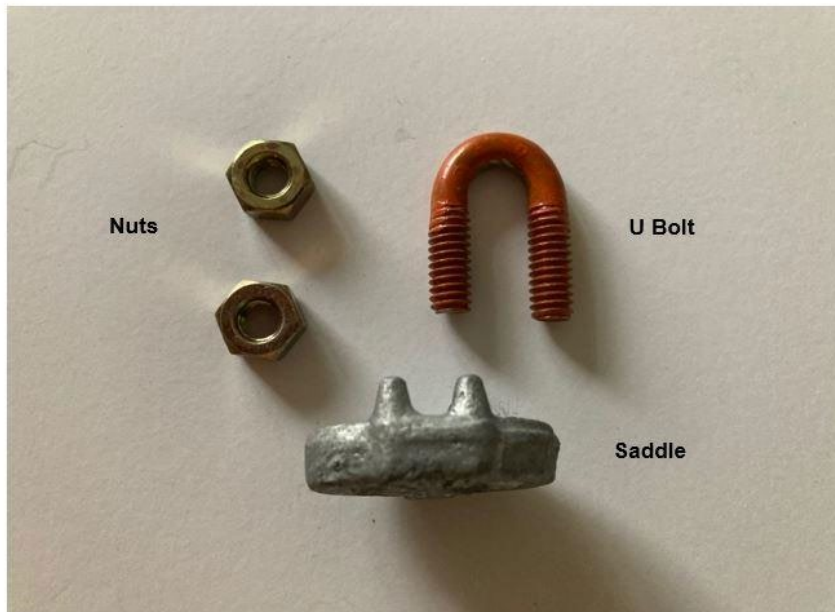
Step 1. Gather needed materials

Tools Needed:

- 2: 1/8” Wire Rope Clips
- 1: 7x19 Wire Rope (1/8” Diameter)
- 1: Thimble
- 1: Torque Wrench (adjustable to 4.5 ft. pounds or 54 in. pounds)
- 1: Wire Cutters
- 1: Tape Measure
- 1: Sharpie to Mark Wire Rope
- 1: Tape



Parts of a Wire Rope Clip



Components Assembled (without cable)



Step 2. Mark for Turnback

When using wire rope clips, the manufacturer of the wire rope will specify the length of turnback required to create the assembly. In this instance – 3 ¼" is required. (Note: the illustration shown comes from a free iRigging app for apple devices)





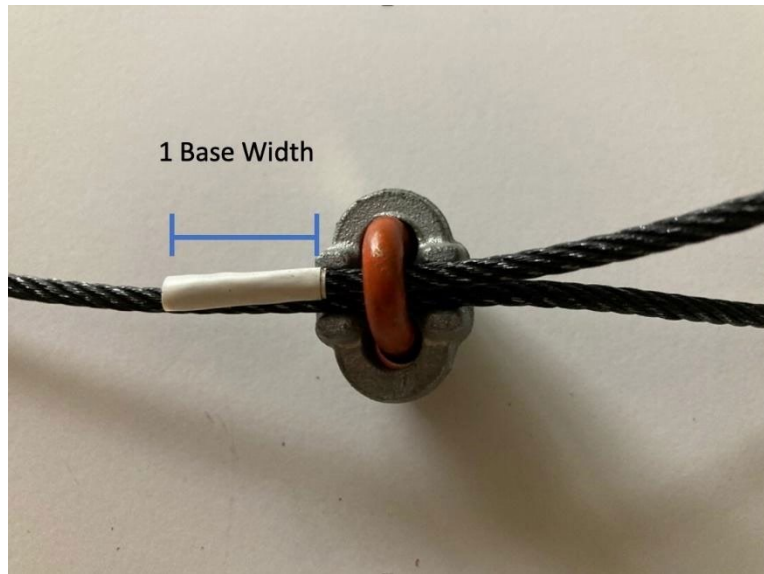


The left image shows a yellow tape measure (Lufkin) measuring the turnback of a black wire rope. The right image shows the same wire rope with the turnback marked. The central image is a screenshot of the iRigging by RCLANCY app interface, which provides specifications for wire rope clips.

iRigging by RCLANCY		
1/8"	3/16"	1/4"
5/16"	3/8"	1/2"
Minimum Sheave Diameter (D/d ratio - 30 minimum)		
3.7		
Quantity of Wire Rope Clips ¹		
2		
Turnback (in) ²		
3.2		
Torque (ft*lb) ³		
4.1		
Breaking Strength (7x10) ²		
200		
Breaking Strength (6x10 (WRC)) ²		
-		
Oval Sleeve Tool # ³		
51-4		
Number of Crimps ³		
2		
Stop Sleeve Tool # ³		
51-4		
Number of Crimps ³		
1		

Step 3: Apply the First Clip

Starting one base width from the dead end (marked with tape), attach the first wire rope clip. Attach the nuts to 4.5 ft. pounds by tightening the two nuts incrementally, alternating between them.



BE CERTAIN THAT THE LIVE END (LONG SIDE) OF THE WIRE ROPE IS RESTING IN THE SADDLE OF THE WIRE ROPE CLIP.
NEVER SADDLE A DEAD HORSE

Step 4: Apply the Second Clip

Insert the thimble to form the "eye" and then apply the second clip at the narrow end. Tighten as directed in Step 3.



Step 5: Apply a load equal to, or greater than the weight anticipated. Re-tighten to recommended torque. The wire rope will elongate while under load and will need to be retightened.



PRO TIP: Recommended torque values are based on threads being clean, dry, and free of lubricant.

Things to Remember:

1. The live end of the wire rope must be resting in the saddle.
2. You must use a torque wrench to tighten to the manufacturer's specified torque. If you fail to use a torque wrench, it will be impossible to determine the breaking strength of your assembly.
3. When applied correctly, wire rope clips are 80% efficient. That means, if the wire rope has a breaking strength of 2000lbs., applying the wire rope clips will reduce that strength to 1600lbs.
4. Wire rope clips can be used again, however, do not reuse wire rope.
5. If using the iRigging App, please remember that measurements in the USA are "Imperial". The app will indicate other information including the number of clips required.

Common Mistakes

Here are some common mistakes to watch out for.

- incorrect torque- check with the manufacturer to be sure you are following recommendations
- incorrect number of clips or incorrect spacing – check with your manufacturer for recommendations based on your unique needs
- using the wrong type of clip
- not matching the clip size to the wire rope (cable) size
- incorrect amount of turnback (check the specs)

Relevant Industry Codes

ANSI E1.4 - 2014: Manual Counterweight Rigging Systems

ANSI E1.1 - 2012: Construction and Use of Wire Rope Ladders

Links and Resources

“Wire Rope Clips: Different Types, Installation, and Common Mistakes”

by Lexie Keller, Mazzella Companies <https://www.mazzellacompanies.com/learning-center/wire-rope-clips-types-installation-common-mistakes/>

Applying Wire Rope Clips – web view and downloadable PowerPoint from the Educational Theatre Association
<https://learn.schooltheatre.org/applying-wire-rope-clips>

Entertainment Rigging by Harry Donovan

Stage Rigging Handbook, Third Edition, by Jay O. Glerum

All ANSI documents are available for free download at www.esta.org (Technical Standards Program)

Image Credits

Images courtesy of Dana Taylor.

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