Technical Bulletin 57: Cut Testing for Wire Rope

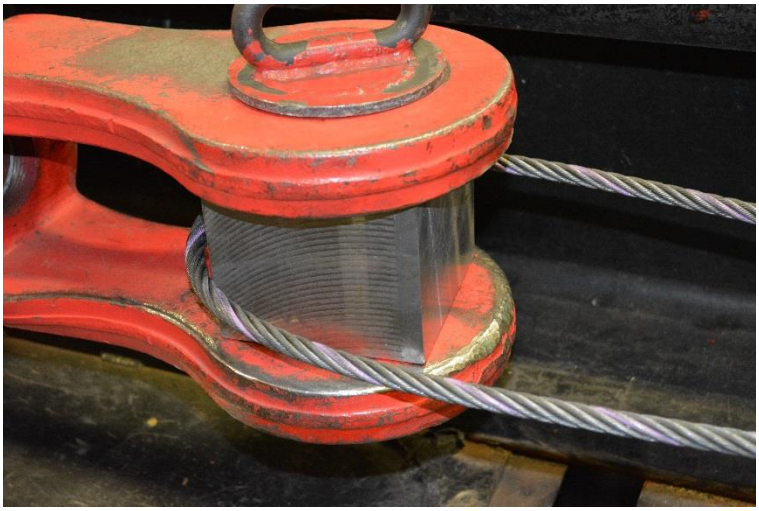
The common conception of wire rope or other steel slings is that it is safer to rig over an edge compared to a synthetic sling. This has never been proven. Slingmax completed testing on wire rope slings over a steel edge to determine when steel slings would cut and how they compare to synthetic roundslings.

Test Set-up

All cut tests were performed on a 5" steel block constructed of 4140 steel. See figure 2. Between each test the edges were ground to maintain a consistent 90° edge. Control tests were performed on a 3-1/2" round pin. See Figure 1. Tests were performed using a 150,000lb capacity test machine and load cell calibrated to ASTM E4-15 standards on 4/21/16.

Figure 1 – Steel Block and Pin

Figure 2– Steel Block Test Set-up



Testing

Wire Rope

Four ½" x 10 ft Flemish Eye Slings were constructed. All slings were tested in a basket. The working load limit (WLL) for each sling in a basket configuration was 5.1 tons or 10,200 lb. One sling was tested as a control on a 3.5 in diameter pin to determine the efficiency of the wire rope. The other three wire rope slings were tested around the steel block. See Figure 3.

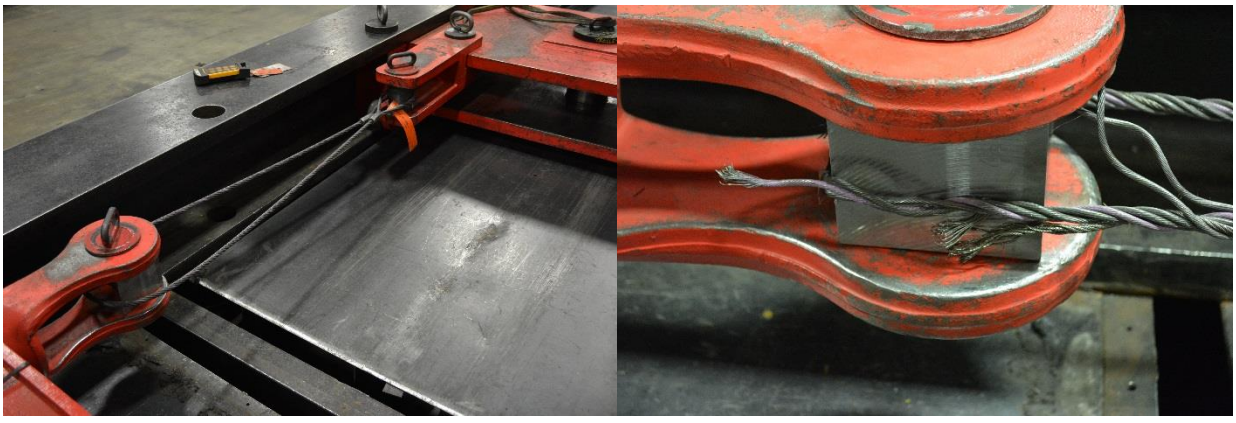
The control sling ultimately failed at 49,620 lb – 4.86:1 Design Factor. The lower than 5:1 Design Factor break test result is attributed to a D/d ratio lower than the recommended 25:1 in the body of a basket hitch.

The first wire rope sling tested around the steel block cut at 32,380 lb – 3.17:1 Design Factor. The second wire rope sling cut at 34,410 lb – 3.37:1 Design Factor. The third wire rope sling cut at 30,750 lb – 3.01:1 Design Factor. The average Design Factor achieved was 3.19:1. The slings maintained an average efficiency over the control sling of 65%.

Table 1 – Wire Rope Test Results

Type of Test	Sling	Length	WLL (lb)	Break (lbf)	Design Factor
Control	½" FE	10ft	10,200	49,620	4.86
Cut Test	½" FE	10ft	10,200	32,380	3.17
Cut Test	½" FE	10ft	10,200	34,410	3.37
Cut Test	½" FE	10ft	10,200	30,750	3.01
Average for FE cut tests				32,513	3.19

Figure 3 – Wire Rope Cut Test



Testing

Synthetic Roundslings

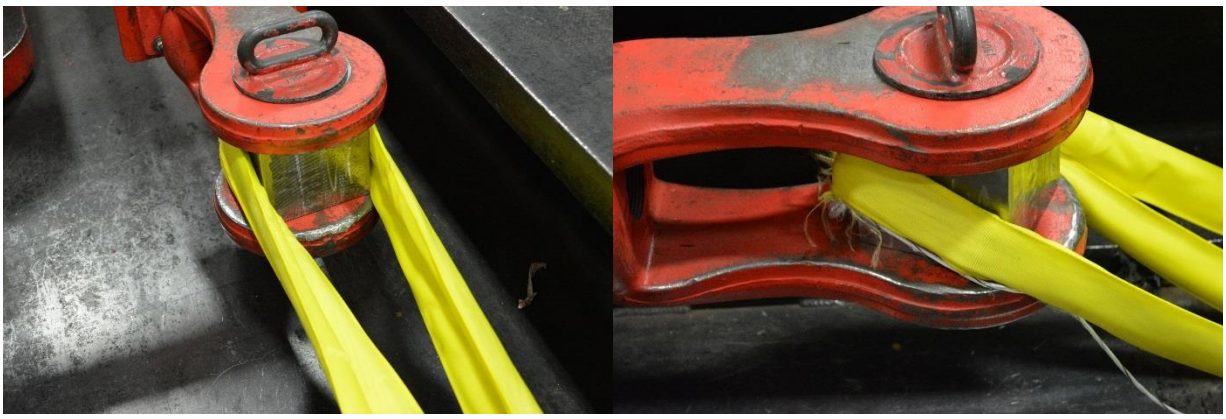
Two synthetic roundslings were tested in a basket configuration around the same steel block. The first sling tested was a Twin-Path® sling rated for 20,000 lb and is shown in Figure 4 below. This sling ultimately failed at 60,070 lb – 3:1 Design Factor. The second roundsling tested was a standard single path polyester roundsling with a working load limit of 18,000 lb. The single path sling cut at 35,590 lb – 1.98:1 Design Factor. This test is shown in Figure 5.

Table 2 – Synthetic Sling Test Results

Type of Test	Sling	Length	WLL (lb)	Break (lbf)	Design Factor
Cut Test – no protection	TPXCF1000	15ft	20,000	60,070	3.00
Cut Test – no protection	SP900	12ft	18,000	35,590	1.98

Figure 4 – Twin-Path Cut Test

Figure 5 – Polyester Roundsling Cut Test



Testing

Cornermax® Sleeve Cut Protection

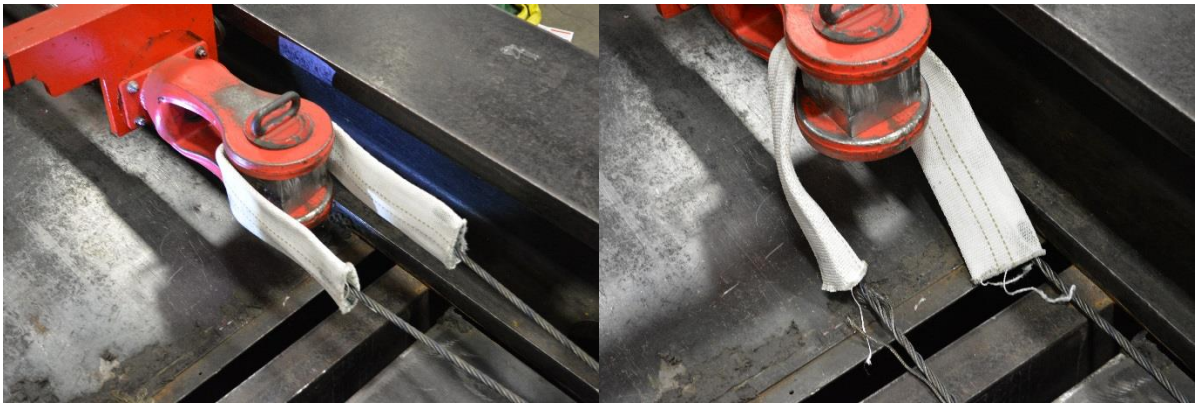
A Twin-Path sling and a ½" wire rope sling were tested with the Cornermax Sleeve in a basket configuration around the steel block. The Twin-Path sling with a working load limit of 20,000 lb, achieved a breaking strength of 92,800 lb - 4.64:1 Design Factor. See figure 6. The wire rope sling cut at 41,170 lb – 4.04:1 Design Factor. See Figure 7.

Table 3 – Cornermax Sleeve Test Results

Type of Test	Sling	Length	WLL (lb)	Break (lbf)	Design Factor
Cut Test – Cornermax Sleeve	TPXCF1000	15ft	20,000	92,800	4.64
Cut Test – Cornermax Sleeve	½" FE	10ft	10,200	41,170	4.04

Figure 6 – Twin-Path® Sling with Cornermax Sleeve Cut Test

Figure 7 – Wire Rope Sling with Cornermax Sleeve Cut Test



Summary

The test results prove that a wire rope sling can cut over a steel edge. Furthermore, a wire rope sling will cut and catastrophically fail at the same Design Factor as an unprotected Twin-Path sling.

Cornermax Sleeves can increase a Twin-Path sling's cut resistance by 65%. This does not prove the same for a wire rope sling. Synthetic cut protection is not an effective way of increasing wire rope's cut resistance. The Twin-Path sling with a Cornermax Sleeve used for protection outperformed all other cut tests.

Table 4 – Cut Test Results