Constructex For Oilfield Applications

Constructex is designed with nine strands of three different strand constructions. Each outside strand is manufactured with a polymer center to give the rope added flexibility in handling. The wire rope is swaged as a final operation to postform the rope and to provide a smooth outer surface due to the triangular shape of the strands. Constructex is available in diameters from 5/8" through 1 5/8".

Applications

Constructex is recommended as a drill line, tubing line and boom hoist rope where longer service life is desired. Superior abrasion and crushing resistance makes Constructex the ideal rope for these applications. Constructex can be recommended with confidence wherever abusive conditions exist, particularly where the rope is retired because of broken wires resulting from wear and crushing on the drum.

Characteristics

Higher Strength:

The compacted design of Constructex allows the rope to have a greater metallic area and a higher strength than conventional ropes. This provides the end user the opportunity to lift heavier loads with the same or even smaller rope diameter. For example, a 1" Constructex has a minimum breaking force of 62.5 tons, compared to 56.9 tons for a 1" 6x19 EEIPS and 51.7 tons for 6x19 EIPS.

Increased Crush Resistance:

The unique design of Constructex, with single operation closing and compaction, results in a smooth exterior surface, a reduction of internal voids and excellence in resisting damage from crushing.

Longer Rope Life:

Constructex ropes will provide longer rope life in many abusive applications due to the combination of higher strength and improved resistance to crushing. As with all ropes, proper daily inspection of the rope and equipment is necessary to assure the user that a safe operation is maintained. For the user, longer rope life means cost savings due to fewer rope changes and less down time.

Inspection of Wire Rope

Introduction

The most important aspect of operating a rope safely in oilfield applications is properly performed inspection, done on a regular basis. The American Petroleum Institute (API) publishes a series of Specifications and Recommended Practices that provide information on wire rope, use of wire rope, detailed inspection procedures and retirement criteria. The applicable standard for wire rope is API 9A and recommended practices are RP 2D, RP 4G, RP 9B and RP 54. A summation of these standards and practices is provided in this document. For more detailed information refer to the specific standard or recommendation practice.

Inspection

All hoisting lines should be visually inspected once each working day and ideally, should cover all rope expected to be in use during operations on that day. The inspection must be more than just a quick look. It needs to be done carefully and in enough light to find damage or broken wires that may require the rope to be taken out of service. It must also be remembered that a dirty or greasy rope is almost impossible to inspect properly, as dirt and grease may hide problem areas.
The individual making the inspection should be familiar with the machine, the wire rope, and that particular application.

Special care should always be taken when inspecting common repetitive wear sections such as:

(1) Flange step up, cross over and repetitive pick up points on the drum
(2) Areas of the rope operating through a reverse bend in the reeving system
(3) Equalizer sheaves
(4) End connections

The inspector should be concerned with discovering gross damage that may be an immediate hazard. Specific types of damage include the following:

(1) Distortion to the uniform structure of the rope
(2) Broken wires
(3) Corrosion
(4) Gross damage to, or deterioration of, end connections
(5) Evidence of heat/electrical/lightning damage
(6) Localized change in lubrication condition

When damage is discovered, the affected sections must be evaluated as detailed in the replacement section below to determine if the rope needs to be removed from service.

Details of daily inspections do not need to be documented, but it is a good idea to keep a frequent inspection log on the crane, simply noting time, date and identity of the inspector.

Periodically, a detailed inspection needs to be performed and documented. The inspection frequency needs to be based on factors such as expected rope life as determined by experience on the particular installation or similar installations, severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads. Inspections need not be at equal calendar intervals and should be more frequent as the rope approaches the end of its useful life. There are many duty cycle rope applications where the service life is less than a month, or sometimes even a week in severe service conditions, so a periodic level of inspection may have to be performed daily.

The periodic inspection must cover the surface of the entire rope length and no attempt should be made to open the rope. In addition to common repetitive wear sections checked during the frequent inspection, additional sections prone to rapid deterioration such as the following need special attention.

(1) Locations where rope vibrations are damped, such as the following:
  a. Sections in contact with equalizer sheaves, or other sheaves where rope travel is limited
  b. Sections of the rope at or near end connections where corroded or broken wires may protrude
(2) Bridle reeving in the boom hoist ropes
(3) Repetitive pickup points and crossover and change of layer points at flanges on drums
(4) Fleeting or deflector sheaves

In addition to the specific types of damage listed in the frequent inspection section, these additional items need to be addressed:

(1) Measuring the rope diameter in numerous locations to assess uniform loss of diameter along the entire length of rope
(2) Close visual observation of the entire length to identify
  a. Lengthening of lay in localized areas
  b. Diameter reduction in localized areas
  c. Distortion of rope structure (kinking, birdcaging, crushing)
  d. Steel core protrusion between the outer strands
  e. Internal corrosion
  f. Wear of outside wires
  g. More detailed inspection of end connections for broken wires and corrosion
  h. Severely corroded, cracked, bent, worn or improperly applied end connections
  i. Waviness (corkscrew effect) of rope
  j. High or low strand

To establish data as a basis for judging the proper time for replacement, a dated report of rope condition at each periodic inspection must be kept on file. This report shall cover points of deterioration listed above. If the rope is replaced, only the fact that the rope was replaced need be recorded.

Certain types of ropes and applications require special attention and require reduced time intervals between periodic inspections:

- Rotation Resistant ropes have a unique construction and are susceptible to damage and increased deterioration when working under difficult conditions such as duty cycle operation.
- Boom hoist ropes because of the importance of their function and because their location may make inspection difficult.

Rope Replacement

There are no precise rules to determine the exact time for the replacement of the rope since many variable factors are involved. Once a rope reaches any one of the removal criteria, it must be replaced immediately unless allowed to operate to the end of the work shift by the judgment of a qualified person. If the rope was not removed immediately, it shall be replaced before the equipment is returned to service.

Conditions such as the following are sufficient reason to require the rope to be removed from service:

(1) Broken wires:
  a. In running ropes (6 and 8 strand constructions, expect 6x7 and rotation resistant ropes) 6 randomly distributed wire breaks per rope lay or 3 wire breaks per strand per rope lay. A rope lay is the distance that it takes one outer strand to make one complete revolution around the rope. A 6 strand rope will typically have a rope lay of 6.4 times the rope diameter (i.e. A 1/2" 6x25FW EIP IWRC RRL rope will have a rope lay of 3.2").
  b. For all categories of Rotation Resistant ropes the retirement criteria is 2 wire breaks in 6 rope diameters or 4 wire breaks in 30 rope diameters (i.e. 6 rope diameters in a 1" rope is 6")
  c. In 6x7 running ropes 3 broken wires in one lay length
  d. Two broken outer wires at strand to strand or strand to core contact point (valley breaks)
  e. In standing ropes, more than 3 broken wires in one lay away from the end connection or more than 2 broken wires at the end connection
(2) Reductions from nominal diameter greater than 5% (Minimum Value = Nominal Diameter x .95)
(3) Distortion of rope structure:
  a. Damage resulting in distortion of the rope structure (e.g., kinking, birdcaging, crushing)
  b. Steel core protrusion between the outer strands
  c. Localized change in lay length
  d. Changes in original geometry due to crushing forces where the diameter across the distorted section is 5/6 of the nominal diameter
(4) Waviness (corkscrew effect) in the rope that causes overall diameter to increase to a value greater than 110% of nominal rope diameter
(5) A high or low strand that is higher or lower than 1/2 of the strand diameter above or below the surface of the rope
(6) Any apparent damage from a heat source including, but not limited to welding, power line strikes, or lightning
(7) Widespread or localized external corrosion as evidenced by pitting, and obvious signs of internal corrosion such as magnetic debris coming from valleys
(8) Severely corroded, cracked, bent, worn, grossly damaged, or improperly installed end connections

Rope Service Life

A long-range inspection program should be established and should include records on the examination of ropes removed from service so that a relationship can be established between visual observation and actual condition of the internal structure.

There are a wide variety of wire rope constructions available to be used on cranes. It is important that the correct rope be used for each specific application. Because wire rope wears in service, the method by which the rope wears is an important factor in determining the most suitable rope. Replacement rope must have a rated strength at least equal to the original rope supplied or recommended for the machine. Any change from the original specification for the rope must be specified by the wire rope manufacturer, crane manufacturer, or qualified person. When there is a question, consult with Bridon American about the rope construction most appropriate for the application.

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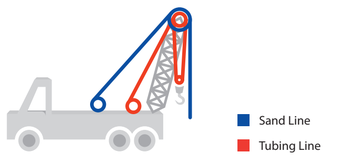
Quick Reference Guide: Oil Field Ropes

Well Servicing Rig



Sand Line

Tubing Line

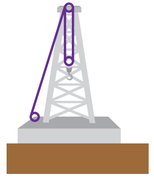
Sand Line

Constructex

Swaged Tubing Line

Tubing Line

Rotary Drilling Rig



Rotary Drill Line (Land)

Constructex

Drill Line

Sand Line

- Large outer wires for resistance to wear.
- Exceptional spooling characteristics.
- Resistance to kinking.
- Easy to splice.

Diameter	Approx. Mass WSC		Min. Breaking Force	
in	lb/ft	kg/ft	tons	kN
3/8	0.21	0.09	5.90	52.20
7/16	0.29	0.13	7.90	70.60
1/2	0.38	0.17	10.30	91.70
9/16	0.48	0.21	13.00	115.70
5/8	0.59	0.26	15.90	141.50
3/4	0.84	0.37	22.70	202.00

NOTE: Typical Construction 6x7 Fiber Core.

Constructex

- Swaged to increase wearing surface and density.
- Long service life due to resistance to scrubbing and crushing.
- High breaking force.
- Flexible construction.

Diameter	Approx. Mass WSC		Min. Breaking Force	
			EIP	
in	lb/ft	kg/ft	tons	kN
5/8	0.90	0.39	25.50	226.90
3/4	1.10	0.50	36.50	324.70
7/8	1.50	0.68	48.50	431.50
1	2.00	0.91	62.50	556.00
1 1/8	2.60	1.18	79.50	707.30
1 1/4	3.20	1.45	97.60	868.30
1 3/8	3.80	1.72	119.00	1058.70
1 1/2	4.60	2.09	139.00	1236.70
1 5/8	5.30	2.41	162.00	1441.30

Swaged Tubing Line

- Excellent resistance to crushing.
- High breaking force.
- Good resistance to abrasion.

Diameter	Approx. Mass WSC		Min. Breaking Force	
in	lb/ft	kg/ft	tons	kN
7/8	1.70	0.77	47.40	421.90
1	2.22	1.01	62.00	551.80
1 1/8	2.80	1.27	73.50	654.20

NOTE: Typical Construction 6x31 Swaged.

Tubing Line

- Combination of flexibility and resistance to crushing.
- Outstanding resistance to wear and fatigue.

Diameter	Approx. Mass WSC		Min. Breaking Force	
			EIP	
in	lb/ft	kg/ft	tons	kN
3/4	1.04	0.46	29.40	261.70
7/8	1.41	0.62	39.80	354.20
1	1.85	0.82	51.70	460.10
1 1/8	2.34	1.03	65.00	578.50

NOTE: Typical Construction 6x26 IWRC.

Rotary Drill Line

- Combination of strength, flexibility and resistance to peening.
- Good resistance to wear and fatigue.
- Long service life when sheaves and drums are of moderate size.

Diameter	Approx. Mass WSC		Min. Breaking Force			
			EIP		EEIP	
in	lb/ft	kg/ft	tons	kN	tons	kN
1	1.85	0.82	51.70	460.10	56.90	506.40
1 1/8	2.34	1.03	65.00	578.50	71.50	636.40
1 1/4	2.89	1.28	79.90	711.10	87.90	782.30
1 3/8	3.49	1.54	96.00	854.40	106.00	943.40
1 1/2	4.16	1.84	114.00	1014.60	125.00	1112.50
1 5/8	4.88	2.15	132.00	1174.80	146.02	1299.40
1 3/4	5.66	2.50	153.00	1361.70	169.00	1504.10

Note: Typical Construction 6x19(S) & 6x26(WS).

6x19 Class IWRC

- High quality 6-strand rope is exceptionally robust.
- Superior strength confirmed by Bridon's Powercheck process for testing a sample.
- Durability and outstanding resistance to wear.
- Fully lubricated to reduce wear and tear.

Diameter	Approx. Mass WSC		Min. Breaking Force			
			EIP IWRC		EEIP IWRC	
in	lb/ft	kg/ft	tons	kN	tons	kN
1/4	0.12	0.05	3.40	30.30	—	—
5/16	0.18	0.08	5.27	46.90	—	—
3/8	0.26	0.11	7.55	67.20	—	—
7/16	0.35	0.15	10.20	90.70	11.20	99.60
1/2	0.46	0.20	13.30	118.40	14.60	129.90
9/16	0.58	0.26	16.80	149.50	18.50	164.70
5/8	0.72	0.32	20.60	183.30	22.70	202.00
3/4	1.04	0.46	29.40	261.70	32.40	288.40
7/8	1.41	0.62	39.80	354.20	43.80	389.80
1	1.85	0.82	51.70	460.10	56.90	506.40
1 1/8	2.34	1.03	65.00	578.50	71.50	636.40
1 1/4	2.89	1.28	79.90	711.10	87.90	782.30
1 3/8	3.49	1.54	96.00	854.40	106.00	943.40
1 1/2	4.16	1.84	114.00	1014.60	125.00	1112.50

NOTE: Metric rope diameters on request. Check www.bridonamerican.com or call customer service for more information.
NOTE: Sizes 1/4" to 1" Powerchecked.
NOTE: Tuggers.

6x36 Class IWRC

- High quality 6-strand rope with increased flexibility.
- Superior strength confirmed by Bridon's Powercheck process for testing a sample (where noted in the table).
- Flexible construction with good bend-fatigue life in most applications.
- Fully lubricated to reduce wear and tear.

Diameter	Approx. Mass WSC		Min. Breaking Force			
			EIP IWRC		EEIP IWRC	
in	lb/ft	kg/ft	tons	kN	tons	kN
1/4	0.12	0.05	3.40	30.30	—	—
5/16	0.18	0.08	5.27	46.90	—	—
3/8	0.26	0.12	7.55	67.20	—	—
7/16	0.35	0.16	10.20	90.70	11.20	99.60
1/2	0.46	0.20	13.30	118.40	14.60	129.90
9/16	0.58	0.26	16.80	149.50	18.50	164.70
5/8	0.72	0.32	20.60	183.30	22.70	202.00
3/4	1.04	0.46	29.40	261.70	32.40	288.40
7/8	1.41	0.62	39.80	354.20	43.80	389.80
1	1.85	0.82	51.70	460.10	56.90	506.40
1 1/8	2.34	1.03	65.00	578.50	71.50	636.40
1 1/4	2.89	1.28	79.90	711.10	87.90	782.30
1 3/8	3.49	1.54	96.00	854.40	106.00	943.40
1 1/2	4.16	1.84	114.00	1014.60	125.00	1112.50
1 5/8	4.88	2.15	132.00	1174.80	146.00	1299.40
1 3/4	5.66	2.50	153.00	1361.70	169.00	1504.10
1 7/8	6.49	2.86	174.00	1548.60	192.00	1708.80
2	7.39	3.26	198.00	1762.20	217.00	1931.30
2 1/8	8.34	3.68	221.00	1966.90	243.00	2162.70
2 1/4	9.35	4.13	247.00	2198.30	272.00	2420.80
2 3/8	10.42	4.60	274.00	2438.60	301.00	2678.90

NOTE: Metric rope diameters on request. Check www.bridonamerican.com or call customer service for more information.
NOTE: Sizes 1/4" to 1" Powerchecked.
NOTE: Winch lines, mast raising lines.

6x19 / 6x36 / 6x61 Classes IWRC

- High quality 6-strand rope with increased flexibility.
- Superior strength confirmed by Bridon's Powercheck process for testing a sample (where noted in the table).
- Flexible construction with good bend-fatigue life in most applications.
- Fully lubricated to reduce wear and tear.

Diameter	Approx. Mass		Min. Breaking Force					
			6x19 IWRC		6x36 IWRC		6x61 IWRC	
in	lb/ft	kg/ft	tons	kN	tons	kN	tons	kN
2 1/2	11.60	5.12	302.00	2687.80	302.00	2687.80	—	—
2 5/8	12.80	5.64	331.00	2945.90	331.00	2945.90	—	—
2 3/4	14.00	6.19	361.00	3212.90	361.00	3212.90	—	—
2 7/8	15.30	6.77	—	—	392.00	3488.80	—	—
3	16.60	7.32	—	—	425.00	3782.50	—	—
3 1/8	18.00	7.96	—	—	458.00	4076.20	—	—
3 1/4	19.50	8.60	—	—	492.00	4378.80	—	—
3 3/8	21.00	9.27	—	—	529.00	4708.10	—	—
3 1/2	22.70	10.03	—	—	564.00	5019.60	555.00	4939.50
3 5/8	24.30	10.73	—	—	602.00	5357.80	592.00	5268.80
3 3/4	26.00	11.49	—	—	641.00	5704.90	632.00	5624.80
3 7/8	27.70	12.22	—	—	680.00	6052.00	669.00	5954.10
4	29.60	13.08	—	—	720.00	6408.00	713.00	6345.70
4 1/8	31.40	13.87	—	—	761.00	6772.90	753.00	6701.70
4 1/4	33.40	14.75	—	—	803.00	7146.70	799.00	7111.10
4 3/8	35.40	15.64	—	—	846.00	7529.40	846.00	7529.40
4 1/2	37.40	16.52	—	—	889.00	7912.10	889.00	7912.10
4 5/8	39.50	17.43	—	—	934.00	8312.60	934.00	8312.60
4 3/4	41.70	18.41	—	—	979.00	8713.10	979.00	8713.10

NOTE: Metric rope diameters on request. Check www.bridonamerican.com or call customer service for more information.
NOTE: Sizes 1/4" to 1" Powerchecked.
NOTE: Winch lines, mast raising lines.