Introduction to Cortland and High Performance Synthetic Rope

IADC

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INTRODUCTION

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GOAL OF PRESENTATION

- Provide an overview of Cortland Company
- Provide a high level review different synthetic fibers used today
- Provide a review of applications where Cortland products have been successfully used
- Provide technical answers

WHO IS CORTLAND?

Cortland Overview

- Manufacturer of High Performance strength members
- Two product value streams
  - Ropes and Assemblies
    - High Performance Synthetic Ropes & Slings
    - Synthetic Medical Suture Assemblies and Control Cables
    - Specialty Mooring System Design
  - Cable and Umbilicals
    - Custom Engineered Electromechanical Cables and Tethers
    - Umbilicals
- Five manufacturing facilities, 275+employees
  - Anacortes, WA, USA (ropes, slings)
  - Hoddesdon, UK (armored cables and umbilicals)
  - Cortland, NY, USA (cables, ropes and medical products)
  - Bergen, Norway (Cortland Selantic) (slings, hardware and anchors)
  - Perth, AU (Cortland Jeyco) (specialized mooring, rigging & towing sys)
- Three sales and service facilities:Aberdeen, Singapore and Houston

Example Applications

Specialty Rope & Cable

Umbilicals

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SYNTHETIC ROPE REVIEW

- FIBER
- CONSTRUCTION

Synthetic Fibers – not one size fits all

	Nylon	Polyester	Polyolefin	Aramid	LCP	PLASMA *HMPE*
Strength	1	0.9-1.1	0.55	2.7	3.2	3.8
Weight	1	1.21	0.8	1.26	1.26	0.85
Elongation	1	0.6	0.8	0.1	0.1	0.1
Melt Point	212^0 C	250^0 C	137^0 C	500^0 C*	329^0 C*	140^0 C
Abrasion Resistance	Good	Excellent	Fair	Fair	Good	Excellent
Creep	Negligible	Negligible	High	Negligible	Negligible	Moderate
Cost	1	1	0.6	5.5	8.5	9.5

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PLASMA

- Highest strength-to-weight ratio
- Highest abrasion resistance
- Excellent dynamic toughness – tension/tension
- Very low elongation (3%-3.5%)
- Excellent flex fatigue resistance - bending
- Excellent chemical resistance
- Density less than 1.0

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12-Strand Construction

The 12 construction offers several advantages when used with high performance fibers:

- Torque-balanced - no tendency to rotate under load
- Easily spliced by hand; can even be done in field with minimal training and/or equipment
- Easy to inspect, inside and out
- Compatible with both drum and traction winches

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12x12 Design Benefits

1. Firmer, or “rounder” rope than conventional 12x1 braided rope
2. Better internal abrasion resistance between strands
3. Greater dimensional stability
4. Ease of handling – especially during splicing
5. Ability to make long continuous lengths by splicing individual braided strands together to form a secure, locked connection

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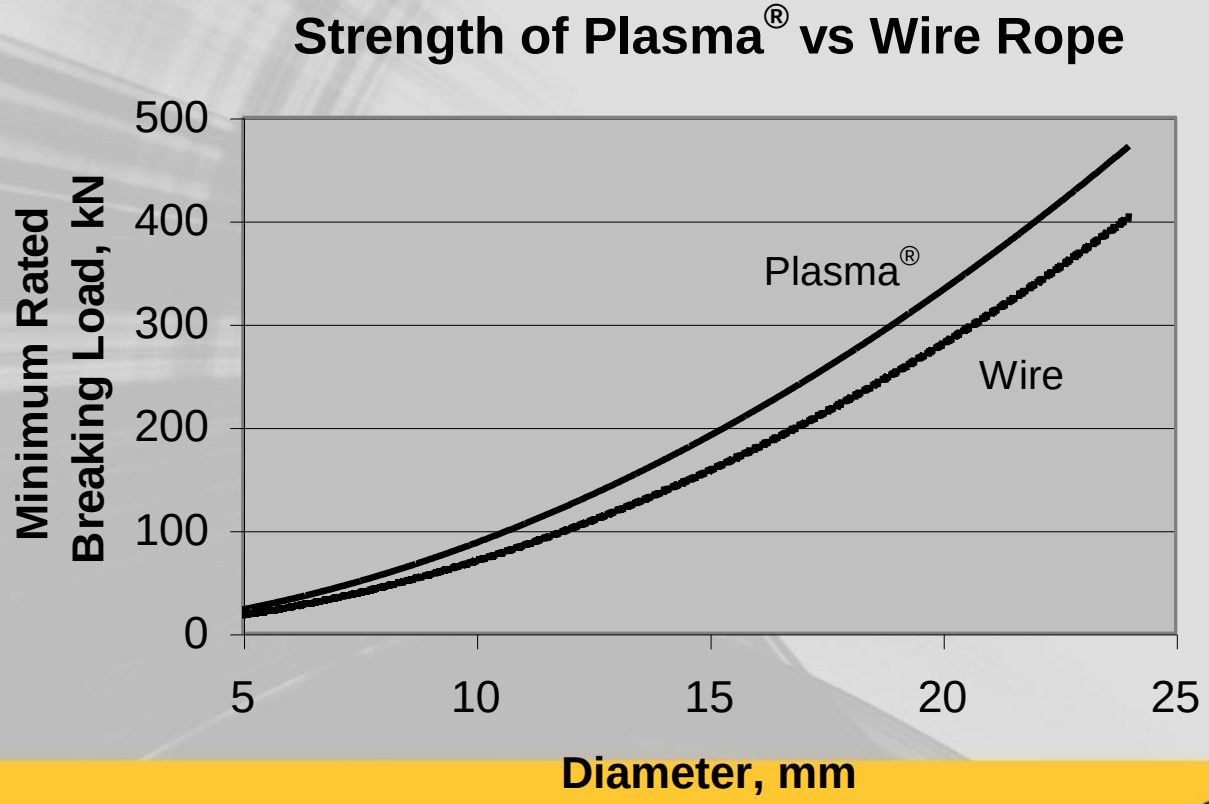
Plasma 12-Strand

- Strengths equivalent to wire rope on a diameter basis
- More than 10x stronger than steel on a weight basis



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12 x 12 Strand

Sizes up to 25” circ. (200mm) and strengths in excess of 4,900,000 lbs. (2233 tonnes)

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12 x 12 Strand Testing

Largest size tested to date
172mm
1892 tonnes – spliced strength

Land Based Track Record

Land Based Track Record

- TRUCK WINCHES
- MINING
- HEAVY LIFT
- RIG MOVING

Truck Winches

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Truck Winches

Mining

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Mining

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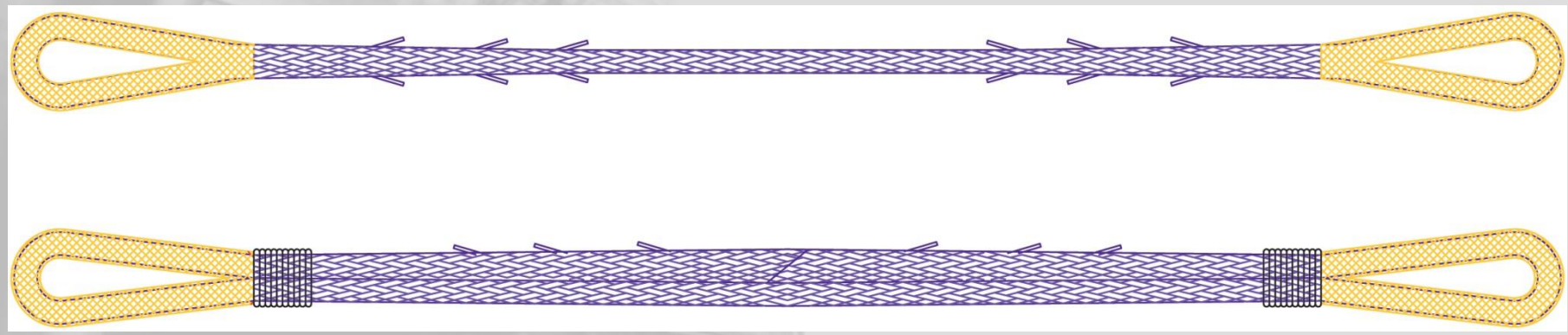
Heavy Lift Slings

Eye-to-eye sling



Endless grommet sling

Heavy Lift Synthetic Rope Slings

- DNV Rule for Marine Operations – Part 2 Chapter 5 /Lifting Equipment 3.1 Slings and Grommets
- ASME B30.9 Slings
- BS EN 1492-4 TEXTILE SLINGS - SAFETY - PART 4: Lifting slings for general service made from natural and man-made fiber ropes
- IMCA Guidance on The use of Cable Laid Sling and Grommets
- The Cordage Institute International Guidelines
  1. CI 2001-04 – Fiber Rope Inspection and Retirement Criteria
  2. CI 1500-02 – Test Methods for Fiber Ropes
  3. CI 1401-06 – Safer Use of Fiber Rope

Heavy Lift Slings

Slings supplied with rating info, specialized chafe gear and soft eyes or thimbles

QUICK REFERENCE LOAD CHART

Eye & Eye Sling

Vertical, choker and basket hitches
Basket hitch at varying angles

ratings based on Design Factor of 5:1

Nominal Size				Sling Ratings in Pounds					
				Vertical	Choker	90°	60°	45°	30°
Dia. inches	Dia. MM	Circ. inches	MBL- lbs	Plasma® 12 Strand - 12x12 construction					
1	24	3	110,000	22,000	17,600	44,000	37,400	30,800	22,000
1 1/16	26	3.25	129,200	25,840	20,672	51,680	43,928	36,176	25,840
1 1/8	28	3 1/2	147,000	29,400	23,520	58,800	49,980	41,160	29,400
1 1/4	30	3 3/4	165,000	33,000	26,400	66,000	56,100	46,200	33,000
1 5/16	32	4	196,000	39,200	31,360	78,400	66,640	54,880	39,200
1 1/2	36	4 1/2	221,000	44,200	35,360	88,400	75,140	61,880	44,200
				Plasma® 12x12					
1 5/8	40	5	291,000	58,200	46,560	116,400	98,940	81,480	58,200
1 3/4	44	5 1/2	314,000	62,800	50,240	125,600	106,760	87,920	62,800
2	48	6	355,000	71,000	56,800	142,000	120,700	99,400	71,000
2 1/8	52	6 1/2	428,000	85,600	68,480	171,200	145,520	119,840	85,600
2 1/4	56	7	481,000	96,200	76,960	192,400	163,540	134,680	96,200
2 1/2	60	7 1/2	530,000	106,000	84,800	212,000	180,200	148,400	106,000
2 5/8	64	8	596,000	119,200	95,360	238,400	202,640	166,880	119,200
2 3/4	68	8 1/2	660,000	132,000	105,600	264,000	224,400	184,800	132,000
3	72	9	780,000	156,000	124,800	312,000	265,200	218,400	156,000
3 1/8	76	9 1/2	850,000	170,000	136,000	340,000	289,000	238,000	170,000
3 1/4	80	10	940,000	188,000	150,400	376,000	319,600	263,200	188,000
3 1/2	84	10 1/2	1,108,000	221,600	177,280	443,200	376,720	310,240	221,600
3 5/8	88	11	1,250,000	250,000	200,000	500,000	425,000	350,000	250,000
3 3/4	92	11 1/2	1,317,000	263,400	210,720	526,800	447,780	368,760	263,400

QUICK REFERENCE LOAD CHART

Endless Grommet Slings

One splice in one leg
Vertical, choker and basket hitches
Basket hitch at varying angles

Nominal Size				Sling Ratings in Pounds					
Dia. inches	Dia. MM	Circ. inches	MBL- lbs	Plasma® 12 Strand - 12x12 construction					
1	24	3	181,500	36,300	29,040	65,340	55,539	45,738	36,300
1 1/16	26	3.25	213,180	42,636	34,109	76,745	65,233	53,721	42,636
1 1/8	28	3 1/2	242,550	48,510	38,808	87,318	74,220	61,123	48,510
1 1/4	30	3 3/4	272,250	54,450	43,560	98,010	83,309	68,607	54,450
1 5/16	32	4	323,400	64,680	51,744	116,424	98,960	81,497	64,680
1 1/2	36	4 1/2	364,650	72,930	58,344	131,274	111,583	91,892	72,930
				Plasma® 12x12					
1 5/8	40	5	480,150	96,030	76,824	172,854	146,926	120,998	96,030
1 3/4	44	5 1/2	518,100	103,620	82,896	186,516	158,539	130,561	103,620
2	48	6	585,750	117,150	93,720	210,870	179,240	147,609	117,150
2 1/8	52	6 1/2	706,200	141,240	112,992	254,232	216,097	177,962	141,240
2 1/4	56	7	793,650	158,730	126,984	285,714	242,857	200,000	158,730
2 1/2	60	7 1/2	874,500	174,900	139,920	314,820	267,597	220,374	174,900
2 5/8	64	8	983,400	196,680	157,344	354,024	300,920	247,817	196,680
2 3/4	68	8 1/2	1,089,000	217,800	174,240	392,040	333,234	274,428	217,800
3	72	9	1,287,000	257,400	205,920	463,320	393,822	324,324	257,400
3 1/8	76	9 1/2	1,402,500	280,500	224,400	504,900	429,165	353,430	280,500
3 1/4	80	10	1,551,000	310,200	248,160	558,360	474,606	390,852	310,200
3 1/2	84	10 1/2	1,828,200	365,640	292,512	658,152	559,429	460,706	365,640
3 5/8	88	11	2,062,500	412,500	330,000	742,500	631,125	519,750	412,500
3 3/4	92	11 1/2	2,173,050	434,610	347,688	782,298	664,953	547,609	434,610

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Heavy Lift Slings

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TRUCK BRIDLES

- Equal or greater strength than wire SIZE FOR SIZE
- Much lighter than wire size for size
- Increased user Safety – significantly reduces handling weight, risks and recoil if failures occur
- Heavy Duty fabrication design
- RFID capability

Plasma 12 Strand –
Endless Plasma Bridle Specifications

Rope Size **(Diameter)**	*Minimum Tensile Strength* **(LBS)**	*Minimum Tensile Strength* **(kN)**	*Working Load Limit* *(5:1 Safety Factor)* **LBS**
1"	176,000	782	35,200
1-1/8”	235,200	1,046	47,000
1-1/4”	264,000	1,174	52,800
1-5/16”	313,600	1,394	62,700
1-1/2”	353,600	1,572	70,700

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Plasma 12 Strand – **Winch Line Specifications**

Rope Size **(Diameter)**	*Minimum Tensile Strength* **(LBS)**	*Working Load Limit* *(5:1 Safety Factor)* **(LBS)**	*Weight/ 100 Feet* **(LBS)**
1”	110,000	22,000	23.4
1-1/8”	147,000	29,400	31.9
1-1/4”	165,000	33,000	36.2
1-5/16“	196,000	39,200	41.7
1-1/2“	221,000	44,200	51.7

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CV TRAK
ATCO


CV TRAK
ATCO


F12
ATCO


ATCO

Sling Inspection – CI2001

Technical Literature

Plasma® 12x12 Sling Inspection Guidelines

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Methods of inspection cont.:

Visual inspection for construction changes, excess twist in rope

Inspect for excess surface wear on rope

Inspect to make sure certification tagging is intact and readable.

Inspection of hollow core area of Plasma® 12x12 rope. In picture above, no internal wear is observed. Exterior yarn abrasion is noted as "light" and not a problem.

Visual inspection of interior yarns shows wear from abrasion or cutting.

Visual inspection of yarns on rope in this sample shows heavy cutting on two adjacent strands, but only moderate surface abrasion (darker areas on the surface of the strands).

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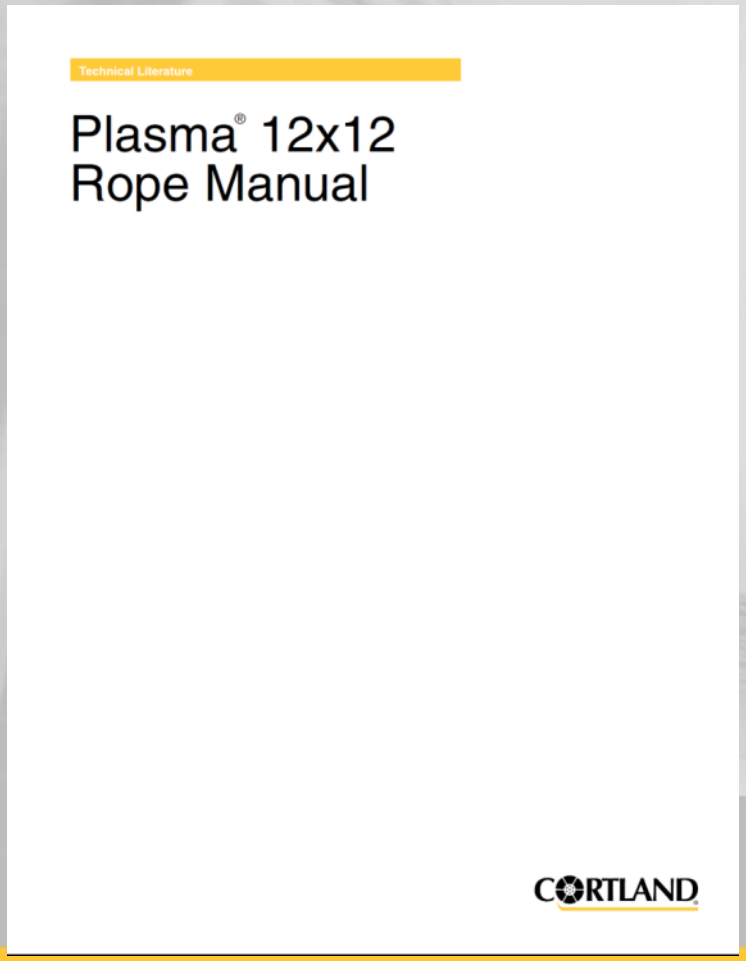
Technical Information



- Extensive technical research conducted to be able to describe the Plasma rope product when fabricated into a lifting sling
- Manual includes
  - Strength ratings
  - Performance descriptions; e.g. D:d

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Durability-video clip

QUESTIONS?

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