

PUBLIC Exhibit 2-03A



Product Overview

•Sucker Rods

•Drive Rods®

•Rod Guides

•Accessories

•Tubular Products

About Norris Products

Norris brand products are known throughout the industry for precision and reliability. Norris' product range includes conventional Sucker Rods, specialty Drive Rods® for progressing cavity pump applications, Polished Rods, Sinker Bars, Pony Rods and Sucker Rod/Polished Rod Couplings.

RG Industries innovative lines of injection molded products are used for rod/tubing wear reduction and paraffin control. Besides manufacturing, Norris offers customers an evaluation of their current production system and is able to make recommendations accordingly.

Norris tubular products include ½" to 7" Swages and Bull Plugs, in a variety of grades and thread types. Other tubular products include Pup Joints (J-55 and L-80), Tubing Nipples, Casing Nipples, Tubing Couplings, Casing Couplings, Repair Clamps and Sleeve Couplings.

At Alberta Oil Tool, quality is integrated into all aspects of business, from administration to manufacturing. Alberta Oil Tool's quality management system is registered by the American Petroleum Institute to ISO 9001:2008 and API Q1. We are also licensed to the API 5CT, 11AX and 11B product specifications and have Canadian Registration Numbers (CRN's) for fittings throughout Canada. All Norris products meet or exceed these quality standards and specifications.

All Norris products are manufactured using the latest technology and we are committed to being a World Class Manufacturer of products by applying the principles of Lean Manufacturing to bring our customers the highest quality product.

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SPECIFICATIONS

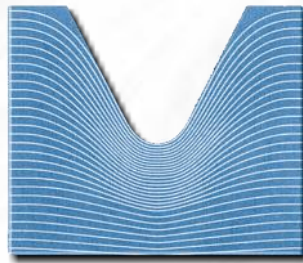
NORRIS Steel Sucker Rods, Drive Rods® and Pony Rods

Norris Steel Sucker Rods, Drive Rods® and Pony Rods are manufactured from micro-alloyed, modified special quality hot rolled carbon or alloy steel. Sucker rod dimensions and tolerances conform to API Spec 11B, latest edition, and are available in $\frac{5}{8}$ " (15.88 mm), $\frac{3}{4}$ " (19.05 mm), $\frac{7}{8}$ " (22.23 mm), 1" (25.40 mm) and 1 $\frac{1}{8}$ " (28.58 mm) body diameter and in 25' (7.62 m) lengths. Drive Rods® for Progressing Cavity Pump application are available in $\frac{7}{8}$ " (22.23 mm), 1" (25.40 mm), 1 $\frac{1}{8}$ " (28.58 mm), 1 $\frac{1}{4}$ " (31.75 mm), and 1 $\frac{1}{2}$ " (38.10 mm) body diameter and in 25' (7.62 m) lengths.

All rods are straightened and inspected by Eddy Current for surface defects. Both ends are upset by automatic high-speed hot forging. Rods are full-length normalized to relieve residual stresses, air-quenched and tempered to refine and homogenize grain structure. All rods are also NOR-Peened® to improve fatigue life. Upset pin blanks are machined and dimensions gauged. Pin threads are cold-formed to strengthen the thread from fatigue. An inhibitor-lubricant is applied to each pin and thread protector installed. An oil-soluble coating protects Norris rods from atmospheric corrosion in storage. All rods are bundled to prevent handling damage during transportation to the well location. Quality control inspections are performed at each step of the manufacturing process.

Rolled Threads vs. Cut Threads

Norris uses cold-formed rolled threads on all of our Sucker Rods, Drive Rods®, and Couplings. The cold-formed rolled thread process, unlike cut threading or burnishing, neither removes nor wastes metal, but displaces the material, ensuring consistent grain flow. The cold-forming process strengthens the tension, shear, yield, and fatigue resistance of the threads.



Rolled Thread



Cut Thread

Sucker Rods

- Dimensions and tolerances conform to API Specification 11B.
- Available in $\frac{5}{8}$ " (15.88mm), $\frac{3}{4}$ " (19.05mm), $\frac{7}{8}$ " (22.23mm), 1" (25.40mm) and 1 $\frac{1}{8}$ " (28.58mm) body diameter.
- Full-length normalized to relieve residual stresses, air-quenched and tempered to refine and homogenize the grain structure.
- NOR-Peened® to improve fatigue life.

Drive Rods®

- Specifically designed to withstand the high torque levels experienced in Progressing Cavity Pump applications.
- Furnished with modified pins to maximize their torque capacity.
- Modified pins provide a minimum 50% increase in torque over conventional API thread connections.
- Available in $\frac{7}{8}$ " (22.23 mm), 1" (25.40mm), 1 $\frac{1}{8}$ " (28.58mm), 1 $\frac{1}{4}$ " (31.75mm) and 1 $\frac{1}{2}$ " (38.10mm) body diameter.
- Full-length normalized to relieve residual stresses, air-quenched and tempered to refine and homogenize the grain structure.

Selection Guide and Pin End Colour Code

TYPE 54	
API Grade	D Carbon
Steel Series	AISI C-1541-M Carbon Steel
Application	Designed for reciprocating lift applications at any depth not exceeding the maximum allowable stress rating, Type 54 is effectively heat-treated to maximize its fatigue resistance and improve its performance in non-corrosive or effectively inhibited corrosive fluids.

TYPE 75	
API Grade	D Special
Steel Series	AISI A-4330-M Nickel-Chromium-Molybdenum Alloy Steel
Application	Type 75 is alloyed and effectively heat-treated to maximize its fatigue resistance and improve its corrosion tolerance in effectively inhibited corrosive fluids. Designed for Reciprocating and Progressing Cavity Pump (PCP) applications not exceeding the maximum allowable stress or torque rating.

Type 78	
API Grade	D Alloy
Steel Series	AISI A-4142-M Chromium-Molybdenum Alloy Steel
Application	Type 78 is alloyed and effectively heat-treated to maximize its fatigue resistance and improve its performance in non-corrosive or effectively inhibited corrosive fluids. Designed for Reciprocating and Progressing Cavity Pump (PCP) applications not exceeding the maximum allowable stress or torque rating.

Type 96	
Grade	Special Service High Strength
Steel Series	AISI A-4138-M Chromium-Molybdenum Alloy Steel
Application	Type 96 is alloyed and effectively heat-treated to maximize its fatigue resistance and improve its performance in non-corrosive or effectively inhibited corrosive fluids. Designed for Reciprocating and Progressing Cavity Pump (PCP) applications not exceeding the maximum allowable stress or torque rating.

Type 97	
Grade	Special Service High Strength
Steel Series	AISI-4330-M Nickel-Chromium-Molybdenum Alloy Steel
	Type 97 is alloyed and effectively heat treated to maximize its fatigue resistance and improve its corrosion tolerance in effectively inhibited corrosive fluids. Designed for Reciprocating and Progressing Cavity Pump (PCP) applications not exceeding the maximum allowable stress or torque rating.

Pin End Colour Code Examples	
Colour	Grade
Brown	54
Orange	75
Yellow	78
Green	96
Purple	97

Ref: API Spec. 11B

NOTE: Rods are available less coupling or with a Full Size, Slim Hole or Oversize coupling attached.

High-Strength material is recommended for Slim-Hole Couplings when used in PCP applications.

Specifications continued...

Norris Steel Sucker Rods & Drive Rods®	Type	54	75	78	96	97
	API Grade	D Carbon	D Special	D Alloy	Special	Special
	AISI Series	C-1541-VM	A-4330-M	A-4142-M	A-4138-M	A-4330-M
	Chemical Properties , %	54	75	78	96	97
	Carbon (C)	0.40/0.44	0.30/0.34	0.38/0.43	0.38/0.42	0.30/0.34
	Chromium (Cr)	0.20 max	0.80/1.00	0.90/1.10	0.55/0.85	0.80/1.00
	Copper (Cu)	0.35 max	0.35 max	0.35 max	0.35 max	0.35 max
	Manganese (Mn)	1.40/1.60	0.80/1.00	0.80/1.00	1.1/1.4	0.80/1.00
	Molybdenum (Mo)	0.06 max	0.20/0.30	0.15/0.25	0.25/0.35	0.20/0.30
	Nickel (Ni)	0.25 max	1.65/1.85	0.25 max	0.30 max	1.65/1.85
	Phosphorus (P)	0.040 max	0.035 max	0.035 max	0.035 max	0.035 max
	Silicon (Si)	0.15/0.35	0.15/0.35	0.15/0.35	0.20/0.35	0.15/0.35
	Sulfur (S)	0.040 max	0.040 max	0.035 max	0.035 max	0.040 max
	Vanadium (V)	0.07/0.09	0.07/0.09	0.030/0.045	0.07/0.09	0.07/0.09
	Mechanical Properties	54	75	78	96	97
	Tensile					
	ksi	115/140	125/140	120/140	140/150	140/150
	MPa	793/965	861/965	827/965	965/1034	965/1034
	Yield, 0.2% Offset					
	ksi	85 min	100 min	100 min	115 min	115 min
	MPa	586 min	689 min	689 min	793 min	793 min
	Elongation, 8"(203.2mm), %	15 min	10 min	10 min	10 min	10 min
	Reduction in Area, %	50 min	45 min	45 min	45 min	45 min
	Hardness (HRC)	22/30	25/30	23/30	30/33	30/33

Drive Rod® Pressure Loss Improvements

- 1"(25.40mm) Drive Rods® with 7/8" (22.23mm) Full Size Couplings: 22% improvement over Sucker Rods with 1"(25.40mm) Slim Hole Couplings.
- 1"(25.40mm) Drive Rods® with 7/8" (22.23mm) High –Strength Slim Hole Couplings: 39% improvement over Sucker Rods with 1"(25.40mm) Slim Hole Couplings.
- 1 1/4"(31.75mm) Drive Rods®: The pressure loss across the coupling is the same as conventional 1"(25.40mm) Sucker Rod and 23% less than conventional 1 1/2" (28.58mm) Sucker Rods.
- 1 1/2"(38.1mm) Drive Rods®: The pressure loss across the coupling is the same as conventional 1 1/2" (28.58mm) Sucker Rods.

Tubing Flow Area Comparison

1" (25.40mm) Drive Rod® with 7/8" (22.23mm) pins in 2 1/2" (73.03mm) Tubing

- 1"(25.40mm) Drive Rod® with 7/8"(22.23mm) Full Size Couplings (1 13/16"(46.04mm) O.D.):
 - 37% more flow area than 1" Sucker Rods with 1" Slim Hole Couplings

1" (25.40mm) Drive Rod® with 7/8" (22.23mm) pins in 3 1/2" (88.9mm) Tubing

- 1"(25.40mm) Drive Rod® with 7/8"(22.23mm) High-Strength Slim Hole Coupling (1 5/8"(41.28mm) O.D.):
 - 28% more flow area than 1" Sucker Rods with Slim Hole Couplings
 - 51% more flow area than 1" Sucker Rods with Full Size Couplings
- 1"(25.40mm) Drive Rod® with 7/8"(22.23mm) Full Size Couplings (1 13/16"(46.04mm) O.D.):
 - 15% more flow area than 1" Sucker Rods with Slim Hole Couplings
 - 36% more flow area than 1" Sucker Rods with Full Size couplings

1 1/4" (31.75mm) Drive Rod® with 1" (25.40mm) High-Strength Slim Hole couplings (2" (50.8mm) OD) in 3 1/2" (88.9mm) Tubing

- 27% more flow area than 1 1/2"(28.58mm) Sucker Rods with 1 1/2" Slim Hole Couplings (2 1/4"(57.15mm) OD)
- 50% more flow area than 1 1/2"(28.58mm) Sucker Rods with 1 1/2" Full Size Couplings (2 3/4"(60.33mm) OD)

Drive Rod® and Drive Pony Rod Torque Chart

Maximum Service Torque

Non-API Drive Rods® designed specifically for torsional application.

All torque values are ft.lbs

Rod Size	Grade D Special Alloy (75)	Grade D Alloy (78)	Special Service (96)	Special Service (97)
¾"(22.23mm) Drive Rod	750	735	800	800
1"(25.4mm) Drive Rod	1,110	1,100	1,200	1,200
1⅝"(28.58mm) Drive Rod	1,570	1,570	1,700	1,700
1¾"(31.75mm) Drive Rod	2,100	2,000	2,500	2,500
1½"(38.1mm) Drive Rod	3,150	3,000	3,750	3,750

All Torque values are N•m

Rod Size	Grade D Special Alloy (75)	Grade D Alloy (78)	Special Service (96)	Special Service (97)
¾"(22.23mm) Drive Rod	1,017	997	1,085	1,085
1"(25.4mm) Drive Rod	1,505	1,491	1,627	1,627
1⅝"(28.58mm) Drive Rod	2,129	2,129	2,305	2,305
1¾"(31.75mm) Drive Rod	2,847	2,712	3,390	3,390
1½"(38.1mm) Drive Rod	4,271	4,067	5,084	5,084

ref:

- All values based on rods and couplings in like new condition.
- No derating factor for Slim Hole couplings when High Strength Couplings are used.
- Values based on actual test results.
- E106 Norris/O'Bannon Rod Elevator for 1"(25.4mm) Drive Rods®.
- E108 Norris/O'Bannon Rod Elevator for 1¾"(31.75mm) Drive Rods®.
- E109 Norris/O'Bannon Rod Elevator for 1½"(38.1mm) Drive Rods®.
- To maximize rod fatigue life, AOT recommends using a .8 safety factor of maximum torque.

NOTE: Correct rod makeup is critical to the effective operation of Reciprocating and Progressing Cavity Pump installations.

DEFINITIONS

Seating Depth and/or Sucker Rod/Drive Rod® String Lengths

- Shallow = less than 4,000 ft. (< 1,219 m)
- Medium = 4,000 ft. to 7,000 ft. (1,219 m to 2,134 m)
- Deep = 7,000 ft. and deeper (> 2,134 m)

Definitions not intended as design criteria.

Call your nearest Norris Representative for specific rod string design recommendations.

Rod Description	Wrench Square Size +/- 0.031"
5/8"(15.88mm)	7/8"(22.23mm)
3/4"(19.05mm)	1"(25.4mm)
7/8"(22.23mm)	1"(25.4mm)
1"(25.4mm)	1 5/16"(33.34mm)
7/8"(22.23mm) with 3/4"(19.05mm) pin	1"(25.4mm)
1"(25.44mm) with 7/8"(22.23mm) pin	1"(25.4mm)
1 1/4"(31.75mm) with 1"(25.4mm) pin	1 5/16"(33.34mm)
1 1/4"(31.75mm) with 1 1/8"(28.58mm) pin	1 1/2"(38.1mm)
1 1/2"(38.1mm) with 1 1/8"(28.58mm) pin	1 1/2"(38.1mm)

Rod Pin Size	Nominal Diameter of Pin
5/8"(15.88mm)	15/16"(23.81mm)
3/4"(19.05mm)	1 1/16"(26.99mm)
7/8"(22.23mm)	1 3/16"(30.16mm)
1"(25.4mm)	1 3/8"(34.93mm)
1 1/8"(28.58mm)	1 9/16"(39.69mm)

ref: API Spec. 11B

Norris stands behind every product that it sells. We guarantee that all manufactured Norris products will meet or exceed industry and Norris specifications and quality standards. A detailed explanation of our Zero Defects Guarantee may be found on our website, www.albertaoiltool.com

Maximum Recommended Weight Indicator Pull on a Sucker Rod or Drive Rod®

The following calculates the maximum rig weight indicator pull on a stuck rod string. The calculations are based on 90% of the minimum yield strength, for a rod string in "like new" condition. The maximum load should be reached by a straight, steady pull and not a shock load.

For a tapered string, calculate the total weight in pounds of all rods above the bottom section. Add to this weight the values in the table below for the rod type and size of the bottom section; This is the maximum load that should be pulled on a rod string. For a one taper rod string, the table values are the maximum pull.

The maximum pull rates for Drive Rod® is the same as conventional Sucker Rod.

Note: For rod weight, see table on page 18.

Additional Weight Indicator

Type 54		
Rod Size	Load in Pounds (lbf)	Dekaneutons (daN)
$\frac{5}{8}$ " (15.88mm)	23,450	10,430
$\frac{3}{4}$ " (19.05mm)	33,750	15,012
$\frac{7}{8}$ " (22.23mm)	46,000	20,461
1" (25.4mm)	60,000	26,689

Type 75 and 78		
Rod Size	Load in Pounds (lbf)	Dekaneutons (daN)
$\frac{5}{8}$ " (15.88mm)	24,850	11,053
$\frac{3}{4}$ " (19.05mm)	35,780	15,915
$\frac{7}{8}$ " (22.23mm)	48,700	21,662
1" (25.4mm)	63,625	28,300
1 $\frac{1}{8}$ " (28.58mm)	80,500	35,806
1 $\frac{1}{4}$ " (31.75mm)	99,400	44,213
1 $\frac{1}{2}$ " (38.1mm)	143,000	63,612

Type 96 and 97		
Rod Size	Load in Pounds (lbf)	Dekaneutons (daN)
$\frac{3}{4}$ " (19.05mm)	45,725	20,350
$\frac{7}{8}$ " (22.23mm)	62,200	27,667
1" (25.4mm)	82,250	36,140
1 $\frac{1}{8}$ " (28.58mm)	102,880	45,761
1 $\frac{1}{4}$ " (31.75mm)	127,000	56,490
1 $\frac{1}{2}$ " (38.1mm)	182,000	80,957

ref:

NORRIS COUPLINGS

Norris Sucker Rod Couplings, Polished Rod Couplings and Sub-Couplings are engineered and designed to meet the challenges existing in today's rod-pumped applications. They are available in API Class T, High Strength or Sprayloy® (API Class SM), and in all Sucker Rod sizes. Norris Couplings are manufactured from special quality cold-formed steel extrusions or cold drawn seamless mechanical steel tubing. Sucker Rod Couplings, Polished Rod Couplings and Sub-Couplings are available in Full Size, Slim Hole or Oversize outside diameters with effective-width Enhanced Contact Face (ECF) designs.

Norris was the first to introduce the ECF designs. ECF's improved design enhances the friction force by maximizing the area of contact between the pin shoulder and coupling face; helping maintain the proper preload stress level required in makeup. This "effective" area of contact also provides greater consistency in the amount of displacement (torque) required to properly preload the pin between multiple connections in the rod string.

All couplings are furnished with a cold-formed, fully rolled thread to provide additional strength and fatigue resistance. Pioneered and developed by Norris in 1969, the cold-formed, fully rolled coupling thread is produced by completely cold-forming (reshaping) the steel fibers so they follow the contour (shape) of the thread. The thread surface that results from fully rolled threads improves its resistance to corrosion and reduces abrasion within the thread. The work hardened flank provides increased surface tensile, yield and shear strength. Due to the pressure deformation, a residual compressive stress system builds up at the thread root, which counteracts tensile loading. When compared to cut or burnished threads, the load capacity and corrosion and fatigue resistance of the rolled thread is significantly increased.



Selection Guide

CLASS T	
Steel Series	AISI A-8630-M Nickel-Chromium-Molybdenum Alloy Steel
Construction	The coupling blanks are formed or machined to size and tolerance, threaded using a cold-forming rolled thread tap and coated for anti-galling and lubrication properties.
Application	Designed for reciprocating lift applications, Class T couplings are recommended for installation where abrasion or corrosion is not a problem.

HIGH STRENGTH	
Steel Series	AISI A-4130-M Chromium-Molybdenum Alloy Steel
Construction	The coupling blanks are formed or machined to size and tolerance, heat treated, threaded using a cold-forming rolled thread tap and coated for anti-galling and lubrication properties. Slim Hole High Strength couplings provided with Norris Drive Rods® are ECF and have the anti-galling and lubrication coating removed from the coupling face to assist in achieving consistent connection makeup in Progressing Cavity Pump (PCP) applications.
Application	Designed to meet higher tensile and torsional load requirements to maximize the load capacity of the connection. High Strength couplings are ideally suited for Progressing Cavity Pump (PCP) applications.

Note: The selection guide is not intended as design criteria.

Call your Norris Representative for specific design recommendations.

SPRAYLOY®	
Steel Series	AISI A-8630-M Nickel-Chromium-Molybdenum Alloy Steel
Construction	The coupling blanks are formed or machined to size and tolerance, hard surfaced on the outside diameter with a 0.01" (0.25mm) to 0.02" (0.51mm) thick nickel-chromium spraymetal coating, threaded using a cold-forming rolled thread tap and coated for anti-galling and lubrication properties.
Application	Designed for reciprocating lift applications, Sprayloy® couplings are recommended for installation where abrasion or corrosion-abrasion is a problem.

Properties & Specifications

Sucker Rod Couplings, Polished Rod Couplings and Sub-Couplings

Physical & Mechanical Properties		Class T	High Strength	Sprayloy®
Tensile	ksi	95/125	120/140	95/125
	MPa	655/861	828/965	655/861
Yield	ksi	80 min.	105 min.	80 min.
	MPa	552 min.	724 min.	552 min.
Elongation	2"(50.8mm), %	16 min.	16 min.	16 min.
Reduction in Area	%	30 min.	30 min.	30 min.
Surface Finish OD	R _a microinch (μin)	125	125	125
	R _a micrometer (μm)	3.175	3.175	3.175
Hardness	HRA	56/62	63/65	56/62
Sprayloy® Coating Hardness	HV ₂₀₀	-	-	595 min

ref: MSS C-0001

Chemical Properties (%)	Class T		High Strength		Sprayloy®	
API Class	T		Special		SM	
AISI Series	8630	4140	4130	4140	8630	4140
Carbon (C)	0.28/0.33	0.37/0.44	0.28/0.33	0.37/0.44	0.28/0.33	0.37/0.44
Chromium (Cr)	0.4/0.6	0.75/1.20	0.8/1.10	0.75/1.20	0.4/0.6	0.75/1.20
Copper (Cu)	0.3 max.	0.3 max	0.3 max.	0.3 max	0.3 max	0.3 max
Manganese (Mn)	0.7/0.9	0.65/1.10	0.40/0.60	0.65/1.10	0.7/0.9	.65/1.10
Molybdenum (Mo)	0.15/0.25	0.15/0.25	0.15/0.25	0.15/0.25	0.15/0.25	0.15/0.25
Nickel (Ni)	0.4/0.7	-	-	-	0.4/0.7	-
Phosphorus (P)	0.035 max.	0.035 max.	0.035 max.	0.035 max.	0.035 max.	0.035 max.
Silicon (Si)	0.20/0.35	0.15/0.35	0.20/0.35	0.15/0.35	0.20/0.35	0.15/0.35
Sulfur (S)	0.020/0.030	0.040 max.	0.025 max.	0.040 max.	0.020/0.030	0.040 max.
Aluminum (Al)	0.015 min.	-	-	-	0.015 min.	-

ref: MSS C-0001

Sprayloy® Coating Chemical Properties (%)	
Aluminum (Al)	0.05 max.
Boron (B)	2.5/4.5
Carbon (C)	0.5/1.0
Chromium (Cr)	12.0/18.0
Cobalt (Co)	0.1 max.
Iron (Fe)	3.0/5.5
Phosphorus (P)	0.02 max.
Silicon (Si)	3.5/5.5
Sulfur (S)	0.02 max.
Titanium (Ti)	0.05 max.
Zirconium (Zr)	0.05 max.
Nickel (Ni)	Balance

ref: API Spec. 11B

Dimensions, Outside Diameter

Class T & High Strength Couplings

	$\frac{5}{8}"$ (15.88mm)	$\frac{3}{4}"$ (19.05mm)	$\frac{7}{8}"$ (22.23mm)	1" (25.4mm)	$1\frac{1}{8}"$ (28.58mm)
Slim Hole	$1\frac{1}{4}"$ (31.75mm)	$1\frac{1}{2}"$ (38.1mm)	$1\frac{3}{4}"$ (41.28mm)	2" (50.8mm)	$2\frac{1}{4}"$ (57.15mm)
Full Size	$1\frac{1}{2}"$ (38.1mm)	$1\frac{5}{8}"$ (41.28mm)	$1\frac{13}{16}"$ (46.04mm)	$2\frac{3}{16}"$ (55.56mm)	$2\frac{3}{8}"$ (60.33mm)
Oversize	-	$1\frac{13}{16}"$ (46.04mm)	2" (50.8mm)	$2\frac{3}{8}"$ (60.33mm)	-

ref: SRC-SHFS-THS-MT

Sprayloy® Couplings

	$\frac{5}{8}"$ (15.88mm)	$\frac{3}{4}"$ (19.05mm)	$\frac{7}{8}"$ (22.23mm)	1" (25.4mm)
Slim Hole	$1\frac{1}{4}"$ (31.75mm)	$1\frac{1}{2}"$ (38.1mm)	$1\frac{3}{4}"$ (41.28mm)	2" (50.8mm)
Full Size	$1\frac{1}{2}"$ (38.1mm)	$1\frac{5}{8}"$ (41.28mm)	$1\frac{13}{16}"$ (46.04mm)	$2\frac{3}{16}"$ (55.56mm)
Oversize	-	$1\frac{13}{16}"$ (46.04mm)	2" (50.8mm)	-

ref: SRC-SHFS-S-MT



NORRIS SINKER BARS

Norris Sinker Bars are manufactured from special quality hot rolled carbon manganese steel bars. Sinker bar dimensions and tolerances conform to API Spec. 11B, latest edition. Sinker Bars have a reduced section on one end for elevator seating and lifting. Pin blanks are machined and dimensions gauged. Pin threads are rolled cold-formed to strengthen the thread from fatigue. An inhibitor lubricant is applied to each pin and thread protector installed. An oil soluble coating protects Norris sinker bars from atmospheric corrosion in storage. Sinker bars are bundled to prevent handling damage during transportation.

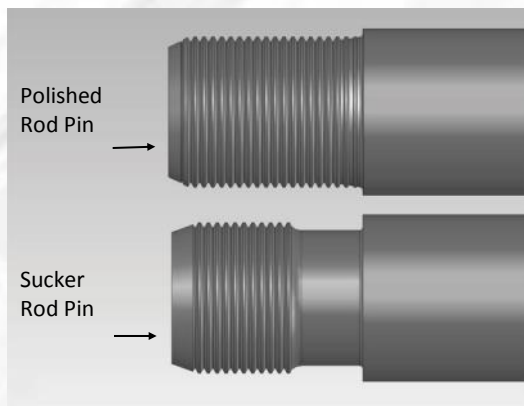
Special sizes and materials are available upon request.

Rod Size, OD	Length	API Pin Sizes	Lbs./ft.	Elevator Rod Size	Width of Wrench Flat
1¼" (31.75mm)	25'	¾" (19.05mm), ⅞" (22.23mm)	4.2	⅞" (22.23mm)	1" (25.4mm)
1½" (38.1mm)	25'	¾" (19.05mm), ⅞" (22.23mm)*	6.0	1" (25.4mm)	1⅝" (33.34mm)
1⅝" (41.28mm)	25'	⅞" (22.23mm)	7.2	1" (25.4mm)	1⅝" (33.34mm)

Note: 1¼" (31.75mm) supplied with ¾" (19.05mm) and ⅞" (22.23mm) polished rod pins due to insufficient shoulder.
 * 1½" (38.1mm) with ⅞" (22.23mm) pins is a Non-API product.

ref:

Alberta Oil Tool manufactures Norris sinker bars with several combinations of body diameter and pin size. Some of these combinations are furnished with a Sucker Rod pin and others come with a Polished Rod pin. The table below lists each size of sinker bar produced by AOT along with its corresponding pin type.



Rod Size, OD	Pin Size	Pin Type	API 11B
1¼" (31.75mm)	¾" (19.05mm)	Polished Rod	Yes
1¼" (31.75mm)	⅞" (22.23mm)	Polished Rod	No
1½" (38.1mm)	¾" (19.05mm)	Sucker Rod	Yes
1½" (38.1mm)	⅞" (22.23mm)	Sucker Rod	No
1⅝" (41.28mm)	⅞" (22.23mm)	Sucker Rod	Yes
2" (50.80mm)	1" (25.4mm)	Sucker Rod	No

When installing Sinker Bars, it is imperative that the pin type be noted and the proper coupling be selected. Sucker Rod pins and Polished Rod pins are very different not only in overall size, but also in the shape of the thread profile. Polished Rod threads have a 9° taper on the final threads which, when used in conjunction with a Polished Rod Coupling, provide a mechanical lock between the rod and coupling. Sucker Rod pins, and likewise Sucker Rod Couplings, do not have this tapered thread. Because of this, a Sucker Rod Coupling cannot be used with a Polished Rod pin. The tapered threads of the Polished Rod pin will not mate properly with the parallel threads of the Sucker Rod Coupling. The parallel threads of the Sucker Rod pin will not interfere with the tapered, internal threads of the Polished Rod Coupling.

After the proper coupling has been selected, a sinker bar connection should be made up using the same procedure as any other rod. The circumferential displacement should be measured using the Norris, "Type 54, 75, 78 & 90" Circumferential Displacement (CD) card (Black Card). The proper measurement on the card will correspond with the size of pin on the sinker bar.

Again, when installing sinker bars, it is very important to remember:

A Polished Rod Coupling can be used with either a Polished Rod pin or a Sucker Rod pin, however a Sucker Rod Coupling can only be used with a Sucker Rod pin, not a Polished Rod pin.

Mechanical Properties

Grade	Minimum Tensile Strength
1 (C) - Carbon Steel	90,000 psi (621 MPa)
2 (K) - Alloy Steel	90,000 psi (621 MPa)
3 (D) - Alloy Steel	115,000 psi (792 MPa)

ref: API Spec. 11B

00071

Sinker Bar Effect

A Norris recommended sinker bar section is a section of large-diameter sucker rods such as $\frac{3}{8}$ " (22.23mm) or 1" (25.4mm), or a section of $1\frac{1}{4}$ " (31.75mm) or $1\frac{1}{2}$ " (38.1mm) O.D. bar stock installed in the rod string just above the pump. This section helps keep the rod string straight and in tension; it reduces downstroke compression buckling of the lower rods; decreases the range of stress on the rod string; and increases pump plunger over travel with increased fluid production.

Rod string buckling can result in downhole problems such as rod body, pin, and coupling failures, poor pump efficiency, increased rod stress loads, and higher well costs.

Causes of buckling or improper downstroke motion include: fluid pounding or pump off; gas pounding or interference; high pumping speeds or rod whip; improper harmonic motion; large bore pumps; heavy or viscous well fluids; pounding down on a pump or tagging bottom; and increased friction between rods and tubing from deviated holes.

Two methods are being used to provide the sinker bar effect:

1. A section of large diameter sucker rods to provide a long, rigid, heavy section installed immediately above the pump.
2. A shorter section of larger-diameter bar stock with sucker rod joints installed above the pump to concentrate the sinker bar effect closer to the pump.

The footage of sinker bars required is calculated as follows:

$$\text{Sinker Bar Footage} = \frac{\text{Plunger Constant} \times \text{Pump Depth(ft)}}{\text{Sinker Bar Weight}}$$

Where:

Plunger Size	$1\frac{1}{16}$ " (26.99mm)	$1\frac{1}{4}$ " (31.75mm)	$1\frac{1}{2}$ " (38.1mm)	$1\frac{3}{4}$ " (44.45mm)	2" (50.8mm)	$2\frac{1}{4}$ " (57.15mm)	$2\frac{1}{2}$ " (63.5mm)	$2\frac{3}{4}$ " (69.85mm)
Plunger Constant	0.091	0.116	0.165	0.162	0.189	0.207	0.211	0.216

And:

Sinker Bar Size (OD)	$\frac{3}{8}$ " (22.23mm)	1" (25.4mm)	$1\frac{1}{4}$ " (31.75mm)	$1\frac{1}{2}$ " (38.1mm)	$1\frac{3}{4}$ " (41.28mm)	$1\frac{1}{2}$ " (44.45mm)
Weight (lb./ft.)	2.2	2.9	4.2	6.0	7.2	8.2

ref:

The sinker bar section replaces an equal footage of sucker rods immediately above the pump. The upper taper footages remain unchanged. It is recommended that rod guides be installed at both ends of the sinker bar section and a larger diameter pump pull rod be used on the pump plunger.

Pin End Colour Code	
Colour	Grade
White	1 (C) - Carbon Steel
Blue	2 (K) - Alloy Steel
Yellow	3 (D) - Alloy Steel



NORRIS POLISHED RODS

Norris Polished Rod bar and dimensions conform to API Specification 11B, latest edition, and AISI Steel Products Manual. Norris Polished Rods are furnished with cold-formed, fully rolled threads to provide additional strength and fatigue resistance. The cold-formed, fully rolled pin thread is produced by completely cold-forming (reshaping) the steel fibers so they follow the contour (shape) of the thread. The thread surface that results from fully rolled threads improves its resistance to corrosion and reduces abrasion within the thread.

The work-hardened flank provides increased surface tensile, yield and shear strength. Due to the pressure deformation, a residual compressive stress system builds up at the thread root, which counteracts tensile loading. When compared to cut or burnished threads, the load capacity and corrosion and fatigue resistance of the rolled thread is significantly increased.

Selection Guide

Alloy Steel	Steel Series : AISI 4140 Chromium-Molybdenum Alloy Steel Features: Alloyed to improve its hardenability and increase its tolerance to corrosion and abrasion. Application: Designed for maximum fatigue resistance and performance improvement in non-corrosive or effectively inhibited corrosion fluids. Can be used with all rod types.
Norloy Steel	Steel Series: AISI 8620 Nickel-Chromium-Molybdenum Alloy Steel Features: The addition of nickel helps increase its tolerance to corrosion and improve its toughness. Application: Designed for maximum fatigue resistance, performance improvement and corrosion tolerance in effectively inhibited corrosive fluids. Can be used with all rod types and is ideally suited for use in conjunction with the Type 75 grade.
Stainless Steel	Steel Series: Type 431 Stainless Steel Features: The best corrosion tolerant properties of all Norris polished rods. This material has good toughness with excellent tensile and torque strength. Application: Designed for maximum fatigue resistance, performance improvement and corrosion tolerance in effectively inhibited corrosive fluids. Can be used with all rod types and ideally suited for use with Drive Rods® in Progressing Cavity Pump (PCP) applications.
Chrome	Steel Series: AISI 4140 Chromium-Molybdenum Alloy Steel Features: 120,000 psi minimum tensile strength; Chromed section has a hardness of 65 Rc. Application: Designed for the most severe abrasive conditions in medium to heavy pumping loads and moderate corrosive service. Available in 1¼" and 1½" diameters and all standard lengths.
XM-19 (N50)	Steel Series: Type XM-19 Stainless Steel Features: Nitrogen-strengthened austenitic stainless steel that possesses superior resistance to highly corrosive environments, sulfide stress cracking, and to intergranular attack. Application: Designed and recommended for the most serious corrosion problems due to its superior corrosion resistance & mechanical properties at both elevated and sub temperatures.
Sprayloy®	Steel Series: AISI 1045 Carbon Steel Features: A hard nickel-chromium spraymetal surface is applied to the outside diameter to further increase its tolerance to corrosion and abrasion. Application: Designed for maximum fatigue resistance, performance improvement and corrosion tolerance in effectively inhibited corrosive fluids. Can be used with all rod types.
Upset	Steel Series: AISI 4140 Chromium-Molybdenum Alloy Steel Features: Available in 1½" diameter in Grade 4140 and Grade 4140 High Torque (min. yield 115,000 psi). Application: Designed specifically for use in PC applications, Upset Polished Rods provide for maximum fatigue resistance and performance improvement in non-corrosive or effectively inhibited corrosion fluids. Upset Polished Rods in Grade 4140 are for use with 1¼" Drive Rods with 1½" pins; Upset Polished Rods in Grade 4140 High Torque are for use with 1½" Drive Rods.



Properties and Specifications

Type		Alloy Steel	Norloy Steel	Stainless Steel	XM-19 (N50)	Sprayloy®
Steel Series		4140	8620	431	XM-19	1045
Chemical Properties						
Carbon (C)		0.37/0.44	0.17/0.23	0.2 max.	0.06 max.	0.43/0.5
Chromium (Cr)		0.75/1.20	0.35/0.65	15.0/17.0	20.50/23.50	-
Manganese (Mn)		0.65/1.10	0.60/0.95	1.0 max.	4.00/6.00	0.6/0.9
Molybdenum (Mo)		0.15/0.25	0.15/0.25	-	1.50/3.00	-
Nickel (Ni)		-	0.35/0.75	1.25/2.5	11.50/13.50	-
Phosphorus (P)		0.035 max.	0.035 max.	0.04 max.	0.04 max.	0.030 max.
Silicon (Si)		0.15/0.35	0.15/0.35	1.0 max.	1.00 max.	-
Sulfur (S)		0.04 max.	0.04 max.	0.03 max.	0.030 max.	0.05 max.
Nitrogen (N)		-	-	-	0.20/0.40	-
Vanadium (V)		-	-	-	0.10/0.30	-
Niobium (Nb)		-	-	-	0.10/0.30	-
Physical Properties						
Tensile	ksi	120/150	100/140	115/145	135 min.	90 min.
	MPa	827/1034	689/965	792/1000	931 min.	620 min.
Diameter Tolerance	Inch	-0.010/+0.005	-0.010/+0.005	-0.010/+0.005	-0.010/+0.005	-0.010/+0.005
	mm	-0.0254/+0.127	-0.0254/+0.127	-0.0254/+0.127	-0.0254/+0.127	-0.0254/+0.127
Length Tolerance	inch	-2.0/+2.0	-2.0/+2.0	-2.0/+2.0	-2.0/+2.0	-2.0/+2.0
	Mm	-50.8/+50.8	-50.8/+50.8	-50.8/+50.8	-50.8/+50.8	-50.8/+50.8
Surface Finish	R _a , μin	8/32	8/32	8/32	8/32	8/32
	R _a , μm	0.2032/0.8128	0.2032/0.8128	0.2032/0.8128	0.2032/0.8128	0.2032/0.8128

Ref: MSS P-0001

Sprayloy® Coating		
Chemical Composition		
Aluminum (Al)		0.05 Max
Boron (B)		2.5/4.5
Carbon (C)		0.5/1.0
Chromium (Cr)		12.0/18.0
Cobalt (Co)		0.1 max.
Iron (Fe)		3.0/5.5
Phosphorus (P)		0.02 max.
Silicon (Si)		3.5/5.5
Sulfur (S)		0.02 max.
Titanium (Ti)		0.05 max.
Nickel (Ni)		Balance
Zirconium (Zr)		0.05 max.
Physical Properties		
Thickness	inch	0.008/0.020
	mm	0.203/0.508
Surface Finish	R _a , μin	8/32
	R _a , μm	0.2032/0.8128
Hardness	HV ₂₀₀	480 min.

ref: API Spec. 11B

Norris Polished Rods	
Descriptions	
Rod Diameter	Rod Pin Size
1½" (28.58mm)	⅝" (15.88mm)
	¾" (19.05mm)
1¼" (31.75mm)	⅝" (15.88mm)*
	¾" (19.05mm)*
	⅞" (22.23mm)
1½" (38.1mm)	1" (25.4mm)
*non-API configuration	
Standard lengths include: 22' (6.71m) 26' (7.92m) 30' (9.14m) 36' (10.97m) 40' (12.19m)	
Custom lengths and rod/pin combinations are available on special order.	



CARE AND HANDLING

Sucker Rods & Drive Rods® Standard Bundle Data

Imperial									
Rod Size	¾"	¾"	¾"	1"	1" w/ ¾" pin	1½"	1½" w/ 1" pin	1½" w/ 1½" pin	1½" w/ 1½" pin
Rods per bundle	120	60	60	60	60	40	40	30	30
Feet per bundle	3000	1500	1500	1500	1500	1000	1000	1000	750
Bundle weight (lbs)	3450	2470	3355	4375	4158	3705	4345	4472	4705
Rod weight per foot (lbs)	1.14	1.62	2.19	2.89	2.77	3.68	4.34	4.47	6.23
Rod weight (lbs)	28.5	40.5	54.8	72.3	69.3	92.0	108.5	111.8	155.8
Exporting Crate* Rods per crate	150	143	143	110	110	80	80	80	60

* Custom sized bundles may be arranged

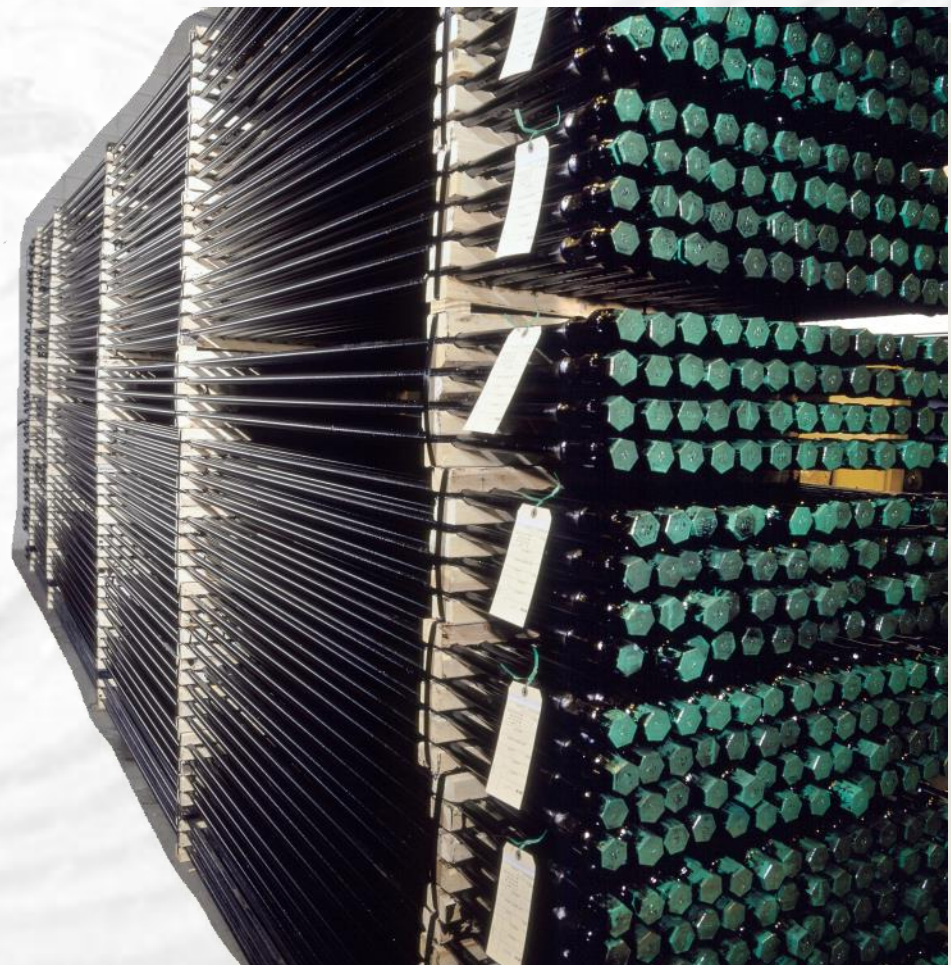
Metric									
Rod Size	15.88mm	19.05mm	22.23mm	25.4mm	25.4mm w/ 22.23mm pin	28.58mm	31.75mm w/ 25.4mm pin	31.75mm w/ 28.58mm pin	38.1mm w/ 28.58mm pin
Rods per bundle	120	60	60	60	60	40	40	30	30
Meters per bundle	914.4	457.2	457.2	457.2	457.2	304.8	304.8	304.8	228.6
Bundle weight (kg)	1564.89	1120.37	1521.80	1984.47	1886.04	1680.56	1970.86	2028.46	2134.15
Rod weight per meter (kg)	1.70	2.41	3.26	4.30	4.12	5.48	6.46	6.65	9.27
Rod weight (kg)	12.93	18.37	24.86	32.80	31.43	41.73	49.21	50.71	70.67
Exporting Crate* Rods per crate	150	143	143	110	110	80	80	80	60

* Custom sized bundles may be arranged

ref: SR Crating

Storage

1. Place sills under each spacer.
2. Stack bundles with spacers over each other.
3. Maximum recommended bundle stack is six (6) bundles high.
4. Always rotate rod stock.
5. Bundle width is 30" typically.
6. Handle bundles one at a time with proper lifting equipment.
7. For Spreader Bar information, call Alberta Oil Tool at 780-434-8566.



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RECOMMENDED MAKEUP PROCEDURES

For Sucker Rods, Drive Rods® and Pony Rods

The Static CD Method:

1) Verify the size and grade of sucker rods and ancillary equipment on location. DO NOT assume that equipment in the well matches the well data sheet. DO NOT assume that the sucker rods or other downhole equipment delivered to the location match the rod string design or work order sheet.

2) Run the subsurface pump and other necessary downhole equipment into the well. (i.e., sinker bars, on-off tools, shear tools, etc.) ALWAYS follow the manufacturers recommendations for all downhole equipment.

3) Pickup the first sucker rod, latch one end into the rod elevator and carry the other end until the sucker rod is hanging freely in the derrick. ALWAYS utilize two people when picking up and handling sucker rods. DO NOT allow the sucker rod to drag on the ground or over other metal objects.

4) Remove the plastic pin protector by hand, with an appropriate spanner wrench or an air impact wrench and 6-point socket. DO NOT use any other method to remove the plastic pin protectors.

5) Clean the threads, pin shoulder and coupling face. ALWAYS remove all debris during cleaning. (i.e., dirt, scale, old lubricant, plastic, etc.)

6) Visually inspect the threads, pin shoulder and coupling face for indications of damage (i.e., pitting, wear, dents, etc.) DO remove and replace damaged product prior to installation.

7) Remove one coupling from the box and apply a small amount of sucker rod lubricant to the coupling threads. ASSURE that the sucker rod lubricant has a grease-like consistency and contains corrosion inhibitors and antioxidants. DO NOT use pipe dope, Kopper Kote®, or other lubricants that contain fillers on threads.

8) Apply a degreasing agent, or similar degreasing agent to the pin shoulder and coupling face to remove any remaining lubricant film. DO use a clean rag for application. DO NOT allow lubricant to remain on the pin shoulder or coupling face.

9) Carefully “stab” the sucker rod onto the pump bushing, pony rod pin, sinker bar pin or coupling, whichever is looking up. Start the lead or first threads by hand. With a rod wrench, spin the connection together until the pin shoulder and the coupling face touch, which is the hand-tight assembly. DO NOT over-tighten. The connection is hand-tight when the pin shoulder and the coupling face touch without extraneous pressure applied.

10) Draw or scribe a vertical line across the top end of the coupling OD and the pin shoulder of the sucker rod. Use an appropriate Circumferential Displacement (CD) Card to measure and draw a second mark across the pin shoulder in the direction of tightening. Repeat the procedure at the bottom end of the coupling. Do assure that you are using the proper CD Card for your application. See the Circumferential Displacement Cards information sheet for details.



11) Power Tong Calibration and Usage Procedures:

- Back the tong pressure off to zero and position the power tongs on the connections.
- Attain full throttle and maintain constant engine RPM.
- Engage the power tongs and slowly increase the tong pressure until the first drawn mark on the coupling rotates to the second mark on the pin shoulder. The power tongs should come to a complete stop (i.e., the power tongs should stall) while engaged. DO NOT hit (bump) the connection again with the power tongs.
- Run this connection in the well.

- e. Repeat steps 3 through 10 with respect to handling, stabbing, hand-tightening the assembly and marking the connection for the next sucker rod.
- f. Attain full throttle and maintain constant engine RPM.
- g. Engage the power tongs and displace the connection at the current tong pressure setting. The power tongs should come to a complete stop (i.e., the power tongs should stall) while engaged. Do NOT hip (bump) the connection again with the power tongs.
- h. Check the pin shoulder and coupling marks for the correct displacement. If necessary, adjust the tong pressure, break and remake the connection.
- i. Once the correct displacement is obtained, run this connection in the well.
- j. With correct displacement now established, repeat steps 11e through 11i for a total of five times to audit the mechanical integrity of the power tongs and related equipment before proceeding to step 12.

12) Makeup Procedures:

- a. Repeat steps 3 through 9 with respect to handling, stabbing and hand-tightening the connection for next sucker rod.
- b. Attain full throttle and maintain constant engine RPM.
- c. Engage the power tongs and displace the connection at the current tong pressure setting. The power tongs should come to a complete stop (i.e., the power tongs should stall) while engaged. DO NOT hit (bump) the connection again with the power tongs.
- d. Run this connection in the well.

13) Recalibration Recommendations:

- a. Repeat steps 11e through 11i every tenth connection. DO adjust tong pressure as necessary at this step. This will account for changes in the temperature of the hydraulic oil and the resulting change in tong pressure displacement.
- b. Repeat steps 11e through 11i when changing sizes. EVERY change in rod size requires a change in circumferential displacement and an associated change in the tong pressure setting. ALWAYS use the current tong pressure setting for sub-couplings (i.e., changeover couplings crossover coupling, combination couplings, etc.)
- c. Repeat steps 11e through 11i after scheduled or unscheduled downtime such as lunch breaks, equipment repairs or other delays. DO adjust tong pressure as necessary at this step. This will account for changes in the temperature of the hydraulic oil and the resulting change in tong pressure displacement.

NOTICE

In addition to using the recommended makeup procedures, Norris also recommends the following:

- It is imperative that the power tongs and related equipment be maintained in accordance with the manufacturer's recommendations.
- When using power tongs, it is recommended that the hydraulic oil system be circulated until a normal operating temperature is reached and that this temperature be maintained within a reasonable level though calibration and installation of the rod string.
- With some power tongs, it may be necessary to loosen the coupling two or three turns to achieve the momentum necessary to make the connection up to the displacement required. Norris recommends that this practice be kept to a minimum.
- Use power tongs for all sizes except $\frac{5}{8}$ " (15.88mm) for consistent makeup.
- Use power tongs for breakout to prevent damage to the sucker rod / drive rod connection.
- When checking CD, the top and bottom mark may not line up exactly in the same position. This is usually not cause for concern. As long as both the top and bottom of the connection are lined up to within the width of the mark on the CD card, the rod is within the correct makeup tolerance.
- After using the CD method recommended for makeup a total of five times, change all couplings in the rod string prior to the next installation.
- The makeup torque for all Drive Rod® connections should be close to the maximum ft-lbs (Nm) torque value that the Drive Rod® will be operating at. (See Service Torque Values and page 7).

Along with the above procedures, Norris recommends the following:

- The use of rod wrenches or power tongs for breakout prevents joint damage from hammers.
- On larger diameter rods (1" (25.4mm) or greater), failure to fully engage, by hand, the connection together until the pin shoulder and the coupling face touch (hand-tight assembly) prior to applying power tongs, can result in thread galling.



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Recommended Makeup Procedures cont.

Effective makeup can be achieved by following the API recommendations in Section 5 of the RP11BR, "API Recommended Practice for Care and Handling of Sucker Rods." In general, the circumferential displacement method involves rotating the coupling against the pin shoulder after hand-tight contact. A prescribed dimension will preload the pin and generate a friction force between the shoulder faces.

Norris furnishes three circumferential displacement (CD) cards for recommended makeup. A displacement card is also available for Norris Drive Rods®.



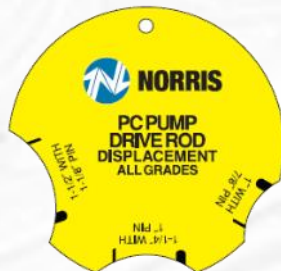
Displacement for Norris Types 54, 75 and 78

Size	New Rod First Run
$\frac{5}{8}$ " (15.88mm)	$\frac{10}{32}$ " (8mm)
$\frac{3}{4}$ " (19.05mm)	$\frac{13}{32}$ " (10mm)
$\frac{7}{8}$ " (22.23mm)	$\frac{16}{32}$ " (13mm)
1" (25.4mm)	$\frac{20}{32}$ " (16mm)
$1\frac{1}{8}$ " (28.58mm)	$\frac{22}{32}$ " (17mm)



Displacement for Norris Types 96 and 97

Size	New Rod First Run
$\frac{5}{8}$ " (15.88mm)	$\frac{11}{32}$ " (9mm)
$\frac{3}{4}$ " (19.05mm)	$\frac{15}{32}$ " (12mm)
$\frac{7}{8}$ " (22.23mm)	$\frac{18}{32}$ " (14mm)
1" (25.4mm)	$\frac{23}{32}$ " (18mm)
$1\frac{1}{8}$ " (28.58mm)	$\frac{25}{32}$ " (20mm)



Displacement for Norris Drive Rods®

Size	New Rod First Run
$\frac{7}{8}$ " w/ $\frac{3}{4}$ " pin (22.23mm w/ 19.05mm pin)	$\frac{13}{32}$ " (10mm)
1" w/ $\frac{7}{8}$ " pin (25.4mm w/ 22.23mm pin)	$\frac{18}{32}$ " (14mm)
1" w/ 1" pin (25.4mm w/ 25.4mm pin)	$\frac{18}{32}$ " (14mm)
$1\frac{1}{4}$ " w/ 1" pin (31.75mm w/ 25.4mm pin)	$\frac{18}{32}$ " (14mm)
$1\frac{1}{4}$ " w/ $1\frac{1}{8}$ " pin (31.75mm w/ 28.58mm pin)	$\frac{18}{32}$ " (14mm)
$1\frac{1}{2}$ " w/ $1\frac{1}{8}$ " pin (38.1mm w/ 28.58mm pin)	$\frac{18}{32}$ " (14mm)

ref:

NORRIS TECHNICAL SUPPORT

Alberta Oil Tool maintains and is continually adding informational documents and presentations to compliment our products. As well we regularly offer product training and information sessions. Please contact your Norris Representative or visit our website at www.albertaoiltool.com for more details.



RG INDUSTRIES

RG INDUSTRIES, the market leader in specialty designed guides for Reciprocating and PC Pump applications, provides complete evaluation of your production system, with recommendations for guide design, materials and spacing. This service includes computer modeling of guide impact on your system.



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RG INDUSTRIES

www.doverals.com
www.albertaoiltool.com
www.rodguideindustries.com
www.norrisrods.com

00081

Standard Products

Straight Vane Tapered Rod Guide

- Centralizers rod string reduce tubing and coupling wear
- Effective in removing paraffin from tubing walls, preventing buildup and improving pump efficiency and production
- Tapered end reduces turbulence and promotes streamlined flow in high volume wells or corrosive environments
- Reduces rod wear downhole
- Factory installed injection-molded guides provide excellent bonding strength
- Offered in a variety of materials to suit conditions

Straight Vane Tapered			
Rod Sizes			
5/8"	3/4"	7/8"	1"
Tubing Sizes			
2 3/8"	2 7/8"	3 1/2"	4 1/2"



Wide Vane Tapered			
Rod Sizes			
5/8"	3/4"	7/8"	1"
Tubing Sizes			
2 3/8"	2 7/8"	3 1/2"	4 1/2"

Wide Vane Tapered Rod Guide

Streamlined...wide vanes, deep concave channels, extended tapered ends

- Improves flow characteristics and wear protection thanks to deep, concave channels and wide vanes
- Distributes load across wider vanes, resulting in improved downhole wear protection and longer life
- Provides durability required for highly deviated wells
- Promotes smooth, unrestricted flow through extended tapered ends
- Contains more erodible material than conventional designs
- Improves shock and impact resistance
- Custom-designed for each rod and tubing size to allow maximum vane width
- Comes in a variety of materials to suit application requirements
- Factory installed, injection-molded for excellent holding power
- 5"(127mm) length

Snap-On Rod Guide

The snap on design is now improved with AU materials that provide longer wear. Better chemical resistance, broader service temperature ranges, better rod retention and easier installation.



00082

Standard Products continued...

Sidewinder Rod Guide

Performance Improvements...produce more oil, longer service life

- Shorter Length does not inhibit rod flex, reducing rod stress
- More erodible wear volume for less maintenance
- More pumping efficiency. Flow geometry results in less turbulence, increasing pumping efficiency
- 6"(152.4mm)

Sidewinder			
Rod Sizes			
3/4"	7/8"	1"	
Tubing Sizes			
2 3/8"	2 7/8"		



Tomahawk			
Rod Sizes			
5/8"	3/4"	7/8"	1"
Tubing Sizes			
2 3/8"	2 7/8"		

Tomahawk Rod Guide

Large footprint with excellent flow-by

- Patented vane design provides largest footprint with least amount of flow restriction
- Excellent erodible wear volume for lower incidence of replacement
- Best protection with the least amount of material down hole compared to similar designs
- Excellent protection in heavy side load application
- Out performs other straight vane designs
- 7"(177.8mm) length

Twister/Tornado Rod Guides

Full paraffin removal...eliminate tubing grooving. Excellent for high side loading. The Spiral Design of the Twister and Tornado vanes maximizes the rotation of the rod string in the Tubing in conjunction with a rod rotator.

- Centralizes rod string to reduce tubing and coupling wear
- Particularly effective in highly deviated holes
- Eliminates grooving of production tubing caused by reciprocating action of guides
- Reduces paraffin buildup - 360° wraparound vanes, clean tubing walls
- Better fluid bypass through — extra wide flow channels, streamlined design
- Extends guide life because wide vanes lower point side-loads
- More erodable volume than standard guides
- Offered in a variety of materials to suit well conditions
- Twister, 5"(127mm) length
- Tornado, 7"(177.8mm) length

Twister			
Rod Sizes			
5/8"	3/4"	7/8"	
Tubing Sizes			
2 3/8"	2 7/8"		

Tornado			
Rod Sizes			
5/8"	3/4"	7/8"	1"
Tubing Sizes			
2 7/8"	3 1/2"		



Progressing Cavity Products

PCT Guide

- Protects Rod Body
- Protects Coupling
- Centralizes Rods
- Assists Fluid Lift
- No moving parts

PCT	
Rod Sizes	
$\frac{7}{8}"$	1"
Tubing Sizes	
$2\frac{7}{8}"$	$3\frac{1}{2}"$



Vertere Coupling-PC Guide

Reduce rod string harmonics, centralize rod string, field installable.

- Coupling body with box ends made from one piece, high-strength 4140 material, Rod sleeve and outer guide molded in place with metal clip, hardened, for increased wear life.
- Designed for PC pump applications.
- Centralizes the rod string at the coupling to reduce tubing wear and rod string harmonics
- Engineered plastic rod sleeve designed for high abrasion resistance and temperature

Vertere	Spindle Size	Guide O.D.
$\frac{7}{8}" \times 2\frac{1}{2}"$ (22.23mm x 63.5mm)	$\frac{7}{8}"$ Reg. x $1\frac{1}{2}"$ (22.23mm x 342.9mm)	2.30" (58.42mm)
$\frac{7}{8}" \times 3"$ (22.23mm x 76.2mm)	$\frac{7}{8}"$ Reg. x $1\frac{1}{2}"$ (22.23mm x 342.9mm)	2.80" (71.12mm)
1" x $2\frac{1}{2}"$ (25.4mm x 63.5mm)	1" SH x $1\frac{1}{2}"$ (25.4mm x 342.9mm)	2.30" (58.42mm)
1" x 3" (25.4mm x 76.2mm)	1" SH x $1\frac{1}{2}"$ (25.4mm x 342.9mm)	2.81" (71.37")

ref:

Progressing Cavity Products continued...

Jake Coupling Guide

Prevents tubing and coupling wear...



- Available in Class T and High Strength materials
- Centralizes the rod string at the coupling to reduce tubing wear
- Designed specifically for PC pump applications
- Coupling is protected by high wear, low friction, abrasion resistant plastic coating
- RGI engineered material will not soften, peel, or swell in gassy or high temperature wells
- Coupling coating has excellent chemical and high temperature properties
- The proprietary material has an enhanced Amodel base, resulting in a product which has increased durability, high impact resistance and excellent side load capabilities
- Use of high quality API rolled thread steel couplings
- Guide is injection molded onto coupling over under cut portion to mechanically lock to coupler

Jake Coupling	Coupling Size	Coating O.D.
7/8" Jake (22.23mm)	7/8" SH x 6" (22.23mm x 152.4mm)	1.960" (49.784mm)
1" Jake (25.4mm)	1" SH x 6" (25.4mm x 152.4mm)	2.245" (57.02mm)
1" Fat Jake (25.4mm)	1" SH x 6" (25.4mm x 152.4mm)	2.380" (60.45mm)
1 1/8" Jake (25.4mm x 76.2mm)	1" SH x 13 1/2" (25.4mm x 342.9mm)	2.81" (71.37")

ref:

Rod Jake-PC Rod Wear Pad

Extend Tubing and Rod life with Rod Jake wear pads

- Rod Jake wear pad uses RGI engineered plastic for high wear resistance
- Engineered plastic also reduces tubing wear
- No moving parts
- For best results use in conjunction with Jake Coupling
- Cost effective way to extend production time, reducing costly down time



Rod Jake	Coating OD	Length
7/8" Rod Jake (22.23mm)	1.525" (38.74mm)	5.25" (133.35mm)
1" Rod Jake (25.4mm)	1.65" (41.91mm)	5.25" (133.35mm)

ref:

Guide Spacing and Material Recommendations

Spacing Recommendations

Excessive side loads occur when there is a deviation in the well bore or the rod string is in compression. Both conditions may occur in the same well. Side load and guide design determine the number of guides per rod needed to effectively protect rods and tubing. With information from a directional survey, RG Industries can project side loads in all areas of a well. Well history on rod and tubing failure is also considered. To determine proper spacing of guides for effective paraffin control, the distance between guides must not exceed the effective stroke length, below the point in the well where paraffin begins to form (cloud point).

To determine the required number of molded-on guides per 25' (7620mm) sucker rod, verify effective stroke length and consult the chart.

Paraffin Scraper Spacing (25' Sucker Rod)		
Effective Stroke Length		Number of Mold-On Guides Required
More Than	But Not Over	
88.0"	∞	4
68.5"	88.0"	5
54.0"	68.5"	6
44.5"	54.0"	7
37.5"	44.5"	8
Custom Spacing available on request.		

ref: DP#50

Material Recommendations

Rod guide and paraffin scraper materials are carefully selected depending on factors such as bottom hole temperatures, fluids produced and the presence of abrasives. Contact your Norris Representative to discuss your requirements.

Two base polymers, PPA (Polyphthalamide) and PPS (Polyphenylene sulphide), are used. These polymers are reinforced with glass or carbon fibre to maximize performance in the harsh environment in which they are used. Mineral fillers are sometimes added to reduce costs and in some instances enhance performance.

Material Recommendations Reference Chart								
Material	Colour	Max Temperature	For Hot Oiling	For Sweet	For Sour	For Sand	For Water	For Brine
NHT	Natural	500° F	●	●	●	●	●	●
Polyphenylene Sulphide (Ryton)(PPS)	Black	400° F	●	●	●	●		●
Amodel Resin (PPA)(AF)	Green	400° F	●	●	●	●	●	●
RG1 (PPA)	Purple	350° F	●	●	●	●	●	●
Amodel Resin (PPAU)(AU)	White	250° F		●		●	●	●
Adamantine	Grey	212° F		●		●	●	●

ref:

*All Highlighted Cells must be submitted for a new or existing design

Date				Contact Name			
Company				Office Ph.			
Lease/Field/LSD				Fax			
Well #				Mobile Ph.			
				Email			

1	Controller	<input type="checkbox"/> None <input type="checkbox"/> Pump Off <input type="checkbox"/> Time Clock <input type="checkbox"/> Variable Speed <input type="checkbox"/> Vibration Switch <input type="checkbox"/> 24 Hr. % Runtime _____ Min. Off _____ On _____	

2	Prime Mover	<input type="checkbox"/> Electric <input type="checkbox"/> Gas	
3		Manufacturer	
4		Type	
5		Size / HP	
6		Torque Mode	
7	Frame		

8	Pumping Unit / Drive Unit	Manufacturer	
9		Type	
10		Size	
11		Rotation	<input type="checkbox"/> CW <input type="checkbox"/> CCW
12		SL	
13		SPM	

14	Sucker Rod String / Driverod® String <input type="checkbox"/> New Design <input type="checkbox"/> Use Specified Design							
	Number	Ft/Meter	Rod Size	Rod Type	Coupling	Manufacturer	New / Used	Installed

15	Rod Guides Scrapering	<input type="checkbox"/> Rod Guides <input type="checkbox"/> Paraffin Scrapers	
17		Manufacturer	
19		Material	

16	<input type="checkbox"/> Injection Molded <input type="checkbox"/> Field Installed	
18	Size	
20	Style	

21	Rod Pump	<input type="checkbox"/> Large Bore <input type="checkbox"/> Insert <input type="checkbox"/> Tubing <input type="checkbox"/> Other	
22		Pump Bore	
23		Plunger Type	
24		Plunger Length	

26	PC	Manufacturer	
27	Pump	Model	

25	Plunger Fit	
----	-------------	--

28	Tubing String	Size		Weight	
29		Grade			
30		Seating Nipple Depth			
34		<input type="checkbox"/> Gas Separator <input type="checkbox"/> Mud Anchor			
36		Back Pressure Valve	<input type="checkbox"/> Yes <input type="checkbox"/> No		
37		Flowline Pressure			

31	<input type="checkbox"/> Anchor <input type="checkbox"/> Packer	
32	Setting Depth	
33	Setting Tension	
35	Description	
38	Tubing Pressure	

39	Completion Data	Casing Size	
41		Liner	<input type="checkbox"/> Yes <input type="checkbox"/> No
43		<input type="checkbox"/> Deviated* <input type="checkbox"/> Vertical	
44		Total Depth	
45		Plug Back Depth	

40	Casing Weight	
42	Casing Pressure	
46	<input type="checkbox"/> Cased (Perforations) <input type="checkbox"/> Open Hole From _____ To _____	

47	Fluid & Production Data	Total Fluid	<input type="checkbox"/> BPD <input type="checkbox"/> M³PD
48		Oil	<input type="checkbox"/> BPD <input type="checkbox"/> M³PD
49		Oil, °API	
50		Gas	<input type="checkbox"/> MCF/D <input type="checkbox"/> M³M³/D
54		Oil %	
56		GLR %	
58		Fluid Specific Gravity	
60		Pump Intake Pressure	
64		Fluid pH	
65		Chlorides, ppm	
66		CO₂, ppm	
67		H₂S, ppm	
68	Fluid Viscosity, cP		

51	Water	<input type="checkbox"/> BPD <input type="checkbox"/> M³PD
52	Water Specific Gravity	
53	Gas Specific Gravity	
55	Water %	
57	GOR %	
59	Tubing Gradient	
61	Pumping Fluid Level	
62	Static Fluid Level	
63	BH Temperature	<input type="checkbox"/> °F <input type="checkbox"/> °C
69	<input type="checkbox"/> Paraffin <input type="checkbox"/> Sand <input type="checkbox"/> Scale <input type="checkbox"/> Other	

NORRIS TUBULAR PRODUCTS



Tubular Fittings

Norris swages and bull plugs are known throughout the industry for their precision and reliability. Manufactured in Canada by Alberta Oil Tool, Norris fittings are available in a wide range of sizes, grades and thread types. It all begins with superior materials. Norris fittings are made of forged and machined seamless steel in accordance with API and ANSI specifications. Each item is carefully inspected to ensure quality fabrication and perfect threads. All of our fittings are beveled for easy starting, and color coded pipe threads make instant identification of thread type possible. To ensure traceability of Norris fittings and Pup Joints is effortless, each piece is steel stamped for company, material and mill identification.

Swage Nipples

Norris Swage Nipples are made from new full weight material that is either hot forged or accurately machined on our numerically controlled lathes, ensuring a perfect thread every time. The threads on Norris hexagon swages 1" (25.4mm) and smaller are never cut. Our production technique exerts sufficient pressure to completely cold form fully rolled threads. This literally rearranges the metallic structure to reinforce and smooth both thread root and flanks. Norris swage nipples are available in both thread by thread and beveled by thread combinations, in weights of standard, extra heavy, double-extra heavy and SCH 160.

In keeping with industry demands, Norris Tubing and Casing Swages 2" (50.8mm) and larger are manufactured from forged and machined materials. Available in J-55, K-55 and L-80 materials and pin & box. Norris low-temperature Swages are manufactured in accordance with API and ANSI specifications and from material conforming to ASTM A350-LF2 and ASTM A420 Grade WPL6 to meet the severe conditions encountered during extreme low temperatures. They are available in extra-heavy and SCH 160 weights, in sizes 1/2" (3.175mm) through 4" (101.6mm).



Bull Plugs

Norris Bull Plugs are manufactured with forged and machined seamless steel in accordance with API and ANSI specifications. The Norris forged steel Bull Plug is three times stronger in the nose as compared to ordinary drawn nose bull plugs. The Norris method puts far more strength in the area where it is needed most. AOT's use of numerically controlled lathes ensure a perfect thread on every Bull Plug. As a safeguard, all critical thread elements are inspected on a continuous basis. As with Norris Swage Nipples 1" (25.4mm) and smaller, the threads on our Bull Plugs 1" (25.4mm) and smaller are never cut. We completely cold form our threads, a technique which literally rearranges the metallic structure to reinforce and smooth both thread root and flanks.

Alberta Oil Tool also manufactures a line of low-temperature/sour-service Bull Plugs. Manufactured to ASTM A350-LF2 and ASTM A420 Grade WPL6 material to meet the severe conditions encountered at extreme temperatures.

In keeping with industry demands, Norris bull plugs are available in various sizes, grades of materials wall thickness' and thread types. Norris bull plugs are manufactured from line pipe, tubing and casing.



00088

Tubing and Casing Couplings

Seamless steel tubing couplings are available in J-55 and L-80 grades, each color coded for easy material identification. Sub and combination couplings and special tubing couplings are both available in 2½"(60.33mm), 2"(73.03mm), and 3½"(88.9mm) sizes.

Special Clearance Tubing Couplings	Size	2½" (60.33mm)	2" (73.03mm)	3½" (88.9mm)
	Tubing O.D.	2½"(60.33mm) upset	2"(73.03mm) upset	3½"(88.9mm) upset
	Coupling O.D.	2.910"(73.91mm)	3.460"(87.88mm)	4.180"(106.17mm)
	Length	4½"(123.83mm)	5½"(133.35mm)	5½"(146.05mm)
	Threads	8 Rd.	8 Rd.	8 Rd.

ref: API Spec. SCT, 5B



Sub and Combination Couplings	Size	O.D.	Length
	2½"(60.33mm) non-upset x 2½"(60.33mm) non-upset	2"(73.03mm)	4½" (107.95mm)
	2½"(60.33mm) upset x 2½"(60.33mm) upset	3 ¹¹ / ₁₆ "(77.79mm)	4½"(123.83mm)
	2½"(60.33mm) upset x 2½"(60.33mm) non-upset	3 ¹¹ / ₁₆ "(77.79mm)	4½"(123.83mm)
	2"(63.5mm) non-upset x 2½"(63.5mm) non-upset	3½"(88.9mm)	5½"(130.18mm)
	2"(63.5mm) non-upset x [smaller size]	3½"(88.9mm)	5½"(130.18mm)
	2"(63.5mm) upset x 2½"(63.5mm) upset	3 ¹¹ / ₁₆ "(77.79mm)	5½"(133.35mm)
	2"(63.5mm) upset x [smaller size]	3 ¹¹ / ₁₆ "(77.79mm)	5½"(133.35mm)
	3½"(88.9mm) non-upset x 3½"(88.9mm) non-upset	4½" (107.95mm)	5½"(142.88mm)
	3½"(88.9mm) non-upset x [smaller size]	4½" (107.95mm)	5½"(142.88mm)
	3½"(88.9mm) upset x 3½"(88.9mm) upset	4½" (114.3mm)	5½"(146.05mm)
	3½"(88.9mm) upset x [smaller size]	4½" (114.3mm)	5½"(146.05mm)

ref: API Spec. SCT



Casing Couplings (Seamless)	Size	O.D.	API Casing Couplings			
			Short		Long	
			Length	Threads per inch	Length	Threads per inch
	4½" (114.3mm)	5.000"(127mm)	6½"(158.75mm)	8 Rd.	7"(177.8mm)	8 Rd.
	5"(127mm)	5.563"(141.3mm)	6½"(165.1mm)	8 Rd.	7¾"(196.85mm)	8 Rd.
	5½"(139.7mm)	6.050"(153.67mm)	6¾"(171.45mm)	8 Rd.	8"(203.2mm)	8 Rd.
	6"(152.4mm)	-	-	-	-	-
	6¾"(168.28mm)	7.390"(187.71mm)	7¾"(184.15mm)	8 Rd.	8¾"(222.25mm)	8 Rd.
	7"(177.8mm)	7.875"(200.03mm)	7¾"(184.15mm)	8 Rd.	9"(228.60mm)	8 Rd.
	7¾"(193.68mm)	8.500"(215.9mm)	7¾"(190.5mm)	8 Rd.	9¾"(234.95mm)	8 Rd.
	8¾"(219.08mm)	9.625"(244.48mm)	7¾"(196.85mm)	8 Rd.	10"(254mm)	8 Rd.
	9¾"(244.48mm)	10.625"(269.88mm)	7¾"(196.85mm)	8 Rd.	10½"(266.7mm)	8 Rd.
	10¾"(273.05mm)	11.750"(298.45mm)	8"(203.2mm)	8 Rd.	-	-
	11¾"(298.45mm)	12.750"(323.85mm)	8"(203.2mm)	8 Rd.	-	-
	13¾"(339.73mm)	14.375"(365.13mm)	8"(203.2mm)	8 Rd.	-	-
	16"(406.4mm)	17.000"(431.8mm)	9"(228.6mm)	8 Rd.	-	-

Except for the special outside diameter and an outside bevel on each end to facilitate clearance, Special Clearance Tubing Couplings are manufactured to API specifications. All sizes are taper tapped ¼" per foot on diameter.

ref: API Spec. SCT, 5B



Tubing Couplings (Seamless)	Size	Tubing O.D.	API External Upset			API Non-Upset		
			Coupling O.D.	Length	Threads per inch	Coupling O.D.	Length	Threads per inch
	1.050"(26.67mm)	1.050"(26.67mm)	1.660"(42.16mm)	3½"(82.55mm)	10 Rd.	1.313"(33.34mm)	3 ³ / ₁₆ "(80.96mm)	10 Rd.
	1.315"(44.4mm)	1.315"(44.4mm)	1.900"(48.26mm)	3½"(88.9mm)	10 Rd.	1.660"(42.16mm)	3½"(82.55mm)	10 Rd.
	1.660"(42.16mm)	1.660"(42.16mm)	2.200"(55.88mm)	3½"(95.25mm)	10 Rd.	2.054"(52.17mm)	3½"(88.9mm)	10 Rd.
	1.900"(48.26mm)	1.900"(48.26mm)	2.500"(63.5mm)	3¾"(98.43mm)	10 Rd.	2.200"(55.88mm)	3¾"(95.25mm)	10 Rd.
	2½"(60.33mm)	2.375"(60.33mm)	3.063"(77.80mm)	4½"(123.83mm)	8 Rd.	2.875"(73.03mm)	4½"(107.95mm)	10 Rd.
	2¾"(73.03mm)	2.875"(73.03mm)	3.668"(93.16mm)	5½"(133.35mm)	8 Rd.	3.500"(88.9mm)	5½"(130.18mm)	10 Rd.
	3½"(88.9mm)	3.500"(88.9mm)	4.500"(114.3mm)	5½"(146.05mm)	8 Rd.	4.250"(107.95mm)	5½"(142.88mm)	10 Rd.
	4"(101.6mm)	4.000"(101.6mm)	5.000"(127mm)	6"(152.4mm)	8 Rd.	4.750"(120.65mm)	5½"(146.05mm)	8 Rd.
	4½"(114.3mm)	4.500"(114.3mm)	5.563"(141.3mm)	6¾"(158.75mm)	8 Rd.	5.200"(132.08mm)	6¾"(155.58mm)	8 Rd.

ref: API Spec. SCT, 5B

Tubing and Casing Nipples

In keeping with industry demands, AOT manufactures a complete line of Norris Tubular and Casing Nipples. These products are available in various diameters, lengths, material grades, thread types and wall thicknesses.



Crossovers

Norris Swage Nipples, Tubing Couplings and Tubing Nipples are available in a range of Crossover combinations. Offered in industry standard sizes, material weights and grades, Norris Crossovers are manufactured with a variety of thread type combinations in Box x Box, Box x Pin, Pin x Box and Pin x Pin configurations.



Pump Seating Nipple

Manufactured to exacting standards, Norris Pump Seating Nipples are used to seat the pump and seal the opening between the pump and the tubing.

Tubing Thread	Length	Inside Diameter	Connection	API 11AX
2 $\frac{3}{8}$ " EUE 8Rd	12"	1.780"	Pin x Pin	Yes
2 $\frac{7}{8}$ " EUE 8Rd	12"	2.280"	Pin x Pin	Yes
2 $\frac{7}{8}$ " EUE 8Rd	12"	2.290	Pin x Pin	No
2 $\frac{7}{8}$ " EUE 8Rd	12"	2.325"	Pin x Pin	No
2 $\frac{7}{8}$ " EUE 8Rd	12"	2.331"	Pin x Pin	No
3 $\frac{1}{2}$ " EUE 8Rd	12"	2.280"	Pin x Pin	No
3 $\frac{1}{2}$ " EUE 8Rd	12"	2.780"	Pin x Pin	Yes

ref: API Spec. 11AX



Pup Joints

Norris Pup Joints are furnished in grades J-55 and L-80. They are available in both upset and non-upset ends. All Pup Joints are manufactured from new full weight seamless tubing and are color coded. Every pup joint is hydrostatically tested to meet the strict API-5CT specification. Each Norris pup joint carries code numbers which permanently links it to file copy records documenting every detail of raw material, testing, manufacturing processes and quality control measures. Perforated Pup Joints and Slotted Pup Joints are also available.



Non-Upset	Size, OD	Nominal Weight	Test Pressure		Drift	Inside Diameter
			Grade J-55	Grade L-80		
	2⅜" (60.32mm)	4.60 lb./ft.	7,000 psi	10,000 psi	1.901" (48.29mm)	1.995" (50.66mm)
	2⅝" (73.02mm)	6.40 lb./ft.	6,600 psi	9,700 psi	2.347" (59.61mm)	2.441" (62.00mm)
	3½" (88.9mm)	9.20 lb./ft.	6,400 psi	9,300 psi	2.867" (72.82mm)	2.992" (76.00mm)

External Upset	Size, OD	Nominal Weight	Test Pressure		Drift	Inside Diameter
			Grade J-55	Grade L-80		
	2⅜" (60.32mm)	4.70 lb./ft.	7,000 psi	10,000 psi	1.901" (48.29mm)	1.995" (50.66mm)
	2⅝" (73.02mm)	6.50 lb./ft.	6,600 psi	9,700 psi	2.347" (59.61mm)	2.441" (62.00mm)
	3½" (88.9mm)	9.30 lb./ft.	6,400 psi	9,300 psi	2.867" (72.82mm)	2.992" (76.00mm)

ref: API Spec. 5CT

Sleeve Couplings

Norris Sleeve-type Couplings provide a quick, flexible joint for plain-end pipe. A resilient gasket, made of oil and gas resilient Buna N, compresses around the pipe ends as bolts are tightened, resulting in a leak-proof, self-aligning seal. Style 380 (short) and 400 (long) Sleeve Couplings consist of sleeve, gaskets, end caps, bolt and nuts. All metal parts are painted for improved resistance to atmospheric corrosion. Replacement parts are also available.

Styles #380 and #400 Coupling Pressures	Size	Working Pressure	
		Style #380	Style #400
	2" (50.8mm)	1,000 psi	1,000 psi
	2½" (63.5mm)	1,000 psi	1,000 psi
	3" (76.2mm)	1,000 psi	1,000 psi
	4" (101.6mm)	1,000 psi	1,000 psi
	6" (152.4mm)	850 psi	850 psi
	8" (203.2mm)	600 psi	600 psi
	10" (254mm)	500 psi	500 psi
	12" (304.8mm)	500 psi	500 psi

ref:



Repair Clamps

Style 2450 Norris "Jiffy" Repair Clamps are designed for quick and easy repair of blowouts, splits and other leaks in all types of pipe and tubing. The stainless steel band with diamond grid Buna N lining conforms to pipe irregularities and provides a positive seal without collapsing the pipe. Lug castings are made from malleable iron, contoured for precision fit and coated for corrosion resistance. One lug has an open slot for fast, easy installation and the others have precision square openings to secure the bolts while tightening. Elongated squares under the bolt heads mate with lug openings to assure proper closure. Carbon steel bolts, nuts and washers are standard and stainless steel fasteners are available on special order.

Jiffy Clamp Sizes	Band Width	No. Sections	No. Bolts	Style	For Pipe Size
	3"(76.2mm)	1	1	2450	½"(12.7mm) - 8"(203.2mm)
				2460	2"(50.8mm) - 4"(101.6mm) steel pipe, PVC
	3"(76.2mm)	2	2	2450	10"(254mm) - 24"(609.6mm)
	6"(152.4mm)	1	2	2450	½"(12.7mm) - 8"(203.2mm)
				2460	2"(50.8mm) - 4"(101.6mm) steel pipe
	6"(152.4mm)	2	4	2450	10"(254mm) - 24"(609.6mm)
	9"(228.6mm)	1	3	2450	2"(50.8mm) - 8"(203.2mm)
	9"(228.6mm)	2	6	2450	10"(254mm) - 24"(609.6mm)
	12'(304.8mm)	1	4	2450	2"(50.8mm) - 8"(203.2mm)
	12"(304.8mm)	2	8	2450	10"(254mm) - 24"(609.6mm)
	15"(381mm)	2	10	2450	10"(254mm) - 24"(609.6mm)
	18"(457.2mm)	2	12	2450	10"(254mm) - 24"(609.6mm)

ref:



CUSTOM

Custom Machining & Finishing

Alberta Oil Tool can custom machine to your specifications. Our experienced staff have the knowledge and machinery to take your ideas from concept to creation.

Alberta Oil Tool offers a variety of special finishes and coatings to meet various conditions and applications, such as Boronizing, Chrome Plating, Nickel Plating, Nitriding & Zinc Phosphating.

Contact your Norris Representative to discuss your requirements.





DOVER

ARTIFICIAL LIFT



Dover Artificial Lift is comprised of Dover Corporation's energy solutions companies, all leaders in their respective fields, working together and utilizing their collective resources to help oil & gas producers optimize revenues, profitability, safety and environmental compliance through high-quality production, completion, gathering, and control systems.

Dover Artificial Lift companies share a customer-driven focus and commitment towards delivering oil & gas production operations increased production, reduced end-user costs and improved environmental compliance. Offering scale, scope and industry-leading products and expertise, Dover Artificial Lift is uniquely qualified to provide integrated solutions across the artificial lift spectrum, delivering the latest technologies, innovations and solutions in rod lifts, plunger lifts, well site controls, analytic tools and customer-centric training and educational programs.

DOVER (NYSE: DOV) is an \$7 billion diversified global manufacturer of value-added products and systems serving a variety of industrial and commercial markets including energy, product identification, material handling, electronic components and equipment, mobile equipment, engineered products and fluid solutions. Dover Artificial Lift is a division within the Dover Energy business segment.



Product Line Card

Norris® Rod Lift Products

Drive Rods® & Drive Pony Rods
 Lift Subs
 Polished Rods
 Polished Rod Bullets
 RGI PC Guides (PCT, Vertere & Jake Couplings)
 RGI Rod Guides (Sidewinder, Tomahawk, Twister/Tornado)
 Rotor Connectors
 Shear Couplings
 Sinker Bars
 Stabilizer Bars
 Sucker Rod Couplings
 Sucker Rods & Pony Rods

Norris® Tubular Products

Belled Nipples
 Bull Plugs
 Casing Couplings
 Casing Nipples & Sub Casing Nipples
 Crossovers
 Jiffy Repair Clamps
 Pump Seating Nipples
 Pup Joints & Perforated Pup Joints
 Safety Sleeves
 Sleeve Couplings
 Swage Nipples
 Tubing Couplings & Sub Tubing Couplings
 Tubing Mandrels
 Tubing Nipples & Sub Tubing Nipples

Harbison-Fischer® Products

Polished Rod Clamps
 Pump Barrels
 Plungers
 Pump Parts & Accessories
 Stuffing Boxes
 Stuffing Box Packing
 Valve Rods

Norriseal® Products

Butterfly Valves
 Chambers & Domes
 Check Valves
 Control Valves
 Liquid Level Controllers
 Liquid Level Gauges
 Liquid Level Switches
 Pressure Controllers
 Regulators

Custom Machining

Customization of products or machining to Customer specifications.

Technical & Product Support

Care & Handling Presentations
 Field Failure Analysis
 Rod String Design
 Valve & Level Controller Sizing
 On-site Support & Training
 Plant Tours

Other Products & Accessories

Alberta Oil Tool and the Dover Artificial Lift group of companies can supply a wide range of additional products to meet Artificial Lift and Wellhead needs. Contact your representative for details.

For more information contact:

Sales

Alberta Oil Tool | Dover Artificial Lift
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AOT_Sales@DoverALS.com

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For further information please contact:



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