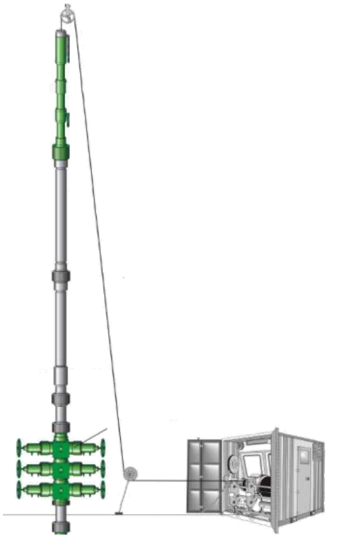
DIMENSION BID

WELL INTERVENTION | PERFORATION SERVICES

BASIC SL



# BASIC SLICKLINE QUICK GUIDE BOOK

## BASIC WELL DETAILS

TECHNICAL DEVELOPMENT UNIT

## SLICKLINE : INTRODUCTION

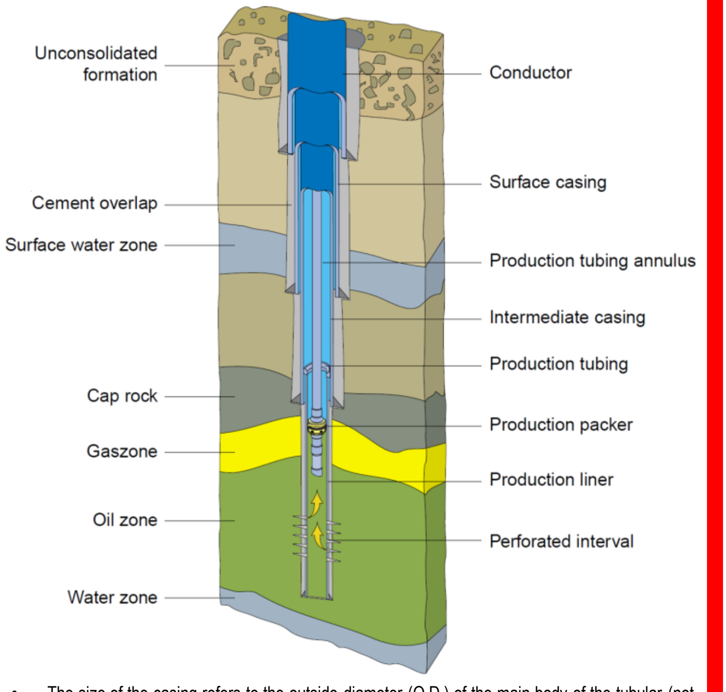


### FUNCTIONAL DESCRIPTION

- The term Slickline relates to the use of a wire or braided line to convey downhole tools or equipment in a wellbore.
- The first use of wire in a wellbore was as a measuring device.
- The first noted use of slickline was by Halliburton to follow a cement plug down while cementing a well.
- These units were originally mounted on the rig, although they later became part of the equipment of the service engineer and were operated off of the left rear wheel of a car or pickup truck.
- Slickline (and occasionally braided line) is commonly used in the following operations:
  - Checking the production tubing drift
  - Checking the build up of wax, scale or wellbore deposits
  - Confirming the well depth or clearance to perforations
  - Running and pulling plugs or flow control devices
  - Opening and closing SSD or similar completion equipment
  - Conducting pressure and temperature surveys using mechanical or electrical gauges and recorders
  - Installing tubing pack-offs or similar completion devices
  - Logging (MPLT) and perforating (SL Perf)

# LINER COMPLETION

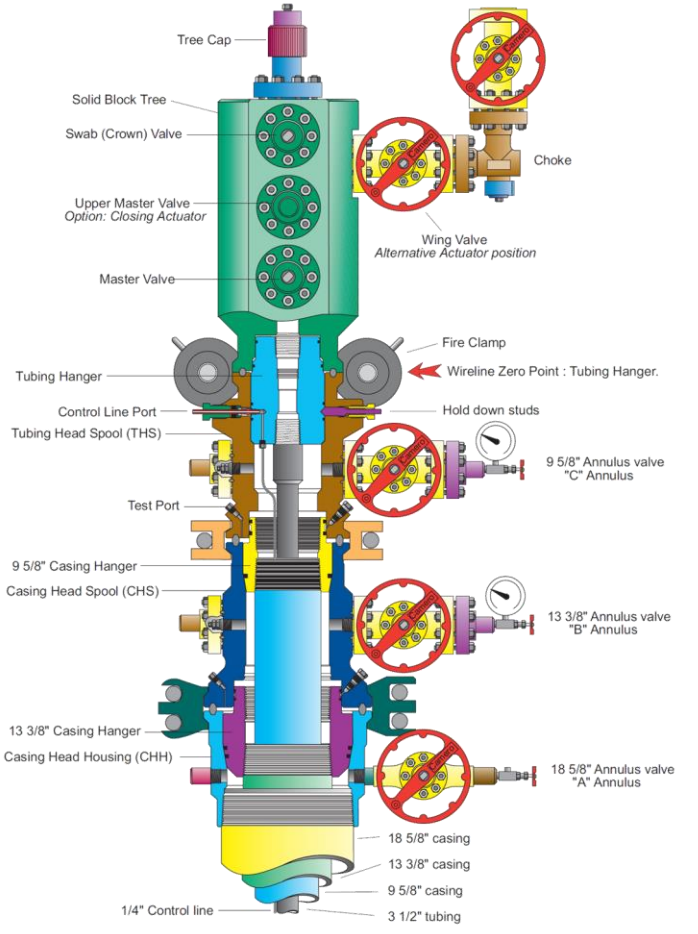





- The size of the casing refers to the outside diameter (O.D.) of the main body of the tubular (not the connector).
- Casing sizes vary from 4.5" to 36" diameter.
- Tubulars with an O.D. of less than 4.5" are called Tubing.
- The API standards recognize three length ranges for casing:
  - ❑ Range 1 (R-1): 16 – 25 ft
  - ❑ Range 2 (R-2): 25 – 34 ft
  - ❑ Range 3 (R-3): > 34 ft
- Casing is run most often in R-3 lengths to reduce the number of connections in the string.
- Since casing is made up in single joints, R-3 lengths can be handled easily by most rigs.

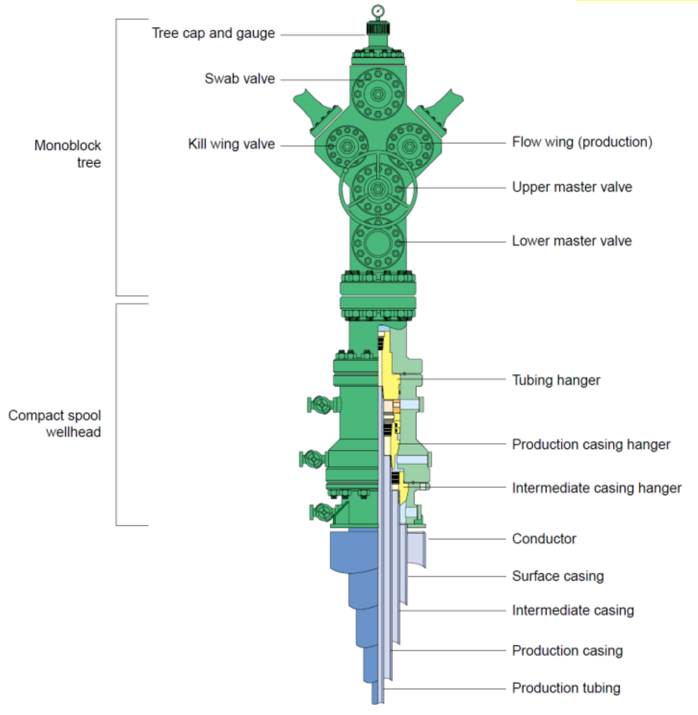
# X-MAS TREE

03/25



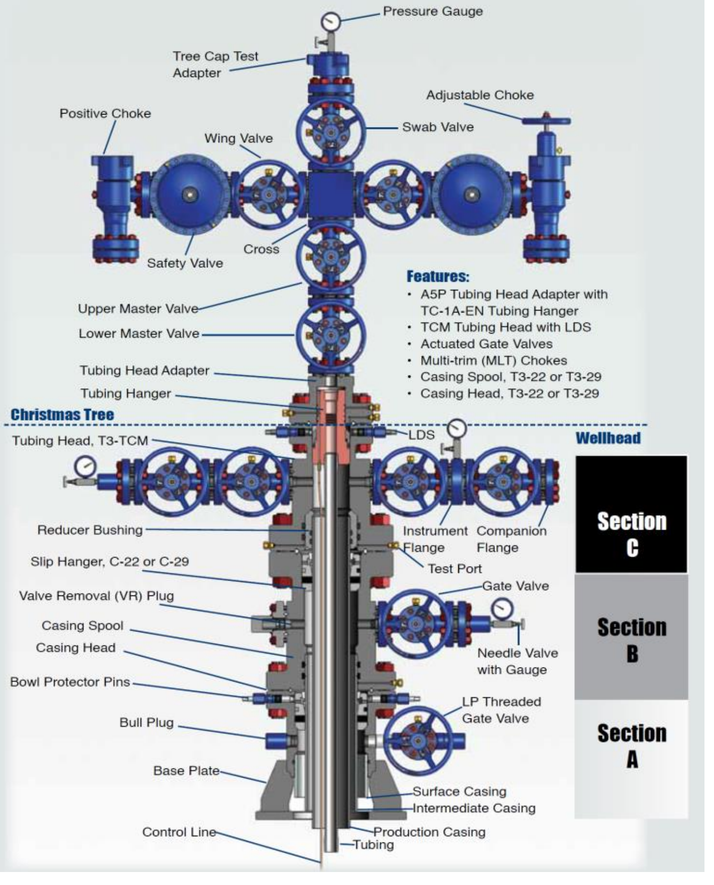
# WELLHEAD & X-MAS TREE

04/25

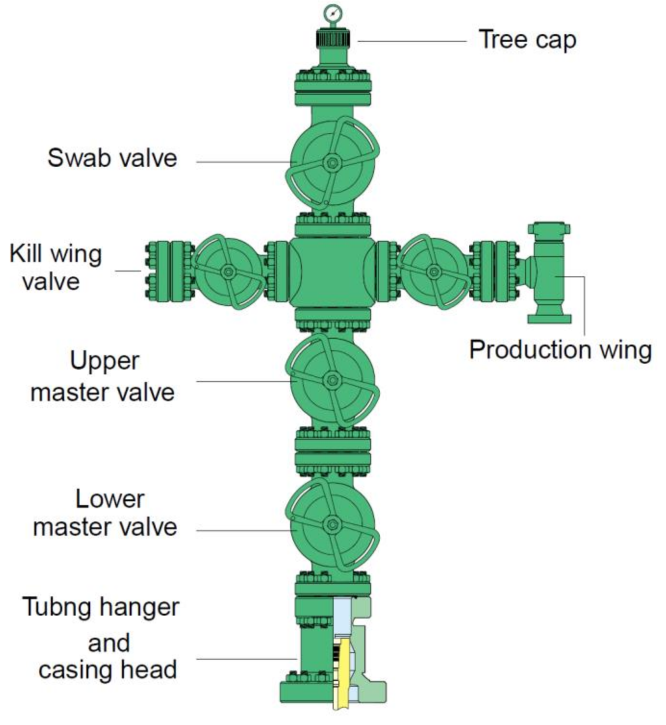



- **Lower Master Valve :** A valve that is normally kept in the open condition and is only closed in the event that all the other valves fail.
- **Upper Master Valve** : The valve that is usually operated to open and close the wellbore. This valve is often fitted with an actuator so that the valve can be controlled remotely.
- **Swab Valve/Crown Valve** : The valve that is kept closed during flowing of the well and is opened to allow access into the tubing string when maintenance of the tubing string is required.
- **Flowline Wing Valve** : used in conjunction with the upper master valve in controlling the well. This valve is normally fitted with an actuator similar to that of the upper master valve so that the valve can be controlled remotely.
- **Kill Line Valve :** Used when the well has to be killed. The size of this valve may be smaller than other valves.
- **Tree cap** : Removed to allow access for service tools.
- **Choke** : Attached to the downstream side of the flowline wing valve, the choke is used to control or regulate the flow of produced fluids. The choke can be of varying styles, positive, adjustable or multi-orifice and in some instances may be fitted with a remote actuator.

# X-MAS TREE TYPES

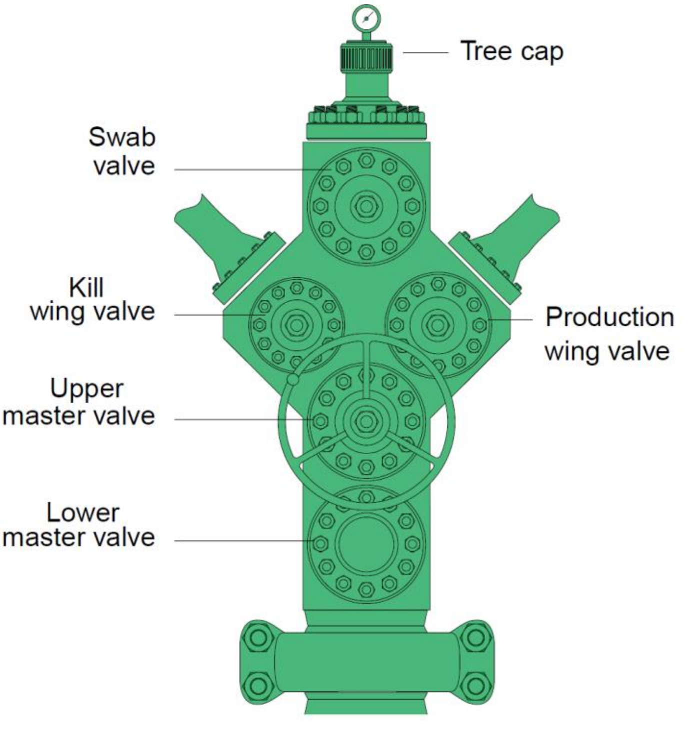


**SINGLE COMPOSITE X-MAS TREE** **06/25**




- Used on low pressure (up to 3000 psi) oil wells
- This type of tree is in common use worldwide.
- Number of joints and potential leakage points make it unsuitable for high-pressure/gas wells.
- Composite dual trees are also available but are not in common use.

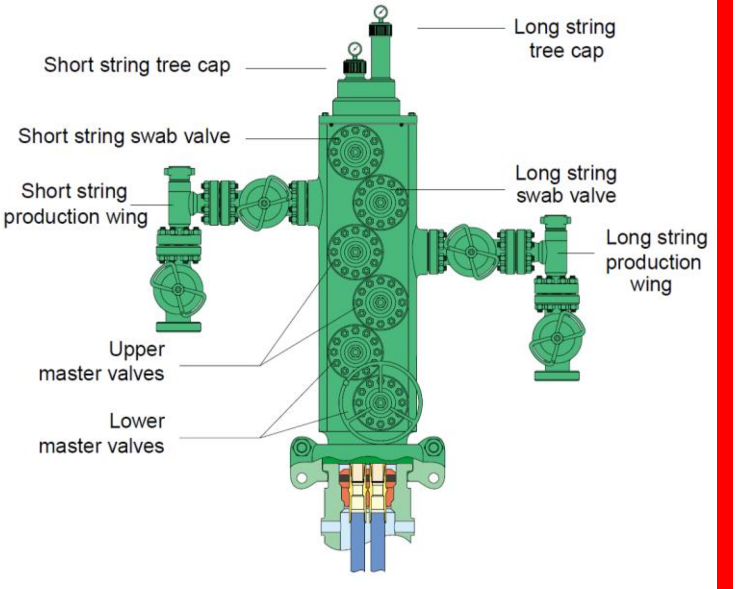
## SINGLE SOLID X-MAS TREE




- For higher-pressure applications up to 10000 psi
- The valve seats and components are installed in a one-piece solid block body.
- Used for both oil and gas wells

# DUAL SOLID X-MAS TREE

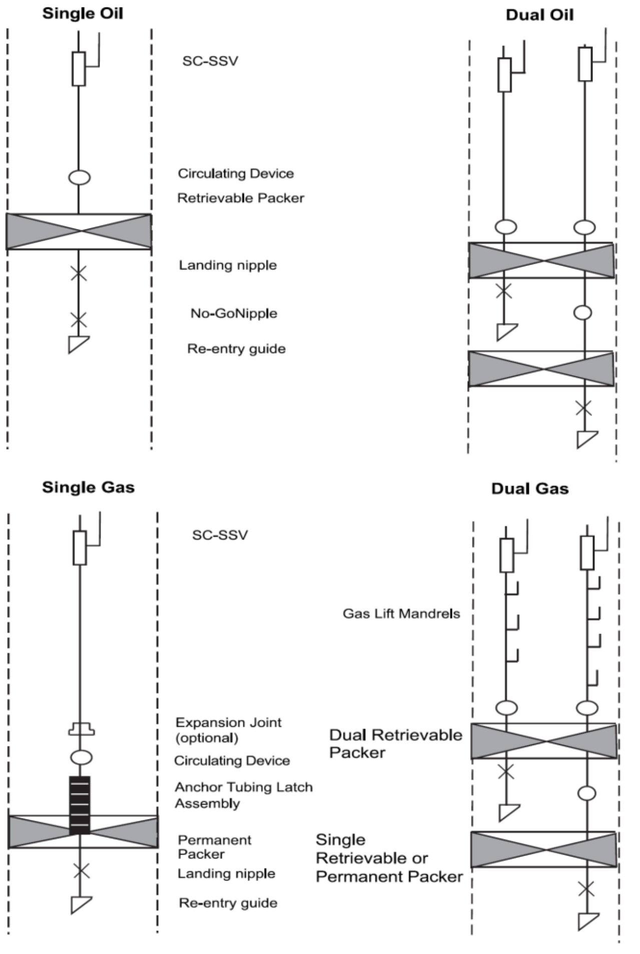
08/25




- For dual tubing strings, the solid block tree is the most widely used configuration.
- The valves controlling the flow from the deeper zone, the long string, are the lower valves on the tree.
- While there are some exceptions to this convention, unless the tree is clearly marked it can be assumed that the valve position reflect the subsurface connections.

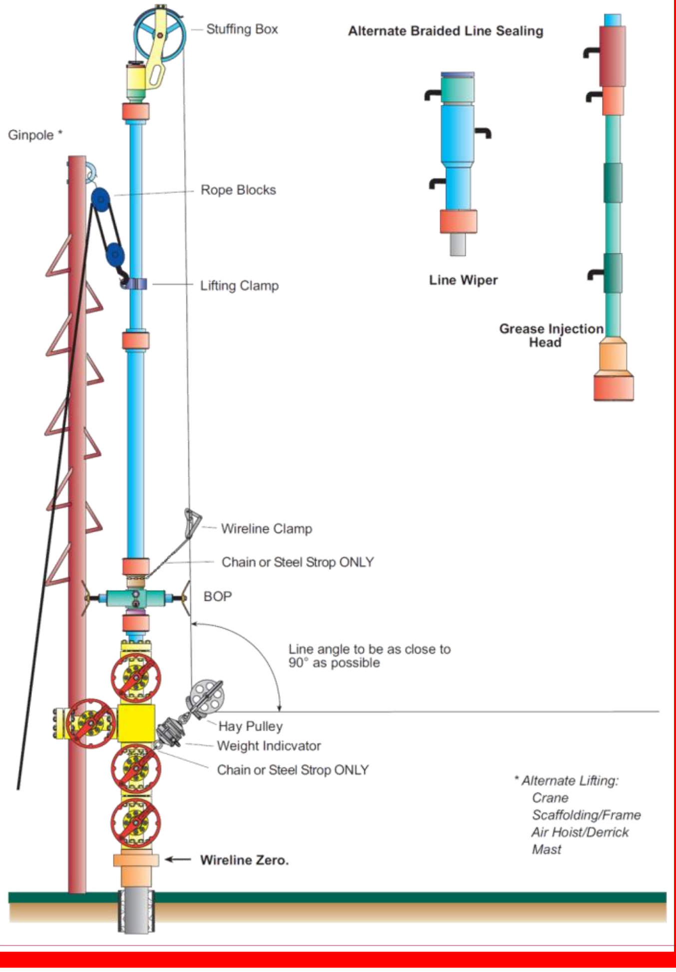
09/25

# BASIC WELL SCHEMATICS



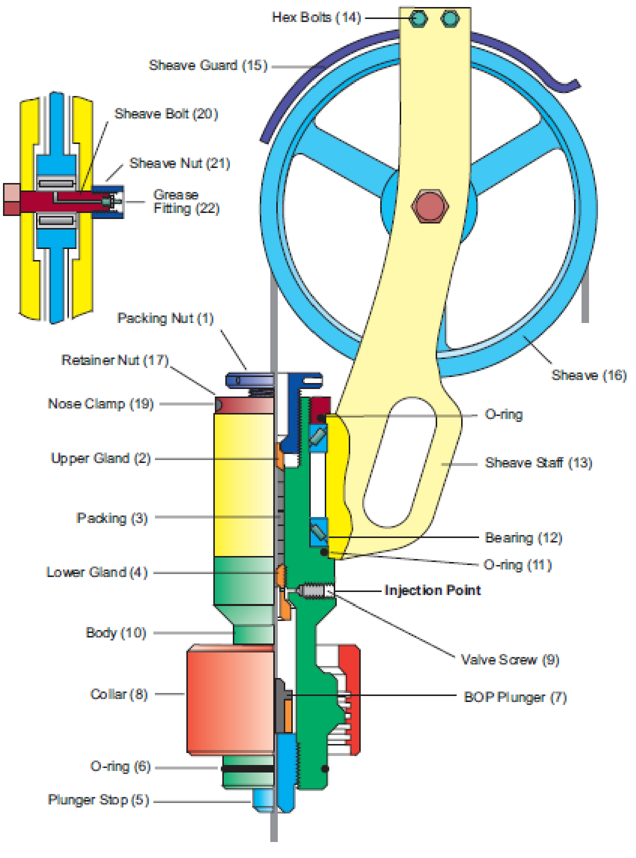
# SLICKLINE RIG-UP



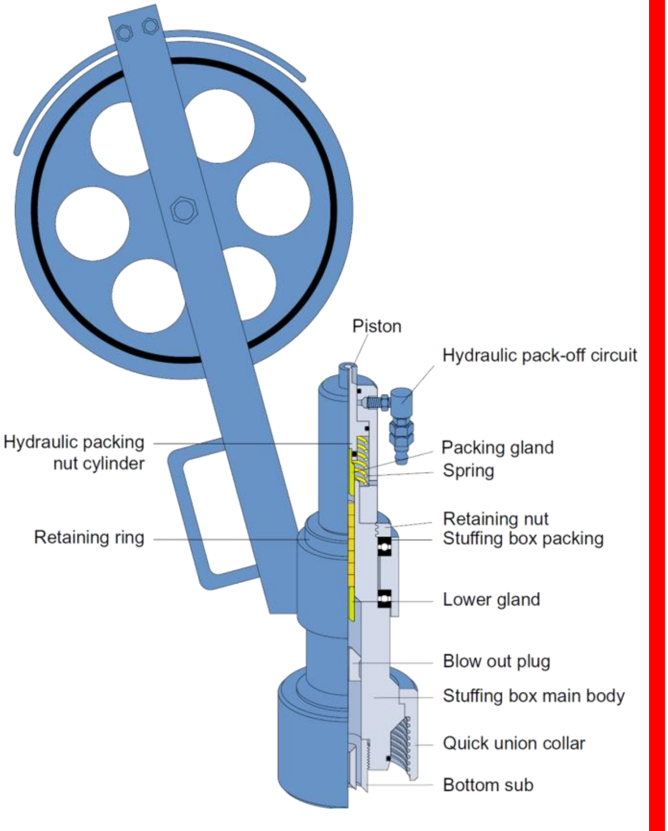


## SLICKLINE STUFFING BOX 1



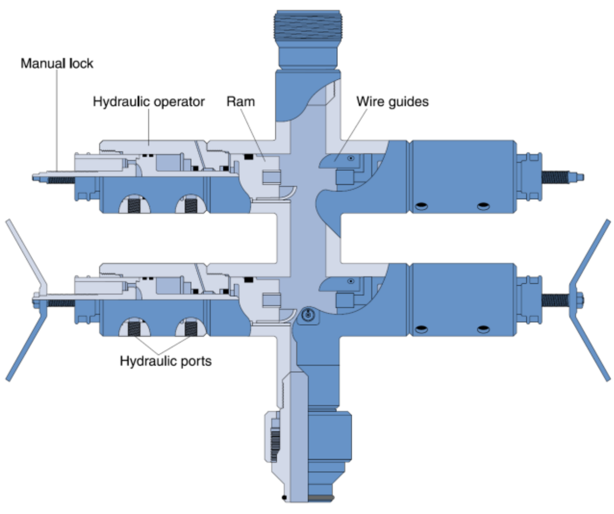


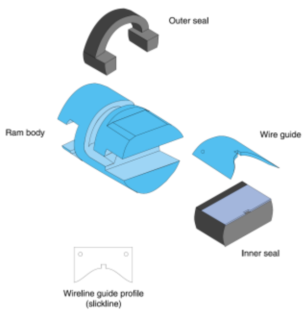
# SLICKLINE STUFFING BOX 2

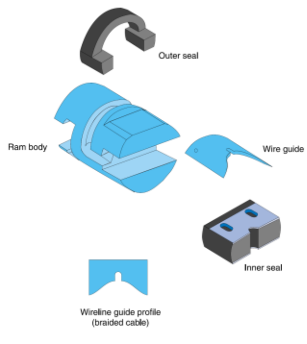


# DUAL RAM BOP

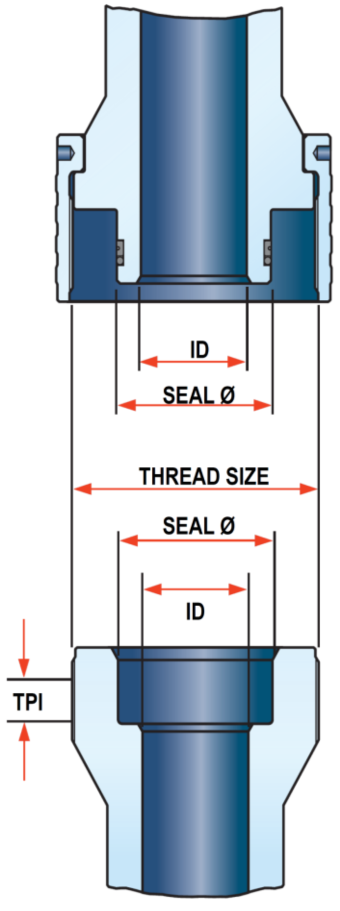



Manual lock
Hydraulic operator
Ram
Wire guides
Hydraulic ports

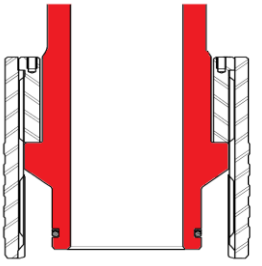

Outer seal
Ram body
Wire guide
Inner seal
Wireline guide profile
(slickline)


Outer seal
Ram body
Wire guide
Inner seal
Wireline guide profile
(braided cable)

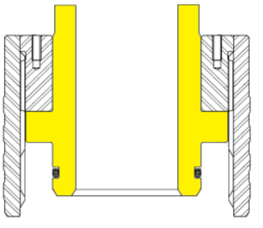
QUICK UNION DETAILS



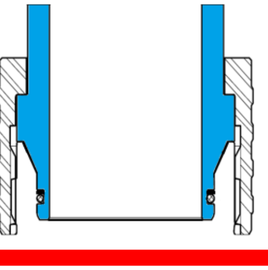

OTIS QU



BOWEN QU



ELMAR QU



## OTIS QUICK UNION TYPE CONNECTIONS

| ASEP Elmar Code | Thread Size | TPI | Seal Dia | Nominal ID | Working Pressure | Service | O-Ring | BU-Ring | BU-Ring Retainer |
|---|---|---|---|---|---|---|---|---|---|
| O01 | 5 | 4 | 3.500 | 3.00 | 5K | STD | L-870310 | N/A | N/A |
| O02 | 5 3/4 | 4 | 4.000 | 3.00 | 10K | H2S | L-870490 | L-873680 | N/A |
| O03 | 6 1/4 | 4 | 4.000 | 2.50 | 15K | H2S | L-870490 | L-974353 | L-873260 |
| O04 | 6 1/2 | 4 | 4.750 | 4.00 | 10K | STD | L-870540 | L-873720 | N/A |
| O05 | 6 1/2 | 4 | 5.188 | 4.00 | 5K | STD | L-873140 | N/A | N/A |
| O06 | 7 1/2 | 4 | 5.500 | 3.00 | 15K | H2S | L-870580 | L-974602 | L-876260 |
| O07 | 8 1/4 | 4 | 6.188 | 5.00 | 5K | H2S | L-870710 | N/A | N/A |
| O08 | 8 3/8 | 4 | 5.250 | 4.00 | 10K | H2S | L-875560 | L-875570 | N/A |
| O09 | 8 3/4 | 4 | 7.500 | 6.38 | 5K | STD | L-870720 | N/A | N/A |
| O10 | 9 | 4 | 6.750 | 5.00 | 10K | H2S | L-870850 | L-876160 | N/A |
| O11 | 9 1/2 | 4 | 6.250 | 4.00 | 15K | H2S | L-872560 | L-977411 | L-871005 |
| O12 | 9 1/2 | 4 | 8.000 | 6.38 | 5K | H2S | L-873120 | N/A | N/A |
| O13 | 11 1/2 | 4 | 8.250 | 6.38 | 10K | H2S | L-876060 | L-876070 | N/A |
| O14 | 12 | 4 | 10.313 | 9.00 | 5K | H2S | L-872440 | N/A | N/A |
| O15 | 12 1/4 | 4 | 7.000 | 5.00 | 15K | H2S | L-875810 | L-982000 | L-873150 |
| O16 | 5 | 4 | 3.500 | 3.00 | 5K | H2S | L-870310 | N/A | N/A |
| O17 | 6 1/2 | 4 | 4.750 | 4.00 | 5K | H2S | L-870540 | N/A | N/A |
| O18 | 7 1/2 | 4 | 5.500 | 4.50 | 10K | H2S | L-870580 | L-873760 | N/A |
| O19 | 6 1/2 | 4 | 4.750 | 3.00 | 10K | H2S | L-870540 | L-873720 | N/A |
| O20 | 5 | 4 | 3.500 | 2.50 | 15K | STD | L-870460 | L-976083 | L-875640 |
| O21 | 5 | 4 | 3.500 | 3.00 | 10K | STD | L-870310 | L-873570 | N/A |
| O22 | 8 1/4 | 4 | 6.188 | 5.12 | 10K | H2S | L-870710 | L-875001 | N/A |
| O23 | 6 | 4 | 4.875 | 4.00 | 5K | H2S | L-870550 | N/A | N/A |

# QUICK UNION DETAILS - BOWEN

## BOWEN QUICK UNION TYPE CONNECTIONS

| ASEP Elmar Code | Thread Size | TPI | Seal Dia | Nominal ID | Working Pressure | Service | O-Ring | BU-Ring | BU-Ring Retainer |
|---|---|---|---|---|---|---|---|---|---|
| B01 | 4 3/4 | 4 | 3.750 | 3.00 | 5K | H2S | L-870470 | N/A | N/A |
| B02 | 6 5/16 | 4 | 4.375 | 3.00 | 10K | H2S | L-870520 | L-873700 | N/A |
| B03 | 6 5/16 | 4 | 3.750 | 2.50 | 15K | H2S | L-870470 | L-974535 | L-873170 |
| B04 | 5 1/2 | 4x2 | 4.375 | 3.00 | 5K | H2S | L-870520 | N/A | N/A |
| B06 | 7 | 5 | 4.375 | 3.00 | 15K | H2S | L-870520 | L-974603 | L-873260 |
| B07 | 8 1/4 | 4x2 | 6.000 | 4.00 | 10K | H2S | L-870690 | L-875340 | N/A |
| B08 | 7 | 5 | 5.250 | 4.00 | 5K | H2S | L-875560 | N/A | N/A |
| B09 | 8 1/4 | 4x2 | 6.750 | 5.50 | 5K | H2S | L-870850 | N/A | N/A |
| B10 | 9 5/32 | 4x2 | 6.750 | 5.50 | 10K | H2S | L-870850 | L-876160 | N/A |
| B11 | 9 7/8 | 4x2 | 8.000 | 6.38 | 5K | H2S | L-873120 | N/A | N/A |
| B12 | 4 3/4 | 4 | 3.750 | 3.00 | 10K | STD | L-870470 | L-873660 | N/A |
| B13 | 5 1/2 | 4x2 | 4.375 | 3.00 | 10K | STD | L-870520 | L-873700 | N/A |
| B14 | 4 1/16 | 4 | 3.000 | 2.00 | 5K | H2S | L-870430 | N/A | N/A |
| B15 | 10 5/8 | 4 | 7.500 | 5.63 | 10K | H2S | L-870720 | L-870021 | N/A |
| B16 | 4 1/2 | 4 | 3.000 | 2.00 | 10K | H2S | L-870430 | L-873630 | N/A |
| B17 | 8 7/8 | 4x2 | 6.500 | 5.00 | 10K | STD | L-873280 | L-875540 | N/A |
| B18 | 13 | 4 | 9.500 | 7.06 | 10K | H2S | L-874008 | L-874009 | N/A |
| B19 | 8 7/8 | 4x2 | 5.500 | 4.00 | 15K | H2S | L-873270 | L-980815 | L-871029 |
| B20 | 6 | 4x2 | 4.875 | 3.38 | 5K | H2S | L-870550 | N/A | N/A |

# QUICK UNION DETAILS – ELMAR

## ASEP ELMAR QUICK UNION TYPE CONNECTIONS

| ASEP Elmar Code | Thread Size | TPI | Seal Dia | Nominal ID | Working Pressure | Service | O-Ring | BU-Ring | BU-Ring Retainer |
|---|---|---|---|---|---|---|---|---|---|
| E04 | 6 3/4 | 4 | 5.375 | 4.892 | 5K | STD | L-870610 | N/A | N/A |
| E05 | 9 | 4 | 7.500 | 6.765 | 5K | STD | L-870660 | N/A | N/A |
| E06 | 4 3/4 | 4 | 3.750 | 3.00 | 10K | H2S | L-870470 | L-873660 | N/A |
| E07 | 8 1/2 | 4 | 7.250 | 6.765 | 3K | STD | L-870840 | N/A | N/A |
| E08 | 8 3/4 | 4 | 6.500 | 5.00 | 10K | H2S | L-870630 | L-873790 | N/A |
| E09 | 4 3/4 | 4x2 | 3.750 | 3.00 | 10K | H2S | L-870470 | L-873660 | N/A |
| E12 | 6 1/8 | 4x2 | 4.750 | 4.06 | 10K | H2S | L-870540 | L-873720 | N/A |
| E13 | 3 3/4 | 8 | 2.500 | - | 10K | H2S | L-875630 | L-872700 | N/A |
| E14 | 9 | 4 | 7.500 | 6.625 | 5K | H2S | L-870660 | N/A | N/A |
| E16 | 6 3/4 | 4 | 5.375 | 4.892 | 5K | H2S | L-870610 | N/A | N/A |
| E21 | 9 3/8 | 4 | 7.750 | 6.67 | 5K | H2S | L-870006 | N/A | N/A |
| E22 | 6 7/8 | 4 | 5.625 | 4.892 | 5K | H2S | L-870590 | N/A | N/A |
| E30 | 9 1/2 | 4 | 5.500 | 4.06 | 20K | H2S | L-8701008706 | L-9701008692 | L-871029 |
| E32 | 7 7/8 | 4x2 | 6.125 | 5.125 | 10K | H2S | L-873040 | L-872080 | N/A |

## SL BASIC TOOLSTRING


The diameters in most common use are 1 1/2" and 1 7/8", but toolstring components are also available in 1", 1 1/4", 2 1/8", and 2 1/2" diameters.

**Rope Socket** Provides a link with the wireline.

***Swivel Joint*** Attached between the rope socket and stem if required.

**Stem** To add weight/mass to the toolstring to overcome well pressure and friction, and provide impact downhole.

***Upstroke Jars*** Attached here if required.

**Mechanical Jars** To provide a means of generating impact.

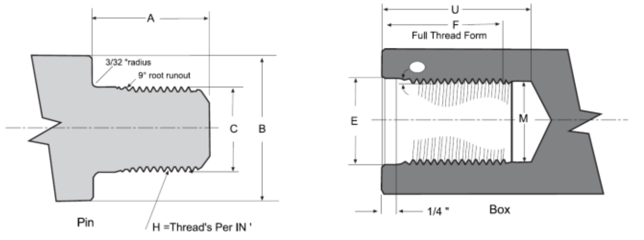
| **Weight reference chart** | | |
|---|---|---|
| Stem dia | Approx (lbs/ft) | (kgs/ft) |
| 3/4 | 1.500 | 0.68 |
| 1 | 2.660 | 1.21 |
| 1 1/4 | 4.160 | 1.90 |
| 1 1/2 | 6.000 | 2.73 |
| 1 7/8 | 9.375 | 4.26 |
| 2 1/8 | 12.040 | 5.47 |
| 2 1/2 | 16.660 | 7.60 |

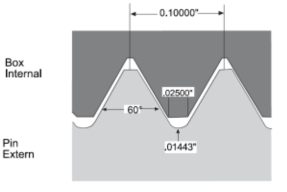
**Knuckle Joint** Attached here if required.

Attach the required tool to the bottom of the jars or knuckle.

# SRT DETAILS



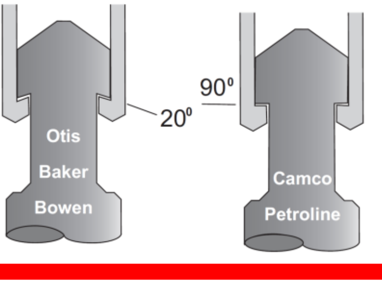



| Size | A | B | C (Nominal) | E | F | M | U |
|---|---|---|---|---|---|---|---|
| 5/8" | 1.125" | 1.375" | 0.9362" (15/16) | 0.995" | 1.29" | 0.830" | 1 5/8" |
| 3/4" | 1.375" | 1.500" | 1.0611" (1 1/16) | 1.080" | 1.54" | 0.955" | 1 7/8" |
| 1" * | 1.750" | 2.000" | 1.3735" (1 3/8) | 1.393" | 1.94" | 1.267" | 2 3/8" |
| 1 1/8" | 2.000" | 2.250" | 1.5609" (1 9/16) | 1.580" | 2.19" | 1.455" | 2 5/8" |

** Not in common use.*

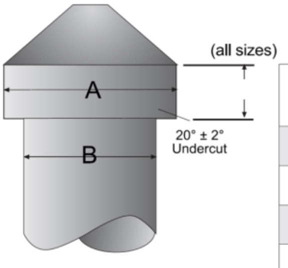
# FISHING NECK PROFILES



# EXTERNAL & INTERNAL FN

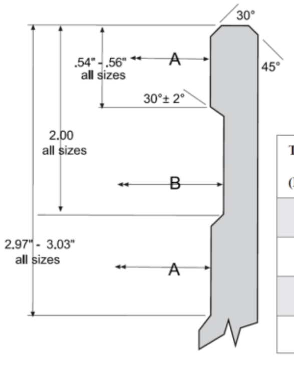


**External Fishing Neck Chart** (inches)




| Toolstring Size (Nominal) | Diameter 'A' | | Diameter 'B' | |
|---|---|---|---|---|
| | Maximum | Minimum | Maximum | Minimum |
| 3/4 | 0.750 | 0.740 | 0.630 | 0.620 |
| 1 | 1.000 | 0.990 | 0.880 | 0.870 |
| 1 1/4 | 1.187 | 1.177 | 1.060 | 1.030 |
| 1 1/2 | 1.375 | 1.365 | 1.190 | 1.160 |
| 1 7/8 | 1.750 | 1.740 | 1.500 | 1.470 |
| 2 1/8 | 1.750 | 1.740 | 1.500 | 1.470 |
| 2 1/2 | 2.313 | 2.303 | 2.060 | 2.030 |

**Internal Fishing Neck Chart** (inches)

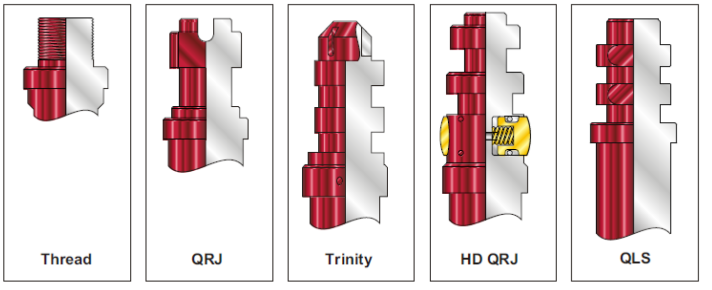



| Tubing Size (Nominal) | Diameter 'A' | | Diameter 'B' | |
|---|---|---|---|---|
| | Maximum | Minimum | Maximum | Minimum |
| 2.062 | 1.06 | 1.08 | 1.22 | 1.24 |
| 2 3/8 | 1.38 | 1.40 | 1.57 | 1.59 |
| 2 7/8 | 1.81 | 1.83 | 2.00 | 2.02 |
| 3 1/2 | 2.31 | 2.33 | 2.50 | 2.52 |

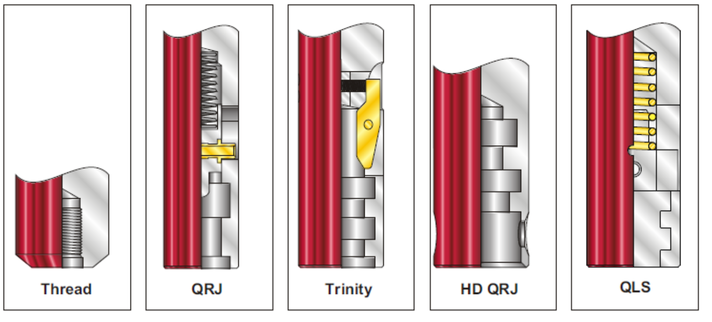
# SL TOOLS CONNECTIONS TYPE



*Top (Male) Connections*




*Bottom (Female) Connections*



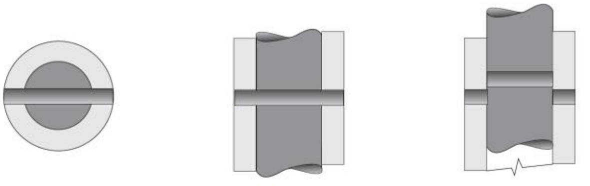

**REMARK**

- SRT : Sucker Rod Thread
- QRJ : Quick Release Joint
- HD-QRJ : Heavy Duty Quick Release Joint
- QLS : Quick Lock Sub

# SHEAR PIN DETAILS



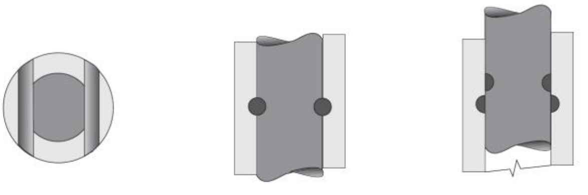
**Radial Shear Pins**



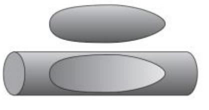
Shearing edges should be sharp and in good condition.

**Tangential Shear Pins**

Usually of a relatively small diameter as there is an increased shear area over radial types.



Shearing edges should be sharp and in good condition.

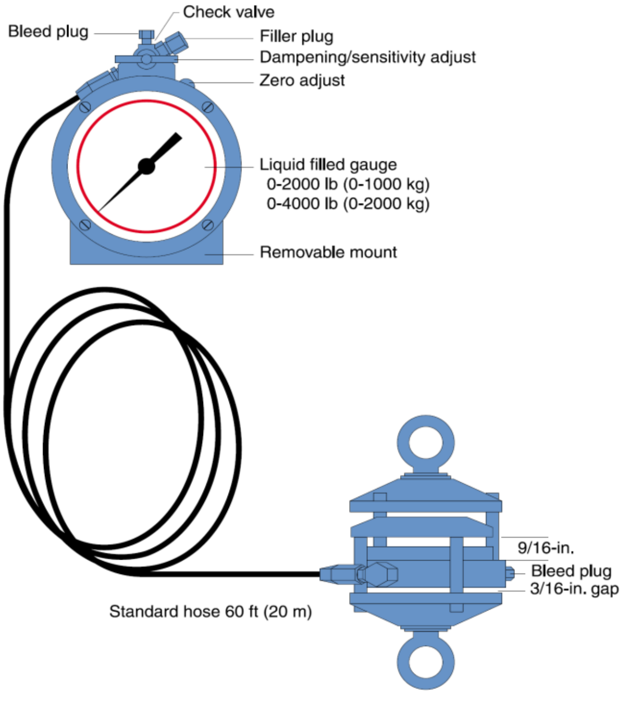


| Material Strengths: | | | |
|---|---|---|---|
| | Aluminium | - | 41,000 psi UTS |
| | Brass | - | 43,000 psi UTS |
| | Mild steel | - | 58,000 psi UTS |

Note : Stainless steel must never be used as it work hardens and may not shear. Check with a magnet to identify stainless steel from mild steel if in doubt. (Stainless steel is most usually non-magnetic)

# WEIGHT INDICATOR SYSTEMS

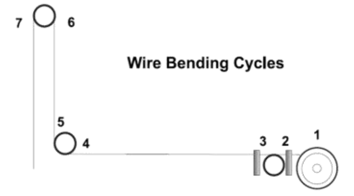





- The slickline weight indicator system is commonly configured as a sealed hydraulic system.
- The sensing load cell is attached to the Christmas tree by a chain and a high-pressure hose connected to the fluid filled pressure gauge which is calibrated in lb, kg or kN.
- The load cell is attached to the hay pulley and Christmas tree forming a 90º angle.
- The system is calibrated to the right angle pull and accuracy will be slightly affected if the angle is not true, but the sensitivity of the system is always maintained.

# SL WIRE BENDING & DETAILS






The following table shows the relative strengths of IPS, UHT and $H_2S$ resistant alloy wirelines:

| Material | Diameter (inches) | Breaking Strength (kgs) | (lbs) | Approximate Recommended Maximum Load (kgs) | (lbs) | Weight per 1,000 metres (kgs) | (lbs) | Characteristics |
|---|---|---|---|---|---|---|---|---|
| IPS | 0.092<br>0.108<br>0.125 | 701<br>956<br>1288 | 1547<br>2109<br>2840 | 510.0<br>816.0<br>914.0 | 1125<br>1800<br>2016 | 33.50<br>46.30<br>62.10 | 74.0<br>102.0<br>137.0 | For non-corrosive wells. Relatively inexpensive. |
| Bright UHT | 0.092<br>0.108<br>0.125 | 898<br>1233<br>1651 | 1980<br>2720<br>3640 | 673.0<br>925.0<br>1238.0 | 1485<br>2040<br>2730 | 33.50<br>46.30<br>62.10 | 74.0<br>102.0<br>137.0 | For higher strength than IPS in similar conditions. |
| Nitronic-50 | 0.092 | 658 | 1450 | 306.0 | 675 | 33.50 | 74.0 | Good in $H_2S$ chlorides up to 390 °F. More sensitive to acid at higher temperature than stainless. |
| 304 Stainless | 0.092<br>0.108<br>0.125 | 703<br>952<br>1224 | 1550<br>2100<br>2700 | 457.0<br>619.0<br>796.0 | 1007<br>1365<br>1755 | 31.06<br>42.60<br>62.85 | 68.5<br>94.0<br>138.6 | Good resistance to $H_2S$. |
| Supa-60 Alloy | 0.092<br>0.108<br>0.125 | | 1260<br>1720<br>2220 | 498.8<br>748.3<br>645.4 | 1100<br>1650<br>1443 | 31.06<br>42.60<br>62.85 | 68.5<br>94.0<br>138.6 | Very good resistance to $H_2S$. |

- Bending stresses creating a weak point in the slickline are the most common cause of broken wire.
- Bending stress occurs when slickline deviates from a straight-line condition, such as when it passes over pulleys or reel drums or when it is flexed by hand.
- As with all metals, continued bending at one point will crystallize the material and lead to a fatigue fracture or break.
- Each time the line passes over a pulley it is subjected to 2 bending stresses.
- When it changes from a straight to a curved path and again when it reverts to a straight path. It is subject to only one when it leaves the reel drum.
- So for each trip in and out of the well, the line experiences a minimum of 14 bending cycles.

**TECHNICAL DEVELOPMENT UNIT**