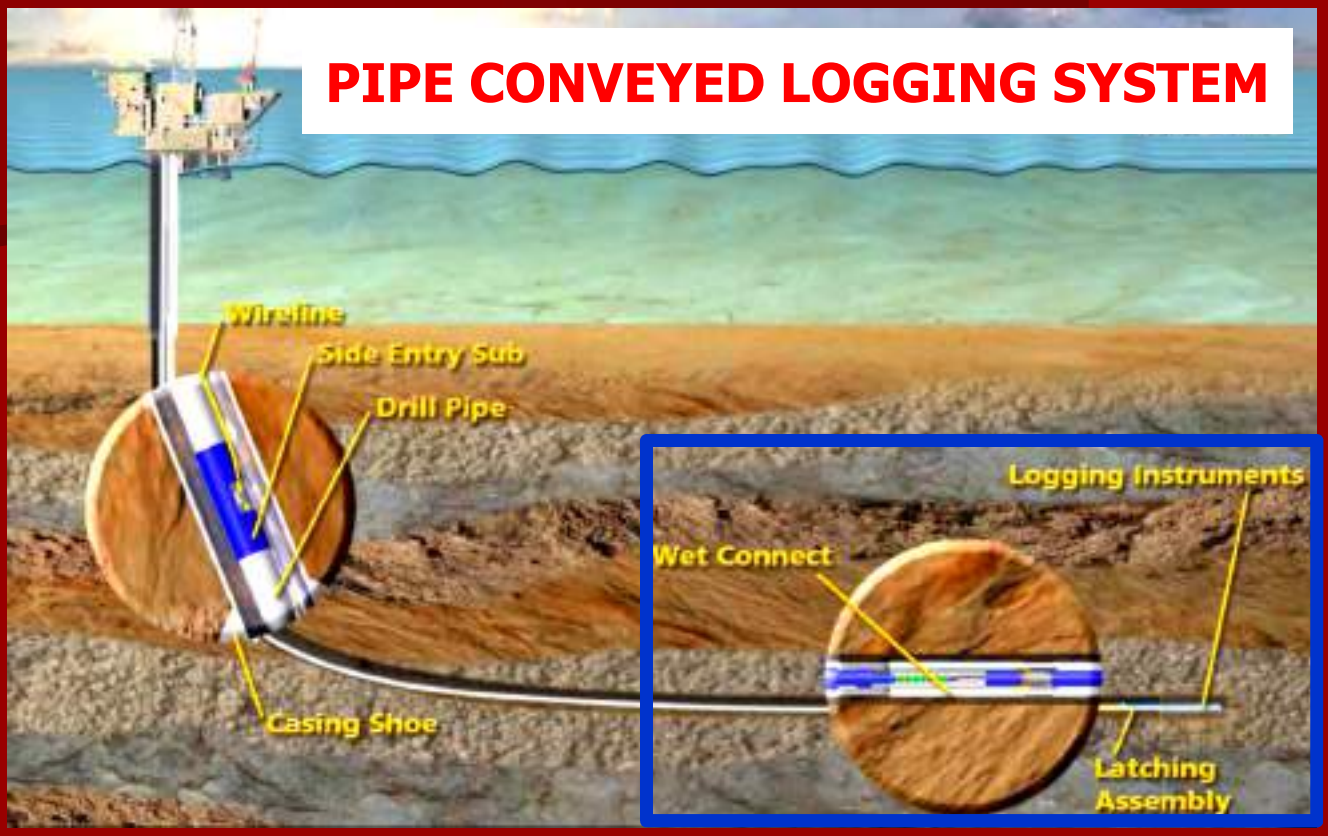
Pipe Conveyed Logging
FlowLess Downhole System



Benefits and Advantages Over Current Systems

- Unlike the traditional designs, the FlowLess Latching Assembly (FLLA) includes a check-valve that prevents the well fluids from entering the DP, effectively performing as a well control barrier - we also offer a version with two check valves in a tandem configuration.
- The FLLA piston-based check-valve has been designed to stand differential pressures in excess of those known to be present in Pipe Conveyed Logging operations
- The Vinci Technologies Linear Connectors are suitable for HPHT wells and support a total of 8 conductors, 7 for the wireline conductors and 1 for the cable armor that avoids random power and telemetry shortcomings

Rev: 2018-10-02

GENERAL

Today the oil or gas wells are drilled deeper, which results in higher downhole pressures and temperatures, a condition that exceeds the operational ratings of the existing wet connector systems.

When using traditional Pipe Conveyed Logging systems the cutout windows of the downhole latching assembly offer an always-open direct fluid path between the outside and the inside of the DP – an unwanted condition when the risk of having well control incidents is possible.

To improve the quality and reliability of the logging services and to add an effective well control barrier in Pipe Conveyed Logging operations Vinci Technologies has introduced the FlowLess Downhole System that includes the following components:

- The FlowLess Latching Assembly where a piston-based check valve has been inserted right above the cutout windows.
- The VTLC-8 Wet Connectors designed to operate in HPHT wells that include an additional conductor connection to ensure good armor-ground continuity.

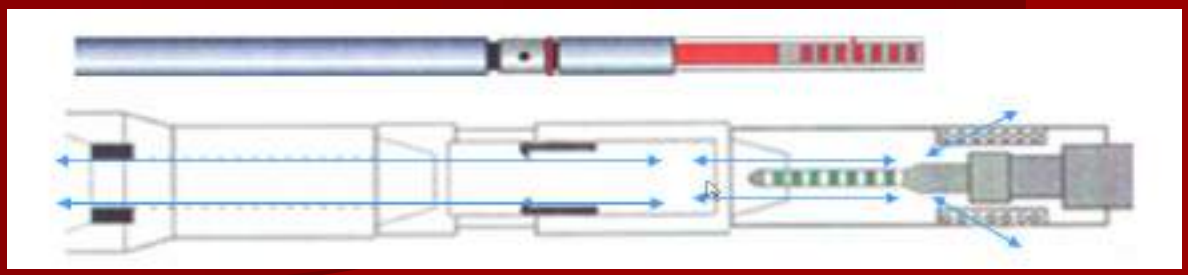
The FLLA can be used with traditional 7-conductor non HPHT wet connectors, however to benefit from the reliability and enhanced HPHT ratings listed the use of the VTLC-8 wet connectors is required.

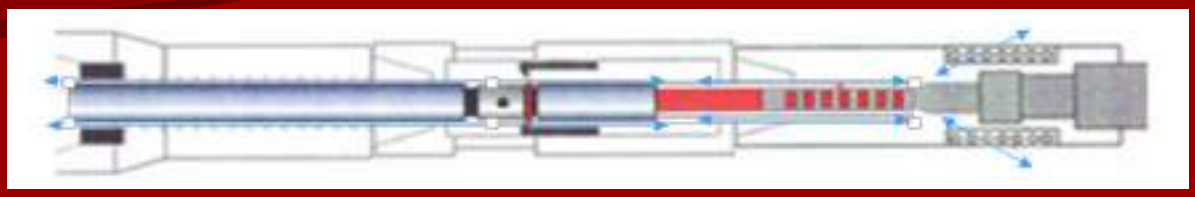
Supported Configurations

Downhole Latching Assembly Type	Wet Connector Model	Sinker Bar OD	Flow Limitation	Connexion
Modular 5” – 3-3/8”	VTLC-8 DLS 400	42 mm	Yes with the 5” body No with the 3-3/8” body	5” or 3-1/2” DP if using the 5” body 3-1/2” DP or 2-7/8” tubing if using the 3-3/8” body
Modular 4-1/2” - 2-3/4”	VTLC-8 DLS 400	42 mm	Yes with the 4-1/2” body No with the 2-3/4” body	5” of 3-1/2” or 2-3/8” DP if using the 4-1/2” body 3-1/2” DP or 2-3/8” tubing if using the 2-3/4” body

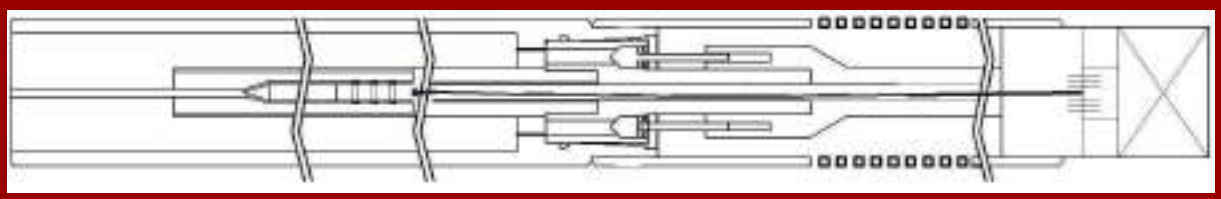
FlowLess Latching Assembly Operations Overview

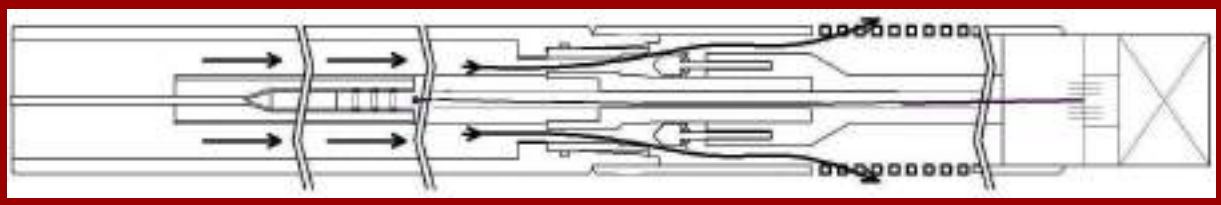
The following figures show the always-open flow path (blue arrows) of traditional latching subs, before and after the wet connectors have been latched:





The following figures show the closed position of the FLLA check-valve piston, held in place by the downhole pressure and back-springs force, and its open position when the pressure inside the DP overcomes the spring resistance and the pressure outside the DP to establish mud circulation (black arrows):





The graphic representations below show on the left the (purple) well fluids and solids blocked from entering the DP by the closed piston and on the right the (brown) drilling mud entering the well after pushing the piston to its open position:

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FLLA and VTLC-8 SPECIFICATIONS

Operational

- Maximum Operating temperature … from 60°F to 500°F
- Maximum Operating pressure …… 30,000 PSI
- Type of fluids …… All types, including salt-saturated up to 300 g/l
- Sour atmosphere ……Yes up to 10 % H2S
- Maximum Differential pressure rating 500 bar (7,250 PSI)
- Maximum connecting speed of connector 3 m/s

Electrical

- Number of electrical contacts ….8
- Withstanding voltage ……Test : 1000 VDC
  ……Operating : 840 VDC,
- Current ……5 Amps at room temp
  ……1.7 Amps at 500°F
- Electrical Insulation ……10 MOhms at 500°F contact to contact
  ……20 MOhms at 500°F contact to earth
  ……500 GOhms at room temperature
- Compatible with most multi-conductor cable heads, custom versions are also supported.

Unique Features and Benefits

- Small diameter latching sinker bar: 1-11/16” (42 mm)
- Standard High-Pressure High-Temperature wet connectors (30,000 psi, 500 °F)
- The wet connectors operate under a balanced-pressure condition
- Floating Piston Check Valve Design
- Large flow-thru paths to support high mud circulation rates
- Eliminates the risk of solids accumulating around the wet connect latching area
- Allows the use of large screen to filter solids from the mud outside the DP
- Easy access to install, check or remove the screens or the check valve
- It does not require frequent maintenance since the check valve does not include dynamic seals
- Allows fast DP tripping out operations since the weight of the drilling mud is sufficient to open the FLLA piston and drain the excess drilling mud. - this prevents pulling a wet string even at normal trip out speeds.
- The logging head is attached to the FLLA strong external housing support instead of the weaker male wet connector support.

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Pipe Conveyed Logging While Fishing System (PCLWF)

- Without cutting the wireline cable and without removing the tool string from the well the **PCLWF system** allows the successful completion of all wireline logging objectives under unexpected Stuck-Tool conditions.

- To allow the transformation of a Stuck-Tool situation into a Pipe-Conveyed Logging set up, the **PCLWF system** is mounted on top of the tool string before lowering it into the well using a wireline cable.

The details of the different operation stages required to transform a Stuck-Tool situation into a Pipe-Conveyed Logging are documented in an animation posted in our website and the following pages.

PCLWF BENEFITS AND ADVANTAGES

- **Pipe-Conveyed Logging (PCL) is an effective method to avoid Stuck-Tool situations and hazardous expensive wireline fishing operations in long and/or inclined wells where the open hole interval crosses zones with high pressure overbalance.**

  A trouble-free PCL single-run operation in a 25,000 ft well with 5,000 ft of open hole could last three days - this same operation performed with unassisted wireline will likely take only one day.

- **Logging While Fishing/Retrieving (LWF/R) is a popular Stuck-Tool contingency method that allows performing the outstanding "critical" logging objectives and the safe recovery of the tools.**

  This contingency method requires cutting the cable at surface to strip drillpipe over it during the fishing stage, and it is only viable for the "critical" objectives within the vicinity of the stuck-tool depth – using LWF/R in the same unassisted wireline operation example given above will likely take three days.

- **Inserting the PCLWF Adapter Tool at the top of the tool string allows a safe fast transformation of a Stuck-Tool condition into a PCL operation.**

  This contingency method does NOT require cutting the cable at surface and allows access to the complete open hole interval with NO limitations - using PCLWF in the same unassisted wireline operation example given above will likely take two days.

  The safety, time reduction, and financial benefits the PCLWF System offers over the alternative methods are maximized in long wells with large openhole intervals.

PCLWF SYSTEMS & SPECIFICATIONS

The following downhole equipment is required to perform a PCLWF operation:

- **PCLWF Adapter Tool – This includes a Male and Female Wet Connectors.**
- **PCLWF Drillpipe Fishing Overshot – Designed to engage the PCLWF Lower Assembly.**
- **PCL Side-Entry Sub – Standard PCL Equipment.**
- **PCL Female Wet Connector Tool – Standard PCL Equipment.**

PCLWF Overall System Operational Specifications

Maximum Operating Temperature	**500 °F**
Maximum Operating Pressure	**30,000 psi**
Type of fluids	**All types, including salt-saturated up to 300 g/l**
Sour atmosphere	**Up to 10 % H2S**
VTLC-8 Wet Connector	**8 Conductors**

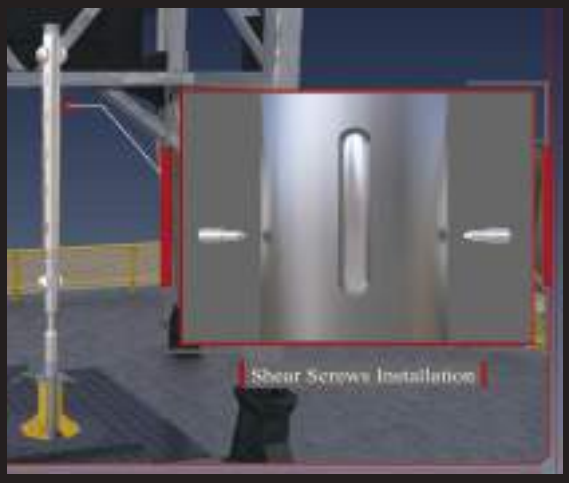
PCLWF Adapter Tool Specifications

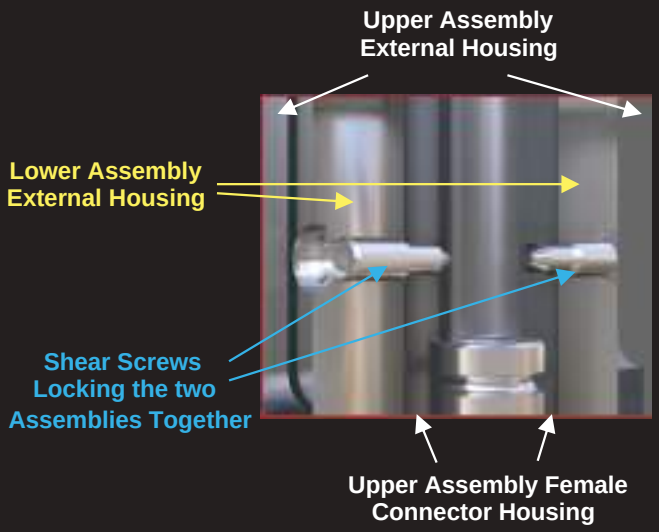
Maximum OD @ Upper Assembly	**4.125 in**
Overall Length	**8.33 ft**
Release Selectable Tension Range	**Up to 14,000 lb.**
Operational Tensile Strength	**139,000 lb. (with a 2:1 safety factor)**

Rev: 2021-08-08

PCLWF SEQUENCE OF OPERATIONS

1. PCLWF Adapter Tool Rig Up





The PCLWF Adapter Tool Upper Assembly is slidden over the Lower Assembly until the Wet Connectors are fully mate before locking them together using two shear screws designed to break at a pre-determined tension. The wireline cablehead is then attached to the PCLWF Adapter Tool before running the toolstring in the hole.

2. Differentially Stuck Toolstring

The toolstring becomes differentially stuck and after failed attempts to free it by pulling on the cable, the decision to transform this condition into a Pipe-Conveyed Logging operation is taken.

3. Removing the Cable and Female Wet Connector

The PCLWF Upper Assembly is detached from the stuck toolstring by pulling tensions high enough to break the two shear screws used. The cable and PCLWF Upper Assembly are then remove from the well and rigged down.

Rev: 2021-08-08

4. Catching and freeing the Stuck Toolstring

The PCLWF Fishing Overshot is run in the hole attached to the drillpipe until engages the PCLWF Lower Assembly on the top of the stuck toolstring. The drillpipe is pushed/pulled until the tool string is free before pulling it inside the casing.

5. PCL Side-Entry-Sub and Female Wet Connector Tool rig up

The PCL Female Wet Connector tool attached to the cable is rigged up inside the drillpipe through the Side-Entry-Sub before lowering it to the bottom of the drillpipe right above the PCLWF Lower Assembly.

6. Successful Wet Connectors latch and start of PCL Operation

While pumping drilling mud through the drillpipe, the PCL Female Wet Connector tool is rushed down into the PCLWF Lower Assembly until the Female and Male Wet Connectors are fully engaged. The logging operations planned are then completed using PCL procedures.

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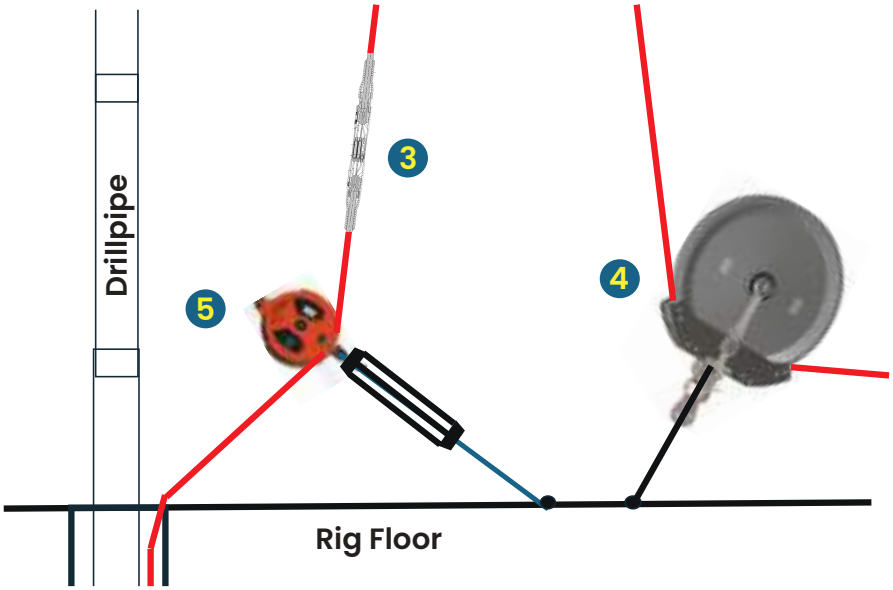
Wireline Logging While Fishing System (LWF)



Logging While Fishing System Components

1. Wireline Side Entry Sub (SES)
2. Cable Cutter Sub (CCS)
3. High-Strength Torpedo Adapter
4. 32-in Wireline Sheave Wheel Dual Groove
5. 17-in Wireline Sheave Wheel

- **Stuck Toolstring/Cable Scenario**

  During a wireline logging operation, if the wireline cable or logging toolstring become stuck in the wellbore, a strip-over fishing operation is initiated to recover the equipment.

- **Additional Logging Deployment**

  After a successful fishing operation, to complete the logging objectives an additional logging run is typically carried out using a pipe-conveyed logging (PCL) deployment.

- **Logging-While-Fishing (LWF) Contingency**

  The Logging-While-Fishing (LWF) system serves as a contingency that interrupts the strip-over fishing operation and converts it into a functional equivalent of a pipe-conveyed-logging deployment.

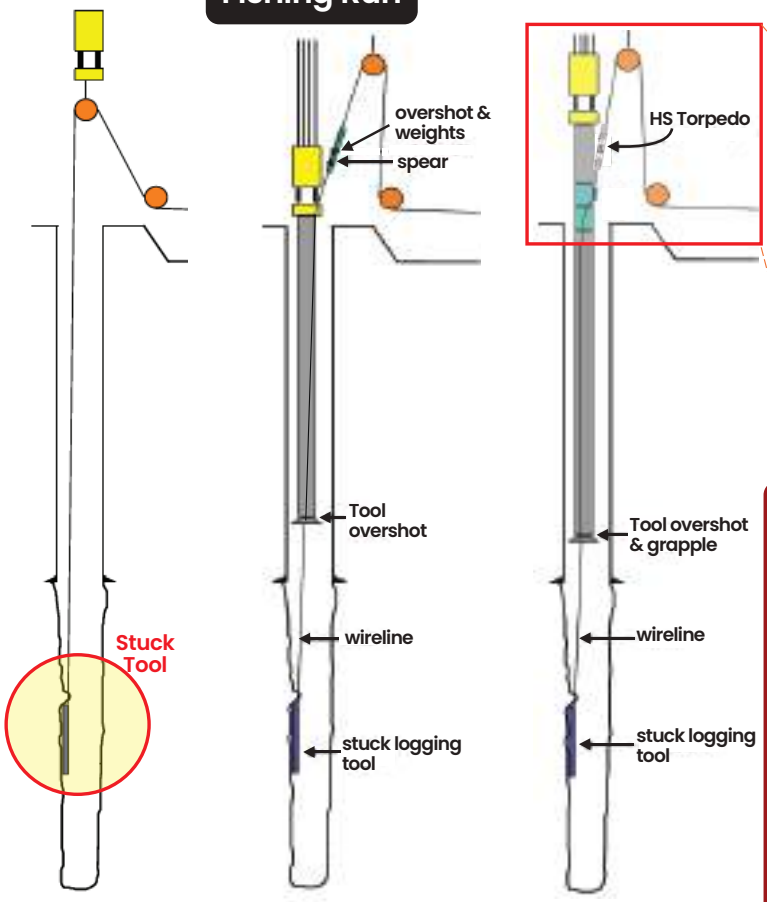
- **Safety and Operational Efficiency**

  The implementation of the LWF system enables monitoring the fish latching process and the acquisition of logging data above and below the stuck depth, eliminating the need for a separate expensive time-consuming logging run.

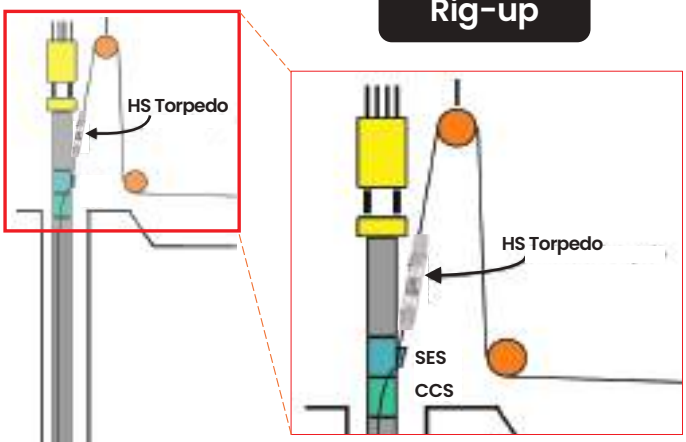
The details of the different operation stages required to transform a Stuck-Tool situation into a Logging While Fishing operation are documented in an animation posted in our website and the following pages.

Logging While Fishing (LWF) Operation with Free Drillpipe

Strip-over Fishing Run

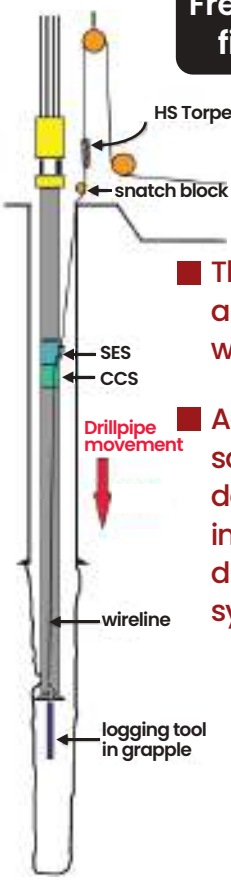


LWF Surface Rig-up



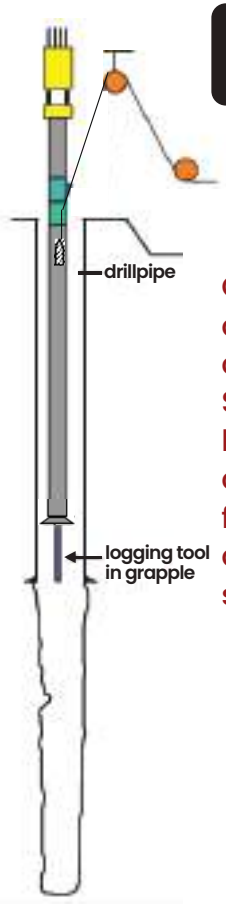
- The end of the tool-side of the cable is fed through the Cable Cutter Sub (CCS) and Side-Entry-Sub (SES) before is attached to the end of the winch-side cable section using a torpedo connection.
- The torpedo connection provides continuity of the electrical conductors and a solid mechanical attachment.
- This set-up allows the toolstring to be powered and functioning while the SES/CCS slide freely over the cable when the drillpipe is lowered into the well.

Freeing the tools and finish the logging



- The toolstring is caught and pulled free by working the drillpipe.
- Additional logging and sampling is done in deeper or shallower intervals by moving the drillpipe and wireline synchronously.

Removing the cable and SES



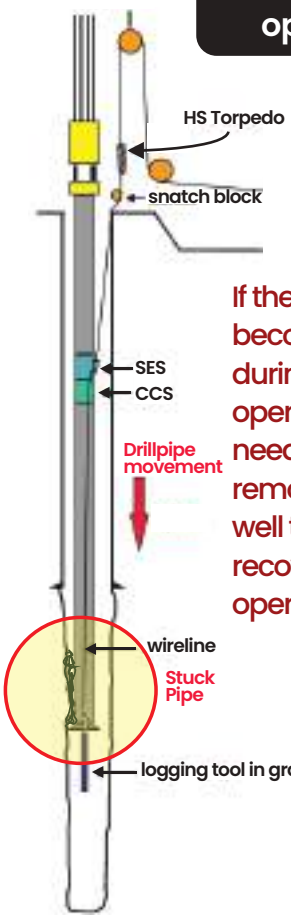
Once the logging and sampling is completed the SES/CCS is brought back to surface, the cable is released from the toolstring and pulled to the surface

Removing the drillpipe and tools

The SES/CCS and wireline are rigged down before the pipe and toolstring are removed from the well

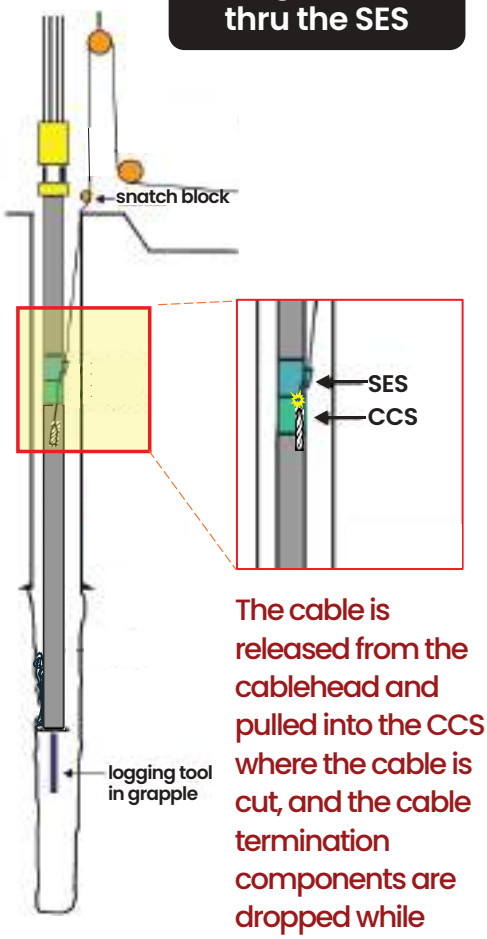
Stuck-Pipe during a Logging While Fishing (LWF) Operation

The drillpipe becomes stuck during a LWF operation

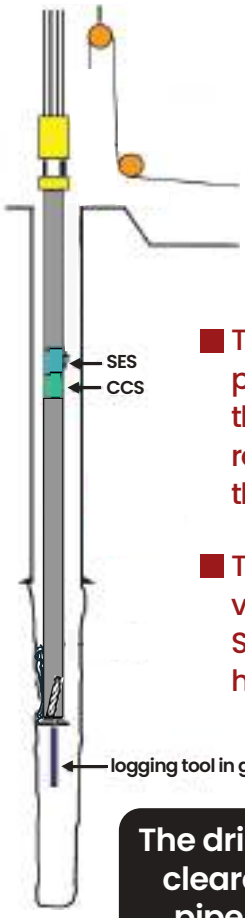


If the drillpipe becomes stuck during a LWF operation the cable needs to be removed from the well to allow pipe recovery operations.

Pulling the cable thru the SES



The cable is released from the cablehead and pulled into the CCS where the cable is cut, and the cable termination components are dropped while keeping the feedthrough hole cleared.



- The cable is pulled through the SES and removed from the well.
- The SES ball valve seals the SES cable entry hole.

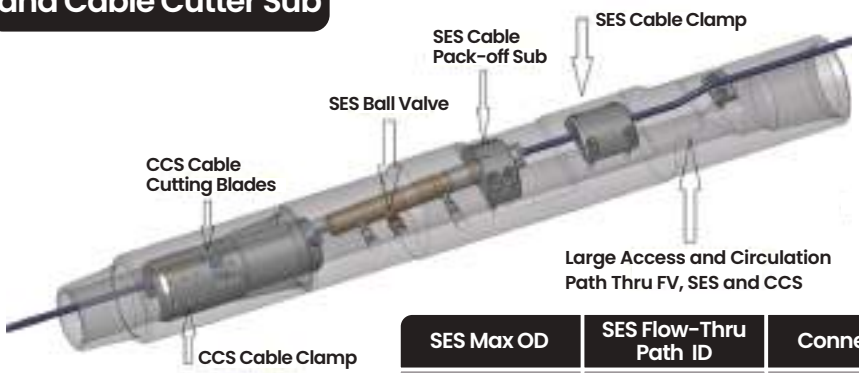
The drillpipe is now cleared to allow pipe-recovery operations

WELL CONTROL RECOVERY PROCESS DURING LOGGING WHILE FISHING OPERATIONS

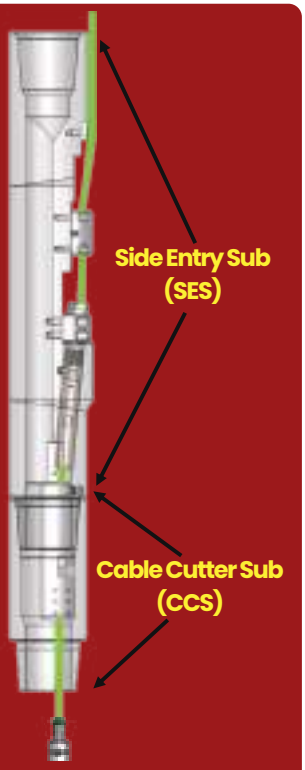
- The process documented here for the Stuck-Pipe condition in LWF operations is equally applicable when there is a loss of well control situation, such a downhole blow out.
- If a loss of well control is a possibility in offshore rigs where the BOPs are at the sea floor, the SES/CCS should be kept above the sea floor to allow adequate sealing of the BOP rams on the drillpipe.

Logging While Fishing (LWF) System Components

Side Entry Sub and Cable Cutter Sub

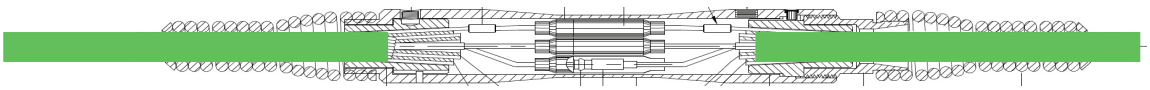


SES Max OD	SES Flow-Thru Path ID	Connection
9″	2.9″	6-5/8″
6.77″	2.17″	5″
5″	1.97″	3-1/2″
3-3/4″	Not Available	2-7/8″



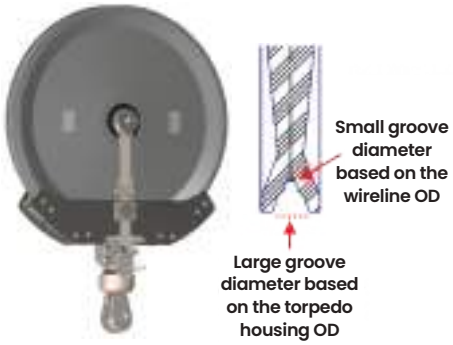
- In LWF operations, to allow the SES-CCS to slide down over the static cable, they are used without their cable clamps.
- When the LWF operation is completed, or at any other time, the cable can be removed from the well by releasing the cable from the toolstring and pulling it until its termination components hit the CCS that cuts the cable at impact.
- After the cable is cut, it exits the SES while the SES pack-off fluid path is sealed by the SES ball valve.
- The CCS performance is independent of the cable strength and condition.

High-Strength Torpedo Connection



- The torpedo connection is designed to host the wireline service company rope socket and cones specific dimensions.
- The torpedo housing metallurgic and geometry are compatible with the 32-in dual-groove sheave wheels and cable tensions expected.

2 x 32-in Wireline Sheave Wheel Dual Groove, SWL: 40 Klbs



- Proof tested to 2x SWL
- Design/Ultimate load of 4:1
- Fully certified (Certificate supplied)
- Tapered Roller Bearings
- Sealed Bearing/Hub System
- Composite wheel is less abrasive to cable/lines
- Full line ancillary items for safety and ease of use

1 x 17-in Wireline Sheave Wheel Single Groove, SWL: 20 Klbs

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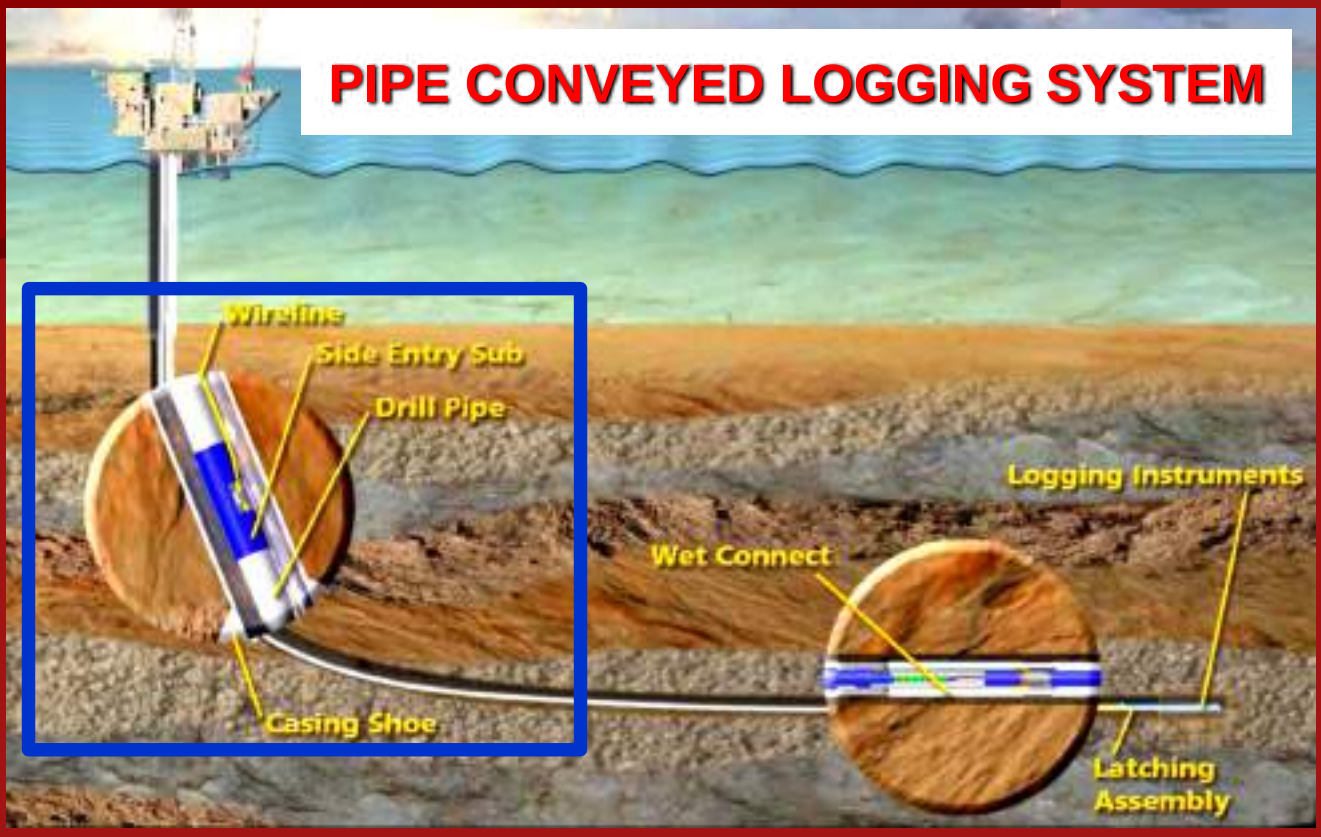
Pipe Conveyed Logging
Enhanced Side-Entry-Sub System



Benefits and Advantages Over Current Systems

- The SES large flow-through hole allows high circulation rates of drilling fluid and running pipe-recovery or fishing tools at all times
- The SES cable pack-off has been successfully tested at 9,000 psi
- The SES Cable Cutter can be activated at any time by pulling a pre-defined high tension on the cable and it keeps the lower section of the cable attached to the SES after the cut is made
- The SES Cable Cutter performance is independent of the cable strength and condition
- The SES Flapper Valve provides an additional well control barrier while allowing pumping drilling mud or running tools through it

Rev: 2018-10-02

GENERAL

The Enhanced SES System includes:

- High-Strength High-Pressure Side-Entry-Sub (SES)
- Cable Cutter Sub (CCS) attached to the bottom end of the SES
- Flapper Valve (FV) mounted on top of the SES

The SES can be used without the CCS or the FV and yet it is the CCS/SES/FV combination that offers the performance and well control advantages listed

This CCS/SES/FV system is compatible with 6-5/8" DP, 5-1/2" DP, 3-1/2" DP and 2-7/8" Tubing.

DIMENSIONS

SES max OD	SES Flow-Thru Path ID	Connection
9''	2.9''	6-5/8''
6.77''	2.17''	5''
5''	1.97''	3-1/2''
3-3/4''	Not Available	2-7/8''

OPERATIONS SEQUENCE

After the CCS/SES/FV has been installed and the wet-connect latching has been successfully achieved, the cable clamp within the CCS is securely attached to the cable before starting the Pipe Conveyed Logging operations.

If it becomes necessary to remove the cable running outside the DP and seal the SES fluid path, a pre-defined high-tension pull is applied by the winch unit that:

o breaks the shear screws holding the cable outside the SES

o activates the CCS cutting blades

After the cable is severed:

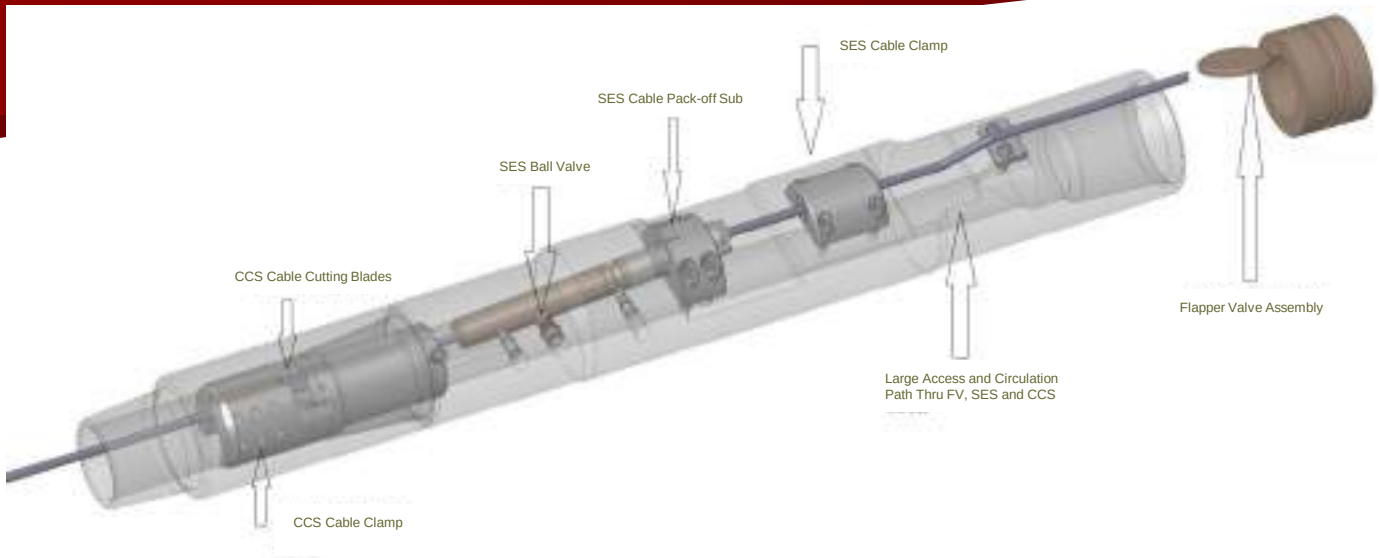
o the upper section exits the SES to be safely removed from the well

o the SES ball valve is activated to seal the SES pack-off fluid path

o the lower section of the cable is retained by the CCS cable clamp

At this point, with the SES sealed and the cable out of the way, contingency recovery operations such as drilling fluid pumping, stuck-pipe, pipe-recovery and fishing operations can be safely performed.

SYSTEM DIAGRAM



CABLE PROTECTOR

During logging operations, the wireline cable is most susceptible to damage. VINCI's TECHNOLOGIES PROTECTORS, create a sufficient stand-off between the outside diameter of the external upset and the casing to prevent damage of the wireline cable by nipping.

VINCI's TECHNOLOGIES CABLE PROTECTOR is specially designed for:

- Quick, easy installation and removal
- Better bonding
- Positive gripping
- Safety in operation

Quick, easy installation and removal of the VINCI's TECHNOLOGIES CABLE PROTECTOR is made possible by the use of locking pins which are forged stainless steel for corrosion protection.
The VINCI's TECHNOLOGIES CABLE PROTECTOR LOCK PIN is designed with an "ARROW HEAD" pin head.
The "ARROW HEAD" and the forged stainless-steel design with rounded angles of the pin decrease the friction surface of the pin inside the protector.
The "ARROW HEAD" position ease insertion of the pin into eyelet of the protection cage

Better bonding
In the CABLE PROTECTORS, the rubber component is bonded to a rugged steel cage with three interlocking fingers on each end.

Positive gripping
Advanced cage design with two advantages:

-Stronger interlocking Rounded protector lock pin means rounded eyelets No risk of incipient cracks
- Better fitting between eyelet and lock pin No elongation of interlocks means better gripping

-Safety in operations:
*The "ARROW HEAD" of the pin locks, the PROTECTOR and eliminates hang-up potential in operations.
*2/10" (5m.m) thickness of the "ARROW HEAD" lock pins prevent the pin head from being flattened against the pipe.
*Higher "compression set" with better gripping on the pipe.
*Axial load of more 2500 lbs. is required to move the PROTECTOR on the pipe, assuring continued stand-off where needed.

Position on tubing string

Is recommended to position the CABLE PROTECTOR above and below each DP coupling at a distance of 5ft. In special cases (such as highly deviated wells or tight dimensions) an additional protector should be installed in the middle of the joint.

Rubber compounds

The rubber composition is made in accordance with the general well conditions (swelling, gassing, slippage and jamming, immersion in completion fluids, corrosion inhibitors).

CABLE PROTECTORS are available in a choice of two rubber compounds:

-Oil resistant for normal downhole conditions and for use where drilling muds have a high oil content and downhole temperature up to 300°F (upon request for higher temperatures)

-Gas resistant compound recommended for wells with high gas concentration

Design

The design of the VINCI's TECHNOLOGIES CABLE PROTECTOR is "Spiral – Exocentric" or "Spiral Centralized".

The "spiral" design intended for applications where high mud velocity is encountered. The "Spiral – Exocentric" design is used only if the gap between the wireline slot and the CASING ID is not enough big and is available on request.

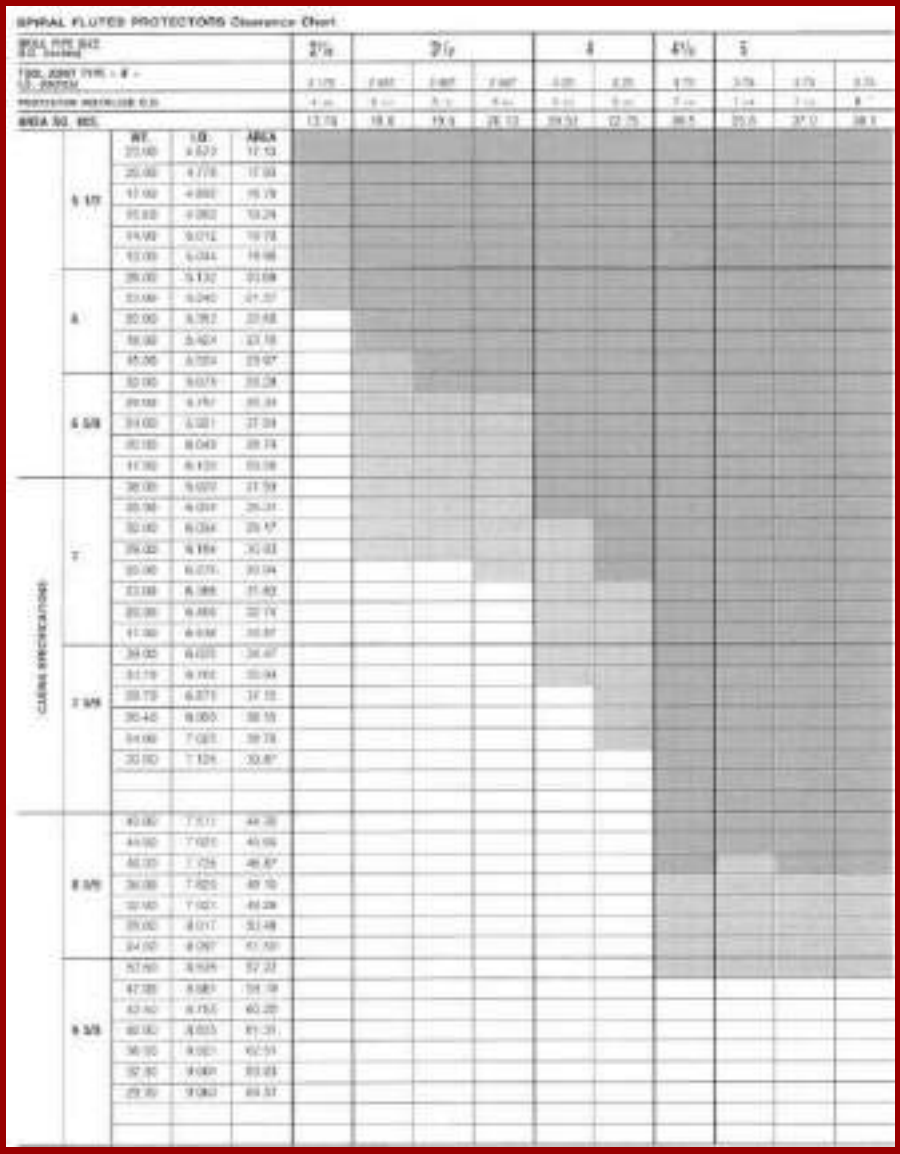
The CABLE PROTECTORS are available for tubing size 2"7/8 to 7".

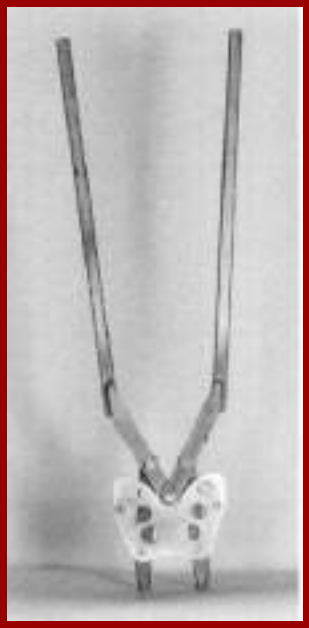
The wireline slot can be from 0"1/4 to 1"1/4.

Quality Control

All aspects of production, from incoming material, elastomer mix and moulding to final performance are carefully controlled.

Cages are tested for rivet strength, rubber to metal bonds and dimensional tolerances. The product grip to drill pipe and slip resistance are also regularly controlled.


SPIRAL FLUTED PROTECTORS Clearance Chart



Installation pool