SAPEX OIL TOOLS LTD.

DRILLING & COMPLETIONS

LINER COMPLETIONS

PRODUCTS, APPLICATIONS & SPECIFICATIONS

TOMORROW'S TECHNOLOGY FOR TODAY'S ENERGY

WHO ARE WE ?

We are an independent International Oilfield Service Company, offering 24-Hour Drilling, Completion and Work-over Service Support to our customers, World - Wide. With fully trained and qualified personnel, we are fully equipped to provide complete backup technical, engineering and field support services to our customers in the installation, operation and maintenance of all equipment that we provide on both Sale and Rental basis.

The SAPEX brand of custom-made down-hole equipment is manufactured in the USA, specifically to meet our customer requirements and to our specifications. SAPEX offers a complete line of Completion Tools, Drilling and Fishing Equipment, Service Tools and related accessories, all designed to meet the needs and operating conditions of our customers. SAPEX brand Equipment includes (but is not limited to):

- **SINGLE / DUAL STRING RETRIEVABLE / PERMANENT COMPLETION PACKERS & ACCESSORIES**
- **THERMAL, STEAMFLOOD, WATERFLOOD AND GASLIFT COMPLETION EQUIPMENT**
- **FLOW CONTROL EQUIPMENT - SLIDING SLEEVES, SEATING NIPPLES, PLUGS, ETC.**
- **WIRELINE TOOLS, COILED TUBING TOOLS AND ACCESSORIES**
- **EXPANSION JOINTS, ON/OFF TOOLS, PBR ASSEMBLIES**
- **CONVENTIONAL GRAVEL PACK EQUIPMENT**
- **RETRIEVABLE SCAB LINER SYSTEMS, PERMANENT INTERNAL CASING PATCHES**
- **SERVICE TOOLS, SQUEEZE PACKERS, RBP'S, PERFORATION WASH TOOLS**
- **CEMENT RETAINERS AND PERMANENT BRIDGE PLUGS (MECHANICAL AND WIRELINE SET)**
- **TUBING SWIVELS**
- **ECP's, INFLATABLE PACKER SYSTEMS**
- **LINER HANGER SYSTEMS (MECHANICAL AND HYDRAULIC)**

Completions, Fishing Services, Testing Services, Straight Equipment Supply and New Product Development briefly summarize SAPEX Oilfield Services' broad ranging capabilities in the unique and exciting world of Oilfield Customer Services and Requirements. SAPEX Oilfield Services Ltd.'s Service Capabilities include:

- **ALL COMPLETION AND WIRELINE SERVICES**
- **LINER HANGER SERVICES**
- **EXTERNAL CASING PACKER AND INFLATABLE PACKER SERVICES**
- **DST / FORMATION EVALUATION - OPEN / CASED HOLE, CONVENTIONAL OR INFLATABLE**
- **FISHING TOOL SALES AND RENTALS COMPLETE WITH FISHING SERVICES**
- **DRILLING TOOL SALES AND RENTALS - HOLE OPENERS, UNDER-REAMERS & STABILIZERS**
- **COMPLETION AND DRILLING EQUIPMENT REPAIR AND REDRESSING SERVICES**

SAPEX Oilfield Services Ltd. serves as a trusted Ally and Business Partner to International Oilfield Companies operating in and around the South East Asian Region. Specifically, SAPEX Oilfield Services Ltd. has qualified itself as an unparalleled Completion Solutions / Services and Oil Tool Equipment Provider, and, as such, strives to further its Service and Supply capabilities in order to better support, build and maintain Customer Loyalty.

SAPEX Oilfield Services Ltd. provides full backup technical and engineering support for the installation, repair and maintenance of all equipment and services we provide. Please contact us through your local SAPEX representative, at any time.

- TOMORROW'S TECHNOLOGY FOR TODAY'S ENERGY -

SAPEX-CHANCELLOR DRILLING & COMPLETIONS DIVISION

LINER COMPLETIONS - INTRODUCTION

Company Profile

The Manufacturing Arm of SAPEX-CHANCELLOR, Chancellor Oil Tool, Inc. was incorporated in 1960 and has remained a family held corporation. Chancellor quickly became a source of oil technology and owns patents for various down hole completion and cementing tools. Chancellor has built a sound reputation for quality and service over the years. Our products and services have been used extensively throughout our domestic oil fields as well as exported to other producing nations. We design, manufacture, and sell a complete product line of down hole tools for the oil industry. Our facility, equipment and personal talents provide for a wide range of manufacturing capabilities. We also work per customer design, sample, or specification, and offer custom machining, welding, and fabrication or emergency repairs at a moments notice.

It was during one of the most recent boom/bust cycles typical of the oil industry, that we decided to put effort into reaching out to other industries to offer our comprehensive machine shop services. This effort has opened up many exciting opportunities for us to demonstrate our manufacturing talents to the customer.

Quality Assurance Quality Control

SAPEX-CHANCELLOR maintains a fully comprehensive QA/QC program that is patterned after ISO 9001. The program features full traceability.

Engineering Design

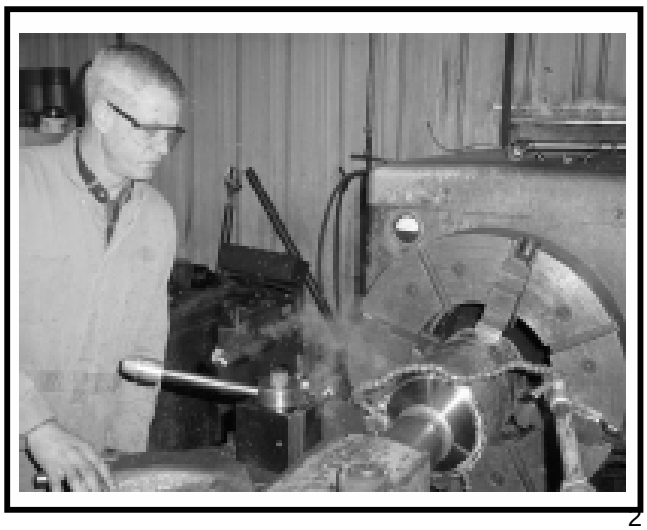
SAPEX-CHANCELLOR has in house design engineering staff for product research and development as well as to assist the customer with product design, and product management experience. AutoCAD 2000, the industry standard, is used to receive and generate manufacturing and customer drawings. The drawings are either turned into design job orders for manual machine or fabrication work or sent to the CNC shop for production programming and work scheduling.

CNC Machine Services

CNC is the answer for all large volume, high quality production. SAPEX-CHANCELLOR has a complete line of modern CNC machines with skilled programmers and operators that pay careful attention to every detail insuring the highest possible quality.

Manual Machine and Welding Services

When production runs are smaller, or when developing a prototype product, it is necessary to utilize the manual machines. Finding and retaining a good experienced machinist is more difficult today than ever. Chancellor prides itself in having the best machinists and welders in the industry. We have five machinists/millwrights with an average of 24 years experience each.



SAPEX-CHANCELLOR DRILLING & COMPLETIONS DIVISION

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SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

TIGHT LINER ASSEMBLY

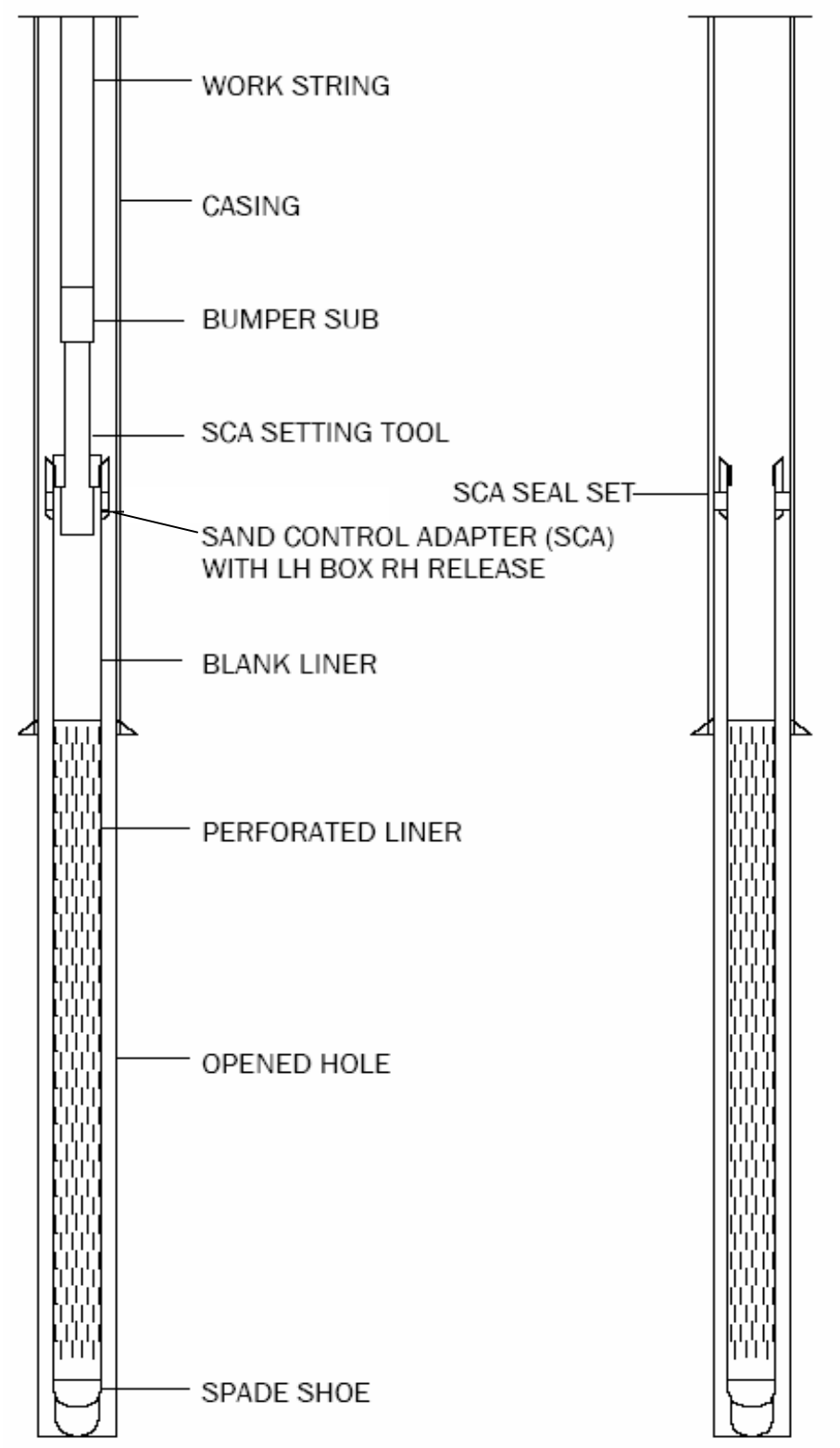
The Standard "Tight Liner" Assembly is the simplest method of installing a slotted liner within an oil well casing to serve as a strainer against the passage of sand and other extraneous materials into the production fluid. The liners are substantially smaller in diameter than the casing to provide annular passage of the production fluid radially and upward. The lower end of the slotted liner sits on bottom of the well. The slotted perforations are placed throughout the entire production interval and the liner top is lapped up into the casing with one joint of blank liner. Liner Top Sand Control Adapters (SCA) are used:

1. as a setting collar for running the liner in the hole on a work string and releasing the liner utilizing a setting tool.

2. as a tool entry guide

3. as an annular seal between the liner top and casing.

There are several types of SCA's available for the right application, from simple economical tool entry guides to high temperature, high pressure adapters.



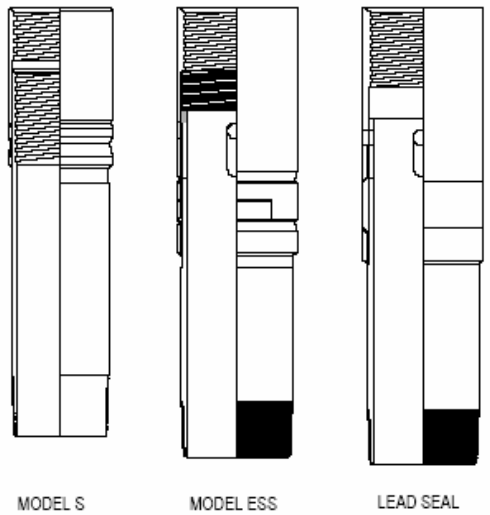
SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

SAND CONTROL ADAPTERS

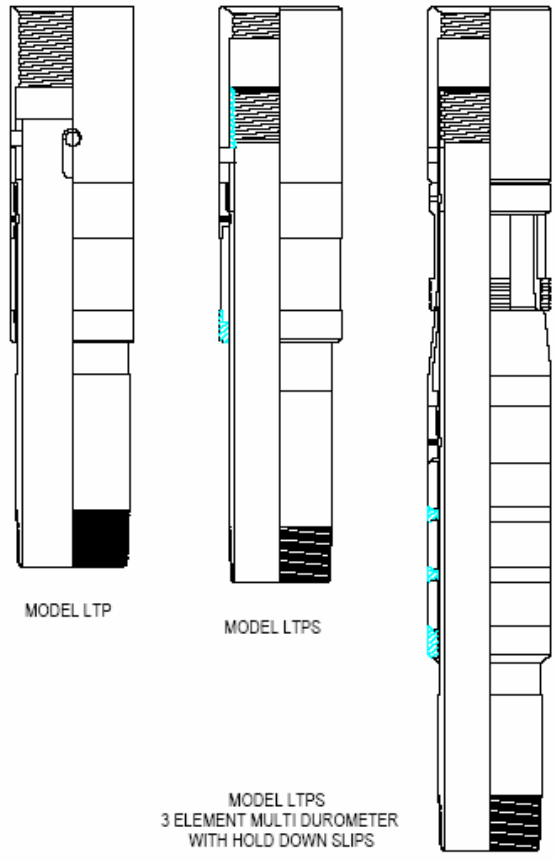
SAPEX-CHANCELLOR offers several models of Liner Top Sand Control Adapters (SCA) for various applications and down-hole conditions. All of these incorporate a set seal element for the purpose of preventing formation sands from entering the well bore. In addition to providing an excellent means of sand control, the SAPEX-CHANCELLOR SCA also serves as a liner top tool entry guide; this eliminates any damage as a result of hitting square shoulders when tools enter the liner. All SAPEX-CHANCELLOR SCA's have an "all weight" O.D. that is ideal for unknown or mixed weight casing strings. They are also equipped with a safety shoulder to prevent premature setting during run in, and internal locking ring or wicker press to keep seal energized after set. The SAPEX-CHANCELLOR SCA can also be combined with a circulating shoe, inner tubing string, and special running thread and clutches for the purpose of circulating and/or rotating in slotted liner.

The Model ESS Expanding Steel Seal was specifically designed for thermal wells and works remarkably well where liner expansion/contraction and steam cutting often cause other seal elements to fail. The steel seal element is machined from ductile steel, has tapered ends, and is sandwiched between matching tapers on the setting ring and stop ring. When set, these mating tapers will expand the steel ring out to form a secure metal to metal annulus seal. The Model S is a very efficient and easy to set metal to metal seal adapter. It can be set on tubing with no drill collar required for extra weight. The Model S has a reduced "all weight" O.D. that makes it a good choice for liner circulating or well bore change over applications. This is also beneficial if tight spots or restrictions in the casing are encountered.

The Model LTP uses an elastomer to provide a premium liner top seal where seal pressure integrity is most important. Regular nitrile can be used for most applications under 275o F and 2000 psi differential pressure. Alternate elastomers materials such as HSN, VITON or AFLAS can be specified depending on higher temperatures of the pressure of H2S of CO2. The three element multi durometer LTP with metal extrusion rings provides the ultimate liner top packer with a differential pressure rating of 5000 psi. The LTP incorporates an internal lock ring that maintains seal integrity after set and release. The LTPS is designed to carry long heavy liners while providing an additional safety set feature that prevents the unintentional setting of the packer while running in the hole. The lead seal is still available as a general purpose adapter but is gradually falling out of favor due to environmental concerns.



Liner Size	Casing		Product Number			
in	Size in	Weight Range lb/ft	ESS	S	LTP	LTPS
mm	mm					
4.5	5.5					
102	140	15.5-20	M990870155	M02120155	M94030155	M011170155
5	6.625					
127	168	24-28	M99087016	M0212016	M9403016	M01117016
5.5	7					
140	178	23-29	M99087017	M0212017	M9403017	M01117017
6.625	8.625					
168	219	24-32	M99087018	M0212018	M9403018	M01117018
7	9.625					
176	244	36-53.5	M99087019	M0212019	M9403019	M01117019

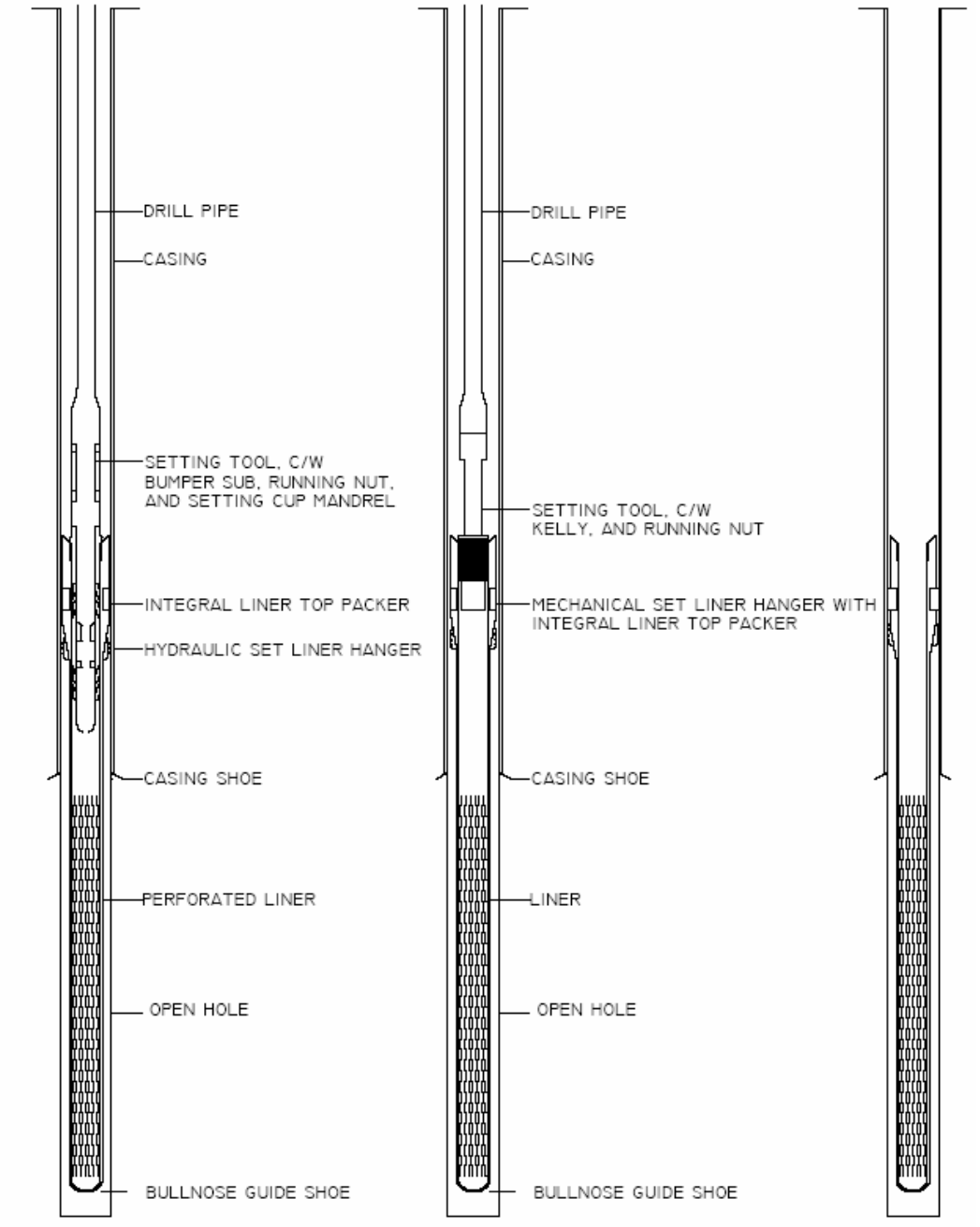


SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

WITH LINER HANGER

At times it is necessary to hang a liner in tension. There are a couple of reasons for this. Either there is no bottom on which to set down and release the liner, or there is sufficient liner length (1,000 feet or more of liner) that might cause buckling or failure when set on bottom. Hanging a liner versus setting it on bottom will prevent liner buckling when setting liner top seal using reciprocating or beating down.

Liner hangers are generally run on the liner top and incorporate a packer seal element. Hold down slips can be incorporated, and various packer seal elements can be provided depending on downhole temperature, pressure, and the concentration of H2S or CO2.



SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

LINER HANGERS WITH INTEGRAL PACKERS

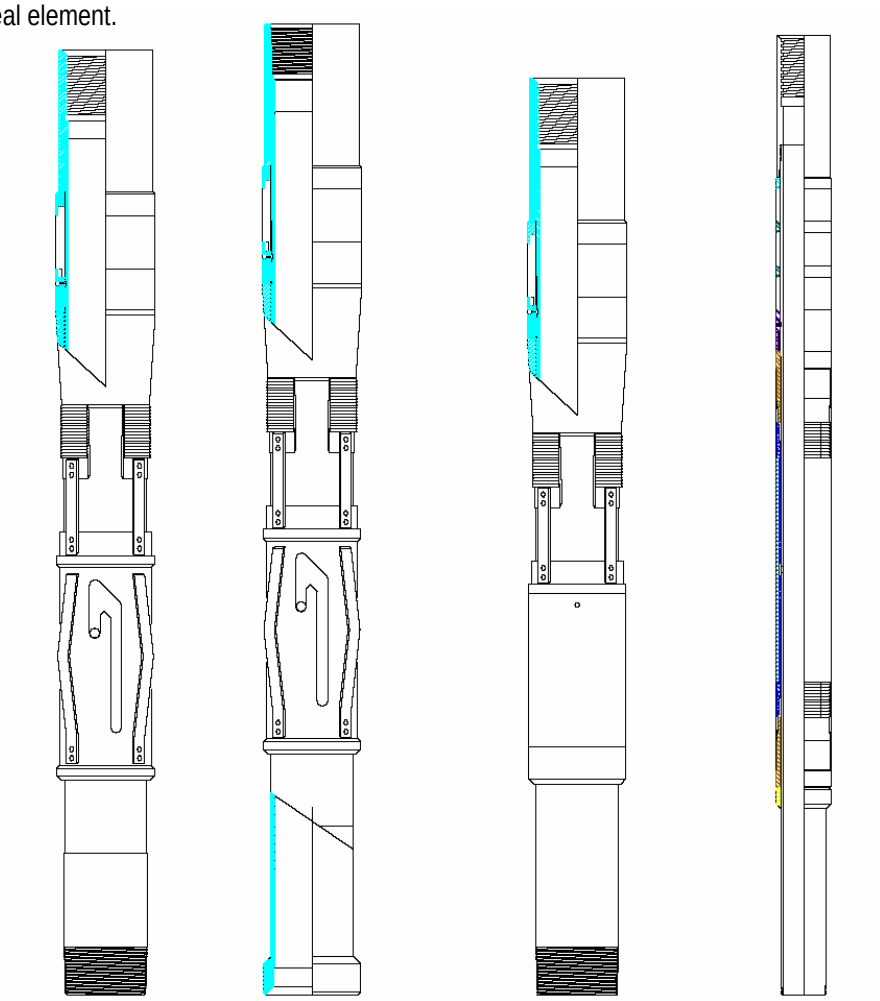
The SAPEX-CHANCELLOR Model MSCP Mechanical Set Liner Hanger with integral liner top packer is a versatile and economical completion tool. The design is based on an enclosed jay within a one piece sleeve with bow springs. The hanger is mechanically set by manipulating the running-in string. The jay slot holds the slips in place below the cone, while running in the well. When the setting depth is reached, the hanger is raised a few inches and rotated left to disengage the jay slot cage. As the hanger is lowered, slips will be held stationary by the bow springs and the taper cone will move downward under the slips, forcing them outward to contact the casing. Approximately 5,000# downward force will shear cone from mandrel to set packer seal. Slacking off liner weight (approx. 10,000 lbs. minimum) is sufficient to set packer seal element. Reciprocation impact of setting tool may be used to apply additional setting force for shorter, lighter liners. A lock ring keeps the packer seal energized. Slips are case hardened to grip the hardest casing. Setting tools are released RH rotation when liner is hung, or if necessary, when liner is landed on bottom The MSCP Bottom Hanger is use typically use in casing patch applications for short isolation intervals with a LTP Packer on top or in long cased to surface protective strings. The hanger can be set with RH or LH rotation as needed.

The SAPEX-CHANCELLOR Model HCSP Hydraulic Liner Hanger with integral Liner Top Packer is the correct choice for hanging liners in deep or deviated wells or longer heavier liners that make mechanical setting difficult. The design is primarily based on the hydraulic setting of the slip segments which distribute the liner weight evenly on the tapered oval cones. A straddle packer cup tool is used to isolate the hydraulic hanger setting ports. A piston is shear pinned in the cup mandrel to prevent premature set. A setting ball is dropped to land and shear out the piston, and hydraulically set the hanger. Slips are case hardened to grip the hardest casing. Approximately 5,000 lbs. downward force will shear the cone from the mandrel to set packer seal. Slacking off liner weight (approx. 20,000 lbs. minimum) is sufficient to set packer seal element.

Reciprocation impact of setting tool may be used to apply additional setting force for shorter, lighter liners. A lock ring keeps the packer seal energized.

The Model HTP Hydraulic set Double Grip Liner Top Packer is ideal for use in horizontal or highly deviated or deep slotted liners, where hydraulic setting of hanger slips is necessary. The slips hang as well as hold the liner in place and prevent movement up or down the hole. The packer element can be either weight set or tension set as well as single or multi Durometer. Expansion of the liner through the hanger is and option which allows the liner to expand and contract freely through the set hanger.

Liner	Casing					MAX
Size	Size	Weight Range		Product		O.D.
in	in	lbs/ft		Number		in
mm	mm		MSCP	HSCP	HTP	
3.5	5.5	15-20	M990930155	C9607655	M0111600155	4.5
89	140					
5	6.625	20-24	M99093016	C960766	M011160016	5.625
127	168	28-32				5.5
5.5	7	30-26	M99093017	C960767	M011160017	6
140	178	29-32				5.875
6.625	8.625	24-28	M99093018	C960768	M011160018	7.625
168	219	32-36				7.45
7	9.625	36-43.5	M99093019	C960769	M011160019	8.4
178	244	47-53.5				8.25

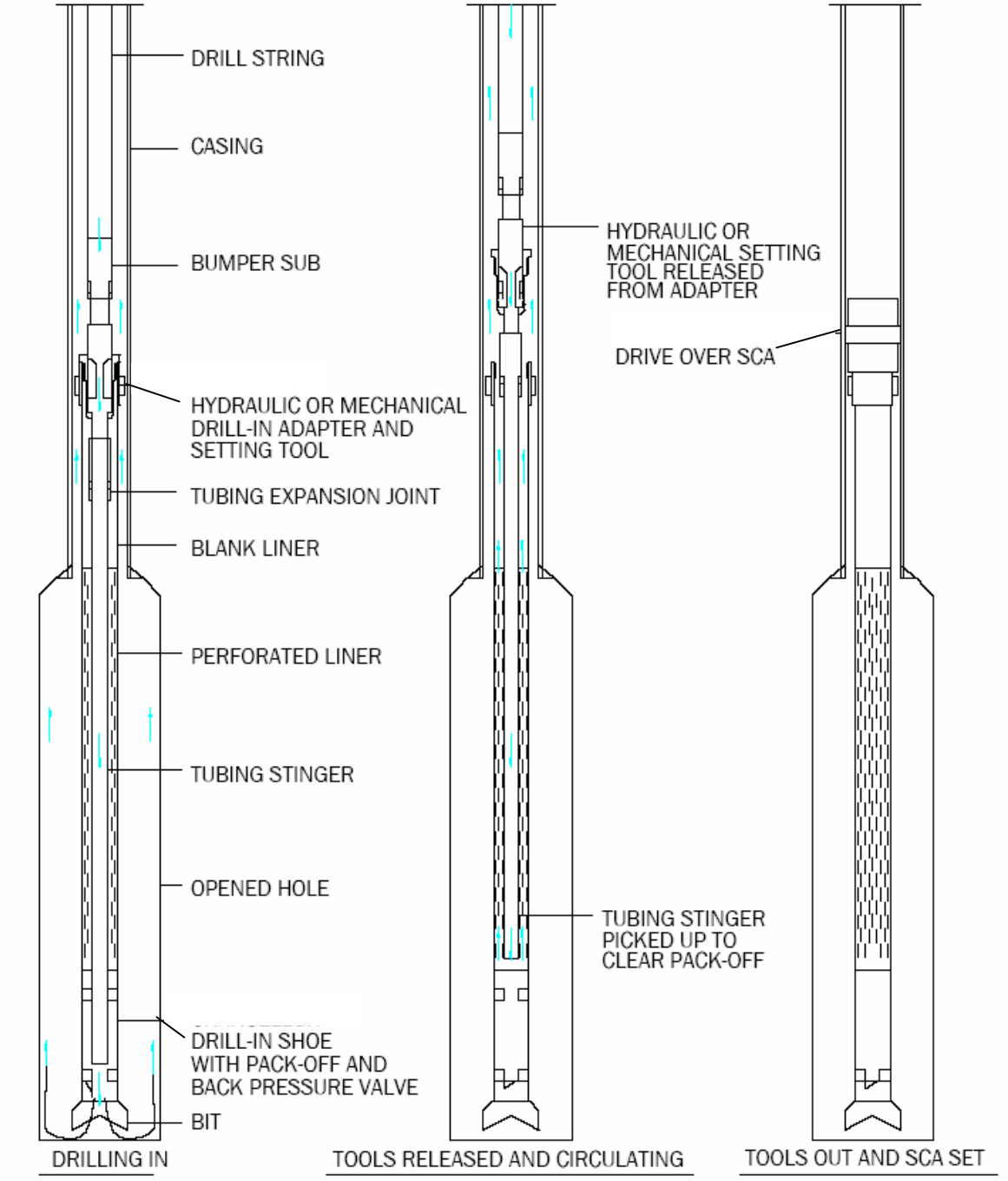


MODEL MSCP LINER TOP HANGER | MODEL MSCP LINER BOTTOM HANGER | MODEL HSCP LINER TOP HANGER | MODEL HTP LINER TOP HANGER

SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

LINER DRILL-IN TOOLS

The SAPEX-CHANCELLOR drill-in assembly is used when drilling in a new liner with or without a pilot or previously drilled hole. This system of drilling-in liners has proven especially beneficial for liner work over in older, depleted, unconsolidated reservoirs or where returns or sloughing of sand is a problem. The assembly is used for new completions as well as redrills. The mechanical type drill-in adapter has sufficient torsional strength for most work overs and power swivel uses. The hydraulic drill-in adapter is the preferred assembly for new completions drilled with a rotary table or when high torque and weight are required at the bit for fast drilling. The assembly includes a bit on bottom of the drill-in shoe. A tubing stinger spaced with an expansion joint, and a drill-in adapter on the liner top. With liner on bottom, the setting tools are released, picked up, and the liner is circulated clean. The tools and stinger are pulled out of the hole and a SCA is run in the hole, driven over the adapter and set.



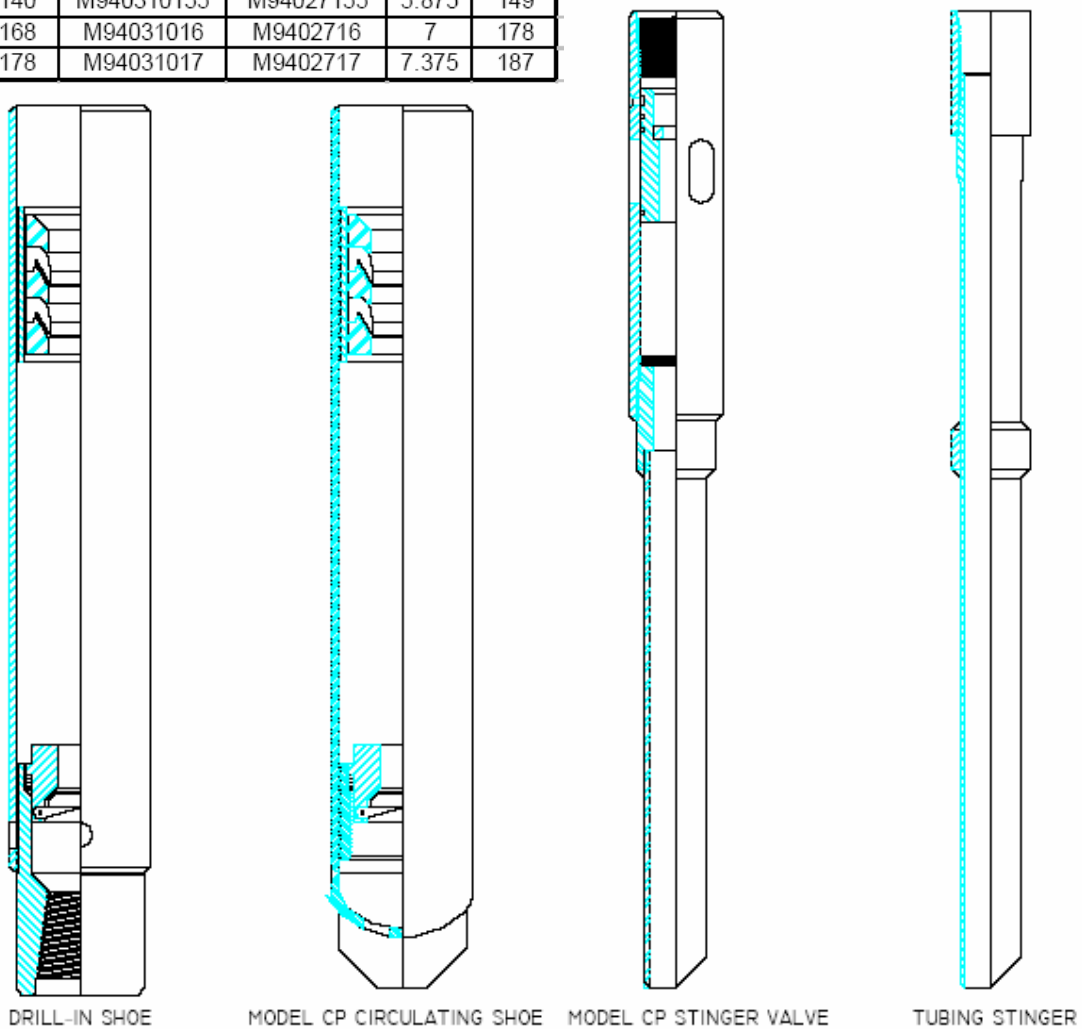
SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

DRILL-IN SHOE AND CIRCULATING SHOE

The drill-in shoe is used when drilling in a liner with a bit on bottom. Tubing is spaced out within the perforated liner with a stinger joint stabbed through the packoffs and landed just above the flapper check valve. This is to insure proper delivery of circulating fluid to the bit. A 3 in. diameter dropping ball is provided to prevent a bailer or other tool from getting stuck in the packoffs.

The SAPEX-CHANCELLOR Model CP Circulating Shoe is ideal for circulating soft formation fill while running liner in or changing over well bore fluids once on bottom. A bottom ported bull nose is used with optional bladed bottom to assist in the process. The liner and circulating shoe can be rotated while circulating in. A 2-3/8" or 2-7/8" stinger joint is run on the bottom of the inner tubing string and stabbed through the rubber packoffs until landing on top of flapper check valve. The tubing string is properly spaced out with pups so that when the liner top adapter/hanger and setting tools are made up to the liner top, the stinger is always stabbed in pack-off while insuring proper delivery of circulating fluid. A stinger valve can be run to provide circulating ports above the packoffs for the purpose of circulating or reversing without having to pull out the stinger. After release of setting tools with tubing string and stinger, a 3 inch diameter cast steel ball is dropped from surface to land on the pack-off to prevent tubing bailers, etc., from getting stuck in the bore. All internals can be made drillable.

Liner Size		Product Number		Max O.D.	
in	mm	circulating shoe	drill-in shoe	in	mm
4	102	M94031014	M9402714	4.375	111
4.5	114	M940310145	M94027145	4.875	124
5	127	M94031015	M9402715	5.375	137
5.5	140	M940310155	M94027155	5.875	149
6.625	168	M94031016	M9402716	7	178
7	178	M94031017	M9402717	7.375	187



DRILL-IN SHOE | MODEL CP CIRCULATING SHOE | MODEL CP STINGER VALVE | TUBING STINGER

SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

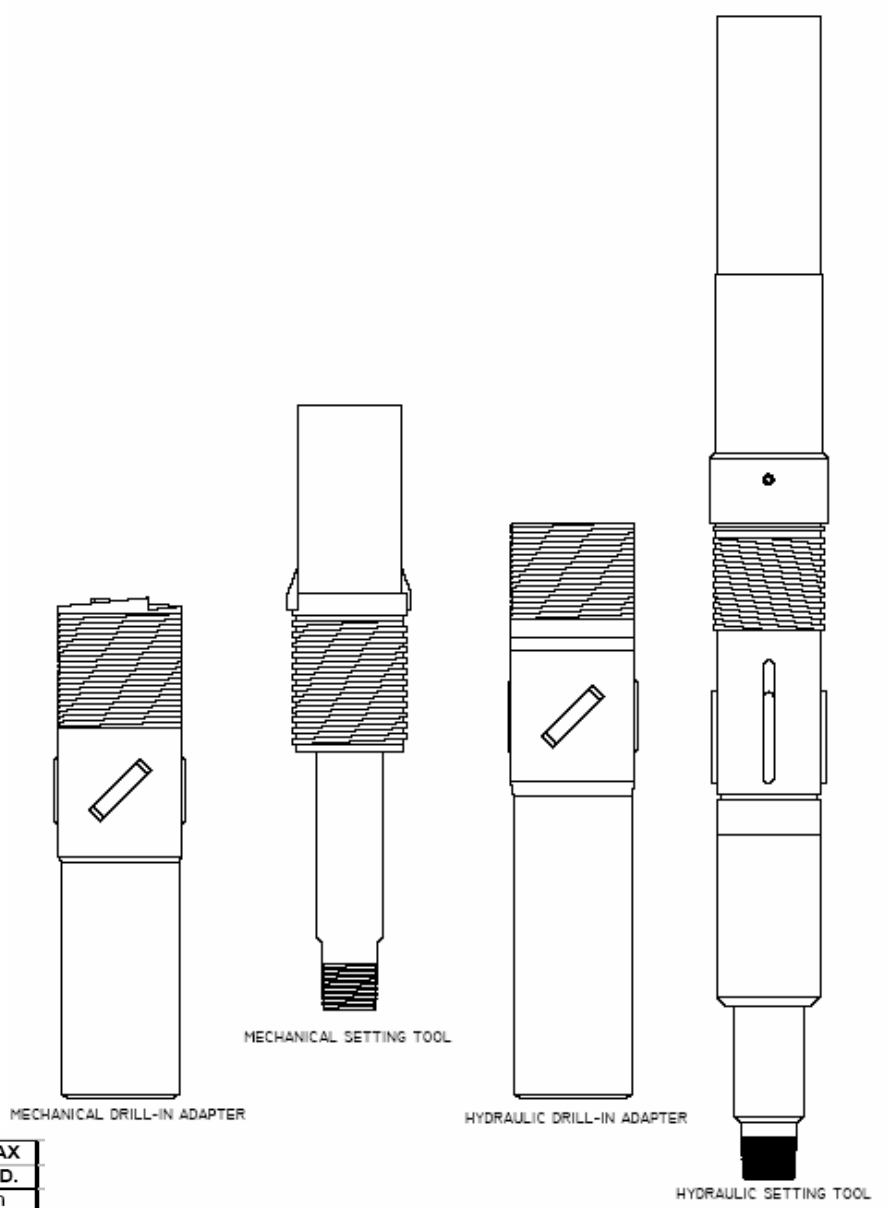
DRILL-IN ADAPTER

The SAPEX-CHANCELLOR hydraulic drill-in adapter was developed to improve upon the limitations of the conventional right hand clutched drill-in adapter. It was specifically designed for excessive torque (in excess of 3000 ft-lbs) that indicated down hole conditions such as inadequate circulation rate or mixture, dog legs or deviations from straight hole drilling, or certain formations that make drilling difficult. The hydraulic drill-in adapter is highly recommended for new or workover drill-ins where no pilot hole has been made.

The features include:
- A maximum drilling torque of up to 15,000 ft-lbs.
- A completely sealed setting tool to preclude the passage of fine sands into the hydraulic components of the setting tool.
- Right hand rotation release for setting tool.
- A fail safe hydraulic release for drive mechanism. Upon reaching T.D. a ball is dropped to shear out the piston to retract drive dogs.
- Ability to drill-in with any circulation fluid.
- Ability to function equally well for drilling in blank liners to be cemented.
- Bypass ports in hydraulic release piston to allow for continues circulation thru tubing after shearing out and releasing.
- Simplicity and fail-safe operation is compatible with standard drill-in practice and equipment.

The hydraulic setting tool and drill-in adapter are delivered to rig site as a complete unit with drive dogs of setting tool in the mating grooves of the drill-in adapter.

The SAPEX-CHANCELLOR mechanical drill-in adapter is a liner top adapter clutched for RH rotation. It was designed specifically for transferring torque from the drill string through the liner assembly down to the shoe or bit. The rotating clutch surfaces between the adapter and the setting tool provide sufficient surface area to withstand most conditions (to 3000 ft-lbs). Since there is no make up between the setting tool and adapter clutches, left hand release of the setting tool is no problem.



Liner Size	Casing Size	Casing Weight Range	Product Number		MAX O.D.
in	in	lbs/ft	Mechanical	Hydraulic	in
mm	mm				mm
4	5.5	15.5-20	M9402855	M9403655	4.5
102	140				114
5	6.625	24-28	M940286	M940366	5.2
127	168				140
5.5	7	23-29	M9402857	M940367	6
140	178				152
6.625	8.625	24-32	M940288	M940368	7.625
168	219				193
7	9.625	36-36.5	M940289	M940369	8.25
178	244				210

SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

STEEL SAND CONTROL ADAPTER

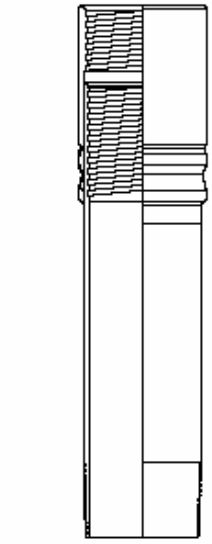
The SAPEX-CHANCELLOR Steel Seal Sand Control Adapters are a superior choice for providing a secure annulus seal between the production liner and the well casing. The seal element is machined from ductile steel and forms a thin wall metal to metal annular seal. The downward orientation of the sealing ring is designed to facilitate retrieval.

The setting tool running nut is engaged to the adapter in a safety position while running in or driving over a liner top. In this position premature setting of the seal is prevented if an obstruction is encountered. The setting procedure is similar to that of common adapters. 10,000 lbs is sufficient weight to set the seal.

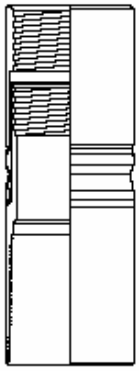
The SAPEX-CHANCELLOR Steel Seal Sand Control Adapters work remarkably well for thermal wells where liner expansion/contraction and steam cutting often cause other seal elements to fail. The metal seal element will maintain a full circle seal through such cycles. The seal has field tested to 1200 psi. U.S. Patent No. 4,796,786 has been given to this invention.

The original Steel Flare type Sand Control Adapter is simple to manufacture and economical to use. The Model S was designed to be an all weight size and is very easy to set.

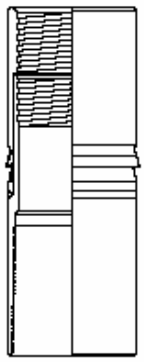
The S steel element can be set on tubing. No drill collars are required. The Model S has a reduced O.D. and is a good choice when circulating is required or tight spots in the casing are anticipated.



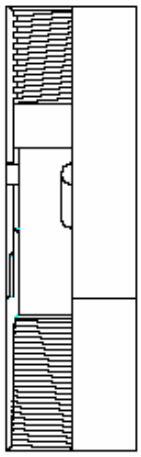
MODEL S TIGHT LINER TYPE
BEFORE SET



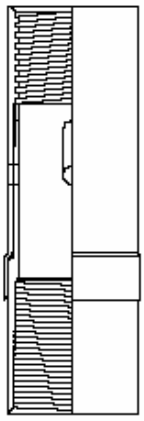
MODEL S DRIVE OVER TYPE
BEFORE SET



MODEL S DRIVE OVER TYPE
AFTER SET



STEEL FLARE DRIVE OVER
BEFORE SET



STEEL FLARE DRIVE OVER
AFTER SET

Liner Size	Casing Size	Casing Weight Range	Product Number	MAX O.D.
in	in	lbs/ft		in
mm	mm		Model S	
4	5.5	15.5-20	M021210155	4.5
102	140			
5	6.625	24-28	M02121016	5.5
127	168			
5.5	7	23-29	M02121017	6
140	178			
6.625	8.625	24-32	M02121018	7.625
168	219			
7	9.625	36-53.5	M02121019	8.5
178	244			

Liner Size	Casing Size	Casing Weight Range	Product Number	MAX O.D.
in	in	lbs/ft		in
mm	mm		Steel Flare	
4	5.5	15.5-20	M92010155	casing drift
102	140			< .125
5	6.625	24-28	M9201015	casing drift
127	168			< .125
5.5	7	23-29	M92010175	casing drift
140	178			< .125
6.625	8.625	24-32	M9201018	casing drift
168	219			< .125
7	9.625	36-53.5	M9201019	casing drift
178	244			< .125

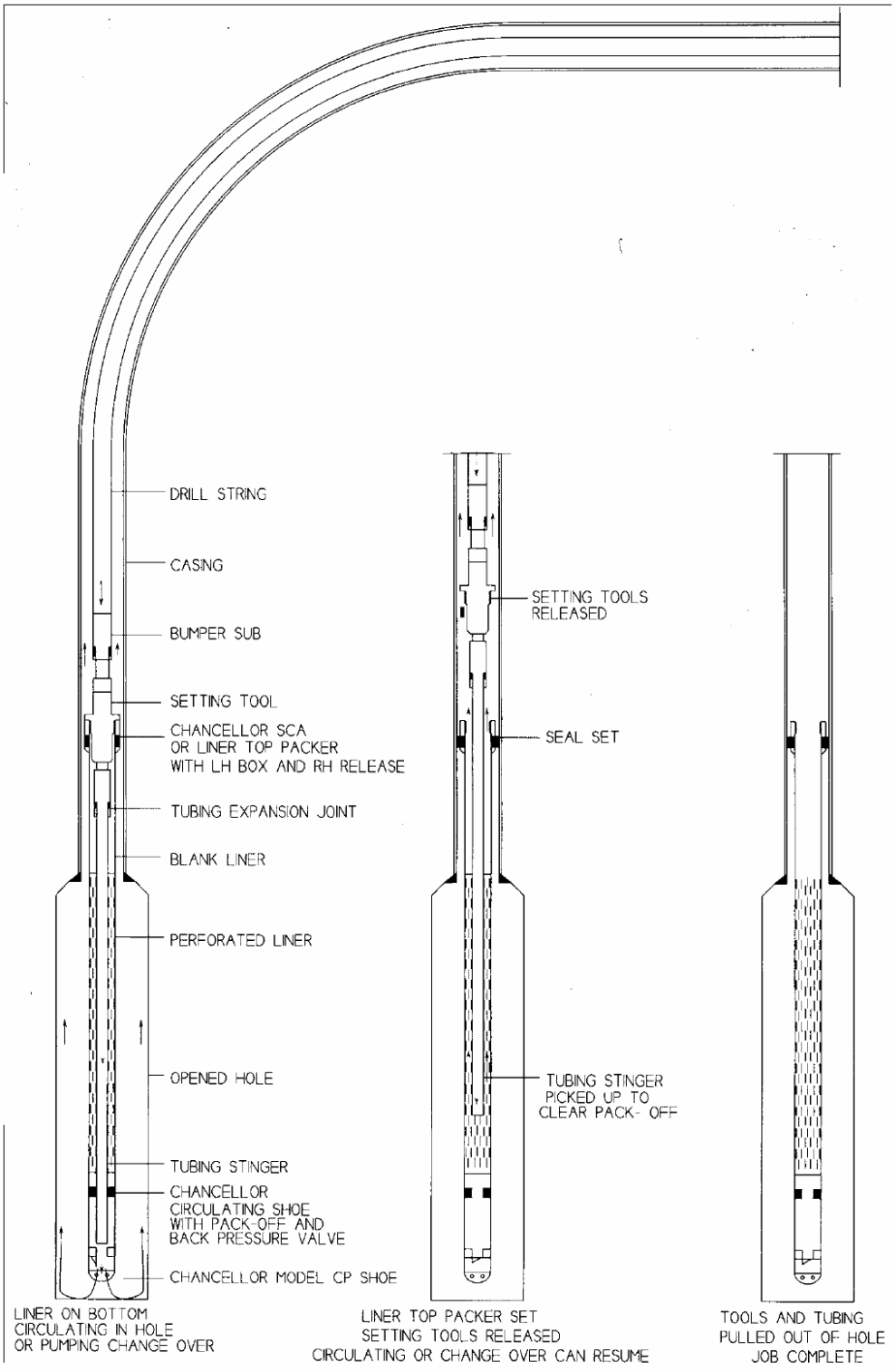
SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

HORIZONTAL LINERS – ONE TRIP, MECHANICAL

SAPEX-CHANCELLOR provides customers with a complete product line for horizontal slotted liner assemblies. Whether it is a simple shallow horizontal or a more challenging extended reach or deeper horizontal, SAPEX-CHANCELLOR has the right tool for the application.

The simplest horizontal slotted liner assembly consists of a bullnose guide shoe on bottom with a liner packer on top. The adapter is sufficiently strong for pushing or pulling the liner while maintaining a seal setting safety position.

Circulating or wellbore fluid change over is an option with the addition of the circulating shoe and inner tubing string. Seal setting is done by reciprocal force and setting tool release is accomplished with RH rotation. No rotation is allowed while running in the hole. This simple and efficient horizontal liner assembly performs quite well for shallow applications.



SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

MODEL "B" AND "BR" LINER TOP PACKER

The SAPEX-CHANCELLOR Model B Liner Top Packer is a premium liner packer and provides a very dependable seal against gas migration and the passage of sand over the liner top and into the well bore.

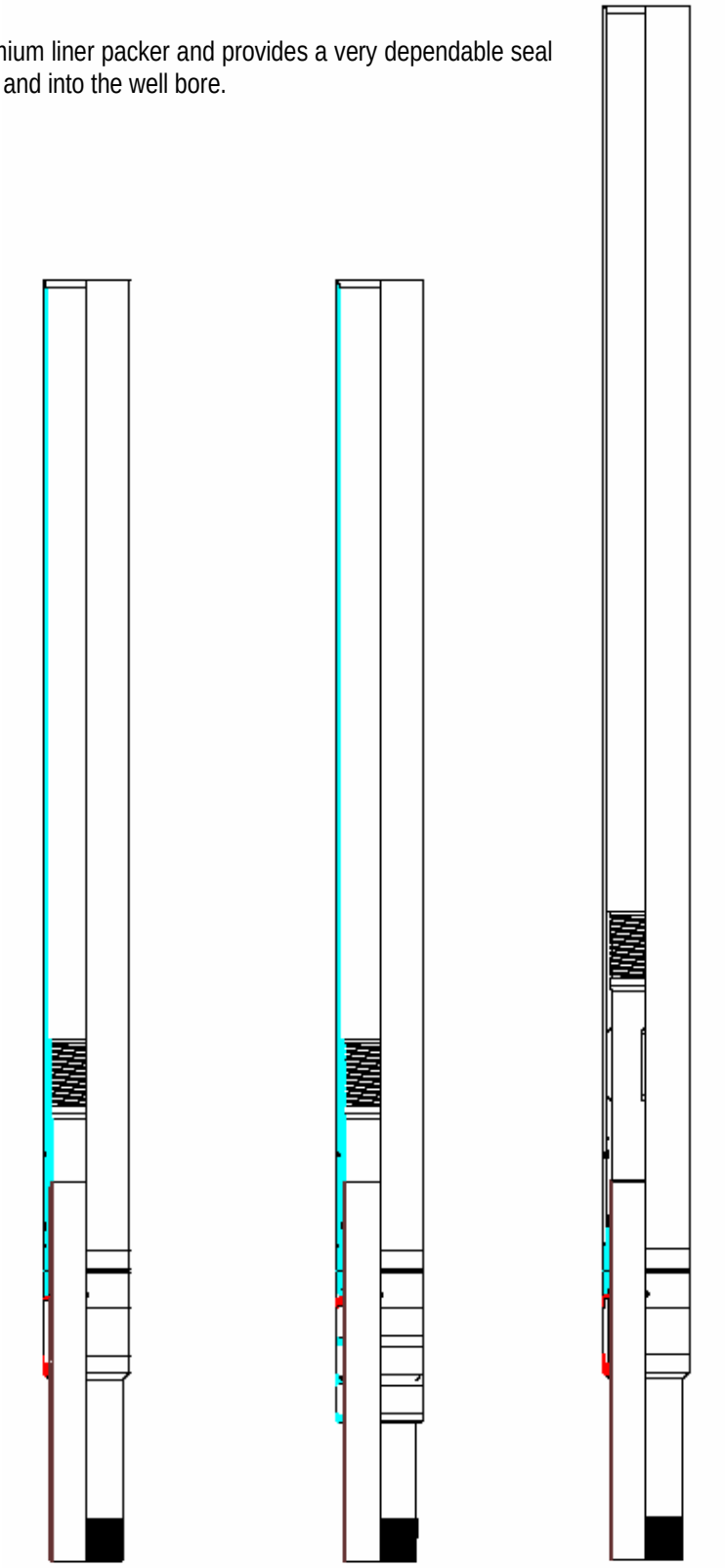
The packer is made up to the liner and run into the hole and set in one trip. Because of its load rating, the model B liner top packer is an excellent choice for running long, heavy, or deviated liners. A liner tie back receptacle (TBR) is provided which allows future tie back of liner or tubing.

The packer is run with a setting tool consisting of a kelly with floating nut, packer setting dog sub and handling lifter. The packer setting dog sub is retained in the TBR while running in the hole so that premature setting of sear is avoided.

Once on bottom, the setting tool is released with RH rotation and picked up so that the dog sub is expanded above the TBR. The packer's seal elements are set by slacking off weight.

The Model BR has splines for the purpose of rotating the liner while running in the hole or setting mechanical liner hangers run just below the packer. The splines also prevent the unintended release of setting tools while running in the hole

Liner	Casing				MAX
Size	Size	Weight Range	Product	Product	O.D.
in	in	lbs/ft	Number	Number	in
mm	mm		Model B	Model BR	mm
4.5	7	20-26	M000990145	M021260145	6
		26-29			5.875
5	7	20-26	M00899015	M02126015	6
		26-29			5.875
6.625	8.625	24-32	M00099016	M02126016	7.5
		32-36			7.375
7	9.625	36-43.5	M00099017	M02126017	8.4
		43.5-53.5			8.25
7.625	9.625	36-43.5	M000990176	M021260176	8.4



MODEL B SINGLE ELEMENT

MODEL B MULTI ELEMENT

MODEL BR SINGLE ELEMENT

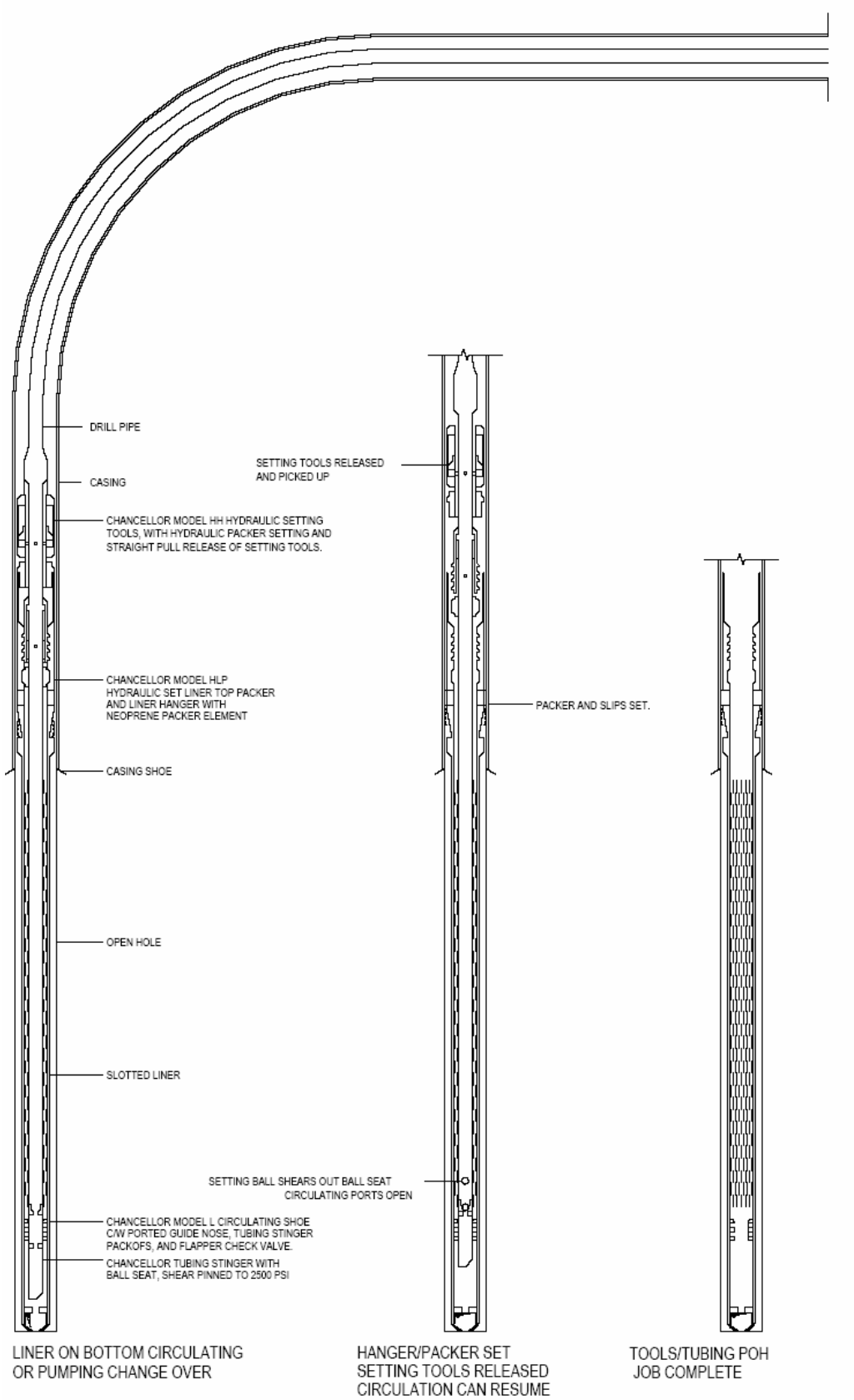
SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

HORIZONTAL LINERS, HYDRAULIC SET AND RELEASE

The SAPEX-CHANCELLOR Hydraulic Set and Release Horizontal Liner Assembly was designed specifically for running long horizontal or highly deviated slotted liners. It utilizes the model HH setting tool which features complete hydraulic packer set ting and hydraulic straight pull release where mechanical setting and release is sometimes difficult or impossible.

The liner can be circulated while running in the hole as well as rotated while in tension or compression. The setting tool remains engaged to the hanger at all times while running in the hole. A mechanical emergency release is available with RH rotation.

The hydraulic release feature of the HH tool can be combined with a mechanical (weight set) packer dog sub to simplify the setting procedure when down hole conditions allow it. Like wise, the hydraulic packer setting feature of the HH tool can be combined with a mechanical (right hand) releasing tool.



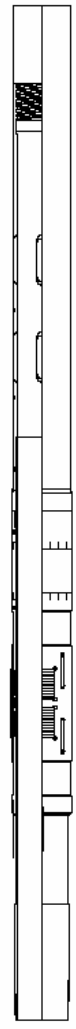
SAPEX-CHANCELLOR SLOTTED LINER ASSEMBLIES

MODEL "HLP" AND "HH" FOR HORIZONTAL LINERS

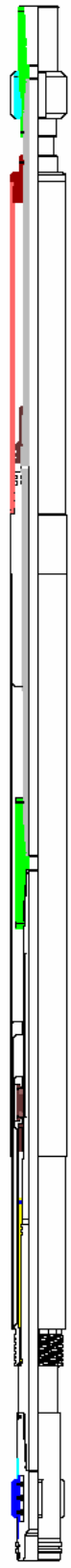
When running long horizontal or highly deviated slotted liners SAPEX-CHANCELLOR recommends the model HLP liner top packer and HH setting tool. The model HH setting tool features complete hydraulic packer setting and hydraulic straight pull release where mechanical setting and release is sometimes difficult or impossible. The liner can be circulated while running in the hole as well as rotated while in tension or compression. The setting tool remains engaged to the hanger at all times while running in the hole. A variety of packer elements can be run on the model HLP liner top packer, depending on well bore conditions. Choices include steel, single or multi durometer nitrile, HSN, VITON, or AFLAS elastomers. The HLP includes double grip slips to anchor the packer after set. The HLP can also be provided without hanger slips.

After circulating, a setting ball is dropped down the drill pipe and conventionally pumped to hydraulically set the liner top packer the ball lands in a seat below the packer or within the tubing string. The hanger/packer starts to set at 1000 Psi. The setting tool releases at 2000 Psi. 2000 Psi will put sufficient setting force (43.000 lbs for 9 5/8") on the packer element. 3000 Psi shears the ball seat at the stinger. The setting tools are released with straight pick up. A mechanical emergency release is available with RH rotation. Conventional or reverse circulation can resume through the open port just above the stinger pack off within the liner/tubing annulus.

Liner Size	Casing Size	Casing Weight Range	Product Number	MAX O.D.
in mm	in mm	lbs/ft		in mm
4 102	5.5 140	15.5-20	M031330155	4.5 144
5 127	6.625 168	24-28	M03133016	5.5 140
5.5 140	7 178	23-29	M03133017	6 152
6.625 168	8.625 219	24-32	M03133018	7.5 191
7 178	9.625 244	36-53.5	M03133019	8.375 213



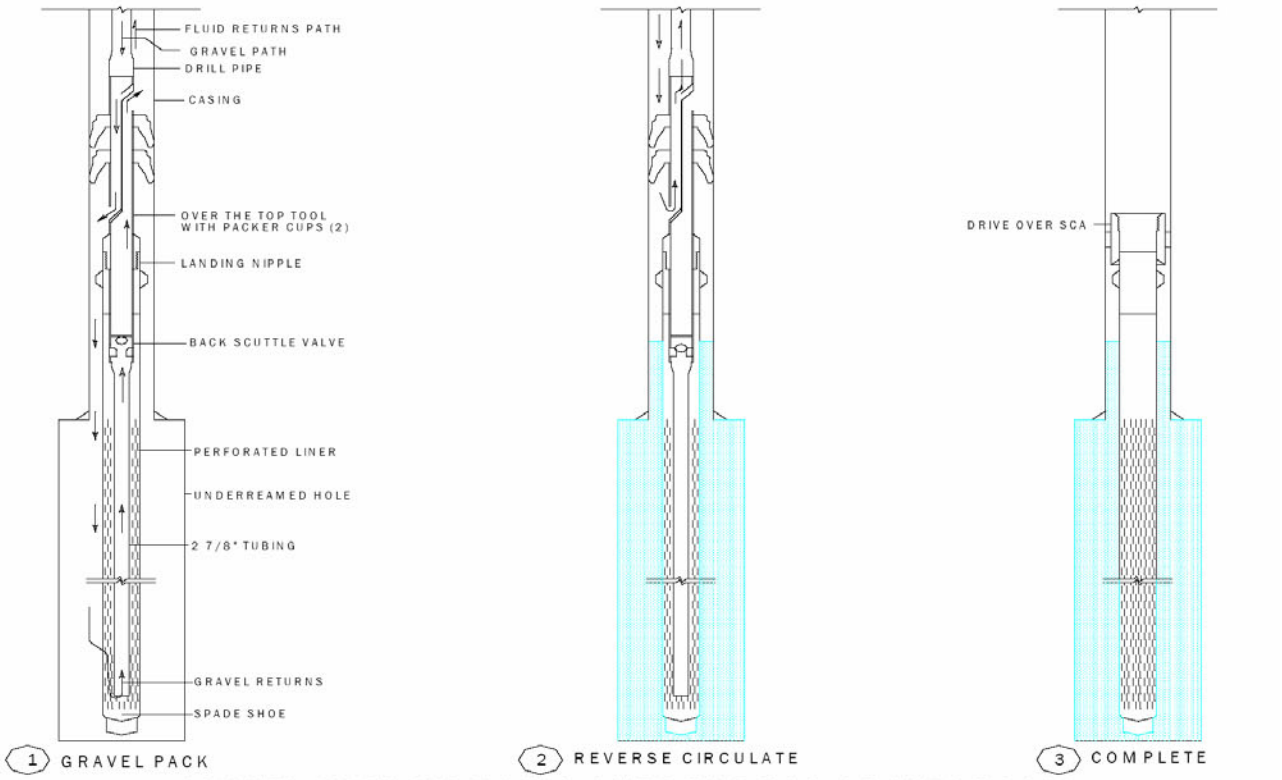
MODEL HLP



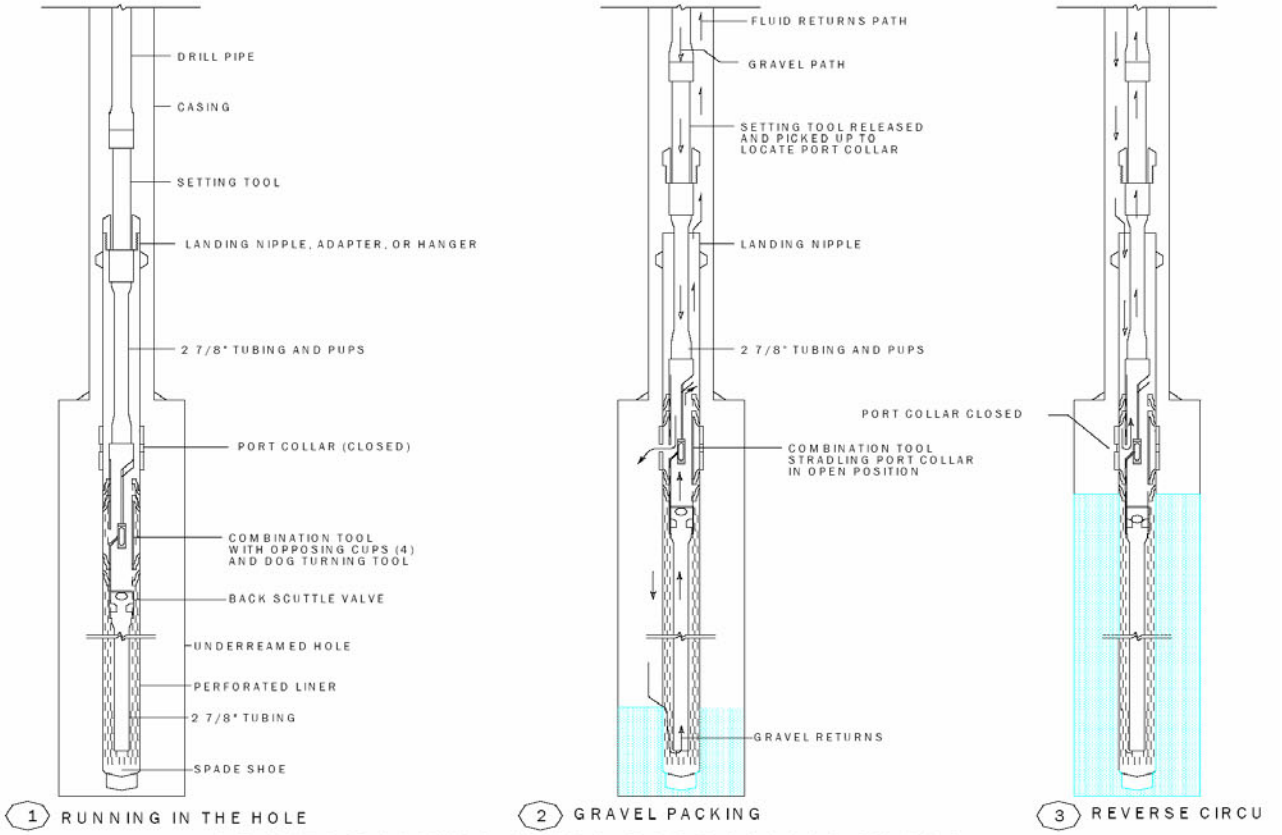
TYPE HH SETTING TOOLS

SAPEX-CHANCELLOR GRAVEL PACKED LINERS

OVER THE TOP AND PORT COLLAR METHODS



GRAVEL PACKING USING OVER THE TOP GRAVEL TOOLS



GRAVEL PACKING USING PORT COLLAR TOOLS

SAPEX-CHANCELLOR GRAVEL PACKED LINERS

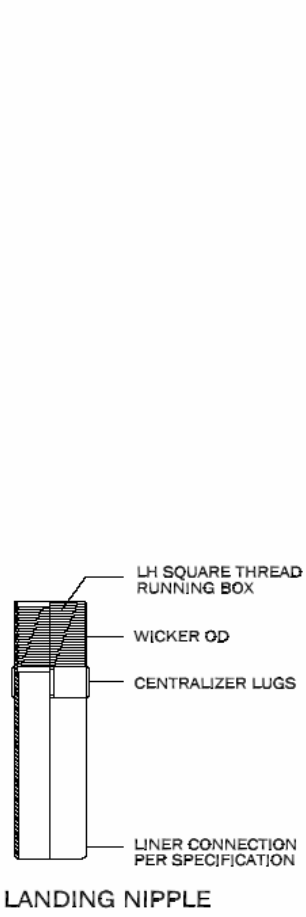
OVER THE TOP TOOLS

Gravel packing is a systematical process designed to further control unconsolidated sand formations from entering the well bore. This utilization of gravel as a controlled filtering device was first introduced to the oil industry in the 1930's. Since then techniques and methods have been refined and designed to fit special requirements.

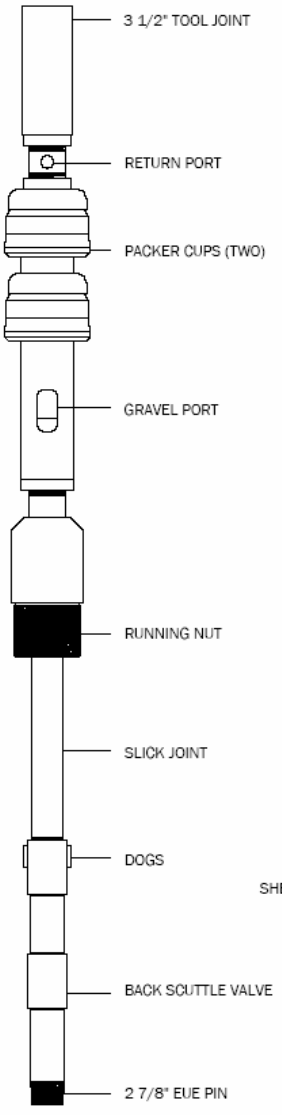
SAPEX-CHANCELLOR's involvement with gravel packing is primarily the manufacture and sales of liner assembly and setting tools as required for the common techniques. These gravel pack systems are part of SAPEX-CHANCELLOR broad capabilities.

The conventional method or, "over the top", technique is very common for the shallow heavy crude formations. This simple method may utilize fresh or KCL water, polymers or foam as the carrying fluid. Slotted liner is run in the hole with a landing nipple on top. An open ended tubing string is run inside the liner and connected to the "over the top" tool (or combination tool). The liner is run in on drill string. Gravel is pumped down the drill string, out gravel ports located below a dual set of packer cups and over the top of the liner. Gravel packs around the liner and a pack off occurs when gravel covers the slots. Excess gravel is then reversed out and the gravel pack tools and tubing are released and pulled out of the hole. A drive over adapter is run and set to seal off the liner/casing annulus.

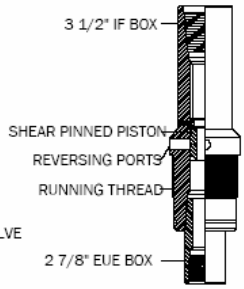
The CP gravel pack tool is used when circulating is necessary. Fill can be circulated or a fluid change over can be pumped conventionally when used with a model CP circulating shoe and tubing stinger. Gravel is pumped down the back side and excess is circulated out by dropping a setting ball to shear out piston and open up return ports.



LANDING NIPPLE



OVER THE TOP GRAVEL PACK TOOL



TYPE CP GRAVEL PACK TOOL

Liner Size		Product	Max O.D.		Min I.D.	
in	mm	Number	in	mm	in	mm
4.0	102	M920124	4.5	114	3.428	87
4.5	114	M9201245	5.5	140	4.000	102
5.0	127	M920125	5.5	140	4.276	109
5.5	140	M9201255	6.0	152	4.892	124
6.6	168	M920126	7.6	193	5.921	150
7.0	178	M920127	8.3	210	6.366	162

SAPEX-CHANCELLOR GRAVEL PACKED LINERS

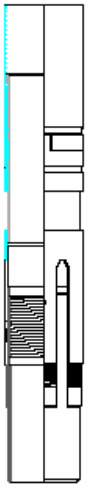
SINGLE TRIP GRAVEL PACK SYSTEM

The SAPEX-CHANCELLOR ST Single Trip Gravel Pack System is designed for over the top or reverse gravel packing a liner in a single trip. This tool completely eliminates the additional trip required to run and set a conventional drive over sand control adapter. This saves a minimum of 2-3 hours rig time. Additional savings are made because there is no need to run in drill collars to set the ST Expanding Steel Seal (ESS). By eliminating the additional trip in the hole, the rig is release sooner, allowing the rig to move to the next well sooner.

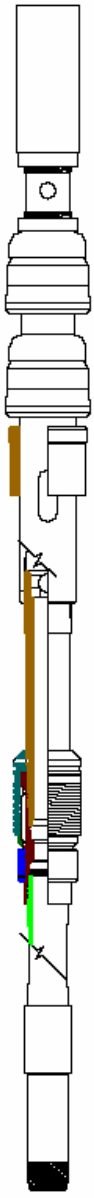
The ST system provides for the option of utilizing a circulating shoe, with inner tubing string for the purpose of circulating fill or fluid change over. The ST system can be run with foam or water. The outside diameter of the ESS allows for sufficient circulating area. There are no packer cups or rotating port sleeves in the system which eliminates the problems associated with the conventional rotating port collar tools. The port closing and Seal setting movements have a built in safety mechanism so as to prevent accidental setting while running in the hole.

Gravel flows down the annulus, around the ST setting tool, and through the open circulating ports (3). Once the gravel is in place, a setting ball is dropped, circulation is down the drill pipe and excess gravel is reversed out. The Model ST incorporates the easy set ESS seal system where the seal stays in contact with the casing at all times providing a positive sand control during liner expansion/ contraction typical of thermal wells. An internal locking mechanism keeps the seal energized throughout these cycles. The ESS has no slips and offers no restriction when pulling is required. All leading edges are beveled. The ESS is set at the completion of the gravel pack. No additional trip or third party is required to set the seal as is typical of conventional two trip drive over adapters.

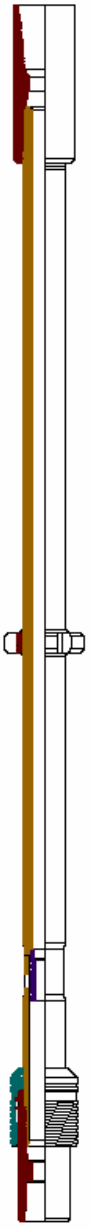
The ST Gravel Pack system can be run with a packer or the conventional over the top cup tool where circulating in is not required. This assembly omits the circulating shoe on bottom and the need for spacing.



ST GRAVEL PACK ADAPTER



ST OVER THE TOP TOOL



ST CIRCULATING SETTING TOOL

SAPEX-CHANCELLOR GRAVEL PACKED LINERS

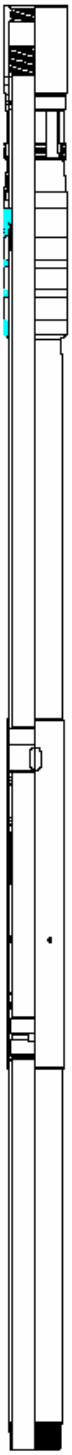
SLIDING SLEEVE PORT COLLAR TOOLS

Use of the Sliding Sleeve Port Collar is very beneficial for deviated, horizontal, or deep liners where it is difficult or impossible to operate a rotating type port collar. The Model SS Sliding Sleeve Port Collar is run with upper and lower extensions and can be combined with any type of liner top packer or hanger. The port collar can also be placed in line or at stacked intervals.

The exit ports and all gravel and fluid by-pass ports areas are maximized for high rate packing. The sliding sleeve is held in the "ports open" position while running in the hole. The lower extension provides room for the shifting tool. The service seals are properly spaced and straddle the open ports to allow positive control for packing, pressuring, and reverse circulating. After the pack is complete and tested, the setting tool is picked up so that the shifting tool engages the sliding sleeve to positively close the ports. A locking ring keeps the sleeve closed. The shifting tool is then released by rotating to the free position. The sliding sleeve can be reopened and closed, if necessary, any number of times by lowering and raising the shifting tool through the sleeve.

Liner Size		Product	Max O.D.		Min I.D.	
in	mm	Number	in	mm	in	mm
4.0	102	M0118014	4.500	114	3.428	87
5.0	127	M0118015	5.500	140	4.276	109
5.5	140	M01180155	6.000	152	4.892	124
6.6	168	M0118016	7.250	184	5.921	150
7.0	178	M0118017	7.500	191	6.366	162

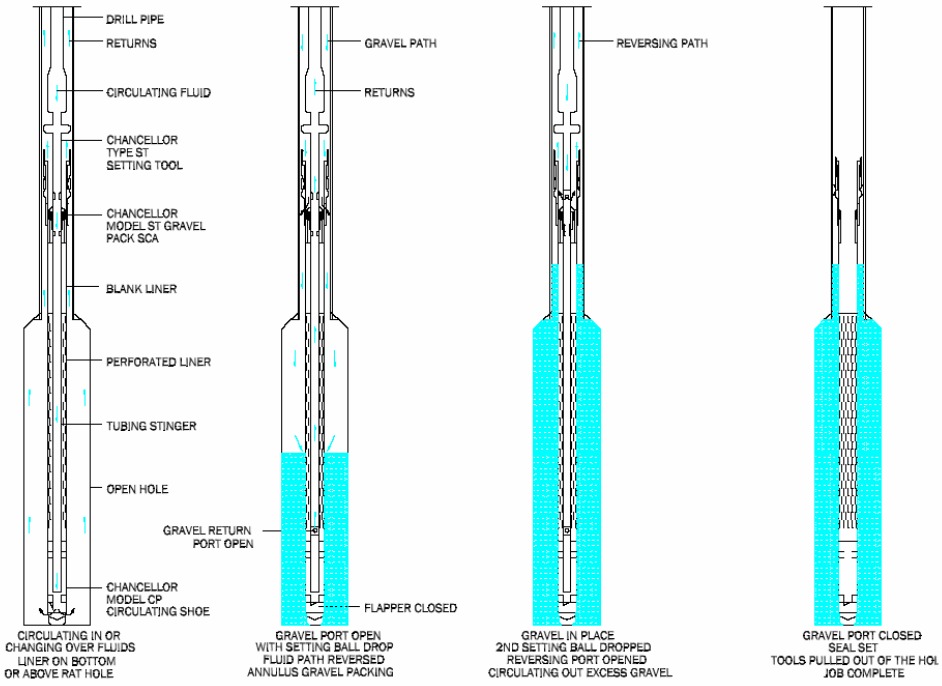
TYPE SS SLIDING SLEEVE
PORT COLLAR SETTING TOOLS



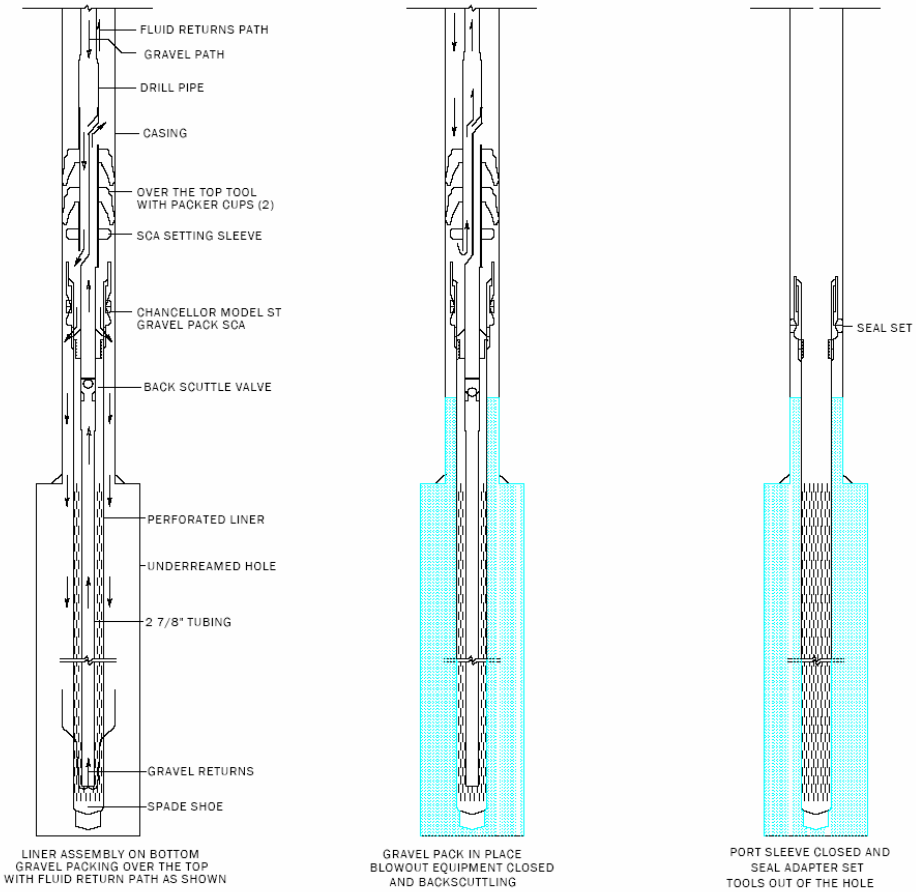
MODEL SS PORT COLAR
COMBINED WITH MODEL LTPS
LINER TOP PACKER WITH HOLD DOWNS
FOR ONE TRIP GRAVEL PACKING

SAPEX-CHANCELLOR GRAVEL PACKED LINERS

SINGLE TRIP GRAVEL PACK SYSTEM



USING CIRCULATING SHOE WITH BACKSIDE PACK



USING OVER THE TOP TOOL

SAPEX-CHANCELLOR GRAVEL PACKED LINERS

MODEL DP-1 DRILL-IN ADAPTER

SAPEX-CHANCELLOR Drill Pak is a method of drilling in a liner and gravel packing down the backside in one trip. These tools were developed by combining SAPEX-CHANCELLOR's "tight" Drill-in liner assembly with a stinger and backup circulating valve, and modifying the hydraulic drill-in adapter with circulating ports. The Drill Pak assembly can be made up with a bit or under reamer (optional) on bottom.

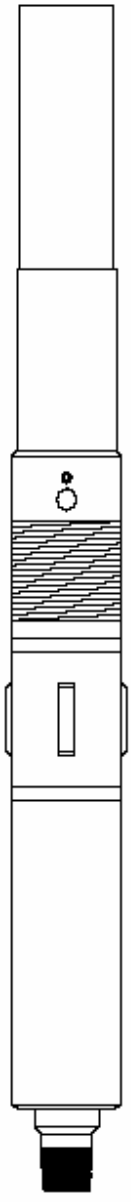
The liner is drilled in to depth using foam, mud, or other drilling fluids. Normal drilling procedures apply. With the liner on bottom, and the hole changed over, the first setting ball is dropped to open up the bottom stinger valve. Reverse circulating is established followed by normal gravel packing procedures. After gravel pack is complete, the releasing ball is dropped down the drill pipe to release the DP1 hydraulic setting tool. Ports are now open to circulate excess gravel off liner top. The setting tools are pulled out of the hole, and the drive over Sand Control Adapter is run to seal off the casing/liner annulus.

The SAPEX-CHANCELLOR Model DP1 Hydraulic Drill-in Adapter was developed to drill in the liner and circulate excess gravel after the backside pack is complete. It was specifically designed for excessive torque.

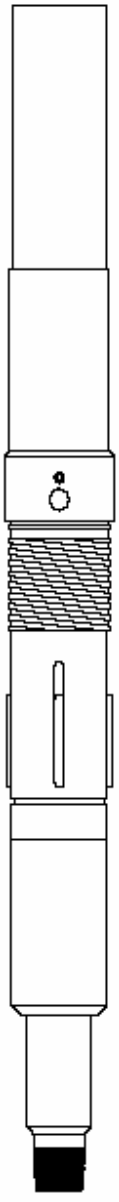
The DP1 features include:
- A maximum drilling torque of up to 15,000 ft-lbs.
- A completely sealed setting tool to preclude the passage of fine sands into the hydraulic components of the setting tool.
- Right hand rotation release for setting tool.
- A fail safe hydraulic release for drive mechanism. Upon reaching T.D. a ball is dropped to shear out the piston to retract drive dogs and open circulating ports.
- Ability to drill-in with any circulation fluid.
- Simplicity and fail-safe operation is compatible with standard drill-in practice and equipment.

The hydraulic setting tool and drill-in adapter are delivered to rig site as a complete unit with drive dogs of setting tool in the mating grooves.

in mm	lbs/ft	Model DP1	in mm
5.5 140	15.5-20	M9402055	4.5 114
6.625 168	24-28	M940206	5.2 140
7 178	23-29	M940207	6 152
8.625 219	24-32	M940208	7.625 193
9.625 244	36-36.5	M940209	8.25 210



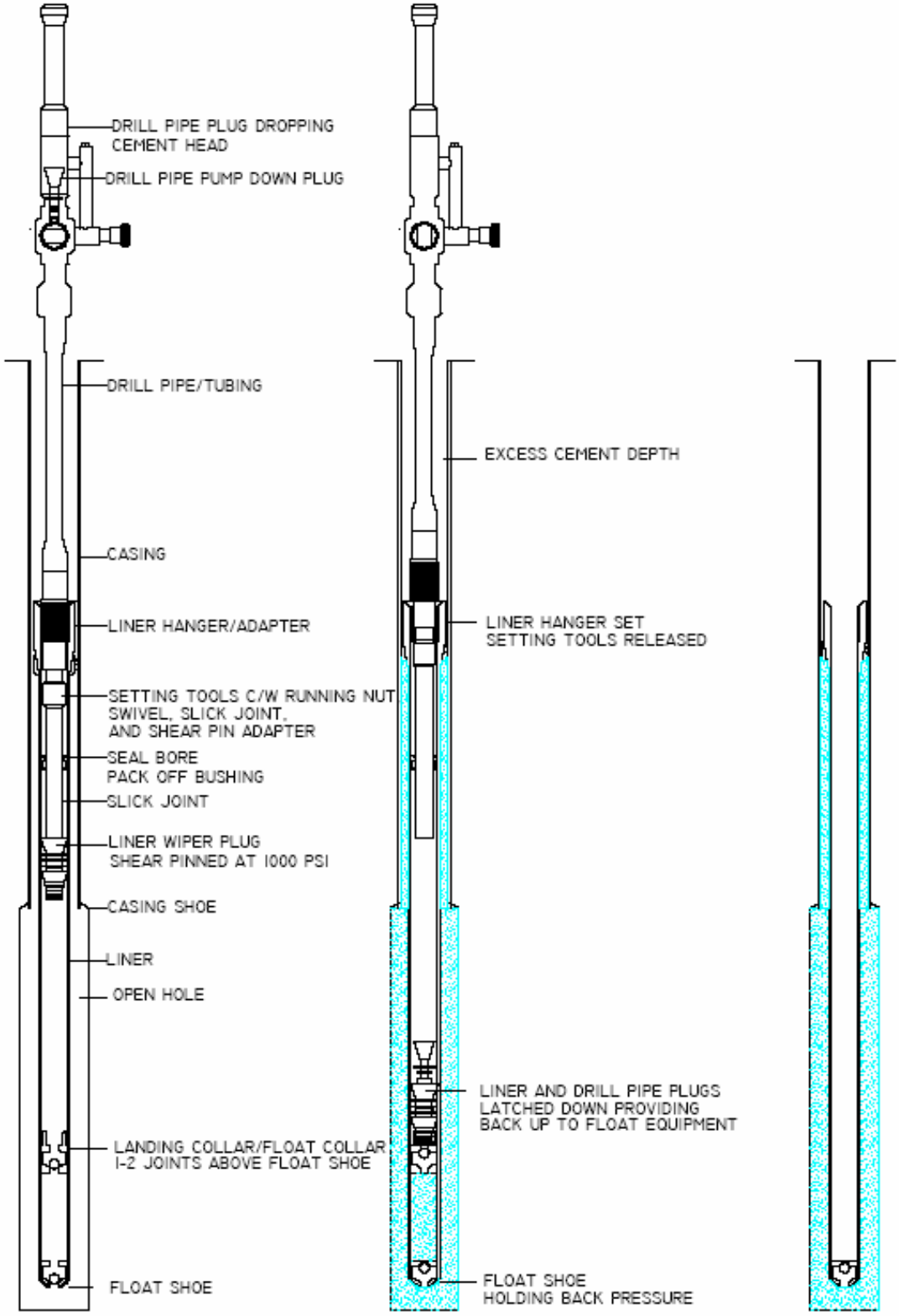
ODEL DP1 HYDRAULIC DRILL-IN ADAPTER WITH SETTING TOOL ENGAGED WHILE DRILLING



HYDRAULIC SETTING TOOL

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

MECHANICAL HANGER ASSEMBLIES



LINER ASSEMBLY ON BOTTOM CIRCULATING CEMENT VOLUME DISPLACED WITH DRILL PIPE AND LINER WIPER PLUGS LATCHED IN LANDING COLLAR. FLOATS HOLDING BACK PRESSURE.

LINER HANGER SET, SETTING TOOLS RELEASED, SETTING TOOLS PULLED OUT OF THE HOLE. EXCESS CEMENT AND INTERNALS DRILLED OUT. JOB COMPLETE

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

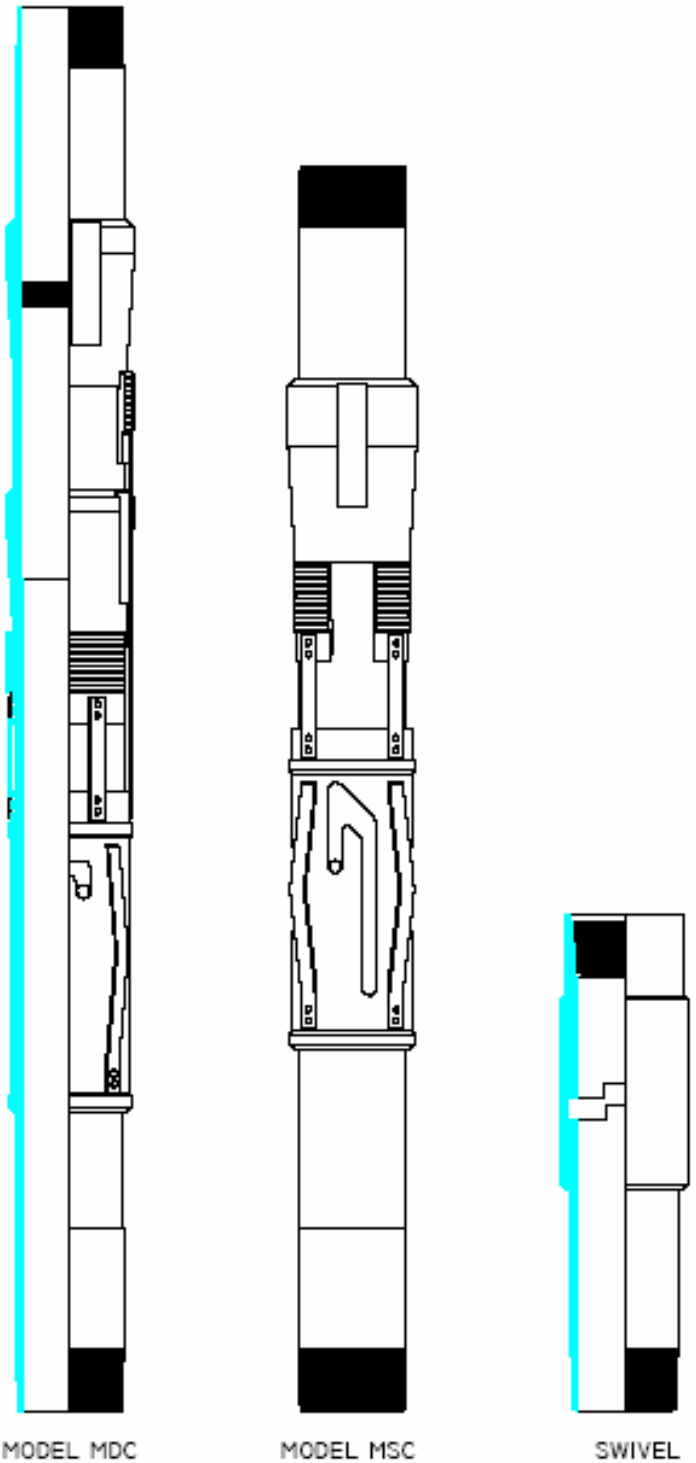
MECHANICAL LINER HANGERS

The SAPEX-CHANCELLOR Mechanical set liner hanger is a versatile and economical completion tool. The design is based on an enclosed jay within a one piece sleeve with friction springs. The hanger is mechanically set by manipulating the running-in string. The jay slot holds the slips in place below the taper cone while running in the well. When setting depth is reached, the hanger is picked up a couple feet and rotated (either right or left hand depending on application). As the hanger is lowered, the slips will be held stationary by the friction springs and the taper cone contacts he slips and forces them outward into the casing.

Slips are carburized to grip the hardest casing. The simple jay mechanical design allows the operator to set and release the hanger any number of times if necessary. The hanger is run in combination with a separate or integral setting collar or liner top packer.

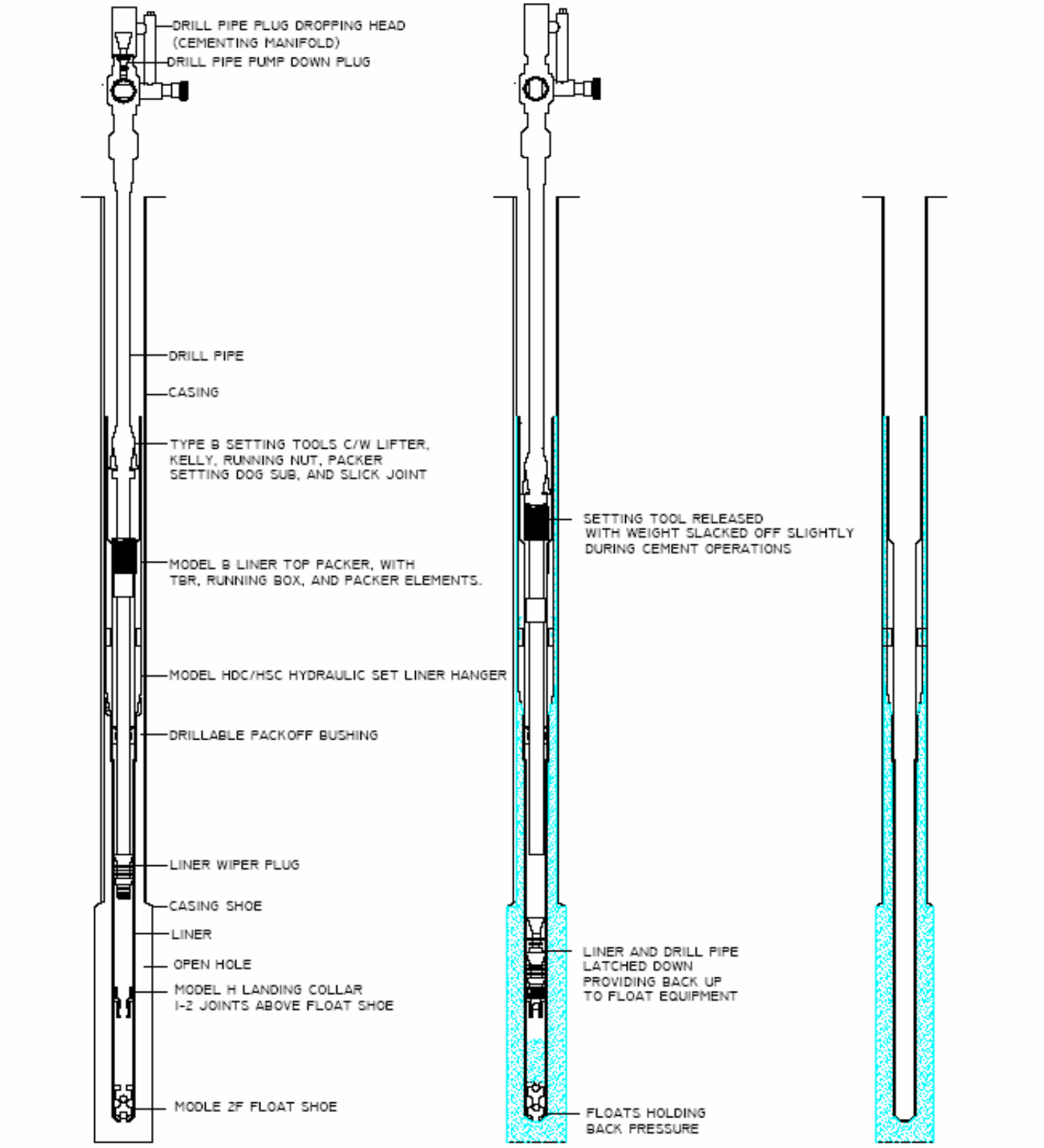
The model MSC mechanical set single cone liner hanger is ideal for short and medium length liners. The model MDC dual cone hanger effectively doubles the hanger capacity of the MSC which is the choice for medium to long heavy liners. Both models offer unrestricted bypass circulation before and after set. The SAPEX-CHANCELLOR liner Swivel is normally used when running mechanical set liners in highly deviated wells in which rotating to set the liner may be a problem. The swivel allows rotation of the hanger without having to rotate the total liner. A clutch system in the swivel (feature may be deleted if required) allows easy release of the running nut from the liner, if the liner has to be set on bottom.

Liner	Casing		Product Number			Max
Size	Size	Weight Range				O.D.
in	in	lbs/ft	MSC	MDC	swivel	in
mm	mm					
3.5	5.5	15-20	M94026155	M990880155	M96057135	4.5
88.9	139.7					
4.5	7	20-23				6.116
127	177	23-26	M940261457	M9908801457	M96057145	5.934
		29-32				5.844
5	7	20-23				6.116
168	219	23-26	M9402617	M99088017	M9605715	5.934
		29-32				5.844
7	9.625	36-43.5	M9402619	M99088019	M9605717	8.4
175	244	43.5-53.5				8.25
9.625	13.375	48-54.5	M94026113	M99088913	M960579	11.875
244	339.7	68-72				11.75



SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

HYDRAULIC HANGER ASSEMBLIES



LINER ASSEMBLY ON BOTTOM CIRCULATING

LINER HANGER SET INITIALLY WITH DROPPING BALL, SETTING TOOL RELEASED DURING CEMENT OPERATION. CEMENT VOLUME DISPLACED WITH DRILL PIPE AND LINER WIPER PLUGS. THE PLUGS LATCHED AND SEALED IN THE LANDING COLLAR.

LINER TOP PACKER SET. SETTING TOOLS OUT OF THE HOLI EXCESS CEMENT DRILLED OUT. JOB COMPLETE

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

HYDRAULIC LINER HANGERS

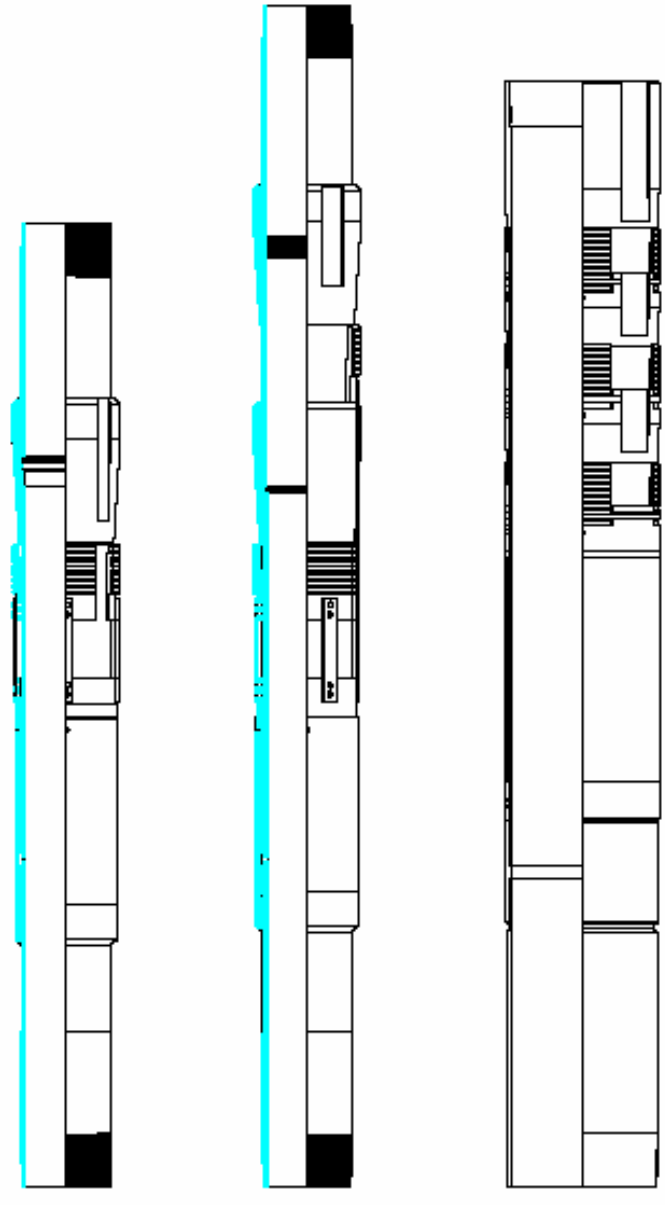
The SAPEX-CHANCELLOR Model HSC Hydraulic Liner Hanger is the correct choice for hanging and cementing in from short weight through medium length liners. The design is primarily based on the hydraulic setting of the slip segments (four total) which distribute the liner weight evenly on the tapered oval cone. The cone is mill grooved and staggered to allow optimal circulation around hanger. The hydraulic set is ideally suited for highly deviated holes at any depth where liner rotation can not effectively set a mechanical type hanger.

The model HDC hydraulic dual cone hanger has twice the slip area and load capacity as the HSC and is well suited for long heavy liners. Six slips distribute weight evenly on two tapered cones.

The Model HP was specifically designed and developed for challenging liner/casing combinations such as 5 1/2" x 7", 7" x 8 5/8", and 11 3/4" x 13 3/8" where there is there is insufficient annular area available to manufacture standard designs such as the HSC and HDC. The HP can be optioned with one or more taper cones and slip assemblies according to the hanger load requirements. The HP is well suited for short thru long heavy liners.

The hydraulic liner hanger may be set before or after Cementing by applying pressure to the running-in string. The hydraulic slip piston is shear pinned to avoid premature setting. The hydraulic liner hanger may be reciprocated during cementing and set after cementing by applying hydraulic pressure against the liner wiper plug after it is landed in a Model WP landing Collar. To set the hanger before cementing, a Model H Landing Collar with setting ball must run.

Liner Size	Casing Size	Casing Weight	Product Number HSC	Product Number HDC	Product Number HP	Max O.D.
in mm	in mm	lbs/ft				in mm
4.5 114.3	7.0 177.8	20-23 23-26	M96052145	M96058145		6.116 155.3 5.934 150.7
		29-32				5.844 148.4
5.0 127.0	7.0 177.8	20-23 23-26	M9605215	M9605815		6.116 155.3 5.934 150.7
		29-32				5.844 148.4
5.5	7.0	23-26			M031340155	5.934 150.7
7.0	8.63	32-36			M03134017	8.409 2.134
7.0 177.8	9.63 244.5	36-43.5 43.5-53.5	M9605217	M9605817		8.409 2.134 8.250 209.6
7.63 193.7	9.63 244.5	36-43.5	M96052176	M96058176		8.400 213.4
9.63 244.5	13.38 339.7	54.5-68 68-72	M960521796	M96058196		11.875 301.6 11.750 298.5
11.75	13.38	54.5-68			M03134019	12.063 306.64



MODEL HSC MODEL HDC MODEL HP

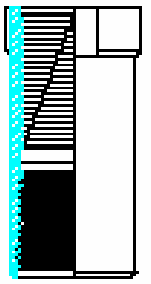
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

SETTING COLLARS

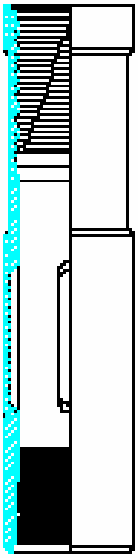
All SAPEX-CHANCELLOR setting collars are typically run above the liner hanger for the purpose of carrying the liner weight and engagement of the setting tool while running-in-the hole. They also serve as a tool entry guide after completion. The model A is a simple and economical choice for RH release. The model AR has splines which offer RH setting (or rotation) of liner in tension as well as RH release with the use of a rotating dog sub. The model AR2 provides for the rotation of liner in tension or compression and is often used with rotating liner hangers.

The model HSP is designed specifically for straight pull hydraulic release and is used with the HH Hydraulic setting tool. The custom thread form` also allows for emergency mechanical RH release. Double splines are included for rotating the liner. The HSP is ideally suited for highly deviated or horizontal applications where RH release is difficult or impossible.

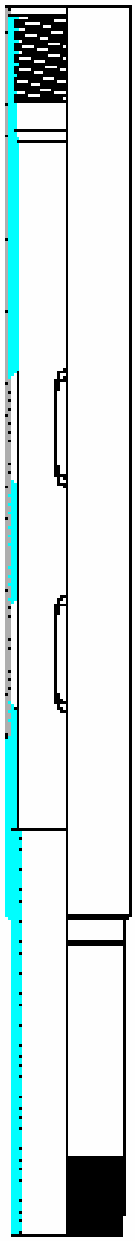
Liner Size	Casing Size	Casing Weight Range	Product Number				Max O.D.
			A	AR	AR2	HSP	
in mm	in mm	lbs/ft					in
3.5 88.9	5.5 139.7	15-20	C940292155	C940295156	C940293755	C00119155	4.5
5 127	7 177	20-29	C9402917	C94029517	C94029377	C0011917	5.75
6.625 168	8.625 219	24-32	C9402918	C94029518	C94029378	C0011918	7.5
7 175	9.625 244	36-53.5	C94029519	C94029519	C94029379	C0011919	8.25
9.625 244	13.375 339.7	48-72	C940295113	C940295113	C940293713	C0011913	11



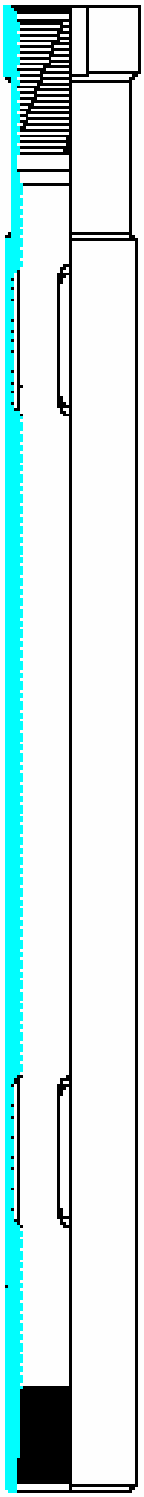
MODEL A



MODEL AR



MODEL HSP



MODEL AR2

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

SETTING COLLARS WITH TBR

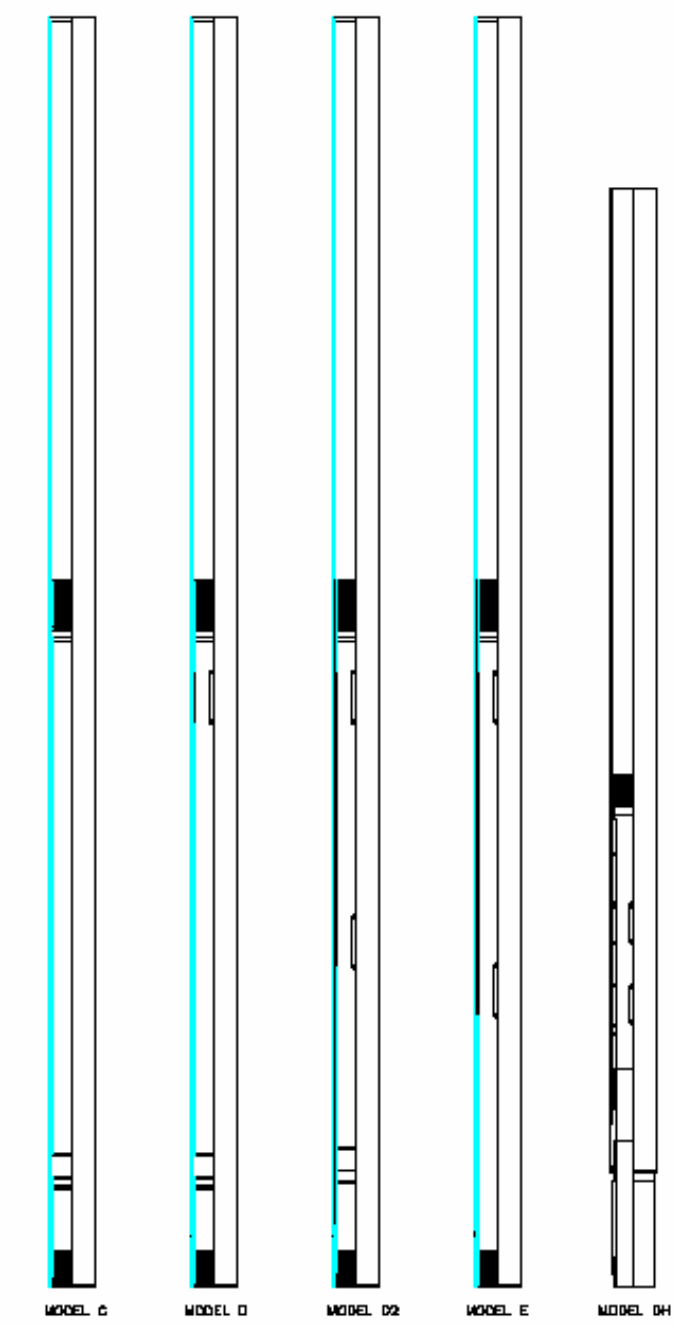
SAPEX-CHANCELLOR setting collars perform several functions with various options available. All models illustrated here are run above the liner hanger for the purpose of carrying liner weight and providing a RH release of setting tools. While maintaining a smooth entry tool guide following completion. A tie back receptacle (TBR) is standard for optimal installation of a tie back packer or seal nipple.

In addition to these features, the model C provides a retrievable pack off bushing (RPB) profile when cementing using the RPB in the setting tool. Use of the RPB and slick joint significantly reduces the upward hydraulic forces characteristic of the packer cup pack off and eliminates the need for drill out as required for the drillable pack off bushing (DPB).

Along with the TBR and RPB profile the model D and D2 are designed for rotating the liner in tension (model D0 or both tension and compression (model D2). These setting collars utilize splines and a rotating dog sub can be used when RH setting and RH release of the mechanical liner hanger is required. The D2 is also used for rotating liners during cement operations. Having splines also insures that the setting tool will not release while running in the hole.

The model E shares the same features as the model D without the RPB profile. A DPB is used when cementing. This setting collar is effective for horizontal or deviated slotted liner applications as well.

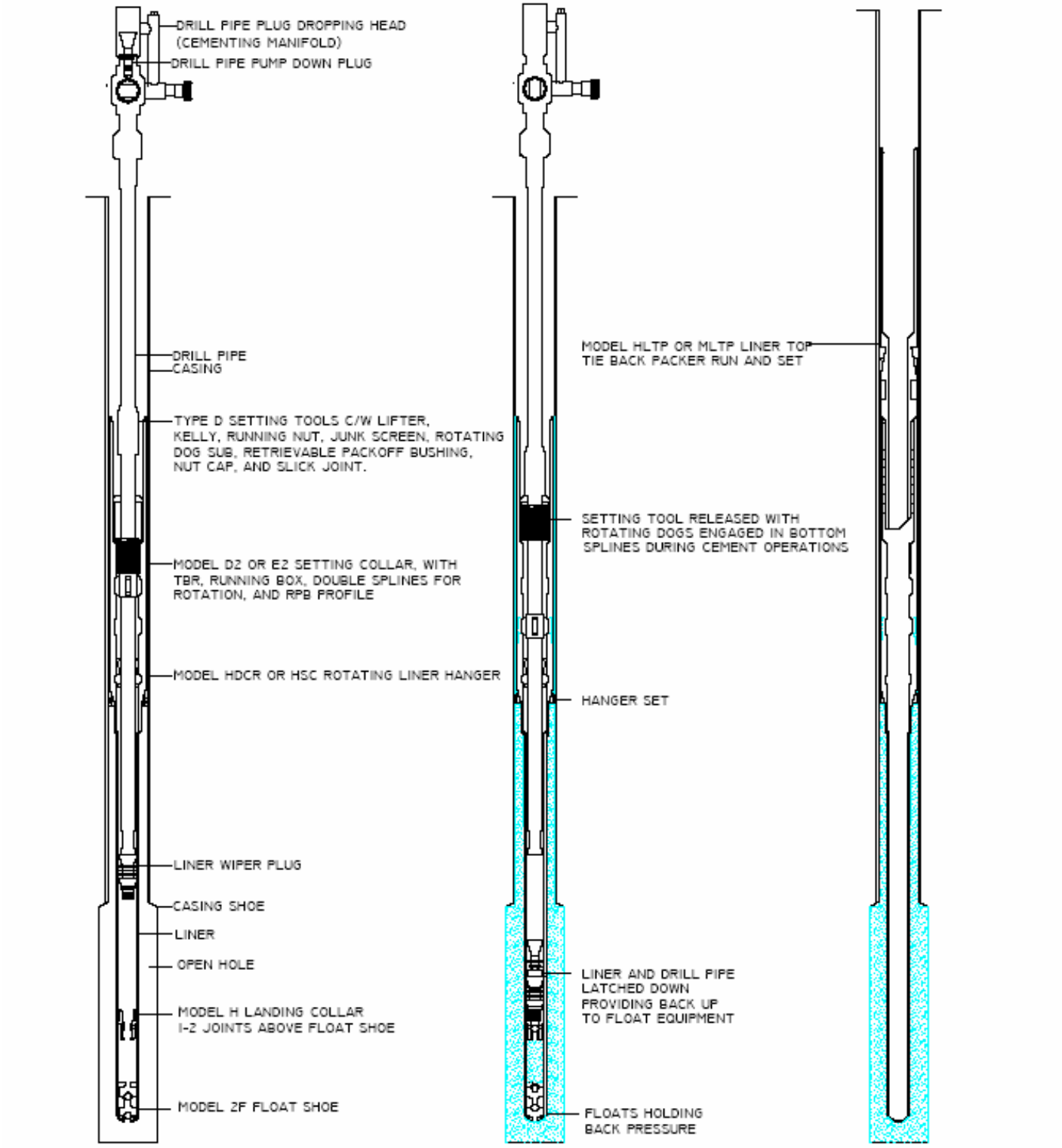
The Model DH has a special thread form that is designed to hydraulically release with the type HH setting tool. The setting tool can be released with mechanical RH release as a back up option.



Liner Size	Casing Size	Weight Range	Product Number					Max O.D.
in	in	lbs/ft	C	D	D2	DH	E	in
mm	mm							
3.5	5.5							
88.9	139.7	15-20	C940292155	M97067155	M980840155	C021127035	M96055155	4.5
5	7							
127	177	20-29	C9402917	M9706717	M98084017	C021127037	M9605517	5.75
6.625	8.625							
168	219	24-32	C94029158	M9706718	M98084018	C021127038	M9605518	7.5
7	9.625							
175	244	36-53.5	C94029159	M9706719	M98084019	C021127039	M9605519	8.25
9.625	13.375							
244	339.7	48-72	C940291513	M97067113	M980840113	C0211270313	M96055113	11

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

ROTATING HANGER ASSEMBLIES



LINER ASSEMBLY ON BOTTOM CIRCULATING. LINER ROTATION POSSIBLE DURING RUN IN WITH LINER IN TENSION OR COMPRESSION UTILIZING DOGS ENGAGED IN UPPER OR LOWER SPLINES.

LINER HANGER SET INITIALLY WITH SETTING BALL, SETTING TOOL RELEASED WITH ROTATING DOGS ENGAGED IN LOWER SPLINES. LINER ROTATING DURING THE CEMENT OPERATION. CEMENT VOLUME DISPLACED WITH THE DRILL PIPE AND LINER WIPER PLUGS. THE PLUGS LATCHED AND SEALED IN THE LANDING COLLAR.

SETTING TOOLS OUT OF THE HOLE. EXCESS CEMENT DRILLED OUT. TBR CLEAN OUT MILL RUN HLTP OR MLTP TIEBACK PACKER RUN AND SET (IF NEEDED). JOB COMPLETE.

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

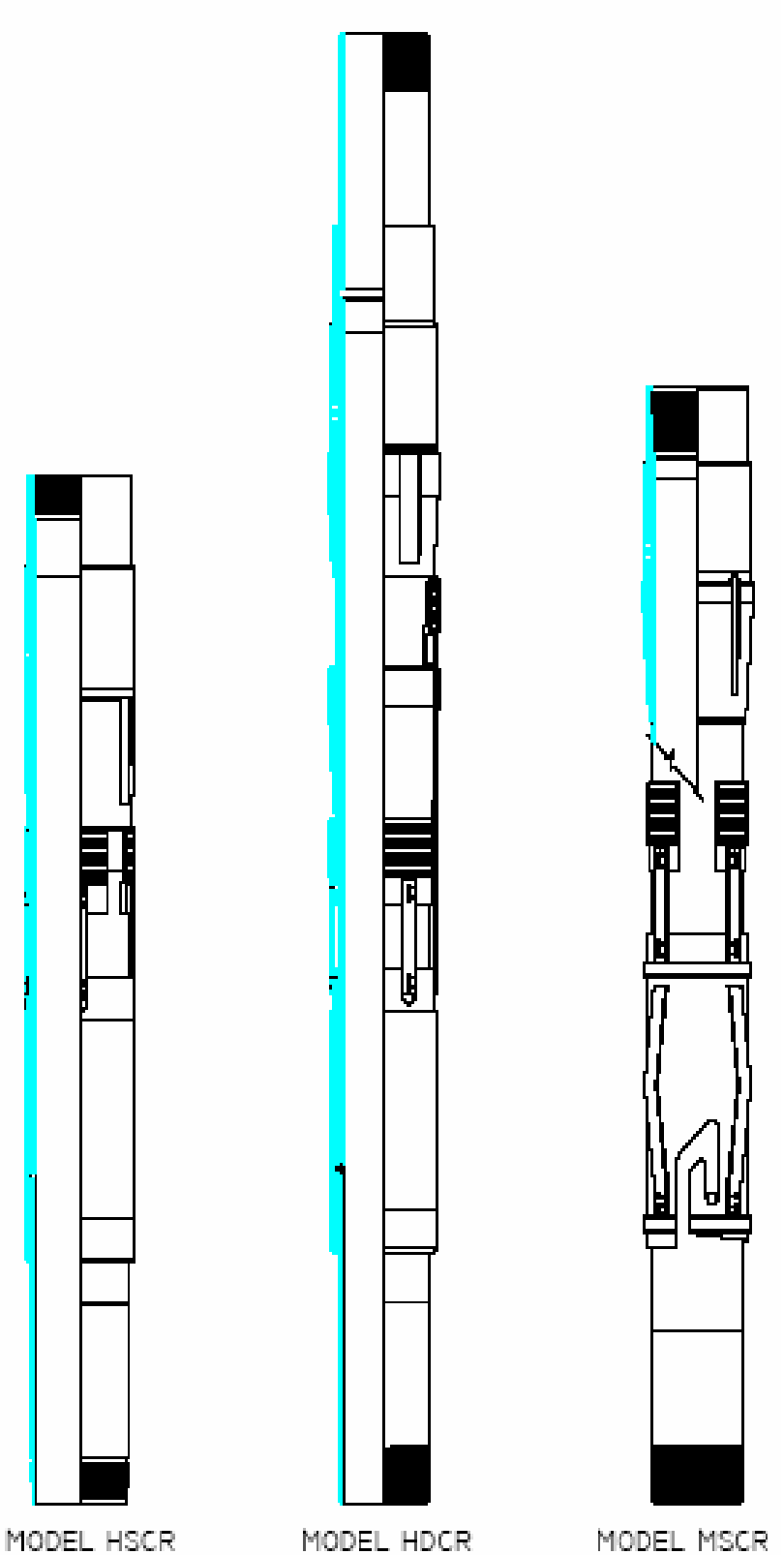
ROTATING LINER HANGERS

SAPEX-CHANCELLOR Rotating Liner Hangers initially hang the liner in tension and then provide a means to rotate the liner during cement operations insuring a more complete cement bond. The design is primarily based on the setting of the slip segments which distribute the liner weight evenly on the tapered swivel cone. The cone is mill grooved to allow optimal circulation around hanger. After setting, the hanger mandrel and liner below can rotate through stationary slips and swivel cone. This is possible by means of a specially engineered high strength thermo plastic journal bearing which is contacted by bearing surfaces on the cone and top collar. The bearing and races are covered and sealed to prevent contamination.

The rotation capacity of this bearing design is very efficient and economical and well suited for rotating moderate liner loads with normal torque during cementing operations. All rotating liner hangers are combined with a double splined setting collar or liner top packer and setting tool with rotating dog sub for transferring torque.

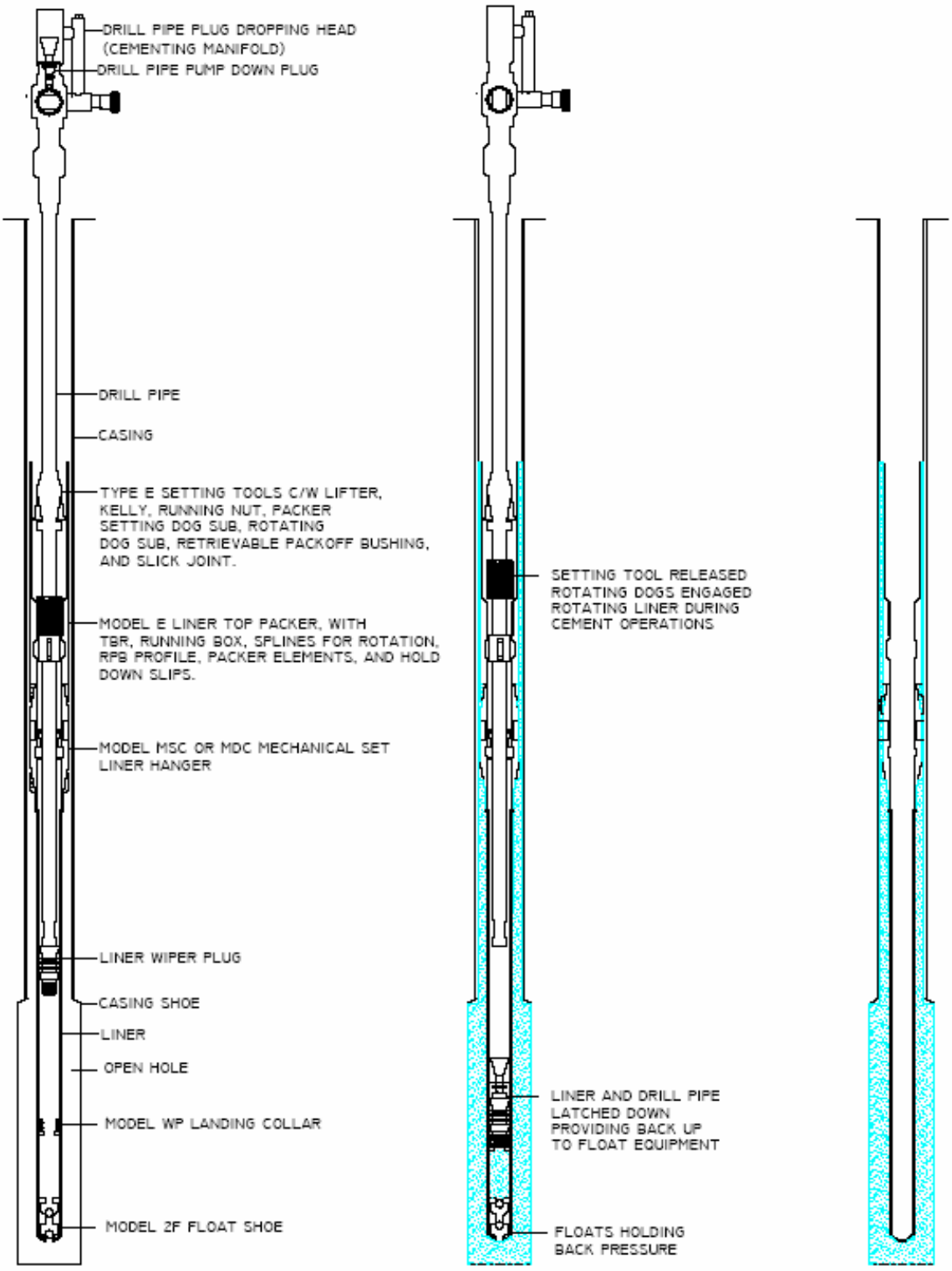
The Model HSC single cone liner hanger and model HDC dual cone liner hanger are ideally suited for deep or deviated liners. The hydraulic setting is done by applying pressure to the run-in string. A setting ball and Model H Landing Collar are used. The Hydraulic Piston is shear pinned to avoid premature setting. The Model MSCR Mechanical Set Rotating Liner Hanger is a very efficient and economical choice for shallow to medium depth vertical wells where RH setting is not a problem.

Liner Size	Casing Size	Casing Weight Range	Product Number			Max O.D.
In / mm	In / mm	lbs/ft	HSCR	HDCR	MSCR	In / mm
4.5 / 114.3	7.0 / 177.8	20-23	M95071145	M980830145	M95042145	6.116 / 155.3
		23-26				5.934 / 150.7
		29-32				5.844 / 148.4
5.0 / 127.0	7.0 / 177.8	20-23	M9507115	M98083015	M95042115	6.116 / 155.3
		23-26				5.934 / 150.7
		29-32				5.844 / 148.4
7.0 / 177.8	9.6 / 244.5	36-43.5	M9507117	M98083017	M95042117	8.400 / 2.134
		43.5-53.5				8.250 / 209.6
7.6 / 193.7	9.6 / 244.5	36-43.5	M95071176	M980830176	M95042176	8.400 / 213.4
9.6 / 244.5	13.4 / 339.7	54.5-68	M95071196	M980830196	M95042195	11.875 / 301.6
		68-72				11.750 / 298.5



SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

HANGER WITH LINER TOP PACKER



LINER ASSEMBLY ON BOTTOM CIRCULATING

LINER HANGER SET BY RIGHT HAND ROTATION. SETTING TOOL RELEASED WITH ROTATING DOGS ENGAGED IN SPLINES. LINER ROTATING DURING CEMENT OPERATION. CEMENT VOLUME DISPLACED WITH DRILL PIPE AND LINER WIPER PLUGS. THE PLUGS LATCHED AND SEALED IN THE LANDING COLLAR.

LINER TOP PACKER WEIGHT SET. SETTING TOOLS OUT OF THE HOLE. EXCESS CEMENT DRILLED OUT. JOB COMPLETE

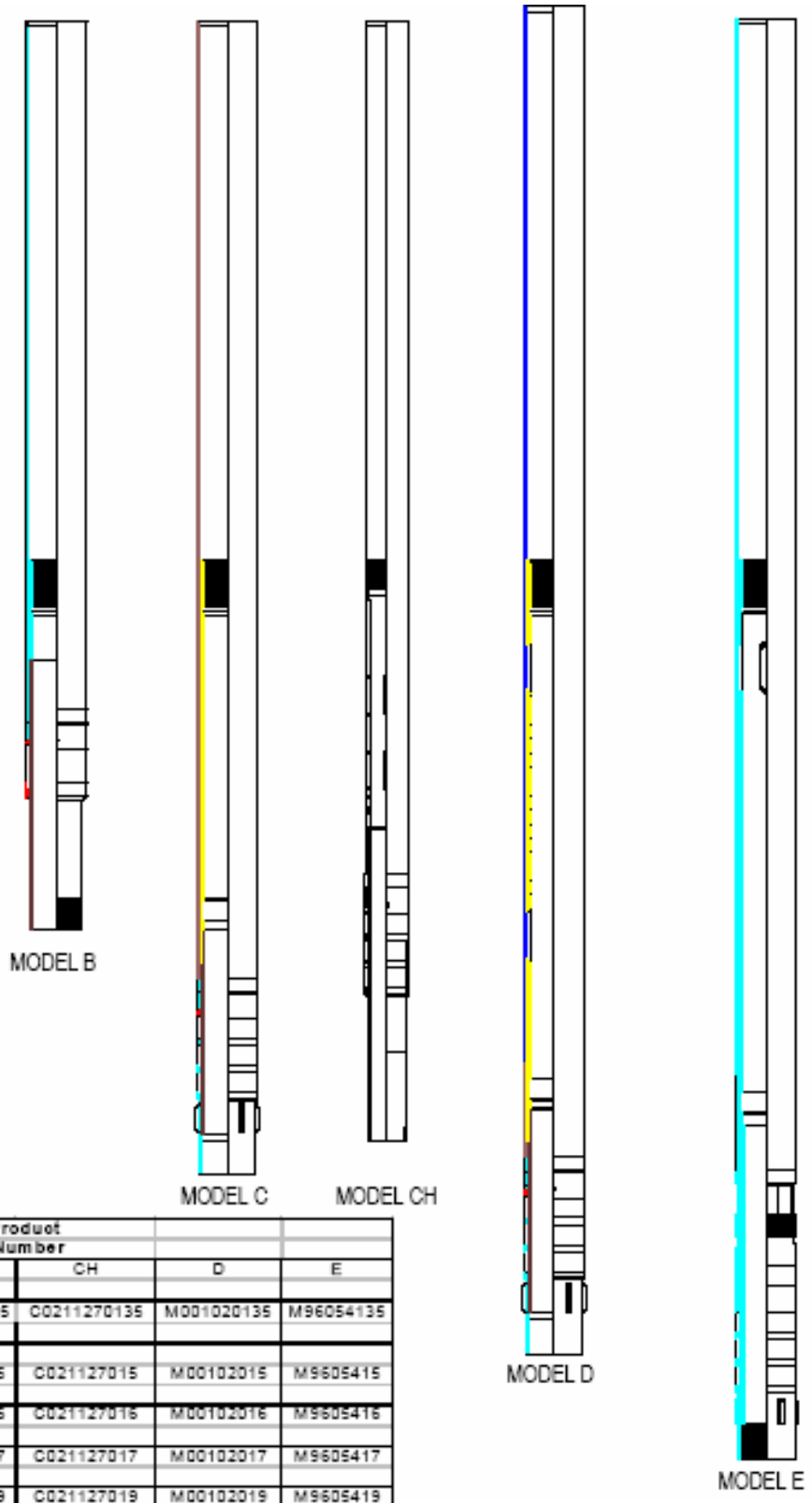
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

LINER TOP PACKERS

SAPEX-CHANCELLOR Liner Top packers are run with or without a liner hanger below and perform several functions with various options available. All models provide a square thread running box for the purpose of carrying liner weight and providing RH release of setting tools. A smooth tool entry guide is maintained following completion. The packer seal configuration can be a one piece single sleeve, or a three unit multi durometer packer. Neoprene, HSN Viton and AFLAS materials are available depending upon down hole conditions. Extension rings help maintain seal and integrity during high pressure conditions. The shear pinned setting ring contains an internal lock ring that keeps the packer seal energized after set. All packer seal elements are weight set.

The model B liner top packer (and all models) have a tie back receptacle (TBR) that serves to retain the packer setting dog sub while running in the hole, preventing premature setting, as well as to provide for future liner tie back. The Model C is also equipped with a retrievable packoff bush profile. The model D is additionally equipped with splines for rotating the liner while running in the hole or for right hand set mechanical liner hangers. The splines also keep the setting tool locked on preventing unlimited release. The model E liner top packer has all these features including hold down slips to prevent short liners from moving up the hole.

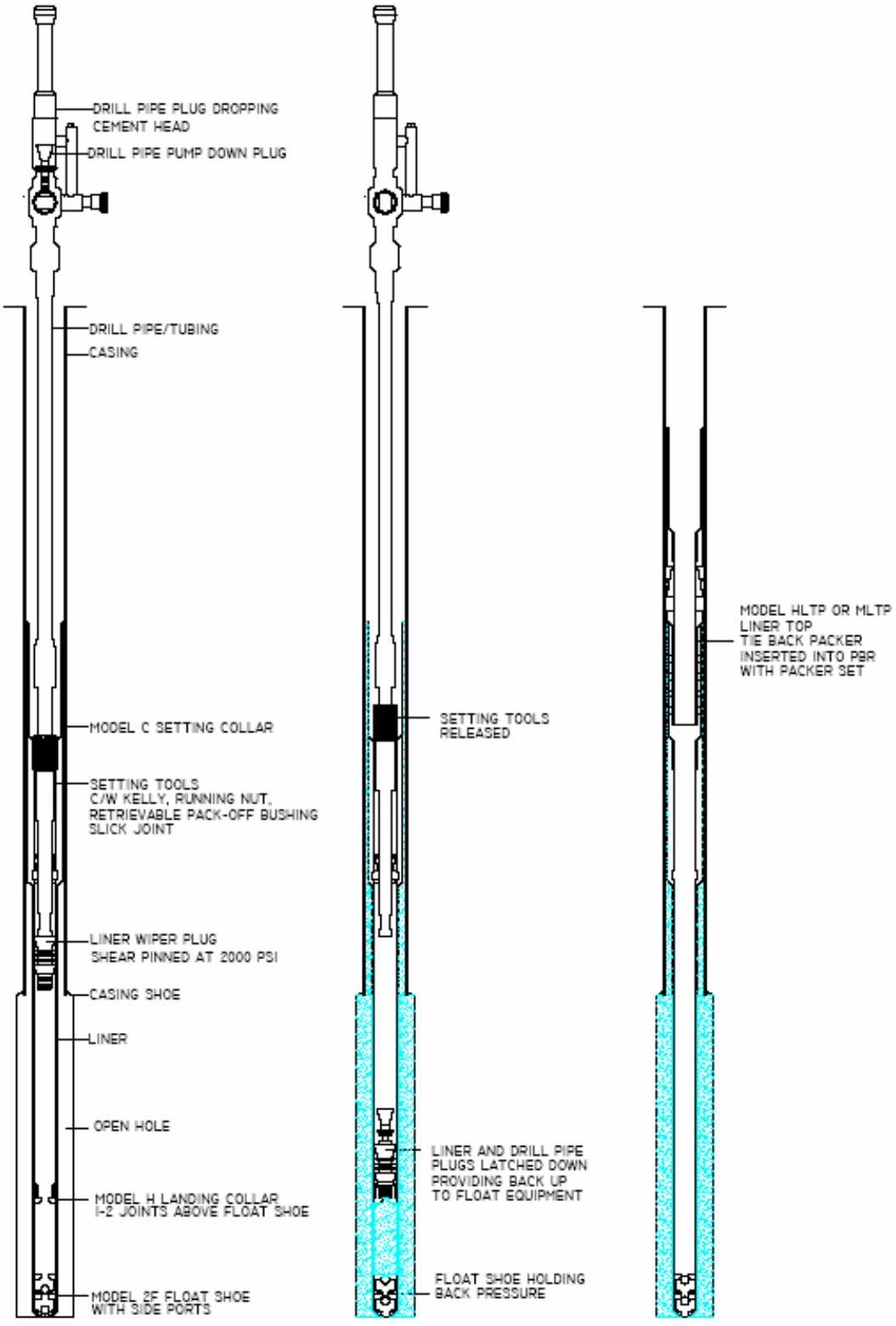
The Model CH Liner Top Packer has a special thread form that is designed to hydraulically release with the type HH setting tool. The setting tool can be released with mechanical RH release as a back up option. After release and the cement operation, the packer is weight set.



Liner Size	Casing Size	Casing Weight Range	Product Number				
			B	C	CH	D	E
in mm	in mm	lbs/ft					
3.5 88.9	5.5 139.7	15-20	M96054135	M01108O135	C0211270135	M001020135	M96054135
5 127	7 177	20-23 23-29	M9605415	M01108015	C021127015	M00102015	M9605415
6.625 168	8.625 219	24-32 32-40	M9605416	M01108016	C021127016	M00102016	M9605416
7 175	9.625 244	36-47 43.5-53.5	M9605417	M01108017	C021127017	M00102017	M9605417
9.625 244	13.375 339.7	48-61 61-72	M9605419	M01108019	C021127019	M00102019	M9605419

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

TIE BACK PACKER APPLICATIONS



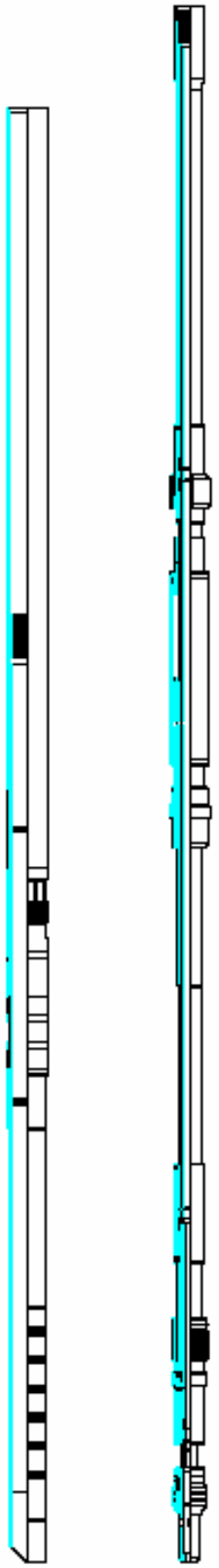
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

LINER TOP TIE BACK PACKER

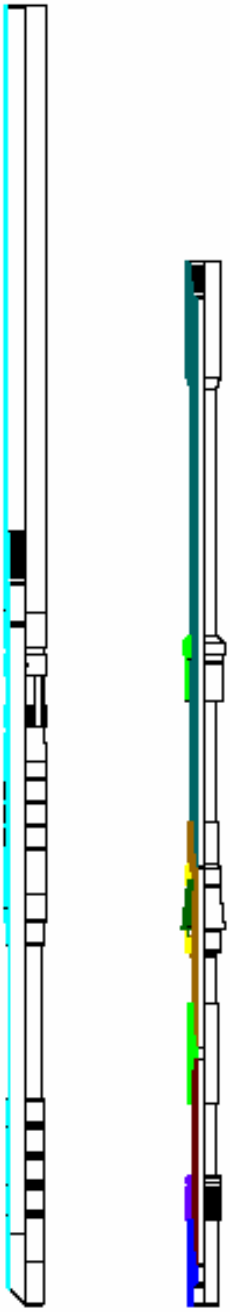
The SAPEX-CHANCELLOR Model HLTP Liner Top Tie Back Packer is a high performance hydraulic set liner top isolation packer. The HLTP is run after the liner is cemented, running tools are retrieved, and a polish mill is run to clean out existing tie back receptacle. The hydraulic setting tool delivers the force necessary to set the packer elements. The packer elements with extrusion rings are held in permanently set position with an internal locking ring. Hold down slips prevent the packer from creeping up the hole. The hydraulic setting feature allows the packer to set even if there has been damage to the existing tie back receptacle. Another advantage that the hydraulic feature provides is in delivering the full setting force to the packer elements. This is especially beneficial in deviated and/or deep wells where the full setting force of a weight set packer is sometimes not delivered.

The SAPEX-CHANCELLOR Model MLTP is a more economical and efficient Liner Top Tie Back packer and is used on most vertical well applications where weight set of packer and hold down slips is not a problem.

Liner Size	Casing Size	Casing Weight Range	Product Number		Max O.D.
in	in	lbs/ft	MLTP	HLTP	in
mm	mm				mm
4.5	7	20-23			6.116 155.3
114.3	177.8	23-26	M97061145	M960760145	5.934 150.7
		29-32			5.844 148.4
5.0	7	20-23			6.116 155.3
127.0	177.8	23-26	M9706115	M98076015	5.934 150.7
		29-32			5.844 148.4
7.0	9.625	36-43.5	M9706117	M98076017	8.409 2.134
177.8	244.5	43.5-53.5			8.250 209.6
7.625	9.625	36-43.5	M97061176	M960760176	8.400 213.4
193.7	244.5				
9.625	13.375	54.5-68	M97061196	M960760196	11.875 301.6
244.5	339.7	68-72			11.750 298.5



MODEL HLTP AND SETTING TOOL



MODEL MLTP AND SETTING TOOL

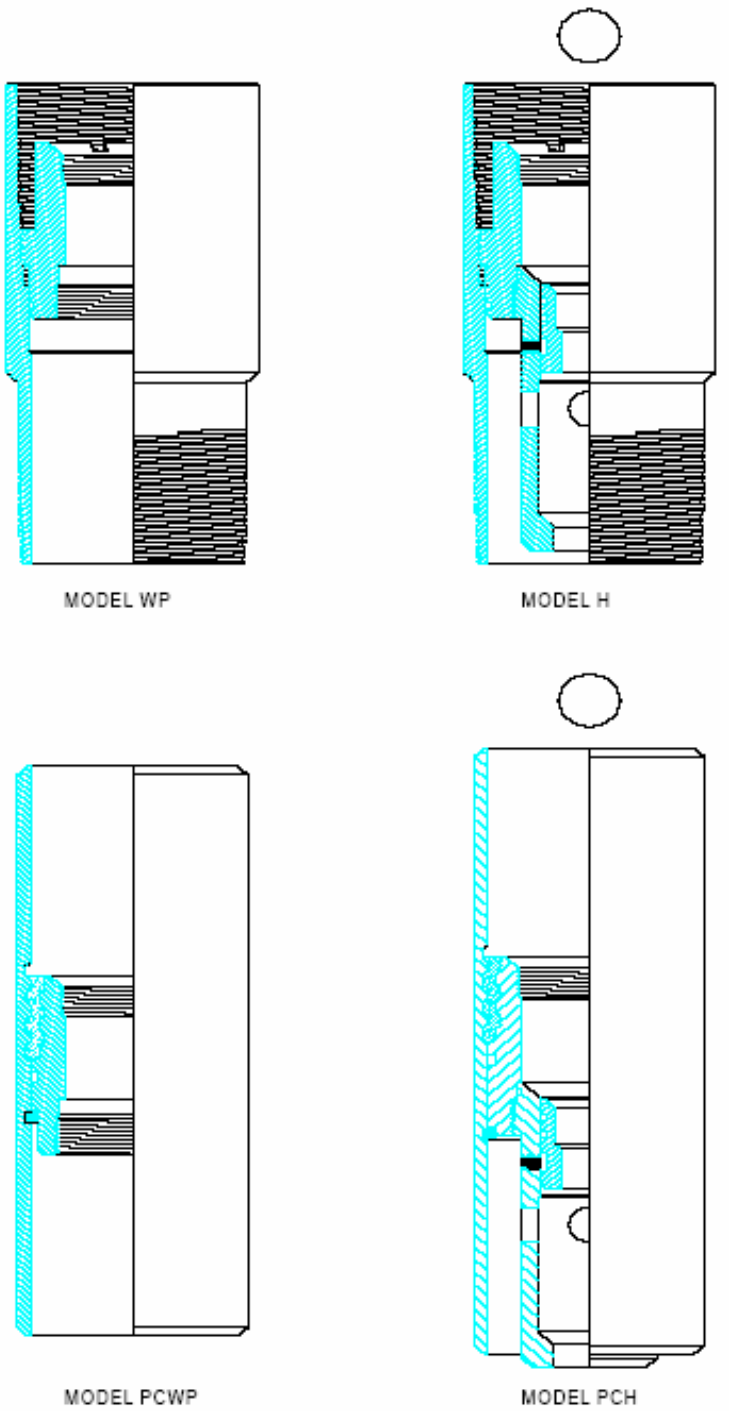
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

LANDING COLLARS

The SAPEX-CHANCELLOR Model WP Landing Collar provides a latch down seat and seal for the liner wiper plug, and provides an additional back up to the float collar and/or the float shoe to insure that cement remains in place after displacement. The landing collar is normally run one or two joints above the float shoe or just above the float collar. The Model WP landing Collar is run for either mechanical liner hangers or adapters, and also used with hydraulic set liner hangers when it is desirable to reciprocate or rotate the liner while cementing prior to setting the liner hanger. 6051-T651 aluminum alloy is used internally and is easily drillable.

The SAPEX-CHANCELLOR Model H Landing Collar is run in the liner assembly when it is necessary to set a hydraulic hanger before cementing. This landing collar provides a seat shear assembly that allows for sufficient differential pressure to be built up against it to activate the hydraulic hanger prior to cementing. The landing collar contains a ball seat that is pinned to shear out at approximately 1000 psi above pressure required to set hanger. Circulation is not restricted once the ball seat is sheared.

The PC equipment was designed for use with premium or flush joint liner connections. The float valves are cement bonded in place with additional retainer rings and seals that add reliability and insure effective backpressure sealing.



Liner Size		Product Number		Max O.D.		Product Number		Max O.D.	
in	mm	Model WP	Model H	in	mm	Model PCWP	Model PCH	in	mm
4.5	114.3	M960530945	M960530145	5	127	M960530945	M960530145	4.5	114.3
5	127	M96053095	M96053015	5.563	141.3	M96053095	M96053015	5	127
5.5	139.7	M960530955	M960530155	6.05	153.7	M960530955	M960530155	5.5	139.7
7	177.8	M96053097	M96053017	7.656	194.5	M96053097	M96053017	7	177.8
7.625	193.7	M960530976	M960530176	8.5	215.9	M960530976	M960530176	7.625	193.7
9.625	244.5	M960530996	M960530196	10.625	269.9	M960530996	M960530196	9.625	244.5

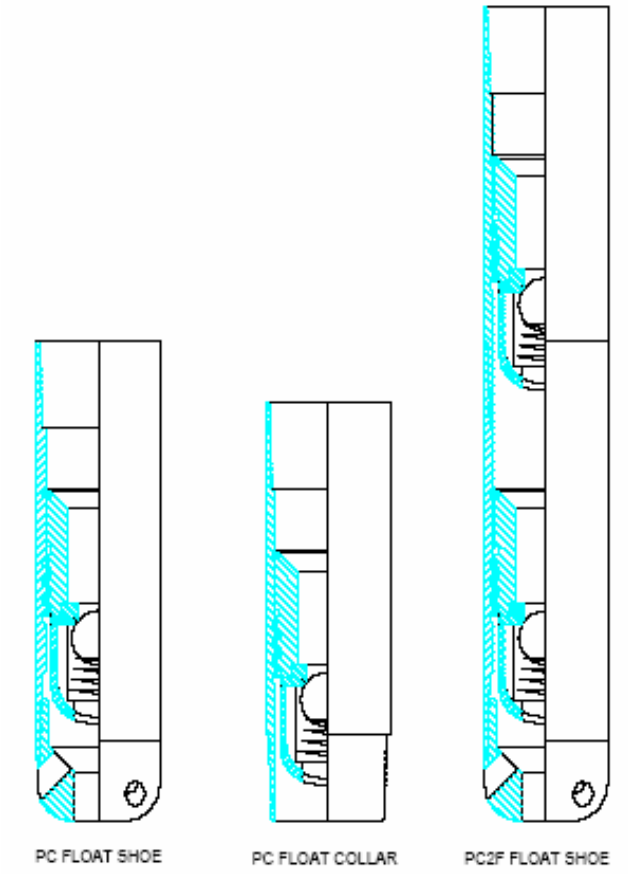
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

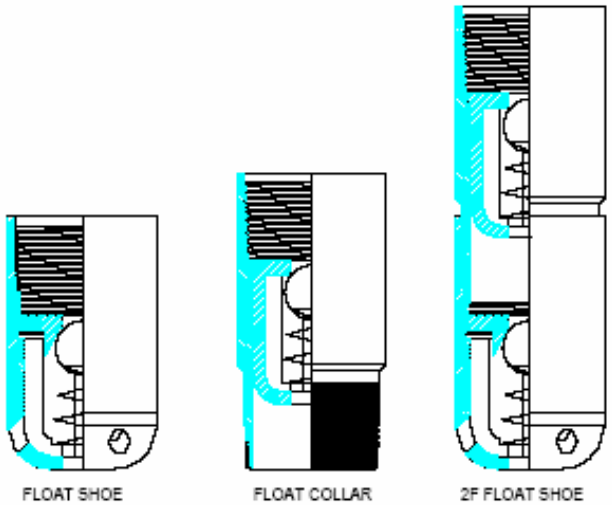
FLOAT EQUIPMENT

The SAPEX-CHANCELLOR Float Equipment features a spring loaded ball that provides optimum assurance that the cement volume pumped around the liner remains in place. The shoe's aluminum guide nose contains interval fins that direct the flow of cement evenly for a better cement job. Bottom and side ports (3) are standard.

The valve is a spring loaded ball type. The ball is made of high density phenolic for strength and resistance to abrasion, even when subjected to long periods of pumping abrasive materials. The ball seat, a rubber o-ring located in an aluminum disk, is designed to be out of the flow path for circulating fluids so it can't wash out. The ball is guided into the seat by aluminum fins which are an integral part of the float shoe. The fins not only guide the ball, but also direct the flow of cement around the shoe for a better cementing job.

Differential pressure is 1500 psi. The PC equipment was designed for use with premium or flush joint liner connections. The float valves are cemented bonded in place with additional retainer rings and seals that add reliability and insure effective backpressure sealing.





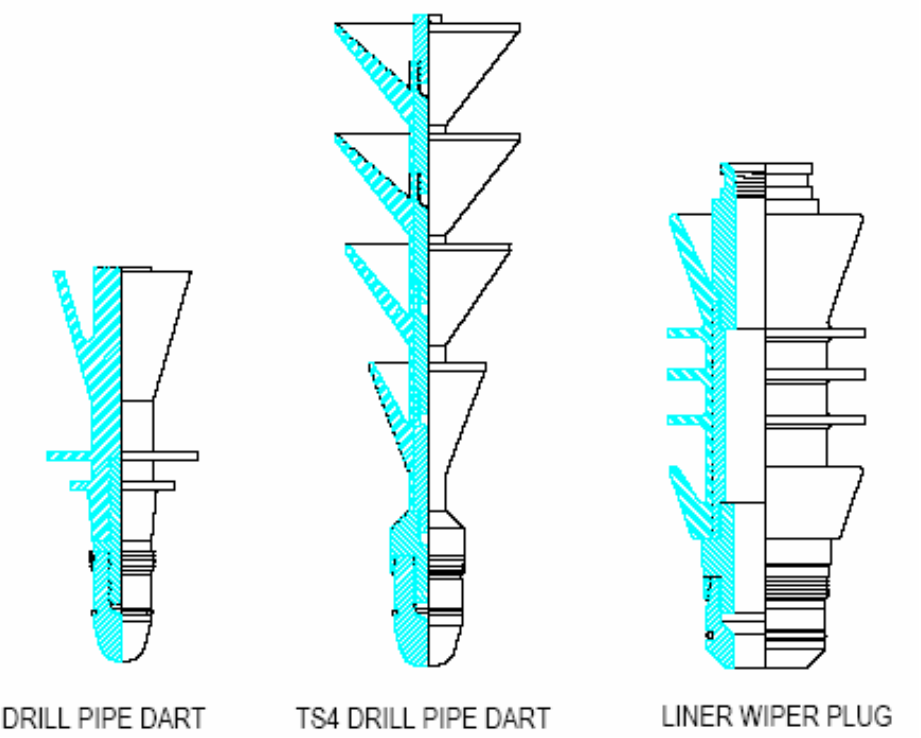
Liner Size			Product Number		Max O.D.			Product Number		Max O.D.	
in	mm	float shoe	float collar	2F floatshoe	in	mm	PC float shoe	PC float collar	PC2F floatshoe	in	mm
4.5	114.3	M920FS45	M920FC45	M9202FVS45	5	127	M920FS45	M920FC45	M9202FVS45	4.5	114.3
5	127	M920FS5	M920FC5	M9202FVS5	5.563	141.3	M920FS5	M920FC5	M9202FVS5	5	127
5.5	139.7	M920FS55	M920FC55	M9202FVSS5	6.05	153.7	M920FS55	M920FC55	M9202FVSS5	5.5	139.7
7	177.8	M920FS7	M920FC7	M9202FVS7	7.656	194.5	M920FS7	M920FC7	M9202FVS7	7	177.8
7.625	193.7	M920FS76	M920FC76	M9202FVS76	8.5	215.9	M920FS76	M920FC76	M9202FVS76	7.625	193.7
9.625	244.5	M920FS9	M920FC9	M9202FVS9	10.625	269.9	M920FS9	M920FC9	M9202FVS9	9.625	244.5

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

DRILL PIPE DART AND LINER WIPER PLUG

The SAPEX-CHANCELLOR liner Wiper Plug is used to effectively displace cement within the liner. After a volume of cement has been pumped, the drill pipe dart is released from the cementing head followed by displacement fluid. The drill pipe dart will latch and seal into the liner wiper plug. The tandem unit is then shear released from the setting tool to further displace the liner to latch and seal into the landing collar. The latch and seal system will provide additional back pressure safety to the float equipment to insure that cement remains in place after displacement. All materials are easily drilled out after cementing.

The SAPEX-CHANCELLOR Model TS4 Drill Pipe Dart is used to effectively displace cement within the drill pipe. The TS4 was specifically designed to displace a combination drill string from 2-7/8" through 5- 1/2" Drill Pipe. After a volume of cement has been pumped, the drill pipe dart is released from the cementing head followed by displacement fluid. The drill pipe dart will latch and seal into the liner wiper plug. This tandem unit is then shear released from the setting tool to further displace the liner to latch and seal into the landing collar. The latch and seal system will provide additional back pressure safety to the float equipment to insure that cement remains in place after displacement. All materials are easily drilled out after cementing.



DRILL PIPE DART | TS4 DRILL PIPE DART | LINER WIPER PLUG

Liner Size		Product Number	Max O.D.	
in	mm	Liner Wiper Plug	in	mm
4.5	114.3	M95040145	4.188	106.4
5.0	127	M9504015	4.5	114.3
5.5	139.7	M95040155	5.313	135
7.0	177.8	M9504017	6.625	168.3
7.6	193.7	M95040176	7.188	182.6
9.6	244.5	M95040196	9.063	230.2

Drill Size	Product Number	Fin Max O.D.		Pipe Min I.D.	
in	TS4 Drill Pipe Dart	in	mm	in	mm
2.875-4.5	M950404TS435	4.5	114.3	1.875	47.6
3.5-5.5	M950404TS45	5	127	2.259	57.2

Drill Size	Product Number	Fin Max O.D.		Pipe Min I.D.	
in	Drill Pipe Dart	in	mm	in	mm
2.375-3.5	M95040435	3.8	96.5	1.875	47.6
4.5-5	M95040445	4 1/2	114	2.259	57.2

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

ORIFICE INSERT AND CEMENTING PLUGS

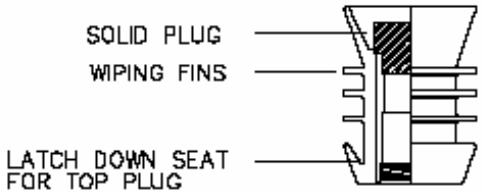
SAPEX-CHANCELLOR's Orifice cementing Equipment was designed and developed to be used in place of conventional float equipment for unrestricted flow and control of fluids during primary cementing operations.

Conventional float equipment (flappers, and spring loaded ball or plunger type) is a good choice for cementing under normal conditions with small to medium sized casings. Conventional float equipment does not allow fluid to fill up or freely by-pass while running casing in the hole. Auto fill type float equipment provides some help in this regard, but due the small orifice (1" diameter), still restricts the fill up and by-pass flow rates. Larger casing sizes can be especially problematic when running conventional float equipment. It takes much longer to run in and is often necessary to fill up each joint.

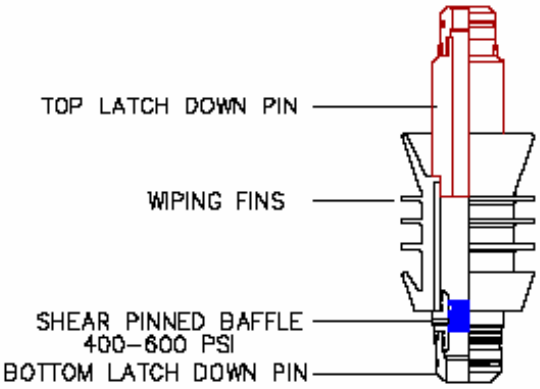
Another problem associated with running conventional float equipment concerns low pressure formations. Under these conditions it is necessary to run casing in the hole very slowly to avoid fracturing the formation and contributing to a lost circulation and poor cement job.

The specific benefit of using SAPEX-CHANCELLOR's Orifice cementing Equipment is that the large orifice allows the casing to fill up freely while running in the hole. This reduces the hydrostatic load on weak formations. The results are a better cement bond with reduced run time and costs.

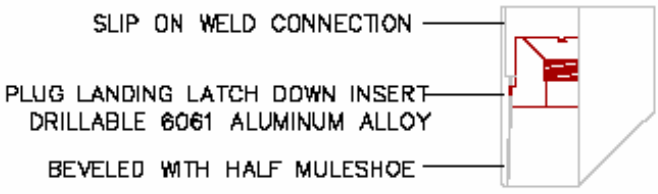
The Orifice insert is run at the shoe or one joint above. The Bottom Plug is launched from a conventional plug dropping head, followed by the volume of cement, and the Top Plug. The Bottom Plug lands and latched into the insert and a piston is noticeably sheared out to allow the cement to be pumped into place. The top Plug lands and latched into the bottom Plug holding the cement in place and insuring a successful cement operation



TOP PLUG



BOTTOM PLUG



ORIFICE CEMENT SHOE

Casing			MAX
Size	Weight Range	Product	O.D.
in	lbs/ft	Number	in
mm			
5.5	15-20	M990930155	5 5/16"
140			
6.625	20-32	M99093016	6 1/8"
168			
7	17-32	M99093017	6 5/8"6
178			
8.625	24-49	M99093018	8 1/8"
219			
9.625	29.3-53.5	M99093019	9 1/16"
244			

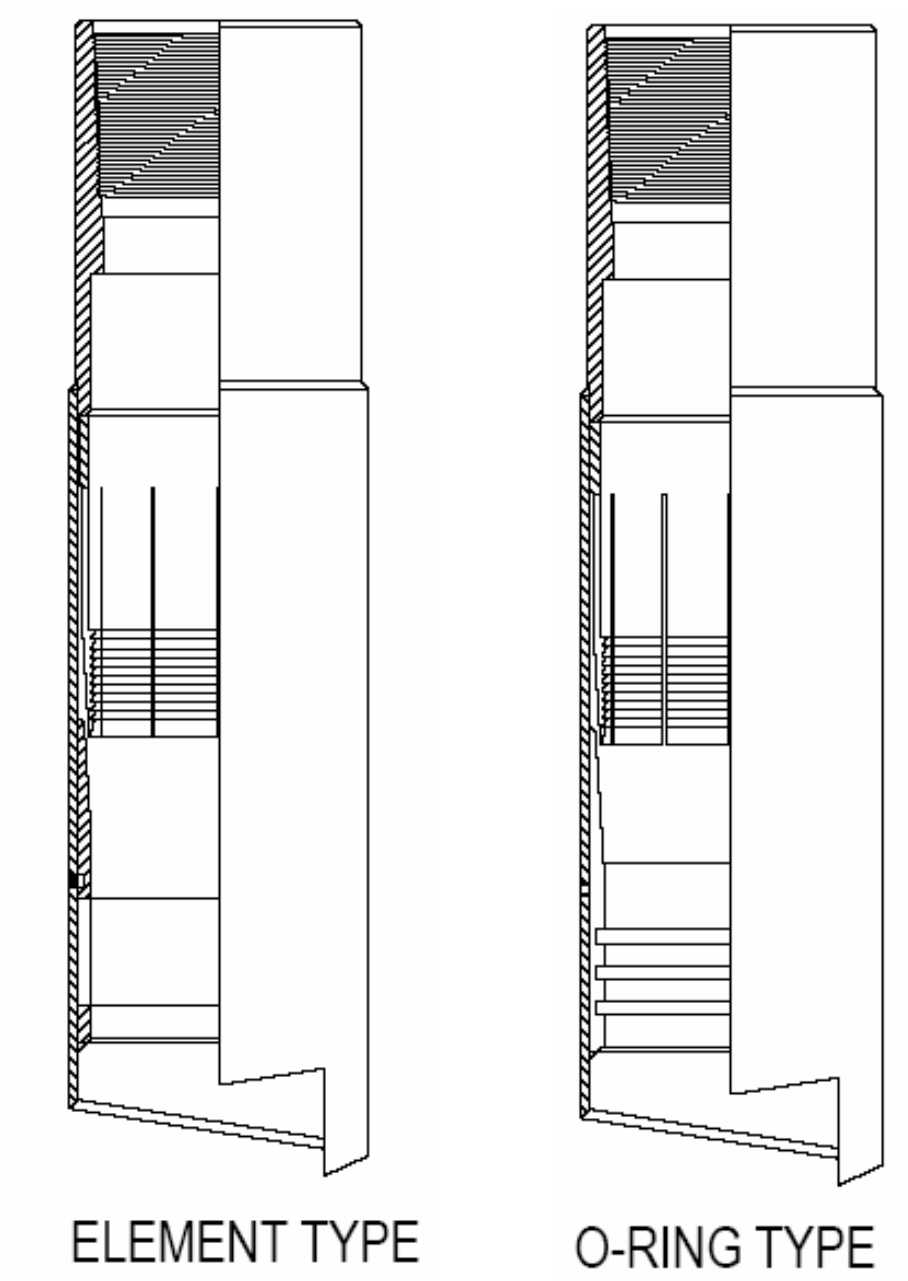
SAPEX-CHANCELLOR CASING PATCH

HOOK SKIRT WITH INTERNAL SLIPS AND SEAL

The SAPEX-CHANCELLOR Hook Skirt is a very effective and economical tool for making a mechanical connection to a liner top or cut off stub in cased hole or open hole. The casing can then be extending the casing up the hole or to surface and cemented to make a permanent pack off the becomes part of the casing or tubing string.

The Hook Skirt has a cut lip on the bottom that insures the successful capture or the stub with right hand rotation. The Hook Skirt is lowered over the stub until it takes weight. The internal slips engage the stub when picked up. The slips are hardened to RC 58 min to provide a positive and secure grip on the hardest casings. The slips are pull rated for as much as 100,000 lbs tension.

There are two choices for internal seal. The O-Ring seals are sufficient where seal integrity is not that critical and economy is more of a consideration. The Packer Element type is the better choice for providing a more positive seal and allows room for irregularities in the casing stub. The internal packer element is energized with the over pull. 10,000 lbs pull is sufficient to set the packer.



SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

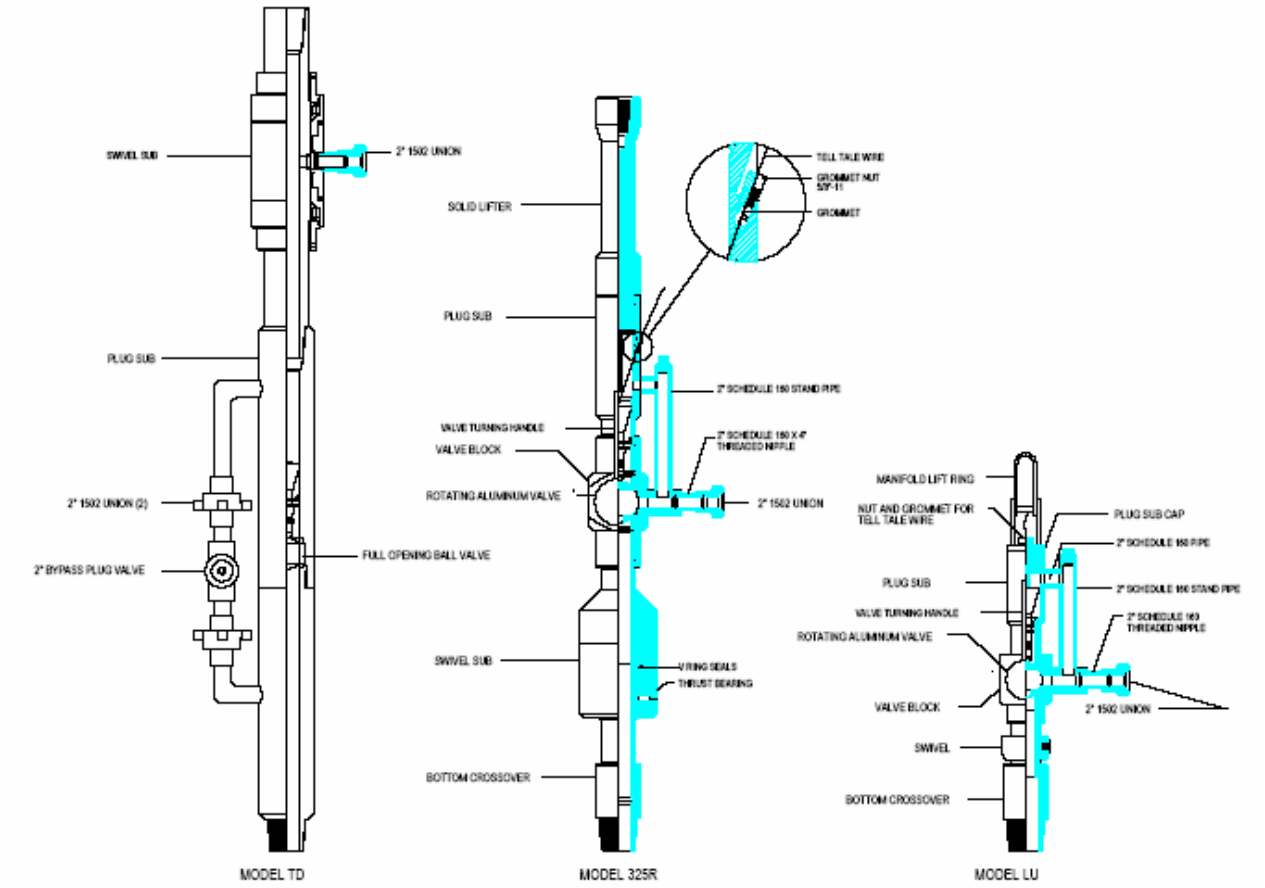
PLUG DROPPING CEMENT MANIFOLDS

The SAPEX-CHANCELLOR Model 325R is a heavy duty plug dropping cement manifold with lifter and roller thrust bearing for rotating liners during cementing operations. The 325R Manifold has a load rating of 500,000 lbs. static and 325,000 lbs. dynamic. The Model LU is a more economical cement manifold where the elevators are latched under the top sub connection, which eliminates the hook load rating requirement. Both of these manifolds are fast acting cement heads and provide a convenient method of maintaining mud/cement separation following the cement pumping operation. The single two-way valve is the key to its rapid and efficient plug initiation. Operation is very simple and foolproof.

The plug is installed into the receptacle located in the top portion of the cement head. The line on the valve must be 900 to the drill pipe. Next, the actuating lever is installed in the valve locking hole, thereby preventing any chance of accidental valve movement. The drill pipe wiper plug resides in the upper part of the cement head while cement is pumped through the lower part via the two-way valve.

Following the cement pumping operation, the valve is rotated 900 and the drilling mud or water is directed to the top of the cement head, Thee displacement fluid pressure forces the wiper plug through the cement head valve and into the drill pipe, maintaining displacing fluid/cement separation. The line on the face of the valve points in the direction of the plug movement. A stop mechanism precisely aligns the valve position. It is impossible to send the plug down the drill pipe until the valve positioning hole is provided allowing one to insert the actuating lever locking the valve in the open position.

The Model TD Top Drive Cement Manifold is the preferred choice for use with rotating liner hangers and a top drive unit. The manifold's solid construction is rated for 1,300,000 lbs tensile strength. A double set of bearings and seals allow for easy rotation. The drill pipe dart is loaded in the plug sub. Cement is pumped down thru the swivel and is bypassed around the dart. The plug is launched and displaced by rotating the bypass plug valve 180 degrees closed and opening the plug ball valve 180 degrees open. A flag sub or a ball dropping sub can be used in conjunction with the TD manifold.



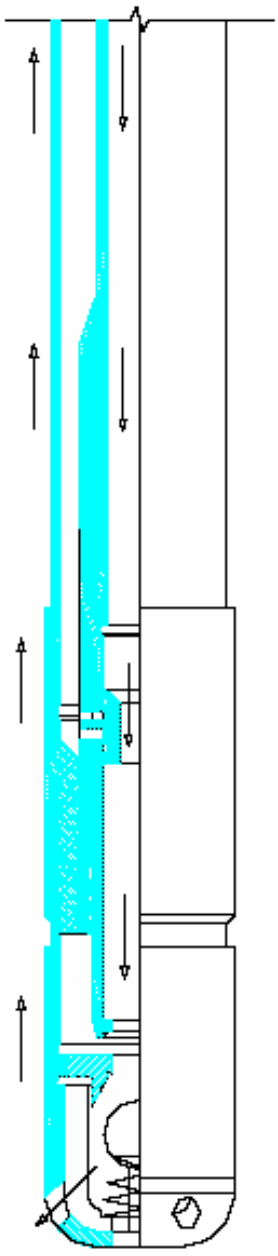
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

STAB-IN EQUIPMENT

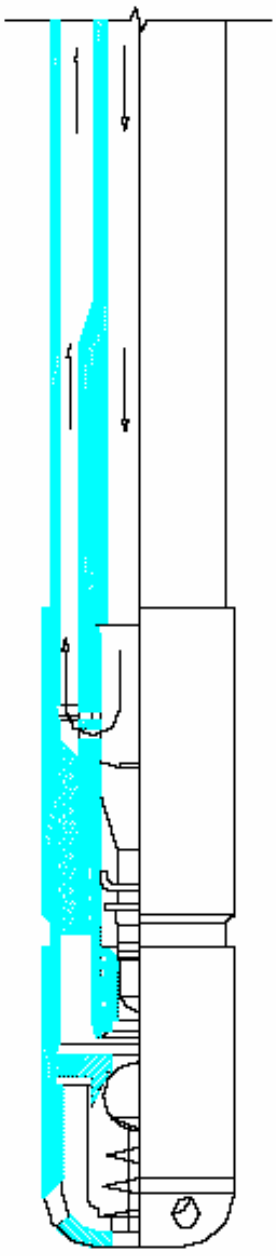
Stab-In cementing provides better volume and pressure control leading to improved cementing jobs by allowing the operator to pump the cement slurry through the drill pipe. This technique is especially effective when collapse must be offset in large diameter, thin-wall casing, since no packer cups are used the effects of upward hydraulic forces are eliminated.

When there is a large displacement problem or when close control of returns is necessary through large-diameter casing, inner-string operations offer major benefits. Chances of cement contamination are decreased, and densities can be easily maintained. And the weight of the landed casing string is less when cementing through the drill pipe.

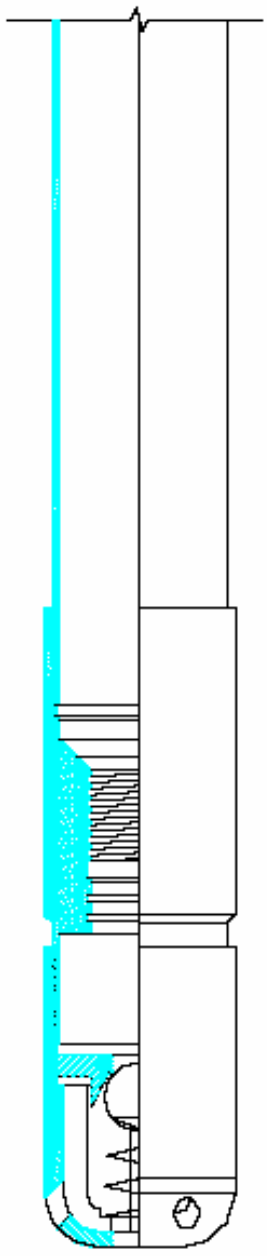
SAPEX-CHANCELLOR equipment is available for inner-string cementing in all sizes and connections. The float shoe can be supplied with down jet ports that give an even distribution of fluid around the circumference of the shoe joint.



SETTING TOOL THEADED INTO CEMENTING SHOE ASSEMBLY. CIRCULATING/CEMENTING ON BOTTOM.



CEMENT DISPLACED FOLLOWED WITH A DRILL PIPE DART. PISTON SHEARED AND CIRCULATING THRU PORTS IN SETTING TOOL.



SETTING TOOL RELEASED AND PULLED OUT OF THE HOLE CASING READY FOR DRILL OUT.

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

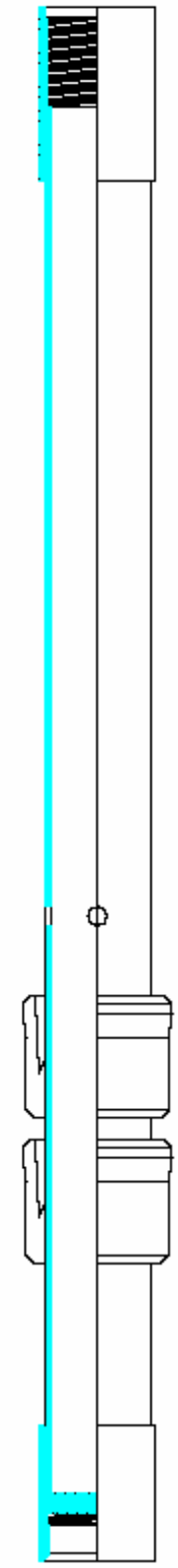
CEMENTING PACKER SHOE

The SAPEX-CHANCELLOR Cementing Packer Shoe is designed to effectively isolate perforated, slotted, or damaged liner below from cement contamination. When set, the packer seal element retains the cement above the shoe and assures a sea between the casing and inner liner.

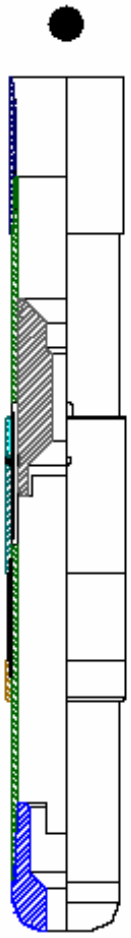
The Model BC Packer Shoe is the most efficient and simple method. The BC contains two casing packer cups placed below drilled cementing ports with a blank drillable baffle below to hold the column of cement. A float insert or collar is run above the packer shoe to insure that cement remains in place. There is no mechanical setting procedure required. This method is not recommended for running at great depth or through bad order casing.

The Model HPS hydraulic Cementing packer Shoe is the superior choice for most applications. The packer shoe is made up on the bottom of the liner string and can be circulated on bottom. A flapper type float insert or float collar is used. A setting ball is dropped and pumped to the piston ball seat. An increase in ball pressure will shear the piston and set the packer element with downward force, expanding the element to seal against the casing. An increase of pressure will shear the piston from the packer setting ring, sending it to the bottom of the shoe, and exposing the cementing ports. The packer sleeve remains energized with an internal lock ring. Circulation can resume up the annulus followed by the cement operation. All internal parts of the shoe are drillable.

Liner	Casing		Product	Number	MAX
Size	Size	Weight Range			O.D.
in	in	lbs/ft	BC	HPS	in
mm	mm				mm
4	5.5	15.5-20	C95036755	M011090155	4.5
102	140				114
5	6.625	24-28	C9503676	M01109016	5.5
127	168				140
5.5	7	23-29	C9503677	M01109017	6
140	178				152
6.625	8.625	24-32	C9503678	M01109018	7.5
168	219				191
7	9.625	36-53.5	C9503679	M01109019	8.375
178	244				213



MODEL BC



MODEL HPS

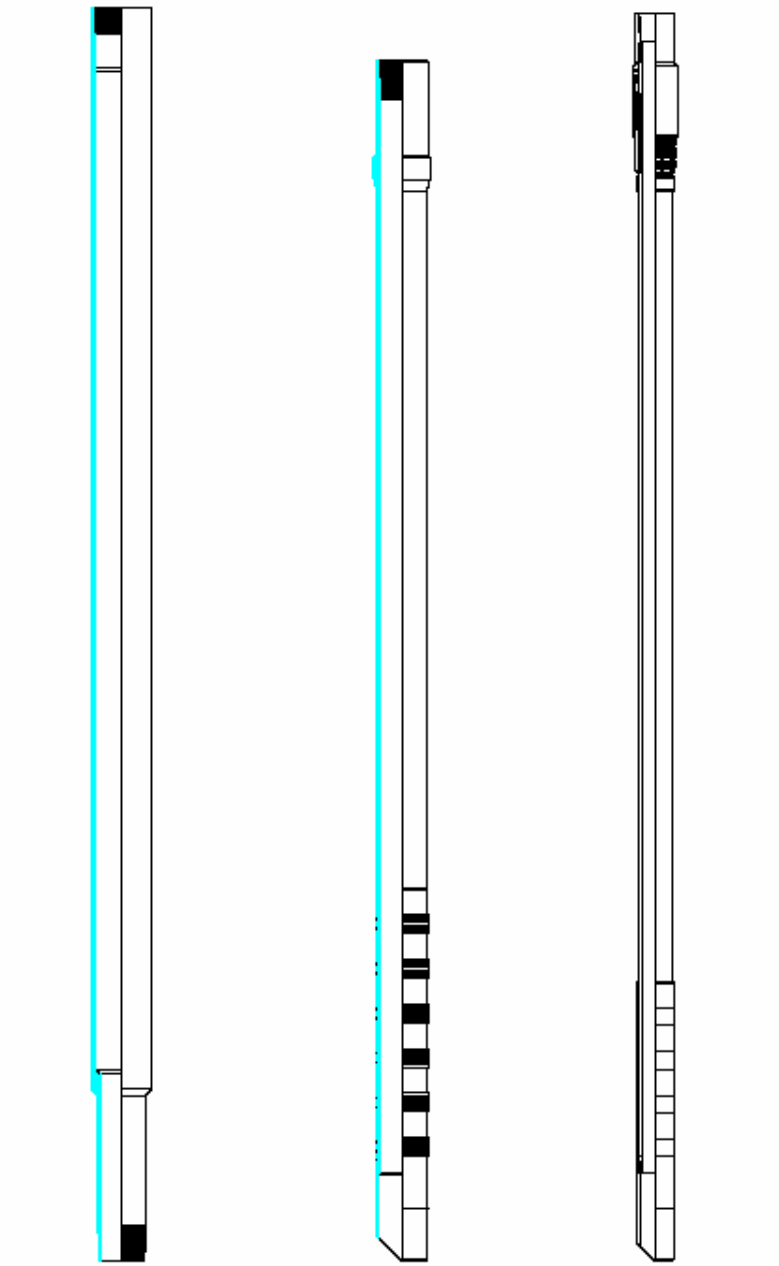
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

BH PBR AND BH SEAL NIPPLE

The SAPEX-CHANCELLOR Type BH Polish Bore Receptacle (PBR) is usually run as an Integral part of the liner string directly below the liner hanger or setting collar. It is specially bored and honed so as to provide a positive sealing bore for the seal nipple assembly during tubing string expansion and/or contraction in response to pressure to pressure and temperature.

The Polish Bore Receptacle provides the maximum internal opening through the production tubing and sealing system.

The SAPEX-CHANCELLOR Type BH Seal Nipple is the second part of a Polish Bore Receptacle and provides a unitized seal assembly on a stem which connects to the end of a tubing or casing string and to successfully create a packer less, free end tubing to casing seal. The seal integrity is maintained allowing tubing to expand and contact in response to pressure and temperature differences without affecting the integrity of the tubing to casing seal. The BH Seal Nipple can be optioned with a snap latch to anchor into the setting collar or liner top packer running threads. The Seal Nipple can be released with RH rotation. Typically a series V-ring (or Chevron) seal stacks are assembled on the seal nipple mandrel and separated by spacer rings. The orientation of the rings can be alternating to seal from both directions, or unidirectional to seal from only one direction. To prevent leakage, the unitized seal assembly mandrel has no threaded connections between seal units. The number of sealing rings per set and the material composition can be changed to match the well conditions or applications. A mule shoe entry guide allows for easy installation into the PBR.



MODEL BH
POLISH BORE RECEPTACLE

MODEL BH SEAL NIPPLE

MODEL BH SEAL NIPPLE
WITH SNAP LATCH

Liner Size		Product Number		O.D.	
in	mm	Seal Nipple	Snap Latch	in	mm
3.5	88.5	M9807225	M02124015	3.75	95.3
5.5	139.7	M9807227	M02124017	5.75	146.1
5.5	139.7	M98072276	M021240176	6	152.4
7	177.8	M98072296	M02124096	7.5	190.5

Liner Size		Product	Seal Bore O.D.		Min I.D.	
in	mm	Number PBR	in	mm	in	mm
5	127	M9807205	5	127	3.75	95.3
7	177.8	M9807207	7	177.8	5.75	146.1
7.625	193.7	M98072076	7.625	193.7	6	152.4
9.625	244.5	M98072096	9.625	244.5	7.5	190.5

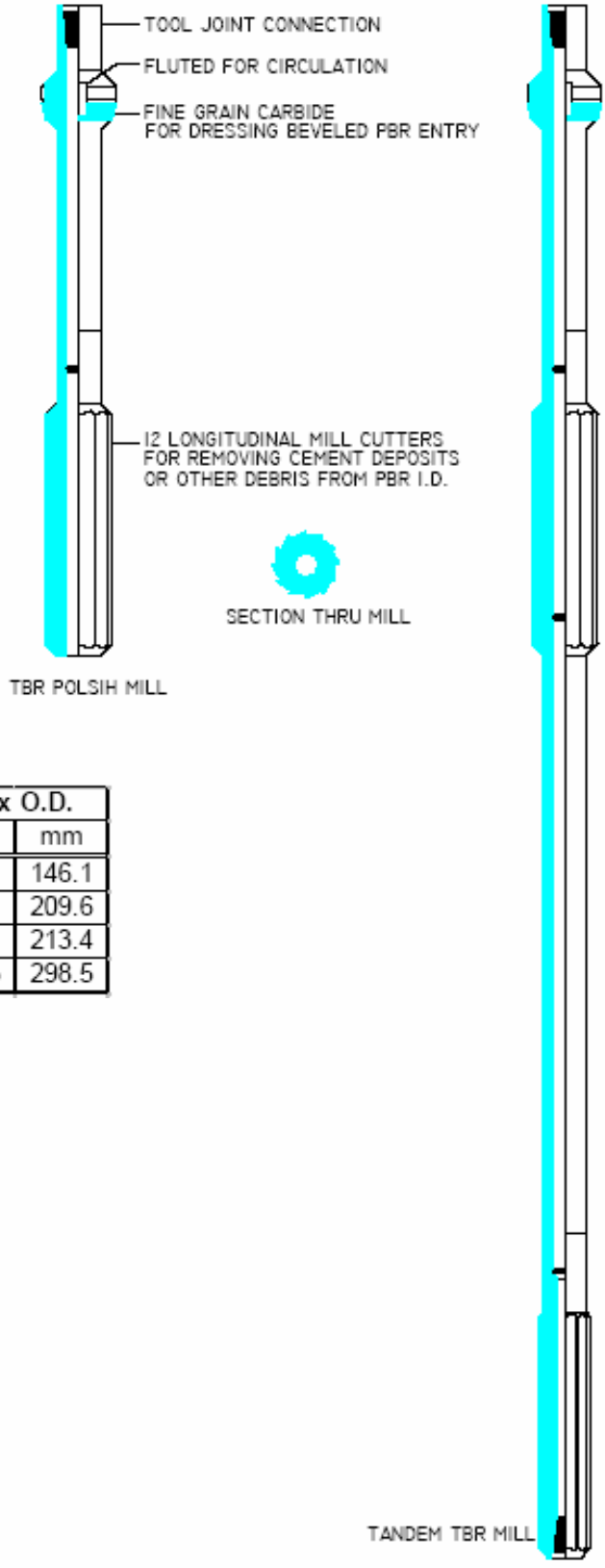
SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

CLEAN-OUT MILL

Before a liner top tie back packer or seal nipple is run, it is sometimes necessary to run a polish mill down through the tie back receptacle (TBR) or seal bore to eliminate any burrs or cement stringers and or deposits. This will insure a high integrity tie back seal.

The TBR polish mill has 12 longitudinal mill cutters for cleaning out the TBR and a top locating collar with fine grain carbide for dressing the chamfered TBR entry.

The tandem polish mill is specifically designed to clean out the liner top TBR is well as a below hanger (BH) polish bore receptacle (PBR) in one trip. This two stage mill consists of a top polish mill as previously described to clean out the top TBR and a bottom mill separated from the top mill by a spacing collar to clean out the bottom PBR. A pilot bit can be run below the bottom mill.



PBR I.D.		Product Number		Max O.D.	
upper	lower	Polish Mill	Tandem Mill	in	mm
5.25	3.75	M98075025	M98075015	5.75	146.1
7.5	5.75	M98075027	M9807517	8.25	209.6
7.75	6	M980750276	M98075176	8.4	213.4
10.5	7.5	M98075029	M9807519	11.75	298.5

SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

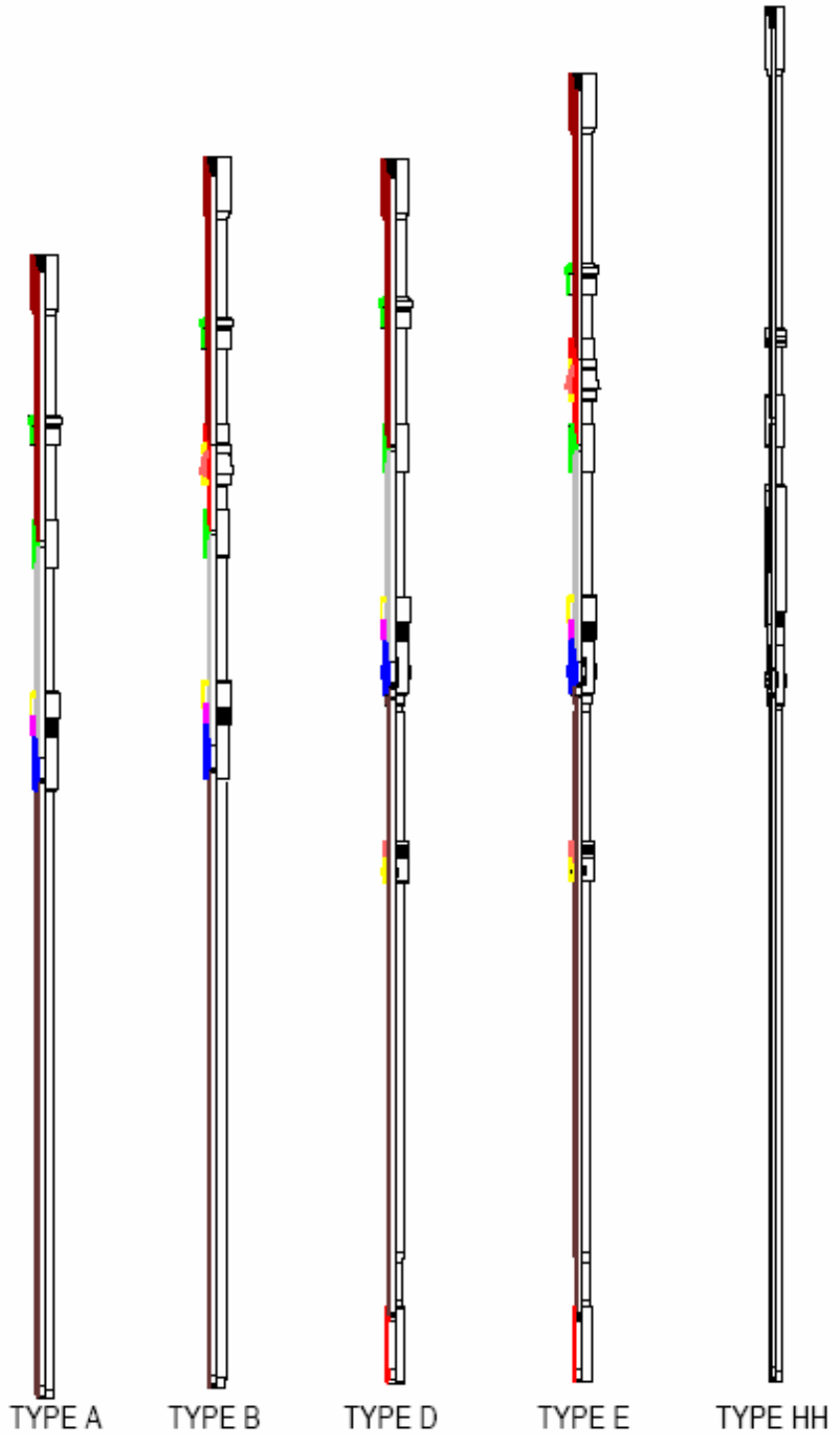
SETTING TOOLS

The SAPEX-CHANCELLOR Cementing Setting Tools are designed for running, setting and cementing liners with SAPEX-CHANCELLOR Mechanical or Hydraulic Set Liner Hangers with or without Setting Collars or Liner Top Packers. The Type A Setting Tool provides a floating nut on a two sided kelly. A lifter and junk screen is standard when running a Liner Top Tie Back Receptacle (TBR). After setting the hanger, or setting the liner on bottom, the setting tool is put in the neutral position and rotated right to release the running nut from the setting collar. The tool is then picked up and pulled out of the hole. A type B slick joint is used in combination with the drillable pack off bushing (DPB) to produce a seal between the liner and the setting tool during cement operations.

The Type B Setting Tool has all the capabilities of the Model A and also provides a packer setting dog sub (PSDS) used to set liner top packers after displacing cement. The PSDS consists of spring loaded dog segments that collapse and reside in the TBR while running the liner in the hole. In this run position there is virtually no way to accidentally set the packer.

After setting the hanger, cementing the liner, and releasing, the setting tool is picked up so that the PSDS clears the top of the TBR. The dog segments are now expanded and can be used to apply weight to set the liner top packer. In addition to these capabilities, the Type D Setting Tool also provides a spring loaded rotating dog sub that mates with splines located in the setting collar. This dog sub transfers torque from the drill string, to the liner, while in tension or compression for the purpose of setting mechanical hangers, rotating liners during the cement operation, or insuring setting tool engagement during run-in. The Model D also utilizes the retrievable pack off bushing and slick joint The Model E setting tool has all the features of the Model D including the PSDS.

The Model HH setting tool provide a hydraulic release of setting tools after setting the liner hanger with a mechanical backup release option.



SAPEX-CHANCELLOR CEMENTED LINER ASSEMBLIES

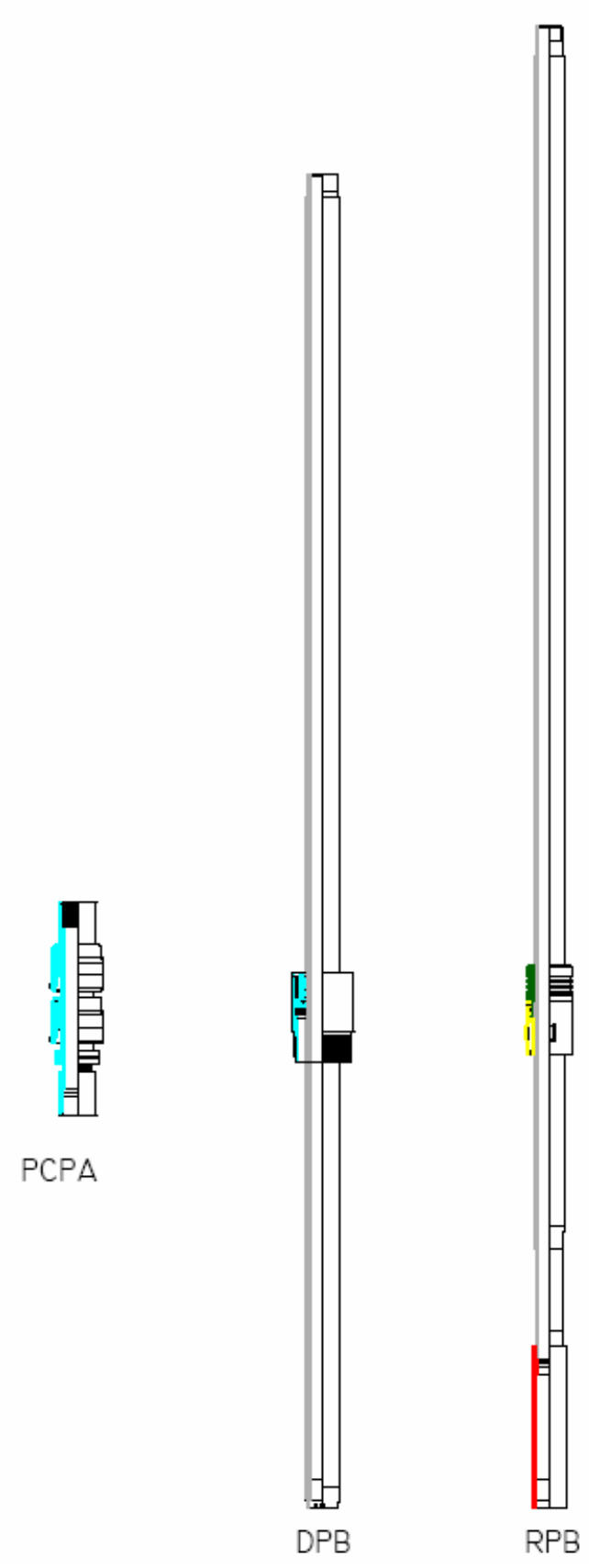
PACKOFF SEAL SYSTEMS

The SAPEX-CHANCELLOR Drillable Pack Off Bushing (DPB) is used to provide a seal between the liner and setting tool during cementing operations. A Type B slick joint is stabbed into the V-ring Seal pack Off Assembly to provide a high integrity seal. This method significantly reduces the upward hydraulic force on the drill pipe during cementing when compared to the casing packer cup method to provide seal. This is especially beneficial when cementing larger diameter liners, and/or cementing at relatively shallow depths where this upward force might exceed the drill pipe string weight and hydraulic up the hole and possibly losing the seal between the liner and the setting tool and ruining the cement job.

The DPB is an integral part of the liner string and remains in the hole when the setting tool and slick joint are removed. 6061-T6511 aluminum alloy is used internally for easy drillability.

The SAPEX-CHANCELLOR Retrievable Pack Off Busing (RPB) combines the benefits of the Drillable Pack Off Bushing with retrievability. The RPB is made up on the setting tool with the slick joint extended through it. The RPB is then landed and locked into the machined profile of the setting collar (or packer).

After the cementing operation, the RPB is released and retrieved with the setting tools. No material or seals are left to be drilled out later. The SAPEX-CHANCELLOR Packer Cup Pack Off Assembly (PCPA) provides a superior and most economical and simple internal seal system when the superior sealing properties of a slick joint and cement bushing are not required. The dual inverted packer cups are installed on a mandrel just below the setting tool. After the cement job the packer cup assembly is retrieved from the liner. The PCPA is not recommended for use in medium to deep wells, or with use on large diameter liners or high temperature applications.



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HEAD OFFICE

CANADA
10 View Drive
Box 141C RR8
Edmonton, Alberta T5L 4H8
Canada
Tel/Fax: +1-780-973-3528
Email: sapex@lycos.com

OPERATING LOCATIONS

INDONESIA
ADMINISTRATIVE
Duta Mas Fatmawati Blok B1 # 16
Jln. R.S. Fatmawati #39
Jakarta 12150
Indonesia
Tel: +62-21-727-98129
Fax: +62-21-727-98128
Email: mka-jakarta@indo.net.id
Email: KL.sapexindo@telkom.net

OPERATING
DURI BASE
Jl. Jend. Sudirman # 63
Duri, Riau 28884
Indonesia
Tel: +62-765-598-006
Fax: +62-765-598-005
Email: sapexindo@telkom.net

PRABUMULIH BASE
Jl. Pertiwi Nangka # 098
Prabumulih, SumSel
Indonesia
Tel/Fax: +62-713-320329

BRUNEI

TechTrack Supplies & Services Company
Lot 4920 Simpang 145, Jalan Sungai
Pandan 4
Kuala Belait, Negara Brunei Darussalam
Mailing Address : P.O. Box 343
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Negara Brunei Darussalam
Tel (673 3) 336409
Fax (673 3) 335722

IRAN

Tehran Afra Co Ltd
4 Eshraghi Street
North Kargar Ave.
Tehran 14118
Iran
Tel (98 21) 69 44 396/7
Fax (98 21) 69 44 398

JAPAN

Avery-Laurence (Japan) Ltd
6-28-401 Akasaka 9-chome
Minatoku, Tokyo 107-0052
Japan
Tel (81 3) 3405 5055
Fax (81 3) 3423 1579

MALAYSIA

Oilvest Engineering (M) Sdn Bhd
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Off Jalan Ampang Hilir
55000 Kuala Lumpur
Malaysia
Tel (603) 4256 7009
Fax (603) 4256 2519

PHILLIPINES

Welkin Oilfield & Industrial Supplies
Corporation
236 Valero Plaza, 124 Valero Street
Salcedo Village 1227, Makati City
Metro Manila
Philippines
Tel (632) 816 1718/812 6197
Fax (632) 817 3412

SINGAPORE

LOAD CELL SERVICES LTD.
66 Toh Tuck Road # 04-09
Singapore 596730
Tel: +65-6462-1338
Fax: +65-6463-1662
Email: ianlim@loadcellservices.com
Email: iancalim@singnet.com.sg

VIETNAM

Loadcell Services Pte Ltd
143 Binh Gia
Vung Tau
Vietnam
Tel (84) 64 582373
Fax (84) 64 581254