



**Weatherford®**

# Float & Stage Equipment





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# Research & Development

Weatherford offers a complete line of precision-made float and stage equipment to satisfy the needs and preferences of the oil and gas industry. Weatherford is committed to providing only high-quality products. Our comprehensive quality assurance program includes:

- Use of only high-quality tubulars.
- Strength tests for every batch of concrete.
- Functional tests on all valves, stage-cementing and packer equipment.
- A dedicated R&D Engineering Group constantly working on new tools committed to reducing operator costs. This commitment to quality maintains Weatherford as the industry leader in float equipment.

When it comes to developing and testing equipment for use in the Primary Cementing phase of your well, Weatherford is the leader. We have full scale vertical and horizontal test wells in Houston, Texas and Aberdeen, Scotland in which equipment is tested.

Weatherford also has two mud flow loops, one in Houston, Texas and another in Houma, Louisiana, with associated testing equipment to simulate most downhole conditions encountered by float equipment. These mud flow loops (MFL) and high temperature cells allow Weatherford to routinely test equipment to API Recommended Practice 10F, and to perform specialized customer tool testing on request.

The MFL uses drilling fluids containing sand (to simulate abrasive solids) to test float and stage equipment. The MFL is capable of monitoring the effects of pressure, flow rate, and temperature on a 24-hour basis, so that performance characteristics can be predicted on all types of equipment.



Mud Flow Loop at Weatherford's Testing and Training Facility, Houston, Texas

Weatherford's Engineering Team regularly monitors all types of float, stage and wiper plug equipment for the following:

- Maximum back-pressure: what pressure is held by the valve and concrete.
- Maximum bump-pressure: what pressure is held by the concrete when the wiper plugs bump and test the casing.
- Flow endurance: how well a valve resists structural damage from fluid erosion and fluid cutting.
- Temperature resistance: the ability of a valve to maintain a seal at elevated temperatures.
- Pressure loss: measured while flowing at rates up to 1,000 gpm with mud and/or cement.
- Fill rates/pressures: used in auto-fill and differential valve development and testing as per API RP10F.
- Sealing flow rate: the reverse flow rate that causes the float valve to seal (applicable to non-spring loaded valves only).
- Function testing of the non-rotating plugs in conjunction with non-rotating float equipment.
- Sub-Surface Release Plug functions under different types of downhole conditions.



# Quality Manufacturing

Weatherford offers a complete range of products serving the needs of our customers for the purpose of running and performing the primary cementation of their casing and tubing strings. At one time this just meant providing centralizers and float equipment. Today, it means a full and expanding product line with over 10,000 different products. Quality cementation has been and will continue to be crucial to successful cementing and to the ultimate return-on-investment of the well.

Weatherford offers not only a complete range of products, but also the manufacturing and field support required to meet current and future needs. Our products represent significant engineering advances, the result of unparalleled expertise in cementation products. Our investment in state-of-the-art computer technology and product development has produced the most advanced float and stage equipment products on the market today.

Our experience in producing float equipment and our commitment to manufacture accurately and efficiently using Computer Numerically Controlled (CNC) equipment have made Weatherford a leader in manufacturing technology and capability. We offer fast delivery of custom-built and premium threaded equipment.

With every order of equipment that you buy from Weatherford, you know that we have made every effort to provide you with products that measure up to your most stringent requirements because we take great pride in what we put our name on. Our manufacturing procedures are in accordance with international quality standards, including API Q1 and ISO-9001.



CNC Equipment



Houma, Louisiana Facility



CAD Systems

# Float Equipment

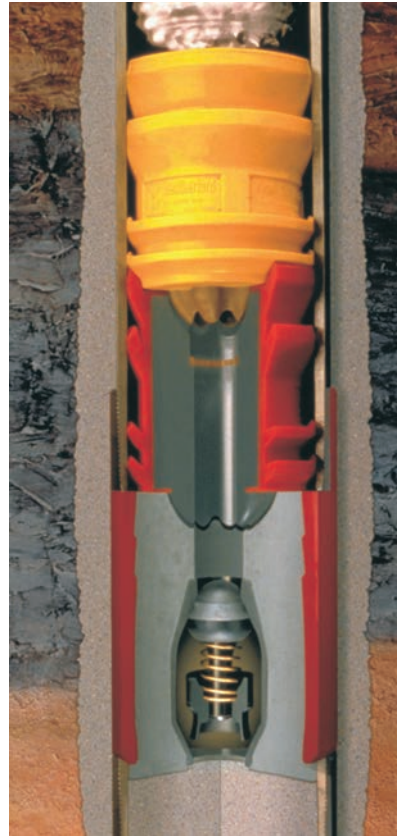
## Advantages:

- Drillability of plugs and float equipment is easy and fast with either conventional rotary bits or PDC bits.
- WiperLok® system provides a proven anti-rotational mechanism and is available in both standard as well as Sub-Surface Release plugs (SSR™ Plugs ).
- Withstands long periods of circulation with highly abrasive fluids.
- Top and bottom plugs rated to 80% of burst pressure for most standard weight and grade casing.
- Polyurethane plug material is resistant to wear, making it ideal for long casing strings.

## Sure-Seal 3™ Float Equipment

The *Sure-Seal 3* float equipment, an integral part of the WiperLok system, incorporates a PDC drillable, spring-loaded, phenolic plunger valve. The equipment features include:

- Exceeds API RP10F Category IIIC casing float equipment flow endurance, pressure and temperature requirements.
- Available in an ultra-high pressure configuration that incorporates a phenolic landing plate. This landing plate provides an anti-rotation mechanism, and evenly distributes forces across the top of the float equipment.
- Large flow area minimizes pressure drop and erosion during circulation.
- Operates in deviated or horizontal wells where differential pressures may be lower.
- Easily drilled, non-ferrous spring (.091 or .114 wire diameter) ensures immediate plunger seating after conversion when circulation or displacement is stopped.
- Resilient low pressure seal assures positive shut-off when differential pressure is low or non-existent.
- Hard phenolic high pressure seal minimizes extrusion and stress damage to the resilient seal at extreme differential pressures. Phenolic plunger contains no metallic components, assuring PDC bit drillability.
- Special design uses fluid hydraulics to draw plunger firmly into retainer cup, minimizing spring fatigue and reducing plunger contact with the side wall. This results in less erosion damage from high velocity flow.
- *Sure-Seal 3* valves come in three sizes to optimize flow areas.
- Available with PDC drillable landing plate in collars or shoes as required.
- Available in sizes 4-in. and larger.



## Sure-Seal 3™ Float Valves

### Sure-Seal 3 Float Valves

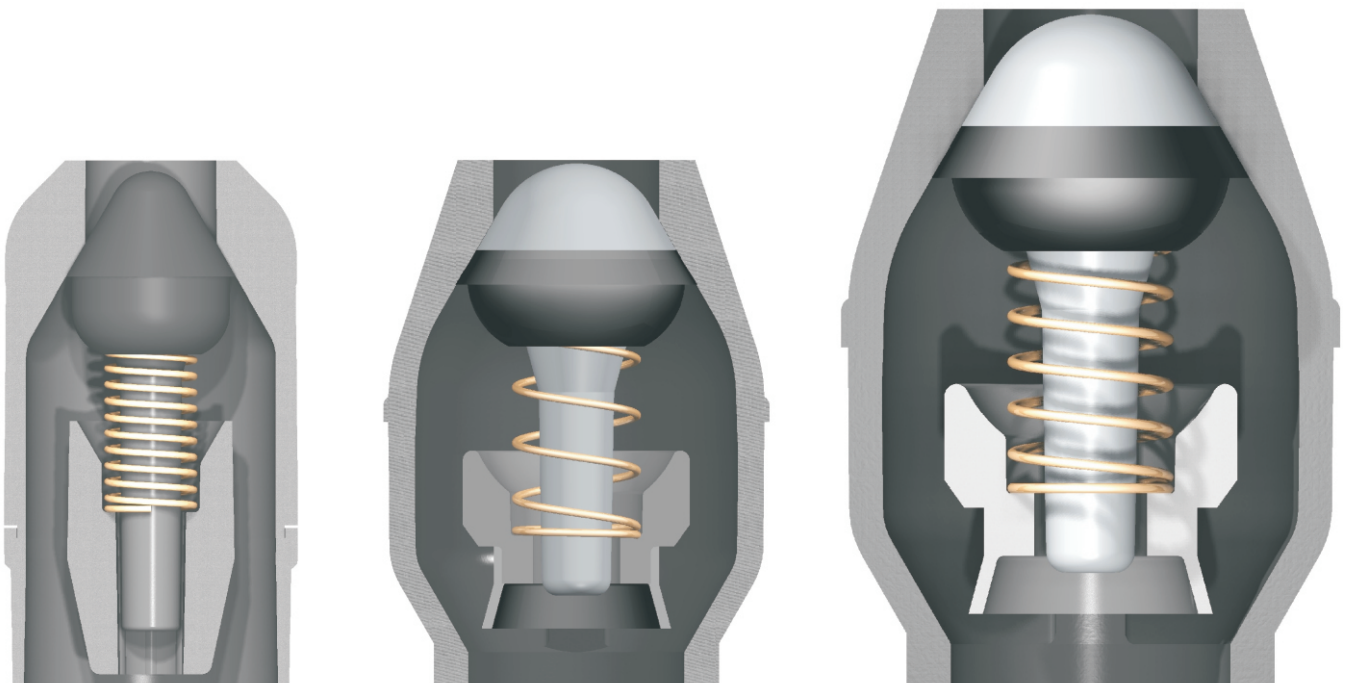
As pictured below, the *Sure-Seal 3* valve is offered in three distinct sizes. Each valve has been stringently tested to the highest performance levels and have set the standards for reliability.

The smallest valve (pictured at left) was engineered to maximize flow in small casing applications. This PDC drillable plastic valve is placed in standard shoes and collars from 4-in. to 5 1/2-in. and can be used in both single or double valve configurations. This valve is rated to 400°F and 10 bbl/min. flow rate for 24 hours.

The medium *Sure-Seal 3* features a minimum of over 3 square inches flow area to allow passage of large cuttings and debris. As with its smaller counterpart it is rated to 5,000 psi at temperature and after extended flow periods. This valve is used in equipment from 7 5/8-in. to 5 1/2-in.

The largest valve, the 3 1/4-in. *Sure-Seal 3*, is used in all standard float equipment sizes 8 5/8-in. and above. In special circumstances this valve can be placed in equipment down to 7-in. when lost circulation material or high circulation rates are expected. This valve features a greater than 4.9 square inch minimum flow area and has been used in every major oil field around the world.

Regardless of which of the three world-class valves is placed in the equipment for your well, you can be assured of the highest quality on the market.





# Guide Shoes

The primary purpose of Weatherford guide shoes is to guide the casing to cementing depth and reinforce the lower end of the casing. Orifices are sufficiently large as to allow most tripping balls, orifice tubes and debris to exit the casing without obstruction.

## Cement Nose Guide Shoe - Model 202

- A rounded cement nose with a generous radius which assures smooth running.
- A special formula cement maximizes shock resistance and minimizes drill-out time.
- This tool is PDC drillable.
- An alternative version L202 Large Bore will be shown with the L series of float collars.



## Downjet Cement Nose Guide Shoe - Model 222

- This guide shoe allows circulation primarily through the central orifice, but has multiple side ports.
- The Model 212 guide shoe with up-jets is also available to provide better displacement mechanics during cementation.
- This tool is also PDC drillable.
- Down-jets in the model 222 guide shoe promote washing down.



## Composite Nose Guide Shoe - Model 202WM

- The newest development in float equipment nose configurations is the eccentric and concentric versions of the composite nose.
- Shown here in the eccentric version, this guide shoe helps the casing or liner string get past ledges and other downhole obstructions.
- The composite nose material is completely PDC drillable.

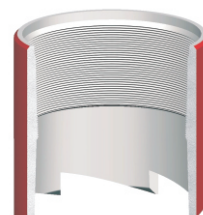


## Texas Pattern Guide Shoe - Model 112

- This guide shoe has an internally beveled edge design.
- It is constructed to prevent drilling and wireline tools from hanging up.
- It can be used to wash down through obstructions in the wellbore while running openended pipe.

## Saw Tooth Pattern Guide Shoe - Model 105

- This guide shoe model features a saw tooth design on its leading edge.
- It is designed for lightly reaming through bridges and fill materials but not active drilling.
- As with all guide shoes, it is most often run with a float collar one to two joints above.

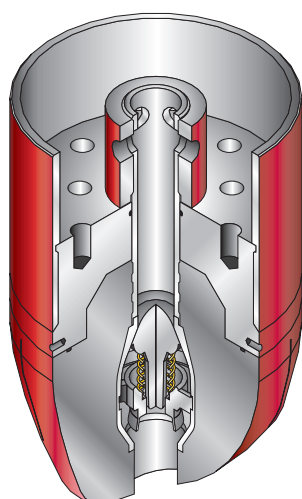




# Guide Shoes

## Large Bore Guide Shoe - Model L202

- The primary purpose of this guide shoe is to guide the casing to depth when run with large bore float equipment.
- Another advantage is allowing a maximum amount of fluid to pass into the casing and be debris tolerant.
- The large orifice is also designed to allow the conversion ball and tube to pass without hindrance through the guide shoe.
- The guide shoe is designed to allow ample flow area should the composite tube rest on the cement rather than pump through.



## Free-Rotating Eccentric Guide Shoe

Weatherford's free-rotating eccentric guide shoe facilitates problem-free running of casing in highly deviated hole sections. The unique nose design enables the guide shoe to change orientation as casing or liners are run into the wellbore. The nose pushes against a ledge in the wellbore, which halts the progress of normal guide or float shoes. The resulting side force rotates the guide shoe away from the obstruction, thus allowing continued running of the pipe to the predetermined depth.

### Applications

- Horizontal or high-angle wellbores
- Vertical wells in which formation lithology produces hard layers of rock with internal diameters of varying gauge
- Re-entry wells in which window orientation may not be known
- Heavy casing strings for which the ability to free stuck casing is limited by rig hoisting capabilities or casing design limitations
- Sidetracks

### Features, Advantages and Benefits

- Self-aligning, PDC-drillable nose rotates with low torque to guide the casing to the path of least resistance.
- All-plastic design reduces drag as the guide shoe pushes past obstructions, expediting operations and eliminating the need to rotate the casing.
- Offset side ports provide excellent hole cleaning characteristics.
- Equipped with drill-out slots and chip breakers, this unique, short design also makes drill-out fast and simple.
- Eccentric guide shoe configurations increase efficiency in highly deviated wellbores.

# Sure-Seal 3™ Float Shoes

## Advantages:

- *Sure-Seal 3* Valves are the foundation of most Weatherford conventional float equipment.
- The valve and cement around it is capable of withstanding long periods of circulation. *Sure-Seal 3* Float equipment exceeds API RP10F Category IIIC flow endurance and pressure test requirements.
- Float shoes are most often run with float collars and must perform the primary function of guiding the casing to total depth while also serving as the primary valve when the cementation displacement is completed.
- The *Sure-Seal 3* Shoe design assures quick PDC drillability.
- Shoe designs vary depending upon hole geometry, formation pressure, bore hole stability and operator preference.

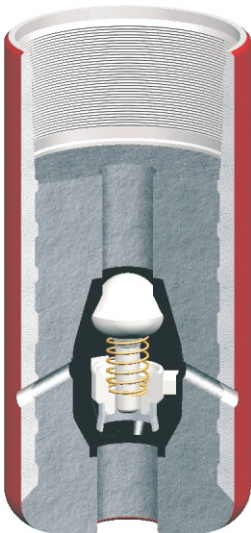
## Cement Nose Float Shoe - Model 303

- The *Sure-Seal 3* float shoe features our PDC drillable spring-loaded poppet valve.
- The shoe's rounded nose assists the running of casing in horizontal or deviated wells.
- It is ideal for use with low differential pressures where other valves may not seal.



## Downjet Float Shoe - Model 323

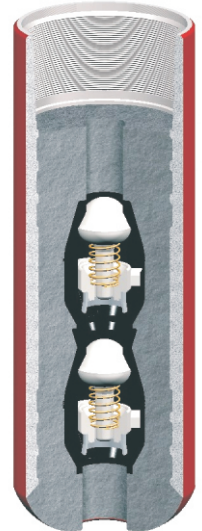
- It delivers a jetting action that is effective in washing out bridges and distributing the cement slurry evenly at the shoe to minimize channeling.
- The downjet shoe provides ample circulation area if the casing is plugged off on the bottom.
- The model 323 features no ferrous components and is PDC drillable.



# Sure-Seal 3™ Float Shoes

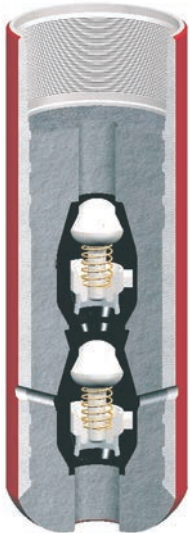
## Double Valve Float Shoe - Model 303DS

- The *Sure-Seal 3* double valve float shoe has all of the features of the standard float shoe and provides the added assurance of sealing when debris prevents the upper valve from closing.
- Most often it is used when the operator does not want to run a collar and drill cement in the shoe track.
- This model is PDC drillable, and is recommended when no other float equipment is to be run.



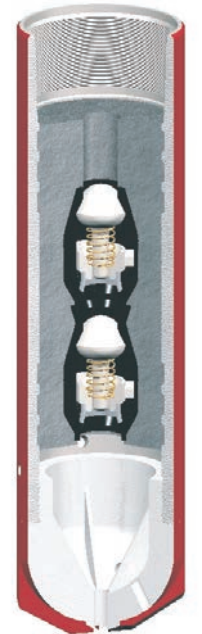
## Double Valve Upjet Float Shoe - Model 313DS

- Features two valves for security.
- The model 323 DS is also available featuring downjet ports.
- Circulating ports can be ordered as downjet or upjet versions.



## Double Valve Bladed Nose Float Shoe - Model 329DS

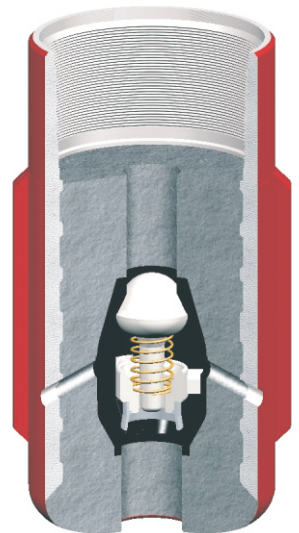
- The *Sure-Seal 3* liner float shoe is available in a single (Model 329) or double valve (Model 329DS) design.
- It is constructed so that the bladed nose prevents rotation of the mechanical liner hanger during setting operations.
- The nose is built of aluminum for easy drillout. The nose has blades and jets that are effective in washing through bridges.
- This model provides ample circulation when the casing is resting on the bottom.
- This type of nose is not designed for drilling or reaming.



# Sure-Seal 3™ Float Shoes

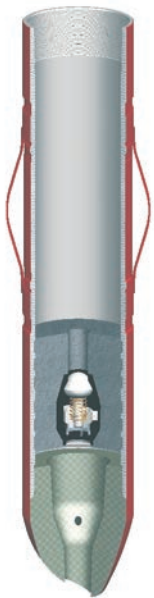
## Downjet Float Shoe with Centralizer Vanes - Model 323C

- The Model 323C combines the proven *Sure-Seal 3* technology with the guaranteed standoff provided by rigid vanes.
- Centering the casing at the shoe assists drag reduction and getting past ledges when the casing is being run into the wellbore.
- Rigid blades can be coordinated with rigid centralizers to provide positive casing stand off while minimizing drag.



## Centralizer Sub Float Shoe with Composite Eccentric Nose - Model 543WM

- Same benefits of 303 Float Shoe, but built within a Centralizer Sub with integral bow spring centralizer blades and a composite nose.
- Centralizes the pipe at the critical shoe area for optimum mud displacement.
- Built to guide casing strings down through extremely tight casing and wellhead restrictions then opening into a larger underreamed wellbore.



## Composite Eccentric Nose Downjet Float Shoe - Model 323WM

- Same superior valve float shoe but now combined with an eccentric, composite nose to give all the advantages for getting past ledges or obstructions downhole.
- Optional jet orientations are available up, down or both.
- Same superior PDC drillability.





# Reamer Shoe Tools

## The Reamer Shoe Tools

These products are designed to run on all sizes of casing or liners. In the event wellbore restrictions or ledges are encountered, a reamer shoe will provide the operator the means to open the wellbore or move down past a ledge. The new DiamondBack® reamer shoe system operates effectively in either rotating or reciprocating applications. Its features are:

- Full coverage tungsten carbide cutting structure in diamond shaped pads.
- Large flow directed ports cover the entire wellbore while rotating and reaming and prevent channeling when pumping cement.
- The aluminum eccentric nose is easily drillable and features Weatherford's chip breaking technology. This prevents the bit balling that sometimes occurs when drilling aluminum.
- Internal nose designed for fast drill-out with PDC or tricone bits.
- Integral (milled-in) spiral stabilizer blades should be coordinated with the centralizers profiles to provide clearance for rigid centralizers.
- Robust Ledgerider™ nose profile allows easy rotation past ledges or obstructions while running pipe.
- Sizes available from 2 7/8-in. to 20-in. or other special combinations.
- Compatible with all casing and liner hanger assemblies. Best, however, when run with the Weatherford Nodeco® rotating liner hangers.
- Backreaming feature allows casing to be reamed down or back should casing have to be pulled out.



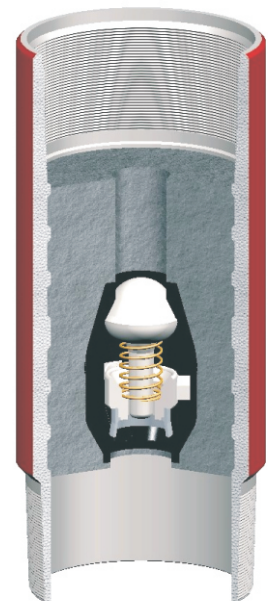
# Sure-Seal 3™ Float Collars

## Advantages

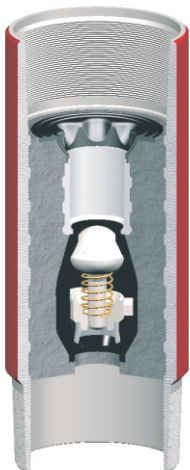
- Float Collars serve several very important roles in the primary cementation phase of the casing string.
- Act as a back-up valve to the one located in the float shoe, or primary valve when guide shoes or MudMaster™ Filter Shoes are run.
- The float collar provides a landing point for the casing wiper plugs, whose function it is to wipe any mud film from the casing during the cement displacement. The float collar allows this contaminated cement to be captured in the shoe track instead of being pumped into the annulus.
- Pressure holding capability of a float collar when a plug bumps against it is referred to as bump pressure, while pressure from the annulus on the back side of the valve is called back pressure.
- Bumping of the wiper plug confirms to the operator that the displacement is complete. The valve and cement around it are capable of withstanding long periods of circulation.
- The *Sure-Seal 3* design assures PDC drillability.

## Float Collar - Model 402

- Steel shell, made from collar stock for greater strength than the casing on which it is run.
- Single poppet style *Sure-Seal 3* valve.
- High strength concrete for maximum resistance to circulating erosion, as well as bump and back pressures.
- Completely PDC drillable. Fastest drillout usually occurs with low WOB and high RPM with PDC bits.
- This piece of float equipment meets and exceeds the API RP10F's highest test criteria, that is the III-C rating. The API RP10F test includes a 24-hour flow test at 10 bbl/min, and a 5,000 psi back pressure test after
- 400°F temperature exposure for 8 hours.



## Float Collar with Non-Rotating Landing Plate - Model 402P

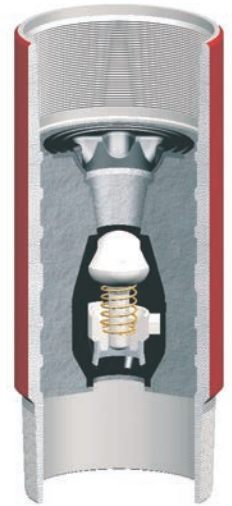


- A superior float collar for both back pressure capability and drillability due to its rugged design and the *Sure-Seal 3* valve.
- Features a phenolic non-rotating plate on which a multi-tooth non-rotating wiper plug will land.
- The throat section of this type of float collar is lined with a phenolic tube giving it added erosion resistance as well as added length. This added length increases the back pressure and bump pressure ratings.
- Non-ferrous internal components keeps this equipment PDC compatible.

## Sure-Seal 3™ Float Collars

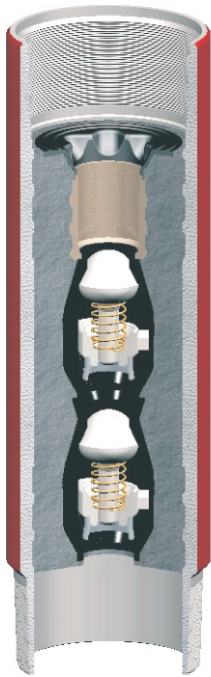
### Float Collar with Non-Rotating Landing Plate - Model 402NP

- Slightly shorter than the 402P, this float collar features the same *Sure-Seal 3* valve.
- The orifice between the non-rotating plate and the valve is slightly shorter and made of concrete.
- Overall reduced length lowers the maximum bump pressure but still retains the API RP 10F III-C ratings.
- The non-rotating landing plate prevents plug rotation during drillout.



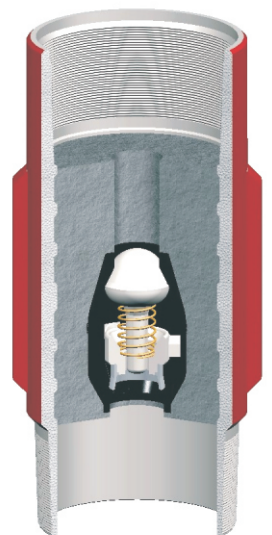
### Double Valve Float Collar with Non-Rotating Landing Plate - Model 402PD

- Just as in the flat profile float shoes and collars, there is an option for double *Sure-Seal 3* valves when an operator wants that added insurance.
- The non-rotating plate is mounted on top of a phenolic throat section. The pressure ratings of this float collar match or exceed that of the 402P.
- This model is PDC drillable.

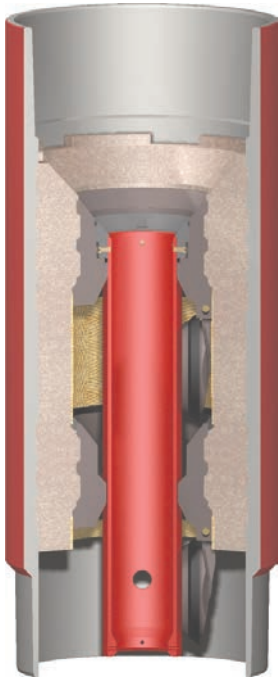


### Sure-Seal 3 Float Collar with Centralizer Vanes - Model 402C

- Special float collars are also available with integral blades. These blades are not welded on, but rather milled from a larger OD stock. Blade options are available for straight and spiral configurations.
- All collars are made from collar stock to avoid any localized hardening generated by welding on high-grade alloys.
- Non-rotating landing plate and bow-spring versions are available on request.



# Auto-Fill Float Equipment



Model L47W0

## Model L47W0

Weatherford's circulating large bore auto-fill float collar includes a surge-reducing and debris-tolerant PDC-drillable valve that allows low circulating rates without conversion, even after the tripping ball has been seated.

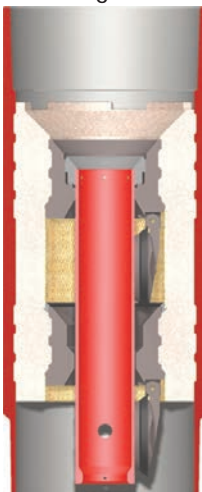
### Applications

- The L47W0 float collar is ideal for pressure-sensitive formations and close-tolerance annuli where surge reduction or fast running speeds are advantageous. This model maximizes debris tolerance in applications where the tripping ball can be released from the surface or placed in the casing above the float collar.

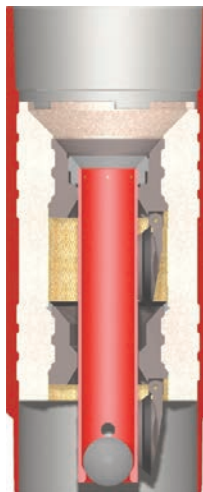
### Features, Advantages and Benefits

- Large open bores maximize surge reduction, debris tolerance, and fill rates, enabling quicker running speeds that result in time and cost savings.
- PDC-drillable composite valve materials allow reduced drill-out times.
- Flow-activated check valve maintains the ability to circulate fluids or automatically fill the pipe string, even after the tripping ball has been seated.
- Sloped landing surface guides tripping ball into the receptacle in inclined wells and provides a non-rotating profile to allow efficient drill-out of Wiperlok<sup>®</sup> cementing plugs.
- The L47W0 float collar is designed for setting at low circulating pressures to minimize formation stress or damage when converting from automatic-fill to conventional float mode.

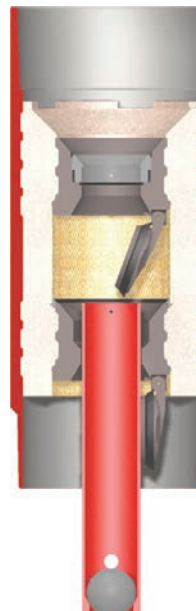
Running in Hole



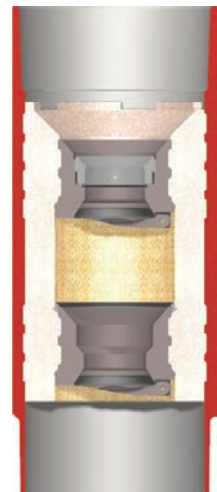
Ball Seated



Pressure and Conversion



Converted Float Valve





# Auto-Fill Float Equipment

## Model L45WP

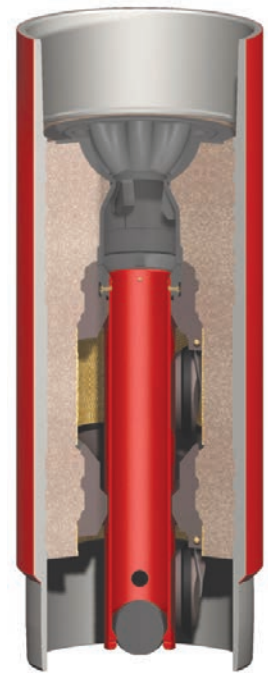
Weatherford's flow-activated large bore auto-fill float collar includes a surge-reducing and debris-tolerant PDC-drillable valve that allows low circulating rates without conversion and eliminates the need to drop a tripping ball from the surface.

### Applications

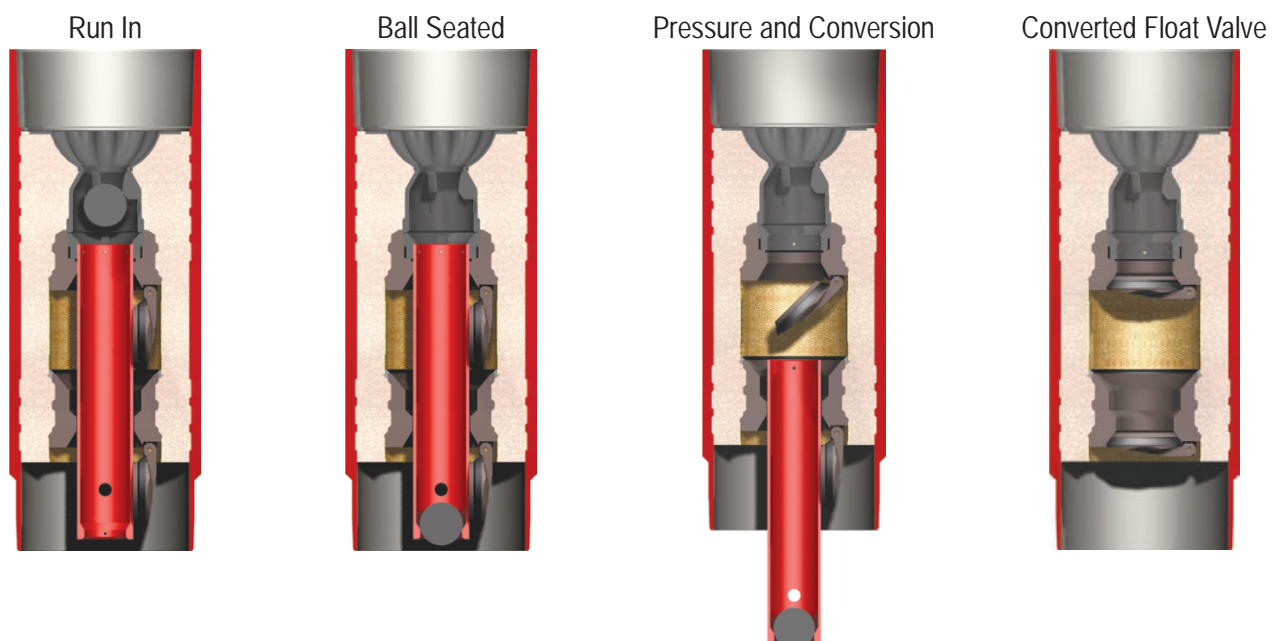
- Recommended for wells with inclinations greater than 30° from vertical and where running string restrictions or high wellbore inclinations may prevent release of a tripping ball from the surface

### Features, Advantages and Benefits

- Surge reduction, debris tolerance, and fill rates are maximized by large open bores, enabling quicker running speeds that result in time and cost savings.
- PDC-drillable composite valve materials allow reduced drill-out times.
- Built-in tripping ball eliminates the need to drop a ball from the surface and allows rapid conversion.
- Double-flapper, flow-activated check valve maintains the ability to circulate fluids or automatically fill the pipe string before conversion.
- The L45WP float collar is designed for conversion at low circulating pressures to minimize formation stress or damage when converting from automatic-fill to conventional float mode.



Model L45WP



# Auto-Fill Float Equipment

## Auto-Fill Float Collar - Model 455BB

- This auto-fill valve is available in 4 1/2-in. and larger casing and liner sizes.
- The valve has a maximum orifice size of 2-in. and can be reduced if necessary. Surge reduction for smaller casing sizes is provided with this valve.
- After conversion the trip ball is free to activate other ball activated equipment below.
- High-angle guide version is recommended for wellbore inclinations greater than 25%.
- Non-circulating version with retained trip ball is available for high angle applications.
- The shoe version of this equipment (not shown) is the 355BB. Both can be converted with one ball.
- Both the 355BB and the 455BB are PDC drillable.
- You can run a guide shoe with the collar but always confirm that the orifice is larger than the conversion ball.



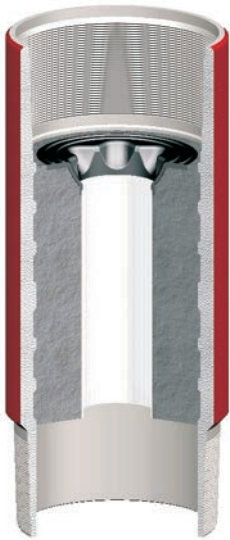
## Differential Fill Float Collar - Model 443

- Differential fill valves are similar to the auto-fill valves in that their main purpose is to fill the casing while running into the wellbore from the annulus.
- The result is a reduction in surge pressure while running the casing by taking a large part of the displaced mud inside the casing instead of outside.
- The valve controls mud influx into the casing and prevents over-filling.
- Conversion from differential fill to a conventional flapper valve is accompanied by pumping a 2-in. zinc alloy ball releasing a sleeve that holds back a spring-loaded flapper. Once converted, the equipment is standard float equipment.
- PDC drillable versions are Model 450 Differential Fill Float Collar and the Model 350 Differential Fill Float Shoe.
- The lower valve is made of cast iron for extended durability. It is no PDC drillable.
- The shoe version of this equipment (not shown) is the 343 and both can be converted with one ball.
- The model 350 and 450 utilize aluminum differential fill valve components.

## Special Collars

### Landing Collar - Model 502

- Landing collars are usually box by pin subs run in the casing or liner string to act as a point on which to land a set of casing wiper plugs.
- Consisting primarily of a shell and concrete molded with a flat profile for landing standard plugs. There are no valves for holding back pressure.

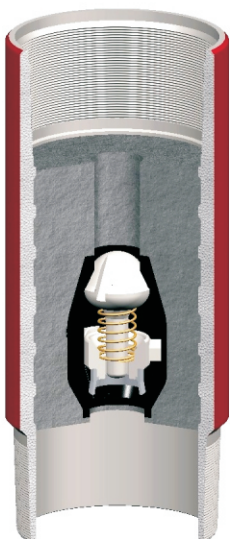
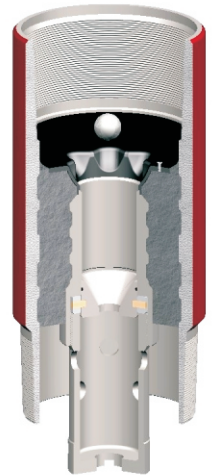


### Landing Collar with Non-Rotating Landing Plates - Model 502P

- A landing collar on which casing or hanger wiper plugs land, but in this case the plugs include non-rotating teeth.

### Landing Collar with Non-Rotating Landing Plate and Ball Catcher - Model 507P

- This is the basic 502 but features a ball catcher inside the orifice.
- The ball catcher can be set up to hold the ball until a predetermined pressure is reached. After ball seat conversion the ball is trapped and fluid is permitted to freely bypass.
- The 502, 502P, and 507P and PDC drillable.



### Orifice Collar for Tieback Strings - Model 402OG

- The OG (orifice groove) collar features the proven Sure Seal 3™ valve with a designed leak path.
- The OG equipment acts as an auto-fill valve when running the tie back assembly.
- The 402OG has the same base components of a 402. Therefore it is completely PDC drillable and can be set up to run with either a standard or non-rotating plug.
- The 402OG releases trapped fluid when stringing in the tie back.

# Stab-in Float Equipment

Weatherford's stab-in equipment is designed for cementing large diameter casing strings through tubing or drill pipe. It virtually eliminates the problem of cement contamination, prevents drilling out large quantities of cement associated with the use of large size cementing plugs, and provides greater accuracy in slurry displacement. Also, large amounts of excess cement is not left on the sea floor, which makes it a more environmentally friendly system for cementing.

## Stab-In Arrangement

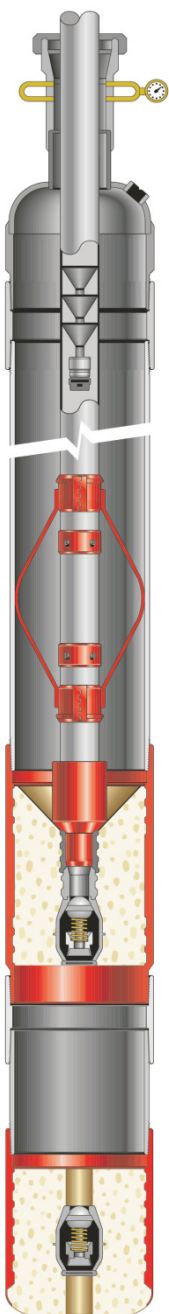
Weatherford has provided inner-string cementing equipment to the industry for over 30 years. Our system provides the necessary tools to accomplish cementing using any one of several methods. Weatherford's inner-string equipment is designed with the float shoe or collar having a tapered concrete top.

The taper guides the drill pipe adapter into the shoe or collar receiver. Two systems are available from Weatherford for use in inner-string cementing. The stab-in and screw-in systems can be provided in virtually any size casing in which drill pipe can be run. With stab-in, no rotation is required to engage or disengage the tool from the inner-string adapter. The operator simply lowers the drill pipe with the stinger on the end into the receptacle and slacks off approximately 20,000 lbs (or whatever amount is necessary to offset pump off

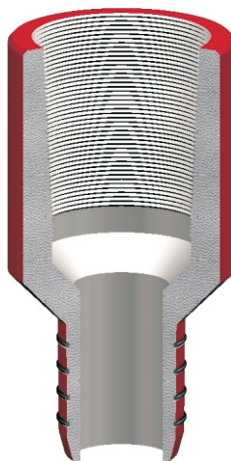
forces) to maintain a fluid tight connection.

For inner-string cementing through a shoe, a double valve assembly is preferred. The screw-in system allows the inner-string adapter to connect the float equipment to the casing while reciprocating. This style is commonly used when running scab-liners. The screw-in stinger is engaged with left-hand rotation and released with right-hand rotation.

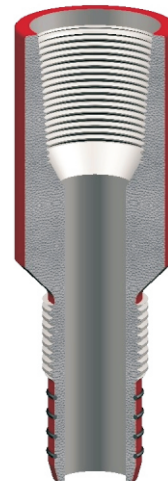
Inner-string cementing is designed to save the operator rig time and cement costs, while improving cementing hydraulics. Weatherford can provide service with a trained technician and a full complement of handling tools such as the drill pipe spider, base plate, and pack-off head, all packaged in a compact offshore transportation box.



Model 154 - Stab-in Stinger



Model 155 - Screw-in Stinger



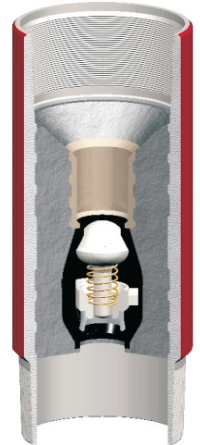


# Stab-in Float Equipment

## Single Valve Stab-In Collar - Model 402-1

The Stab-In Float Shoe (Model 303-1) and the Stab-In Float Collar (Model 402-1) feature:

- A Sure-Seal 3™ valve proven superior in flow endurance
- A tapered cement top and smooth phenolic bore receptacle which facilitates stab-in operations
- PDC drillable once the stinger and drill pipe are removed
- Uses Stab-In stinger Model 154



## Single Valve Stab-In Collar with Latch-In Plug - Model 402-1L

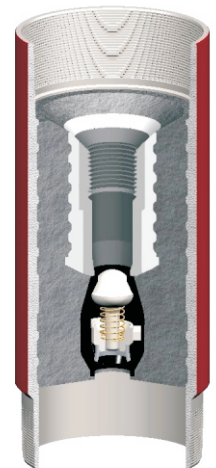
The Float Shoe (Model 303-1L) and Float Collar (Model 402-1L) have the same features as Model 402-1, but with the addition of a latch-in drill pipe wiper plug. This tool features:

- Latch-in drill pipe wiper plug
- Positive bump on displacement with the plug
- Uses stab-in stinger Model 154



## Screw-In (Duplex) Float Collar - Model 481

- The Model 481 Float Collar can be run with a Model 303 Float Shoe or any of the regular float shoes and guide shoes.
- Stinger has coarse left hand threads; back-out requires rotation to right.
- Prevents pump-off pressures acting on drill pipe.
- Uses screw-in stinger Models 155 or 155RD.

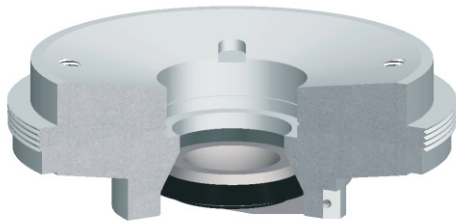


## Double Valve Stab-In Downjet Float Shoe with Latch-In Plug - Model 323-2L

- Basic difference in this version is that the shoe/collar comes with two *Sure Seal 3* valves for added security.
- The latch-in receptacle is aluminum to allow it to hold more back pressure while the stinger receptacle is phenolic.

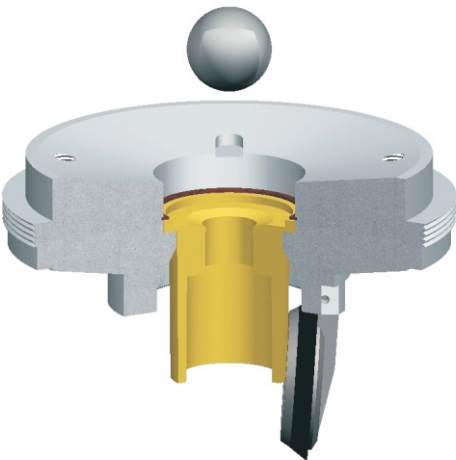


# Insert Float Equipment



## Insert Float Valve - Model 1111

- Has an easily drilled cast aluminum flapper valve.
- Threads available for STC or LTC couplings (STC must be specified for 8 5/8-in., 24 lb/ft casing).
- Can be run alone or in combination with a float collar, float shoe or guide shoe.
- Serves as a landing point for a casing wiper plug.



## Auto-fill Insert Float Valve - Model 1112

- Has an easily drilled cast aluminum flapper valve that is held open by a plastic orifice fill tube that controls filling of casing while running in.
- Assembly threads into coupling.
- Equipment is converted with a high density trip ball which is dropped from surface.
- The 111, 1112, and the 1005 can be drilled with PDC bits.



## Baffle Plate - Model 1005

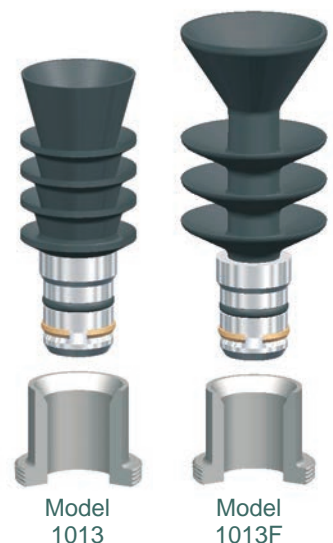
- A cast aluminum plate for threading or slipping into a coupled connection.
- Serves as an economical plug stop.
- Also available in Bakelite (Model 1007)

## Latch-In Plug and Baffle - Model 1013

- Latch-in top plug with cast iron nose and threaded cast iron receptacle which allows the casing to fill automatically.
- Also available in an aluminum nose and receptacle version (Model 1014).
- The 1013 and 1013F are not PDC drillable while the 1014 and 1014F can be drilled with a PDC bit.

## Latch-In Flex Plug and Baffle - Model 1013F

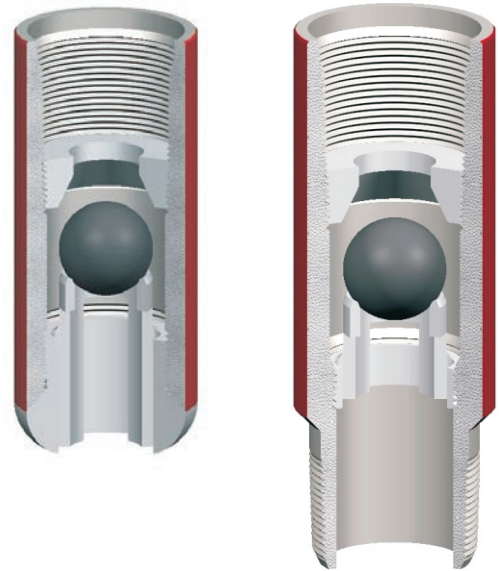
- A flexible latch-in plug with cast iron nose and threaded cast iron receptacle.
- A latch-in plug that latches into the receptacle for a positive seal in both directions.
- Available with aluminum nose and receptacle (Model 1014F)



## Tubing and Small Float Equipment

### Tubing Float Shoe - Model 302 V and Tubing Float Collar - Model 401 V

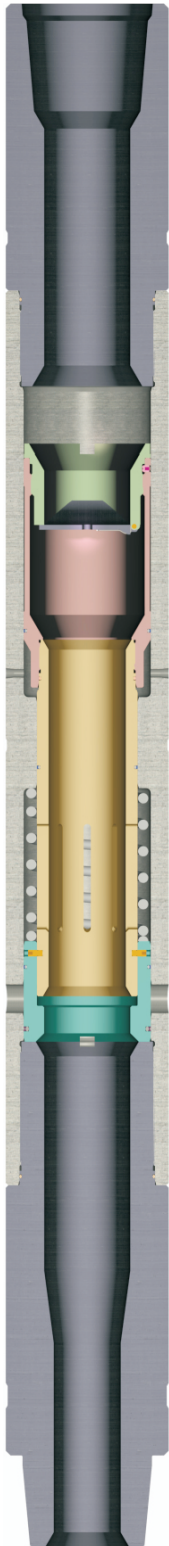
- The unique patented\* vortex design allows maximum possible flow areas through the valve components minimizing fluid velocity and resulting erosion damage.
- A passageway through the retainer cup draws the ball into a contoured cup that guides the ball to the center when flow is initiated downward.
- Flow is directed away from the ball and creates a low-pressure area to secure the ball and prevent hammering.
- A rubber-coated phenolic ball seats rapidly with reverse flow even in water and high deviations.
- An aluminum seat and ball retainer are securely threaded and sealed to the collar and shoe.
- The collar and shoe withstand high temperatures, pressures, and extended circulation.
- They exceed API RP10F Category III flow endurance and pressure test requirements.



### Circulating Hydronaut™ Shoe - Model 364VR

- Provides controlled automatic fill of tubing.
- Permits circulation without conversion of needed.
- A bridging ball prior to cementing converts the shoe to conventional float equipment.
- Available in 2 7/8-in. and 3 1/2-in. sizes.

# SurgeMaster™ II



Weatherford's *SurgeMaster* II multi-opening diverter tool is designed to reduce surge pressure on a formation and increase running speeds while running the casing or liner. The tool operates by directing mud into the annulus above any restrictions. The *SurgeMaster* II is superior to other tools in today's market because it can open and close as many times as necessary. The tool's ports open automatically as the drillpipe is run into the wellbore. When pipe movement ceases, the ports close. Because the bypass ports are normally closed, circulation can be established at any time without deactivating or permanently closing the tool. The automatic cycling of the tool is disabled when the running string's internal pressure is increased to a preset pressure that is lower than the setting pressure of a hydraulic hanger, subsea plug set, float collar, or other downhole equipment.

## Features, Advantages and Benefits

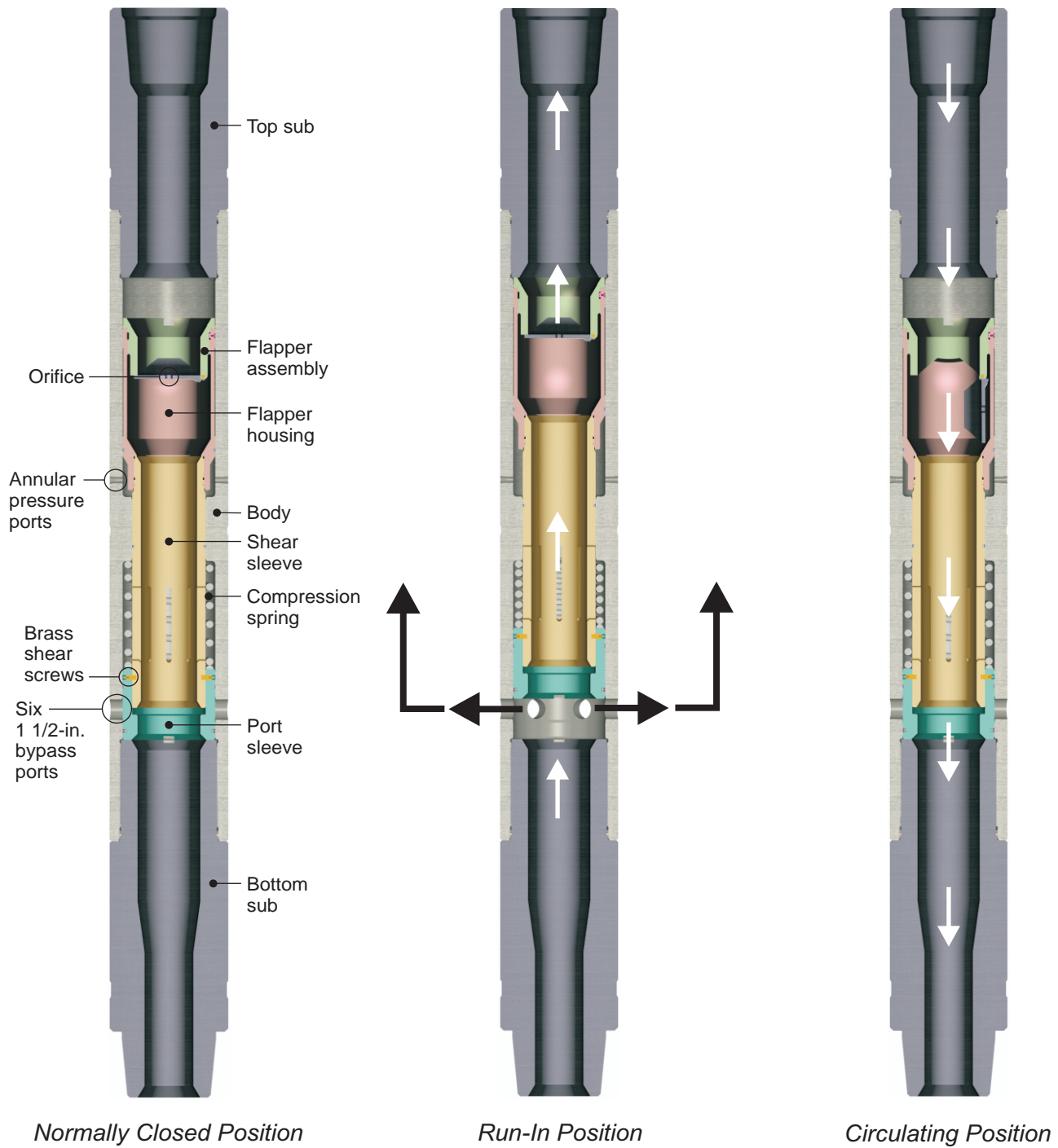
- Large bypass ports move from closed to open positions automatically while pipe is run in both vertical and horizontal wellbores, increasing running speed.
- A flow-induced backpressure acting against the flapper forces the inner sleeve to compress the body spring while sliding up and opening the ports, resulting in surge reduction.
- A small orifice in the curved flapper allows a metered filling of the running string, protecting the drillpipe from collapse pressures and minimizing the risk of overfilling.
- Normally closed bypass ports allow circulation of the running string as often as necessary, resulting in decreased response time without losing the benefit of the diverter.
- The cyclic function of the tool is deactivated by increasing the running string's internal pressure to a preset amount, saving time and enhancing safety by eliminating the need for operator intervention.

## Specifications

Connections	6 5/8-in. full-hole box x pin	
Maximum OD	8.5 in.	215.90 mm
Make-up length	80.75 in.	2,051.05 mm
Depth limitation	none	
Differential pressure rating	10,000 PSI	689.5 bar
Temperature rating	300°F	149°C
Port size (diameter)	1.5 in.	38.10 mm
Number of ports	6	
Flow area through ports	10.6 in. <sup>2</sup>	6,838.70 mm <sup>2</sup>
Minimum flow area	9.62 in. <sup>2</sup>	6,206.44 mm <sup>2</sup>
Minimum ID	3.5 in.	88.90 mm
Drift ID	3.375 in.	85.73 mm
Deactivation differential pressure	1,170 PSI (200 PSI/shear screw)	80.7 bar (13.8 bar/shear screw)



## Operation Overview



# MudMaster™ II Filter Shoe and Auto-Fill Float Equipment

Weatherford's patented *MudMaster II* filter shoe system is designed for use in critical environments and high-inclination wells especially sensitive to surge pressures and well debris. This patent-pending component of the WellMaster™ system provides distinct advantages in casing strings equipped with auto-fill equipment and is the first line of defense for ensuring successful cementing operations.

**Debris tolerance.** The unique design of the *MudMaster II* shoe track allows the mud to flow freely through very large cumulative flow areas while removing potentially damaging contaminants. In conventional auto-fill designs, cuttings and debris are swept into the casing string as mud fills the pipe, which can contribute to float valve, inflatable packer, and liner hanger failures.

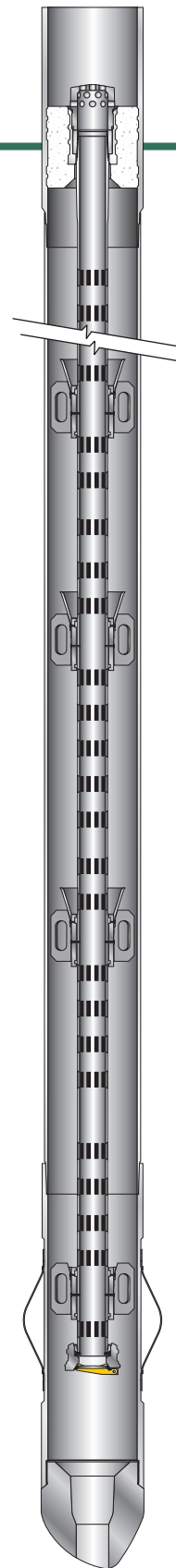
**Surge reduction.** Surge pressures are reduced with fluids flowing freely into the casing through an innovative high-flow area guide nose and slotted filter pipe, thus increasing maximum allowable running speed and minimizing mud losses.

## Features, Advantages and Benefits

- Unique shoe track design keeps debris away from the casing string and allows mud to flow easily through very large cumulative flow areas to reduce incidents caused by debris ingress.
- The *MudMaster II* filter shoe joint can be delivered to the well site as a fully assembled shoe track to save significant setup time.
- Filter components are PDC drillable and compatible with most liner, subsea, and full-string casing accessories; therefore, no special equipment is needed to operate the filter shoe. The minimized number of moving components enhances equipment reliability, and drill-out time is reduced. In addition, filter components are designed for use with nominal 38- to 42-ft casing joints, usually available from inventory, removing the need for a special pup joint or accessory threading charges.
- The filter shoe allows the operator to use the L45W PDC drillable float collar, which also saves time by allowing circulation of the casing string or performance of other operations without losing the auto-fill capability of the collar. Retention of the ball in the float collar allows for maximum flow area for clean mud through the valve while eliminating the need to drop a tripping ball from the surface.

## Applications

- Pressure-sensitive formations and close-tolerance annuli, where surge reduction and fast running speeds are advantageous
- Liner and casing strings, where debris in the wellbore could adversely affect or block auto-fill equipment, inflatable packer valves, or moving components in liner hangers



U.S. Patent No.  
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6,571,869

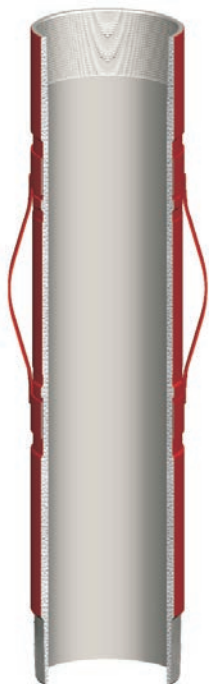
# Centralizer Sub and Float Equipment

In many deepwater applications, the casing strings are extremely restricted for annular space. It is common practice to under-ream the hole past the previous shoe to improve casing running cementing operations. Weatherford designed the patented centralizer sub to address the difficult issue of providing stand-off in under-reamed sections.

Combining the centralizer sub and float valves provides improved economics and places a centralizer near the critical shoe area.

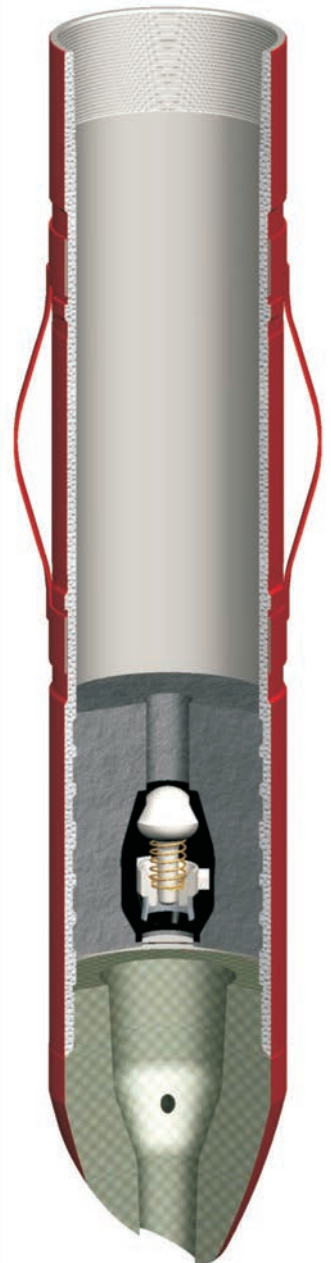
## Centralizer Sub Float Shoe with Composite Eccentric Nose - Model 543WM

- This tool features a welded centralizer mounted in a recessed groove on the outer sub body.
- Versions are available that allow casing rotation.
- The shoe configuration is designed with an eccentric composite nose. The jets are most often set as down-jets.
- The entire system is PDC drillable and rated to API RP, 10F, III-C.
- The valve is cemented in most cases. Other versions with different valve types are available such as auto-fill or differential-fill.
- The eccentric nose allows the casing to be run or rotated past troublesome ledges.
- Centralizer subs also available with float valves.



## Bow Spring Centralizer Subs - Model 541

- Built from matched grade steel and threads to match customer's casing or liner string.
- Centralizer subs are engineered to match casing specifications while maintaining internal diameters.
- The centralizer is always pulled regardless of the direction of pipe movement.
- Rotation not recommended with standard model.
- Centralizer subs can be run in holes with as little as 0.125-in. diametric clearance.
- Model 541R available for casing rotation.



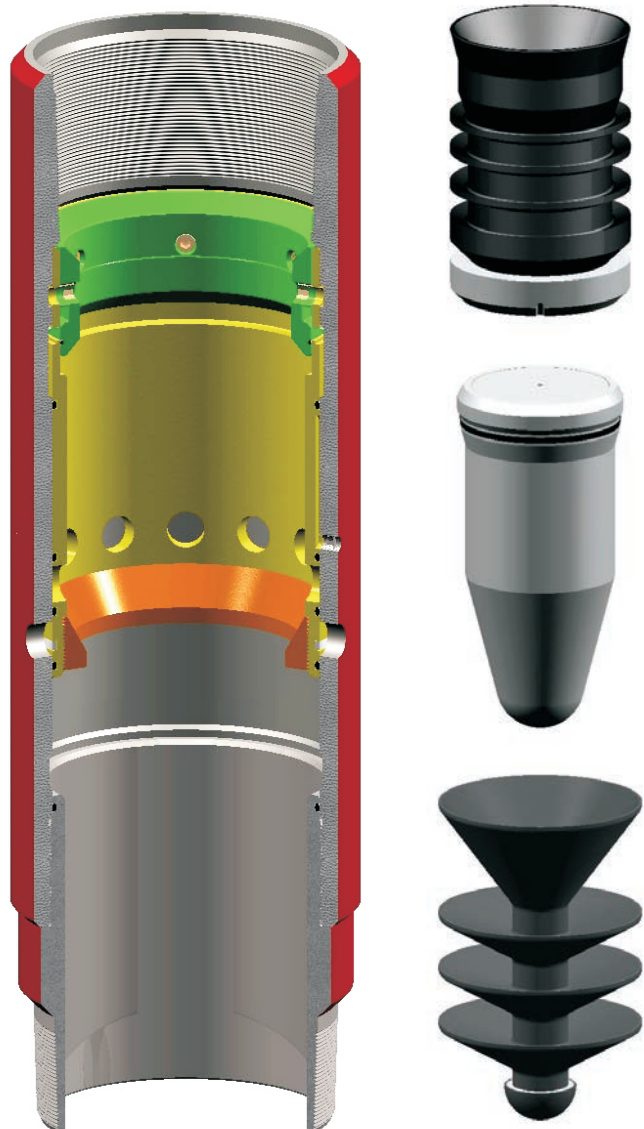
# Mechanical Stage Tools

## Stage Tool - Model 751E

Weatherford's patented Eliminator™ heavy duty multiple stage cementing tools are unparalleled in the industry for successful stage cementing with minimum cost. No stage cementing equipment boards such an impressive list of advantages:

- Compact, simple design.
- Single unitary sleeve both opens and closes the tool.
- No pressure traps.
- Clear surface indications of opening and closing.
- Superior strength due to unitary sleeve design resulting in greater wall thickness and reduced ODs as compared to other designs.
- Aluminum seats—the seats are made of an easily drilled aluminum material.
- Unique mechanism prevents premature closing.
- Locking and anti-rotation devices.
- Special application plugs and cancellation cones available.
- Special seals available for H<sub>2</sub>S, CO<sub>2</sub> and geothermal applications.
- No premature openings due to annular restrictions or pressure buildups. The Eliminator stage tool

Tool Sizes (in.)	Opening Pressure (PSI)	Closing Pressure (PSI)
3 1/2 through 5 1/2	700 to 1,000	1,500
6 5/8 through 10 3/4	700 to 1,000	1,200
11 3/4 through 13 3/8	700 to 1,000	1,000
16 through 20	400 to 700	800

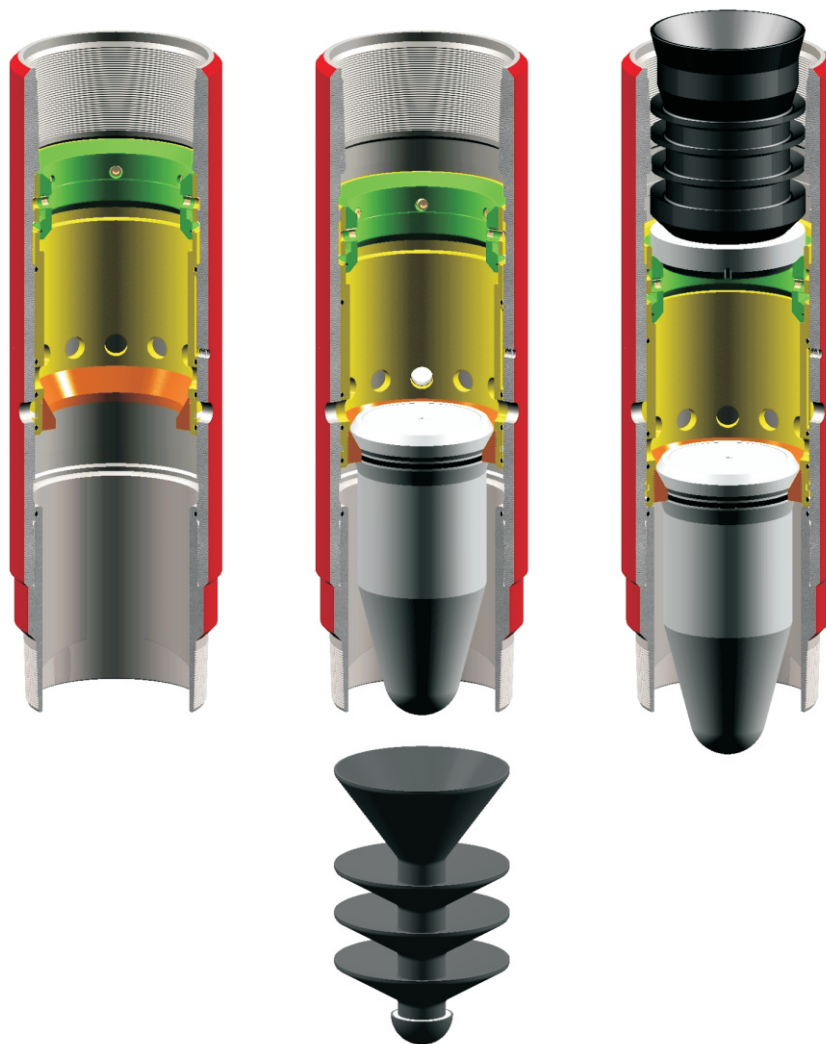




## Mechanical Stage Tools

### Features:

- Sizes 4 1/2-in. through 9 5/8-in. standard N80 8-round tools are furnished with LTC box and STC pin connections. Sizes 4 1/2-in. through 9 5/8-in. L-80, P110 and heavy weight N80 8-round tools are furnished with LTC box and pin connections. Sizes 10 3/4-in. Through 20-in. 8-round tools in all grades are furnished with STC box and pin connections.
- Eliminator™ stage cementing tools with non-standard sizes, ratings, threads and special clearance diameters are available on special order.
- Premium threaded *Eliminator* stage cementing tools may be equipped with box subs as well as pin subs.
- A Model 752E stage cementing tool is positioned below a Model 751E stage cementing tool in a three-stage cementing job. Model 751E two-stage cementing tools are color-coded red. Model 752E three-stage cementing tools as well as their opening and closing plug sets are color-coded blue.
- The Model 751E stage tool can be run and is compatible with most annular casing packers.

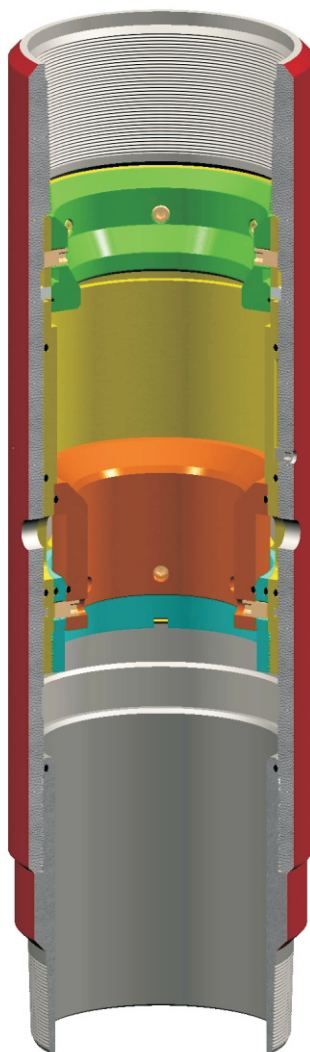


# Hydraulic Stage Tools

## Stage Tool - Model 754 HO Hydraulic Opening Multiple Stage Cementing Tool

Weatherford has many tools to assist the completion and drilling engineer in achieving a successful primary cementation in wellbores with inclinations of 60 to 90 degrees or in well conditions that are not conducive to free-fall opening plugs. Model 754HO offers several distinct advantages over competitive tools such as:

- Hydraulic operation—the opening process requires no free-fall plug device; therefore, it is not dependent upon hole angle or mud properties for operation.
- Can be run in conjunction with most liners when combined with a special set of closing plugs.
- This tool is compatible for use with single or multiple casing packers.
- Aluminum seat—the seats are made of an easily drillable aluminum material that requires little or no torque to drill up. While a specific PDC drillable hydraulic stage tool (754 PDC) is also available with special plugs, most 754HO stage tools are PDC drillable.
- Back-up opening system—where annular pressure limitations do not allow hydraulic operations of the tool, it can be operated with either the free-fall plugs or pump down plug system.
- One piece inner sleeve—the high strength steel, unitary seal-off sleeve is a one-piece construction which is not exposed to obstructions that may be encountered in the annulus.
- Quality construction—the engineering safety factors built into this tool make it extremely reliable. It has an extensive track record from fields all over the world.

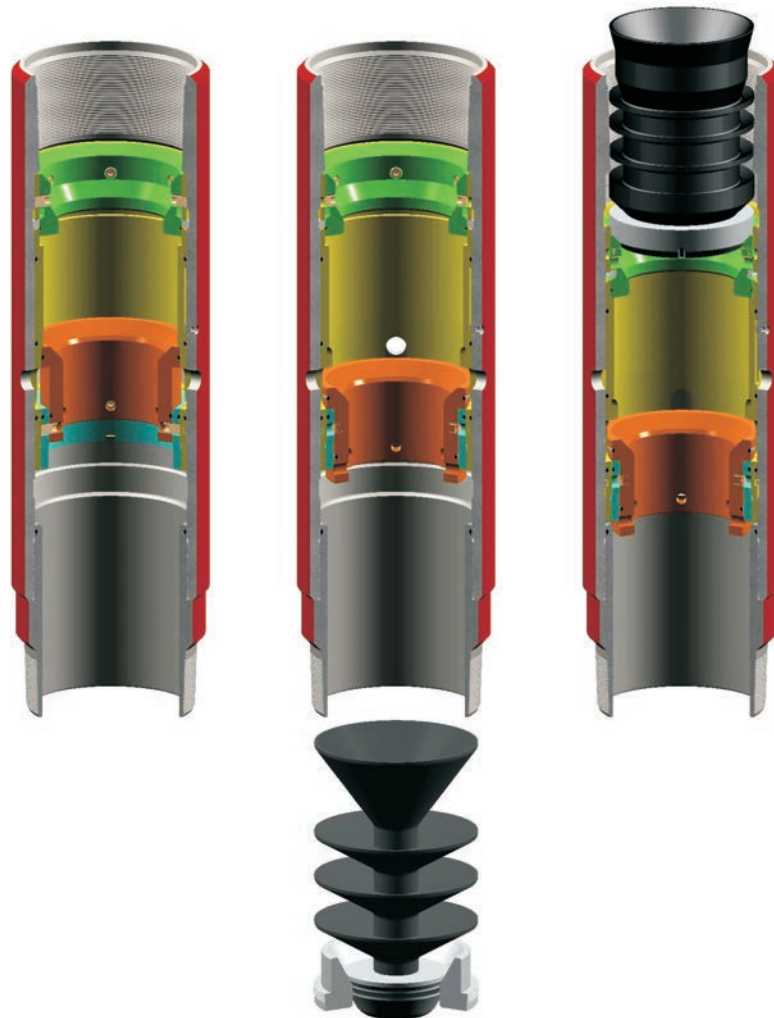


## Hydraulic Stage Tools

### Features:

- Hydraulically opened with internal casing pressure—saves rig time waiting on free-fall plugs.
- After closing, no pressure imbalance exists that would allow the tool to open.
- Elimination of the free fall plug means faster drillouts.
- Opening pressure is adjustable on the rig site to meet hydraulic conditions of each individual well.
- Tool is based on proven technology for locking devices and sealing sleeve.
- Integral box connection on most threads with no welding to give extremely high body strength.
- Available in sizes 2 7/8-in. through 20-in.
- Single unitary sleeve design allows reduced OD and increased ID dimensions, which opens up other configuration possibilities such as casing packers. Anti-rotation features on seat and closing plugs speed drill-out times.

The Model 754 hydraulic stage tools are shipped with all shear screws in place. The opening pressure is easily adjustable in the field to precisely match operational requirements by the operator, cementer, or a trained Weatherford field technician. Operational limits, dimensions, and procedures for all stage tools are included in every shipping crate. Close tolerance, H<sub>2</sub>S resistant, and PDC drillable stage tools for liner hanger systems available upon request.

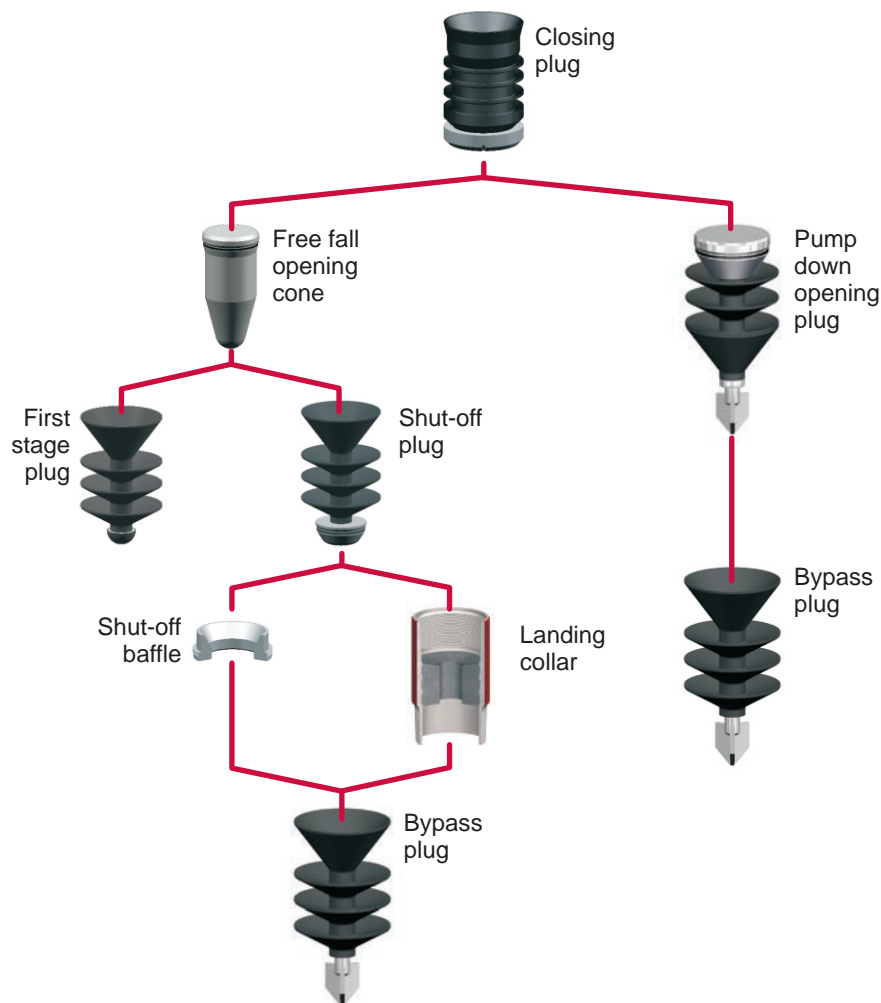


## Stage Tools Accessories

### Accessories:

All 751 Eliminator™ two-stage tools are furnished with first-stage plug, 751E free-fall opening cone and 751E closing plug, unless otherwise specified. All 752E three-stage tools are furnished with 752E free-fall opening cone (color blue) and 752E flexible closing plug (color blue), unless otherwise specified. Optional plug sets available:

- 751E-2C for pump-down opening or continuous two-stage cementing consists of bypass plug and 751E pump-down opening plug.
- 751E-2B for two-plug first stage system, consist of bypass plug and shut-off plug and baffle.
- 752E-3C for three-stage, pump-down opening or continuous lower-stage cementing consists of bypass plug and 752E pump-down opening plug (color blue).
- 751E-2D for two-stage cancellation cone (color black).





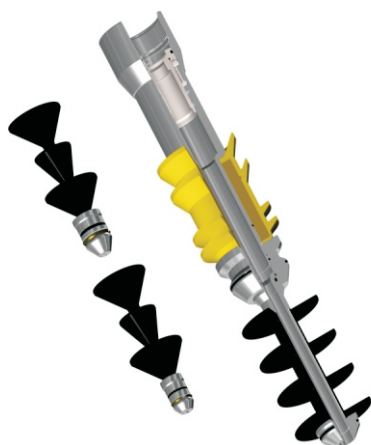
## Pack-Off Stage Tools

### Model 781E Pack-Off Stage Tool (POST™) System

Weatherford has designed the Eliminator™ based Pack-Off Stage Tool (POST) for specific applications. Typically these are where weak formations are encountered or in areas, such as above a slotted liner, where cement can be detrimental to the production formation. The *Eliminator POST* system is a combination of the 751E stage tool with an integral casing packer. The *Eliminator POST* and the standard eliminator stage tools use the same plug system.

- The packer on the *Eliminator POST* tool is capable of holding up to 4,000 PSI differential when properly inflated with drilling fluids.
- The packer on the *POST* system gives a weight indication when the packer sets.
- The *POST* system can be run in horizontal wells above the top of a slotted liner when a pump down opening plug is used. A number of packer lengths can be selected for the *POST* system, including a 4 ft standard length rib packer or a 10 ft rib packer.
- The *POST* system uses the cementing ports for inflation; therefore, only one set of holes needs to be isolated with the closing sleeve.
- The *POST* system features an externally adjustable inflation pressure that can be set at the well site prior to going in the hole.
- The *POST* system features a sliding sleeve that will fully open all cementing ports, in contrast to a single port provided with a rupture disk tool.
- The *POST* system can be run as a two-stage or three-stage tool.

**NOTE:** The *POST* system has a larger OD than a standard stage tool to allow for the secondary opening sleeve. Therefore, the nominal hole ID the tool will be run in should be a minimum of 3/8-in. (.375-in.) larger than the OD of the tool.



### Hydraulic Tools PDC Model 854 Liner Hanger Plug Set

The 854 plug set is a patented design set of plugs based on the Weatherford SSR collet system. They were engineered to allow the operator to run a high quality plug system with liner hangers, activated through the use of wiper darts instead of balls.

The plug set allows the operator to bump up the lower plug and hydraulically open a Model 754PD stage tool (and casing packers if required), then perform a model second stage cement job. When finished, a second dart is used to displace the cement and launch the closing plug.



# BULLDOG™ Inflatable Packers

*BULLDOG* packers are a tough new breed of inflatables that provide consistent, reliable annular and zonal isolation protection and security.


**BULLDOG annulus casing packer (ACP)** systems are run as part of the casing string in open or cased holes. Their outstanding strength, expansion and centralization capability provides a positive, permanent high-pressure seal in the most severe borehole conditions. They can be inflated with mud, brine or cement, but cement is recommended for the optimal long-term seal.

Weatherford offers *BULLDOG* ACP systems in discontinuous- and continuous-rib designs and tailors each system to the individual application. Systems are available in casing sizes from 2-3/8 in. to 26 in. (60.3 mm to 1,524 mm). Element lengths for continuous-rib packers range from 4 ft to 10 ft (1.2 m to 3.0 m). Element lengths for discontinuous-rib packers are 10, 20 and 40 ft (3.0 m, 6.1 m and 12.2 m). In addition, a full line of accessories such as port collars, stage tools and inflation tools complements Weatherford's line of ACP products.

The top-mounted valve system provides a true indication of annular pressure for reliable, optimal control of inflation valve functions. This protected, longitudinal valve system has full-seal redundancy (twin valve systems on 20-ft and 40-ft [6.1-m and 12.2-m] models).

Application-specific elastomers exhibit resistance to high temperatures (to 375°F. 190°C) and to corrosive fluids and gases, while maintaining excellent strength and elastomeric properties.

**BULLDOG inflatable straddle packer (ISP)** systems can be run in horizontal or high-angle open or cased holes. The tool selectively isolates specific zones for treating, testing or production evaluation. The inflatable elements can be set multiple times per run to cost effectively evaluate or stimulate multiple zones or different segments of a specific zone.



The ACP system with continuous ribbed element is designed for applications in casing or competent formation and can be inflated with either cement or fluid.

The discontinuous-rib ACP system, expandable to 3-1/2 times its original size, is designed for all openhole applications, including washed-out and elliptical hole sections. It is designed primarily for cement inflation but can also be fluid inflated.

# BULLDOG™ Injection Production Packer (IPP)

Weatherford's *BULLDOG* IPP series provides a positive, pressure-tight seal for annular isolation between the workstring and casing or open hole to assist in remedial or abandonment applications during drilling and production. Compatible with drillpipe, threaded tubing and coiled tubing, IPPs offer the versatility of a temporary or permanent seal for single- or multiple-packer configurations in wells of any deviation.

Ideal for use where restricted or poor-quality casing or open hole will not accommodate mechanical packers, the IPP works as a production packer or bridge plug to ensure isolation. Its relatively small outer diameter passes through restrictions to inflate and set in larger openings.

## Common IPP Applications:

- Temporary or permanent isolation of zones, formations, recompletions
- Isolation below restrictions
- Casing tests
- Water shut-off
- Flow tests
- Selective treatment
- Wellhead changes
- As a bridge plug, cement retainer, or scab liner

## Single-Set IPP - Rotational Release

- Inflates by applying work string pressure
- Deflates by rotating five turns at tool
- Deflates into tubing and annulus below packer
- Equalizes into annulus above packer
- Optional delayed-opening valve
- Pull out of hole to reset
- Run with solid or ball-and-seat pump out plug

## Single-Set IPP - Pull Release

- Inflates by applying work string pressure
- Deflates with upward pull
- Deflates into tubing and annulus below packer
- Equalizes into annulus above packer
- Pull out of hole to reset
- Optional delayed-opening valve available
- Ideally suited to deviated or horizontal wells
- Compatible with coiled tubing.
- Run with solid or ball-and-seat pump out plug

## Multi-Set IPP

- Inflates by applying work string pressure
- Deflates by rotating five turns at tool
- Deflates into tubing only
- Blank off below packer with pump down dart or blanking plug to reset
- Run with solid or ball-and-seat pump

## Heavy Duty IPP

- Inflates by applying work string pressure
- Deflates by rotating ten turns at tool
- Deflates into tubing and annulus below packer
- Equalizes into annulus above packer
- Pull out of hole to reset
- Run with solid or ball-and-seat pump out plug

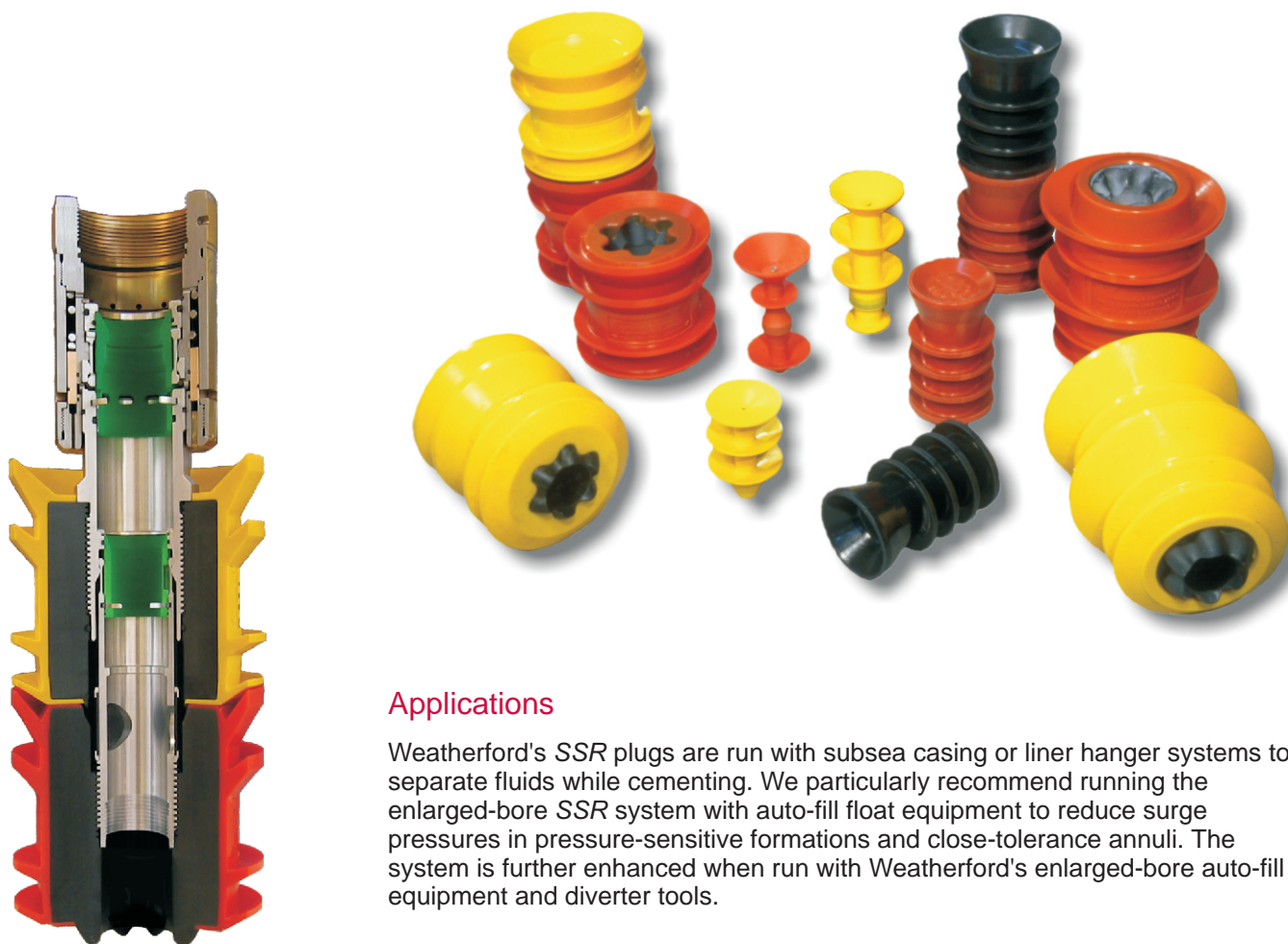
Single-Set IPP–  
Rotational Release



# Sub-Surface Release Wiper Plugs

## The Sub-Surface Release (SSR™) Cementing Plug System

The SSR system provides compactness, reliability and simplicity in cementing operations. It incorporates an adaptation of the field-proven cementing plugs and is comprised of four parts—double dart plug container, swivel equalizer, non-rotating sub-surface plugs with drill pipe wiper darts and a non-rotating float collar. The plug containers that Weatherford has developed and offers have been customer driven. Plug container offerings are matched to well and customer requirements and range from the TDH to the remote control canister heads. Weatherford's enlarged-bore SSR plug system features an integral pressure equalizer, which is retrieved with the casing or liner hanger running tools.



### Applications

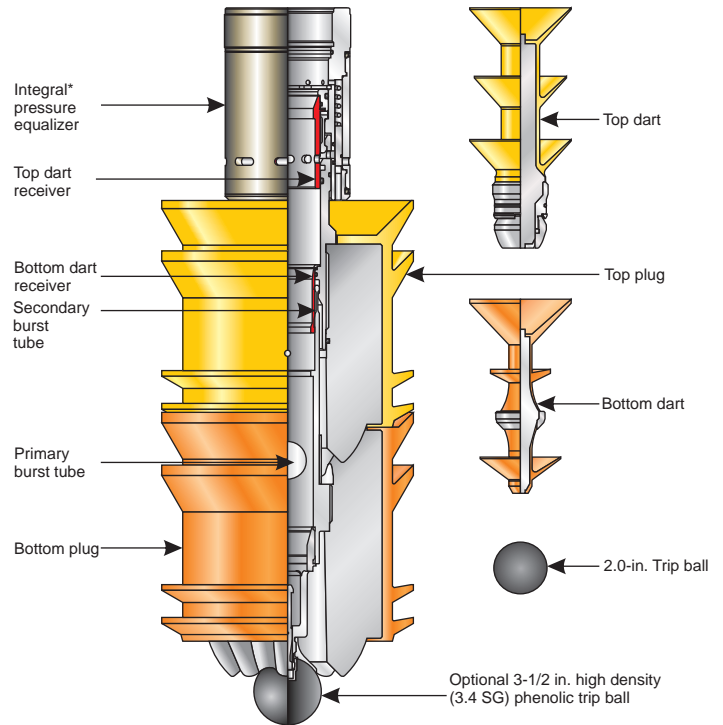
Weatherford's SSR plugs are run with subsea casing or liner hanger systems to separate fluids while cementing. We particularly recommend running the enlarged-bore SSR system with auto-fill float equipment to reduce surge pressures in pressure-sensitive formations and close-tolerance annuli. The system is further enhanced when run with Weatherford's enlarged-bore auto-fill equipment and diverter tools.



# Sub-Surface Release Wiper Plugs

## Features, Advantages and Benefits

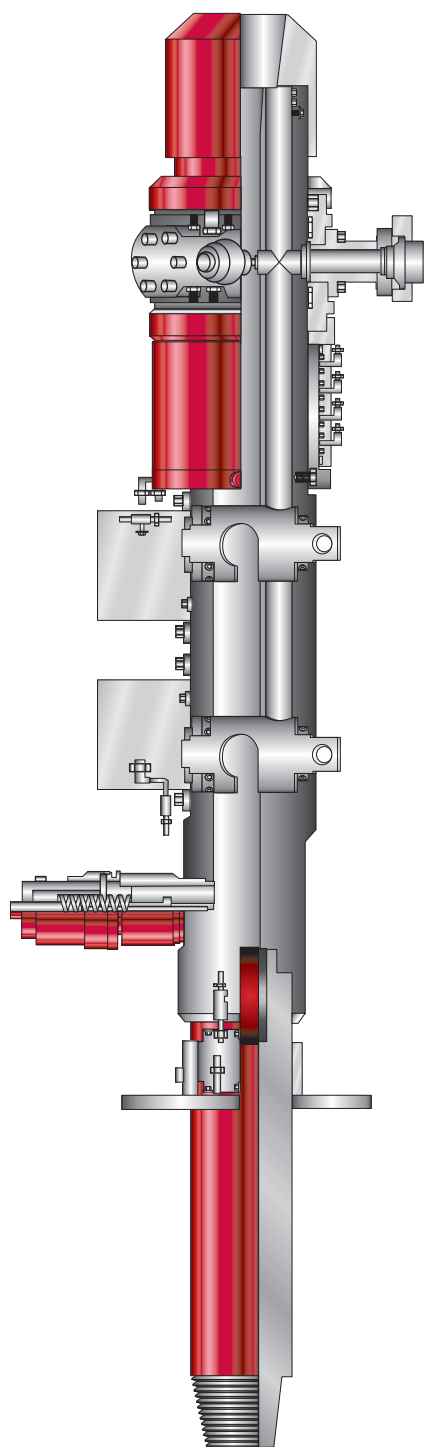
- Integral pressure equalizer system is retrieved with the running tool.
- Polyurethane plug fins offer superior abrasion resistance and wiping action.
- Standard drillpipe darts can be pumped through a 2.54-in. drift diameter while the large-bore drillpipe darts can be pumped through a 2.875-in diameter.
- System is PDC-drillable with WiperLok® non-rotating system.
- Two large 2.0-in. (50-mm) diameter bottom-plug burst disks minimize the risk of plugging with solids or debris.
- Built-in disposable swivel equalizer eliminates the cost of renting this equipment.
- Bottom plug features an emergency by-pass system.
- Top and bottom plug systems for 9 5/8-in. and larger casing have a 2.1-in. ID without the ball release or capture options. Large-bore versions have a 2.4-in. ID.



## SSR Plug System Performance

Maximum temperature rating	250°F (121°C); 300°F (149°C) limited service
Shear pressure, 3 1/2-in. ball release	250 PSI
Launch pressure, bottom plug	800 to 1,200 PSI
Launch pressure, top plug	2,000 to 2,500 PSI
Rupture pressure, bottom plug	900 to 1,100 PSI
Bump pressure	5,000 PSI (9-5/8 in.)
Flow endurance (without ball release)	4 hr: 27 BPM (large-bore); 24 BPM (mid-bore)
Flow endurance (with 3 1/2-in. ball release or ball catcher attached)	8 hr: 18 BPM
Flow endurance (ball release or ball[s] retained in catcher)	8 hr: 18 BPM
Pressure equalizer actuation pressure	30 to 60 PSI

# Sub-Surface Release Cementing Heads



## RC-TDH Remote-Control Top-Drive Cementing Head

The RC-TDH Remote-Control Top-Drive Cementing Head was built specifically for use with a top-drive system. It is a remotely controlled system that is based on the design of the reliable Weatherford TDH cement head. It can be used not only with liner systems, but also when running and cementing casing.

### Applications

Weatherford's Remote Control Top-Drive Cementing Manifolds are used for cementing liners or sub-sea casing strings that require dart-launching capability.

### Features

- Remote-controlled release of ball and darts from console on rig floor
- Permits release of ball and darts while rotating and reciprocating the drill string
- Powered and controlled by rig air
- Compact and easy to operate
- Accommodates two darts and a setting ball
- Indicator verifies dart release
- Allows circulation through the top drive and/or through the cement line even when fully loaded
- Design approved by Det norske Veritas and rated to 7,500 PSI working pressure at 400 metric tonnes SWL

### Benefits

- Eliminates the need for personnel in a riding belt to operate head
- When placed above drill floor level, thus reducing chances for injury
- Saves time and enhances the cement job by not having to stop rotating or reciprocating when releasing ball or darts
- Saves rig time by eliminating the need for a cementing Kelly, and is easier and safer to handle than a conventional head and kelly
- Simplifies operations when circulation is required to wash down to the bottom of the wellbore
- Eliminates the need to break any connections when dropping the setting ball or releasing the darts

# Sub-Surface Release Cementing Heads

## TDH Top-Drive Cementing Manifold

Weatherford's TDH Top-Drive Cementing Manifolds are used for cementing liners or subsea casing strings that require dart-launching capability. Engineered to release one or two drillpipe darts and a setting ball, the has been the premium cementing manifold in the oil and gas industry for many years

### Applications

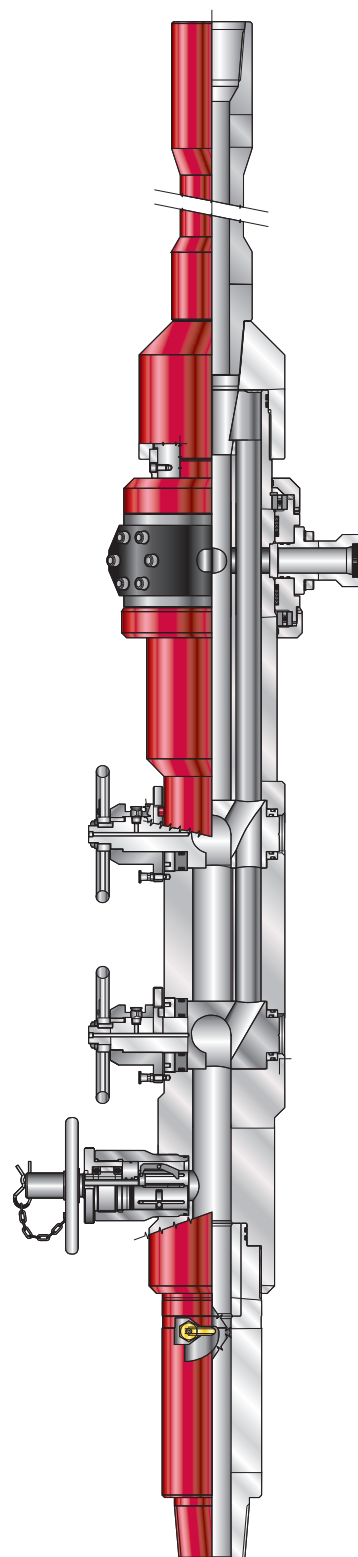
- Can be used with any liner or casing string to be landed with a drillpipe string, including subsea long strings
- Can be used with top-drive or rotary-drive drilling rigs

### Features

- Compact and easy to operate
- Accommodates two darts and a setting ball
- Integral swivel, ball release, and dual dart-release indicator
- Design approved by Det norske Veritas
- Rated to 7,500 PSI working pressure
- Tensile rating over 1 million pounds

### Benefits

- Eliminates the need for a cementing kelly, thus saving rig time
- Easier and safer to handle than a conventional head and kelly
- Simplifies operations when circulating to bottom
- Allows circulation through the top drive and/or through the cement line, even when fully loaded
- Eliminates the need to break connections when dropping the setting ball or releasing dart

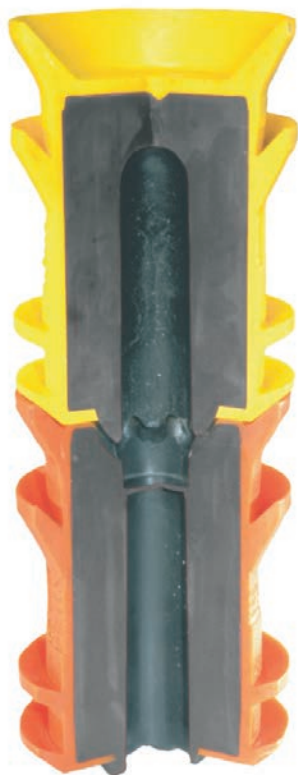


# Cement Wiper Plugs

Weatherford has developed a new generation of standard and non-rotating cementing plugs to drill out faster and to meet the increasingly stringent conditions of deeper and higher pressure drilling. These high technology plugs are designed to provide the industry's highest performance levels when used in conjunction with the WiperLok® system. The plugs maintain separation of cementing fluids, wipe casing walls clean, and prevent cement contamination. When bumped against a float collar, they provide positive indication of displacement and casing integrity.

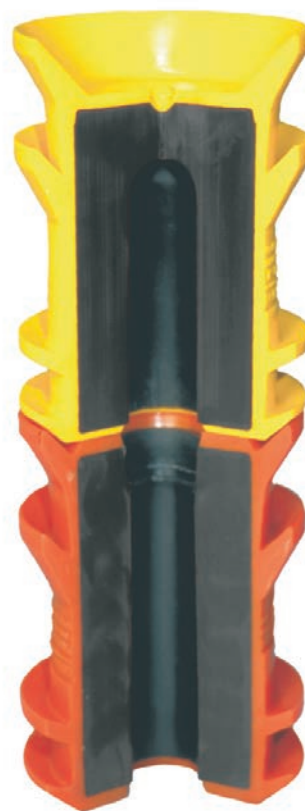
## Standard Cementing Plugs

- High-grade design for compatibility with all types of float equipment.
- Temperature rating of 150°C/300°F.
- Secondary sealing and wiping fin on both top and bottom plugs.
- Polyurethane fins for superior casing wiping and abrasion resistance.
- PDC and insert bit drillable materials featuring a durometer core.



## Wiperlok Non-Rotating Cementing Plugs

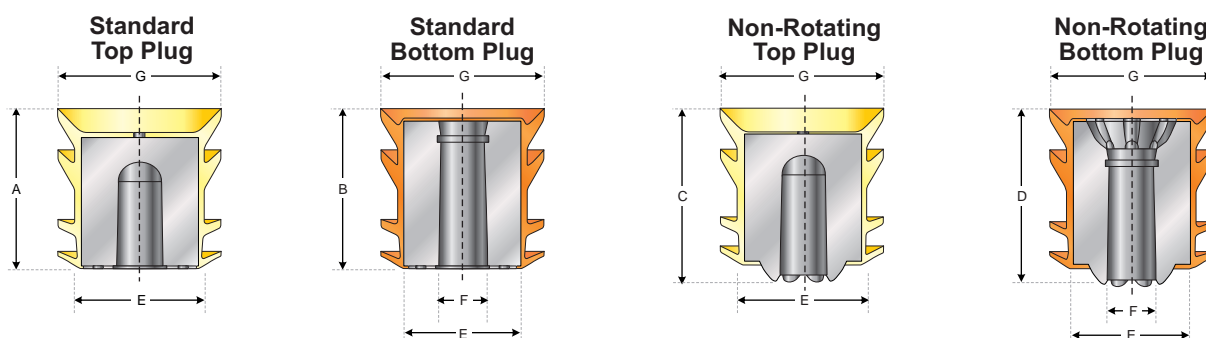
- The same easy-to-drill high temperature properties of the standard plugs.
- A one-piece core with an innovative non-rotational device allowing the plugs to mate in any casing inclination with the Weatherford non-rotating float equipment.
- A core design and proprietary materials allow easy drill-out with PDC and insert bits.
- Weatherford also has tapered plugs for most casing combinations of two or three strings in either the standard or non-rotational type. These plugs feature a single core and are uniquely molded into one unit.





# Charts and Dimensions

## Wiper Plug Specifications



Size (in.)	Weight Range (lb/ft)	Bump Pressure Ratings (PSI)	Minimum ID (in.) (mm)	Maximum ID (in.) (mm)	Number of Teeth	A (in.) (mm)	B (in.) (mm)	C (in.) (mm)	D (in.) (mm)	E (in.) (mm)	F (in.) (mm)	G (in.) (mm)
3-1/2	9.20 to 13.70	5,000	2.549 64.74	2.992 76.00	5	7.48 190	7.48 190	N/A	N/A	2.17 55	0.87 22	3.15 80
4	9.50 to 16.50	6,000	3.015 76.58	3.548 90.12	5	7.83 199	7.83 199	8.27 210	8.27 210	2.48 63	0.87 22	3.82 97
4-1/2	9.50 to 17.00	6,000	3.615 91.82	4.090 103.89	5	7.83 199	7.83 199	8.27 210	8.27 210	2.99 76	0.87 22	4.33 110
5	11.50 to 21.40	6,800	4.001 101.63	4.560 115.82	5	7.83 199	7.83 199	8.27 210	8.27 210	3.35 85	0.87 22	4.80 122
5-1/2	14.00 to 26.80	6,800	4.375 111.13	5.080 129.03	5	7.83 199	7.83 199	8.27 210	8.27 210	3.62 92	0.87 22	5.31 135
7	20.00 to 38.00	8,000	5.795 147.19	6.456 163.98	6	9.17 233	9.17 233	9.72 247	9.72 247	5.31 135	1.57 40	6.69 170
7-5/8	24.00 to 42.80	8,000	6.376 161.95	7.025 178.44	6	9.29 236	9.29 236	9.76 248	9.76 248	5.71 145	1.77 45	7.28 185
8-5/8	24.00 to 49.00	8,000	7.386 187.60	8.097 205.66	6	9.06 230	9.06 230	9.76 248	9.76 248	6.42 163	1.97 50	8.27 210
9-5/8	32.30 to 70.30	8,000	8.001 203.23	9.001 228.63	6	9.06 230	9.06 230	9.92 252	9.96 253	7.40 188	2.56 65	9.25 235
10-3/4	40.50 to 85.30	6,000	9.000 228.60	10.050 255.27	8	9.69 246	9.69 246	10.63 270	10.63 270	8.31 211	3.07 78	10.24 260
11-3/4	42.00 to 87.20	6,000	10.126 257.20	11.084 281.53	8	9.88 251	9.88 251	10.83 275	10.83 275	8.94 227	2.99 76	11.26 286
13-3/8 to 14	48.00 to 96.00 (13-3/8 in.) 82.50 to 138.84 (14-in.)	6,000	11.819 300.20	12.876 327.05	8	11.85 301	11.85 301	13.70 348	13.74 349	10.87 276	3.78 96	13.11 333
16	52.50 to 131.71	3,000	14.220 361.19	15.396 391.06	12	15.79 401	15.79 401	17.87 454	17.87 454	13.31 338	4.09 104	15.87 403
18-5/8 to 20	73.09 to 122.00 (18-5/8 in.) 78.60 to 261.86 (20-in.)	3,000	17.000 431.80	19.250 488.95	12	17.05 433	17.05 433	19.09 485	19.09 485	16.22 412	4.65 118	19.61 498

- Temperature rating: 250°F (121°C), 300°F (150°C) limited service
- Core material: Durometer
- Fin material: Polyurethane
- Configuration: 4 wiping/sealing fins
- Rupture disk burst pressure: Standard 400 PSI (27.6 bar)

### Notes:

1. Plug bump pressure ratings are based on *WiperLok* top and bottom plugs landed and sealed on Weatherford model 402P float collars. Refer to Weatherford float equipment specifications for bump pressure ratings on other models.
2. Special plugs are also available for combination casing strings, such as 9-5/8 x 10-3/4 in., for non-API casing sizes, such as 17-7/8 in., and for higher-temperature applications.
3. For casing sizes and weights not shown, higher bump pressure capabilities, or special client applications, contact Weatherford.

# Charts and Dimensions

## Float Equipment Specifications

Guide Shoe, Float Shoe & Float Collar Dimensions							Casing Weight Range			
SIZE (Casing OD)		TYPE	OD		Drillout I.D.		Float & Guide Shoes		Float Collars	
in.	mm		in.	mm	in.	mm	lbs/ft	kg/m	lbs/ft	kg/m
4 1/2	114.30	Std.	5.000	127.00	4.000	101.60	9.50 - 13.50	14.15 - 20.11	9.50 - 13.50	14.15 - 20.11
		P.G.	5.000	127.00	3.895	98.93	11.60 - 15.10	17.28 - 22.49	11.60 - 15.10	17.28 - 22.49
5	127.00	Std.	5.560	141.22	4.408	111.96	13.00 - 18.00	19.36 - 26.81	13.00 - 18.00	19.36 - 26.81
		P.G.	5.560	141.22	4.389	111.48	13.00 - 18.00	19.36 - 26.81	13.00 - 18.00	19.36 - 26.81
5 1/2	139.70	Std.	6.050	153.67	4.907	124.64	14.00 - 23.00	20.85 - 34.26	14.00 - 23.00	20.85 - 34.26
		P.G.	6.050	153.67	4.787	121.59	17.00 - 23.00	25.32 - 34.26	17.00 - 23.00	25.32 - 34.26
6 5/8	168.28	Std.	7.390	187.71	5.944	150.98	20.00 - 32.00	29.79 - 47.66	20.00 - 32.00	29.79 - 47.66
		P.G.	7.390	187.71	5.944	150.98	20.00 - 32.00	27.79 - 47.66	20.00 - 32.00	27.79 - 47.66
7	177.80	Std.	7.660	194.56	6.351	161.32	20.00 - 35.00	29.79 - 52.13	20.00 - 32.00	29.79 - 47.66
		P.G.	7.660	194.56	6.270	159.26	23.00 - 38.00	34.26 - 56.60	23.00 - 38.00	34.26 - 56.60
7 5/8	193.70	Std.	8.500	215.90	6.864	174.35	26.40 - 47.10	39.32 - 70.16	26.40 - 39.00	39.32 - 58.09
		P.G.	8.500	215.90	6.864	174.35	26.40 - 47.10	39.32 - 70.16	26.40 - 39.00	39.32 - 58.09
8 5/8	219.10	Std.	9.630	244.60	7.992	203.00	24.00 - 49.00	35.75 - 72.99	24.00 - 49.00	35.75 - 72.99
		P.G.	9.630	244.60	7.845	199.26	32.00 - 49.00	47.66 - 72.99	32.00 - 49.00	47.66 - 72.99
9 5/8	244.50	Std.	10.630	270.00	8.865	225.17	32.30 - 53.50	48.11 - 79.69	32.30 - 53.50	48.11 - 79.69
		P.G.	10.630	270.00	8.699	220.96	40.00 - 71.80	59.58 - 106.85	40.00 - 58.40	59.58 - 86.99
10 3/4	273.10	Std.	11.750	298.45	10.056	255.42	32.75 - 65.70	48.78 - 97.86	32.75 - 55.50	48.78 - 82.67
		P.G.	11.750	298.45	9.770	248.16	51.00 - 71.10	75.96 - 105.90	51.00 - 71.10	75.96 - 105.90
11 3/4	298.50	Std.	12.750	323.85	11.020	279.91	42.00 - 71.00	62.56 - 105.75	42.00 - 60.00	62.56 - 89.37
		P.G.	12.750	323.85	10.770	273.56	54.00 - 71.00	80.43 - 105.75	54.00 - 71.00	80.43 - 105.75
13 3/8	339.70	Std.	14.380	365.25	12.579	319.51	48.00 - 72.00	71.50 - 107.24	48.00 - 72.00	71.50 - 107.24
		P.G.	14.380	365.25	12.579	319.51	48.00 - 86.00	71.50 - 128.10	48.00 - 72.00	71.50 - 107.24
16	406.40	Std.	17.000	431.80	15.124	384.15	65.00 - 109.00	96.82 - 162.36	65.00 - 97.00	96.82 - 144.36
18 5/8	473.10	Std.	20.000	508.00	17.755	450.98	87.50 - 139.00	130.33 - 206.85	87.50 - 106.00	130.33 - 157.75
20	508.00	Std.	21.000	533.40	19.125	485.78	94.00 - 133.00	140.01 - 198.10	94.00 - 106.50	140.01 - 158.63

### NOTES:

- Std. grade equipment is made of K-55 material and is H<sub>2</sub>S resistant. Std. shoe equipment is suitable for use with all casing grades. Std. collar equipment is suitable for use with API grades L-80/N-80 & lesser, including any similar proprietary grade of steel. P.G. (Premium Grade) shoes and collars are made of high strength steel meeting or exceeding P-110 specifications.  
When it is necessary that a shoe or collar meet exact chemical and physical properties of a special grade of steel, such as L-80 or C-90, then it is necessary to special order.
- Std. and P.G. equipment is available with API 8-round or buttress connections.  
\*Size 4-1/2" through 9-5/8" Std. equipment is furnished with LT&C box and ST&C pin.  
\*Size 4-1/2" through 9-5/8" P.G. equipment is furnished with LT&C box and pin.  
\*Size 10-3/4" through 20" equipment is furnished with ST&C box and pin.
- These dimensions and weight ranges apply to Std. and P.G. 8-round and buttress float equipment only. Other equipment may vary from the above specifications. Verify dimensions and weight ranges on labels furnished with equipment.

# Charts and Dimensions

## Pressure Ratings for Standard Float Equipment

SURE-SEAL 3 FLOAT COLLAR PRESSURE RATINGS												
SURE-SEAL 3™ FLOAT COLLAR SIZE	PLUG BUMP PRESSURE RATING		BACK PRESSURE RATING		STANDARD GRADE (Std.)				PREMIUM GRADE (P.G.)			
					COLLAPSE PRESSURE		INTERNAL YIELD PRESSURE		COLLAPSE PRESSURE		INTERNAL YIELD PRESSURE	
(in.)	PSI	MPa	PSI	MPa	PSI	MPa	PSI	MPa	PSI	MPa	PSI	MPa
4 1/2	6,800	46.88	5,000	34.47	9,900	68.26	9,625	66.36	21,623	149.89	21,271	146.66
5	6,800	46.88	5,000	34.47	10,234	70.56	9,992	68.89	20,764	143.16	20,312	140.05
5 1/2	6,800	46.88	5,000	34.47	9,409	64.87	9,092	62.69	20,566	141.79	20,093	138.54
6 5/8	6,800	46.88	5,000	34.47	9,709	66.94	9,417	64.93	19,417	133.88	18,833	129.85
7	6,800	46.88	5,000	34.47	8,576	59.13	8,203	56.56	18,111	124.87	17,424	120.13
7 5/8	6,500	44.82	5,000	34.47	9,567	65.96	9,263	63.87	19,134	131.92	18,525	127.73
8 5/8	6,400	44.13	5,000	34.47	8,540	58.88	8,165	56.30	18,461	127.28	17,800	122.73
9 5/8	6,400	44.13	5,000	34.47	8,356	57.61	7,972	54.97	18,132	125.02	17,447	120.29
10 3/4	5,000	34.47	4,000	27.58	7,358	50.73	6,938	47.84	16,974	117.03	16,219	111.83
11 3/4	4,500	31.03	3,600	24.82	6,956	47.96	6,529	45.02	15,308	105.55	14,947	103.06
13 3/8	3,200	22.06	3,600	24.82	6,095	42.02	6,013	41.46	9,997	68.93	12,025	82.91
16	2,000	13.79	2,000	13.79	4,895	33.75	5,311	36.62	7,445	51.33	10,621	73.23
18 5/8	1,500	10.34	1,700	11.72	5,051	34.83	5,402	37.25	7,777	53.62	10,804	74.49
20	1,500	10.34	1,700	11.72	3,162	21.80	4,297	29.63	4,293	29.60	8,593	59.25

SURE-SEAL 3 NON-ROTATING FLOAT COLLAR PRESSURE RATINGS												
FLOAT COLLAR SIZE	MODEL 402NP				MODEL 402N				MODEL 402P			
	Plug Bump Pressure Rating		Back Pressure Rating		Plug Bump Pressure Rating		Back Pressure Rating		Plug Bump Pressure Rating		Back Pressure Rating	
	PSI	MPa	PSI	MPa	PSI	MPa	PSI	MPa	PSI	MPa	PSI	MPa
7	5,000	34.474	5,000	34.474	N/A	N/A	N/A	N/A	8,000	55.158	5,000	34.474
7 5/8	5,000	34.474	5,000	34.474	N/A	N/A	N/A	N/A	8,000	55.158	5,000	34.474
8 5/8	5,000	34.474	5,000	34.474	N/A	N/A	N/A	N/A	8,000	55.158	5,000	34.474
9 5/8	5,000	34.474	5,000	34.474	N/A	N/A	N/A	N/A	8,000	55.158	5,000	34.474
10 3/4	4,000	27.579	4,000	27.579	N/A	N/A	N/A	N/A	6,000	41.369	5,000	34.474
11 3/4	3,300	22.753	3,600	24.821	N/A	N/A	N/A	N/A	6,000	41.369	5,000	34.474
13 3/8	3,200	22.063	3,600	24.821	N/A	N/A	N/A	N/A	6,000	41.369	5,000	34.474
16	N/A	N/A	N/A	N/A	2,000	13.79	2,000	13.79	3,000	20.684	2,500	17.237
18 5/8	N/A	N/A	N/A	N/A	1,500	10.342	1,700	11.721	3,000	20.684	2,500	17.237
20	N/A	N/A	N/A	N/A	1,500	10.342	1,700	11.721	3,000	20.684	2,500	17.237

1. Sure-Seal 3 float collars meet API RP10F Category III C requirements.
2. WiperLok® urethane plug maximum temperature rating: 250°F, 300°F limited service.
3. Maximum back pressure applied should not exceed 80% of the collapse pressure rating of the casing.
4. Internal and external pressure applied should not exceed connection leak resistance and pressure rating of the casing.
5. Bump pressure ratings may be lower if debris prevents sealing between the plugs and the float collar.
6. 9-5/8" Wiperlok Nitrile plugs are limited to 8,000 psi bump pressure @ 270°F, 6,000psi @ 300°F, 5,000psi @ 350°F.
7. Ratings for Model 402P applies to Model 502P and Model 507P.
8. Pressure ratings for double valve float equipment are equivalent to the single valve models
9. Sure-Seal 3 Float Collar maximum bottom hole static temperature rating is 400°F.

MECHANICAL STAGE TOOLS		
Tool Sizes (in.)	Opening Pressure (PSI)	Closing Pressure (PSI)
3 1/2 through 5 1/2	700 to 1,000	1,500
6 5/8 through 10 3/4	700 to 1,000	1,200
11 3/4 through 13 3/8	700 to 1,000	1,000
16 through 20	400 to 700	800



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