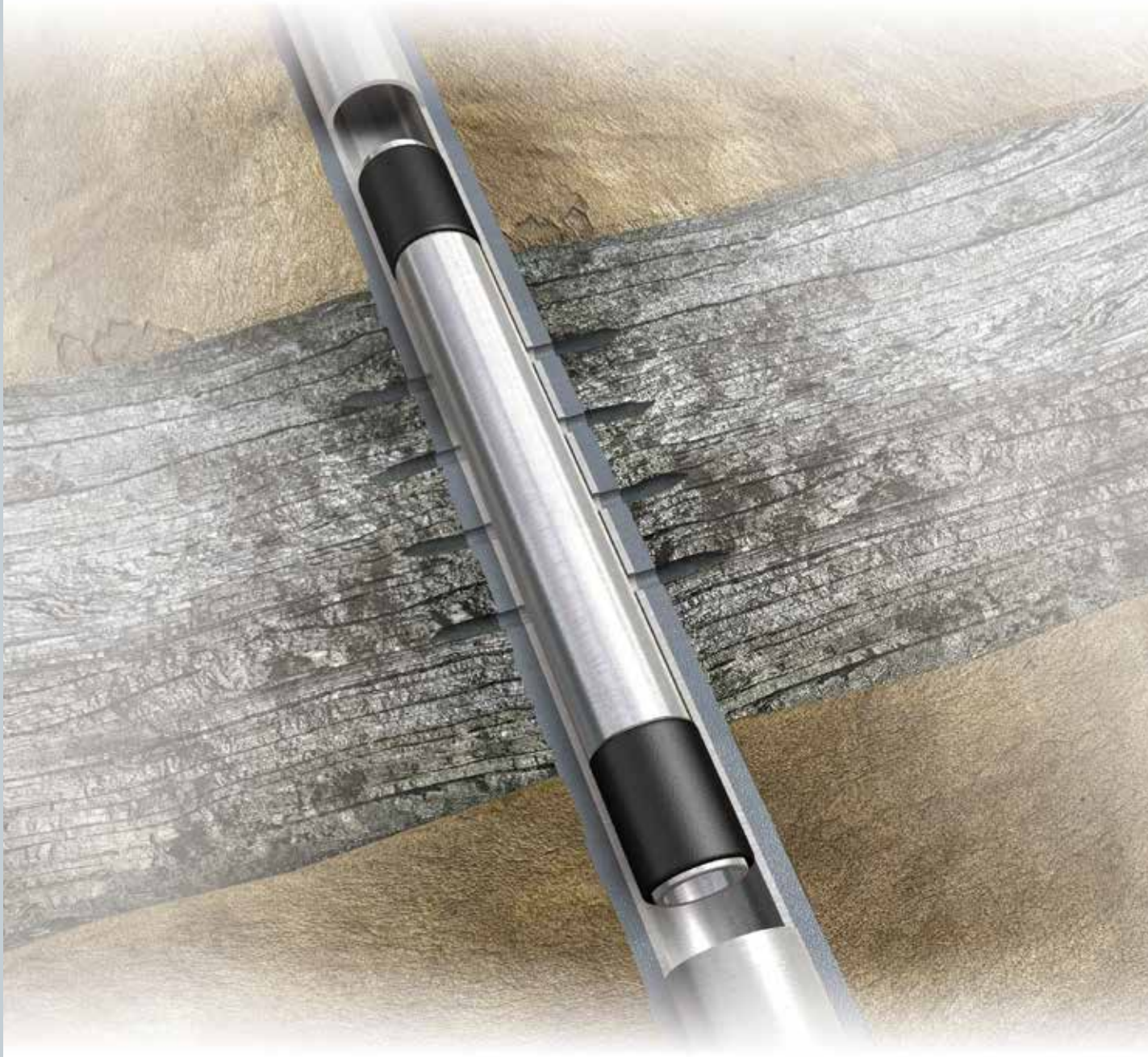
Weatherford®

MetalSkin®

Cased-Hole Liner System



THE SOLID CHOICE™

Using advanced solid expandable technology to reduce costs, optimize completion size and ultimately maximize production and ROI

Reducing Operating Costs over the life of the well

Weatherford's MetalSkin® cased-hole liner is a solid-tubular expandable system that addresses the most common and challenging casing-remediation applications.

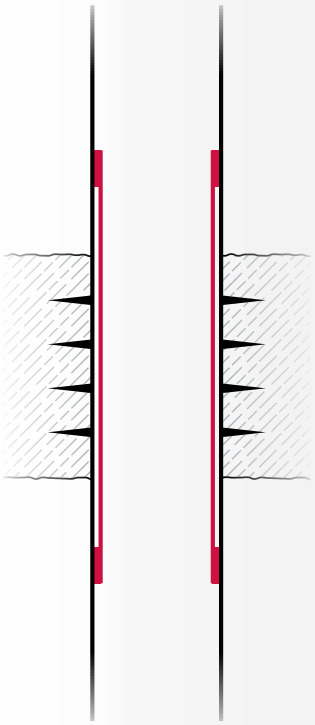
The *MetalSkin* system is a robust liner (or clad) that seals and isolates damaged casing or perforations. It bridges the gap in casing repair between cement squeezing and scab liners. The system **provides permanent isolation** and eliminates repeated workover operations. Most importantly, it **provides a larger ID** and better access than scab liners for future drilling, completion, production or injection operations.

The *MetalSkin* cased-hole liner combines the experience gained through thousands of installations of legacy expandable products and the advanced technology of solid-pipe expansion. The result is a **highly reliable and robust** system that provides enhanced burst and collapse resistance. The capability to connect multiple joints enables the liner to be customized to suit specific well objectives.

As a pioneer in expandable systems with **tens of thousands of installations**, Weatherford continues to enhance the technology. Our efforts have resulted in the *MetalSkin* family—**the most technologically advanced** cased-hole and open-hole solid expandable systems on the market.

Solid answers
to mature-field challenges

The *MetalSkin* cased-hole liner system is designed to deal with challenges such as excessive water production, reservoir sweep inefficiency and aging wells.



Mechanical casing failure:
- Casing corrosion
- Casing splits
- Collar leaks
- Buckled Casing
- Parted Casing

Production or injection optimization:
- Water shutoff
- Zonal isolation
- Eliminating thief zones
- Covering unwanted perforations
- Sealing off laterals & sidetracks

The value of the *MetalSkin* cased-hole liner system is two-fold: it is permanent and it provides a larger through bore than other mechanical solutions. Once it is installed, drilling, stimulation, completion or injection operations can begin, all with one objective: place larger pipe into the production zone.

Rather than a short-term fix, such as squeezing cement, the system provides a reliable, long-term solution to operational challenges.

Solid and reliable system
for increased production capacity

The MetalSkin® cased-hole liner's simple design results in a remedial liner system that can be quickly installed and is highly reliable. In many cases, the system can be installed in one day, minimizing nonproductive time and maximizing re-completion options. In mature fields, it may be your most valuable asset management tool.

The *MetalSkin* cased-hole liner can be easily installed with a workover rig. No high-volume pumping equipment is required.

Quick, reliable expansion process

The installation process takes minimal rig time once the well is prepared. When the *MetalSkin* system is positioned correctly, applied surface pressure expands and sets the anchor. The rig then pulls the cone through the liner, expanding it from the bottom up. The ID of the expandable liner and the connections are never exposed to expansion pressure, thus maintaining integrity of the system. This method simplifies the installation and enhances safety and reliability while reducing operational risks.

Time saved with no drillout

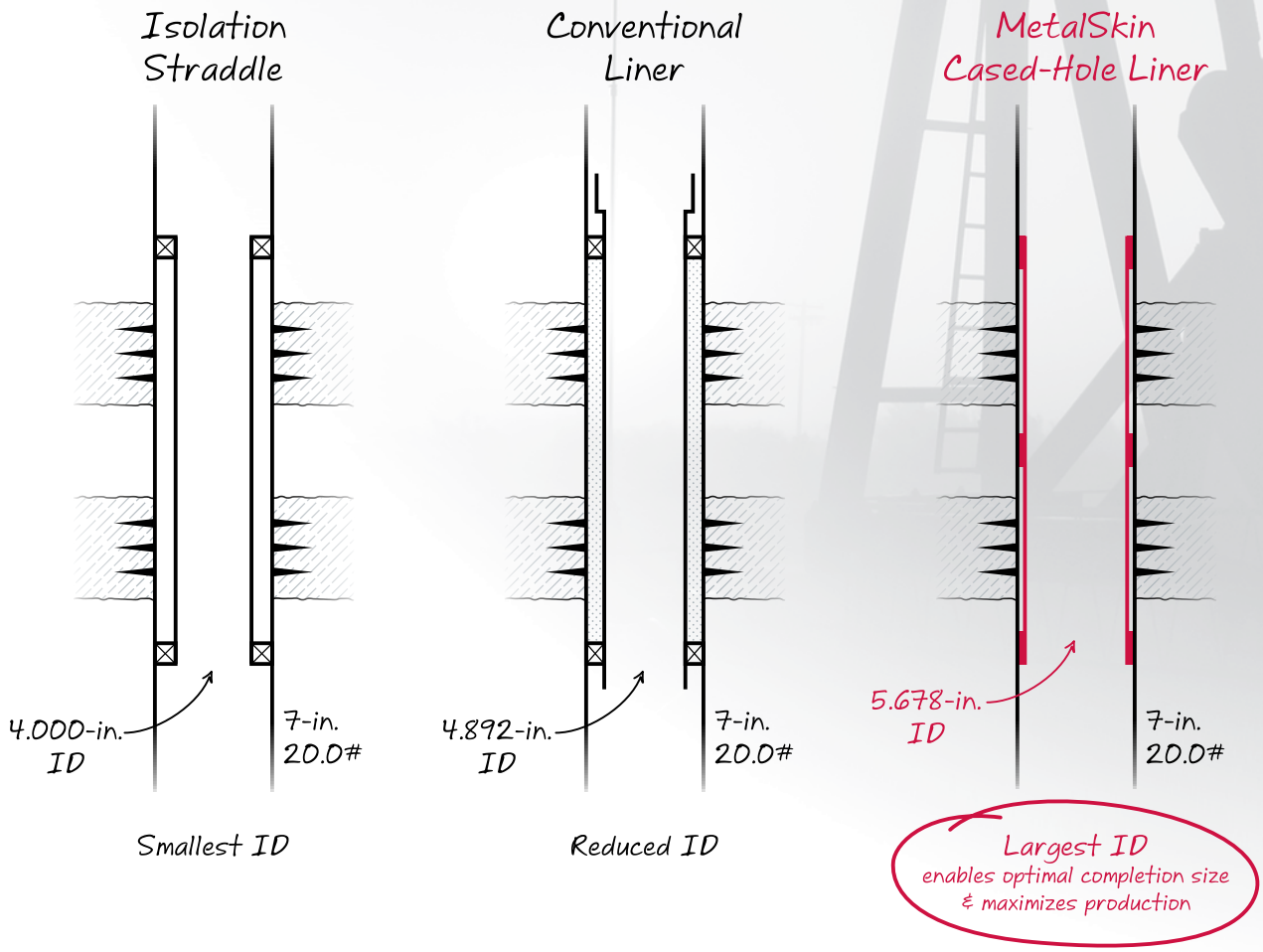
This single-trip system requires no drillout after installation. There is no shoe to house the expansion cone, so the liner OD is minimized to ease run in. No darts, plugs or shoes are required to generate pressure when the anchor is set, so there is nothing to drillout.

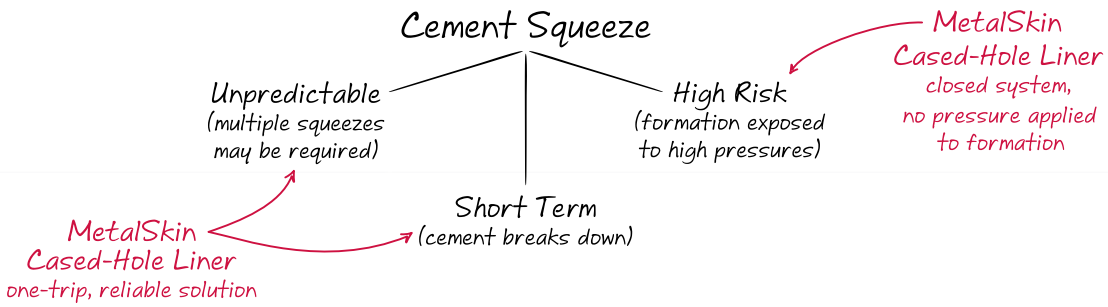
Optimized production

Once installed, the *MetalSkin* cased-hole liner provides larger through-bore access to lower zones compared to alternative solutions. It is a reliable, long-term isolation system that can be custom designed to cover long intervals with multiple joints of expandable pipe. Most importantly, it enables optimum recompletion design to enhance production and reservoir management.

MetalSkin cased-hole liner
versus conventional alternatives

The *MetalSkin* cased-hole liner provides permanent casing repair with minimal ID reduction. It is installed in a single trip and requires no cement or drillout. The larger ID enables optimal completion designs to maximize production or injection rates.





Solid performance advantages

the only solid-expandable, cased-hole liner with no drillout required

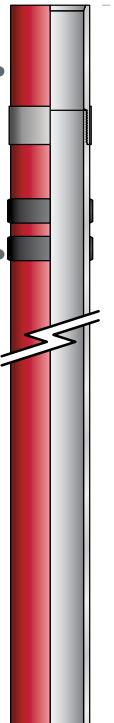
A leader in solid-expandable technology, Weatherford has drawn on its extensive experience to develop the most advanced cased-hole liner system on the market.

Key advantages of the *MetalSkin* cased-hole liner system include:

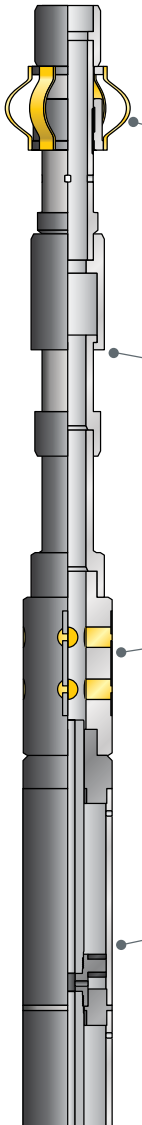
expandable liner ►

Top cap supports expansion forces created when applied pressure sets anchor.

Elastomer seal elements can be located anywhere in the liner to provide annular isolation between expanded pipe and parent casing.



◄ running tools

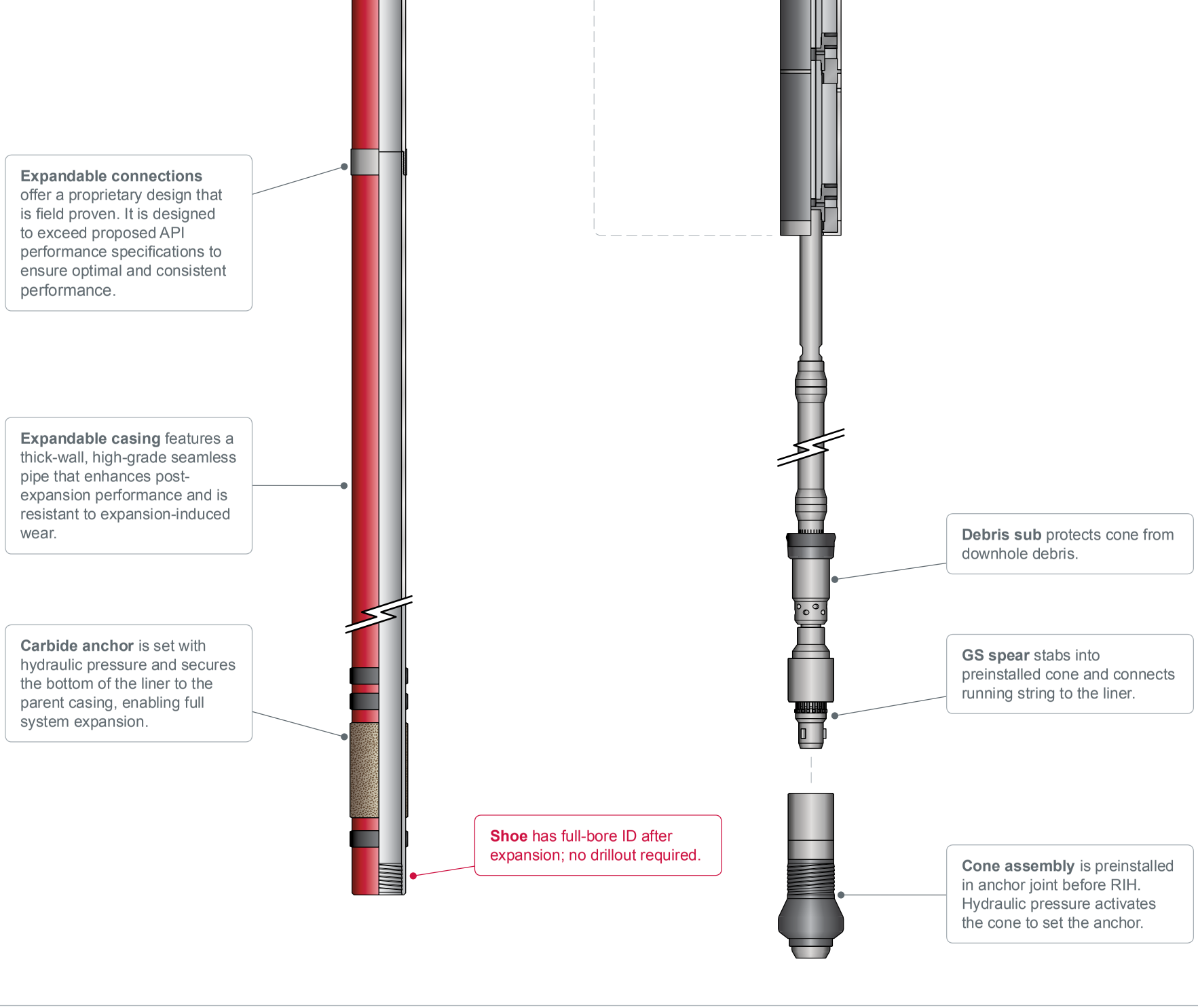


Slide valve has an open port that enables circulation while run in hole (RIH); it closes to allow applied pressure to activate expansion cone.

Bumper jar ensures reliable operation of the slide valve and hold-down subs in low-volume wells.

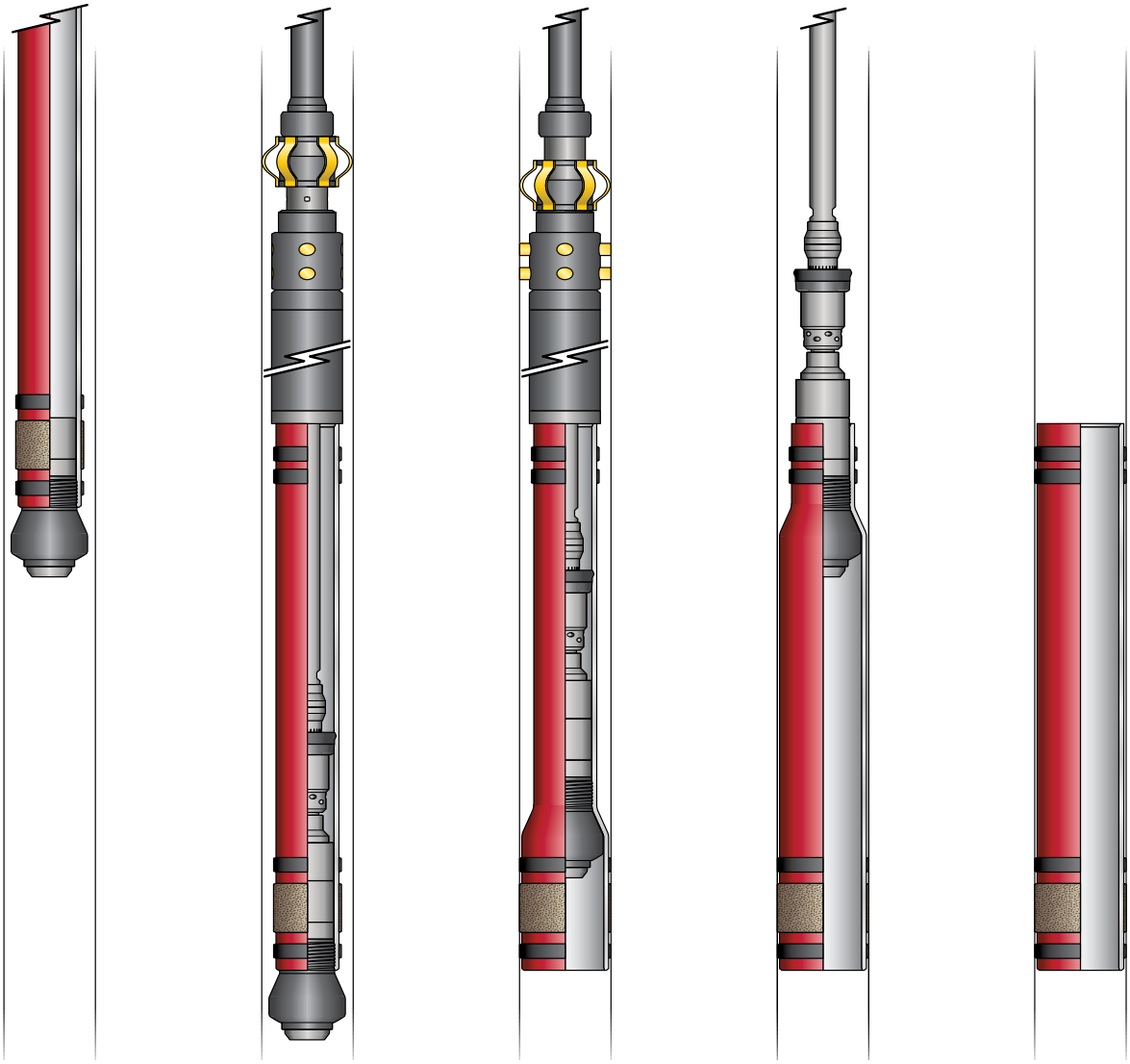
Hydraulic hold-down sub secures system in place while hydraulic forces set anchor.

Hydraulic setting tool has low-pressure, high-force pistons that drive the jack to set anchor.



Quick, one-trip installation
for a reliable, long-term solution

Weatherford's MetalSkin® cased-hole liner system is a one-trip system designed to convey and install an expandable solid-tubular liner inside existing casing. The running sequence is simple and straightforward.



Prepare well, make up expandable liner, and hang in rotary.

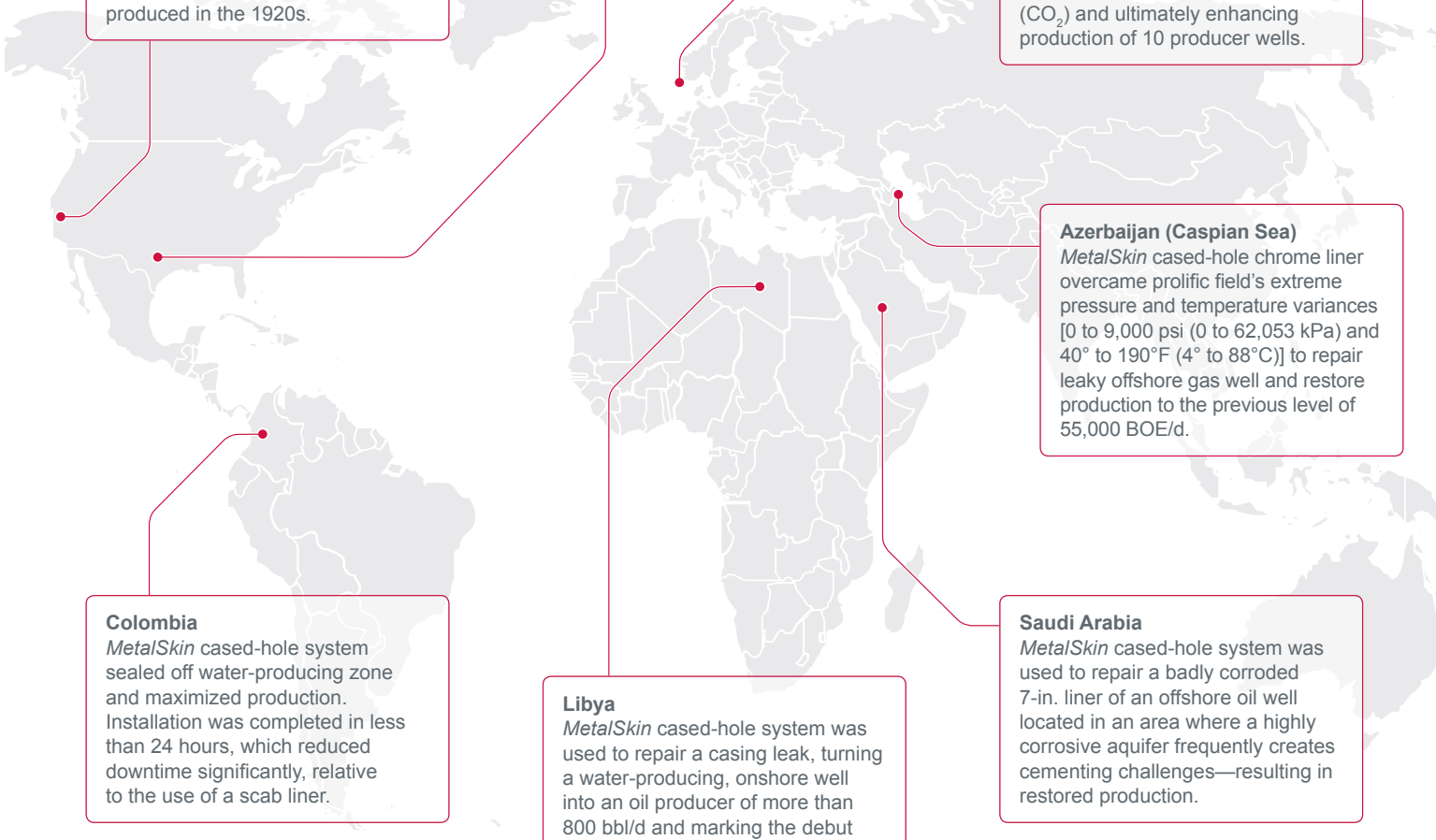
Stab in work string and run to depth.

Apply hydraulic pressure to activate the expansion tool, initiate expansion, and set the anchor.

Release pressure and continue to expand the liner by applying direct overpull while tripping out of the hole.

NO DRILLOUT REQUIRED. Continue rig operations.

Solid results
from around the world



USA (California)
MetalSkin cased-hole liner sealed off a perforated thief zone to restore re-effective injection rates and pressures in a water-injector well in an aging field that was first produced in the 1920s.

USA (Texas)
MetalSkin cased-hole liner was used to repair long interval (165 ft/50 m) and to place 70-year-old injector well back on line in just three days.

Norway (North Sea)
MetalSkin cased-hole liner was used to repair extensive damage over a 2.5-ft (0.76-m) section of casing in an offshore injector well, enabling injection of carbon dioxide (CO_2) and ultimately enhancing production of 10 producer wells.

Azerbaijan (Caspian Sea)
MetalSkin cased-hole chrome liner overcame prolific field's extreme pressure and temperature variances [0 to 9,000 psi (0 to 62,053 kPa) and 40° to 190°F (4° to 88°C)] to repair leaky offshore gas well and restore production to the previous level of 55,000 BOE/d.

Colombia
MetalSkin cased-hole system sealed off water-producing zone and maximized production. Installation was completed in less than 24 hours, which reduced downtime significantly, relative to the use of a scab liner.

Libya
MetalSkin cased-hole system was used to repair a casing leak, turning a water-producing, onshore well into an oil producer of more than 800 bbl/d and marking the debut of solid expandable technology in Libya.

Saudi Arabia
MetalSkin cased-hole system was used to repair a badly corroded 7-in. liner of an offshore oil well located in an area where a highly corrosive aquifer frequently creates cementing challenges—resulting in restored production.

For more information on these Real Results and others, visit **weatherford.com/realresults**.

Advancing the design
of solid-expandable liner connections

Weatherford established the **Oil Country Tubular Goods (OCTG) Technology Center** to define more precisely the performance parameters of threaded connections in solid-expandable liners and ultimately to enhance their design.

Unlike conventional testing of expandable connections, the DLX simulator can uniquely and accurately replicate downhole conditions that the expanding casing experiences in a real well environment.

Conventional methods of testing threaded connections fall short on two fronts: creating samples that accurately reflect their downhole counterparts and adequately accounting for factors that can affect connection performance, such as high-dogleg severity, variations in pre- and post-expansion loads, pressure and constraint (fixed-free versus fixed-fixed). Capable of replicating mechanical, variable-load and fixed-load liner expansion, the **dynamic load expansion (DLX)** simulator (patent pending) produces samples that accurately reflect their downhole counterparts, which translates to more accurate test results.

The one-of-a-kind simulator has two 15-ft (4.6-m) stroke cylinders that apply compression to the work piece; a third applies tension and adjusts for length change during expansion. The capability to maintain a pre-expansion load in front of the expansion cone and a post-expansion load behind the cone makes the DLX uniquely realistic.

The first of its kind, Weatherford's OCTG Technology Center uses data from the specialized testing equipment to design next-generation connections with better strength and sealing properties—before, during and after expansion—relative to their conventional equivalents.

MetalSkin® Cased-Hole Liner System

The Solid Choice™ from the expandable experts

The *MetalSkin* cased-hole liner system minimizes slimming of the well profile post-repair—reducing costs, optimizing completion size and ultimately maximizing ROI. To find out more about how our family of advanced *MetalSkin* systems can minimize unscheduled events, reduce well construction costs, and increase reservoir exposure and production, please contact an authorized Weatherford representative, or visit **weatherford.com/metalskin**.

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