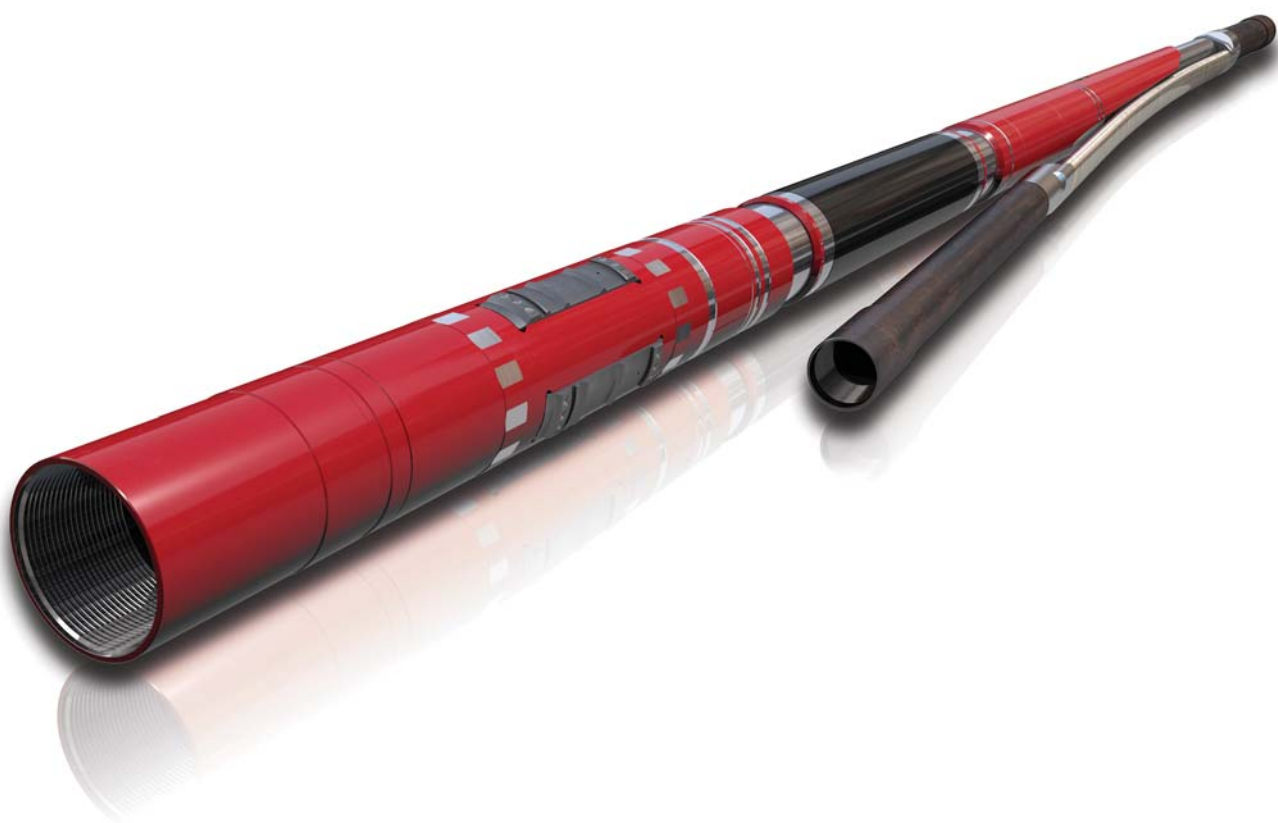


# 02

## Multilateral Technology



### Advanced Reservoir Drainage Solutions

Halliburton is the world's leading provider of innovative and flexible multilateral systems. Introduced in 1993, this system is designed to provide a robust means of access to both laterals and main bore with the ability to install a range of completion systems for either commingled or separated production requirements.

To access additional reservoir targets that would not have been economically feasible using single bore technology, multilateral drainage architecture connects a lateral wellbore, or a number of lateral wellbores, via a junction constructed in the main borehole.

From the lateral bore, further laterals, branches, or splays can be added to increase the advantage already gained. The main and lateral wellbore designs can be vertical, directional, or horizontal with multilateral system selection based on the individual reservoir requirements.

**HALLIBURTON**

Completion Tools

## Multilateral Drainage Architecture

For today's more challenging environments, Halliburton offers a broad range of multilateral solutions that can be integrated with the Completion Tools product line and are geared specifically to meet and complement reservoir engineering demands to enhance the total asset value.

Advanced multilateral architecture was developed to increase reservoir exposure but can reduce overall field development costs for the increase in production. Constraints on platform slot/surface, subsea locations, and production equipment can leave some areas of a reservoir underdeveloped, often leaving significant quantities of oil in place. Enhanced hydrocarbon recovery, where there is declining production from traditional single vertical or horizontal wells, can also employ multilateral technology as a remedial solution to revitalize many fields.

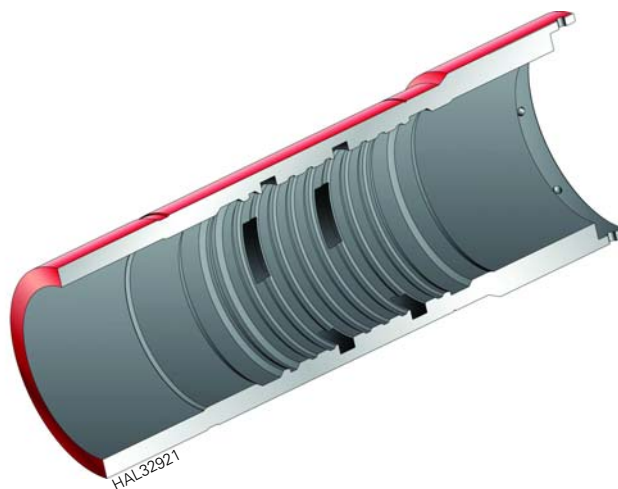
Multilateral technology, used for both new and re-entry wells, offers the ability to drain reservoirs more efficiently and drain multiple reservoirs simultaneously, notwithstanding different pressure regimes.

Furthermore, using multilateral architecture can reduce the number of surface locations, which in addition to reducing overall project costs, mitigates environmental impact.

The drive to minimize costs and risks on a well-by-well basis during field development can result in higher well construction costs to deliver production targets. Halliburton expertise in delivering innovative multilateral technology meets the challenge of improving production and increasing the longevity of a field while reducing the customer's cost base to deliver greater profitability and a higher return on investment.

### Latch Coupling

At the heart of the Halliburton multilateral system is the latch coupling, which provides an anchoring mechanism for accurate placement of the window aperture. The latch coupling enables full bore drift to the main bore and forms part of the main bore casing. It becomes a permanent feature, thus permitting an accurate and repeatable method of locating Halliburton multilateral tools at the precise depth and orientation for exit from the window.



*Latch Coupling*

## Multilateral Pre-Milled Window Systems

Junction construction in new well applications incorporates a pre-milled casing joint and latch coupling. The casing joint window is pre-milled axially in line with a high side reference on the latch coupling to help ensure anchoring orientation is precisely aligned with the aperture. The aperture is enclosed in an aluminum sleeve, which means once installed downhole, milling is easy because it is only necessary to open the window in the aluminum sleeve. Debris management is no longer an issue because it involves no steel cuttings, and lengthy milling and cleanout trips are eliminated.

### LatchRite® Pre-Milled Window Multilateral System (TAML Level 2 or 4)

The LatchRite® multilateral system provides a high-strength TAML Level 4 junction with sand control and full-gauge access to the lateral and main bore via a pre-milled window. It uses an industry-proven, protected multilateral washover operation that dresses off the lateral liner and recovers the whipstock in one efficient operation, thus achieving zonal isolation using cement. The system can also be used to construct a TAML Level 2 junction that helps eliminate the disadvantages of conventional milling.



LatchRite® Pre-Milled Window System

## FlexRite® Multilateral Completion System (TAML Level 5)

The multi-award-winning FlexRite® system provides a hydraulically isolated TAML Level 5 high-strength junction with sand control option. It is designed for use in new wells and incorporates either the aluminum-wrapped pre-milled window or the all-aluminum joint, also known as the aluminum casing exit system, in conjunction with the latch coupling. It uses a flexible junction with two semicircular sections that enable maximum load-carrying capabilities. This system offers through-tubing intervention and lateral re-entry with separate workover capabilities and has the added ability to accommodate intelligent completions via an interface that permits selective flow control from each branch through inflow control valves. Operations, such as production logs, stimulation, cleanout, water and gas isolation, and water and gas shutoff can be performed after installation.

Field proven since 2000 and constantly evolving, no other TAML Level 5 system in the industry has enjoyed a greater success rate and number of installations than the Halliburton FlexRite system. This is a testament to the highly skilled engineers behind the system's creation and the trained, experienced operations personnel who plan and execute installations worldwide.



FlexRite® Multilateral System

## Multilateral Milled Exit Systems

Used in both new and re-entry well applications, multilateral milled exit systems are junction construction systems in which all lateral exits are geometrically milled downhole to emulate the pre-milled window system. These systems use latch coupling installed in the casing string of new wells or via an anchor packer with an integral latch coupling in the case of re-entry into existing wells.

### MillRite® Milled Exit Multilateral System (TAML Level 2 or 4)

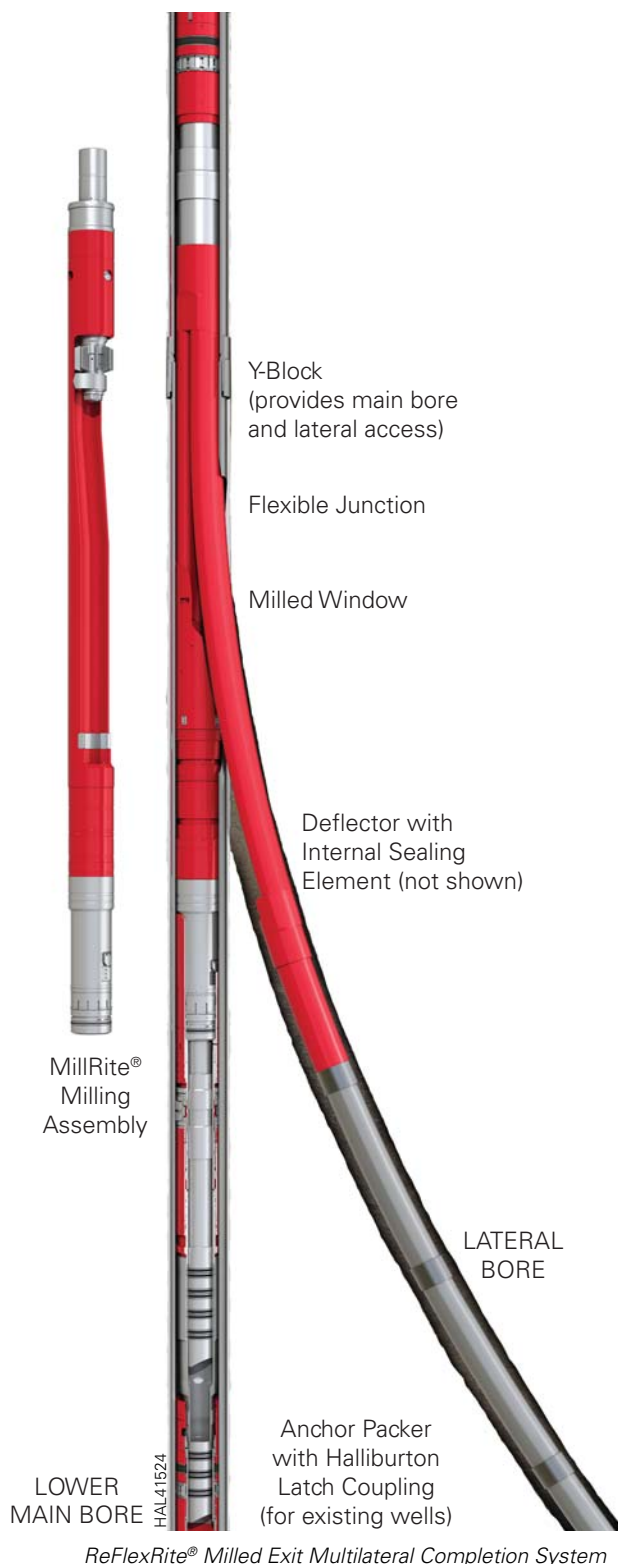
The junction is constructed using a track-guided milling system, creating a consistent geometrically defined window aperture to form a high-strength TAML Level 4 junction. This construction process helps eliminate “rolloff” and dogleg severity issues associated with conventionally milled windows. It also allows repeatable lateral re-entry for the life of the well. It uses the successful multilateral washover operation and achieves hydraulic integrity using cement. The MillRite® system can also be used to construct a TAML Level 2 junction.

### ReFlexRite® Multilateral Completion System (TAML Level 5)

The Halliburton multi-award-winning ReFlexRite® system is a re-entry multilateral solution that helps enable the addition of new lateral branches to existing wells in which no preparations were originally made to accommodate a multilateral junction. This helps enable access to unproduced reservoir sections on existing platforms without performing slot-recovery operations or sacrificing production from existing wellbores. The solution combines technological features from the FlexRite® and MillRite systems. The ReFlexRite system incorporates a flexible junction and two semicircular sections, maximizing load-carrying capability to access the main bore and lateral simultaneously.

The ReFlexRite system offers through-tubing intervention and lateral re-entry with separate workover. It has the added ability to accommodate intelligent completions via an interface to permit selective flow control from each branch through inflow control valves. Operations, such as production logs, stimulation, cleanout, water and gas isolation, and water and gas shutoff can be performed after installation.

Field proven since 2001 and constantly evolving, the ReFlexRite multilateral completion system has an unrivaled run history and remarkable reliability.

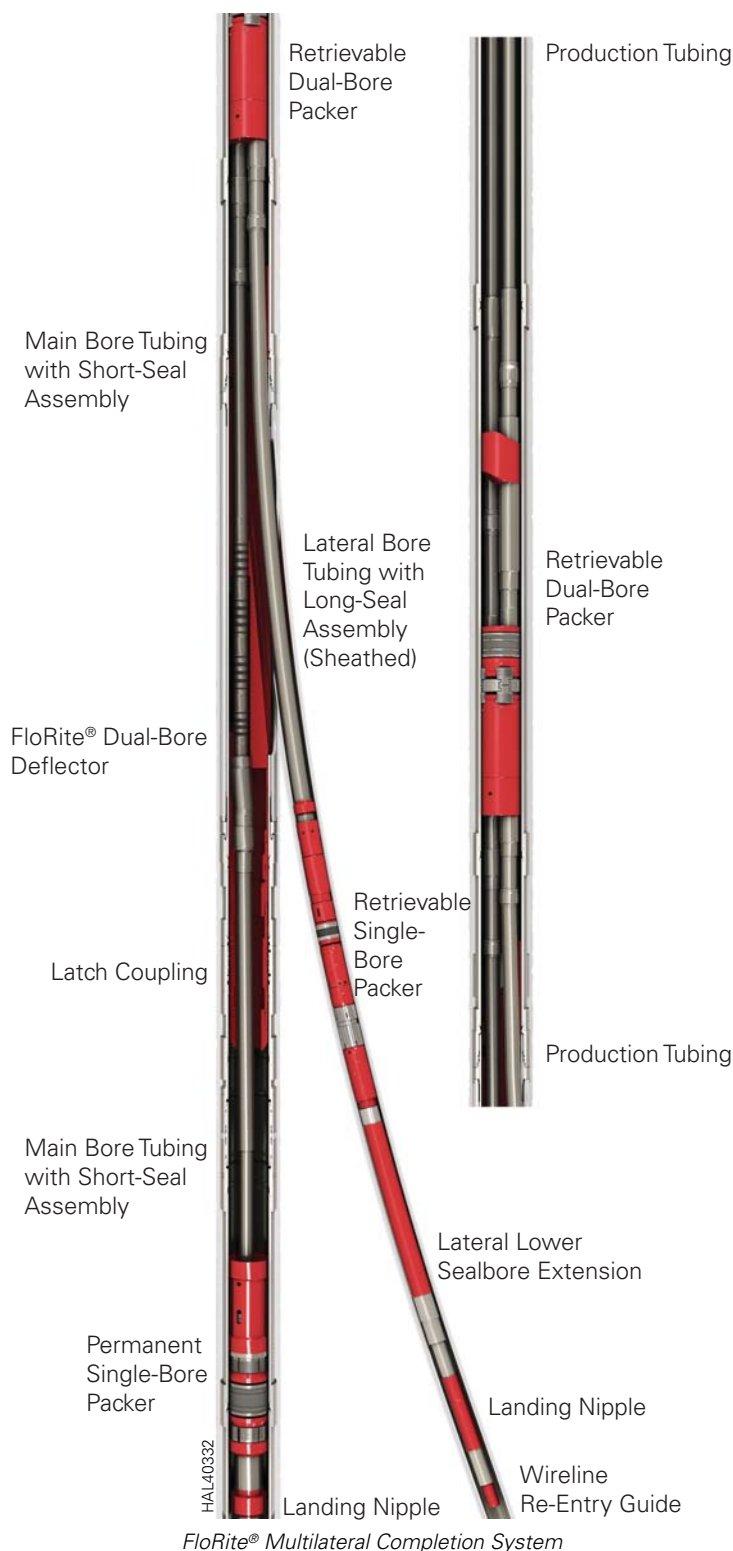


## Multilateral Completions Systems

These unique completion systems are designed specifically for multilateral applications and allow re-entry access into the laterals and lower main bore. This helps enable isolation and flow control from each. These completion systems can be used in pre-milled or milled junctions and conventionally milled windows.

### FloRite® Multilateral Completion System

The FloRite® multilateral completion system is specifically designed for wells that require complete junction-pressure isolation. The system also provides re-entry capability to access the laterals throughout the completion for the life of the well. This helps eliminate the need to pull the upper completion should access be necessary for cleanup, stimulation, or data acquisition. Prime candidates are injection wells, gas wells, or wells with reservoir horizons and various pressure regimes. Production from each lateral can either be completely segregated to surface with the installation of a dual completion or commingled with the use of the optional vector block. A single-string completion can be installed, while allowing selective access to either the lateral or main bore. Latch coupling allows installation at the optimum system depth and orientation.





## IsoRite® Multilateral Completion System

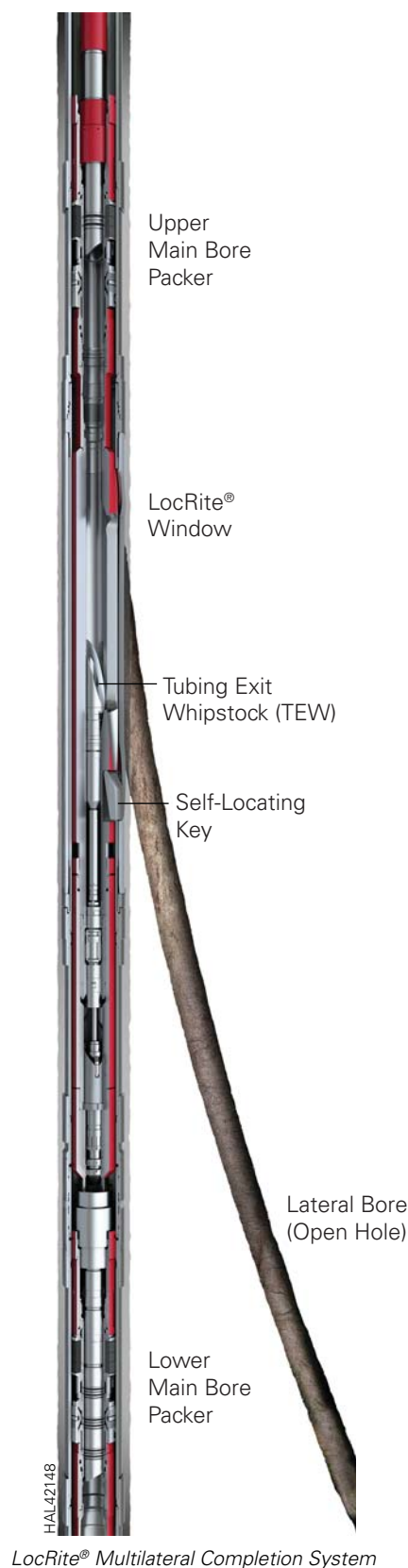
The IsoRite® system can be installed in the main bore of a TAML Level 2, 3, or 4 junction and aligned to the original window exit. It incorporates a completion window arrangement equipped with integral landing profiles and sealbores that enable the setting of deflectors for lateral access or isolation sleeves for lateral control. Latch coupling allows installation at the optimum system depth and orientation for lateral re-entry operations.

## LocRite® Multilateral Completion System

The LocRite® system is equipped with a self-locating key that allows installation in a conventionally milled window at the required azimuth and depth for a lateral completion operation. With the addition of the self-locating key, this system incorporates all the advantages of the IsoRite system for a multilateral well with a conventionally milled exit.

## Junction Isolation Tool System

The low permeability of shale and tight-gas plays makes multistage fracture stimulation of the formation a necessary step for recovering hydrocarbons. With Halliburton window exit systems, the costly fracturing stimulation treatment becomes more economical because multiple horizontal laterals can be drilled from one location. However, all multilateral junctions must be isolated from the stimulation fluids and pressure. To isolate the junction, a temporary Level 5 completion is installed using the Halliburton junction isolation tool (JIT). The JIT requires no hole/casing size increase and no casing limitations, while enabling selective access to both laterals for high-pressure stimulations without restricting the high pump rates necessary.



## Multilateral Advanced Completions Systems

### FlexRite® Intelligent Completion Interface System

The FlexRite® intelligent completion interface (ICI) system integrates a shrouded polished bore receptacle into the FlexRite junction, making it compatible with intelligent completion equipment, such as inflow control valves and downhole gauges. Now, production from either the main bore or lateral can be independently controlled and monitored from surface without intervention operations.

### FlexRite Multi-Branch Inflow Control System

The award-winning FlexRite multi-branch inflow control system allows selective control and monitoring of three or more lateral legs in a TAML 5 well. This enhanced control at junction depth provides the ability to choke back individual laterals experiencing gas influx or water breakthrough without impacting the production of other laterals, thus greatly enhancing the life and productivity of the well. A large drift diameter throughout the entire main bore allows for a single trip, final installation of an intelligent completion string, isolation and control of each lateral with inflow control valves, downhole gauges, and Swellpacker® systems.

### FlexRite Liner-Conveyed Gravel Pack System

FlexRite liner-conveyed gravel pack (LCGP) system technology is adapted to apply gravel pack completions in a FlexRite system multilateral well in both the main bore and in each lateral for new or existing wells. In a single run, the lower main bore is isolated with a scab liner, the lateral completion is deployed in the open hole, and gravel packed. The scab liner is then retrieved, and the

FlexRite system junction is run, tying into the lateral gravel pack completion via an openhole sting-in operation. The 10 3/4-in. FlexRite enhanced lateral access junction helps enable LCGP application through the junction at a higher pressure rating up to 5,000 psi. This isolates the junction area when reversing out the gravel pack from the second lateral leg. By optimizing production and minimizing erosion with larger screens, this application eliminates a liner run, cleanout run trip, and liner testing, which saves drilling fluid displacement and conditioning time.

### FlexRite Liner Deployment System

The FlexRite liner deployment system (LDS) deploys liners in a long reservoir openhole section on drillpipe, leaving a liner top to tie into on the subsequent junction completion via an openhole sting-in operation. Screens can be staged into the open hole in segments, thus allowing screen deployment in extended-reach laterals. This allows the LDS to overcome torque and drag limitations in the main and lateral section and defeat junction mechanical strength limitations in the lateral section. The system can also be configured to run in hole with a sacrificial bit and downhole motor for washdown capabilities.



FlexRite® Multilateral Completion System



## FloRite® Intelligent Completion Interface System

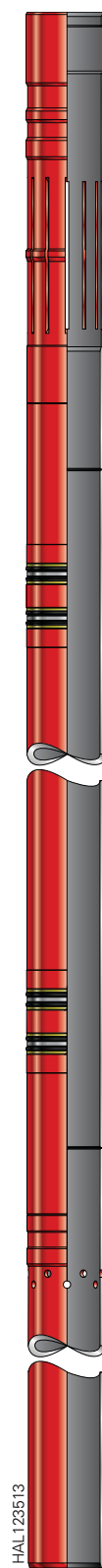
The FloRite® intelligent completion interface (ICI) system can interface with all Halliburton Intelligent Completion systems, thus allowing flow control from each lateral as well as downhole monitoring. This system has a twin-flow-type vector block equipped with integral landing profiles and sealbores that enable the setting of deflectors for lateral access or isolation sleeves for lateral control.

## IsoRite® ICI System

The IsoRite® ICI system is run in conjunction with Halliburton Intelligent Completion tools and is installed in the main bore of a TAML Level 2 or 4 junction and aligned to the original window exit. This system incorporates a completion window arrangement equipped with integral landing profiles and sealbores that enable the setting of deflectors for lateral access or isolation sleeves for zonal isolation during production. The latch coupling allows installation at the optimal system depth and orientation for lateral re-entry operations.

## IsoRite Feed-Through System

The IsoRite feed-through (FT) system uses a completion window with FT capabilities for control lines, allowing the ability to place control valves and gauges closer to the reservoir and below the window. The IsoRite FT system uses a self-alignment latching mechanism that allows for the orientation and setting of the completion window without rotation.



*IsoRite®  
Completion System*

