Universal Connection Interface for Subsea Completion Systems

This application is based on U.S. Provisional Patent Application No. 60/616,289, which was filed on October 6, 2004.

Background of the Invention

The present invention relates to completion systems for subsea oil and gas wells. More specifically, the invention relates to a universal interface system for the connections between the various components of the completion system and the tools which are used during installation and testing of the completion system.

Typical subsea completion systems comprise a number of permanently installed components, such as a wellhead, a tubing hanger, a tree, a tree cap, and a flowline jumper. Such systems usually also comprise a number of tools which are used temporarily during installation and testing of the completion system. These tools may include a lower riser package ("LRP"), an emergency disconnect package ("EDP"), a blowout preventor ("BOP"), and a tubing hanger running tool ("THRT"). During installation, testing, and production, these components and tools are stacked atop and connected to each other in a particular configuration.

Typically, the upper end of each of the wellhead, the tree, the EDP and the LRP comprises a hub having a specific external locking profile. In addition, the lower end of each of the tree, the EDP, the LRP, the flowline jumper and the BOP are normally equipped with a hydraulic connector for selectively engaging the external locking profile of another particular component. Furthermore, the upper end of the wellhead may include an internal profile in which the tubing hanger is landed. Moreover, in some systems the tree may include an internal profile which is adapted to receive the tree cap.

During the assembly, testing, and production phases of most common subsea systems, the various components are stacked in a particular order, such that each lower connector portion engages the upper hub portion of another particular component. Since each hub/connector interface can be designed independently, each interface is typically optimized for size, strength, and weight. Thus, the various hubs are often incompatible with all but the one connector they are specifically designed to mate with. The design of the tubing hanger/wellhead interface and the tree/tree cap interface are usually similarly customized. The

result of this design philosophy is an inherent inflexibility in the installation and test procedures.

Summary of the Invention

In a first aspect of the invention, there is provided a subsea completion system which includes: a wellhead which is positioned at the upper end of a well bore and comprises a first upper connection interface; a tree which is positioned above the wellhead and comprises a second upper connection interface; and an LRP which is positioned above the tree and comprises a third upper connection interface; a tubing hanger which is positioned in the wellhead and comprises a fourth upper connection interface; a BOP; and a THRT; characterized in that the BOP comprises a first lower connection interface that is operatively engageable with the first, second and third upper connection interfaces, and the THRT comprises a second lower connection interface that is operatively engageable with the second, third and fourth upper connection interfaces; wherein during a first stage of installation of the subsea completion system the BOP is connected to the wellhead and the THRT is connected to the tubing hanger; and wherein during a second stage of installation of the subsea completion system the tree, with the LRP connected to the top thereof, is connected to the wellhead and both the BOP and the THRT are connected to the LRP.

In accordance with one embodiment of the invention, each of the first through fourth upper connection interfaces comprises a locking profile and each of the first and second lower connection interfaces comprises a lock ring that is engageable with the locking profile. In another embodiment of the invention, each of the first, second, and third connection interfaces comprises an external locking profile and the first connection interface comprises an external connector which includes a lock ring that is engageable with the locking profile.

In accordance with another embodiment of the invention each of the first through fourth upper connection interfaces comprises a first sealing surface, each of the first and second lower connection interface comprises a second sealing surface, and the first and second sealing surfaces are engageable by a common seal. In another embodiment, each of the second, third and fourth connection interfaces comprises a production bore and the second lower connection interface comprises a production stab which is engageable with the production bore.

In a second aspect of the invention, there is provided a method for constructing a subsea completion system which comprises: installing a wellhead at the upper end of a well bore, the wellhead comprising a first upper connection interface; providing a tree with a second upper connection interface; connecting an LRP to the top of the tree, the LRP comprising a third upper connection interface; providing a tubing hanger with a fourth upper connection interface; connecting a BOP to the top of the wellhead; connecting a THRT to the tubing hanger; landing the tubing hanger in the wellhead through the BOP; disconnecting the BOP from the wellhead; connecting the BOP to the top of the LRP, with the LRP connected to the top of the tree; and connecting the tree to the wellhead; characterized in that the BOP comprises a first lower connection interface that is operatively engageable with the first, second and third upper connection interfaces, and the THRT comprises a second lower connection interface that is operatively engageable with the second, third and fourth upper connection interfaces.

In a third aspect of the invention, there is provided a subsea completion system which includes: a wellhead which is positioned at the upper end of a well bore and comprises a first upper connection interface; a tree which is positioned above the wellhead and comprises a second upper connection interface; an LRP which is positioned above the tree and comprises a third upper connection interface; a tubing hanger which is positioned in the wellhead and comprises a fourth upper connection interface; characterized in that the subsea completion system further includes a SID which comprises a fifth upper connection interface and a first lower connection interface that is operatively engageable with the first, second and third upper connection interfaces; and a THRT which comprises a second lower connection interface that is operatively

engageable with the second, third and fourth upper connection interfaces; wherein during a first stage of installation of the flow completion system the SID is connected to the wellhead and the THRT is connected to the tubing hanger; and wherein during a second stage of installation of the subsea completion system the tree, with the LRP connected to the top thereof, is connected to the wellhead and both the SID and the THRT are connected to the LRP.

Embodiments of the present invention may be utilized in conjunction with a variety of subsea completion systems and installation methods, including those disclosed in U.S. Patent Application Publication No. 2005/0098321, both of which are hereby incorporated herein by reference.

Thus embodiments of the present invention comprise a subsea completion system in which the interfaces between several of the various tools and components have been standardized in a universal configuration. Consequently, these tools and components may be selectively stacked in any desired order and configuration. Embodiments of the invention therefore allow for increased flexibility in the selection of

installation and testing procedures, thus providing opportunities for savings in costs and time.

These and other embodiments and advantages of the present invention will be made apparent from the following detailed description, with reference to the accompanying drawings. In the drawings, the same reference numbers may be used to denote similar components in the various embodiments.

Brief Description of the Drawings

Figure 1 is a schematic representation of several components of an exemplary subsea completion system which each comprise a universal connection interface of the present invention;

Figure 2 is a longitudinal cross sectional view of an exemplary embodiment of a subsea completion system having several components which each comprise a universal connection interface of the present invention;

Figure 3 is a longitudinal cross sectional view of a second exemplary embodiment of a subsea completion system in an initial stage of installation having several components which each comprise a universal connection interface of the present invention;

Figure 4 is an enlarged view of the portion of the completion system of Figure 3 which is identified by the letter "A";

Figure 5 is an enlarged view of the portion of the completion system of Figure 3 which is identified by the letter "B";

Figure 6 is a longitudinal cross sectional view of the completion system of Figure 3 shown in a subsequent stage of installation;

Figure 7 is an enlarged view of the portion of the completion system of Figure 6 which is identified by the letter "C";

Figure 8 is an enlarged view of the portion of the completion system of Figure 6 which is identified by the letter "D";

Figure 9 is an enlarged view of the portion of the completion system of Figure 6 which is identified by the letter "E";

Figure 10 is a longitudinal cross sectional view of the completion system of Figure 6 shown in a subsequent stage of installation;

Figure 11 is an enlarged view of the portion of the completion system of Figure 10 which is identified by the letter "F";

Figure 12 is a longitudinal cross sectional view of the completion system of Figure 10 shown in a subsequent stage of installation;

Figure 13 is an enlarged view of the portion of the completion system of Figure 12 which is identified by the letter "G";

Figure 14 is a longitudinal cross sectional view of the completion system of Figure 12 shown in a subsequent stage of installation; and

Figure 15 is an enlarged view of the portion of the completion system of Figure 14 which is identified by the letter "H".

Detailed Description of the Preferred Embodiments

In accordance with the present invention, several components of a subsea completion system, and ideally also the tools which are required to install and test the completion system, are each provided with a universal connection interface on either their upper ends, their lower ends, or both their upper and lower ends. Consequently, the order in which these components are connected and installed can be tailored to the needs of a particular subsea well, and the number of tools which are required to install and test the components can be minimized. Accordingly, the present invention provides a great deal of flexibility and cost savings in the design and installation of subsea completion systems.

In an exemplary embodiment of the invention, at least two components comprise a universal lower connection interface and at least two components comprise a universal upper connection interface which is complementary to the lower connection interface. Accordingly, each of the first two components can be connected to either of the second two components. In another exemplary embodiment of the invention, at least one installation or test tool comprises a universal lower connection interface and at least two components comprise a universal upper connection interface which is complementary to the lower connection interface. As a result, the tool may be used with either or both of these two components. In the context of the present invention, the term complimentary means that the universal connection interfaces are capable of being operatively engaged with each other, such as by being connected and/or sealed to each other.

Figure 1 is illustrative of the flexibility which the universal connection interfaces of the present invention afford in the design and installation of subsea completion systems. The top half of Figure 1 depicts a number of subsea

completion system components which each comprise a universal lower connection interface 10, and the bottom half of Figure 1 depicts a number of subsea completion system components which each comprise a universal upper connection interface 12. In addition, each of the lower connection interfaces 10 is complementary to each of the upper connection interfaces 12. Thus, each of the components shown in the top half of Figure 1 can be connected to each of the components shown in the bottom half of Figure 1. For example, the EDP may be installed on either the wellhead, the tree or the LRP. Similarly, the THRT may be used with either the tubing hanger, the tree or the LRP.

Moreover, several of the components shown in Figure 1, such as the tree and the LRP, may comprise both a universal lower connection interface 10 and a universal upper connection interface 12. As a result, each such component can be installed in a variety of locations in the subsea completion system.

It should be noted that, in the context of the present invention, the term universal does not necessarily mean identical. Rather, to be considered universal, the connection interfaces should have a minimum number of similar features which will enable them to operatively engage the connection interface of at least one other component. As shown in Figure 1, for example, the lower connection interfaces 10 for the EDP and the tree cap are not identical; however, these connection interfaces comprise a sufficient number of similar features to enable the EDP and the tree cap to be connected to both the tree and the LRP.

Thus, the universal lower connection interfaces 10 for the components shown in the upper half of Figure 1 comprise certain similar features which enable each of these component to be connected to any of the components shown in the lower half of Figure 1. Likewise, the universal upper connection interfaces 12 for the components shown in the lower half of Figure 1 comprise certain similar features which enable each of these components to be connected to any of the components shown in the upper half of Figure 1.

In particular, the lower connection interface 10 for each of the tree and the LRP includes an external connector 14 and a production stab 16, the lower connection interface for each of the EDP and the jumper includes an external connector 14 and a production bore 18, the lower connection interface for the THRT includes a production stab 16 and a latching mechanism 20, and the lower connection interface for the tree cap includes a latching mechanism 20. Also, the

upper connection interface 12 for each of the wellhead, the tree and the LRP includes an external hub profile 22 which is engageable by the external connector 14, and the upper connection interface for each of the tubing hanger, the tree and the LRP includes both an internal latching profile 24 which is engageable by the latching mechanism 20 and a production bore 26 which sealingly receives the production stab 16.

Thus, the various components shown in Figure 1 can be connected in a variety of configurations. For example, the tree can be landed and locked onto the wellhead, with the production stab 16 engaging the production bore 26 of the tubing hanger. Also, the LRP can be landed and locked onto either the wellhead or the tree, with the production stab 16 engaging the production bore 26 of either the tubing hanger or the tree. In addition, the EDP and the flowline jumper can each be landed and locked onto the wellhead, the tree, or the LRP. Furthermore, the tree cap can be landed and locked onto either the wellhead, the tree or the LRP. Moreover, the THRT can be used to install not only the tubing hanger, but also the tree and the LRP.

Referring now to Figure 2, the universal connection interfaces of the present invention may be utilized in the following particularly advantageous installation procedure for an exemplary subsea completion system 28. First, a tree 30 and an LRP 32 are made up at the surface, run subsea on a cable or drill string and then wet parked near a wellhead 34. Alternatively, the tree 30 and the LRP 32 can be made up to a BOP 36 at the surface and this assembly then run subsea, in which event the BOP would be disconnected once the assembly is wet parked near the wellhead 34. Next, the BOP 36 is landed on the wellhead 34, and a tubing hanger 38 is installed in the wellhead through the BOP using a THRT 40. The THRT 40 is then retracted into the BOP 36 and the BOP is disconnected from the wellhead 34 and reconnected to the LRP 32. The BOP/LRP/tree assembly is then landed on the wellhead 34 and the tree 30 is connected to the wellhead. The THRT 40 is then lowered from the BOP 36 and secured to the LRP 32. This is the configuration of the subsea completion system 28 which is shown in Fig. 2.

The flow completion system 28 may now be flow tested. Of particular significance, the LRP 32 provides the necessary barriers for the production bore, and the BOP 36 provides the necessary barriers for the annulus. Thus, no need

exists for either a subsea test tree (SSTT) or an open water riser, resulting in significant savings in costs and time.

Turning to Figures 3 through 15, the installation sequence for an exemplary flow completion system 110 which comprises universal connection interfaces on several components will now be described. Starting with Figure 3, a seabed isolation device ("SID") 112, which is similar to a subsea BOP having all but the shear rams removed, is lowered from the surface on a high pressure riser 114 and landed and locked onto a wellhead 116. A tubing hanger 118 is then lowered on a THRT 120 through the high pressure riser 114 and the SID 112 and installed in the wellhead 116.

As shown more clearly in Figure 4, the high pressure riser 114 comprises a universal lower connection interface 10a which is complementary to a universal upper connection interface 12a on the SID 112. The lower connection interface 10a comprises an external hydraulic connector 122, such as a conventional tieback connector, which includes an actuator 124 and a lock ring 126. The lower connection interface 10a also comprises a lower seal groove 128 for a suitable gasket 130, such as a VX gasket, and an isolation adapter bushing 132 which is attached to the high pressure riser 114 and which supports a radially outward facing ring seal 134.

The upper connection interface 12a includes an external locking profile 136, such as a conventional H4 hub profile, which is engaged by the lock ring 126 when the connector 122 is actuated to thereby secure the high pressure riser 114 to the SID 112. The upper connection interface 12a also comprises an upper seal groove 138 for the gasket 130, which forms a pressure tight seal between the high pressure riser 114 and the SID 112 when these components are secured together, and a sealing surface 140 for the ring seal 134.

As shown more clearly in Figure 5, the SID 112 also comprises a universal lower connection interface 10b which is complementary to a universal upper connection interface 12b on the wellhead 116. The lower connection interface 10b comprises several features which are similar to those of the lower connection interface 10a. Thus, the lower connection interface 10b comprises an external hydraulic connector 122 which includes an actuator 124 and a lock ring 126, such as the Torus IV connector manufactured by FMC Technologies, Inc. of Houston, Texas. In addition, the lower connection interface 10b comprises a lower seal

groove 128 for a suitable gasket 130, such as a VX gasket, and an isolation adapter bushing 132 which is attached to the SID 112 and which supports a radially outward facing ring seal 134.

The upper connection interface 12b comprises several features which are similar to those of the upper connection interface 12a. Thus, the upper connection interface 12b includes an external locking profile 136, such as a conventional H4 hub profile, which is engaged by the lock ring 126 when the connector 122 is actuated to thereby secure the SID 112 to the wellhead 116. In addition, the upper connection interface 12b comprises an upper seal groove 138 for the gasket 130, which forms a pressure tight seal between the SID 112 and the wellhead 116 when these components are secured together, and a sealing surface 140 for the ring seal 134.

Referring still to Figure 5, the THRT 120 is shown to comprise a universal lower connection interface 10c which is complementary to a universal upper connection interface 12c on the tubing hanger 118. The lower connection interface 10c comprises an internal latching mechanism 142 which includes an actuator 144 and an internal lock ring 146. In addition, the lower connection interface 10c includes a production stab 148 which is secured to the THRT 120 and which includes an annular sealing lip 150 that is formed on its lower end.

The upper connection interface 12c comprises an internal locking profile 152 which is engaged by the lock ring 146 when the latching mechanism 142 is actuated to thereby secure the THRT 120 to the tubing hanger 118. The upper connection interface 12c also includes a sealing surface 154 which is engaged by the sealing lip 150 to form a pressure tight seal between the tubing hanger production bore 156 and the THRT production bore 158.

Referring now to Figure 6, after the tubing hanger 118 is installed in the wellhead 116, the THRT 120 is retracted into the SID 112 and the SID is disconnected from the wellhead. The SID 112 is then connected to an LRP 160 which, as in the previous embodiment, has previously been connected to a tree 162 at the surface and then wet parked next to the wellhead. The SID 112, the LRP 160 and the tree 162 are subsequently lifted as a unit and landed on the wellhead 116, and the tree is then secured to the wellhead.

As shown more clearly in Figure 7, the LRP 160 comprises a universal upper connection interface 12d which is complimentary to the universal lower

connection interface 10b on the SID 112. The upper connection interface 12d comprises several features which are similar to those of the upper connection interfaces 12a and 12b discussed above. Thus, the upper connection interface 12d includes an external locking profile 136, such as a conventional H4 hub profile, which is engaged by the lock ring 126 when the connector 122 is actuated to thereby secure the SID 112 to the LRP 160. The upper connection interface 12d also comprises an upper seal groove 138 for the gasket 130, which forms a pressure tight seal between the SID 112 and the LRP 160, and a sealing surface 140 for the ring seal 134.

The universal upper connection interface 12d on the LRP 160 is also complimentary to the universal lower connection interface 10c on the THRT 120. Thus, the upper connection interface 12d comprises several features which are similar to those of the upper connection interface 12c for the tubing hanger 118. In this regard, the upper connection interface 12d comprises an internal locking profile 152 which is engaged by the lock ring 146 when the latching mechanism 142 is actuated to thereby secure the THRT 120 to the LRP 160. In addition, the upper connection interface 12d comprises a sealing surface 154 which is engaged by the sealing lip 150 to form a pressure tight seal between the THRT production bore 158 and the LRP production bore 164.

Referring to Figure 8, the LRP 160 also comprises a universal lower connection interface 10d which is complementary to a universal upper connection interface 12e on the tree 162. The lower connection interface 10d comprises several features which are similar to those of the lower connection interfaces 10a, 10b for the high pressure riser 114 and the SID 112. Thus, the lower connection interface 10d comprises an external hydraulic connector 122, such as a Torus IV connector, which includes an actuator 124 and a lock ring 126. In addition, the lower connection interface 10d comprises a lower seal groove 128 for a suitable gasket 130, such as a VX gasket, and an isolation adapter bushing 132 which supports a radially outward facing ring seal 134. Also, in the embodiment of the invention shown in Figure 8, the lower connection interface 12d comprises a production stab 148 which is secured to the LRP 160 and which includes an annular sealing lip 150 on its lower end.

The upper connection interface 12e comprises several features which are similar to those of the upper connection interfaces 12a through 12d discussed

above. Thus, the upper connection interface 12e includes an external locking profile 136, such as a conventional H4 hub profile, which is engaged by the lock ring 126 when the connector 122 is actuated to thereby secure the LRP 162 to the tree 162. In addition, the upper connection interface 12e comprises an upper seal groove 138 for the gasket 130, which forms a pressure tight seal between the LRP 160 and the tree 162, and a sealing surface 140 for the ring seal 134. Additionally, the upper connection interface 12d comprises a sealing surface 154 which is engaged by the sealing lip 150 to form a pressure tight seal between the LRP production bore 164 and the tree production bore 166.

In order to enable THRT 120 to connect to the tree 162, the upper connection interface 12e may also include an internal locking profile 152 which is similar to those of the upper connection interfaces 12c and 12d. In this embodiment, however, the locking profile 152 is formed on a adapter bushing 168 which is secured to the inner diameter of the tree 162 by a lock ring 170. If no need exists to connect the THRT 120 to the tree 162, however, the adapter bushing 168 may be omitted. The adapter bushing 168 thus allows the upper connection interface 12e of the tree 162 to be adapted to operatively engage other components of the flow completion system 110, if needed.

As shown most clearly in Figure 9, the tree 162 comprises a universal lower connection interface 10e which is complementary to the universal upper connection interfaces 12b, 12c on the wellhead 116 and the tubing hanger 118, respectively. The lower connection interface 10e comprises several features which are similar to those of the lower connection interfaces 10a through 10d discussed above. Thus, the lower connection interface 10e comprises an external hydraulic connector 122 which includes a lock ring 126 that engages the locking profile 136 on the wellhead 116 to thereby secure the tree 160 to the wellhead. In addition, the lower connection interface 10e comprises a lower seal groove 128 for the gasket 130 and an isolation adapter bushing 132 which supports a radially outward facing ring seal 134. Furthermore, the lower connection interface 12e comprises a production stab 148 which is secured to the tree 162 and which includes an annular sealing lip 150 that sealingly engages the seal surface 154 to thereby provide a fluid tight seal between the tubing hanger production bore 156 and the tree production bore 166.

Referring now to Figure 10, the subsea completion system 110 is shown with the SID 112 and the THRT 120 removed and with an EDP 170 connected to the LRP 160. The EDP 170 is run on an open water riser 172 which is connected to the EDP with, for example, a speed lock clamp 174.

As shown most clearly in Figure 11, the EDP 170 comprises a universal lower connection interface 10f which is complementary to the universal upper connection interface 12d on the LRP 160. Moreover, the lower connection interface 10f comprises several features which are similar to those of the lower connection interfaces 10a through 10e discussed above. Accordingly, the lower connection interface 10f comprises an external hydraulic connector 122, such as a high angle release Torus IV connector, which includes a lock ring 126 that engages the locking profile 136 to thereby secure the EDP 170 to the LRP 160. The lower connection interface 10f also includes a lower seal groove 128 for the gasket 130, which provides a pressure tight seal between the LRP and the EDP when these two components are secured together. In addition to these features, the lower connection interface 10f comprises a lower seal profile 176 for an intermediate gasket 178, which in turn seals against an upper seal profile 180 on the upper connection interface 12d for the LRP 160.

After the flow completion system 110 has been successfully flow tested, it is ready to be placed into production. Referring to Figure 12, this is accomplished by retrieving the EDP 170 and the LRP 160 and securing, e.g., a subsea centerline jumper 182 to the tree, 162.

As shown in Figure 13, the jumper 182 comprises a universal lower connection interface 10g which is complementary to the universal upper connection interface 12e of the tree 162. In addition, the lower connection interface 10g comprises several features which are similar to those of the lower connection interfaces 10a through 10f discussed above. Thus, the lower connection interface 10g comprises a connector 122 which includes a lock ring 126 that engages the locking profile 136 on the tree 162, a lower seal groove 128 for the gasket 130, and a lower seal profile 176 for the intermediate gasket 178. In contrast to the lower connection interfaces discussed above, however, the lower connection interface 10g also includes a number of locking pins 184.

In addition to the features described above, the upper connection interface 12e for the tree 162 includes a lock groove 186 which is engaged by the locking

pins 184 to further secure the jumper 182 to the tree 162. In addition, the lower sealing profile 180 for the intermediate gasket 178 is formed on the adapter bushing 168, rather than directly on the inner diameter of the tree 162. This characteristic of the present invention allows the upper connection interface 12e to be adapted if necessary to operatively engage other components of the flow completion system 110.

When it is desired to temporarily abandon the well, the subsea centerline jumper 182 can be removed and replaced with a tree cap 188. This is the configuration of the subsea completion system 110 which is shown in Figure 14.

As shown more clearly in Figure 15, the tree cap 188 comprises a universal lower connection interface 10h which is complementary to the universal upper connection interface 12e of the tree 162. The lower connection interface is similar to the lower connection interface 10b discussed above in that it comprises an internal lock ring 146 which engages an internal locking profile 152 to thereby secure the tree cap 188 to the tree 162. In this regard, the locking profile 152 is formed on the adapter bushing 168, rather than directly on the inner diameter of the tree 162.

Thus, the universal connection interfaces 10, 12 of the present invention afford a great deal of flexibility and cost savings in the design and installation of subsea completion systems. By providing these interfaces on the top and/or bottom ends of several components of the completion system and the tools which are used to install and test the completion system, the order in which the components are connected and installed can be tailored to the needs of a particular subsea well. In addition, the number of tools which are required to install and test these components can be minimized.

It should be recognized that, while the present invention has been described in relation to the preferred embodiments thereof, those skilled in the art may develop a wide variation of structural and operational details without departing from the principles of the invention. For example, the various elements shown in the different embodiments may be combined in a manner not illustrated above. Therefore, the appended claims are to be construed to cover all equivalents falling within the true scope and spirit of the invention.

Claims:

1. A subsea completion system which includes:

a wellhead which is positioned at the upper end of a well bore and comprises a first upper connection interface;

a tree which is positioned above the wellhead and comprises a second upper connection interface; and

an LRP which is positioned above the tree and comprises a third upper connection interface ;

a tubing hanger which is positioned in the wellhead and comprises a fourth upper connection interface;

a BOP; and

a THRT;

characterized in that

the BOP comprises a first lower connection interface that is operatively engageable with the first, second and third upper connection interfaces, and the THRT comprises a second lower connection interface that is operatively engageable with the second, third and fourth upper connection interfaces;

wherein during a first stage of installation of the subsea completion system the BOP is connected to the wellhead and the THRT is connected to the tubing hanger; and

wherein during a second stage of installation of the subsea completion system the tree, with the LRP connected to the top thereof, is connected to the wellhead and both the BOP and the THRT are connected to the LRP.

2. The subsea completion system of claim 1, wherein each of the first through fourth upper connection interfaces comprises a locking profile and each of the first and second lower connection interfaces comprises a lock ring that is engageable with the locking profile.

3. The subsea completion system of claim 1, wherein each of the first, second, and third upper connection interfaces comprises an external locking profile and the first lower connection interface comprises an external connector which includes a lock ring that is engageable with the locking profile.

4. The subsea completion system of claim 1, wherein each of the first through fourth upper connection interfaces comprises a first sealing surface, each of the first and second lower connection interfaces comprises a second sealing surface, and the first and second sealing surfaces are engageable by a common seal.

5. The subsea completion system of claim 1, wherein each of the second, third and fourth upper connection interfaces comprises a production bore and the second lower connection interface comprises a production stab which is engageable with the production bore.

6. A method for constructing a subsea completion system which comprises:

installing a wellhead at the upper end of a well bore , the wellhead comprising a first upper connection interface;

providing a tree with a second upper connection interface;

connecting an LRP to the top of the tree, the LRP comprising a third upper connection interface;

providing a tubing hanger with a fourth upper connection interface;

connecting a BOP to the top of the wellhead;

connecting a THRT to the tubing hanger;

landing the tubing hanger in the wellhead through the BOP;

disconnecting the BOP from the wellhead;

connecting the BOP to the top of the LRP, with the LRP connected to the top of the tree; and

connecting the tree to the wellhead;

characterized in that

the BOP comprises a first lower connection interface that is operatively engageable with the first, second and third upper connection interfaces, and the THRT comprises a second lower connection interface that is operatively engageable with the second, third and fourth upper connection interfaces.

7. The method of claim 6, wherein each of the first through fourth upper connection interfaces is provided with a locking profile and each of the first and second lower connection interfaces is provided with a lock ring that is engageable with the locking profile.

8. The method of claim 6, wherein each of the first, second and third upper connection interfaces is provided with an external locking profile and the first lower connection interface is provided with an external connector which includes a lock ring that is engageable with the locking profile.

9. The method of claim 6, wherein each of the first through fourth upper connection interfaces is provided with a first sealing surface, each of the first and second lower connection interfaces is provided with a second sealing surface, and the first and second sealing surfaces are engageable by a common seal.

10. The method of claim 6, wherein each of the second, third and fourth upper connection interfaces is provided with a production bore and the second lower connection interface is provided with a production stab which is engageable with the production bore.

11. A subsea completion system which includes:

a wellhead which is positioned at the upper end of a well bore and comprises a first upper connection interface;

a tree which is positioned above the wellhead and comprises a second upper connection interface;

an LRP which is positioned above the tree and comprises a third upper connection interface;

a tubing hanger which is positioned in the wellhead and comprises a fourth upper connection interface;

characterized in that

the subsea completion system further includes a SID which comprises a fifth upper connection interface and a first lower connection interface that is operatively engageable with the first, second and third upper connection interfaces; and

a THRT which comprises a second lower connection interface that is operatively engageable with the second, third and fourth upper connection interfaces;

wherein during a first stage of installation of the flow completion system the SID is connected to the wellhead and the THRT is connected to the tubing hanger; and

wherein during a second stage of installation of the subsea completion system the tree, with the LRP connected to the top thereof, is connected to the wellhead and both the SID and the THRT are connected to the LRP.

12. The subsea completion system of claim 11, further comprising:

a high pressure riser which comprises a third lower connection interface that is operatively engageable with the first, second, third and fifth upper connection interfaces;

wherein during a third stage of installation of the subsea completion system the high pressure riser is connected to the SID.

13. The subsea completion system of claim 11, further comprising:

an EDP which comprises a fourth lower connection interface that is operatively engageable with the first, second, third and fifth upper connection interfaces;

wherein during a fourth stage of installation of the subsea completion system the SID is removed and the EDP is connected to the LRP.

14. The subsea completion system of claim 11, further comprising:

a subsea centerline jumper which comprises a fifth lower connection interface that is operatively engageable with the first, second, third and fifth upper connection interfaces;

wherein during a fifth stage of installation of the subsea completion system the SID and LRP are removed and the jumper is connected to the tree.