

Claims

What is claimed is:

1. A riser section for coupling a surface platform to a wellhead, the riser section comprising:
 - a main tube for fluid flow between the wellhead and the platform;
 - a flange extending radially from each end of the main tube;
 - tie rods coupled to and extending between the flanges to share a tensile load applied to the riser section and transferred through the flanges;
 - an auxiliary fluid line extending between the flanges to share the tensile load applied to the riser section; and
 - wherein the tie rods are disposed to counter an imbalance in tensile strength of the riser section caused by at least one of size and arrangement of the auxiliary fluid line.
2. The riser section of claim 1, further comprising multiple auxiliary fluid lines extending between the flanges, the auxiliary fluid lines configured to share the tensile load applied to the riser section.
3. The riser section of claim 2, wherein the tie rods are disposed to counter an imbalance in tensile strength of the riser section caused by at least one of size and arrangement of the auxiliary fluid lines.
4. The riser section of claim 1, wherein the tie rods are threadingly coupled to the flanges.
5. The riser section of claim 1, wherein the tie rods are unevenly spaced about the circumference of the main tube.
6. The riser section of claim 2, wherein the positions of the tie rods are based, at least in part, on the positions of the auxiliary fluid lines.
7. The riser section of claim 1, wherein a circumferential wall of the main tube is thinner than would be necessary to withstand a given load than without the tie rods.
8. The riser section of claim 1, wherein the tie rods are disposed to provide the riser section

with an omni-directional load bearing profile.

9. The riser section of claim 1, wherein the tie rods comprise material of higher tensile strength than a material of the main tube.

10. The riser section of claim 2, wherein the tie rods differ in tensile strength, and tie rods of higher tensile strength are disposed in areas of lower auxiliary fluid line tensile load sharing, and tie rods of lower tensile strength are disposed in areas of higher auxiliary fluid line tensile load sharing.

11. The riser section of claim 2, wherein tensile strength of the tie rods disposed in a circumferential area around the main tube inversely corresponds to tensile load sharing capability of the auxiliary fluid lines disposed in the circumferential area.

12. A drilling system for boring earthen formations using a drilling platform, the drilling system comprising:

- a subsea wellhead; and

- a riser string disposed between the drilling platform and the subsea wellhead, the riser string comprising a plurality of riser sections, at least one of the riser sections comprising:

 - a main tube for fluid flow between the subsea wellhead and the drilling platform;

 - a flange extending radially from each end of the main tube;

 - tie rods coupled to and extending between the flanges to share a tensile load applied to the riser section and transferred through the flanges;

 - an auxiliary fluid line extending between the flanges to share the tensile load applied to the riser section; and

 - wherein the tie rods are disposed to counter an imbalance in tensile strength of the riser section caused by at least one of size and arrangement of the auxiliary fluid line.

13. The drilling system of claim 12, further comprising a blowout preventer coupled to the riser and to the wellhead.

14. The drilling system of claim 12, wherein the riser section comprises multiple auxiliary

fluid lines extending between the flanges, the auxiliary fluid lines configured to share the tensile load applied to support the riser string, and wherein the tie rods are disposed to counter an asymmetry in tensile strength of the riser section caused by the auxiliary fluid lines.

15. The drilling system of claim 14, wherein the positions of the tie rods are based, at least in part, on the positions of the auxiliary fluid lines.

16. The drilling system of claim 14, wherein the tie rods differ from one another in tensile strength, and tie rods of higher tensile strength are disposed in areas of lower auxiliary fluid line tensile load sharing, and tie rods of lower tensile strength are disposed in areas of higher auxiliary fluid line tensile load sharing.

17. The drilling system of claim 14, wherein tensile strength of the tie rods disposed in a circumferential area of the riser section inversely corresponds to the tensile load sharing capability of the auxiliary fluid lines disposed in the circumferential area.

Claims

What is claimed is:

1. A drilling system for boring earthen formations using a drilling platform, the drilling system comprising:

a subsea wellhead; and

a riser string disposed between the drilling platform and the subsea wellhead, the riser string comprising a plurality of riser sections, at least one of the riser sections comprising a main tube and one or more tie rods coupled to and extending between flanges radiating from each end of the riser section.

2. The system of claim 1, wherein the tie rods are configured to share a tensile load applied to the at least one riser section.

3. The system of claim 1, at least one of the riser sections further comprising one or more auxiliary fluid lines extending between the flanges, the auxiliary fluid lines configured to share with the main tube a tensile load applied to the main tube to support the riser section.

4. The system of claim 3, wherein the tie rods are disposed to counter an imbalance in tensile strength of the riser section caused by at least one of size and arrangement of the auxiliary fluid lines.

5. The system of claim 3, wherein the positions of the tie rods are based, at least in part, on the positions of the auxiliary lines.

6. The system of claim 3, wherein the tie rods differ in tensile strength, and tie rods of higher tensile strength are disposed in areas of lower auxiliary fluid line tensile load sharing, and tie rods of lower tensile strength are disposed in areas of higher auxiliary line tensile load sharing.

7. The system of claim 3, wherein tensile strength of the tie rods disposed in a circumferential area around the main tube inversely corresponds to tensile load sharing capability of the auxiliary fluid lines disposed in the circumferential area.

8. The system of claim 1, wherein the tie rods are disposed to provide the riser section with an omni-directional load bearing profile.

9. The system of claim 1, wherein the tie rods comprise material of higher tensile strength than a material of the main tube.

10. The system of claim 1, further comprising an auxiliary fluid line extending between the flanges, the auxiliary fluid line sharing with the main tube none of a tensile load applied to support the riser section; wherein the ties rods are disposed symmetrically about the main tube.