Claims

1. An apparatus for testing rings cut from pipes for use in making subsea pipelines, the apparatus comprising:

- first and second test chamber sections which when connected together define a test chamber for housing a test ring;
- sealing means for forming a seal against the ring when mounted in the chamber;
- means for connecting the first and second sections together to form the chamber and to engage the sealing means against the test ring when mounted in the chamber to form a pressure resistant seal between the inside of the ring and the outside of the ring;
- a fluid inlet port in one of the chamber section to allow a pressurised fluid to be admitted to the chamber outside the test ring;
- a hydraulic ram for applying a force against the inner surface of the test ring when mounted in the chamber;
- at least one sensor for measuring the force applied to the test ring by the hydraulic ram;
- at least one sensor for measuring the movement of the test ring; and
- at least one sensor for measuring strain and deformation of the test ring.

2. An apparatus according to claim 1 comprising means for pumping fluid to the hydraulic ram.

3. An apparatus according to claim 2 wherein the means for pumping fluid to the hydraulic ram is a needle pump.

4. An apparatus according to anyone of claims 1 to 3, wherein the at least one sensor measuring the movement of the test ring, is a displacement transducer.

5. An apparatus according to anyone of claims 1 to 4, wherein the apparatus comprises at least two sensors for measuring the movement of the test ring relative to the test apparatus.

6. An apparatus according to anyone of claims 1 to 5, wherein the at least one sensor for measuring the force applied to the test ring by the hydraulic ram is a force meter.

7. An apparatus according to anyone of claims 1 to 6, further comprising a spacer ring, positioned between the first and second sections, and taken with the first and second sections to define the test chamber for receiving the test ring.

8. A method for determining whether a test ring is correctly assembled in a test chamber for testing pipes for use in making subsea pipelines, wherein the test ring is cut from a pipe of the type used to make the pipeline and has flat substantially parallel surfaces on the end of the test ring; the method comprises:
i) mounting the test ring in a pressure chamber such that the ends of the test ring forms seals with opposing surfaces of the chamber to isolate the inside of the test ring from the outside;
ii) providing means for measuring the displacement of the test ring;
iii) providing means for measuring a force applied to the inner surface of the test ring;
iv) applying a force to the inner surface of the test ring; and
v) measuring the displacement of the test ring and measuring the force applied to the inner surface and using the displacement measurement and force measurements to determine whether the test ring is correctly mounted in the pressure chamber.

9. A method according to claim 8 comprising stopping the applied force to the inner surface of the test ring once the test ring has been displaced by a predetermined distance.

10. A method according to claim 9 wherein the predetermined distance is 1mm.

11. A method according to anyone of claims 8 to 10 comprising providing a pressure of above 0MPa and below an expected collapse pressure to the pressure chamber, when applying a force to the inner surface of the test ring.

12. A method according to anyone of claims 8 to 11, wherein the method further comprises determining a range of allowable restraining forces before carrying out steps i) to v).

13. A method according to anyone of claims 8 to 12, wherein the method further comprises maintaining the test ring in the pressure chamber and carrying out an external pressure collapse test on the test ring.

14. A method according to claim 13, wherein the external pressure collapse test comprises:

- providing means for measuring strain and deformation of the test ring;
- increasing the pressure outside the ring and measuring the strain and deformation on the test ring as the pressure increases; and
- determining the external collapse pressure of the test ring.

15. A method according to claim 14 wherein determining the external collapse pressure of the test ring comprises determining a comparison of pressure applied to the outside of the ring and maximum strain measured to detect the onset of accelerating non-linear reduction in ring diameter with increasing pressure.

16. A method for testing pipes for use in making subsea pipelines, comprising:

- cutting a ring from a pipe of the type used to make the pipeline
- forming flat substantially parallel surfaces on the end of the ring to provide a test ring;
- mounting the test ring in a pressure chamber such that the ends of the test ring forms seals with opposing walls of the chamber to isolate the inside of the test ring from the outside;
- providing means for measuring the displacement of the test ring and providing means for measuring a force applied to the inner surface of the test ring;
- applying a force to the inner surface of the test ring;
- measuring the displacement of the test ring and measuring the force applied to the inner surface and using the displacement measurements and force measurements to determine whether the test ring is correctly assembled in the pressure chamber;
- providing means for measuring strain and deformation of the test ring;
- increasing the pressure outside the ring and measuring the strain and deformation on the test ring as the pressure increases; and
- determining a comparison of pressure applied to the outside of the ring and maximum strain measured to detect the onset of accelerating non-linear reduction in ring diameter with increasing pressure.

17. A method according to any one of claims 8 to 16 wherein applying a force to the inner surface of the test ring, comprises applying the force until the applied force to the test ring exceeds the lateral resisting force.

18. A method according to any one of claims 8 to 17 wherein, applying a force to the inner surface of the test ring, includes providing means for applying a force to the inner surface of the test ring.

19. A method according to claim 18 wherein providing means for applying a force to the inner surface of the test ring comprises providing a hydraulic ram, wherein the hydraulic ram is connected to a pump for supplying a fluid to the hydraulic ram.

20. A method according to anyone of claims 8 to 19 wherein applying a force to the inner surface of the test ring comprises applying a rate of force of from 0.002kN/min to 0.04kN/min.

21. A method according to anyone of claim 14 to 20 wherein the means for applying a force to the inner surface of the test ring is removed from the test ring before the step of increasing the pressure outside the ring is carried out.

22. A method according to anyone of claims 8 to 21 wherein the method is carried out using the apparatus according to any one of claims 1 to 7.

23. A pipe testing apparatus for performing the method according to anyone of claims 8 to 22.