

- i. Resin in the structural wall shall be Isophthalic or Vinyl ester.
- ii. Additional exterior stiffeners may be required to maintain circularity on large diameter pipes and shall be installed to the manufacturer's requirements.
- iii. Design of the outer layer of the pipes shall be formed of an vinyl ester resin with or without sand aggregates and with or without reinforcement of glass. The outer protective layer shall have a minimum thickness of 1 mm and protect the structural layer against extraneous causes (atmospheric conditions, mechanical damage, UV and chemical stress). For Centrifugally Cast GRP Pipe the outer protective layer shall have a sand content with a minimum percentage of 65 % of sand against ultra – violet influences.
- iv. Use flanged joints for all exposed pipes and fittings inside treatment plants, process structures, pumping stations, and valve chambers.
- v. Flanges shall be filament wound, tape wound, contact moulded, hot or cold pressed with epoxy or vinyl ester resins only.
- vi. All bolts shall be stainless steel grade 316.
- vii. Flanged pipe joints must incorporate an annular gasket at the joints and these gaskets must cover the full face of the flange with holes cut in them corresponding to the bolt holes in the flanges. Drill flanges to BS EN 1092 (metric units) type PN16. If approved by the Engineer, use a plain ring covering the flange between the bolt circle and the bore of the pipe. Use 3mm thick gaskets incorporating two layers of cotton fabric insertions evenly spaced in the gasket. When flanged joints are to be made, secure the bolts and the nuts initially to finger tightness. Thereafter the final tightening of the nuts shall be effected by torque spanners in such sequence that diametrically opposite nuts are tightened together to achieve the manufacturers recommended torque.
- viii. All joints shall be in accordance with the manufacturer's instructions.

## **18.2.3 Quality Control Tests**

### **18.2.3.1 GRP Pipes and Fittings**

- a) Routine Factory Quality Control Tests.
  - i. Carry out the quality control tests listed below at the frequency stated.