the excavated material in order to create a plug surrounding the pile shaft. Re-drilling will then take place. If further fluid loss or shaft collapse occurs, the bore will be immediately backfilled with low strength, lean mix concrete prior to any further excavation taking place.

d) Before Installing steal cage and casting concrete when reaching the pile toe level, loose and remolded material and debris will be removed with the drilling or cleaning bucket.

e) High slump concrete of specified grade should be used according to Table 14 of BS 8004 : 1986

f) For a continuous assurance of concrete quality and integrity, concrete should be poured to minimum 1.50 m above the theoretical pile cut-off level.

g) Casting of piles shall be performed as a continuous operation. The concrete should be designed to remain workable for a minimum of three hours from the time of the batching to the time of placement into the pile.

h) The concrete shall be placed by tremie tube method; the tube diameter. shall not be less than 150 mm. The tube shall be inserted at the centre of the pile to reach the toe. The top shall be connected to a funnel. The concrete shall be delivered directly from the transit mixer to the funnel. The tube to be lifted 100 mm above pile toe level prior to concreting. While concreting, the length of the tube to be shortened if necessary but shall be maintained always into the concrete of at least 2.0 m length.

i) Continuous supervision on site by engineer and the contractor is always necessary to ensure that the piles are properly executed.

j) Care to be taken to ensure that there will be no displacement or distortion of reinforcement during the formation of the pile.

1.6.3 PILES TESTING

Piles testing shall conform to the following minimum requirements:

a) At least one for each pile diameter, non-working pile shall be tested, to 200% of the pile's working load. BS 8004:1986, Section 7.5.5 or ASTM D 1143/1143M. Osterberg cell can be accepted only in the preliminary test.

b) 1 % of the total number of working piles and minimum one test for each pile diameter/type shall be statically tested to not less than 150 % of the pile's working load, BS 8004:1986, Section 7.5.5 or ASTM D 1143-89.

c) 5 % of the total number of working piles shall be tested using high strain dynamic method to not less than 150 % of the pile's working load. ASTM D 4945-89.

d) 10% of the total number of working piles shall be tested using cross- hole sonic core logging test method for piles of diameter equal or more than 600mm. ASTM D 6760-08.

e) 100 % of working piles shall be tested by using low strain dynamic integrity test and shall be repeated for piles statically tested. ASTM D 5882-07.

f) The following procedure shall be followed for particular tests whenever are required by the project specification or design conditions:

- Pile instrumentation test should be performed on tested pile(s). The test shall be performed at the time of static load test for piles of diameters 1000 mm or more.
- Static laterally loaded piles test should be conducted where the lateral loads governing the design.
- Static tension pile test should be conducted where tension piles are used to resist uplift.
- 10 % of working piles boreholes and all preliminary & statically tested working piles are to be selected randomly and tested by mechanical calliper logging (ASTM D 6167 – 11 & ASTM D 5753 – 95e1).
- Steel reinforcement and concrete strength and durability shall be tested as per QC Guidelines.