METHOD STATEMENT

FOR

INSTALLATION & STRESSING OF PERMANENT GROUND ANCHOR

A. DEFINITIONS

a) Ground Anchors
An installation consisting basically of a stressing anchorage, a tendon and fixed anchor, which is capable of transmitting an applied tensile load to a load bearing stratum, for the specified duration of the structure in which it is required to withstand the design load.

b) Anchor Head
Anchor head is that part of the ground anchor which transmits the thrust against the face of the structure to be supported through steel anchor plates or other approved materials.

c) Tendon
This is part of the ground anchor connecting the anchor head and anchor bond length which comprises of dia 15.2mm strands with breaking load not less than 260 KN.

d) Fixed Anchor Length
This is the length of anchorage over which the tensile load is transferred to the surrounding ground. It shall be constructed outside the zones of active soil failure.

e) Free Anchor Length
This is that length of tendon which transmits no load to the surrounding strata.

f) Tendon Bond Length
This shall be the length of the tendon which is effectively bonded directly to the Grout.

g) Design Load
This is the working load (WL) in the line of the anchor.
B. INSTALLATION METHOD

1. Drilling & Cleaning of Hole

Boreholes are to be drilled with wash boring drilling method to the required lengths. Temporary casing is to be used where the ground is likely to collapse. A drag bit or casing drill can be used to drill the hole according to the specified diameter,

Holes are to be flushed with water/air after drilling to a reasonable cleanliness.

2. Installation of Cables

The strands used shall be 0.6” nominal diameter strand. All strands are to be cut to length and tied together with tie wire at approximately 2.0 meters centres. Plastic centralisers are to be fixed to the cable 3.0 metres centre to centre over the entire length of the cable. Free tendon length or strand free length shall be sheathed with a suitable plastic hose.

This bond length shall be loosened (unwire) and cleaned before insertion of anchor into drilled hole. The fixed tendon length shall also have centralisers at 3 metres centres.

If for any reason the cable cannot be installed to the correct depth and blowing air and water through the primary grout pipe does not free the cable, it should be withdrawn and the hole re-drilled.

When the cable is installed, the hole is to be cleaned again by flushing clean water through the primary grout pipe until reasonably clean water flows out from the top of the hole.


Primary grouting must be carried out on the same day as cable installation (See Appendix A for mix proportion)
A primary grout pipe is to be tied to the cable and should reach within 0.5m to the bottom of the hole. This grout pipe is withdrawn progressively during primary grouting.

The Grout is to be mixed for approximately two minutes in a mechanical mixer and pumped into the hole through the primary grout tube. Pumping shall continue until the flushing water is displaced with grout of even consistency flowing out of the drill hole.

Six grout test cubes (100x100 mm) shall be taken for each day of grouting. Three cubes shall be tested on the 7th day after grouting. Stressing may be permitted if the cube strength reaches 18 N/mm². The second set of three cubes shall be tested on the 28th day after grouting.

**NOTES**

a) Anchors shall be formed in such a manner as to ensure that no damage will be sustained by previously formed anchors in adjacent positions. The minimum spacing between ground anchors shall be 3 time anchor diameter.

b) The anchors shall be handled on site and inserted into the boreholes without being damaged.

c) Holes for the anchors will be drilled to the required depth and diameter in the type of anchorage zone specified.

d) Contractor shall ensure that casings for drilling are readily available for use when needed.

e) The assembled tendon will be inserted into the hole.

f) Grouting will be by tremie system through a Grout tube and the bore hole shall be filled up to the top.

g) Anchors shall not be loaded until 7 days after grouting.

h) After the Grout strength has reached its required design strength (normally after 7 days), the stressing anchorage is placed is then proof loaded to 1.25 time working load.
The anchor will be locked off at 1.1 times working load to allow for setting in of wedges and for time dependent load losses to take place without adversely affecting the capacity of the anchor.

C. TESTING PROCEDURES

i) **Proof Tests**

2 anchors shall be subjected to routine acceptance test, test load shall be 1.50 of WL and carried out in stages as follows:

1st stage - stress to 0.50 WL
2nd stage - stress to 1.00 WL
3rd stage - stress to 1.50 WL and lock off at 1.1 WL

At each state the load shall be held for 5 minutes.

j) **Failure Criteria**

An anchor is deemed to have failed if:

* The anchor fails to hold the load.

* During any part of the load procedure the applied load produces a constant rate of anchor movement.

All anchors that have failed shall either be:

Down graded to a load and additional anchors to be installed to restore the affected anchoring system to original design requirements.

k) **Accuracy of Measurement**

The whole load shall be measures on a single pressure gauge calibrated in divisions not more than 10% of the minimum applied load on the constructed anchors. Extension shall be measured to an accuracy of 1 mm.
APPENDIX A

MIX PROPORTION FOR GROUTING PERMANENT ANCHORS

Water : Cement ratio is 0.45

1. **Primary Grout Mix Proportions**

**Grout Mix**

The proportions of Grout and the minimum strength of work cubes shall comply with the following requirements:

- Range of water/cement ratio : 0.40 to 0.45
- Cube crushing strength at 7 days after mixing : 20 N/mm²
- Cube crushing strength at 28 days after mixing minimum : 30 N/mm²

Site Mix workers shall take these parameters :

- Water - 22.5 Litres
- Cement - 1 bag (50 kg)