

Particular Specification for Large Diameter Bored Piles with Bell-outs

1.0 Definition

Large Diameter Bored Piles with Bell-outs are piles of a diameter exceeding 600 mm formed by boring, chiselling or grabbing with an enlarged base formed by under-reaming, plus filling with concrete. The bell-out at the pile base shall be formed within the bedrock with the use of a reverse circulation drill incorporating an under-reaming head.

2.0 Design Requirements

2.1 Design Assumptions

The theoretical safe loading capacity of large diameter bored piles with bell-out shall be the allowable bearing pressure on bedrock times the pile base area. Combining the end-bearing capacity and rock socket side resistance to increase the load-carrying capacity shall not be allowed.

The presumed allowable maximum bearing pressure of piles on bedrock shall be in accordance with Clause 5.19 (iv) of the General Specification for Building. Large Diameter Bored Piles with Bell-outs shall not be founded on rocks inferior to Grade III.

The use of presumptive values in accordance with Clause 5.19 (iv) of the General Specification for Building does not preclude the requirement for consideration of settlement of the structure.

The gradient of bell-out shall not exceed 30 degrees from vertical, and the diameter of pile at bell-out shall not exceed 1.5 times the diameter of pile shaft. The bell-out shall start at 300 mm below the bedrock level (see Fig. 1). In order to achieve good quality concrete, the diameter of piles at bell-out shall not exceed 3.75 m.

* Notwithstanding GS Clause 5.04(i), the average compressive stress of concrete pile shaft imposed by the working load shall not exceed 25% of the design grade strength of the concrete or 9.0 MPa whichever is smaller.

OR

* The average compressive stress of concrete pile shaft imposed by the working load shall not exceed 25% of the design grade strength of the concrete or 7.5 MPa whichever is smaller.

* delete as appropriate

The Contractor shall satisfy himself that the above method of calculating the theoretical safe loading capacity provides sufficient factor of safety in his design. Should he consider that this method does not provide an adequate factor of safety in his design, he shall submit an alternative method of calculations for the approval of the Supervising Officer (SO).

2.2 Reinforcement Detail

Reinforcement should be provided as shown in Fig. 1. The depth 'H' in Fig. 1 is bell-out tool dependent. It shall be verified on site and agreed with the SO before commencement of pile installation. However, the effect of reinforcement shall not be included in calculating the bearing capacity of pile.

2.3 Drilling before Construction

Site borings to pre-determine the piles founding levels shall be carried out by an independent Ground Investigation Contractor from Group I and Group II of the List of Approved Suppliers of Materials and Specialist Contractors for Public Works – Ground Investigation Field Work Category. Drill hole(s) (one for pile diameter less than or equal to 2.5 m and two for pile diameter greater than 2.5 m) shall be sunk at each bored pile position to determine the pile founding level. For this purpose, continuous rock core samples of N size with length not less than 5 m plus the socket length (as defined in Fig. 1) shall be taken below the bedrock level for inspection. However, this predicted founding level cannot be considered as final and the actual rock quality at base of pile should be inspected and verified during pile excavation before approval.

2.4 Other Requirements

The requirements related to Large Diameter Bored Piles as stipulated in the General Specification for Building apply equally to Large Diameter Bored Piles with Bell-out.

3.0 Testing

3.1 Ultrasonic Echo Sounding Test

Ultrasonic Echo Sounding Test shall be carried out by an approved independent testing laboratory employed by the Contractor to check the shaft and bell-out profile, dimensions and verticality of each bored pile prior to installation of reinforcement cage and concreting.

3.2 Coring Test for the Pile Under-ream

Carry out coring tests outside the pile shaft and within the enlarged base areas in accordance with Clause 5.29 of the General Specification for Building to investigate the integrity of the pile under-ream as directed by the SO.

4.0 Controlling and Monitoring the Verticality and Alignment of Bored Piles

The Contractor shall submit a detailed method statement and procedures for controlling and monitoring the verticality and alignment of piles for the SO's approval before commencement of pile installation.

During the pile installation, tolerance for verticality of each pile shall be frequently checked as directed by the SO. In case the deviation exceeding the allowable tolerance, the Contractor shall propose method of rectification for the SO's approval prior to further pile installation.

5.0 Design Submissions

In addition to those stated in Clause 5.02 of the General Specification for Building and 4.0 above, submit 2 copies of each of the following with the design submissions:-

- a. Details of boring method and equipment.
- b. Details of concrete mix.
- c. Sequence and details of concreting operation.

No piling works shall commence on site unless the design submissions are approved by the SO.

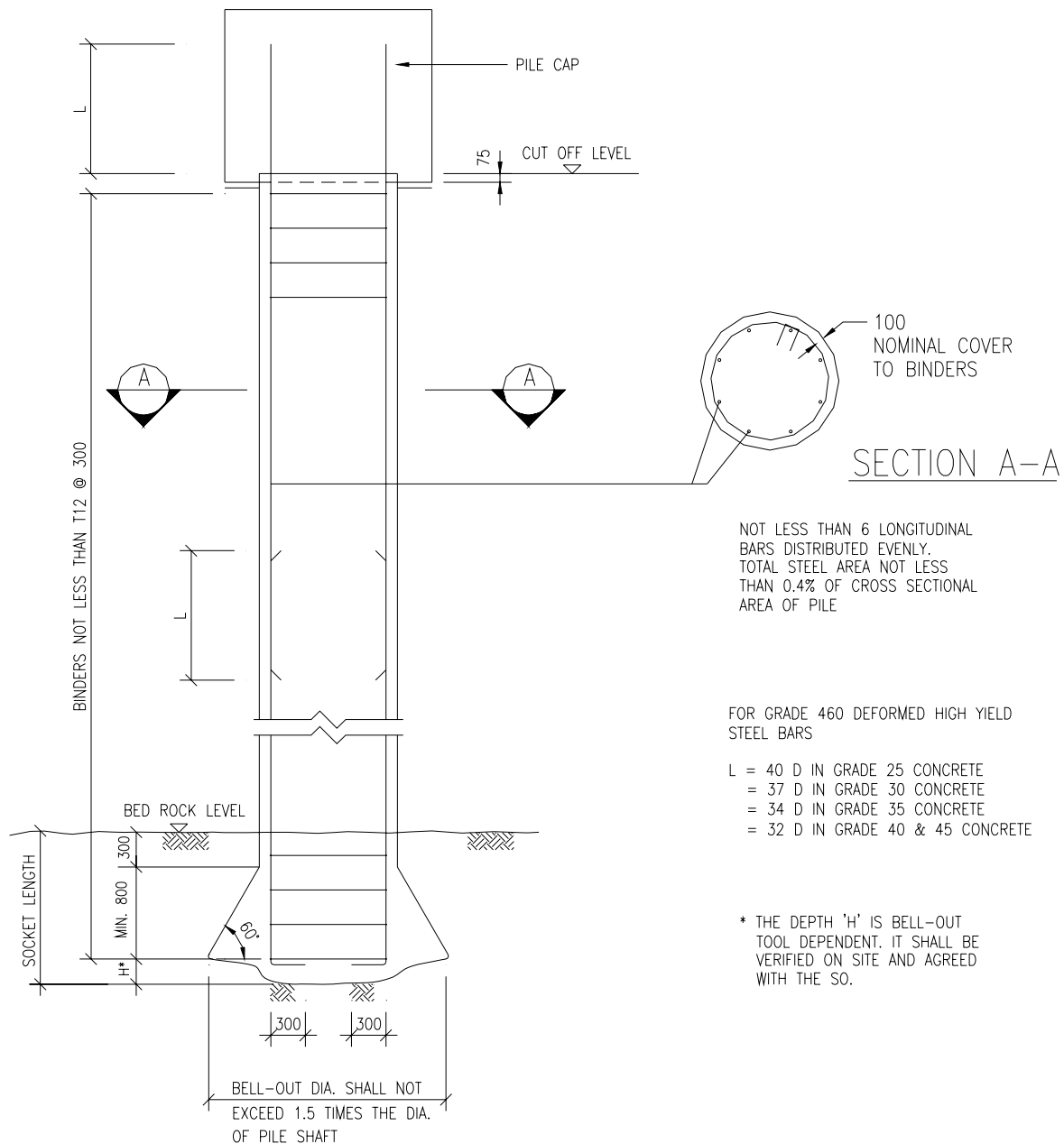


FIG. 1 TYPICAL DETAIL OF LARGE DIAMETER BORED PILE WITH BELL-OUT