

HDB Structural Requirements for A&A work on HDB Premises

1. General

The Professional Engineer in Civil Engineering discipline (PE (Civil)) shall ensure that their design complies with the latest Code of Practice under SS EN (including the National Annex), and regulatory requirements.

2. Material

(a) Concrete - minimum Grade C32/40 shall be used for the superstructure, substructure and the bored pile design.

(b) Steel – Structural steel members shall be designed in accordance with Eurocode 3 (EC3) and the NA SS EN 1993. A minimum grade of S275 shall be used for structural steel sections.

(c) Reinforcement - All steel reinforcement bars shall have a minimum characteristic yield strength of $f_{yk} = 500 \text{ N/mm}^2$ and comply to SS 560 or BS4449. For welded fabric, the reinforcement must also comply to SS 561. BS EN 10080 shall apply for testing for all reinforcements.

3. Actions

3.1 Variable Action

The imposed loads used shall comply with to NA to SS EN 1991.

Variable Action reduction for foundation and column shall not be implemented in the structural design.

The roof fascia shall be designed to support the load of suspended cradle which is used for architectural works and subsequent maintenance works.

3.2 Permanent Action

Other minimum Permanent Action to be considered in the design is: All floor finishes shall be designed as a uniformly distributed load of 1.2 kN/m².

4. Concrete Cover

1	Structural Class	S4 (50 Years)
2	Exposure Class	XC1 for internal slab for residential unit. XC3/XC4 for super structural elements
3	Concrete Grade	C32/40
4	Fire Resistance	Where applicable, the minimum thickness of concrete covers necessary to meet the fire resistance requirement is to be separately considered

5. Foundation

All types of pile foundation and footing shall be designed to comply with the latest Code of Practice under SS EN and other statutory requirements.

5.1 All types of pile foundation

For the design of foundation shall take into consideration of the following:

- (a) All types of pile foundation refer to bored pile, steel H-pile, micropile, jack-in steel pipe pile, jack-in steel H-pile and precast reinforced concrete pile.
- (b) Minimum lean concrete of 50mm thick shall be provided below pile cap.
- (c) The new/proposed foundations are to be located clear of existing foundations influence zone.
- (d) Safety factor - All types of pile foundation shall be designed with safety factor of minimum 2.5 times the nominal working load.
- (e) Pile penetration - The penetration length for each type of piles shall be clearly indicated on the plans.
- (f) Pilecap - The design of the pilecap shall be based on the pile load capacity.
- (g) Pilecap - The minimum embedment of the piles in the pilecap shall be 100mm for precast reinforced concrete pile and 150mm for steel pile and bored pile.
- (h) Pilecap – The cut-off levels of the proposed pilecaps shall not exceed the cut-off levels of existing shallow foundations (i.e. footings/raft).
- (i) Pilecap - The minimum distance between the edge of piles and edge of pilecap shall be 250mm.

5.2 Bored pile

The bored pile shall be of minimum concrete grade C32/40.

5.3 Timber pile

No timber pile foundation shall be used.

5.4 Precast reinforced concrete (RC)

Precast reinforced concrete (RC) piles shall only be used for linkways, link building, precinct pavilions and other single storey light structures.

5.5 Footing

- (a) The soil bearing capacity for design of footing at different depth below ground level shall be based on the bore log result of corresponding depth. The soil bearing capacity and the corresponding depth used in design shall be clearly indicated in the design calculation and footing layout plans.
- (b) If the relevant soil bore-log results are not available, the maximum soil bearing capacity of footing for light structures such as linkways, outdoor refreshment area and pergola shall be 50kN/m² at a minimum depth of 1.5m below ground level.
- (c) Minimum lean concrete of 50mm thick shall be provided below the footing.
- (d) The new/proposed footings are to be located clear of existing foundations and their cut-off levels shall not exceed the cut-off levels of the existing footings/pilecaps.
- (e) The new/proposed foundations shall not encroach onto existing foundations.
- (f) Backfill to excavation shall be of the same or better-quality materials and mechanically compacted to its original condition.

6. Column

- (a) Column shall be founded for independent structure.
- (b) Column shall be designed as short column.
- (c) The column load shall correspondingly be indicated in the reinforcement bar schedule for columns.
- (d) For column/wall of building structures that is located next to driveways shall be checked and designed for vehicular impact load during service condition.
- (e) No penetrations shall be made through column.
- (f) The existing foundation must not be used to support new column/stanchions.
- (g) Minimum 4 nos. of anchor bolts shall be provided for the base plate connecting steel stanchions onto the existing slab.
- (h) No conduits/pipes (e.g. electrical works), sanitary services, rainwater down pipes shall be embedded into the existing column/walls.

7. Slab Design

(a) Reinstatement details of slab openings are required for installation of new waste pipes. The reinforcement bars used should be similar or of bigger size than the existing reinforcement bars. All affected floor slabs shall be properly reinstated in accordance with as-built plans.

(b) Trimming bars of minimum 10mm diameter of similar or higher steel grade shall be provided for existing slab opening due to creation of openings.

8. Steel Structures and Claddings

(a) Metal roofing sheets shall not be used for blocks higher than 4-stories.

(b) Steel hollow sections, if used, shall not be drilled through for securing cladding or metal roofing sheets. The steel plates, angle or cleats shall be used and welded to the steel hollow sections for connections to roof or cladding panels.

(c) The technical specifications for the self-drilling or self-tapping screws used must be provided as part of the design calculations for conformity in the design.

(d) Self-drilling or self-tapping screws shall not be used for connection of main structural members.

(e) Connections for cantilever members shall use a minimum of 4 anchor bolts to resist the moment connection.

(f) The grade of self-drilling screws shall comply to BS EN 3506. The screws must be corrosion resistant. There shall be a minimum of 3 thread penetration into the threaded surface and the screws must be designed to resist the imposed stresses. Only self-drilling screws (that do not require a pilot hole), bolts or welding are allowed to be used as a secondary fastener to external fixtures. Self-tapping screws (which require pilot hole) and rivets shall not be used for fixing of external fixtures or other specialist works.

(g) The technical specification of the bolts and self-drilling screws, etc that are used for conformity in the design shall be included as part of design calculations. The connection system shall be designed to resist the imposed stresses.

9. Outdoor Refreshment Area (ORA)

(a) The proposed ORA structures are to be supported on independent foundation.

(b) The proposed structures shall be designed to resist impacts from falling objects of 5kg from the topmost floor from said building above it.