

# **Committee for Quality Control of High Rise Building Construction Projects**

## **Submission Requirements for Earth Retaining or Stabilizing Structures For High Rise Buildings with Basement Construction**

If the excavation depth is more than 1.5 m, the following should be submitted:

1. Deep excavation analysis and design
2. Instrumentation and monitoring system
3. Calculation of ERSS design
4. Submission Document Check-List
5. Presentation.
6. Letter from YCDC Letter (to be attached)

**Note: The above requirements are intended only for High Rise Buildings with basement construction. If other party use this guide line, the submission requirements should be amended by the authorized persons.**

## **GEOTECHNICAL DESIGN**

### **Basement Construction:**

#### **General Requirements for Excavation and Lateral Support (ELS)**

1. ELS plans submission document should include the geotechnical assessment, geotechnical details and calculations, site investigation reports.
2. Designer should prepare and sign the plans and structural design as well as the structural assessment report of the effects of the excavation and dewatering on adjoining structures.
3. ELS design report should explain the references for recognized specifications and code of practice for design calculation.
4. Construction methodology should explain, for example, detail excavation and support installation sequence and then removal of temporary support, construction of permanent structure for each stage.
5. Designer should prepare the impact assessment of surrounding building and facilities, monitoring plan and instrumentation.
6. The followings should be included in detail drawings of basement :
  - a) Detail drawings of all structural elements, joint connection, reinforcement and technical notes.
  - b) Detail site layout plan with adjacent building and bored hole location.
  - c) The construction structural details of the lateral support system, including detailing of the structural supports (struts, anchorage etc.) for each stage of excavation.
  - d) Detail excavation depth including localized pits and sloping ground.
7. Adjacent building survey should be done according to the survey form in the guideline.

### **Technical Requirements**

Consideration should be given in geotechnical design as below.

1. Restricted Area
2. Protection to adjacent structures (road, building, underground related facilities etc.)
3. Construction hazards

### **Geotechnical Design Requirement**

1. The surcharge load should be considered a minimum value of 20 kN/m<sup>2</sup>. Additional surcharge loading should be used in the design to take account of incidental loading arising from adjacent buildings, construction plant and stacking of materials.
2. Dynamic load factor of traffic should be considered due to the movement of vehicles during construction.
3. The ground-water pressure, ground water flow into excavation and its influence on the wall stability and impact on the adjacent building should be considered in design.

4. The Ultimate Limit States (ULS) of the wall shall be checked by using the global safety factor of 2. Unfactored soil strength parameters and loads are used in the stability checks.
5. Serviceability Limit States (SLS) checks should be carried out to assess the impacts on adjoining buildings, structures, services and land that require the use of deformation parameters in given the attached table (2). Wall deflection and ground settlement behind the basement wall should be computed and submitted for critical sections.
6. In any case, angular distortion of differential ground settlement with the adjacent structural building should be less than 1/500.
7. Analytical method is allowed for single excavation stage.
8. For the analysis of interaction of soil and support, recognized finite element computer program should be used where the excavation is multilayer excavation and supporting.
9. The program used, soil model used, other specifications and design assumptions should be clearly stated in calculation report.
10. For multi layers of excavation and supporting, consideration should be given the interaction between the removal of temporary support and performance of permanent support.
11. The axial force, bending moment and shear force of all structural members should be computed and submitted.
12. The accidental load, temperature load and lives load should be properly designed in structural design. AISC specifications are recommended for the design of steel members.
13. All geotechnical capacities of structural members (ground anchor, soil nail etc.) in compliance with relevant design codes of practices can be taken into account.

## Appendices for Geotechnical Design

**Table (1)**

1	Overall Stability	To check the sufficient embedment depth to prevent overturning of the wall and overall slope stability
2	Basal Failure	To check the wall penetration depth to prevent basal failure in front of the wall after excavation to formation level
3	Hydraulic Failure	To check the penetration of the wall to avoid piping or ‘blow out’ in front of the wall after excavation to formation level.
Note: The design check methods or formula should match with application of predetermined design concept.		

**Table (2A) Allowable wall deflection limits**

No.	Distance	Zone	Allowable maximum wall deflection limits, $\delta_w/H$
1	$H > d$	Zone 1	$< 0.5 \% H$
2	$2H > d > H$	Zone 2	$< 0.7 \% H$
3	$d > 2H$	Zone 3	0.7 % H for ground type A 1.0 % H for ground type B

Where,  $\delta_w$  = maximum wall deflection

H = Excavation depth,

d = distance between existing structure and the edge of the excavation

Ground Type A = over-consolidated stiff clays and silts, residual soils, and medium to dense sands

Ground Type B = soft clays, silts or organic soils.

Allowable displacement: Near existing building with allowable displacement shall be **< 0.5 %**.

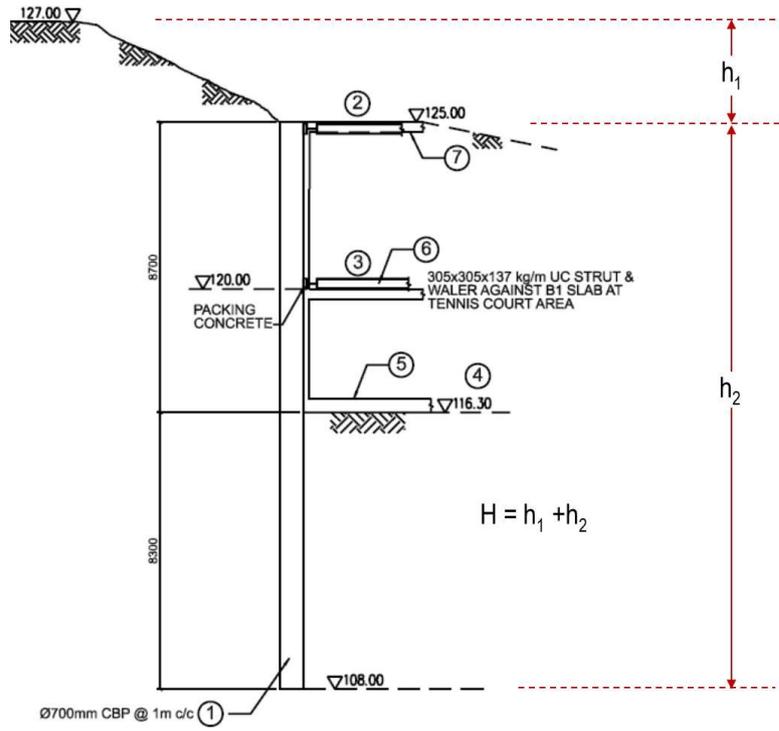
**Table (2B) Control of wall deflection during Construction**

Allowable Limit		
Check level	Alert level	Work suspension level
50% of WSL	70% of WSL	Allowable wall deflection limit

### Control of vertical settlement during Construction

1. For nonstructural building, the allowable vertical settlement should be considered by the recognized criteria.
2. Based on the types of foundation of adjacent buildings, the allowable differential settlement shall be estimated by the recognized criteria.
3. The safety factor should be considered for sensitive building.

# Detail excavation depth of excavation



Adjacent Structure Survey (for building)

A. Survey

1. Stories :

2. Structure

- Steel     Wooden     Brick  
 RC     Others

3. Basement:

4. Foundation:

- Mat Foundation     Single Foundation  
 Bored Pile Foundation     Others

5. Retaining Wall

- Open Cut     Soldier Piles     Sheet/ rail piles  
 DWs     Bored piles     Others

6. Basement Depth:

7. Foundation Depth:

8. Retaining Wall Depth:

9. Width of Building faced to site:

10. Column Net Spacing:

11. Inclination

- Perpendicular to site  
 Parallel to site

12. Built date:

13. Condition Description:

14. Clearance to site:

15. Remark:

B. Building Photo



Adjacent Structure Survey (for road)

A.Survey

1.Width of Road

One Way  Two Way

2.Foundation Depth:

3.Traffic Condition:

Main Road  Temporary Road

4. Traffic Loading:

5.Width of Road faced to site:

6. Condition Description:

7. Remark:



5. Retaining Wall

- Open Cut       Soldier Piles       Sheet/ rail piles  
 DWs       Bored piles       Others

6. Basement Depth:

7. Foundation Depth:

8. Retaining Wall Depth:

9. Width of Building faced to site: 23 m

10. Column Net Spacing: 3.5 m

11. Inclination

Perpendicular to site

Parallel to site

12. Built date: 1990

13. Condition Description: Good condition:

14. Clearance to site: 7.5 m

15. Remark:

Adjacent Structure Survey (for road)

A.Survey

1.Width of Road:

One Way  Two Way

2.Foundation Depth: 0.5 m

3.Traffic Condition

Main Road  Temporary Road

4. Traffic Loading: heavy

5.Width of Road faced to site: 23 m

6. Condition Description: The road is little brake

7.Remark:

