Thane Municipal Corporation,

Thane

General Guidelines for

High Rise Buildings

(For proposals Appraisal)

General Guidelines for High Rise Buildings

HRC formation:

Vide Govt. Resolution No. TPS/1216/2930/Pra.Kra.71/17/UD-12 dated 16, January 2018, Govt. of Maharashtra has constituted a Technical Committee for scrutiny of proposals of High rise Buildings (HRB) having height more than 70 m. within Thane Municipal Corporation limit. In pursuance to this all building proposals where the height of the proposed building exceeds **70 m**. will have to refer to the aforesaid Committee known as High Rise Committee **(HRC).**

Suggested Guidelines:-

These guidelines have been formulated considering feedback from professionals/ Architects and earlier experiences. These guidelines will be revised from time to time so that best practices can be incorporated on the basis of experience gained within the committee as well as any additional information and knowledge which may become available.

In these guidelines the word "building" and Phrases "High Rise Building" or "HRB" have been used as equivalents and defined as "Any structure for whatsoever purpose and of whatsoever materials constructed and every part thereof whether used as human habitation or not and it includes foundation, plinth, walls, floors, roofs, chimneys, plumbing and building services, fixed platforms, verandah, balcony, cornice or projection, part of a building or anything affixed thereto or any wall enclosing or intended to enclose any land or space and signs and outdoor display structures"

Purpose of the guidelines :-

The major objectives of these guidelines are:

- Development of vertical structure, which does not lead to elevated slums in the city devoid of amenities.
- To have safe, secure and durable structure.

Rules of business for the committee:-

a) List of invitees: - The composition of members has been defined by the notification itself and adding further invitees is not anticipated. Nevertheless in case of any expert advice is to be sought in any matter, aid of the experts in colleges of repute can be requisitioned.

b) Frequency of meeting :- The frequency can be limited to once in a month. By the direction of Hon. Chairman of HRC, special meeting can be convened with a week's notice for any matters of urgency.

c) Site visits to the submitted proposals can be done as and when required in consultation with HRC members especially Structural and Geotechnical Engineer.

d) Procedure for submission of proposals: - As procedure mentioned in the guidelines herewith.

e) Objective screening & cut off time: - The information, details submitted by proponent will be shared with all members a week in advance to firm up their opinion.

f) Circulation of Agenda: - Project information and the prescribed proformas with concerned details be mailed/ personally given to each member a week in advance.

g) Conditions to be imposed: - To be as ordered by the Hon'ble Chairman. Any other special condition can be proposed with approval of the committee.

h) Any other procedural aspect: - Subject to discussion and concurrence of the committee.

Guidelines for High Rise Development:-

These guidelines are in addition to the rules made in D.C. Regulations 1994, Fire Act and guidelines in NBC-2016 (amended from time to time).

1) Submission of Proposal :-

a) No High Rise Building Proposal shall be proposed on net plot area less than 2000 sq.m. But proposals on plots having net area less than 2000 sqm under MHADA redevelopment and Cluster development only can be accepted on merits with the permission of Hon. Chairman of HRC.

b) High Rise Building Proposal shall be submitted for total High Rise Building as planned for full potential as can be admissible on date of submission and if amended, have to obtain amended HRC NOC. In case of Special Township scheme, approval prior to HRC notification will be honored but any further amendments will attract these provisions.

c) The proposal should be submitted in the prescribed formats only (enclosed within) to Member Secretary, High Rise Committee, Thane Municipal Corporation, Thane.

d) The proponent shall have to deposit Rs 10,00,000/- (Rs. Ten Lakh) as a scrutiny fee per wing per building at the time of submission other than regular charges. If proposed wing is for rehabilitation then scrutiny fee will be waived off.

e) The Appendix And Checklists given in these guidelines are mandatory and required to be completed and submitted with the proposal along with appointment letters of Architect, Structural Engineer and Geotechnical Engineer. No proposal will be accepted without these Appendices. Along with all submissions, concession reports of the competent authority, if applicable is required to be given as a part of the submission.

2) Parking Spaces

The parking spaces shall be provided as per the provisions of DCR 1994 (amended from time to time). The location of parking spaces shall be well ventilated. Sufficient provision for visitors parking shall be proposed at suitable location with toilet for drivers. In addition, Mechanical ventilation may be insisted depending upon the proximity of the surrounding buildings and condition of the ventilation. Parking floors shall be provided with parapet wall of 1.2 m height. In case of vertical fins / slashes 0.4 sqm opening per linear meter of periphery shall be permitted as per Annexure H, volume 1, NBC-2016.

In addition to car parks, additional space should be earmarked for two wheelers and cycles within the parking area, preferably on ground level. The requirement shall be on the basis of analysis of occupancy and use as per DCR 1994 (amended from time to time).

Stack and / or Puzzle car Parking shall be allowed in multilevel podium, parking floors and in stilt. Multilevel podium, parking floors, Mechanized parking and separate parking towers will be encouraged. Parking floor height shall not be more than 4.20 m. In case of Stack and / or Puzzle car parking, Parking floor height will be allowed up to 4.60 m (subject to Modification), however traffic simulation plan shall be submitted.

3) Dis aster Management Plan

The Disaster Management Plan shall be prepared as per the norms. In view of disaster management, Central Control Room/ Building Management System (B.M.S.) Room shall be proposed abutting the common passage near the exit/ reception at ground floor. Detailed disaster management plan for the onsite and offsite use shall be prepared keeping in view all the possible disaster situations. These DMPs shall be operational system which can be made working immediately after the completion. It is also expected that proper plan is also in place for the building construction period. It shall be mandatory to develop the mechanism to ensure that Disaster Management Plan is functioned throughout the occupation period. A separate enabling clause in the sale agreement of prospective buyer shall be included in MOFA agreement.

4) Structural Design

The structural design in standard commercial software package and AutoCAD format duly certified by Licensed Structural Consultant shall be submitted. The submission shall be as per the documents mentioned in Structural checklist and Design Basis Report .

The following additional details shall be considered over and above those stipulated in relevant codes of practice.

1) Possibility of pounding with adjacent HRB in a cluster or at expansion joint shall be cross checked and should be incompliance with the relevant code.
2) All structural as well as non structural elements shall have minimum fire rating as prescribed in NBC-2016, with minimum protection of 2 hours.
3) Testing of piles : Static pile test for minimum of 1 % of total piles driven or as per prevailing standard code whichever is more shall be undertaken, preferably for those in the tower area.
4) No anchors shall be allowed to extend beyond the plot boundary.
5) External walls shall be either 230 mm thick brick wall or 150 mm thick concrete block wall. Such walls shall be properly anchored to the RCC / steel structural elements.
6) Minimum three bore holes shall be provided in the main tower area. The depth of these bore holes shall be up to about 30 m below the rock strata or as per IS 16700 (2017)

5) Basement (Open Space)

1) If the depth of basement excluding excavation is up to 4 m, the minimum marginal space open space for basement from road side shall be 1.5 m,
2) Further if, the depth of basement excluding excavation is from 4 m to 8 m, the minimum open space for basement from road side shall be 2 m and,
3) If the depth of basement excluding excavation is more than 8 m, the minimum open space for basement from road side shall be 2.5 m.

The depth of the excavation should not exceed 12 mt from the existing ground level.

In case, the proponent wants to increase the depth of excavation, a proper justification may be recorded & presented to HRC along with construction plan.

6) Traffic Simulation Report :-

Every Proposal shall be accompanied by Traffic Simulation Report and shall be in line with traffic study report prepared for Thane Municipal Corporation and it is mandatory on proponent to get it cross checked from TDD of TMC.

7) Fire Prevention and Life Safety:-

Requirements for Fire Prevention and Life Safety in High Rise Buildings are as per D.C. Regulations 1994 (amended from time to time), Part 4: Fire and Life Safety, NBC (2016) and as recommended by Maharashtra Fire Prevention and Life Safety Measures Act (2006).

8) General :

The signs for showing staircase, exit, lift, refuge and fire fighting driveway to be pointed on the ground. Fire shafts to be identified with red color and basement ventilation shafts to be indicated shall be displayed distinctly at all common places where possible. Further, following points shall be observed.

1) If the foundation and shoring (if applicable) is constructed at the time of submission or visit, then developer/ proponent should have to change the height or dismantling of the structure as per suggestions given by the member of HRC.
2) HRC member may insist additional tests to improve the quality of soil investigation. Project proponent should have to submit the report of additional tests before presentation to HRC.
3) Latest IS codes should be preferred for foundation and structural design.
4) All terraces shall be open to sky & shall be accessible through common passage.
5) Swimming pools shall open to sky only.
6) The recreation areas shall be as per DCR 1994 (amended from time to time).
7) In case of partly completed buildings, Structural consultant should submit stability certificate before HRC. If necessary, HRC will send this structural design and drawing to recognized institutes like IIT/NIT for proof checking.
8) The initial Scrutiny remarks of TDD, Permission /CC given by TDD and Fire Brigade NOC shall be submitted at the time of submission of the proposal.

9) For the new proposal with unlimited height, following requirements to be complied.

a) For proposed new buildings and layouts (whether proposed as per Appendix S or R or High Rise Building proposals in Urban Renewal Plan) **12.0 m**. clear open space (without any obstruction) open to sky all around the building with **16.5 m.** turning circle shall be provided. But In case of abutting Road, relaxation can be given on merits to proposals under Appendix S or R or High Rise Building proposals in Urban Renewal Plan.

b) Modern fixed fire fighting system to be installed.

c) Fire evacuation lift should be provided.

d) For proposed new buildings, Fire check floor of 1.8 m. height (below beam bottom level) and open from all the sides shall be provided at every 70.0 m. height. All services like water line, Sewer line shall be permitted in this Fire check floor.

e) For proposed buildings, every fire check floor shall be provided with break pressure tank of 30,000 Ltr. capacity (provided in distributed manner with connected loop) with booster pump.

f) Building which is already approved up to 92.0 m. and proposing more height then fire check floor shall be provided at 92.0 m. thereafter at 140.0 m. and then after every 70.0 m. height.

g) Separate fire fighting system shall be provided for each individual building/wing as per Mumbai DCPR 2034.

h) The lifts lobbies, staircase shall be provided with pressurized system.

i) For proposed new High Rise Buildings, Two staircases are to be provided, out of which one staircase is of 2.0 m. width and another staircase is of 1.5 m. width.

j) As per DCR 1994, for fire fighting , underground water tank of min 2 Lakh Ltr capacity for each building or common underground water tank of capacity of 10 Lakh Ltr for group of max 5 adjacent buildings shall be provided.

k) But on common underground water tank , proponent should provide separate main pump of capacity 3200 Ltr per min, Jocky pump of capacity 900 Ltr per min, Sprinkler pump , separate Booster pump , separate stand by pump of same capacity, required for each building.

l) If common pump room is proposed for group of 5 buildings, capacity of Main pump and Jockey pump should not be less than 300 Hp and there should be 1 Jockey pump at every 30 m distance and at ground level and there should be one Hydropnumatic Pump at ground level.

m) Under ground water tank proposed for firefighting only should be connected to municipal water main.

n) For proposed new buildings and CC not issued to the buildings having height more than 70.0 m in the layout, Controlled Lowering Device for evacuation or External Evacuation system as approved by CFO shall be provided.

o) For built up area 10 Lakh Sqft or more than that in single building or in group, Proponent should hand over one Water Brouser cum High Rise Building fire fighting vehicle free of cost to Fire Brigade Department.

p) If ramp provided for the fire fighting movement, it shall be of 9.00 m. wide with **16.5 m.** turning circles, and gradient of 1:10, open to sky. If closed ramp is provided then 6.00 m. height below the beam level shall be provided.

q) For proposed new buildings and CC not issued to the building having podium/shop line , Podium / shop line shall not be more than 3.0 m. beyond the building line.

r) Podium height is to be restricted upto **30 m.** (Ground to top of the podium – **30** m.)

s) Swimming pool shall be provided open to sky only.

t) Basement depth shall be restricted to 12.0 m. and maximum 3 level basements are allowed in the depth (Subject to approval of proposed modification).

10) If any proposal which is earlier approved before 07/09/2017 up to 92 m. and now proposes beyond 92m, shall be allowed up to **110 m.** only as per HRC recommendations on merits subject to structural stability and compliance of requirement stipulated by CFO department.

9) Checklist for submission of proposal to TMC

a) Submit information as per following documents

- The application to High Rise Committee
- scrutiny fee receipt
- Appointment of Architect, Structural Engineer and Geotechnical Engineer.
- Appendix A
- The initial Scrutiny remarks of TDD,
- Permission /CC given by TDD,
- Traffic Simulation Report
- Fire Brigade NOC
- Structural checklist and documents as per format
- Geotechnical checklist and documents as per format
- Design Basis Report as per format
- Site visit report .

b) Submit 3 sets of Complete Architectural Drawings duly signed & stamped by Project Proponent, Architect & respective Consultant.

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Requirements of fresh submission to High-Rise Committee

1. **At the time of fresh submission:**

a) Proponent should have to submit Permission granted by Town Development Department and Fire Brigade NOC as planned for full potential as can be admissible on date of submission within the purview of DCR 1994 (amended from time to time) alongwith the proposal.

b) All architectural features like detailed dimensioned elevations and façade sections, façade support system details and parameters and description of elevation finishes must be frozen.

c) The application made to High Rise Committee should be based strictly on the currently available FSI with full potential to the project proposed.

2. **High Rise Bldg submission will be made in two stages.**

A. In the first stage,

The structural consultant and the geotechnical consultant shall jointly present the concept and structural scheme of the building, materials used, the design parameters, loading standards, references used, software used, the load flow pattern, foundation system, superstructure framing and construction methodology to be adopted in support of the structural design assumptions and any innovative techniques used in the design of the High Rise Building to convince the HRC that the design will make the building safe, stable and the performance of the building is suitable for comfortable occupancy.

At this stage, the following documents shall be submitted to HRC (High Rise Committee)

i. **Appendix A -** Project Personnel on Record Information Sheet must be filled by the Project Proponent.

ii. **HRC/DBR -** Design Basis Report which includes minimum information shall be submitted.

iii. **Site summary report** in the attached format to be made available at the time of site visit by technical committee for High Rise Building.

Site Visit:-

After the above submission and going through the submitted documents and formats by proponent, technical members of the committee will go for site visit. Respective consultants will have to remain present on site as per site visit schedule. At the time of site visit, the members may convey their comments, suggestions, recommendations and instructions to alter any design aspects of the building if it feels so. The structural /Geotechnical consultant shall have to fulfill all these comments, suggestions, recommendations and instructions if any.

After the resubmission if any and if the HRC is convinced of the appropriateness of the scheme and design methodology, permission will be granted to proceed for the second stage.

B. In the second stage submission, the following documents shall be submitted to HRC.

i. The CD / Pen drive containing the presentation made by the consultants' team as described above.

ii. A checklist shown in document **HRC/CHK-LST-STR-ENG** shall be filled and submitted by Structural Engineer.

iii. All details mentioned in document **HRC/CHK-LST-STR-ENG** must be submitted by the Structural Engineer on Record.

iv. A checklist shown in document **HRC/CHK-LST-GT-ENG** shall be filled and submitted by Geotechnical Engineer.

v. All details mentioned in document **HRC/CHK-LST-GT-ENG** must be submitted by Geotechnical Engineer on Record.

HRC members (Structural & Geotechnical Engineer) will call the concerned consultants team for technical presentation. After scrutinizing the above documents and going through this technical presentation, if and when all parameters appear to be satisfactory, HRC members (Structural & Geotechnical) will clear submitted HRB proposal on technical ground.

3. After this technical clearance, HRC will call Architect for architectural presentation for submitted proposal. After scrutinizing the submitted proposal on permission given by TDD, CFO NOC and above technical clearance, HRC will clear submitted HRB proposal.

4. After the clearance given by HRC for a proposed bldg, no further changes of any kind shall be effected without permission of the HRC.

5. Any changes made in the proposal without obtaining clearance from HRC, earlier clearance given by the HRC shall be treated as revoked / invalid.

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Contextual Guidelines for High Rise Buildings

Use of Guidelines :-

The guidelines are aimed at addressing high rises in mixed types of development and surroundings. The purpose is to integrate the development with the vision of the city which looks at more and more vertical development. Many of the guidelines can vary from place to place and in the context in which the development is proposed, however, in large number of cases, these can be easily applied.

Guidelines for High Rise Development :-

The Guidelines presented below are the minimal requirement and can be further enhanced which can add to the quality of life of people and rejuvenated environmental conditions.

Contextual, Location, Typology

1. A detailed layout of the proposed building and location showing surrounding areas (1-3km) around the site. This preferably includes the details about major roads, road width, access roads to the site, number of high rise building in the vicinity, number of high rise buildings proposed in the locality etc. Apart from this a note of prominent features such as archaeologically important places, Heritage sites, schools, places of worships, forest/national park , creek , lakes etc. be provided. Layout plan should clearly show the distances of other buildings/roads surrounding all 4 sides of the plot.
2. The building creates a view which aims at unifying the features and space.
3. The base of the building and its height (base or podium) should have a proper relationship with the street or roads facing the property. For dense area it could be 1:1 and up to 1:3 depending upon the importance of the street and roads or as per DCR 1994 (amended up to date) . The building should be able to provide appropriate space for the pedestrian besides other spaces for utilities for fire, earthquake, ambulances, riot vehicles/police etc. Design should be able to provide the open spaces close to its own location as also provide public access and movement.

4. High rises are meant to provide spaces for more people by going higher and therefore there is likelihood that there would be need of more open space on ground, for pedestrian and road spaces. Proper setback and space for pedestrian should be created.
5. Minimum distance from one property to another (especially high rise) or buildings within the plots should be at least 20 m or based on the shadow analysis and wind analysis. The shape and location should be such that it can provide sense of space creation.
6. Provision of sidewalks for current and projected pedestrian traffic as high-rises would make more people to use the space. Commercial high-rises should create more pedestrian space and open spaces. Building residents spill out area outside the building and design should also be given importance.
7. Pedestrian walkways development across the area would be the priority which indicates that the creation of newer buildings creates more accessibility and connectivity to open spaces and communities.
8. Walkways design must keep in mind unobstructed and smooth yielding with the movement of able and disable citizens.
9. The setback for the area can consider providing places for buses and public utilities movement and related infrastructure.
10. Location of open spaces should preferably be at the lower level as it provides sense of space as also the buildings related sun, wind, shadow and views. The open space could also be for gatherings, emergency situation, benches, chairs, etc.

Safety and Disaster Management Plan

11. Identify all the risk areas and develop a disaster management plan keeping in view any accidents which may occur within the building or outside.

12. Some of the scenario for disaster would be fire, earthquake, flood, terror strike, power failure, water unavailability, blasts, road congestions, communication, others.
13. The DMP should not be limited to the high rise building but also if disaster strikes neighborhood buildings and activities.
14. Description of any buildings important from architectural, historical, hospitals and other important installations, such as defense, police, jail, railways, airport etc

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APPENDIX – A

Project personnel on record and Contact information

1)	Project Reference No.	HRB -
2)	Municipal Reference No. (VP No.)	
3)	Project Name	As advertised by Developer to the public
4)	Project Address	As mentioned in VP File
5)	Project Proponent / Developer's Name & Signature	
6)	Project Proponent / Developer's Address	
7)	Project Proponent / Developer's Telephone / Mobile / email address	
8)	Architect's Name, qualifications & License No.	
9)	Architect's Address & Signature	
10)	Architect's Telephone / Mobile / email address	
11)	Structural Engineer's Name, qualifications & License No.	
12)	Structural Engineer's Address & Signature	
13)	Structural Engineer's Telephone / Mobile / Email address	
14)	Geotechnical Consultant's Name and qualifications.	
15)	Geotechnical Consultant's Address & Signature	
16)	Geotechnical Consultant's Telephone / Mobile / Email address	
17)	Project Management Consultant's Address & Signature	

HRC/DBR

DESIGN BASIS REPORT

Following data should be part of Design Basis Report.

- **Brief Description of the Project** – Number of basements, commercial floors, residential floors, Service floors, refuge floors, projection above terrace level and number of additional / provisional floors considered in design.
- **List of Codes** – Codes which are considered in design. If any specific reference is taken from foreign codes, same should be clearly mentioned. Any specific assumption in the design should be supported by reference papers.
- **Loading Parameters** – All the loading assumptions shall be clearly mentioned in A3 size GA drawings with sunken loading, live load. Typical sections indicating the elevational / façade features shall be shown. Assumptions and the basis of the same for the elevational features above terrace slab shall be mentioned. Calculation of Time Period for the structure, Importance factor, performance factor shall be specified. Wind terrain category, Gust wind calculations shall be mentioned.
- **Clear cover to Reinforcement** – These shall be mentioned for all structural members with minimum fire rating of 2 hours for columns, shear walls and beams and 1.5 hours for slabs.
- **Grade of concrete** – Grade of concrete for various elements viz. beams, slabs, columns, shear walls.
- **Exposure condition** – Exposure condition assigned to site should be specified.
- **Wind Tunnel Testing** – Wind tunnel analysis should be carried out for all structures with height above 250 m from the normal ground level, keeping in mind the present condition as well as the likely development in the vicinity area after the completion of the project.

- **Construction Sequence and loading parameters for the same** – If due to any site constraints the loading on the floor slabs is to be enhanced, the mention of the same and calculations for the same shall be provided.
- **Proposed Approach to Structural Analysis** – Various flooring systems considered in the structure, the software used for analysis and design approach adopted. Release in moments of link beams, cracked moment of Inertias for structural members along with the assumptions for the same shall be specified.
- **Load Combinations** – Various load combinations used in the design of individual members. Additional combinations from the Wind tunnel tests considered, if any.
- **Soil Profile in Brief** – In brief the soil profile of the project along with the Safe bearing capacity and the type of foundations adopted.
- **Soil Retention system** – A brief description of the soil retention system adopted for the project along with the construction sequence.
- **Key Plan** - showing Expansion / Separation joints (if any).
- **Added Features** – If any additional features are considered in design such as dampers, out rigger beams, etc shall be specified clearly stating the purpose of the same.

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Site summary report to be made available at the time of site visit by technical members of High Rise Committee

Date of visit_____

Note : Site Plan and all Architectural Drawings should be available at the site.

Proposal no. HRB _____

Project name: _____

Project Proponent / Developer	
Architect	
Structural Consultant	
Geotechnical Consultant	
Total Height of Building Proposed	
Total height of Building Constructed so far	
Number of Basements Proposed	
Number of Podiums Proposed	
Number of floors Proposed	
Number of Parking Required as per rules	
Number of Parking Proposed	
Whether additional parking for bicycles and two wheelers proposed	
Area of Plot	
Total Built up Area Proposed	
FSI Utilized	
BU Area as per FSI Calculations	

Area per floor	
Width of access roads available	
Clear open space available from edge of basement	North
	South
	East
	West
Open space available beyond the edge of podium	North
	South
	East
	West
Permanent Open space available	North
	South
	East
	West
Width of Ramp Proposed	
One Way/Two Way	
First Refuge Floor Proposed	
Subsequent Refuge Floors Proposed	
No.of Staircases proposed	
Width of the staircase flight	
Whether stretcher lift proposed	
Whether dedicated fire lift proposed	
Whether CFO‘s NOC for full height of the building obtained	

Length of Cantilever Projection Proposed	
Whether glass façade proposed	
Type of foundation proposed	
SBC to be considered for design	
Shoring Arrangements Made/Proposed	
Whether Rock Anchors Used	
Location of the swimming pool	
Whether Green Building Certification Proposed	
Percentage of Plot Area under Green Cover Proposed	
Whether MOEF NOC obtained	
Grade of Concrete for foundations	
Grade of Concrete for superstructure	
Traffic Studies	

HRC/CHK-LST-STR-ENG

Check List for the Main Structural Consultant

The main structural consultant is required to submit following information.

1) Provide **Design Basis Report** as per the document **HRC/DBR**

2) Provide description of Sub-structure and Super-structure as per the format given in the **Appendix** enclosed.

3) Provide brief Description of Structural System with sketches, images of drg. etc. with specific focus on Lateral load resisting system‘.

4) Provide brief note on modeling, software used etc. Clearly mention whether infill / partition wall is idealized as part of lateral load system?

5) Provide the height of building in mtr.

   5A) Provide plan dimensions of the building (mtr x mtr)

6) Provide following EQ loading details.

   a) Zone Factor =

   b) Importance factor =

   c) Response Reduction factor =

   d) Soil Type =

   e) % LL considered in seismic =

   f) Time Period in the horizontal X-direction (sec)

   (from formula in code) =

   g) Time Period in the horizontal Z-direction (sec)

   (from formula in code) =

   h) Total Seismic weight (Sw) of building (kN) =

   i) Static Base-shear in X-direction (as % of Sw) =

   j) Static Base-shear in Z-direction (as % of Sw) =

k) Table of distribution for static base shear

l) Max. deflection at roof level. (mm)

m) Max. inter storey drift./ Height

7) Provide following Wind loading details.

a) Category of building =

b) Class of building =

c) Basic wind speed in m/sec. =

d) Maximum wind pressure (kN/m2) =

e) Force coefficient =

f) Wind Base-shear in the horizontal X-direction(kN) =

g) Wind Base-shear in the horizontal Z-direction(kN) =

h) Gust factor calculations (if Gust-wind applied)

i) Details of wind-tunnel force data (if applicable)

j) Estimated magnitude of wind induced vibrations =

k) Max. deflection at roof level (mm) =

l) Max. inter storey drift. =

8) Provide following data from Dynamic Analysis.

Modes	**Frequency in Hz**	**Time Period in sec**	**X-participation**	**Z-participation**
Mode 1				
Mode 2				
Mode 3				
Mode 4				
Mode 5				
Mode 6				
Mode 7				
Mode 8				
Mode 9				
Mode 10				
	Summation			

(Note : Fundamental mode should not be a torsional mode)

9) Provide Table for lateral deflections (mm) at Terrace Level in the following format.

Load Case	Dx-max	H/Dx	Drift-x	Dz-max	H/Dz	Drift-z
DL						
DL + LL						
EQx						
EQz						
Wx						
Wz						

10) Provide Corner displacements (mm) for Torsional Irregularity (along x-direction) in the following format.

Load Case	Corner-1	Corner-2	Corner-3	Corner-4	Avg-x	% Max./ Avg.
Eq-x						
WI-x						

11) Provide Corner displacements (mm) for Torsional Irregularity (along z-direction) in the following format.

Load Case	Corner-1	Corner-2	Corner-3	Corner-4	Avg-Z	% Max./ Avg.
Eq-Z						
WI-Z						

12) Provide acceleration (mg) values in the following format.

Eq-x	Eq-Z	WI-x	WI-Z

13) Provide following data regarding Vertical Elements.

a) Size of maximum loaded column =

b) Gravity load on max. loaded column =

c) Axial stress in max. loaded column (Gravity loads) =

d) Grade of max. loaded column =

e) Axial settlement in max. loaded column =

f) Axial settlement in min. loaded column =

g) % Base-shear resisted by all columns along X (static) =

h) % Base-shear resisted by all columns along Z (static) =

14) Provide, if applicable, following data regarding Floating Columns.

a) Total gravity load on floating column (provide table if there are multiple floating columns) =

b) Size and span of girders supporting floating columns =

c) Number of floors supported by floating columns =

d) Deflection of girder under column (from model) =

e) Deflection of girder under column (from s/s action) =

f) Specific details about floating columns on cantilever girders

(Refer Table below)

Column	Supporting Girder		Deflection Values		Floors Above	Total Load in Column
	Size	Span	Model	S/S Action		

15) Provide, if applicable, following data regarding soft story effect.

a) Stiffness of lower floor (in deflection/KN) =

b) Stiffness of upper floor (in deflection/KN) =

c) Relative stiffness ratio (upper/ lower) =

d) Level of soft story =

e) Number of floors above soft story =

16) Provide, if applicable, following data for each cantilever.

a) Cantilever span =

b) Structural system =

c) Nature of usage =

d) Maximum elastic deflection under gravity loads =

17) Provide stability calculations for uplift and overturning (model extract in case of model)

18) Typical design calculations for footings

19) Typical design calculations for RCC columns (Or Composite Columns)

20) Typical design calculations for RCC walls

21) Typical design calculations for RC beams (Or Steel Beams)

22) Typical design calculations for RCC Girders (Or Steel Girders/ Trusses)

23) Typical design calculations for Steel Bracings

24) It is desirable to conduct Wind tunnel studies for any HRB with total height beyond normal ground level exceeding 250 mt. However, such buildings above 250 mt. height can also be designed as per the I.S.Code as well.

25) Provide a note on special provisions suggested for the building (like dampers etc.)

26) Soft copy of model including input and output.

27) Soft copy of Power point presentation including all above points.

28) Items 1 through 27 on CD.

Note : Provide appropriate unit against each quantity.

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HRC/CHK-LST-GT-ENG

Check List for the Main Geotechnical Consultant

Sr.No.	Item	References
1.	Property Details	
	Project Name	
	Project Address	
2.	Detail of the Structure	Includes height abutting the boundaries of the plot
	North side	
	West side	
	South Side	
	East Side	
	No. of Basement	
	Height of each basement	
3.	Soil Investigation Details	
	Boring methods	(Including Double / triple tube for boring)
	No. of Bore holes	As per IS 16700
	Spacing of bore holes	Per wing (As per IS 16700)
	Terminated Depth of Boreholes	As per IS16700
	GWL (m)	
	Testing Laboratory	NABL Accredited (Preferred)
4.	Foundation	
	Type of proposed foundation	
	Depth of Footing /raft pile termination	
	Load Calculation / contact pressure	Factored load on footing or column / ach pie group (Yes /No)
	SBC estimated	Methods
	Sub-grade Elastic Modulus	Based on Lab /field test
	Settlement/ Differential settlement	Yes /No
	Uniform /Differential settlement	Yes/ No

4.1	Raft Foundation	
	Bottom level of raft	
	Minimum clearance between outermost basement retaining wall and compound wall	
	Size	
	Thickness	
	Depth	
	Modulus of Subgrade Reaction	Based on Experiment /interpretation
	Modeling of Soil for raft foundation	Clause 9.7.1 Of IS16700 (2017)
	Anchors details (If Required)	(Yes /No) If yes (Footing load test for confirmation of sharing raft load)
4.2	Pile Raft	
	Sharing of load by raft and piles	Include calculation
	Pile cap rest on strata	Yes/ No If Yes (Footing load test for confirmation of sharing raft load)
	Pile raft design	Soil – Structure interaction is necessary as per IS 16700 (2017)
	Foundation settlement and pressure measurement	As per clause 11.3 of IS 16700 (2017)
4.3	Pile Foundation	
	Type, diameter, spacing	
	Socket depth	1.5D, 3D etc.
	Foundation settlement and pressure measurement	As per clause 11.3 of IS 16700 (2017)
4.4	Lateral load analysis	IS code of p – y Curves
	Pile load test	Static tests (% as per BIS) then dynamic load tests and pile integrity tests.
	Initial	
	Routine	
	Any other Field test / conducted / recommended	
4.5	Uplift capacity of foundation	Detail Calculation
	Based on wind pressure	
	Based on GWL	
	Based on earthquake	

	If rock anchors are used are they grouted after installation and stressing? Or Passive achor	Yes/No , If yes provide detailed calculation
	Whether pressure release pipes have been used ?	Yes/No
5	Shoring Arrangement	
	Has a shoring system been installed	Yes/No
	Type (touching piles C/C spacing Secent pile / diaphragm wall)	Are required in the report
	Size and Depth	
	Anchors if required	Preferably no anchors only Case specific with all necessary precaution and permissions
	GWL	Included in the lateral pressure calculations
7	Retaining wall (If any)	Yes / No
8	Submission of final report	In advance to authority should reach the minimum 5 days before

Project Proponent

Stamp and Signature

Architect

Stamp, Signature &

License No

DESIGN BASIS REPORT (Guidelines for Geotechnical Report)

1. Geotechnical Report must be included in two parts,

   Part A :- Geotechnical investigation and

   Part B :-Geotechnical Interpretation for the safe and economic foundation the final report submitted must be in consultation with all concerning agencies (Architect, Structural consultant etc.) in no case general recommendation shall be proposed.

2. All Relevant BIS must be followed including NBC code is IS 16700 (2017) for Tall structural.

3. Foundation details (Typical or special) must be included with cross-section plan etc.

4. Detail analysis and design of above mentioned features must be included in the report and highlighted in presentation In no case recommendation shall be made without calculations.

5. All Parameters, Especially for soil / rock must be investigation experimentally and in no case they should be assumed in the shear and settlement calculations.

6. In case of pile foundation, single and group capacities including settlement details must be included in the report. In no case single pile capacity is recommended in the design.

7. Provide appropriate SI Unit against each quantity.

8. Building height above 150/250 m must follow the guidelines as per is IS 16700 (2017).

9. Soft copy of software analysis used in the report must be submitted along with report.

Information Available During HRC Visit

Part A (as mention above)

I. Site Details

II. Location (Including Google map)

III. General geology of topography

IV. Codes / Standard followed

V. Investigation by Double / Triple tube

VI. Bore logs

VII. Soil profile

VIII. Field /Lab tests (Soil tests are compulsory even foundation proposed on rock)

IX. Tests from NABL laboratory

X. Presence of GWL

XI. Test on rock samples within stress influences zone (Should represent in entire soil profile). In no case one or two samples should represent UCS.

XII. If footing plan is finalized then include Bearing Capacity And Settlement.

SUBMISSION OF FINAL REPORT

Report presented during the visit should be modified including suggestion if any in the final submission

Part A

Chapter 1

a. Introduction
b. Location of site, Geographical (example Google map)
c. Geology of region

Chapter 2

a. Design soil / rock parameters
b. Input parameters for Super- Structure (Fx , Fy ……Mx, My) for various cases.
c. Column shear wall layout /Software mode used for frame analysis of foundation model coordinates.
d. Field test results for various parameters (Static Load test / Pile Load Test etc.) Quantity and quality must be as per codes.
e. Laboratory test results for soil / rock (physical Properties, Elastic Properties etc…)

PART B

a. Trial section or typical section of foundation/ raft/ Pile group (Plan, Cross- Section etc)
b. Theoretical analysis (safe bearing capacity, settlement referring various codes. Analysis for shallow foundation or pile foundation resting on weathered rock must be supported with alternate methods. For example method based on core strength verified by Cole. & Stroud and other empirical methods, sample calculation must be incorporated.
c. Soil Structure analysis as per IS 16700 (2017)
d. Validation of theoretical analysis with field test results.

Chapter 4

a. Undertaking of strata confirmation in case of open foundation termination criteria for pile foundation from Geotechnical consultant, For confirmation in situ tests must be supported by various monitoring methods. Ex.PPR.
b. In any case foundation stracta must be certified by Geotechnical Engineer and not by Contractor or machine operator.
c. Undertaking for various static NDT (Dynamic & integrity etc.) tests as per standards include the same if tests are conducted before submission.
d. Undertaking for various instrumentation and monitoring stage wise construction.

Presentation of HRC

a. Presentation must follow the final report.
b. No deviation (addition /deletion) with respect to final report.
c. Software analysis output must be presented with input Parameter

Note :- If any additional technical analysis required then may be included

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