PUNE MUNICIPAL CORPORATION

OFFICE OF THE CITY ENGINEER (PMC),

Structural Scrutiny Sheet For High Rise Building

H.R.B. No._____

DESIGN BASIS REPORT

For M/s. _____

Project Name:

1	Project Reference No. (HRC Folio No)	HRB-
2	Municipal Reference No. (Building Proposal Ref. / File No.)	
3	Project Name	
4	Project Address	
5	Project Proponent / Developer's Name	
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	
10	Architect's Telephone / Mobile / email address	
11	Structural Engineer's Name, Qualifications & License No.	
12	Structural Engineer's Address.	
13	Structural Engineer's Telephone/ Mobile / Email address.	
14	Geotechnical Consultant's Name and qualifications.	
15	Geotechnical Consultant's Address.	
16	Geotechnical Consultant's Telephone / Mobile / Email address.	
17	M.E.P. Consultant's Name, Address, License No & Signature.	
18	M.E.P. Consultant's Telephone / Mobile / Email address.	

List of Drawings

1	Foundation
2	Columns and Shear Walls
3	Framing Plans for all floors

DESIGN DATA

STRUCTURAL INFORMATION

Section Showing number of floors along with height per floor and total height.

1) STRUCTURAL RELATED GENERAL INFORMATION

Total No. of floors	
• No of basements floors with height	
• Number of podium Floors along with height of floor	
• No of Stilt floor with height	
• Number of Residential Floors	
• Number of Refuge Floors	
• Number of service Floors	
• Number of Fire check Floors	
Total height of building	

2) LIST OF CODES

I. IS 456 – 2000 - Plain and reinforced concrete- code of practice

II. IS 1893 – (Part I) – 2016 Criteria for earthquake resistant design of structures.

III. IS 875 – (Part –I) – 1987 edition 3.1(1997-12) Code of practice for design loads (other than earthquake) for buildings and structures- Dead loads

IV. IS 875 – (Part- II) – 1987 - reaffirmed 1997) Code of practice for design loads (other than earthquake) for buildings and structures.- Imposed loads

V. IS 875 – (Part – III) – 2015 - Code of practice for design loads (other than earthquake) for buildings and structures.- Wind loads

VI. IS 875 – (Part – V) -1987- reaffirmed 1997) Code of practice for design loads (other than earthquake) for buildings and structures.- special loads and load combinations.

VII. IS 13920 – 2016 - Ductile detailing of reinforced concrete structures subjected to seismic forces- code of practice.

3) LOADING PARAMETERS

1.1 Dead loads and live loads on different units of structure as follows

a) Typical Residential Floors

Self Weight - slab = _____ KN/m^2

Superimposed Dead Load

Floor Finishes = _____ KN/m^2

Total Superimposed Dead Load = _____KN/m^2

Live Load = _____KN/m^2

b) Core Area / Corridors / Lobby /Stair cases

Self Weight - slab = _____ KN/m^2

Superimposed Dead Load

Floor Finishes = _____ KN/m^2

Total Superimposed Dead Load = _____KN/m^2

Live Load = _____KN/m^2

c) Wet Area / Toilets

Self Weight - slab = _____ KN/m^2
Superimposed Dead Load
Floor Finishes = _____ KN/m^2
Total Superimposed Dead Load = _____KN/m^2
Live Load = _____KN/m^2

d) For Podium floors

Self Weight - slab = _____ KN/m^2
Superimposed Dead Load
Floor Finishes = _____ KN/m^2
Total Superimposed Dead Load = _____KN/m^2
Live Load = _____KN/m^2

e) For Part Refuge Floors

Self Weight - slab = _____ KN/m^2
Superimposed Dead Load
Floor Finishes = _____ KN/m^2
Total Superimposed Dead Load = _____KN/m^2
Live Load = _____KN/m^2

Separate loads for water tank portion as per water height

f) For Fire check Floors

Self Weight - slab = _____ KN/m^2
Superimposed Dead Load
Floor Finishes = _____ KN/m^2
Total Superimposed Dead Load = _____KN/m^2
Live Load = _____KN/m^2

g) For Service check Floors

Self Weight - slab = _____ KN/m^2
Superimposed Dead Load
Floor Finishes = _____ KN/m^2
Total Superimposed Dead Load = _____KN/m^2
Live Load = _____KN/m^2

h) For Terrace Floors

Self Weight - slab = _____ KN/m^2
Superimposed Dead Load
Floor Finishes = _____ KN/m^2
Total Superimposed Dead Load = _____KN/m^2
Live Load = _____KN/m^2

4) GRADE OF CONCRETE AND STEEL FOR STRUCTURAL MEMBERS

i) Grade of concrete

For Raft = _____ Grade Concrete

Please indicate grades member wise and along with levels.

ii) Grade of Reinforcement Steel - _____ TMT

5) ENVIRONMENTAL EXPOSURE CONDITIONS

As per exposure conditions given in IS 456:2000

Sub Structure:

All Substructure elements

Super Structure:

All external columns and peripheral beams-

All internal columns, beams and floor slabs-

6) WIND TUNNEL TEST

If performed

7) CONSTRUCTION SEQUENCE AND LOADING PARAMETERS

Construction to be done in single phase

8) PROPOSED APPROACH TO STRUCTURAL ANALYSIS

I. ETabs – 16.2.1
II. Safe 16 –

Or Staad / or any other software as applicable to be mentioned

9) LIST OF DESIGN LOAD COMBINATIONS AS PER IS: 875(PART-5)

To be added as applicable

10) SOIL PROFILE IN BRIEF

Geo technical investigation report is attached herewith.

11) SOIL RETENTION SYSTEM

Provide soil retention system with calculations.

12) EXPANSION JOINT/SEPARATION JOINT

Provide detailed calculations

13) ADDED FEATURES

Provide .

14) Check List for the Main Structural Consultant

1.	Design Basis Report as per the document HRC/DBR/V1.0.		
2.	Description of Sub-structure and Super-structure as per the format given in the Appendix enclosed.		
3.	Brief Description of structural system with sketches, image of drg. Etc. with specific focus on 'Lateral load resisting system'		
4.	Brief note on modeling, software used etc. Clearly mentioned whether infill/ partition wall is idealized as part of lateral load system?		
5.	Method of Analysis		
6.	Earthquake parameter		
a)	Zone Factor	Z =	
b)	Importance factor	I = 1.2 or 1.5	
c)	Response Reduction factor	R = ____ (IS 1893:2016) along with explanation	
d)	Soil Type		
e)	% LL considered in seismic		
f)	Time Period in the horizontal X-direction as per code IS: 1893 (Part 1)-2016 – 7.6.2(b)	Tx = $\frac{0.09h}{\sqrt{d}x}$ h= Height of Building = _____sec	$T_a = \frac{0.075h^{0.75}}{\sqrt{A_w}} \geq \frac{0.09h}{\sqrt{d}}$ **OR** $A_w = \sum_{i=1}^{N_w}\left[A_{wi}\left\{0.2+\left(\frac{L_{wi}}{h}\right)^2\right\}\right]$
g)	Time Period in the horizontal Y-direction as per code IS: 1893 (Part 1)-2016– 7.6.2(b)	Ty = $\frac{0.09h}{\sqrt{d}y}$ h= Height of Building = _____Sec.	$T_a = \frac{0.075h^{0.75}}{\sqrt{A_w}} \geq \frac{0.09h}{\sqrt{d}}$ **OR** $A_w = \sum_{i=1}^{N_w}\left[A_{wi}\left\{0.2+\left(\frac{L_{wi}}{h}\right)^2\right\}\right]$
h)	Total Seismic weight KN	___ KN	
i)	Static base shear in X direction in KN		
j)	Static base shear in Y direction in KN		
k)	Dynamic base shear X direction in KN		
l)	Dynamic base shear Y direction in KN		
m)	Scale Factor X- direction		
n)	Scale Factor Y- direction		
o)	Maximum Deflection at roof level		
p)	Maximum inter storey drift In X direction In Y direction		

q) Table of distribution for base shear: For Dynamic base shear

Story	Load	VX	Load	VY
OHWT-LMR TOP				
OHWT-LMRBTM				
TERRACE				

r) Graph of distribution for SEPC-X of base shear (Dynamic)

s) Graph of distribution for SEPC-Y of base shear (Dynamic)

7) Wind loading parameter and results:

Wind loading Parameters		
a)	Category of building	
b)	Class of building	
c)	Basic wind speed in m/sec	
d)	Wind speed parameter	
	K1	
	K2 for height _____m	
	K3	
	Ka	
	Kd	
	Kc	
	Design wind speed at terrace level Vzin m/s	= K1 x k2 x k3 x k4x Vb = _____ = _____ m/s
	Wind pressure at terrace level Pz = kn/m^2	=Cf x 0.6 x Vz^2 = _____ = _____KN/m^2
e)	Shape factor (force coefficient)Cf As per IS875-Part-3-Fig no. 4A	
f)	Gust factor calculations	
g)	Wind tunnel test	

h) Base shear and Maximum Deflection due to wind loads

No.	Loading Type	Wind Base Shear (KN)		Deflection (MM)		Story Drift (%)	
		X	Y	X	Y	X	Y
1	Static						
2	Gust						

7. f.1).**GUST WIND LOAD CALCULATIONS – in X direction:-**

H	Total height of main structure of the building in meters above Ground level		
B	Breadth of a structure in the horizontal plane normal to wind direction		
D	Maximum base dimension of building in meters In a direction parallel to the applied wind force.		
T_x	Time period of building /structure in along wind direction (Second Mode)		
f_{ax}	1/T		
g_R	Peak factor for resonant response √[2ln(3600Xfa)]		
β	Damping Coefficient Bolted Steel/RCC Structure		
k_1	probability factor(risk coefficient)		
k_2	terrain roughness and height factor		
k_3	topography factor		
k_4	importance factor for cyclonic region All other structures		
V_b	Regional wind basic speed, for MUMBAI		
V_{hd}	Design Hourly mean wind speed at height z		
	$V_{hd} = V_b\ k_1\ k_2\ k_3\ k_4$		
p_z	wind pressure at height z		
	$0.60\ V_{hd}^2$		
K_d	Wind directionality factor		
K_a	Area Averaging Factor		
K_c	Combination Factor		
p_d	Design Wind Pressure		
	$K_d K_a\ K_c\ p_z$		
L_h	Measure of effective turbulence length scale at height h		
	Category 3		
N	Effective reduced frequency		
E	Spectrum of turbulence in the approaching wind stream		
b_{0h}	Average breadth of buiding between 0 to h		
S	Size reduction factor		
H_s	Height Factor for resonance response		
g_v	Peak factor for upwind velocity fluctuation		
z_{oi}			

$I_{h,i}$	Turbulence intensity at height h in terrain category i		
r	roughness factor		
B_s	Background Factor		
ϕ	factor to account for second order turbulence intensity		
Gx	Gust Factor $1+r\sqrt{([g_v^2.B_s(1+\phi^2)]+[H_s g_r^2 SE/\beta])}$		

7. f.2).**GUST WIND LOAD CALCULATIONS – in Y direction:-**

H	Total height of main structure of the building in meters above Ground level		
B	Breadth of a structure in the horizontal plane normal to wind direction		
D	Maximum base dimension of building in meters In a direction parallel to the applied wind force.		
T_x	Time period of building /structure in along wind direction (First Mode)		
f_{ax}	l/T		
g_R	Peak factor for resonant response √[2ln(3600Xfa)]		
β	Damping Coefficient Bolted Steel/RCC Structure		
k_1	probability factor(risk coefficient)		
k_2	terrain roughness and height factor		
k_3	topography factor		
k_4	importance factor for cyclonic region All other structures		
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p_d	Design Wind Pressure		
	$K_d K_a\, K_c\, p_z$		
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	Category 3		

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ϕ	factor to account for second order turbulence intensity		
Gx	Gust Factor $1+r\sqrt{([g_v^2.B_s(1+\phi^2)]+[H_s g_r^2 SE/\beta])}$		

8) Data from Dynamic Analysis

Mode	**Period**	Frequency	**X-Participation**	**Y-Participation**	**RZ-Participation**	**Sum -X**	**Sum -Y**	**Sum-RZ**
	sec		X-Translation	Y - Translation	Rotation			
1								
2								

9) Table for diaphragm displacement at Terrace Level

Load	**Dx-Max**	**H/Dx**	**Drift-X**	**Dy-Max**	**H/Dy**	**Drift-Y**
Case	**(MM)**		%	**(MM)**		%
DL						
DL+LL						
EQX						
EQY						
WX						
WY						

10) Table for Torsion irregularity

a) (along X-direction)

Load case	**Corner -1**	**Corner -2**	**Corner -3**	**Corner -4**	**Corner -5**	**Avg-X**	**% = Max/Avg**	**Max/ Min**
EQX								
WX								

b) (along Y-direction)

Load case	Corner -1	Corner -2	Corner -3	Corner -4	Corner -5	Avg-X	% = Max/Avg	Max/ Min
EQY								
WY								

11) Data regarding Vertical Elements.

a)	Maximum loaded column/shear wall no.	
b)	size column/shear wall in mm	
c)	Factored Gravity load on col./wall in KN	
d)	Factored Axial stress in max. loaded column	
e)	Grade of max. loaded column at base	
f)	Unfactored Axial settlement in max. loaded column/wall	
g)	Minimum loaded column/Shear wall no.	
h)	Unfactored Axial settlement in Minimum loaded column/wall	
i)	% Base-shear resisted by all columns & walls along X (static)	
j)	% Base-shear resisted by all columns & walls along Y (static)	

12) Data for each cantilever.-

Buildings	
Cantilever span in meter	
Beam Size	
Nature of class	
Maximum elastic deflection under gravity load in mm	

13) Details of transfer if any Its calculations along with simply supported deflection and analysis deflection given by program

14)	Provide stability calculations for uplift and overturning (model extract in case of model)	
15)	Typical design calculations for footings	Annexure A
16)	Typical design calculations for RCC Column	Annexure B
17)	Typical design calculations for RCC beams	Annexure C
18)	Typical design calculations for Steel Bracings	Annexure D
19)	Wind tunnel studies shall be conducted for any HRB with total height beyond normal ground level exceeding 250 mt. Wind tunnel studies shall include modeling of all surrounding obstacles in the area. The report from study should be submitted.	
20)	Provide a note on special provisions suggested for the building (like dampers etc.)	
21)	Soft copy of model including input and output.	
22)	Soft copy of Power point presentation including all above points.	
23)	Items 1 to 23 on CD.	

APPENDIX

DESCRIPTION OF SUB-STRUCTURE

NO. OF BASEMENT		
Minimum clearance between outermost basement retaining wall and compound wall		
Has a shoring system been installed? Submit section detail of the shoring system		
Give details of methodology used to resist uplift pressure due to ground water	Bottom Level of Raft w.r.t. ground level in mts.	
	Total downward load of self weight of raft + Counter weight over raft	

	Water level assumed for uplift calculation	
Description of the foundation for the tower block Nature of Foundation	Rock Anchors	
SBC assumed T/sq.mt.		
Sub-grade Elastic Modulus		
Pile dia with capacity		
Flooring system of the Basements		
Retaining wall types & Sequence of backfilling	Whether propped cantilever, Cantilever Supported between Buttresses / Counter forts, etc.	
Intended Use of basements		
If rock anchors are used, are they grouted after installation and stressing?		
Is structural steel used in the construction of the sub-structure?		
If yes, what are the measures taken for its fire proofing and corrosion resistance?		
Whether Expansion/Separation joints provide?		
Whether expansion joint/separation joint continues through basement?		
If yes, detail at Basement level & retaining wall junction		

DESCRIPTION OF STRUCTURE

No. of Floors	
Shape Of Building, Plan, Elevation whether Symmetric in Elevation	

Maximum plan dimension in M	
Ratio of Plan dimension	
Typical Floor to floor height in mt. Maximum floor to floor height in entire height of building in mt.	
Aspect Ratio (Ht. of building till terrace/Minimum dimension of building	
Type of floor slab	
Average slab thickness	
Whether Wall are RCC, Composite or In structural steel	
Lateral System Whether the Geometry of Building is Symmetric	
Whether the lateral load resisting system is symmetrically placed in Geometry	
Use of floor at different levels (Residential / Commercial / industrial)	
Is there any Transfer level If yes, depth of Transfer Girder	
Whether Expansion joint is provided? If yes, what is the maximum plan dimension in mt.	
Whether separation gap is sufficient joint is provide?	
Maximum cantilever projection in mt.	

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