THAT'S IT KNIT (EXTENSION)

59 South Panishile, Zirani, Kashimpur, Gazipur.
(23.989606N, 90.258063E)
27 February 2024

RMG SUSTAINABILITY COUNCIL

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1. Building Information

7-Storied Utility Building: Seven-storied (G+6) RCC building.

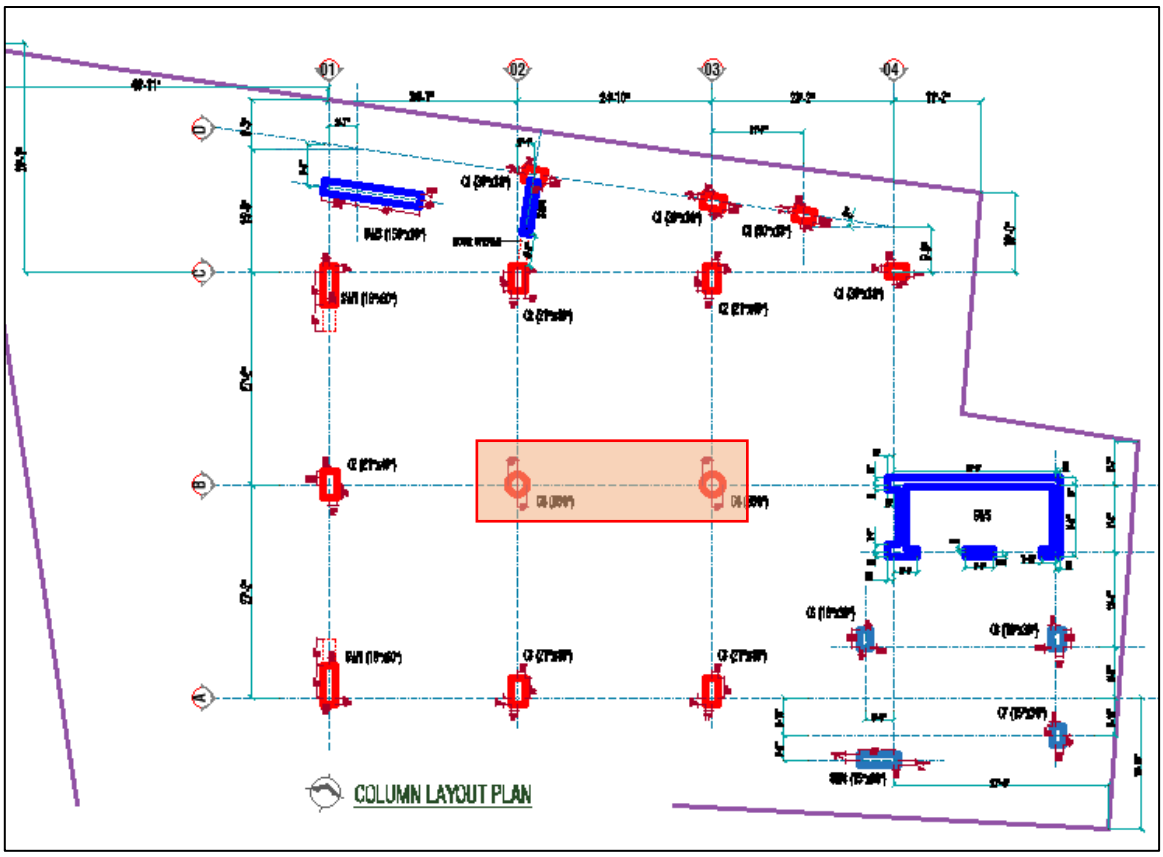
Boiler Room: single-storied RCC building**.**

RMS, Store & Guard Room: single-storied RCC building**.**

Cable Bridge: Steel frame structure.

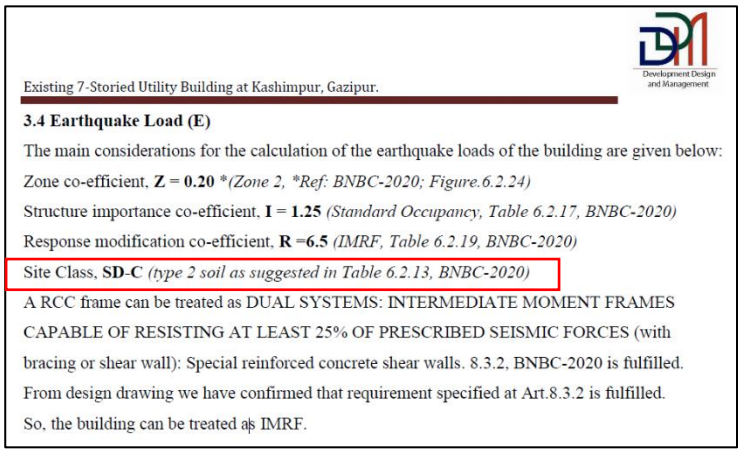
2. Observations

Observation-1: Marginal stress in column exceeds normal design limit (7-Storied Utility Building).



Description: The cursory calculation indicates that stress in the marked column exceeds the normal design limit considering the provided floor live load of 5 kPa/6 kPa for typical floors, roof live load of 5 kPa, and concrete strength of 16.1 MPa. The building engineer is required to review the design, loads, and column stresses for the marked columns based on in-situ material strength. The factory engineer is also required to Produce and actively manage a loading plan for all floor plates within the factory considering floor capacity and column capacity.

Observation-2: Soil investigation report does not comply with BNBC requirements. (7-Storied Utility Building).



Existing 7-Storied Utility Building at Kashimpur, Gazipur.

3.4 Earthquake Load (E)

The main considerations for the calculation of the earthquake loads of the building are given below:

Zone co-efficient, **Z = 0.20** **(Zone 2, *Ref: BNBC-2020; Figure.6.2.24)*

Structure importance co-efficient, **I = 1.25** *(Standard Occupancy, Table 6.2.17, BNBC-2020)*

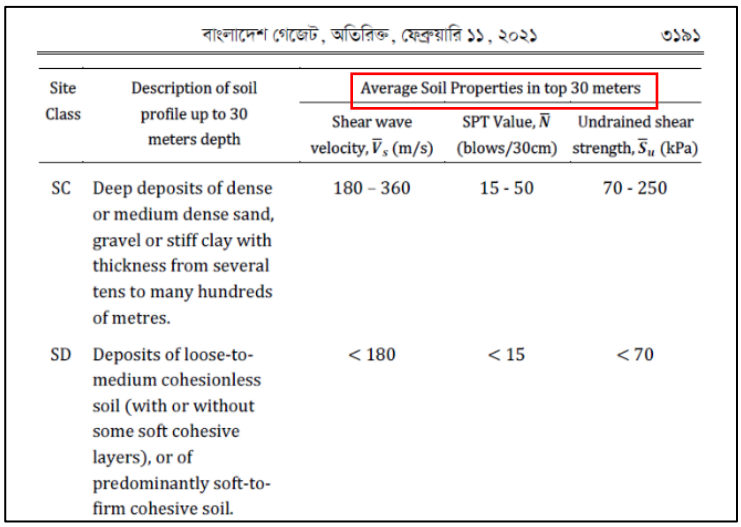
Response modification co-efficient, **R =6.5** *(IMRF, Table 6.2.19, BNBC-2020)*

Site Class, **SD-C** *(type 2 soil as suggested in Table 6.2.13, BNBC-2020)*

A RCC frame can be treated as DUAL SYSTEMS: INTERMEDIATE MOMENT FRAMES CAPABLE OF RESISTING AT LEAST 25% OF PRESCRIBED SEISMIC FORCES (with bracing or shear wall): Special reinforced concrete shear walls. 8.3.2, BNBC-2020 is fulfilled.

From design drawing we have confirmed that requirement specified at Art.8.3.2 is fulfilled.

So, the building can be treated as IMRF.



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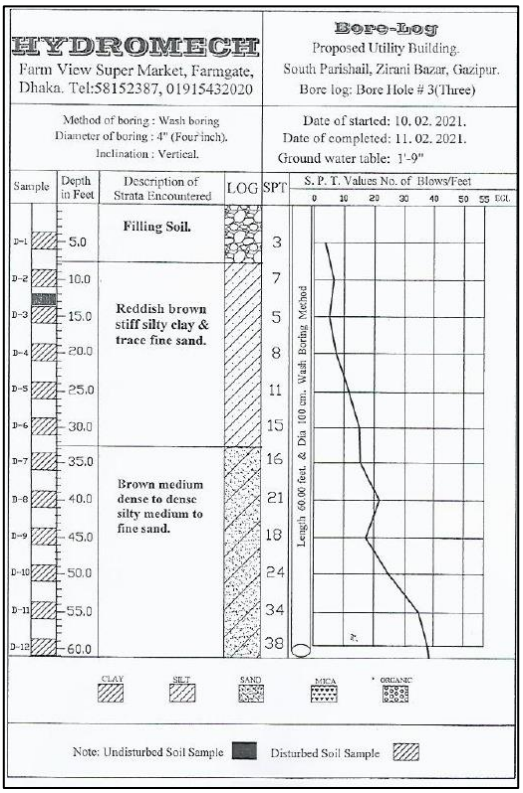
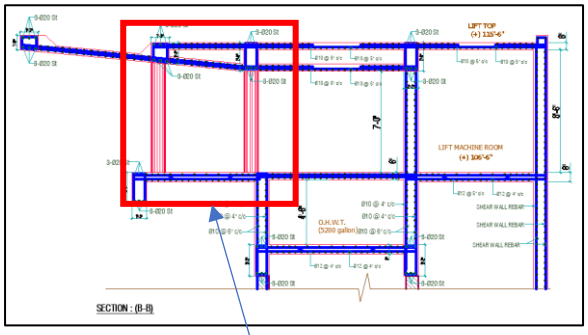
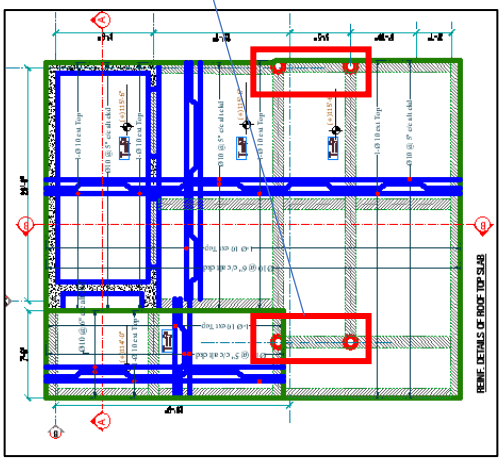
Site Class	Description of soil profile up to 30 meters depth	Average Soil Properties in top 30 meters		
		Shear wave velocity, $\overline{V}_s$ (m/s)	SPT Value, $\overline{N}$ (blows/30cm)	Undrained shear strength, $\overline{S}_u$ (kPa)
SC	Deep deposits of dense or medium dense sand, gravel or stiff clay with thickness from several tens to many hundreds of metres.	180 – 360	15 - 50	70 - 250
SD	Deposits of loose-to-medium cohesionless soil (with or without some soft cohesive layers), or of predominantly soft-to-firm cohesive soil.	< 180	< 15	< 70

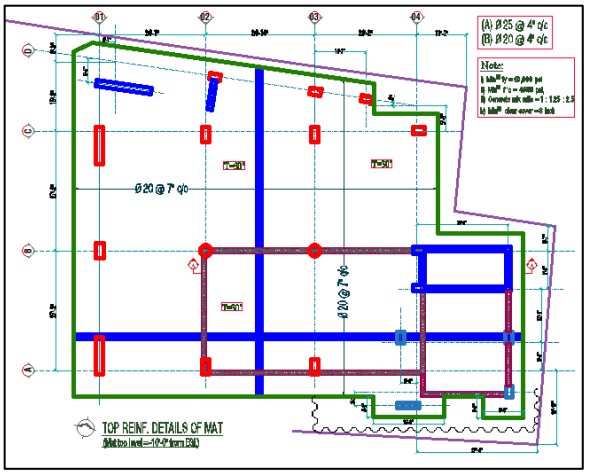


Description: During inspection, a geotechnical investigation report has been provided by the factory for the existing 7 storied factory building. The report consists of 6 borehole data up to a depth of 18m. As per BNBC table no 6.2.13 requirement a 30m bore is required to determine the average SPT "N" value. In the design report Site class "SD" has been considered to determine the Seismic design category based on this soil test report. The building engineer is required to investigate the soil layer at a minimum depth of 30m and revise the design report accordingly.

Observation-3: Lack of information in design report (7-Storied Utility Building).







Description: Beam adequacy check for additional loading from the column: At the top of roof of 7 storied utility building, the additional circular column is found directly supported by the roof beam. The building engineer is required to check the beam adequacy for additional loading from the column and incorporate it in the design report.

Surcharge loading on MAT is missing in the design report: The building foundation is a MAT foundation. The Mat foundation is loaded with surcharge from topsoil/sand. The building engineer is required to consider the surcharge coming from the soil on the MAT foundation and incorporate it in the design report.

Observation-4: Column at the ground floor susceptible to vehicular impact (7-storied Utility Building).

Description: During inspection, it was found that the ground floor columns of the 7-Storied Utility Building are susceptible to vehicular impact. The factory is required to provide adequate barriers around the column on the ground floor to prevent vehicular impact.

Observation-5: Inconsistency in the design report (Boiler Room).

Structural Design Report of Proposed Boiler Building for TIKL

3.4 Earthquake Load (E)

The main considerations for the calculation of the earthquake loads of the building are given below:

Zone co-efficient, **Z = 0.28** **(Zone 3, *Ref: BNBC-2020; Figure.6.2.24)*

Structure importance co-efficient, **IV = 1.5** *(Standard Occupancy, Table 6.2.17, BNBC-2020)*

Response modification co-efficient, **R =8.0** *(IMRF, Table 6.2.19, BNBC-2020)*

Site Class, **SC** *(type 2 soil as suggested in Table 6.2.13, BNBC-2020)*

A RCC frame can be treated as Special Moment resisting frame if requirement mentioned at Art. 8.3.2, BNBC-2020 is fulfilled.

From design drawing we have confirmed that requirement specified at Art.8.3.2 is fulfilled. So, the building can be treated as SMRF.

Structural Design Report
of
PROPOSED BOILER BUILDING FOR TIKL
At
ZIRANIBAZER, KASHIMPUR, GAZIPUR

DECEMBER 25, 2022

Client
HA-MEEM GROUP

Consultant:

Development Design and Management

Table 6.2.15: Seismic Zone Coefficient *Z* for Some Important Towns of Bangladesh

Town	Z	Town	Z	Town	Z	Town	Z
Bagerhat	0.12	Gaibandha	0.28	Magura	0.12	Patuakhali	0.12
Bandarban	0.28	Gazipur	0.20	Manikganj	0.20	Pirojpur	0.12
Barguna	0.12	Gopalganj	0.12	Maulvibazar	0.36	Rajbari	0.20
Barisal	0.12	Habiganj	0.36	Meherpur	0.12	Rajshahi	0.12
Bhola	0.12	Jaipurhat	0.20	Mongla	0.12	Rangamati	0.28
Bogra	0.28	Jamalpur	0.36	Munshiganj	0.20	Rangpur	0.28
Brahmanbaria	0.28	Jessore	0.12	Mymensingh	0.36	Satkhira	0.12
Chandpur	0.20	Jhalokati	0.12	Narail	0.12	Shariatpur	0.20
Chapainababganj	0.12	Jhenaidah	0.12	Narayanganj	0.20	Sherpur	0.36
Chittagong	0.28	Khagrachari	0.28	Narsingdi	0.28	Sirajganj	0.28
Chuadanga	0.12	Khulna	0.12	Natore	0.20	Srimangal	0.36
Comilla	0.20	Kishoreganj	0.36	Naogaon	0.20	Sunamganj	0.36
Cox's Bazar	0.28	Kurigram	0.36	Netrakona	0.36	Sylhet	0.36
Dhaka	0.20	Kushtia	0.20	Nilphamari	0.12	Tangail	0.28
Dinajpur	0.20	Lakshmipur	0.20	Noakhali	0.20	Thakurgaon	0.20
Faridpur	0.20	Lalmanirhat	0.28	Pabna	0.20		
Feni	0.20	Madaripur	0.20	Panchagarh	0.20		

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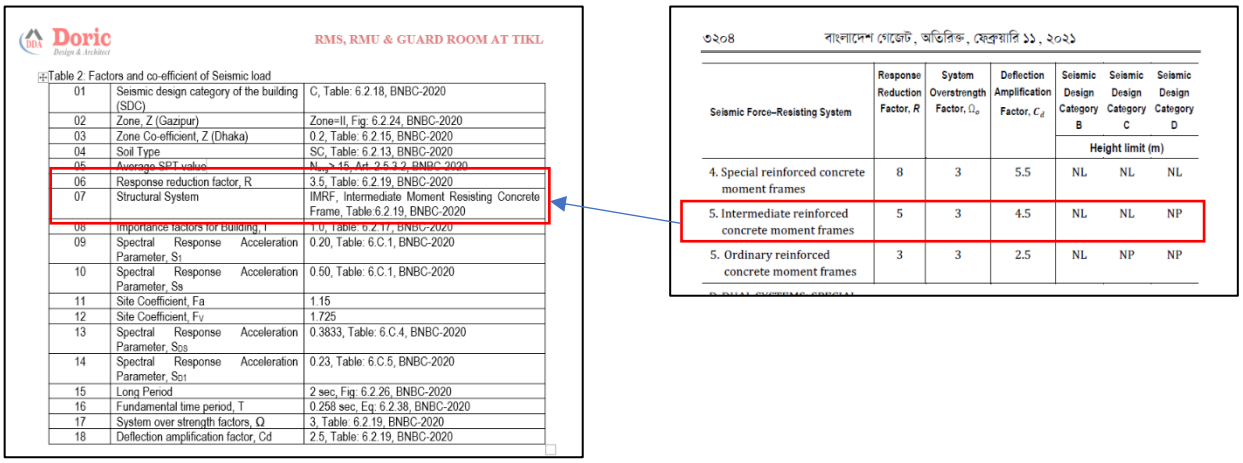
Seismic Force–Resisting System	Response Reduction Factor, *R*	System Overstrength Factor, Ω_o	Deflection Amplification Factor, C_d	Seismic Design Category B	Seismic Design Category C	Seismic Design Category D
				Height limit (m)		
4. Special reinforced concrete moment frames	8	3	5.5	NL	NL	NL
5. Intermediate reinforced concrete moment frames	5	3	4.5	NL	NL	NP
5. Ordinary reinforced concrete moment frames	3	3	2.5	NL	NP	NP

Description: In the design report of the Boiler room for earthquake loading Seismic zone coefficient has been considered as Zone 3 (Z= 0.28) and the response modification co-efficient considered as IMRF (R=8). However, as per BNBC 2020, Gazipur is in seismic zone 2 (Z=0.2) and the response modification coefficient for intermediate reinforced concrete moment frame is (R= 5). The building engineer is required to update the design report as per BNBC requirement and submit it to RSC for review.

Observation-6: Inconsistency in the design report for (RMS, Store & Guard Room).



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RMS, RMU & GUARD ROOM AT TIKL

Table 2: Factors and co-efficient of Seismic load

01	Seismic design category of the building (SDC)	C, Table: 6.2.18, BNBC-2020
02	Zone, Z (Gazipur)	Zone=II, Fig: 6.2.24, BNBC-2020
03	Zone Co-efficient, Z (Dhaka)	0.2, Table: 6.2.15, BNBC-2020
04	Soil Type	SC, Table: 6.2.13, BNBC-2020
05	Average SPT value	N_{av} >15, Art. 2.5.3.2, BNBC-2020
06	Response reduction factor, R	3.5, Table: 6.2.19, BNBC-2020
07	Structural System	IMRF, Intermediate Moment Resisting Concrete Frame, Table:6.2.19, BNBC-2020
08	Importance factors for Building, I	1.0, Table: 6.2.17, BNBC-2020
09	Spectral Response Acceleration Parameter, S_1	0.20, Table: 6.C.1, BNBC-2020
10	Spectral Response Acceleration Parameter, Ss	0.50, Table: 6.C.1, BNBC-2020
11	Site Coefficient, Fa	1.15
12	Site Coefficient, Fv	1.725
13	Spectral Response Acceleration Parameter, S_{DS}	0.3833, Table: 6.C.4, BNBC-2020
14	Spectral Response Acceleration Parameter, S_{D1}	0.23, Table: 6.C.5, BNBC-2020
15	Long Period	2 sec, Fig: 6.2.26, BNBC-2020
16	Fundamental time period, T	0.258 sec, Eq: 6.2.38, BNBC-2020
17	System over strength factors, Ω	3, Table: 6.2.19, BNBC-2020
18	Deflection amplification factor, Cd	2.5, Table: 6.2.19, BNBC-2020

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Seismic Force–Resisting System	Response Reduction Factor, R	System Overstrength Factor, Ω_o	Deflection Amplification Factor, C_d	Seismic Design Category B	Seismic Design Category C	Seismic Design Category D
				Height limit (m)		
4. Special reinforced concrete moment frames	8	3	5.5	NL	NL	NL
5. Intermediate reinforced concrete moment frames	5	3	4.5	NL	NL	NP
5. Ordinary reinforced concrete moment frames	3	3	2.5	NL	NP	NP

Description: In the design report of RMS, Store & Guard Room for earthquake loading response modification co-efficient considered as IMRF (R=3.5). However, as per BNBC 2020 response modification coefficient for intermediate reinforced concrete moment frame is R= 5. The building engineer is required to update the design report as per BNBC requirement and submit it to RSC for review.

3. Action Plan

Observation	Action Plan	Timeline
Marginal stress in the column exceeds the normal design limit. (7-Storied Utility Building)	The building engineer is required to review the design, loads, and column stresses for the marked columns based on in-situ material strength by taking minimum 4 cores from columns.	within 6 weeks
Marginal stress in the column exceeds the normal design limit. (7-Storied Utility Building)	Produce and actively manage a loading plan for all floor plates within the factory considering floor capacity and column capacity.	within 6 weeks
Marginal stress in the column exceeds the normal design limit. (7-Storied Utility Building)	Implement remediation work if required.	within 6 months
Soil investigation report does not comply with BNBC requirement. (7-Storied Utility Building).	The building engineer is required to investigate the soil layer at a minimum depth of 30m and revise the design report accordingly.	within 6 weeks
Lack of information in design report (7-Storied Utility Building).	The building engineer is required to check the beam adequacy for additional loading from the column, consider the surcharge coming from the soil on the MAT foundation and incorporate it in the design report and submit it to RSC for review.	within 6 weeks
Lack of information in design report (7-Storied Utility Building).	Implement remediation work if required.	within 6 months
Column at ground floor at susceptible to vehicular impact (7-storied Utility Building).	Factory is required to provide adequate barriers around the column on the ground floor to prevent vehicular impact	within 6 weeks
Inconsistency in the design report (Boiler Room).	The building engineer is required to update the design report as per BNBC requirements and submit it to RSC for review.	within 6 weeks
Inconsistency in the design report (Boiler Room).	Implement remediation work if required.	within 6 months
Inconsistency in the design report for (RMS, Store & Guard Room).	The building engineer is required to update the design report as per BNBC requirements and submit it to RSC for review.	within 6 weeks
Inconsistency in the design report for (RMS, Store & Guard Room).	Implement remediation work if required.	within 6 months