

Bando Design Ltd. (Extension-2)

Purba Narsinghapur, Earpur Union Parishad Road, Ashulia, Savar

Geographic Coordinates: 23.932430, 90.300463

10th October 2023



Building Information

01. Building-6: The structure is a seven (G+6) storied reinforced concrete (RC) building with a semi-basement.

Observations

Stress in column exceeds normal design limit

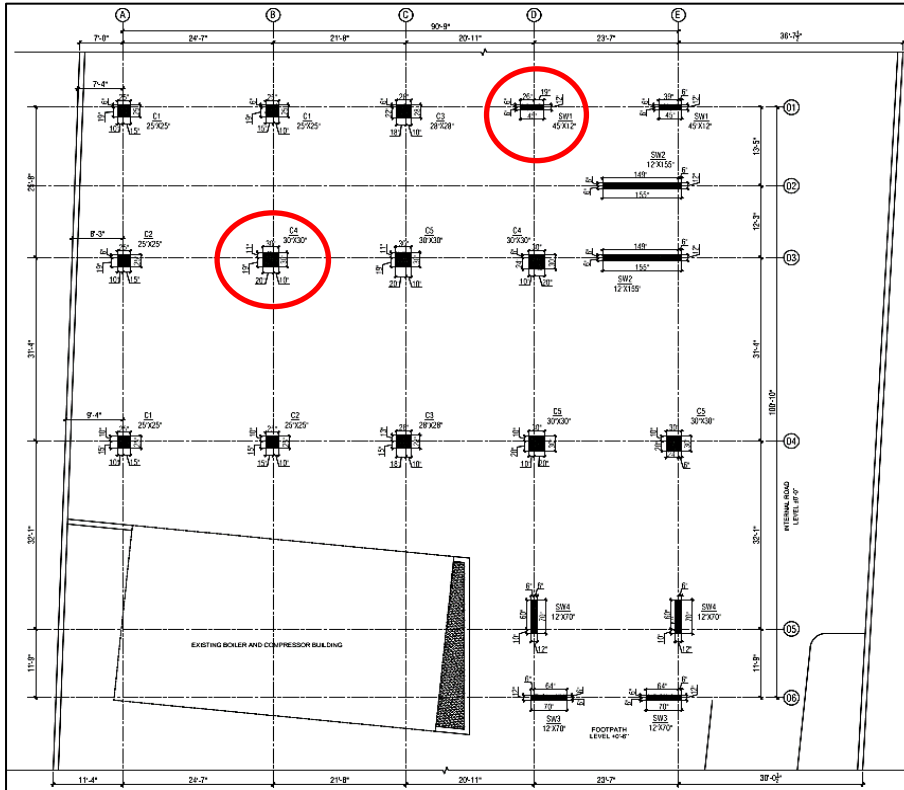
Cylinder Test For Building -06 (Utility)

SL	Date Of Casting	Date of Test	Item/Description	Location	Average Crushing Strength	Remarks
01	02.12.2021	30.12.2021	Situ Pile	PC-5	4080 PSI	
02	29.11.2021	30.12.2021	Situ Pile	PC-5	3960 PSI	
03	08.12.2021	12.01.2022	Situ Pile	PC-4	5170 PSI	
04	13.12.2021	12.01.2022	Situ Pile	PC-4	4590 PSI	
05	25.04.2022	28.05.2022	Pile Cap	7A, 3A	8470 PSI	
06	29.11.2021	26.01.2022	Situ Pile	3A	5660 PSI	
07	18.12.2021	15.01.2022	Situ Pile	PC-11	4590 PSI	
08	15.12.2021	15.01.2021	Situ Pile	PC-18	5070 PSI	
09	21.12.2021	18.01.2022	Situ Pile	PC-08	5190 PSI	
10	24.12.2021	22.01.2021	Situ Pile	PC-7A	5500 PSI	
11	6.01.2022	03.02.2022	Situ Pile	PC-3A	4210 PSI	
12	10.01.2022	07.02.2022	Situ Pile	PC-10	5370 PSI	
13	23.05.2022	21.06.2022	Retaning Wall	1St Lift	7260 PSI	
14	03.06.2022	04.07.2022	Retaning Wall	2nd Lift	7630 PSI	
15	17.06.2022	26.07.2022	Retaning Wall	3rd Lift	7960 PSI	
16	30.07.2022	31.08.2022	Ground Floor Column	SW-2, 02/E	7390 PSI	
17	15.09.2022	20.10.2022	1st Floor Column	SW-4, 05/E	5920 PSI	
18	18.10.2022	15.11.2022	2nd Floor Column	C-02, 4/B	6800 PSI	
19	21.11.2022	28.12.2022	3rd Floor Column	C-01, A/4	7480 PSI	
20	25.01.2023	09.03.2023	5th Floor SW	SW-02, E/03	7703PSI	
21	25.01.2023	09.03.2023	5th Floor	C-01, A/04	8134 PSI	
22	04.03.2023	02.04.2023	7th Floor Column	C-01 , A-04	7230 PSI	
23	21.04.2022	24.05.2022	Water Tank And MAT Casting	Mat Casting	6860 PSI	
24	28.04.2022	28.05.2022	Mat Casting	Mat Casting	9300 PSI	
25	14.06.2022	23.07.2022	Ground Floor	Ground Floor	6580 PSI	
26	24.06.2022	02.08.2022	Water Tank Slab	Water Tank	5630 PSI	
27	02.07.2022	04.08.2022	Ground Floor Slab	Ground Floor	6380 PSI	
28	20.07.2022	22.08.2022	Ground Floor	Ground Floor	6730 PSI	
29	03.08.2022	31.08.2022	Ground Floor	Ground Floor	7500 PSI	
30	10.08.2022	13.09.2022	Ground Floor	Ground Floor	6710 PSI	
31	05.09.2022	04.10.2022	1st Floor Slab	1st Floor	6960 PSI	
32	10.10.2022	08.11.2022	2nd Floor Slab	2nd Floor	6900 PSI	
33	24.03.2023	09.05.2023	7TH Floor Roof Slab	7th Floor	7140 PSI	
34	24.03.2023	09.05.2023	7th Floor Roof Slab	7th Floor	6420PSI	

Available concrete strength test report:
Column and RC wall- 9 sets, Slab- 11 sets, Mat- 2 sets,
pile- 11 sets and pile cap- 1 set

The provided test report does not comply with the frequency of testing requirement of BNBC. As per BNBC, samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 60 cum. of concrete, nor less than once for each 250 sqm. surface area for slabs or walls.

The building engineer must check the testing frequency as per BNBC-2020 part-6 (section 5.12 & 5.6.2) and revise the prepared design report accordingly.



Column layout: marking stressed column



Source of loading: light storage

The cursory calculation indicates that stresses in the marked columns are marginally above the normal design limit considering minimum concrete (16.34MPa) for 6 kPa typical floor live load. The source of loading is storage on all typical floors.

The building engineer is required to check the frequency of testing requirements of BNBC for existing concrete cylinder test data. If not justified, verify in-situ concrete strength either by 100mm diameter cores from lower tier columns. Also, review the design, loads and column stresses in the area identified above. Produce and actively manage a loading plan for all floor plates.

Observation: Building-6 (Utility Building)

Inconsistencies in design report

7 **Observation: Building-6 (Utility Building)**

3.2 MATERIALS CONSIDERED IN DESIGN

Material strength considered

All concrete test results were found to be greater than 5000 psi, conservatively the minimum we considered.

Compressive Strength of Concrete, $f'c = 5000$ psi (Col^m & SW) and $f'c = 4500$ psi (Beam & Slab)

Modulus of Elasticity of Concrete, $E_c = 4030$ (ksi) and $E_c = 3824$ (ksi)

Reinforcement: Deformed bar yield strength = 72,500 psi.(500mpa)

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07 (G+6)-STORIED INDUSTRIAL BUILDING FOR BANDO DESIGN LTD. AT PURBO NARSINGHAPUR, EARPUR UNION PARISHAD ROAD, ASHULIA, SAVAR, DHAKA.

Reinforcement yield strength 500MPa in the design report

Reinforcement yield strength f_y was considered 500MPa (grade 500) in the provided design report and test report. Which does not comply with BNBC. As per the BNBC, for special moment frames and special structural walls, deformed reinforcement resisting earthquake-induced flexural and axial force, or both, shall comply with ASTM A706 Grade 420. Alternatively only BDS ISO 6935-2 Grades 300, 350, 400 and 420 or ASTM A615 Grades 275 and 420 reinforcement shall be permitted.

The building engineer is required to justify the design consideration and revise the prepared design report accordingly.

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05.	Average SPT value of Soil Layer	$N_{avg} > 15$, Art. 2.5.3.2, BNBC-2020
06.	Response reduction factor, R	6.5, Table:6.2.19, BNBC-2020
07.	Structural system	IMRF, Special reinforced concrete shear walls Table: 6.2.19, Art. 8.3.10, BNBC-2020
08.	Importance factors for Buildings, 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, S_5	0.50, Table:6.C.1, BNBC-2020
11.	Site Coefficient, F_a	1.15, Table:6.C.2, BNBC-2020
12.	Site Coefficient, F_v	1.725 Table:6.C.3, BNBC-2020
13.	Spectral Response Acceleration Parameter, S_{D5}	0.383 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 is, T	0.87 sec. Eq. 6.2.38, BNBC-2020
17.	System over strength factor, Ω	2.5, Table:6.2.19, BNBC-2020
18.	Deflection amplification factor, Cd	5, Table:6.2.19, BNBC-2020

The equation of fundamental period of RCC building is, $T = (h_n)^m = 0.0466 (25.91)^{0.9} = 0.87$, where, h_n is the height of building from the existing base level. The total base shear is calculated using mentioned coefficients. In addition, the equation of total base shear is $V = S_1 W$; $S_a = 0.666 Z I C / R * C_s$. Total effective dead loads including self-weight of building, super imposed dead load and 25%, 50% of assigned Roof Live Loads and Floor Live loads are considered respectively for calculating earthquake forces in mass source.

DUAL FRAME: IMRF + Special Shear Wall
(R=6.5, At least 25% EQ force resist by frame)

Structural considered IMF & special shear wall in the provided design report

Priority Actions

Problems Observed

Building-6 (Utility Building)

Item 1: Stress in column exceeds normal design limit.

Item 2: Inconsistencies in design report.

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Stress in column exceeds normal design limit. (Building-6)	The building engineer is required to check the frequency of testing requirements of BNBC for existing concrete cylinder test data. If not justified, verify in-situ concrete strength either by 100mm diameter cores from lower tier columns.	6-weeks
02	Stress in column exceeds normal design limit. (Building-6)	Review the design, loads and column stresses for the structure.	6-weeks
03	Stress in column exceeds normal design limit. (Building-6)	Produce and actively manage a loading plan for all floor plates considering floor, column, and foundation capacity.	6-weeks
04	Stress in column exceeds normal design limit. (Building-6)	Carry out the remedial works if required.	6-months
05	Stress in column exceeds normal design limit. (Building-6)	Implement floor load management program (posting floor load plan, providing signage, and maintaining floor loads accordingly).	6-months
06	Inconsistencies in design report (Building-6)	The building engineer is required to justify the design consideration and revise the prepared design report.	6-weeks