# Mondol Fabrics Ltd. (Extension)

Nayapara, Kashimpur, Gazipur

(23.989864, 90.317476)

7 November 2023

RMG SUSTAINABILITY COUNCIL

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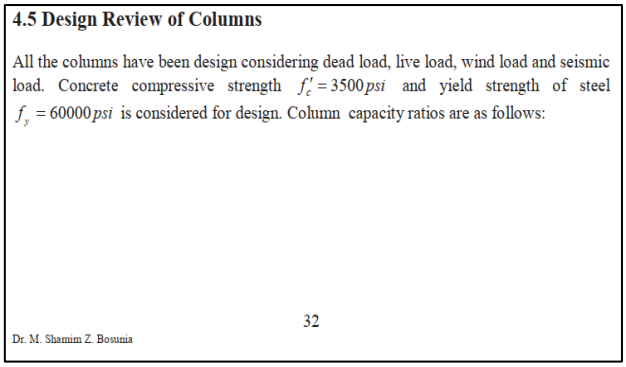
# 1. Building Information

**Building-8:** Eight-storey (G+M+7) reinforced concrete (RC) building with two mezzanine floors inside the ground and 1st floor.

# 2. Observations

**Observation 1: Lack of calculation of material strength in design report (Building-08).**



**4.5 Design Review of Columns**

All the columns have been design considering dead load, live load, wind load and seismic load. Concrete compressive strength $f_c' = 3500\,psi$ and yield strength of steel $f_y = 60000\,psi$ is considered for design. Column capacity ratios are as follows:

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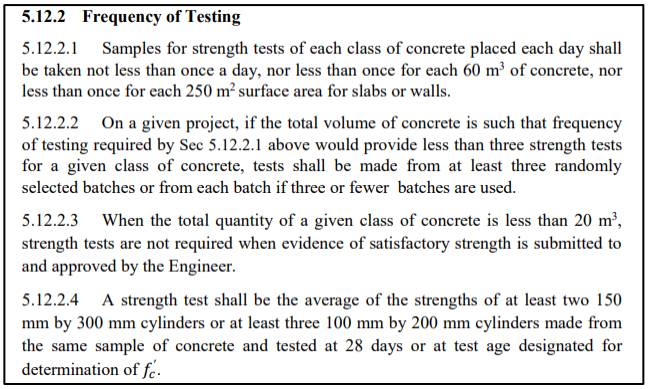
Dr. M. Shamim Z. Bosunia

Material Specification in Design Report



**5.12.2 Frequency of Testing**

5.12.2.1 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 $m^3$ of concrete, nor less than once for each 250 $m^2$ surface area for slabs or walls.

5.12.2.2 On a given project, if the total volume of concrete is such that frequency of testing required by Sec 5.12.2.1 above would provide less than three strength tests for a given class of concrete, tests shall be made from at least three randomly selected batches or from each batch if three or fewer batches are used.

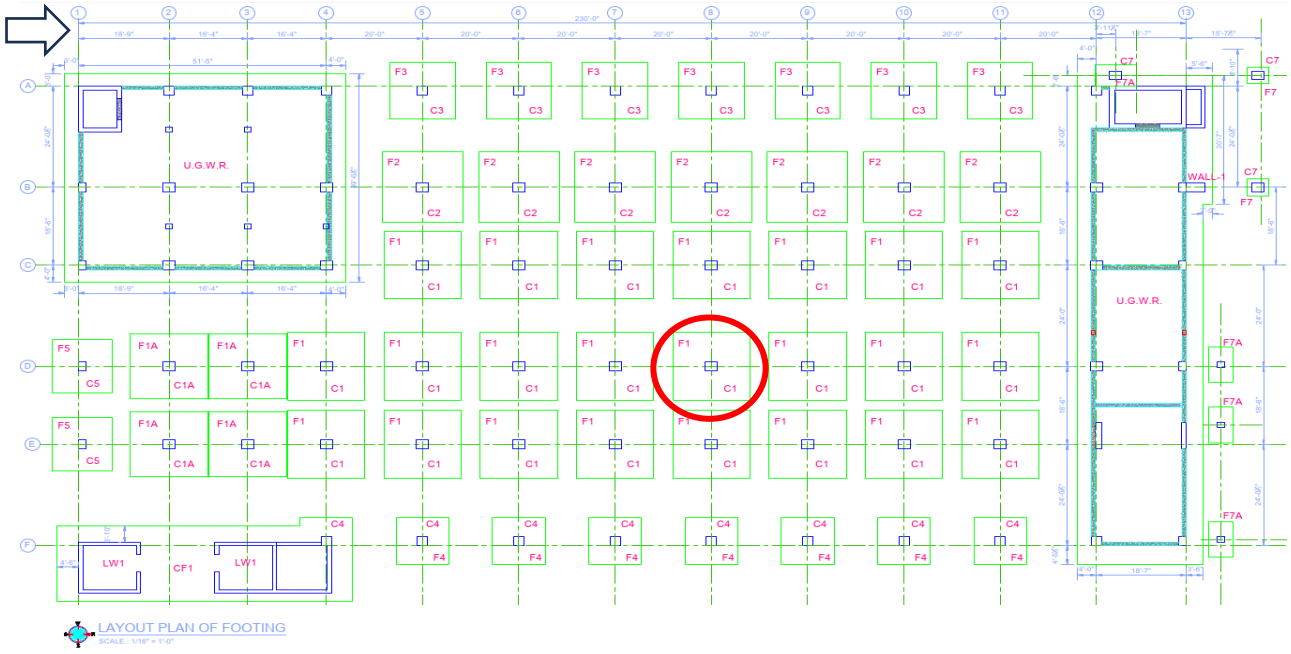
5.12.2.3 When the total quantity of a given class of concrete is less than 20 $m^3$, strength tests are not required when evidence of satisfactory strength is submitted to and approved by the Engineer.

5.12.2.4 A strength test shall be the average of the strengths of at least two 150 mm by 300 mm cylinders or at least three 100 mm by 200 mm cylinders made from the same sample of concrete and tested at 28 days or at test age designated for determination of $f_c'$.

Cylinder Test Criteria as per BNBC

**Description:** A set of design reports was available for Building-8 prepared following BNBC 2006. In the design report, the concrete strength has been considered of 3500 psi on cylinder test reports. The building engineer is required to verify the frequency of testing requirements as per BNBC (Part VI, Chapter 5, 5.12.2) and update the analysis & design report if required.

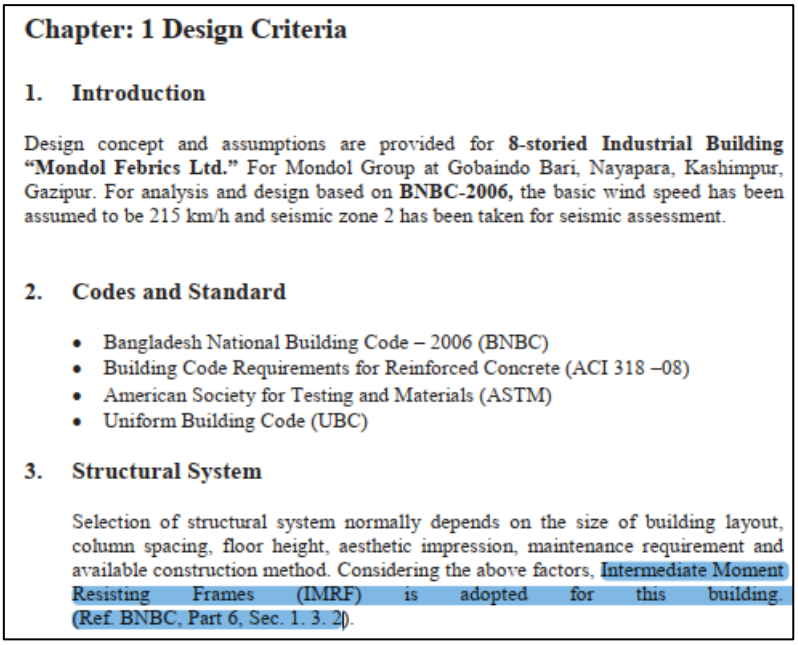
**Observation 2: Stress in the foundation exceeds the normal design limit (Building-8).**




The normal design limit exceeds for the isolated footing grid-D-8

**Description:** A cursory calculation shows that the normal design limit exceeds the isolated footing. The foundation capacity has been checked considering a floor live load of 5 kPa & 4 kPa for the production floors, 6 kPa for the storage area & 1.5 kPa for the roof. Considering minimum concrete strength 16.3 MPa and re-bar strength 415 MPa from the available re-bar test report and available bearing capacity from boreholes of the soil test report and grid location of the column footing. The building engineer is required to review the design, loads and column stresses in the area identified above. Produce and actively manage a loading plan for all floor plates.

**Observation 3: Inconsistencies in design report (Building-8).**



## Chapter: 1 Design Criteria

### 1. Introduction

Design concept and assumptions are provided for **8-storied Industrial Building "Mondol Febrics Ltd."** For Mondol Group at Gobaindo Bari, Nayapara, Kashimpur, Gazipur. For analysis and design based on **BNBC-2006,** the basic wind speed has been assumed to be 215 km/h and seismic zone 2 has been taken for seismic assessment.

### 2. Codes and Standard

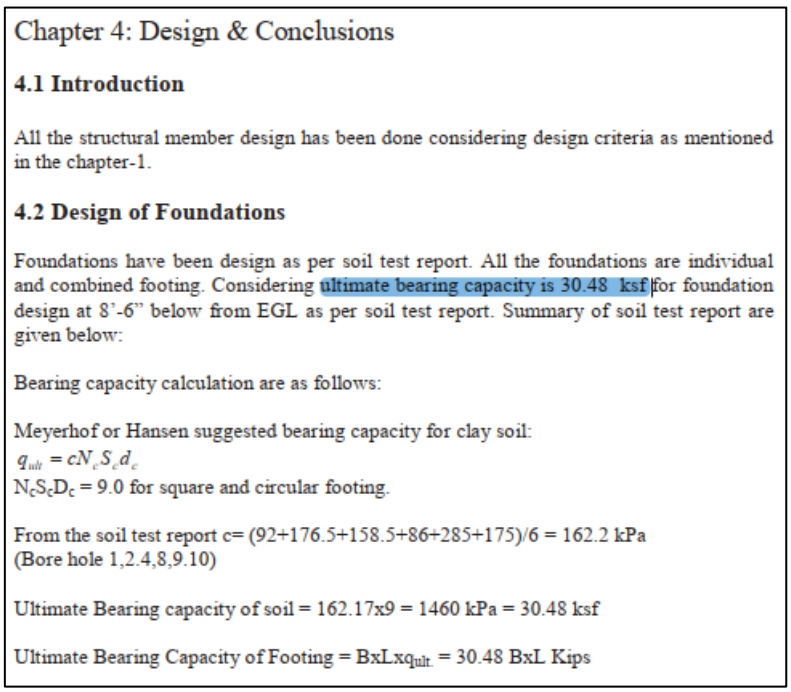
- Bangladesh National Building Code – 2006 (BNBC)
- Building Code Requirements for Reinforced Concrete (ACI 318 –08)
- American Society for Testing and Materials (ASTM)
- Uniform Building Code (UBC)

### 3. Structural System

Selection of structural system normally depends on the size of building layout, column spacing, floor height, aesthetic impression, maintenance requirement and available construction method. Considering the above factors, Intermediate Moment Resisting Frames (IMRF) is adopted for this building. (Ref. BNBC, Part 6, Sec. 1. 3. 2).

Structural system consideration in the design report

**Description:** A Design Report was provided at the time of inspection where IMRF is considered with proper justification. The building engineer is required to provide detailed clarification regarding IMRF in the design report according to BNBC 2006 Part-6 section 8.3.10 and submit it to RSC for review.



## Chapter 4: Design & Conclusions

### 4.1 Introduction

All the structural member design has been done considering design criteria as mentioned in the chapter-1.

### 4.2 Design of Foundations

Foundations have been design as per soil test report. All the foundations are individual and combined footing. Considering ultimate bearing capacity is 30.48 ksf for foundation design at 8'-6" below from EGL as per soil test report. Summary of soil test report are given below:

Bearing capacity calculation are as follows:

Meyerhof or Hansen suggested bearing capacity for clay soil:

$q_{ult} = cN_cS_cd_c$

$N_cS_cD_c = 9.0$ for square and circular footing.

From the soil test report c= (92+176.5+158.5+86+285+175)/6 = 162.2 kPa
(Bore hole 1,2.4,8,9.10)

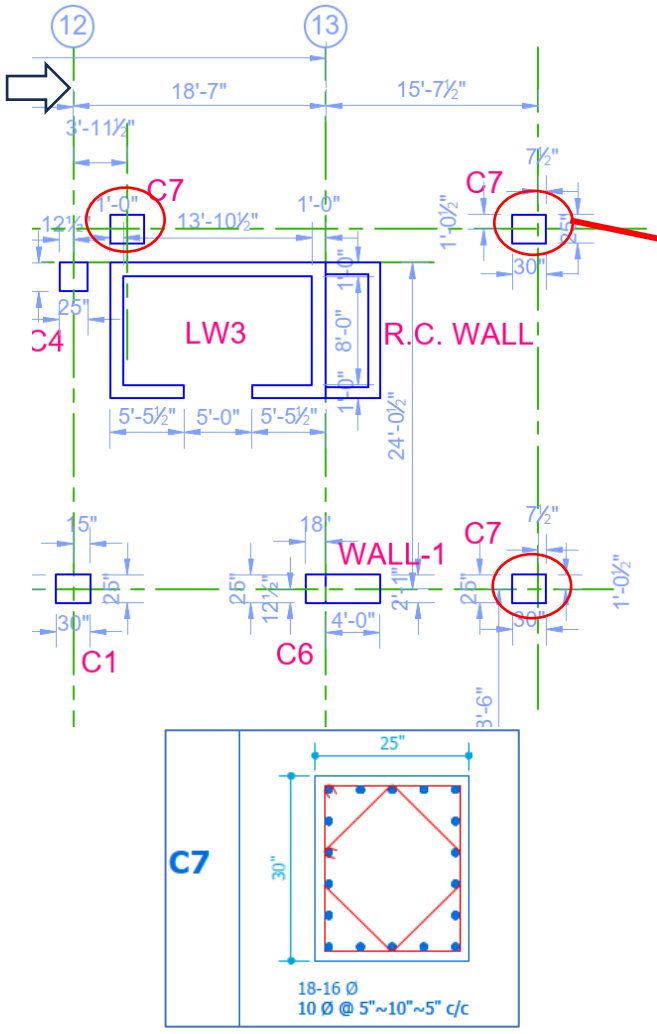
Ultimate Bearing capacity of soil = 162.17x9 = 1460 kPa = 30.48 ksf

Ultimate Bearing Capacity of Footing = $BxLxq_{ult.}$ = 30.48 BxL Kips

Bearing capacity consideration (30.48ksf) in the design report

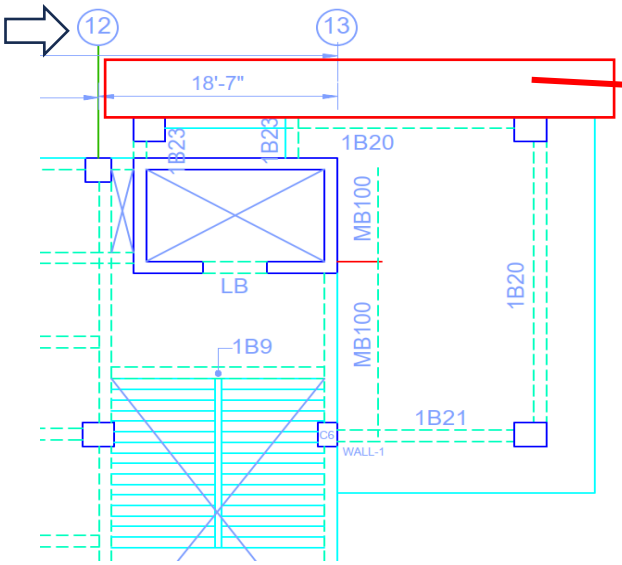
**Description:** The consideration of ultimate bearing capacity is not clear, cursory calculation from soil test shows less than the considered value. The building engineer is required to provide detailed clarification of specific sourcing of the values considered for the bearing capacity in the design report.

**Observation 4: Inconsistencies in the provided drawing (Building- 8).**




Column C7 (750X675) in drawing

With plaster, 500X650 found on site




The extended corbel beam is not shown in the provided drawing

Extended corbel beam was found on the 1st floor on-site with a concentrated loading steel bridge

**Description:** Column C7 dimensions are different from the on-site condition. Also, beam layout and detail mismatches were observed. A building engineer is required to survey the whole structure and prepare the as-built drawing reflecting the on-site condition as well as update the design report.

**Observation-5: Racks are not anchored or braced (Building-08).**

**Description:** Some racks on floors are not anchored or braced to resist lateral (earthquake) forces. The building is required to adequately anchor/brace all non-structural elements to resist earthquake forces to comply with the BNBC.

**Observation-6: Column susceptible to trolley impact (Building-8).**

**Description:** Some columns had the sign of vehicle impact. The building engineer is required to provide guard around the column/Shear walls to prevent trolley impact.

**<u>Observation-7:</u> Cracks were found in the brick wall (Building-8).**


**Description of observation:** Some cracks were found in an internal brick wall. A building engineer is required to repair the cracks with a suitable method.

## 3. Action Plan

| Observation | Action Plan | Timeline |
|---|---|---|
| **Building-08** | | |
| Lack of calculation of material strength in design report. | The building engineer is required to verify the frequency of testing requirements as per BNBC (Part VI, Chapter 5, 5.12.2) and update the analysis & design report if required. | within 6 weeks |
| Stress in the foundation exceeds the normal design limit. | The building engineer is required to review the design, loads and column stresses in the area identified above. | within 6 weeks |
| | Produce and actively manage a loading plan for all floor plates. | within 6 weeks |
| Inconsistencies in design report. | A building engineer is required to prepare the design report considering BNBC 1.9. | within 6 weeks |
| | Carry out the remedial works if required. | within 6 months |
| Inconsistencies in the provided drawing. | A building engineer is required to survey the whole structure and prepare the as-built drawing reflecting the on-site condition as well as update the design report. | within 6 weeks |
| Racks are not anchored or braced (Building-08). | The building is required to adequately anchor/brace all non-structural elements to resist earthquake forces to comply with the BNBC. | within 6 months |
| Column Susceptible to trolley impact (Building-08). | The building engineer is required to provide guard around the column/ Shear walls to prevent trolley impact. | within 6 months |
| Cracks were found in the brick wall (Building-08). | The Building Engineer is required to repair the cracks with suitable methods. | within 6 months |