

Explore Garments Ltd.

Gorai, Mirzapur, Tangail-1941, Bangladesh

(24.09535, 90.16862)

17 December 2023



1. Building Information

Main Production Building: This is an eleven storied (G+10) RC building.

Utility Building: Two-storied (G+1) RC building with a partial steel roof shed.

ETP: Two-storied (G+1) RC building.

RMS Room-1: Single-storied RC moment resisting frame building.

RMS Room-2: Single-storied RC moment resisting frame building.

Pump Room: This is a single storied RC building.

Security Guard Room: This is a single-storied RC moment resisting frame building.

Chemical Store: Single-storied non-engineered shed.

Gate-2: This is a single storied RC building.

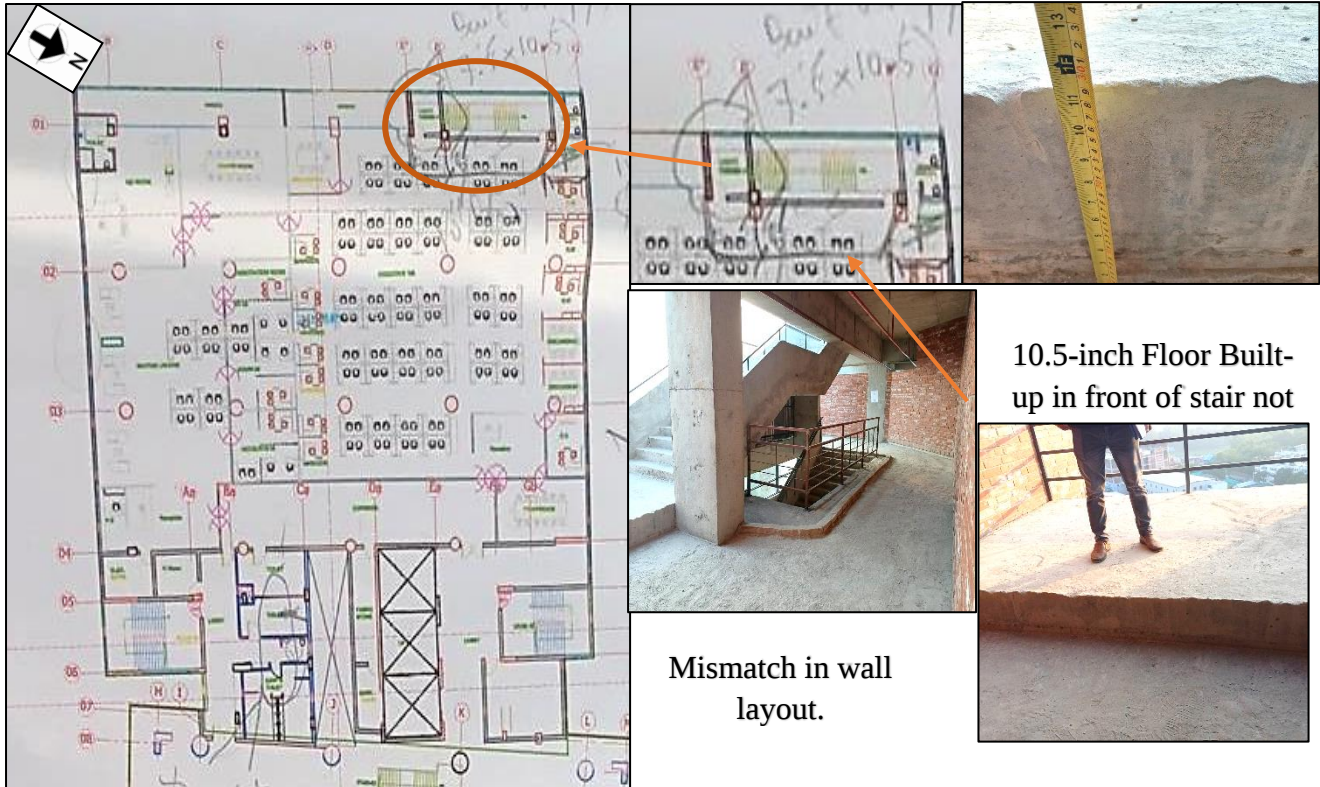
2. Observations

Observation-1: Design Report needs to be updated (Main Production Building).

Forces and Moments With the configuration as discussed in the preceding section the building has been analyzed for six basic load cases. Based on these six basic cases, twenty-six design combinations can be obtained. After finishing the analysis a vast array of results is obtained and it is impractical to present all the results in this report. Therefore, only a few results are shown graphically in figures (analysis plots). Structural Design Check The structural design is based on the results of analysis and design provided by the software ETABS. Checking the design of various structural elements like foundations, shear walls, core walls, beams and slabs are discussed below. Foundation In checking of foundation involves checking the pile thickness and reinforcement required. Based on the pile load test of which gave 225 kip allowable load, number of piles has been adjusted. Computer model ETABS has been used to calculate pile cap reinforcement. Therefore, from the consideration of pile capacity & others, the foundation design is quite adequate. Columns, Shear Walls and Lift Cores The design of columns of the project has been obtained from ETABS. Some of the columns in the ground and first floor sections are modeled using shell elements (pier). These columns are designed using the same software which is a companion software to ETABS. Beams The design of beams of the project has been obtained from ETABS. Some examples of beam design are shown in later. Slabs The design of the floor slabs which shall be supported on columns, shear walls as well as tendons. It is found that, the thickness of the slabs are generally adequate.	Floor System The floor slabs are designed as typical reinforced concrete slab of thickness 150mm and are supported by beams which ultimately transfer the load to columns and shear walls. Vertical Structural Elements The vertical structural elements that transfer loads from floors to the foundation consist of columns, shear walls and core walls. Due to architectural demand, the core walls or shear walls are placed un-symmetrically. STRUCTURAL DESIGN PROCESS For the purpose of designing of Store project, a full 3d computer model has been used for analysis and design check has been also performed. Design Standards The first step in any building design or review process is to set the design standard. For Store project, Bangladesh National Building Code (BNBC, 2006) has been adopted. This is a legal requirement for all the buildings constructed in Bangladesh. Additionally, American Concrete Institute Code (ACI) is also consulted to complement BNBC where needed necessary. Loads Prior to make any structural analysis, it is essential that the loads that may act upon the building during its lifetime be duly considered and is incorporated in the analysis. The loads that may act upon the structure are discussed below;
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Description: A design report has been produced for all parts of the Main Building. However, Foundation, Beam, and Drift checks have not been provided properly. Also, no information has been given about the structural framing system. The building engineer is required to update the design report as per 1.9.1.1 (BNBC) including all serviceability and design in tabular format.

Observation-2: Mismatch in as-built drawings (Main Production Building).



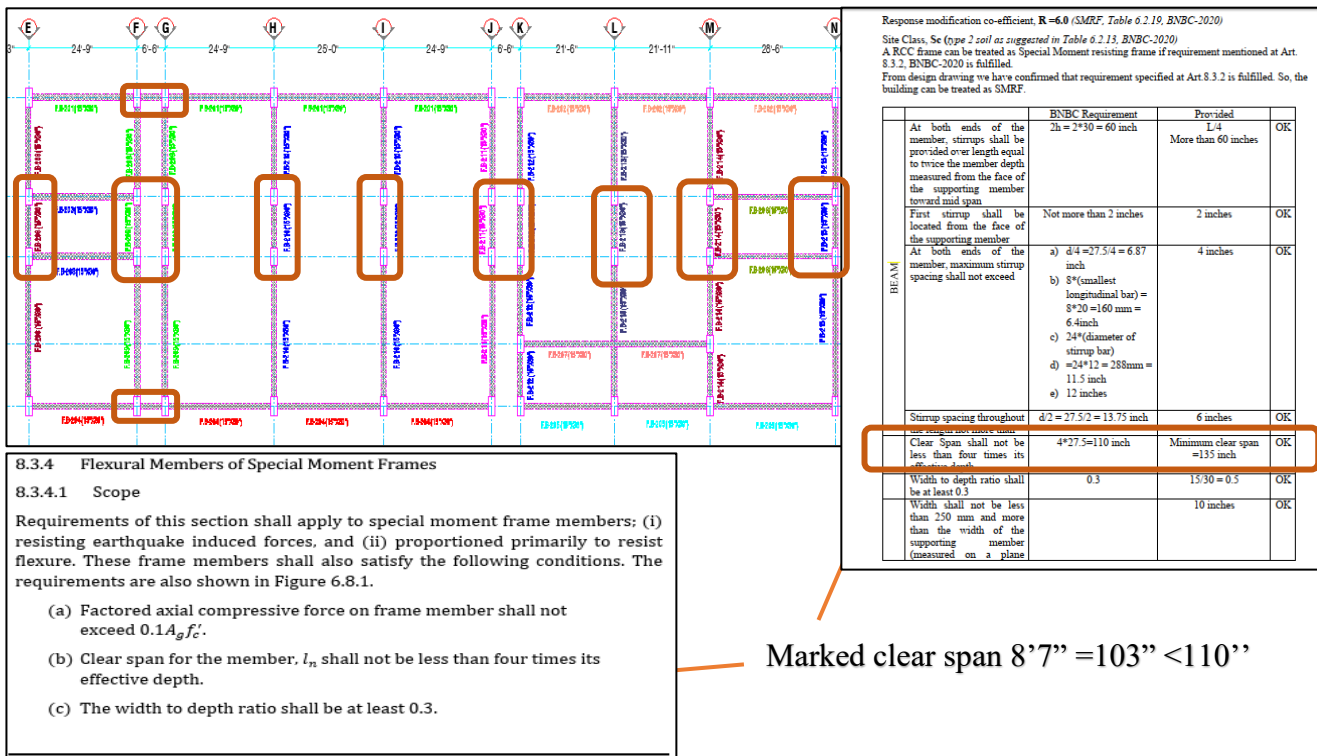
Description: During inspection, mismatches were found between onsite condition and as-built drawing. Floor built-up was observed in front of stair on 10th floor on store part. Also, partition wall layout was not match with onsite condition near the stair area. The building engineer is required to survey the full structure and produce accurate as-built drawings.

Observation-3: Non-structural elements found unbraced/not anchored (Main Production Building).



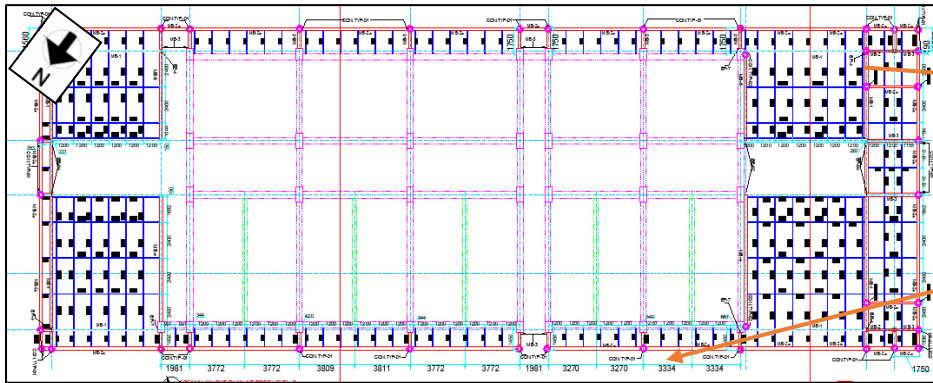
Description: Non-structural elements suspended from, attached to, or resting top the structure shall be adequately anchored and braced to resist earthquake forces. Factory is required to brace/anchor all non-structural elements.

Observation-4: Design Report needs to be updated (Utility Building).

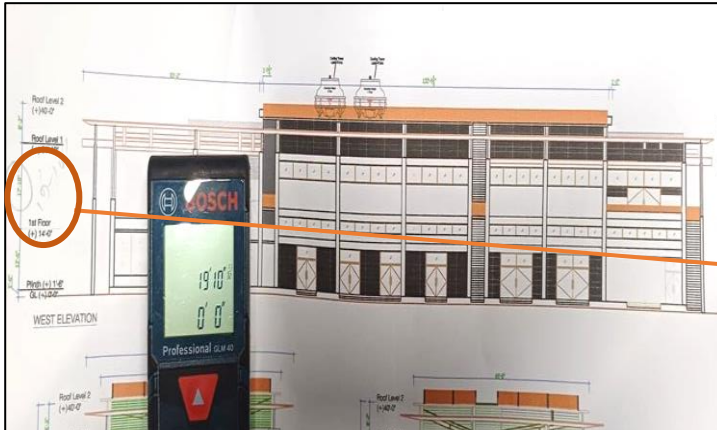


Description: Utility building has been designed in accordance with NBC 2020 considering Special Moment Resisting Frame (SMRF). Flexural members of the SMRF system have to comply with Sec. 8.3.4.1(b) of NBC 2020. However, several beams in the structural system observed not complying with this requirement. The building engineer is required to revise the design and design report with appropriate framing system complying with Table 6.2.19 and Sec 8.3 of NBC 2020.

Observation-5: Mismatch in as-built drawings (Utility Building).



A steel pipe tray connected to the steel part which is absent in as-built drawings.



Floor to ceiling height was observed 6.04 m instead of 5.44 m.



Gardening at the roof – not shown in the drawing

Description: During the inspection, mismatches were found between the onsite condition and the as-built drawing. Water tank and roof top gardening was not shown in the drawing. Also, steel pipe tray is connected to the steel portion which has not shown in drawings. The building engineer is required to survey the full structure and produce accurate as-built drawings.

Observation-6: Load plan needs to be implemented at the ground floor (Utility Building)



Description: A boiler was found at the top slab of the underground water reservoir. Building engineer is required to produce and implement a load plan as per slab capacity.

Observation-7: Apparently a high brick wall was observed (Utility Building)



Description: Apparently a high brick wall (3.8m height) was observed on the 1st floor. Building engineer is required to check the stability of the brick wall.

Observation-8: Vibration on 1st floor (Utility Building)



Description: Vibration was felt on the 1st floor. The building engineer is required to check the reason for the vibration, check the slab adequacy subject to imposed loading & vibration and suggest proper remedial/damping methodology.

Observation-9: Water ponding on the roof (utility Building)



Description: Water ponding was observed on the roof of the building. The building engineer is required to develop a proper drainage system on the roof with an adequate slope.

Observation-10: Apparently non-engineered roof shed (ETP)



Non-Engineered Shed



Poor Connection

Description: During the inspection, the apparently non-engineered shed was found. The building engineer is required to check the members, connection & stability system of the structure and suggest proper alternatives accordingly.

Observation-11: Apparently non-engineered structure (Chemical Store)



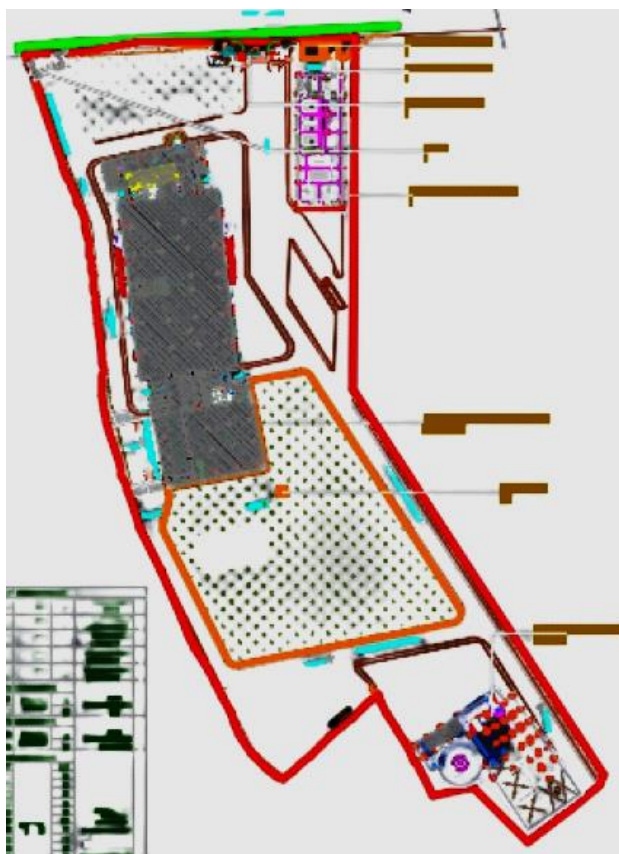
Non-Engineered Shed



Poor Connection

Description: Lack of lateral stability system, apparent inadequate members and non-engineered connection were observed. The building engineer is required to check the member, connection & stability system of the structure and suggest proper remediation accordingly.

Observation-12: Building Permit from local authority not available (All Structures)



Description: During the inspection, the building permit from the local authority was not available for all buildings. The factory authority is required to collect building permits from the local government authority for all buildings.

3. Action Plan

Observation	Action Plan	Timeline
Design Report needs to be updated (Main Production Building).	The building engineer is required to update the design report as per 1.9.1.1 (BNBC) including all serviceability and design in tabular format.	within 6 weeks
	Carry out remedial work if required.	within 6 months
Mismatch in as-built drawings (Main Production Building).	The building engineer is required to survey the full structure and produce accurate as-built drawings.	within 6 weeks
Non-structural elements found unbraced/not anchored (Main Production Building).	Building engineer is required to brace/anchor all non-structural elements.	within 6 weeks
Design Report needs to be updated (Utility Building).	The building engineer is required to revise the design report for the appropriate framing system complying with Table 6.2.19 and Sec 8.3 of BNBC 2020.	within 6 weeks
	Carry out remedial work if required.	within 6 months
Mismatch in as-built drawings (Utility Building).	The building engineer is required to survey the full structure and produce accurate as-built drawings.	within 6 weeks
Load plan needs to be implemented at ground floor (Utility Building)	Produce and actively manage a loading plan for all floor plates within the factory considering slab capacity.	within 6 weeks
Apparently a high brick wall was observed (Utility Building)	Building engineer is required to check the stability of the brick wall.	within 6 weeks
	Carry out remedial work if required.	within 6 months
Vibration on 1 st floor (Utility Building)	The building engineer is required to check the reason for the vibration, check the slab adequacy subject to imposed loading & vibration and suggest proper remedial/damping methodology.	within 6 weeks
	Carry out remedial work if required.	within 6 months

Water ponding on the roof (Utility Building)	Building engineer is required to develop a proper drainage system on the roof with adequate slope.	within 6 weeks
Apparently non-engineered roof shed (ETP)	The building engineer is required to check the members, connection & stability system of the structure and suggest proper alternatives accordingly.	within 6 weeks
	Carry out remedial work if required.	within 6 months
Apparently non-engineered structure (Chemical Store)	The building engineer is required to check the member, connection & stability system of the structure and suggest proper remediation accordingly.	within 6 weeks
	Carry out remedial work if required.	within 6 months
Building Permit from local authority not available (All Structures)	The factory authority is required to collect building permits from the local government authority for all buildings.	within 6 months

Observation	Action Plan	Timeline
Apparently non-engineered roof shed (ETP)	The building engineer is required to check the member, connection & stability system of the structure and suggest proper alternatives accordingly.	within 6 weeks
	Carry out remedial works if required.	within 6 months
Apparently non-engineered structure (Chemical Store)	The building engineer is required to check the member, connection & stability system of the structure and suggest proper remediation accordingly.	within 6 weeks
	Carry out remedial works if required.	within 6 months
Building Permit from local authority not available (All Structures)	Factory authority is required to collect building permit from local government authority for all structures.	within 6 months