

SOUTHERN CLOTHINGS LIMITED

(Extension)

Bottola, Zirabo, Ashulia, Dhaka
(23.907989, 90.321843)

12 June 2023



Building Information

1. **Building-3:** Partially three storied (G+2) steel building.
2. **Building-4:** Two storied (G+1) steel building.
3. **Building-5:** This structure is a two storied (G+1) steel building.
4. **Building-6 (Utility Building):** Partially three storied (G+2) RC building.

Observations

**Load plan & design report not comply
with BNBC requirements**



Storage on suspended floors

Currently, the typical floor of the building is being allotted for fabric store. As per BNBC, the minimum floor live load for light storage is 6 kN/m² (125 psf). But the storage (typical floors) area of the building is designed for 5 kN/m² live loads. The building engineer is required to revise the storage live load limit and related design documents based on BNBC requirement.

Dead Load:

- a) Self-weight of structural members
- b) Deck Slab Weight= 6-inch brick chips= 75 psf
- c) 5" (125mm) Partition wall (Brick) = 500 psf. (the wall height 10'-0")
- d) 5" (125mm) parapet wall (Brick) = 150 psf

Live Load Calculation:

- a) Storage = 105 psf = 5.0KN/m²
- b) Stair Case & Landing = 105 psf = 5.0KN/m²
- c) Roof Live load as per BNBC2006

Live load 100 psf (5 kN/m²) in the design report

4.5	INDUSTRIAL, STORAGE & HAZARDOUS (Occupancy - G, H & J)	Workshop, factory, warehouse	1 Light workroom without storage	3.0	2.7
-			2 Machinery hall & circulation area	4.0	4.5
1.8			3 Factory, workshop etc.	5.0	4.5
			4 Manufacturing : light	6.0	4.5 ^(S)
			heavy	12.0	9.0 ^(S)
			ice	15.0	9.0 ^(S)
2.7			5 Printing plant :		(S)
4.5			Press room	7.0	11.0
			Composing and linotype room	5.0	9.0 ^(S)
2.7			Paper storage room	12.0	9.0 ^(S)
4.5			6 Motor room, fan room etc. including the weight of machinery	7.5	4.5
4.5			7 Cold storage, grain storage	15.0	9.0 ^(S)
4.5			8 Storage warehouses : light	6.0	4.5 ^(S)
			heavy	12.0	9.0
7.0			9 Foundries	20.0	12.0

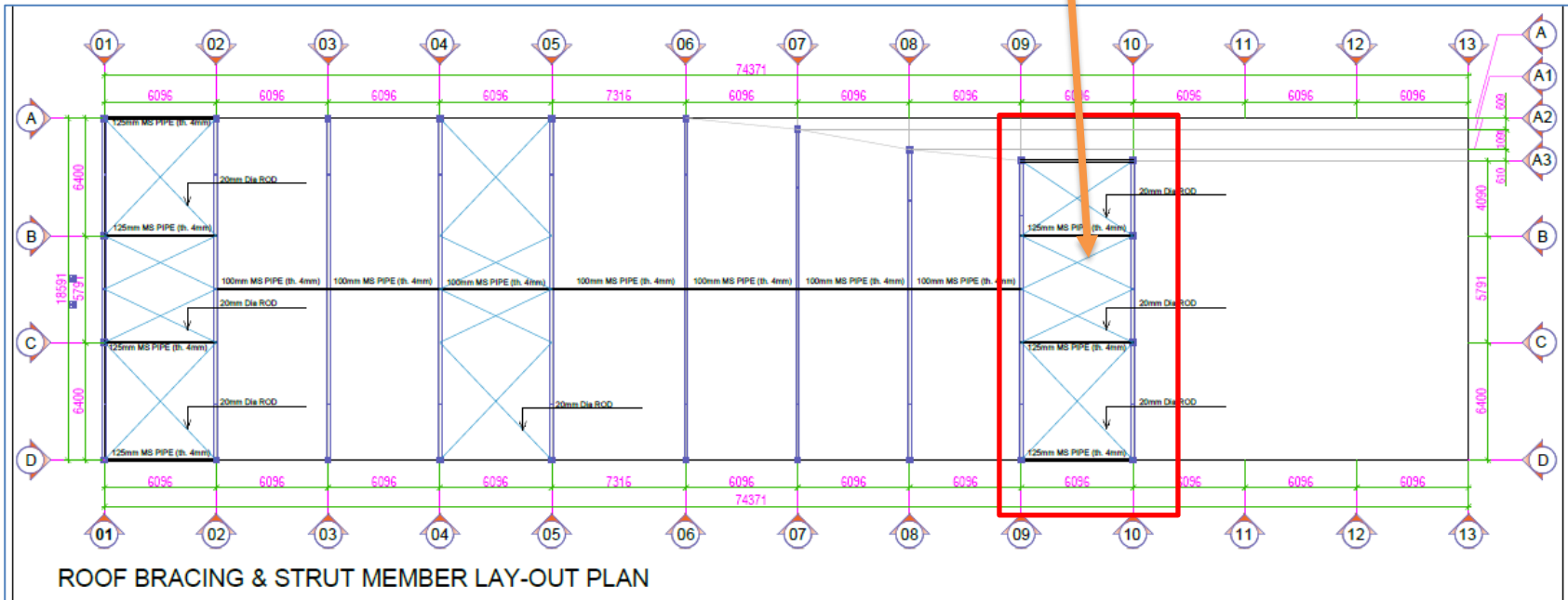
Live load table of BNBC-2006

Mismatch in as-built drawings

Roof bracing and compression strut layout are not matched with as-built condition. Building engineer is required to revise the structural drawings as per on site condition and submit to RSC.



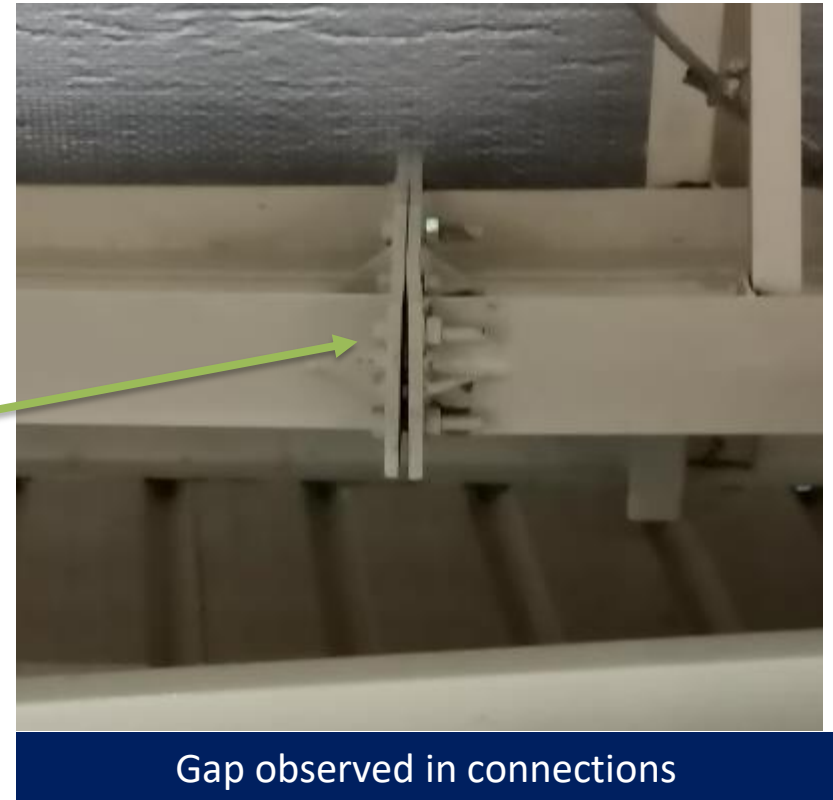
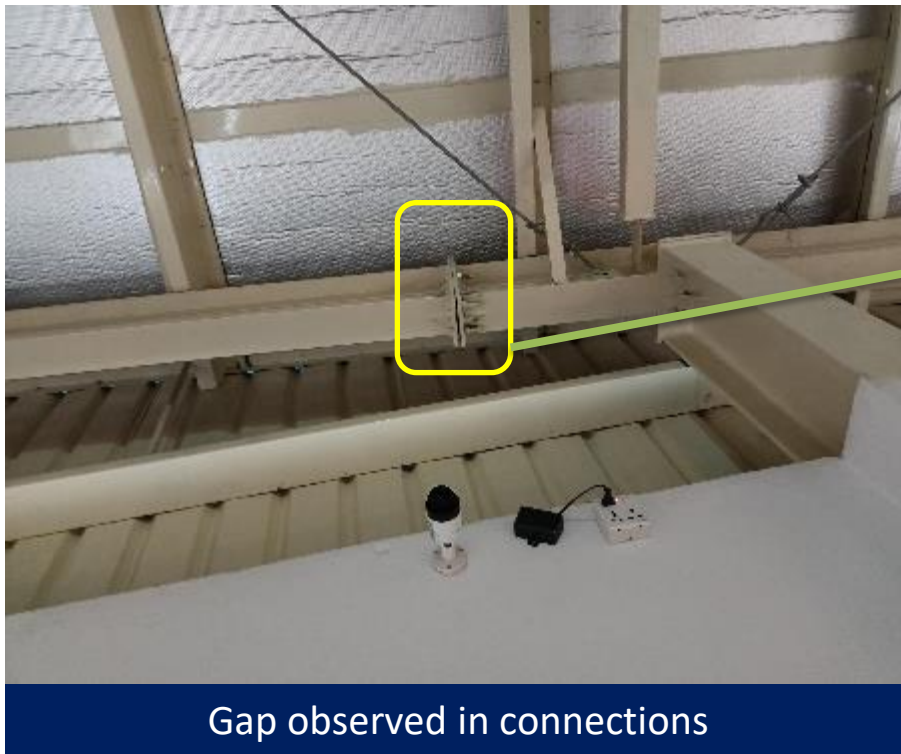
Strut and bracing



Observation: Building-3

Significant connection gap

Significant gaps observed in Rafter-column joint at several locations. Building engineer is required to carry out suitable remedial works.



Staking of construction material on the roof



Stacking of construction materials and wastage found almost everywhere on the roof.

Racks not anchored or braced



Non-anchored storage rack at several floors

Some racks on different floors are not anchored or braced to resist lateral (earthquake) forces. The factory is required to anchor/brace all non-structural elements adequately to resist earthquake forces.

Design report required to be revised



Floor loading

On the other hand, load plan was not found for the building. Building engineer is required to revised the design report updating the above-mentioned issues and submit to RSC.

Tensile strength of MS plate was considered 345 Mpa (50 Ksi) but no plate test report was found during the inspection. Building engineer is required to confirm the tensile strength of MS plate from existing building.

1.4 Specifications of steel members

Table 0-1: Material specifications

No.	Components		Specifications	Strength (Mpa)
1	Built-up Members		ASTM A-50 Grade 572 Type 1 (Or equivalent)	$F_y = 345$
2	Hot Rolled Members	Tubes	EN 10210-1 S355J2H (Or equivalent)	$F_y = 248$
		Channels	EN 10025-2 Grade S355JR (Or equivalent)	$F_y = 248$
3	Cold Formed Members		ASTM A653M (Or equivalent)- Galvanized	$F_y = 345$
4	Roof & Wall Panel		ASTM A792M (Or equivalent)	$F_y = 345$
5	Mezzanine Deck Panel		ASTM A653M (Or equivalent)	$F_y = 345$
6	X-Bracing	Cable	ASTM A475 (Or equivalent)	$F_t = 119 \text{ kN}$
		Rods	ASTM A36M (Or equivalent)	$F_y = 250$
		Angles	ASTM -A36M (Or equivalent)	$F_y = 250$
7	Anchor Bolts		ASTM -A307/A-36M (Or equivalent)	$F_u = 400$
8	High Strength Bolts		ASTM- A325 M Type -1 / Din 933 Grade 8.8 (Or equivalent)	$F_u = 800$

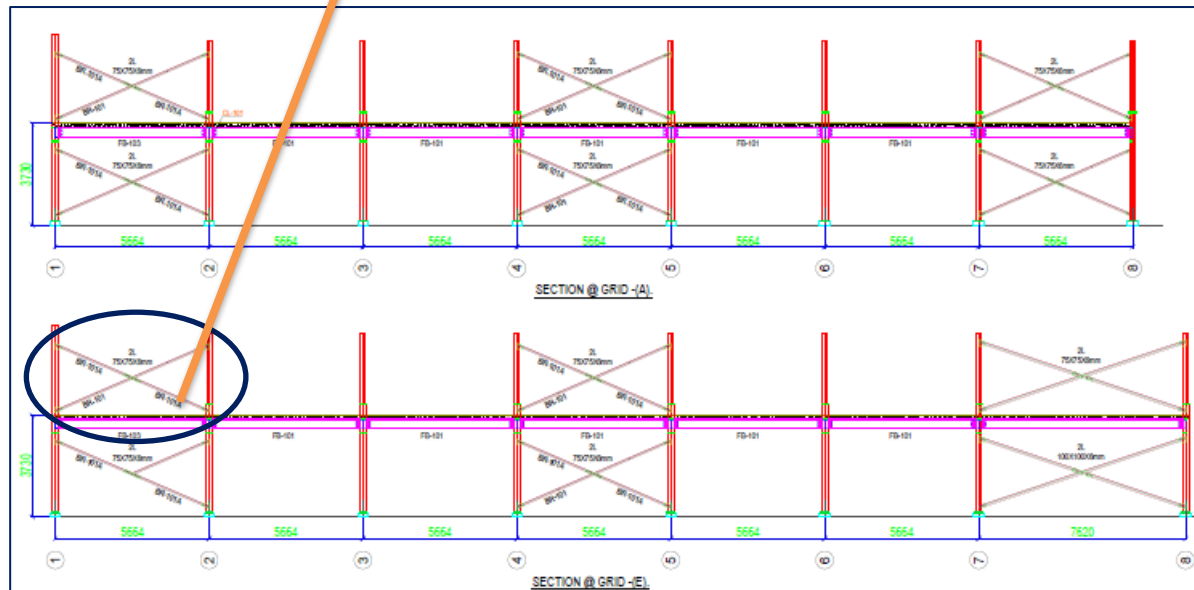
Material strength in the design report

Vertical bracing missing



Missing bracing

Vertical bracings were found missing at Northwest corner of the shed due to door opening. Building engineer is required to install the missing bracing where necessary.

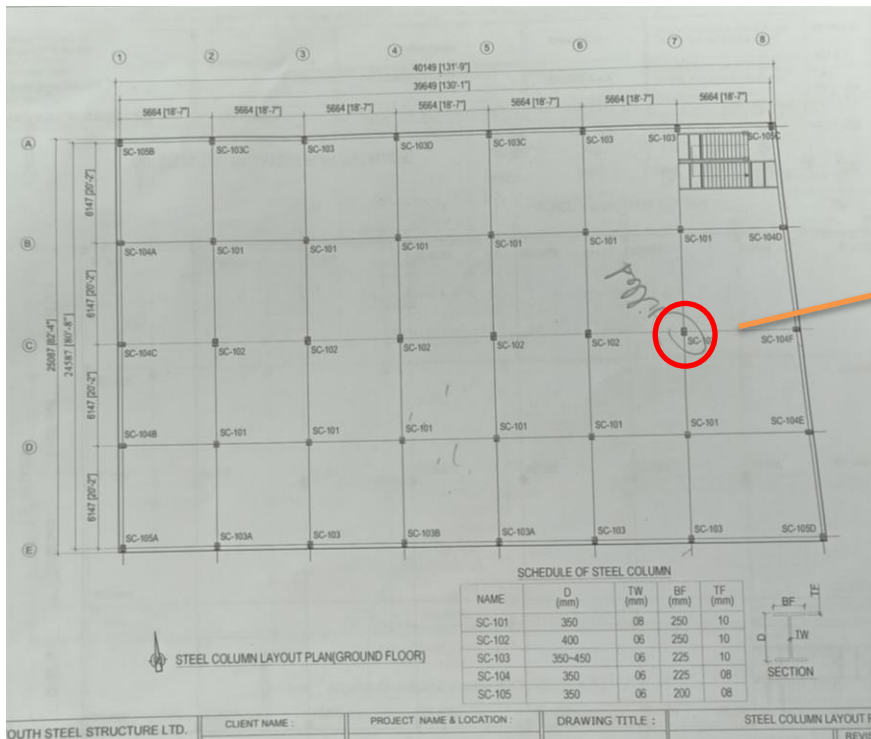


Sectional details of bracing

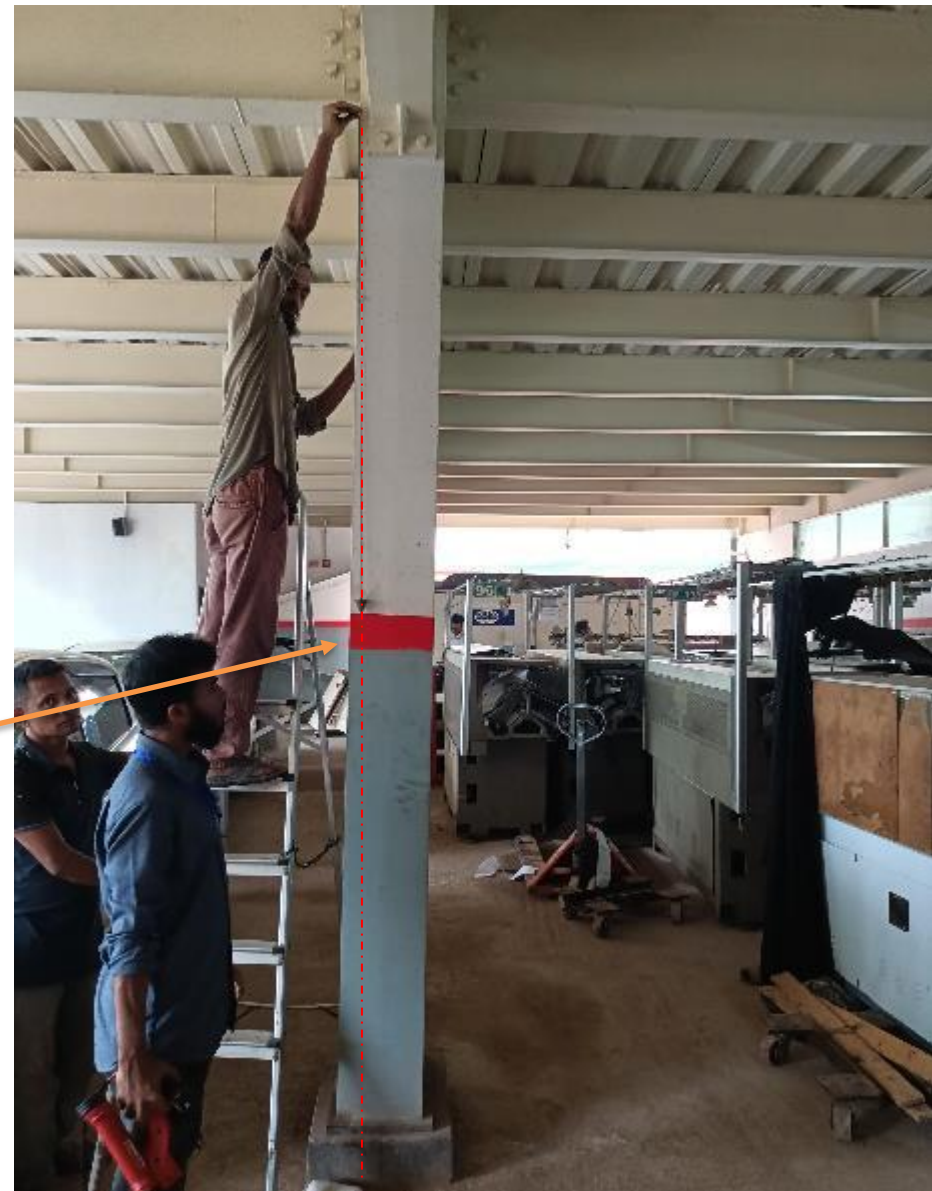
Observation: Building-4

Distorted steel column

A distorted steel column found on ground floor in parking areas. Stability for the distorted columns and related elements need to be checked. Factory Engineer to review design, loads and column stress in the area identified above.



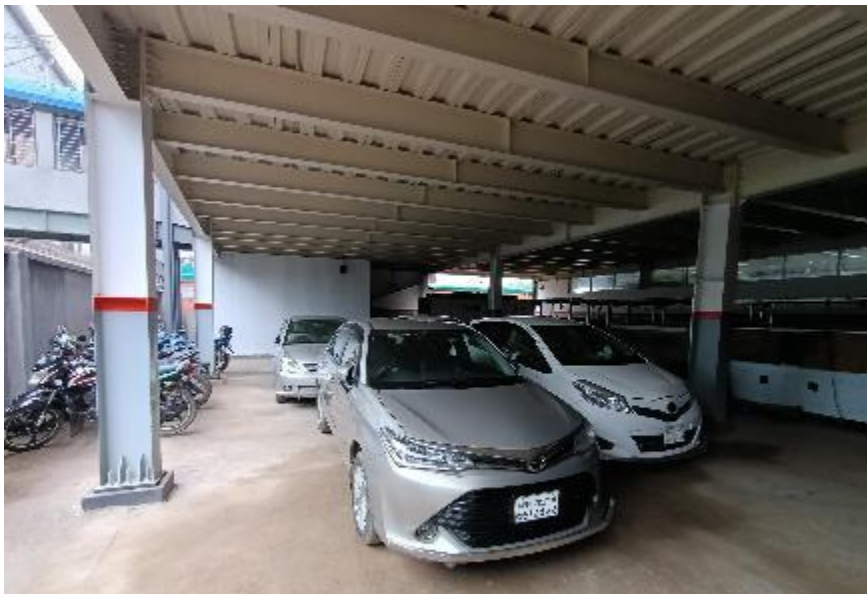
Column Layout



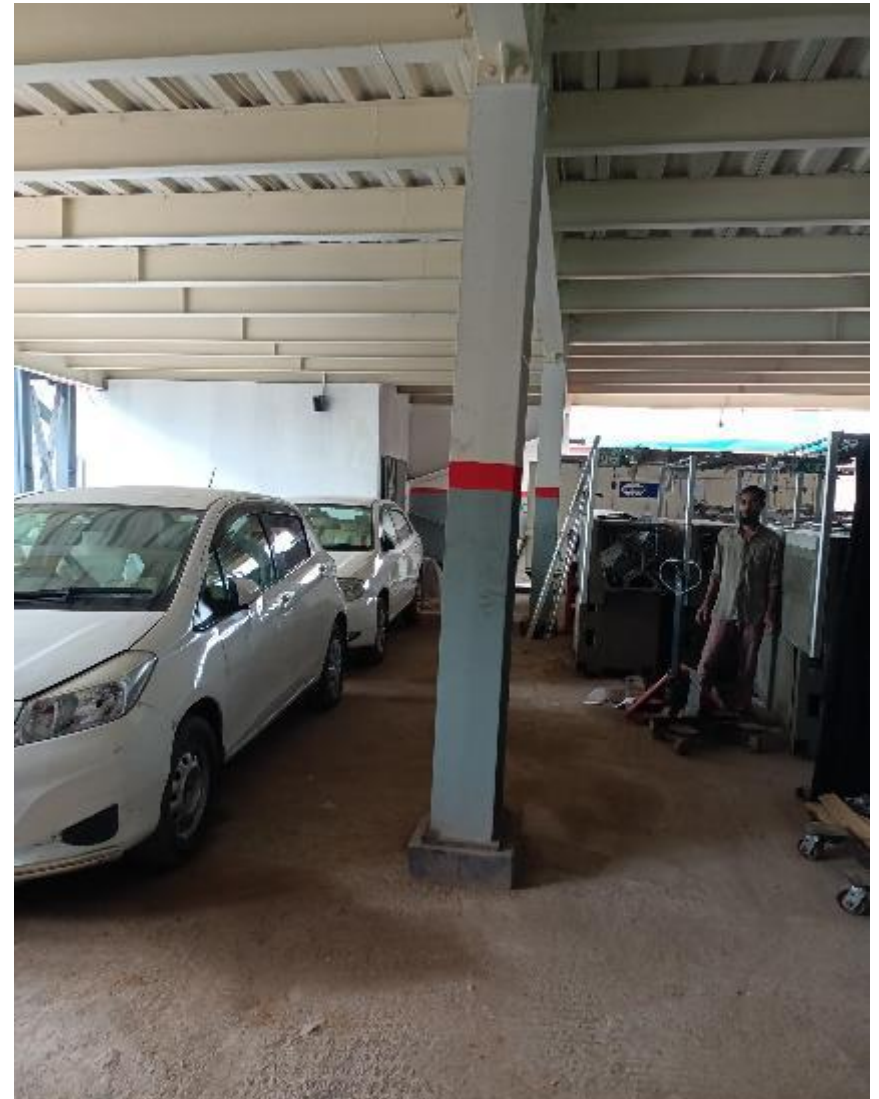
Distorted steel column

Columns susceptible to vehicle impact

Columns are susceptible to vehicle impact in the parking areas on ground floor. Building engineer is required to install a barrier to prevent vehicle impact in column.



Susceptible column



Susceptible column

Prepared design report required to be revised



Floor loading

On the other hand, load plan was not found for the building. Building engineer is required to revised the design report updating the above-mentioned issues and submit to RSC.

Tensile strength of MS plate was considered 290 Mpa (42 Ksi) but no plate test report was found during the inspection. Building engineer is required to confirm the tensile strength of MS from existing building.

2.1 Steel Grade

The building is a steel structure. The strength of the steel has considered being A-572 i.e. yield strength is 290 MPa.

2.2 Summary of Material Assessment

The summary of the materials are shown in Table 2-1 below:

Table 2-1: Strength of material for the use in alalysis and design review.

Material property	Value
Design yield strength of structural steel, f_y	290 MPa (42,000 psi)
Rebar strength, f_y	420 MPa (60,000 psi)

2.3 Design Code

The following design code is followed for the full structural analysis.

- American Society for Steel Construction (AISC)-Load and Resistance Factor Design (LRFD)
- Bangladesh National Building Code 2020 (BNBC 2020)

Material strength in the design report

Connection gap in joint

Significant gaps observed in strut joint at several locations. Building engineer is required to carry out suitable remedial works.



Gap observed in connections

Absence of design documents

As per BNBC, every building or structure designed shall have its design documents prepared in accordance with the provision of Section 1.9.1. The design document shall include a design report, and a set of structural drawings, which shall be prepared in compliance with section 1.9.1.1 and section 1.9.1.2, part-6 of BNBC. At the time of inspection, only as-built drawing and geotechnical report were available, but no design report & load plan were available which are required to be prepared in compliance with section 1.9.1.1 (part-6, BNBC).



No design report was available for Utility Building

Apparently non engineered shed



Roof shed

The structure was appeared to be non engineered due to lack of apparent load path, poor connection and apparently inadequate member size. Building engineer is required to carry out member adequacy & lateral stability check of the wastage shed.

Stacking of construction material on roof



Stacking of construction materials and wastage found almost everywhere on the roof.

Lack of information and drawings

No drawing documents were available for the connection bridge-1. On the other hand, sectional details were found missing in the provided as-built of connection bridge-2. Factory is required prepared full set of as-built drawings and design documents for the structure.



Connection Bridge-1



Connection Bridge-2

Corrosion in steel member

Corrosion in steel member of connection bridge were observed in the several locations. The building engineer is required to suggest proper remedial measure accordingly



Corrosion



Corrosion

Observation: Connection Bridge 1 & 2

Problems Observed

Building-3:

Item 01: Load plan & design report not comply with BNBC requirements.

Item 02: Mismatch in as-built drawings.

Item 03: Significant connection gap.

Item 04: Staking of construction material on the roof.

Item 05: Racks not anchored or braced.

Building-4:

Item 06: Design report required to be revised

Item 07: Vertical bracing missing.

Item 08: Distorted steel column.

Item 09: Columns susceptible to vehicle impact.

Building-5:

Item 10: Prepared design report required to be revised.

Item 11: Connection gap in joint.

Problems Observed (Continue)

Building-6:

Item 11: Absence of design documents.

Item 12: Apparently non engineered shed. (Roof Shed)

Item 13: Stacking of construction material on roof.

Connection Bridge 1 & 2:

Item 14: Lack of information and drawings.

Item 15: Corrosion in steel member.

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Load plan & design report not comply with BNBC requirements. (Building 3)	Building engineer is required to revise the storage live load and related design documents based on BNBC requirement.	6-weeks
02	Load plan & design report not comply with BNBC requirements. (Building 3)	Implement the recommendations of design report.	6-months
03	Load plan & design report not comply with BNBC requirements. (Building 3)	Implement floor load plan.	6-months
04	Mismatch in drawings. (Building 3)	Building engineer is to survey the whole structure and update as-built drawings representing accurate site condition.	6-weeks
05	Significant connection gap. (Building 3)	Building engineer is required to repair the gap in connections with a suitable method.	6-weeks
06	Staking of construction material on the roof. (Building 3)	Remove construction materials and wastage from roof.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
07	Design report required to be revised. (Building 4)	Building engineer is required revise the design report considering actual size and strength of concrete & steel materials.	6-weeks
08	Design report required to be revised. (Building 4)	Produce and actively manage the floor loading plan following BNBC.	6-weeks
09	Design report required to be revised. (Building 4)	Carry out remedial works (if any) after review by RSC.	6-months
10	Design report required to be revised. (Building 4)	Implement floor load plan.	6-months
11	Vertical bracing missing. (Building 4)	Install the vertical bracings where necessary.	6-weeks
12	Distorted steel column. (Building 4)	Building engineer to review design of distorted steel column considering the as-built condition of the column.	6-weeks
13	Distorted steel column. (Building 4)	Carry out remedial works (if any) after review by RSC.	6-months
14	Columns susceptible to vehicle impact. (Building 4)	Install a barrier to prevent vehicle impact in column.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
15	Design report required to be revised. (Building 5)	Building engineer is required revise the design report considering actual size and strength of concrete & steel materials.	6-weeks
16	Design report required to be revised. (Building 5)	Produce and actively manage the floor loading plan following BNBC.	6-weeks
17	Design report required to be revised. (Building 5)	Carry out remedial works (if any) after review by RSC.	6-months
18	Design report required to be revised. (Building 5)	Implement floor load plan.	6-months
19	Connection gap in joint. (Building 5)	Building engineer is required to repair the gap in connections with a suitable method.	6-weeks
20	Absence of design documents. (Building 6)	Building engineer is required to prepare the design documents including a design report, and a set of structural drawings in compliance with section 1.9.1.1 and section 1.9.1.2, part-6 of BNBC and submit it to RSC for review.	6-weeks
21	Absence of design documents. (Building 6)	Produce and actively manage a set of floor loading plan following BNBC.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
22	Absence of design documents. (Building 6)	Carry out remedial works (if any) after review by RSC.	6-months
23	Absence of design documents. (Building 6)	Implement floor load plan.	6-months
24	Apparently non-engineered Shed. (Building 6-roof shed)	Building engineer is required to carry out member adequacy & lateral stability check of the shed.	6-weeks
25	Apparently non-engineered Shed. (Building 6-roof shed)	Implement remediation work where necessary.	6-months
26	Stacking of construction material on roof. (Building 6)	Remove construction materials and wastage from roof.	6-weeks
27	Lack of information and drawings. (Connection bridge 1 & 2)	Building engineer is to survey the whole structure and update as-built drawings representing accurate site condition.	6-weeks
28	Corrosion in steel member (Connection bridge 1 & 2)	Building engineer to remove the corrosion and apply suitable corrosion resistance coating.	6-weeks