

Issue 1
16 July 2023

Sterling Denims Ltd. Unit-2

Dhania, Nayerhat, Ashulia, Savar, Dhaka- 1350.

Geographic Coordinates: 23.915762, 90.237534

5 June 2023



Building Information

1. **Main Production Building Unit-2:** The structure is a nine (B+G+8) storied reinforced concrete (RC) building with a partial basement.
2. **Utility Building-2:** The structure is a four (B+G+3) storied RC building with a basement.
3. **PP Spray Shed:** The structure is a two (G+1) storied steel structures.
4. **Chemical Store Shed:** The structure is a single storied steel shed.
5. **Security Building:** The structure is a single storied RC building.

Observations

Design report needs to be updated and reviewed

4.8 ADEQUACY OF SLAB AND BEAM DESIGN

The typical floor slab is two way beam supported slab. The maximum panel size is 22'-7" x 29'-7" and the thickness provided 9" is adequate as per BNBC / ACI Code. The reinforcement provided in typical floor slab is 10mm@ 8" c/c and 1-12mm extra bottom/gap at bottom. 12 mm@10" c/c at top and 2-10mm extra top/gap, 2-12mm extra top/gap in long direction and in short direction respectively. The reinforcement is adequate. Slab reinforcement is adequate to carry the load upon it.

BEAM REINFORCEMENT REQUIRED FROM ETABS ANALYSIS:

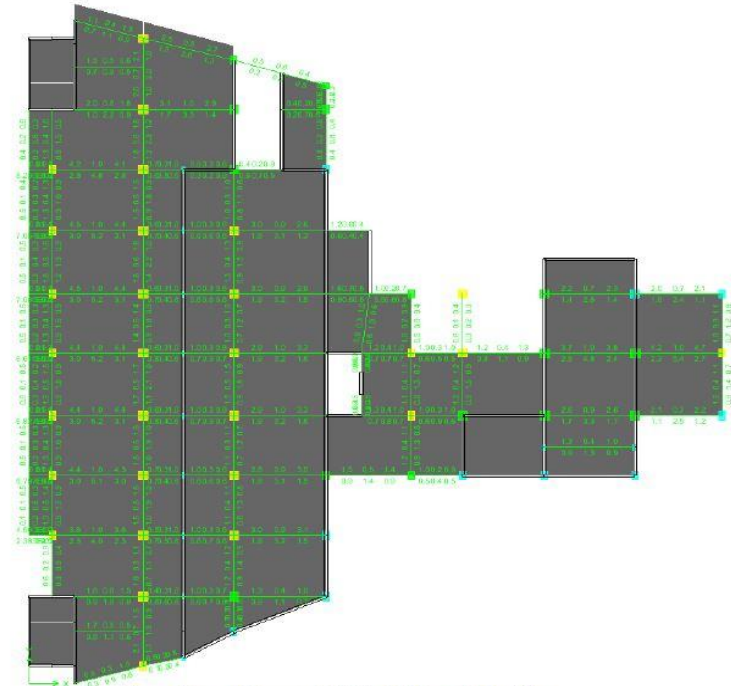


Figure: Beam reinforcement (in²) in GF Floor of the building

4.8 ADEQUACY OF SLAB AND BEAM DESIGN

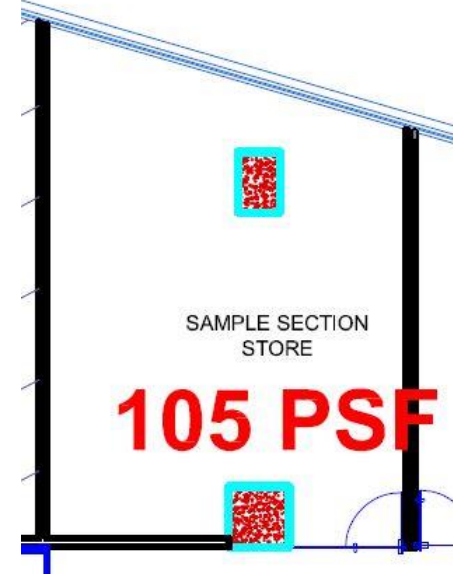
The typical floor slab is two way beam supported slab. The maximum panel size is 22'-7" x 29'-7" and the thickness provided 9" is adequate as per BNBC / ACI Code. The reinforcement provided in typical floor slab is 10mm@ 8" c/c and 1-12mm extra bottom/gap at bottom. 12 mm@10" c/c at top and 2-10mm extra top/gap, 2-12mm extra top/gap in long direction and in short direction respectively. The reinforcement is adequate. Slab reinforcement is adequate to carry the load upon it.

BEAM REINFORCEMENT REQUIRED FROM ETABS ANALYSIS:

Plan irregularity/diaphragm irregularity/weak storey check/slab design not provided in design report

Plan irregularity/weak storey check not provided in design report. Also, only a brief description for slab is provided rather than providing a detail design of slab. Building engineer is required to update the design report including all requirements of BNBC 1.9.1.

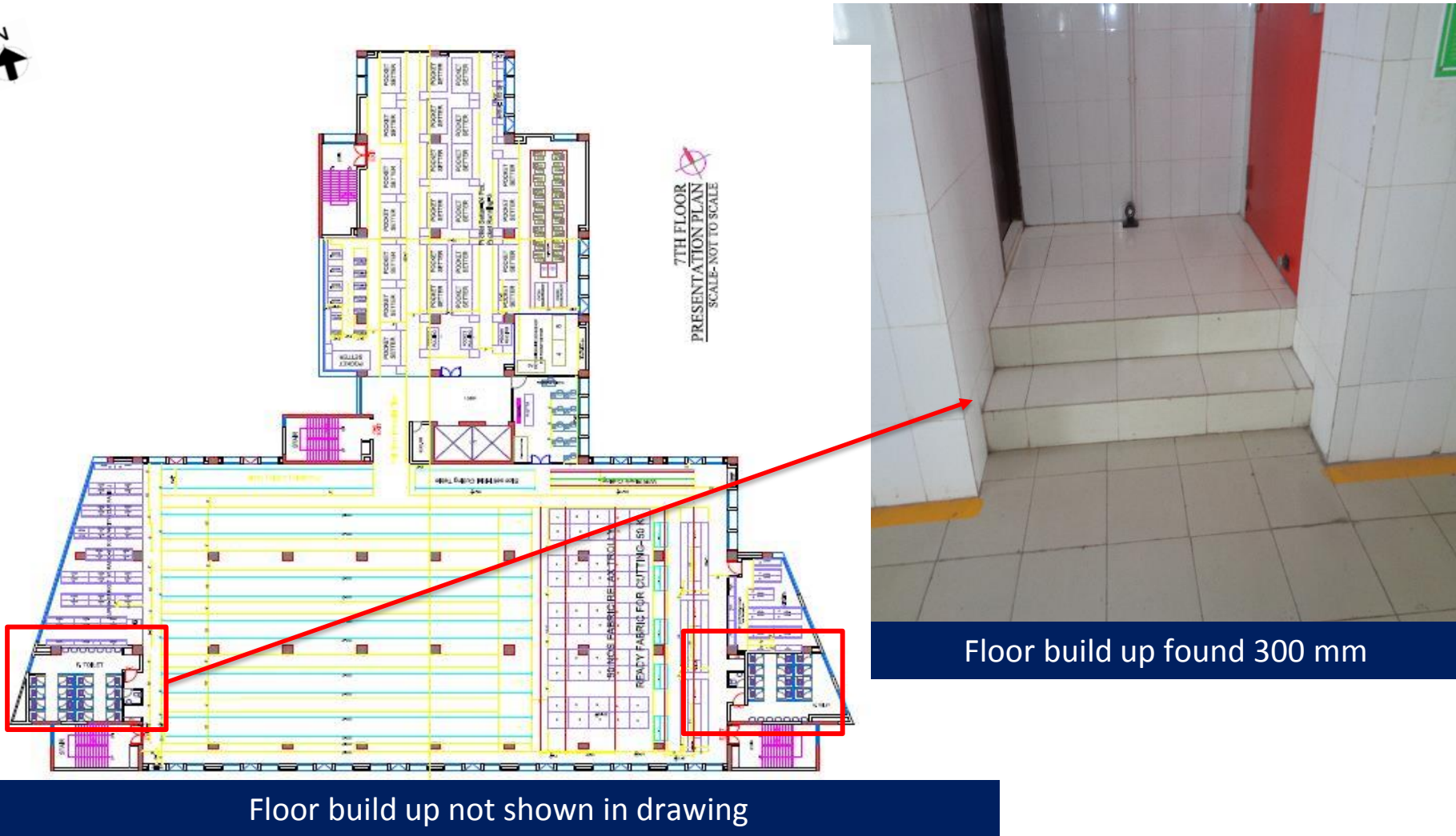
Prepared load plan to be revised



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	
	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)	
	5 Printing plant :			^(S)
	Press room	7.0	11.0	
	Composing and linotype room	5.0	9.0 ^(S)	
	Paper storage room	12.0	9.0 ^(S)	
	6 Motor room, fan room etc. including the weight of machinery	7.5	4.5	
	7 Cold storage, grain storage	15.0	9.0 ^(S)	
	8 Storage warehouses : light	6.0	4.5 ^(S)	
	heavy	12.0	9.0	
	9 Foundries	20.0	12.0	

Live load on highlighted area is considered as 5 kPa in prepared load plan. As per BNBC- Part 6, live load for light storage areas is required to be considered minimum 6 kPa. Building engineer is required to revise the load plan as per BNBC requirement and check the design accordingly.

Discrepancies in as-built drawing



300 mm floor build up was found at toilet areas which was not shown in drawing. Building engineer is required to update the as-built drawing.

Apparently non engineered rooftop shed



Roof Shed



Poor connection

Rooftop shed was appeared to be non-engineered due to lack of apparent load path, poor connection and inadequate member size. Building engineer is required to check the connection adequacy for uplift forces as part of EA and implement remediation work where required.

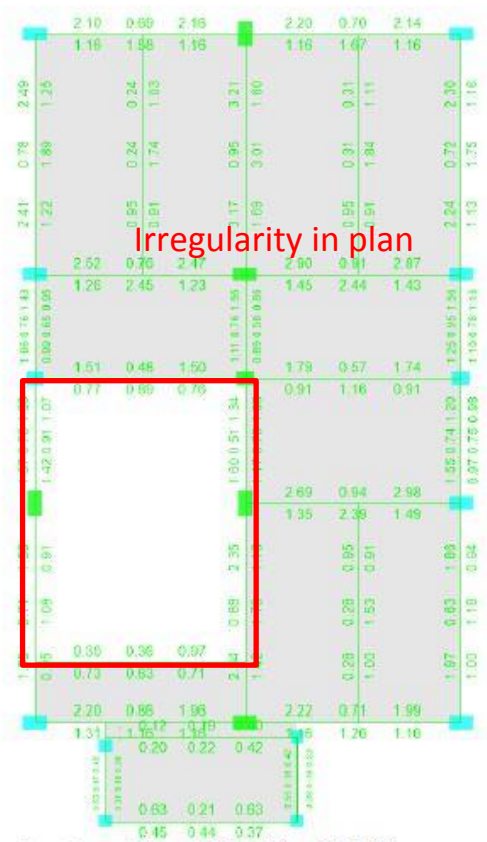
Possible vehicle impact for column



Inadequate safety barrier provided for the exposed columns at ground floor

Columns at ground floor are prone to possible vehicle impact. Building engineer is required to provide barrier for all exposed column at ground floor to prevent from possible vehicle impact.

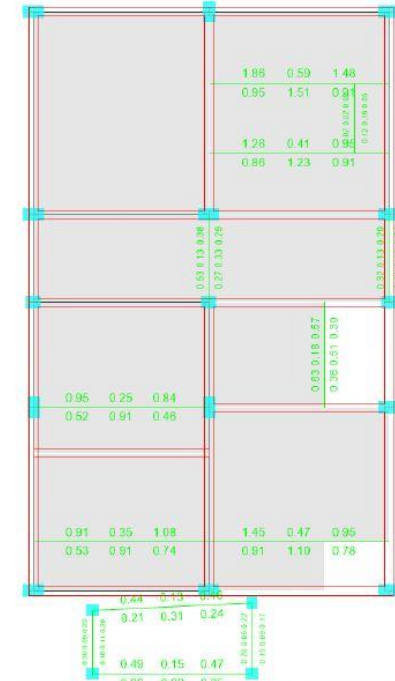
Design report needs to be updated and reviewed



4.7 ADEQUACY OF SLAB AND BEAM DESIGN

The typical floor slab is two way beam supported slab. The maximum panel size is 28'-1" X 24'-6" and the thickness provided 9" is adequate as per BNBC / ACI Code. The reinforcement provided in typical floor slab is 12mm@ 10" c/c and 1-12mm extra bottom/gap at bottom, 12 mm@12" c/c at top and 2-12mm extra top/gap in long direction and in short direction. The reinforcement is adequate. Slab reinforcement is adequate to carry the load upon it.

BEAM REINFORCEMENT REQUIRED FROM ETABS ANALYSIS:



Weak storey/diaphragm irregularity check/slab design not provided in design report

Weak storey check not provided in design report. Also, only a brief description for slab is provided rather than providing a detail design of slab. Building engineer is required to update the design report including all requirements of BNBC 1.9.1.

Design report needs to be updated and reviewed

2 Materials Considered In Design

Material strength considered

Concrete:

Compressive Strength of Concrete $f_c' = 3,500$ psi.

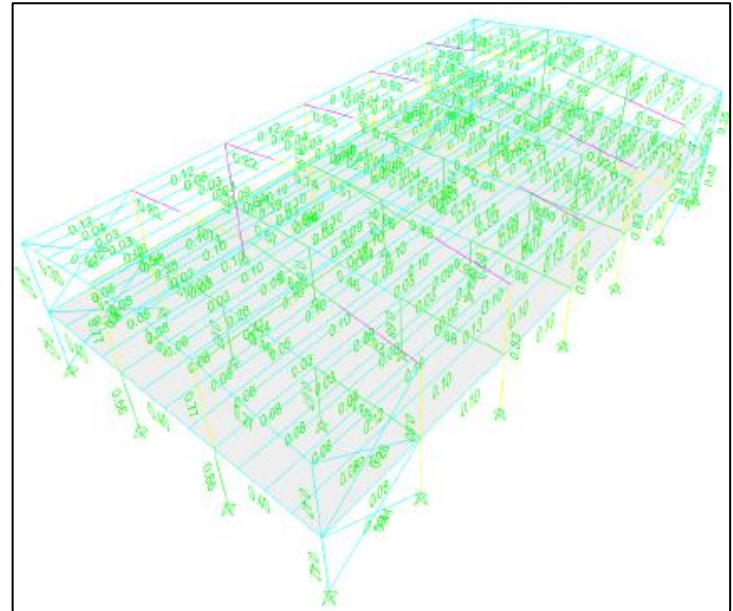
Reinforcement: Deformed bar with minimum yield strength = 60,000 psi (60 grade).

Steel plate: 50,000 psi (50 grade).

Anchor Bolt and Nut Bolt: 40,000 psi (40 grade).

Welding: 70,000 psi (70 grades).

Material strength specification in design report



FEA model for super structure

In design report, concrete design strength 3500 psi and steel MS plate design strength 50 ksi has been considered. However, no material test report was available to confirm these considered material strength. In addition, no adequacy check for pedestal column was also provided. Building engineer is required to update the design report including all requirements of BNBC 1.9.1.

Discrepancies in as-built drawing



PP Spray Shed



Undocumented 250mm masonry wall

During inspection, an undocumented 250mm masonry wall area was observed on 1st floor which was not incorporated in as-built architectural drawing. The building engineer is required to survey the whole structure and update the as-built drawing as per on-site condition in accordance with BNBC.

Apparently inadequate connection

Observations: PP Spray Shed



Oversized hole in bolted connection



Oversized hole, loose bolt and gap between connection plates observed in bolted connection. Also, the steel bracing connections and the gusset size appeared to be inadequate. The building engineer is required to check the connections adequacy as part of EA and fill up all the connection gaps & tighten the bolt with proper engineered way.



Apparently inadequate bracing gusset plate and eccentricity in joint



Gap between connection plates & loose bolt

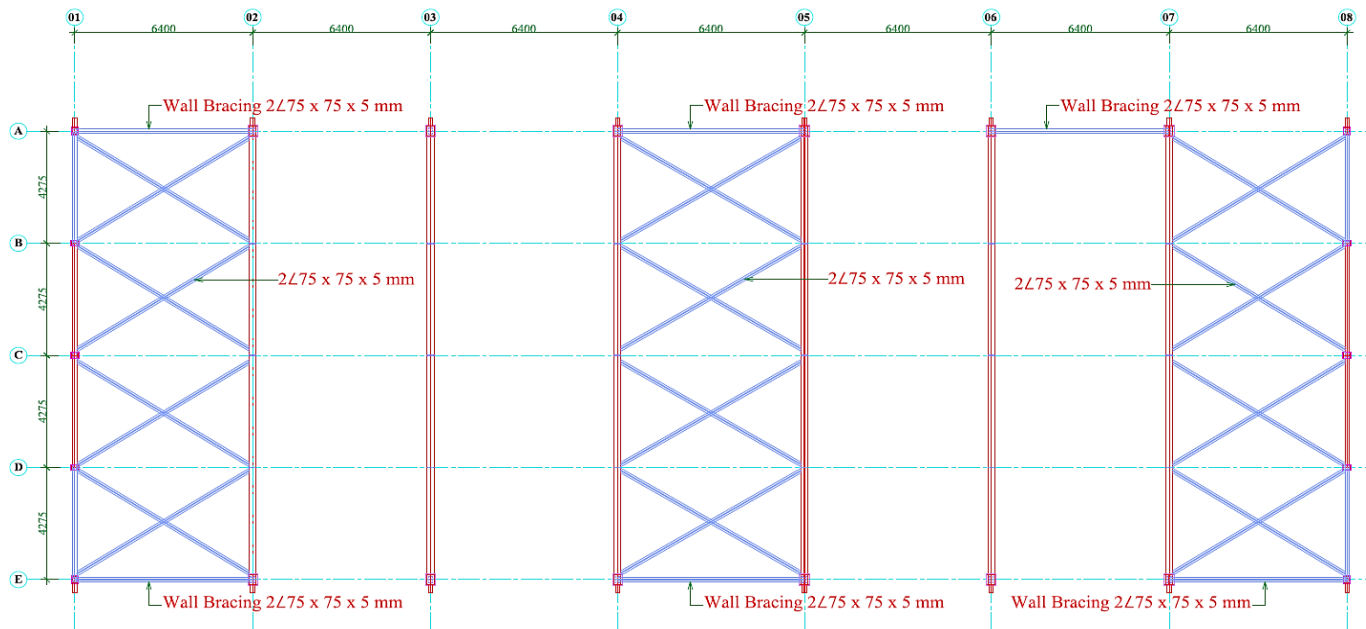
Corrosion in steel members



Corrosion in steel members

Corrosion was observed in steel columns and bracings of PP Spray Shed. Factory is required to remove the corrosion & provide rust proof paint on all steel members to protect from corrosion.

Mismatch between structural drawing and on-site condition



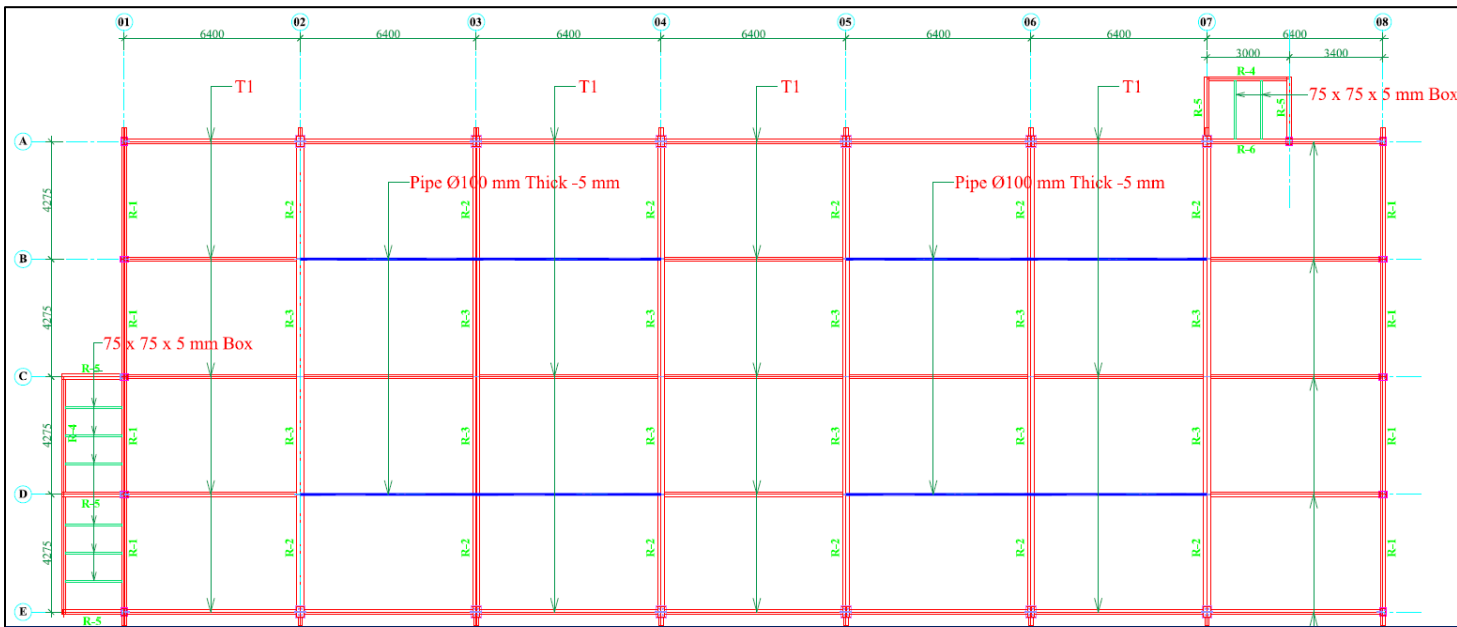
Bracing layout drawing: 2L-75x75 mm bracing at roof



2L-50x50 mm bracing measured at roof

50x50 mm bracing was found instead of 75x75 mm bracing at roof. The building engineer is required to survey the structures and prepare accurate as-built drawings with connection details. Also, check the adequacy of the shed for the actual size of bracing members.

Observation: Chemical Store Shed

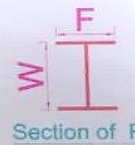


Compression strut layout drawing: I shaped strut (T1) at eave, ridge and end & central bays

Pipe compression strut was found instead of I-shaped strut at roof. The building engineer is required to survey the structures and prepare accurate as-built drawings with connection details. Also, check the adequacy of the shed for the actual size of strut members.

Steel Rafter Schedule:

Rafter	WEB		FLANGE	
	Depth W (mm)	Thickness T (mm)	Width F (mm)	Thickness T (mm)
R1	300	6	150	8
R2	750~350	6	250	8
R3	350~550	6	250	8
R4	150	4	100	5
R5	350~250~125	4	150	6
R6	200	4	150	6
T1	200	5	150	6



→ steel pipe (≈ 100 mm dia)

I shaped compression strut size: T1=200x5,150x6



MS pipe compression member found onsite

Observation: Chemical Store Shed

Steel Rafter Schedule:

Rafter	WEB		FLANGE	
	Depth W (mm)	Thickness T (mm)	Width F (mm)	Thickness T (mm)
R1	300	6	150	8
R2	750~350	6	250	8
R3	350~550	6	250	8
R4	150	4	100	6
R5	350~250~125	4	150	6
R6	200	4	150	6
T1	200	5	150	6

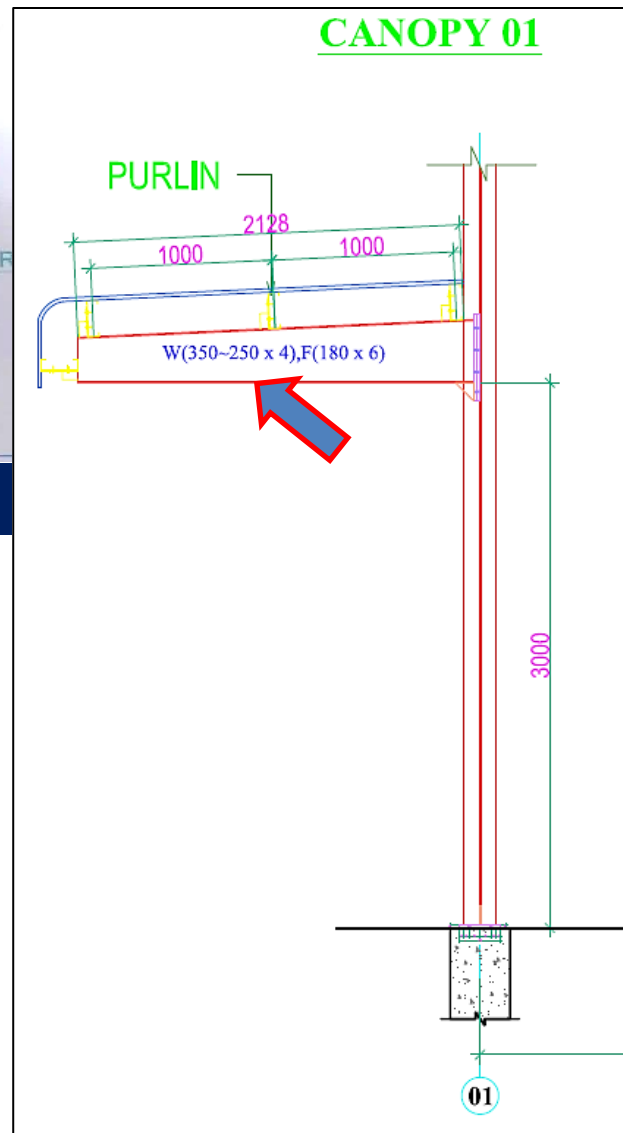
Section of R

steel pipe (≈ 100 mm dia)

Cantilever size- W350~250x4,F180x6



Cantilever size- W250~125x4,F150x6
measured onsite



Cantilever rafter of Canopy-01

Mismatch found between cantilever rafter sizes. The building engineer is required to survey the structures and prepare accurate as-built drawings with connection details. Also, check the adequacy of the shed for the actual size of rafter members.

Observation: Chemical Store Shed

Crack in brick walls



North-East Corner



South-West Corner

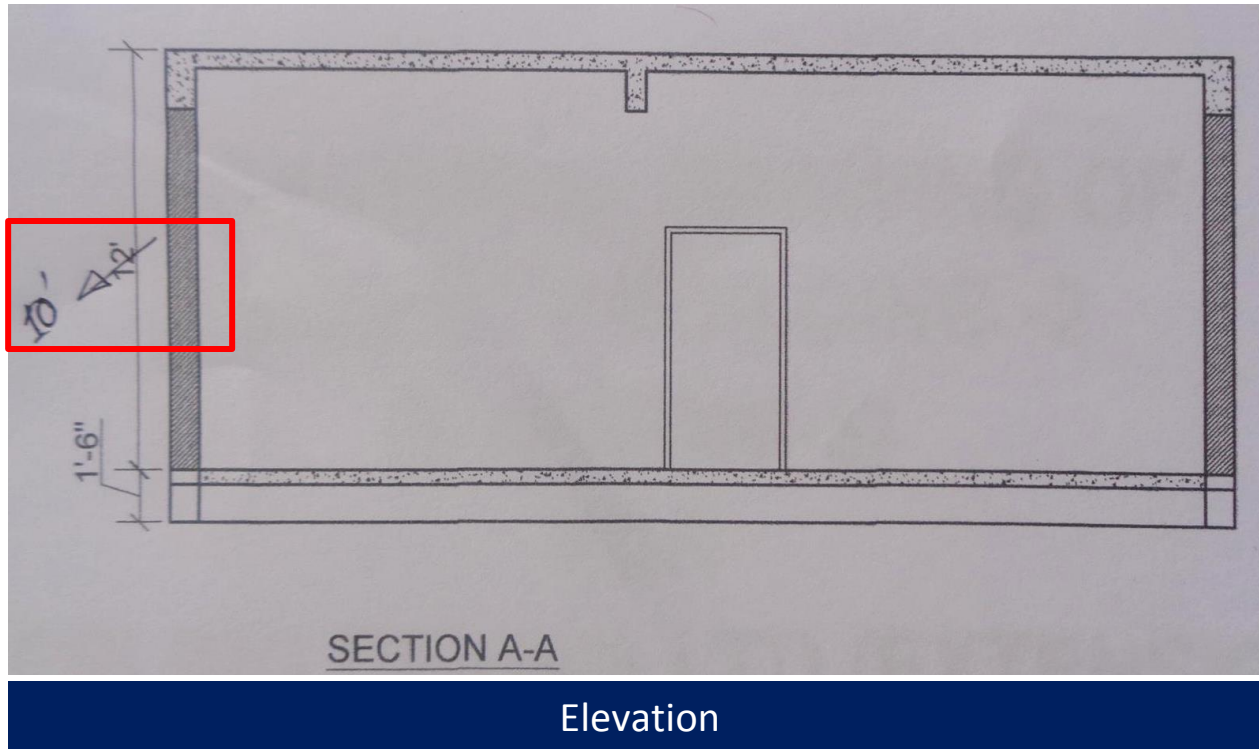


Crack in brick walls

Crack observed in brick walls. The building engineer is required to identify the reason of crack and carry out suitable remedial works.

Observation: Chemical Store Shed

Discrepancy in as-built drawing



Floor height was measured 3 m instead of 3.6 m. The building engineer is required to survey the structures and prepare accurate as-built drawings.

Exposed rebar on the roof



Exposed rebar on the roof which is prone to corrosion

The building engineer is required to provide protective coating to the exposed rebar.

Problems Observed

Main Production Building Unit-2:

Item 1: Design report needs to be updated and reviewed.

Item 2: Prepared load plan to be revised.

Item 3: Discrepancies in as-built drawing.

Item 4: Apparently non engineered rooftop shed.

Item 5: Possible vehicle impact for column.

Utility Building -2:

Item 6: Design report needs to be updated and reviewed.

PP Spray Shed:

Item 7: Design report needs to be updated and reviewed.

Item 8: Discrepancies in as-built drawing.

Item 9: Apparently inadequate connection.

Item 10: Corrosion on steel members.

Chemical Store Shed:

Item 11: Mismatch between structural drawing and on-site condition.

Item 12: Crack in brick walls.

Security Building:

Item 13: Discrepancy in as-built drawing.

Item 14: Exposed rebar on the roof.

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	Design report needs to be updated and reviewed (Main Production Building Unit-2)	Building engineer is required to update the design report including all requirements of BNBC 1.9.1.	6-weeks
02	Design report needs to be updated and reviewed (Main Production Building Unit-2)	Carry out the remedial works if required.	6-months
03	Prepared load plan to be revised (Main Production Building Unit-2)	Building engineer is required to revise the load plan as per BNBC requirement and check the design accordingly.	6-weeks
04	Prepared load plan to be revised (Main Production Building Unit-2)	Carry out the remedial works if required.	6-months
05	Discrepancies in as-built drawing (Main Production Building Unit-2)	Building engineer is required to update the as built drawing.	6-weeks
06	Apparently non engineered shed (Main Production Building Unit-2)	Building engineer is required to check the connection adequacy for uplift forces as part of EA.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
07	Apparently non engineered shed (Main Production Building Unit-2)	Implement remediation work where required.	6-months
08	Possible vehicle impact for column (Main Production Building Unit-2)	Building engineer is required to provide adequate safety barrier for all exposed column at ground floor to prevent from possible vehicle impact.	6-weeks
09	Design report needs to be updated and reviewed (Utility Building -2)	Building engineer is required to update the design report including all requirements of BNBC 1.9.1.	6-weeks
10	Design report needs to be updated and reviewed (Utility Building -2)	Carry out the remedial works if required.	6-months
11	Design report needs to be updated and reviewed. (PP Spray Shed)	Building engineer is required to prepare the design report including all requirements of BNBC.	6-weeks
12	Design report needs to be updated and reviewed. (PP Spray Shed)	Carry out the remedial works if required.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
13	Discrepancies in as-built drawing. (PP Spray Shed)	Building engineer is required to update the as built drawing as per BNBC.	6-weeks
14	Apparently inadequate connection. (PP Spray Shed)	The building engineer is required to check the connections adequacy as part of EA and fill up all the connection gaps & tighten the loose bolt with proper engineered way.	6-weeks
15	Apparently inadequate connection. (PP Spray Shed)	Suggest necessary remedial actions.	6-weeks
16	Apparently inadequate connection. (PP Spray Shed)	Carry out suggested remediation works where required.	6-months
17	Corrosion in steel members. (PP Spray Shed)	Building engineer is required to remove the corrosion and provide rust proof paint on all steel members to protect from corrosion.	6-weeks
18	Mismatch between structural drawing and on-site condition. (Chemical Store Shed)	The building engineer is required to survey the structures and prepare accurate as-built drawings with connection details.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
19	Mismatch between structural drawing and on-site condition. (Chemical Store Shed)	Check the adequacy of the shed for the actual size of steel members.	6-weeks
20	Mismatch between structural drawing and on-site condition. (Chemical Store Shed)	Carry out suggested remedial works if required.	6-months
21	Crack in brick walls. (Chemical Store Shed)	The building engineer is required to identify the reason of crack and carry out suitable remedial works.	6-weeks
22	Discrepancy in as-built drawing. (Security Building)	The building engineer is required to survey the structures and prepare accurate as-built drawings.	6-weeks
23	Exposed rebar on the roof. (Security Building)	Building engineer is required to provide protective coating to the exposed rebar.	6-months

Survey Limitations and Assumptions

This report is for the private and confidential use of RSC for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of RSC.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual inspection of the building.

This Report is not intended to be treated as a generalised inspection and does not cover the deterioration of structural members through dampness, fungal or insect attack, nor does it deal with problems and defects of a non-structural nature. Other non structural aspects of the building such as fire safety have not been assessed in this survey.

Except as otherwise noted, drains and other services were not viewed or tested during our inspection and are therefore similarly excluded from this Report. We have not inspected any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External inspection of the façade walls has generally been carried out from ground level only by visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the structure and in particular foundations. Strengths of materials and components are untested and we recommend that the factory owners Building Engineer carries out in situ testing over and above those suggested to satisfy themselves with the material strengths and component details.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed. This report does not interfere with the factory owners Building Engineers responsibility for the structural performance of this building, The Building Engineer remains fully responsible for the structural adequacy of the building.

This report does not comment in detail on the future seismic performance of the building and only highlights the fact that the building may experience significant damage or collapse in a seismic event along with many others in the Dhaka region.

The observations in this report are based on the Engineering Judgement of the lead surveyor/engineer at the time of the survey. We assume in making these observations that no covering up of faults defects, filling or plastering over cracking or significant repair work has been carried out by the building owner. Any future alteration or additional work by the building owner will void this report.