# Square Apparels Limited.

Mamarishpur, Mallikbari, Bhaluka, Mymensingh
(24.27937, 90.36931)
06 June 2022

RSC RMG SUSTAINABILITY COUNCIL

# Building Information

**Building-1 (Production Building):** Six Storied RC Building (G+5).

**Building-4 (Storage Building):** Single Storied Prefabricated Steel Shed (G).

**Building-5 (Utility Building):** Single Storied RC Building (G).

**Building-6 (Pump House):** Single storied RC Building with Basement (B+G).

**Building-7 (Incineration Boiler):** Single Storied Prefabricated Steel Shed (G).

**Building-8 (Dining Shed Building):** Single Storied Prefabricated Steel Shed (G).

# Observations

**Lack of information in design report and details of seismic design criteria**

## Observations: Building-1

**Wind load:**

The calculation of wind load confirms the Sub-clause 2.4, Chapter 2, and part 6 of BNBC. The following equation has been used to calculate sustained wind pressure of the structure.

$Pz = Cg\ Cp\ Cc\ Ci\ Cz\ V_b^2$ [BNBC, 2.4.6.2, 2.4.6.3 page – 6-33, 6-34]

Exposure A was considered for wind load calculation.

Following are the basic parameters assumed for wind loads on buildings

Basic Wind Speed: 217 km/hr

Structure Importance Coefficient: 1.0

Exposure Category: 'A'

Combined Height and Exposure Coefficient: As per Table 6.2.10 (Ref. BNBC)

Overall pressure coefficients for wind load are used as per table 6.2.15 (BNBC)

**Earth Quake load:**

Following are the basic parameters assumed for seismic analysis of buildings

Zone Factor (Z): 0.25 (Zone III)

Important Factor (I): 1.0

Response Modification Coefficient: 12(SMRF)

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Results have been scaled to have a minimum base shear as per formula

V= ZICW/R (Ref. BNBC)

The time period of the buildings have been adopted based on the formula

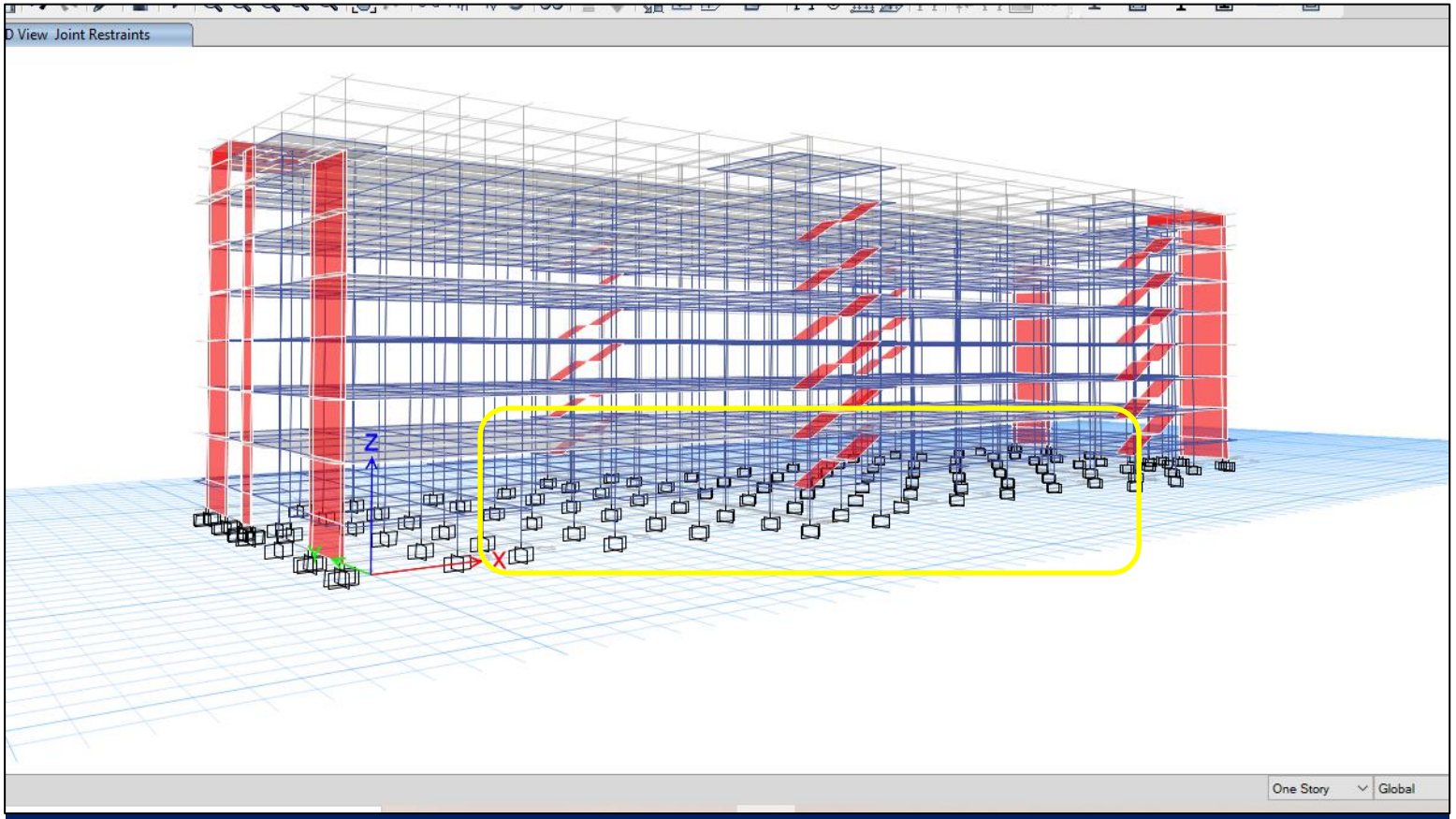
$T=0.073(h_n)^{3/4}$ (Ref. BNBC)

Response modification factor R-value has been assumed as 12 which is referred to Special Moment Resisting Frame (SMRF), but no seismic detailing was provided with the report. Moreover, wind and earthquake load calculations were not included in the report.



# Observations: Building-1

Foundation system of the building is single footings which are rested on compressible soil but fixed support at the end of R.C.C columns have been assigned in the FEA model. Factory engineer is required to review the support system of the foundation.

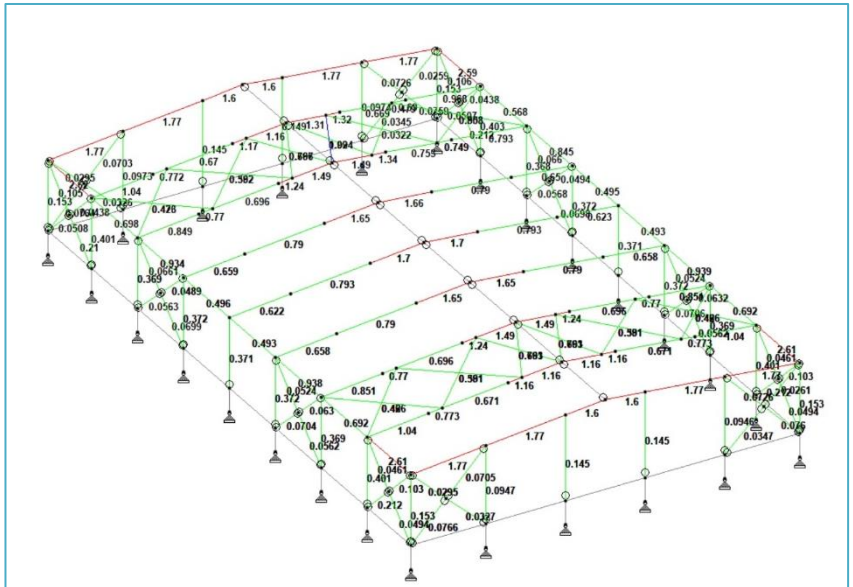



Foundation system of the building

# Observations: Building-1

Overstressed structural member

## Observations: Building-4



Stress Member Ratio

In DEA report, overstress has been found in steel members. Also, it has been noted that pedestal RC columns of the building are inadequate. Remedial actions has not been carried out as per recommendation of DEA report.

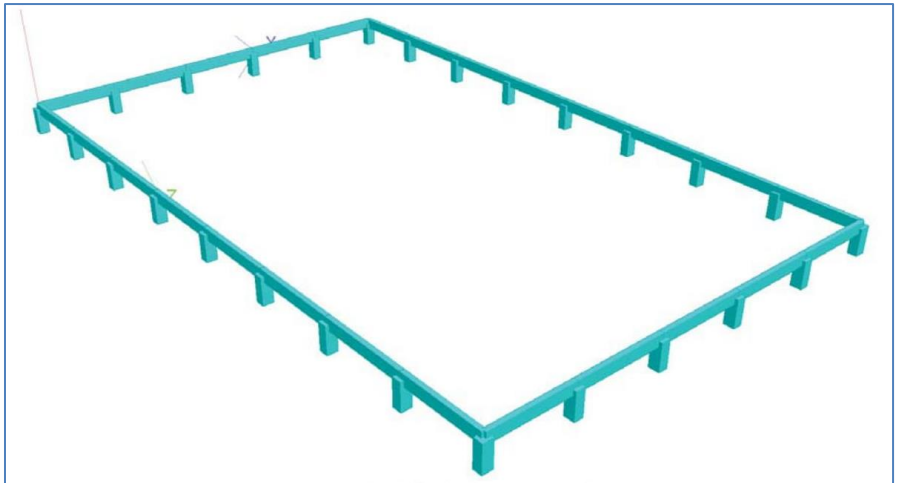


Fig: RCC Column and Grade

**Column Compliance Table (Bellow PL):**

| Column Id | Grid | Dimension | Existing Steel (%) | Required Steel at (%) | Compliance |
|---|---|---|---|---|---|
| A,1 | C02 | 600x700 | 0.73 | 1.15 | Inadequate |
| A,2 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,3 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,4 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,5 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,6 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,7 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,8 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| A,9 | C02 | 600x700 | 0.73 | 1.15 | Inadequate |
| F,1 | C02 | 600x700 | 0.73 | 1.15 | Inadequate |
| F,2 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,3 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,4 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,5 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,6 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,7 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,8 | C01 | 600x700 | 0.83 | 1.15 | Inadequate |
| F,9 | C02 | 600x700 | 0.73 | 1.15 | Inadequate |
| B,1 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| C,1 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| D,1 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| E,1 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| B,9 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| C,9 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| D,9 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |
| E,9 | C03 | 600x700 | 0.65 | 1.15 | Inadequate |

# Observations: Building-4

# Mismatch in structural drawings



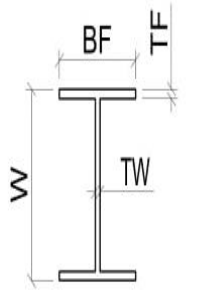
## Observation: Building-4

Steel Column Size- (W: 200 mmx 6 mm; F: 200 mm x 8 mm)

During inspection C-104 steel column size was found W- 200 mmx 6 mm; F- 200 mm x 8 mm instead of W- 250 mmx 6 mm; F- 250 mm x 8 mm. Factory engineer is required to update as built structural drawing as per existing condition.

SCHEDULE OF STEEL COLUMN MATERIALS:

| NAME | W (mm) | TW (mm) | BF (mm) | TF (mm) |
|---|---|---|---|---|
| C-101 | 400~1250 | 10 | 350 | 16 |
| C-102 | 400 | 8 | 250 | 16 |
| C-103 | 400 | 8 | 245 | 16 |
| C-104 | 250 | 6 | 250 | 8 |




TYP. SECTION

Steel Column Schedule



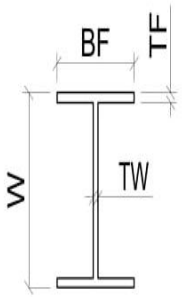
# Observation: Building-4

Steel Rafter Size- (W: 390 mm x 5 mm; F: 200 mm x 8 mm)

During inspection R-204 steel rafter size was found W- 390 mmx 5 mm; F- 200 mm x 8 mm instead of W- 250 mmx 5 mm; F- 250 mm x 8 mm. Factory engineer is required to update as built structural drawing as per existing condition.

SCHEDULE OF STEEL RAFTER MATERIALS:

| NAME | W (mm) | TW (mm) | BF (mm) | TF (mm) |
|---|---|---|---|---|
| R-201 | 900~1285 | 8 | 300 | 12 |
| R-202 | 900~770 | 5 | 250 | 12 |
| R-203 | 770~380 | 5 | 250 | 8 |
| R-204 | 250 | 5 | 250 | 8 |




TYP. SECTION

Steel column schedule



# Observation: Building-4

# Corrosion in steel members



## Observation: Building-4


Corrosion in steel column (Canopy)

During inspection corrosion was found in steel column & rafter. Factory is required to take proper remedial measures for preventing the corrosion from steel members.

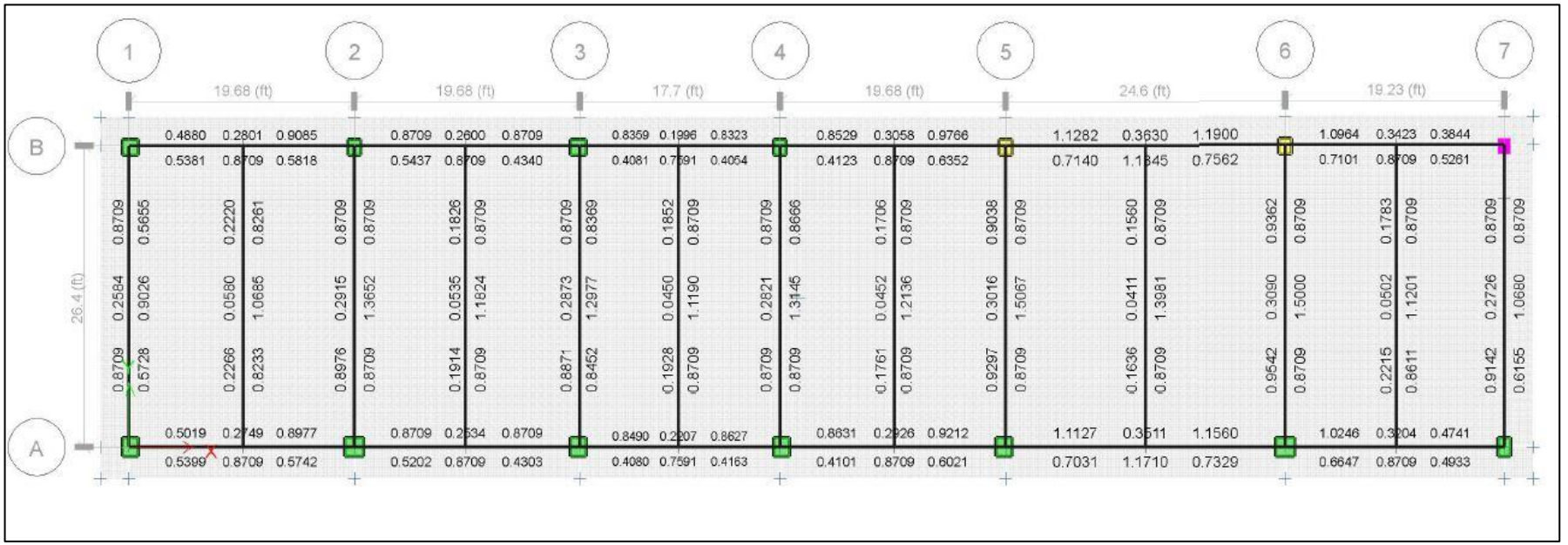

Corrosion in steel safter at Canopy



# Observation: Building-4

# Material strength consideration in design report

## Observations: Building-5




Design report was available on site for Building-5. In which concrete compressive strength fc' was considered 3500 psi but no material test report was found for justifying the strength.

Building engineer is required to confirm the design concrete compressive strength.

**Detail Information of Structure:**

**A. Structural System:**

| | |
|---|---|
| No. Of Stories: | **One** |
| Frame Type: | Reinforced Concrete Frame |
| Foundation System: | **Isolated Footing** |

**Strength of Concrete and Reinforcing Bar**:

The grade of steel used in the design of columns, slabs and beams are fy = 60,000 psi.

Concrete strength, fc' = 3500 psi



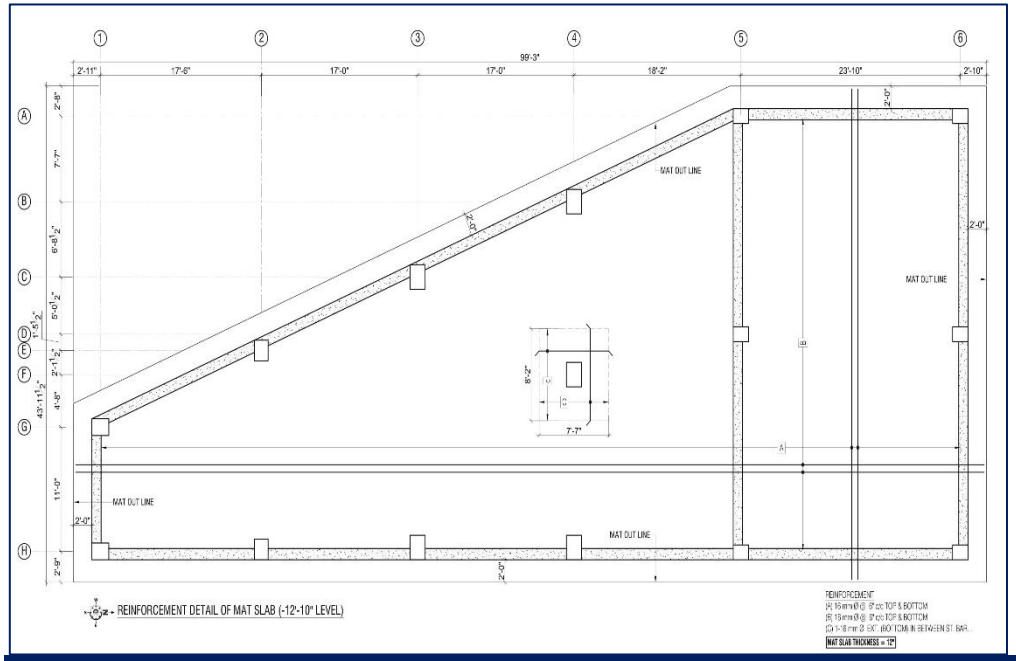
# Observations: Building-5

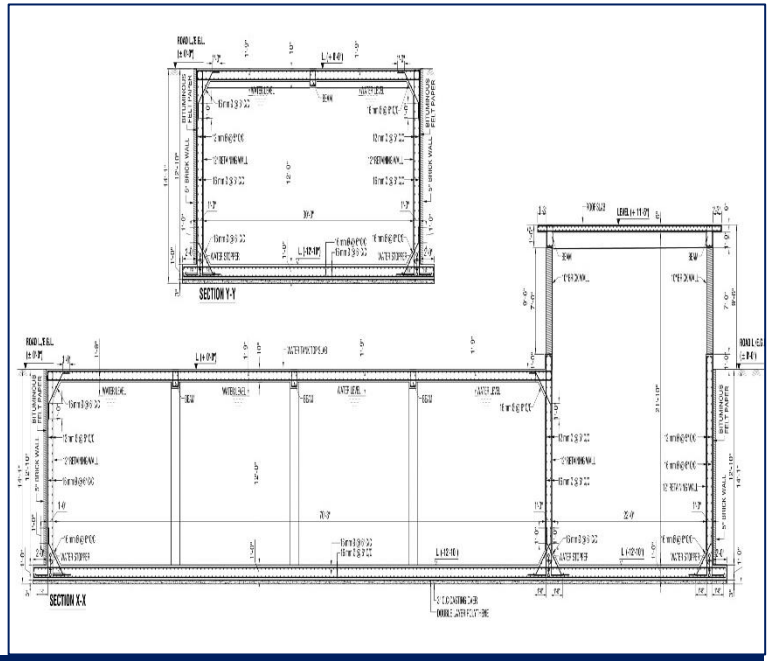
**Geotechnical investigation report not available**



## Observation: Building-6

The soil investigation report was not available on site. So, the foundation capacity could not be verified. The factory is required to investigate the soil bearing capacity and verify the foundation adequacy accordingly.




Reinforcement & Sectional Details of Mat Foundation



# Observation: Building-6

**Water ponding & dampness on slab soffit**



## Observation: Building-6

Water ponding was found at roof of the pump house building.
During inspection sign of water clogging & dampness at slab soffit was found. Factory is required to improve water drainage system to avoid water clogging at roof.


Water Ponding on Roof

Dampness at Slab Soffit

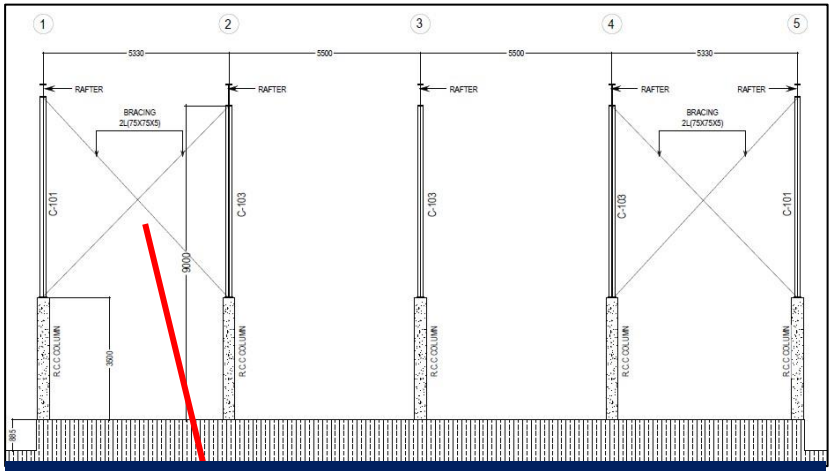


# Observation: Building-6

**Lack of lateral stability system**



## Observations: Building-7




Bracing Layout plan (elevation)

Lateral load transfer media missing at roof level


Tension/Angle bracing without compression strut

Angle bracing at end bays

Lateral load transfer media (compression strut) along the long direction is missing. Building engineer to check the lateral stability of the structure.

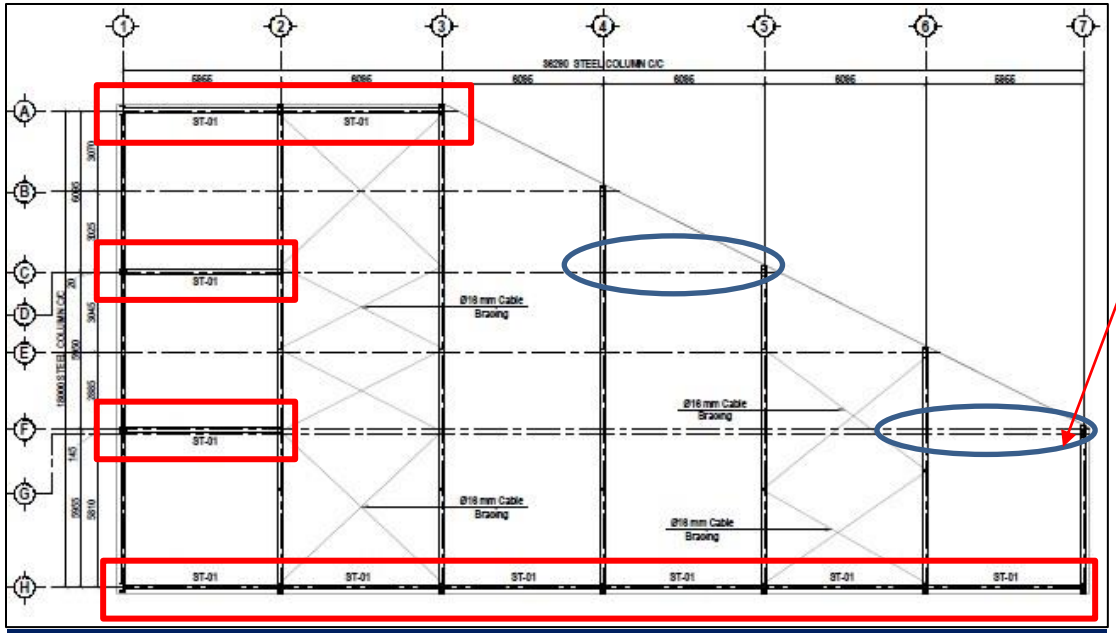


# Observations: Building-7

**Lack of lateral stability system**



## Observations: Building-8




Roof Bracing and compression strut (marked location) Layout plan

Lack of lateral load transfer media (compression strut) marked in blue along the long direction. Building engineer to check the lateral stability of the structure.


Lateral load transfer media missing at roof level

Compression strut missing



# Observations: Building-8

# Tests carried out

Stone Chips – Column Building-1

Stone Chips – Column Building-5

Stone Chips- Column (Building-6)


(Building-6): Rebar Scan

Stone Chips - Column (Building-7)



# Test Carried Out:

# Problems Observed

**Building-1 (Production Building):**

Item 01: Lack of information in design report and details of seismic design criteria.

**Building-4 (Storage Building):**

Item 02: Overstressed structural member.

Item 03: Mismatch in structural drawings.

Item 04: Corrosion in steel members.

**Building-5 (Utility Building):**

Item 05: Material strength consideration in design report.

**Building-6 (Pump House):**

Item 06: Geotechnical investigation report not available.

Item 07: Water ponding & dampness on slab soffit.

**Building-7 (Incinerator Boiler):**

Item-08: Lack of Lateral Stability.

**Building-8 (Dining shed Building):**

Item-09: Lack of Lateral Stability.

# Priority Actions

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 01 | Lack of information in design report and details of seismic design criteria. (Building-1) | Building engineer is required to review the design of the building for special seismic design criteria and support system | 6-weeks |
| 02 | Lack of information in design report and details of seismic design criteria. (Building-1) | Building engineer to update the design document including FEA model & design report in compliance with section 1.9.1.1 and section 1.9.1.2 as per BNBC. | 6-weeks |
| 03 | Lack of information in design report and details of seismic design criteria. (Building-1) | Implement the recommendations of design report. | 6-months |
| 04 | Overstressed structural member. (Building-4) | Building engineer is required to review the design of the building and carry out remedial works as per suggestion of the DEA report. | 6-weeks |

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 05 | Mismatch in structural drawings. (Building-4) | Building engineer is required to produce full set of as-built drawing reflecting the as constructed condition. | 6-weeks |
| 06 | Corrosion in steel members. (Building-4) | Apply suitable method to protect the steel members from corrosion. | 6-weeks |
| 07 | Material strength consideration in design report. (Building-5) | Building engineer is required to confirm the design concrete compressive strength and review the design as per the concrete strength. | 6-weeks |
| 08 | Material strength consideration in design report. (Building-5) | Implement the recommendations of design report. | 6-months |

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 09 | Geotechnical investigation report not available. (Building-6) | The factory is required to investigate the bearing capacity of soil for the buildings. | 6-weeks |
| 10 | Geotechnical investigation report not available. (Building-6) | Verify the foundation adequacy of the buildings. | 6-weeks |
| 11 | Geotechnical investigation report not available. (Building-6) | Implement remedial actions where necessary. | 6-months |
| 12 | Water ponding & dampness on slab soffit. (Building-6) | Building engineer is required to improve water drainage system with adequate slope to avoid water clogging. | 6-weeks |

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 13 | Water ponding & dampness on slab soffit. (Building-6) | Building engineer is required to investigate the damaged area and suggest proper remedial actions. | 6-weeks |
| 14 | Water ponding & dampness on slab soffit. (Building-6) | Implement remedial actions, as necessary. | 6-months |
| 15 | Lack of lateral stability system. (Building-7) | Building engineer is required to check the lateral stability of the shed. | 6-weeks |
| 16 | Lack of lateral stability system. (Building-7) | Implement the remediation where required. | 6-months |

| Item No. | Observation | Recommended Action Plan | Recommended Timeline |
|---|---|---|---|
| 17 | Lack of lateral stability system (Building-8). | Building engineer is required to check the lateral stability of the shed. | 6-weeks |
| 18 | Lack of lateral stability system (Building-8). | Implement the remediation if required. | 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.