

# Integra Apparels (Bangladesh) Ltd- Extension

742, Dhour, Nayanagar, Turag, Dhaka-1230  
(23.88675, 90.37658)

15 May 2023



# Building Information

1. **Extension Building:** This structure is a four storied (G+3) building (Ground to second floor is a reinforced concrete (RC) structure and 3rd floor is a steel shed).
2. **Medical and Childcare Building:** This structure is a single storied reinforced concrete building.
3. **Store Office Building:** This structure is a single storied shed.

# Observations

# **Seismic design consideration of the building**

#### 2.4.4 Earthquake Load (E)

Proper structural design of any building structure must include loads due to earthquake shaking. Although there has been no major incident of earthquake hazard in the recent past of Bangladesh, earthquakes are not uncommon in this area. Scientific geological study of the earth crust below Bangladesh shows that Bangladesh does fall in moderate to high seismic risk zone. Statistical evidence from past major and minor earthquake incidents shows that a major earthquake is overdue in the recent times of geological scale. Therefore, it is necessary to prepare against any possible earthquake hazard. It should be kept in mind that the objective of earthquake resistance building design is not to make a strong building which can resist any damage due to earthquake. Instead, earthquake resistant design basically aims at minimizing the possible damage and casualty to an acceptable level. Regarding the earthquake resistant structural design, it is essential that the specific design code is followed. For the analysis and design checking of this building, *Equivalent Static Force Method* of BNBC (2006) is followed. The main considerations for calculation of earthquake load are given below.

- ❖ Zone co-efficient,  $Z = 0.15$  (zone 2, As Per BNBC 2006)
- ❖ Structure importance co-efficient,  $I = 1.00$  (Standard Occupancy, Table 6.2.23, BNBC 2006)
- ❖ Where Numerical co-efficient,  $C_t = 0.03$  in SI unit for RCC moment resisting frame.
- ❖ Response modification co-efficient,  $R$  (For Steel) = 6 (OMRF, Table 6.2.24, BNBC)
- ❖ Response modification co-efficient,  $R$  (For RCC) = 8 (IMRF, Table 6.2.24, BNBC)
- ❖ Site co-efficient,  $S_z = 1.2$  (type 2 soil as suggested in Table 6.2.23, BNBC)

Response Modification Factor (RMF)  $R$  is considered for IMRF

As per construction work evidence, the rebar detailing does not meet the Intermediate Moment Resisting Frame (IMRF) requirements. However, the building engineer considered IMRF for seismic base shear calculation. Building engineer is required to review the design of the seismic requirements of the building.



During construction photo provided by the factory



90 deg. Hook

## Observations: Extension Building

# **Lack of lateral stability of roof shed**



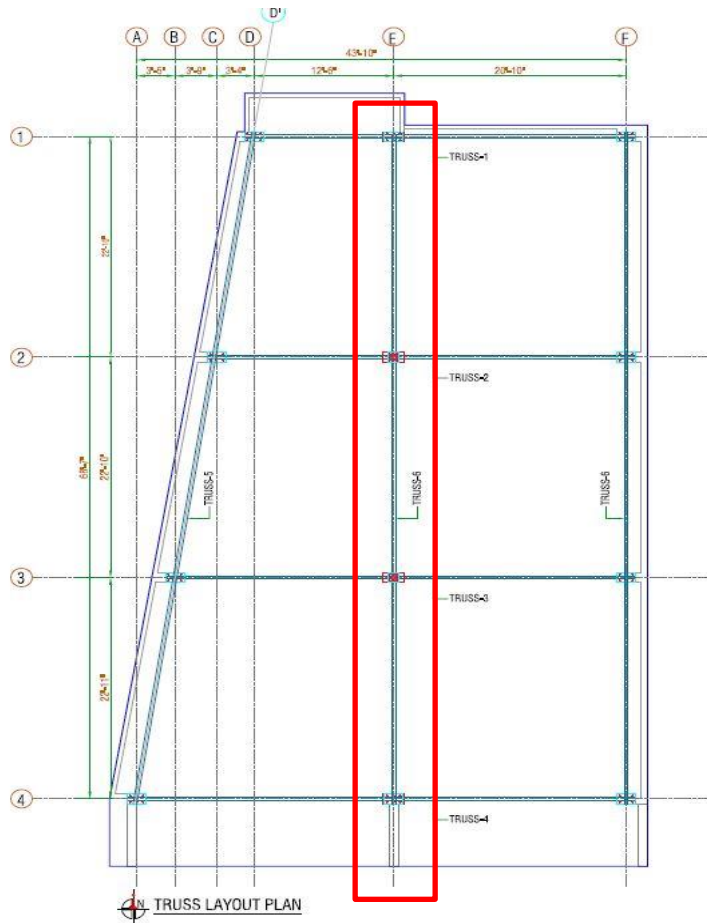


No lateral bracing system provided for roof shed

No lateral framing provided for the truss frame to transfer the lateral load in long direction. Building engineer is required to check the lateral stability of the roof shed.

# Discrepancy in as-built drawing





Truss frame and column shown in as-built drawing



Truss frame and column not found on site

Truss frame and column shown in as-built drawing but not found on site. Building engineer is required to update the as-built drawing.

## 9 Observation: Extension Building

# Gap in connection



Gap between truss and RC column

Gap was observed between truss and RC column at several locations. Building engineer is required to repair the connection gap with a suitable method.

## 11 Observation: Extension Building

# **Crack on brick wall-column joint**



Crack on brick wall-column joint

Crack was found on brick wall-column joint at several locations. Building engineer is required to investigate the cause of cracks and suggest any remediation required.

# **Non-structural elements found unbraced/not anchored**

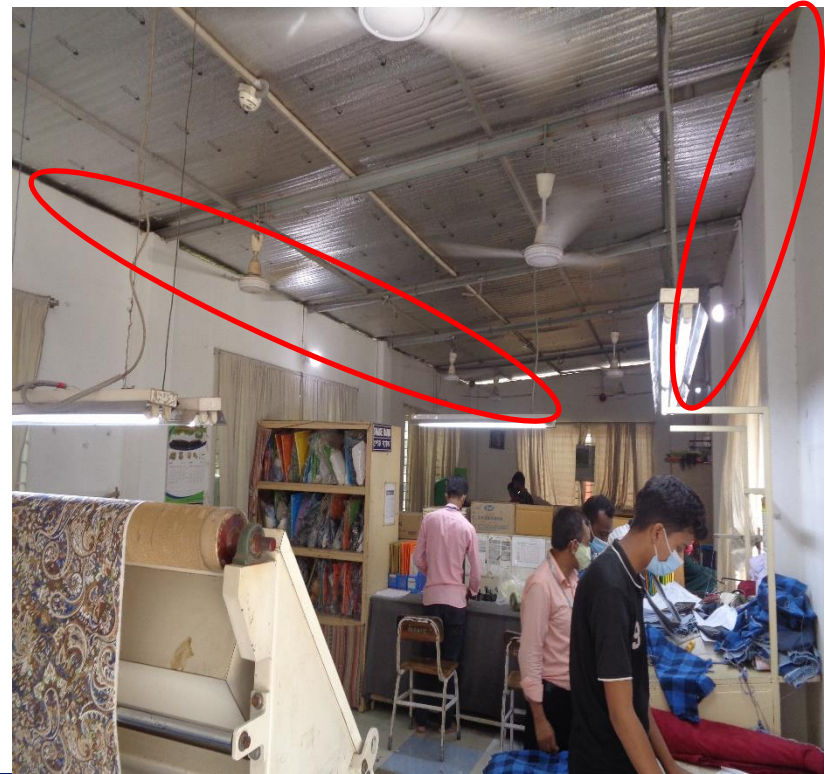




Storage rack found within the building without braced/anchored

Building engineer is required to brace/anchor all non structural elements.

**Apparently inadequate connection**



Steel rafters are inserted into brick wall

Steel rafters are inserted into brick wall therefore the connections are appeared to be inadequate. Building engineer is required to check the connection adequacy and implement remediation work where required.

## Observation: Store Office

## **Lack of as-built drawing**

**Observation: Medical and Childcare Building; Store  
Office**





Medical and Childcare



Store Office

As-built drawing was not available for these structure. Building engineer is required to produce as-built drawing..

## Observation: Medical and Childcare Building; Store Office

# Problems Observed

## **Extension Building:**

Item 01: Seismic design consideration of the building.

Item 02: Lack of lateral stability of roof shed.

Item 03: Discrepancy in as-built drawing.

Item 04: Gap in connection.

Item 05: Crack on brick wall-column joint.

Item 06: Non-structural elements found unbraced/not anchored.

## **Store Office:**

Item 07: Apparently inadequate connection.

## **Medical and Childcare Building; Store Office:**

Item 08: Lack of as-built drawing.



# Priority Actions

| Item No. | Observation                                                        | Recommended Action Plan                                                                                                                          | Recommended Timeline |
|----------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 01       | Seismic design consideration of the building. (Extension Building) | Building engineer is required to check the detailing of moment framing system and review the design of the seismic requirements of the building. | 6-weeks              |
| 02       | Seismic design consideration of the building. (Extension Building) | Implement suggested remediation work if required.                                                                                                | 6-months             |
| 03       | Lack of lateral stability of roof shed. (Extension Building)       | Building engineer is required to check the lateral stability of the roof shed and suggest necessary remedial action.                             | 6-weeks              |
| 04       | Lack of lateral stability of roof shed. (Extension Building)       | Implement suggested remedial work where required.                                                                                                | 6-months             |
| 05       | Discrepancy in as-built drawing (Extension Building)               | Building engineer is required to prepare accurate as-built drawing.                                                                              | 6-weeks              |
| 06       | Gap in connection (Extension Building)                             | Building engineer is required to repair the connection gap with a suitable method.                                                               | 6-weeks              |

| Item No. | Observation                                                              | Recommended Action Plan                                                                                          | Recommended Timeline |
|----------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------|
| 07       | Crack on brick wall-column joint (Extension Building)                    | Building engineer is required to investigate the cause of the cracks and suggest proper remediation accordingly. | 6-weeks              |
| 08       | Crack on brick wall-column joint (Extension Building)                    | Carry out remedial works where required.                                                                         | 6-weeks              |
| 09       | Non-structural elements found unbraced/not anchored (Extension Building) | Building engineer is required to brace/anchor all nonstructural elements.                                        | 6-weeks              |
| 10       | Apparently inadequate connection. (Store Office)                         | Building engineer is required to check the connection adequacy for uplift forces.                                | 6-weeks              |
| 11       | Apparently inadequate connection. (Store Office)                         | Implement remediation work where required.                                                                       | 6-months             |
| 12       | Lack of as-built drawing (Medical and Childcare Building; Store Office)  | Building engineer is required to produce as-built drawing.                                                       | 6-weeks              |