

RSB Industrial Ltd (Extension)

Plot: 32-34, Sector: 04, Road: 04, CEPZ, Chattogram
(22.282693, 91.774712)
12 October 2023

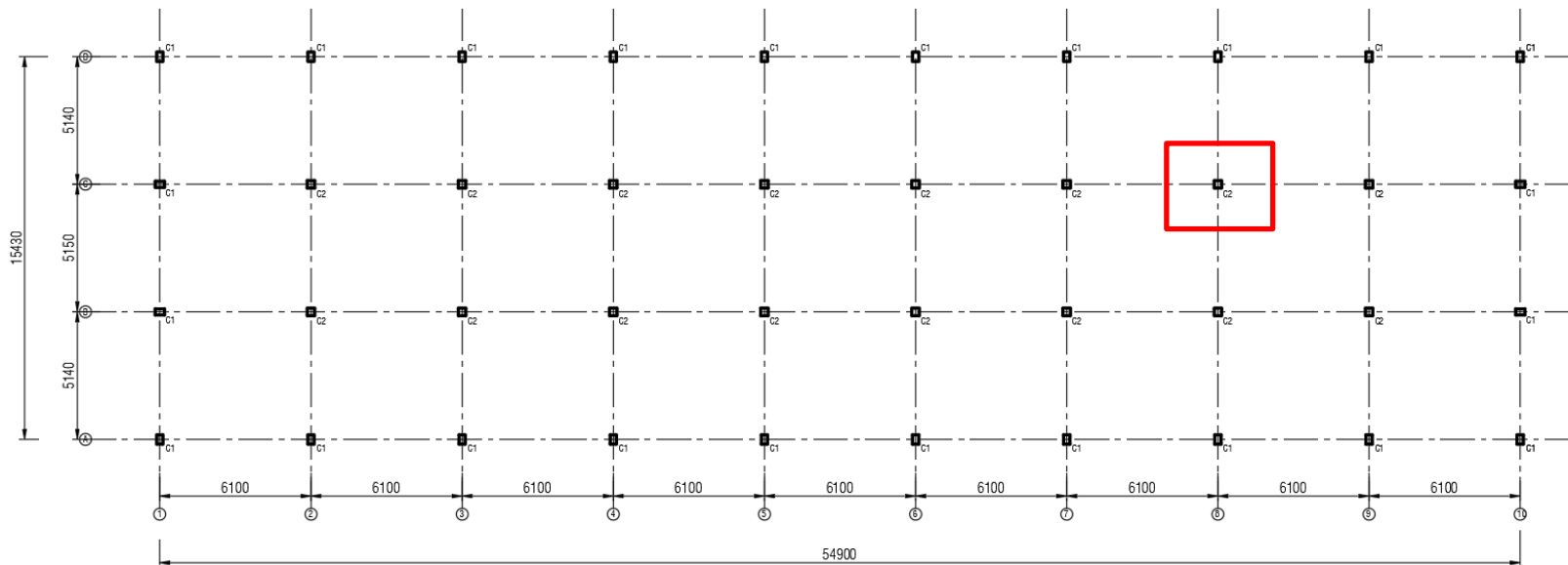


Building Information

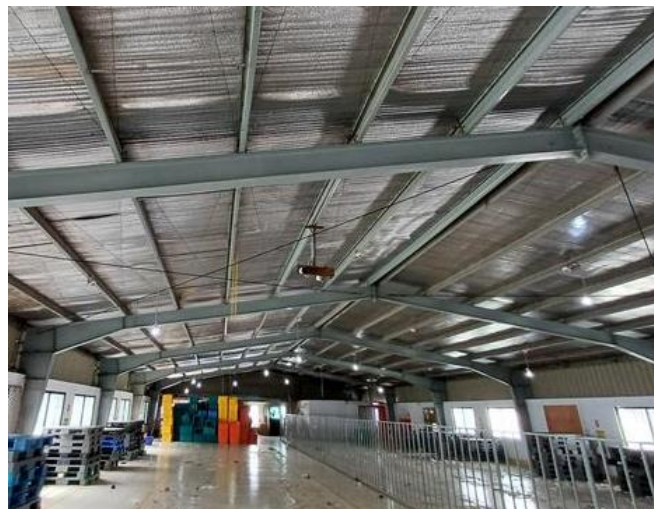
1. **RSB Building No. 02:** The structure is a four storied (G+3) building. First two floors are reinforced concrete (RC) structure and above two floors are steel structure.
2. **RSB Building No. 03:** The structure is a five-storied (G+4) reinforced concrete (RC) building.
3. **RSB Building No. 04:** The structure is a two storied (G+1) RC building.
4. **Generator Shed-02:** The structure is a single-storied steel shed.
5. **Utility Building-02:** The structure is a single-storied RC building.
6. **Fire Hydrant Pump Room:** The structure is a single-storied RC building.
7. **Chemical Room:** The structure is a single storied RC building.
8. **Security Room-02:** The structure is a single storied RC building.

Observation

High stress in column

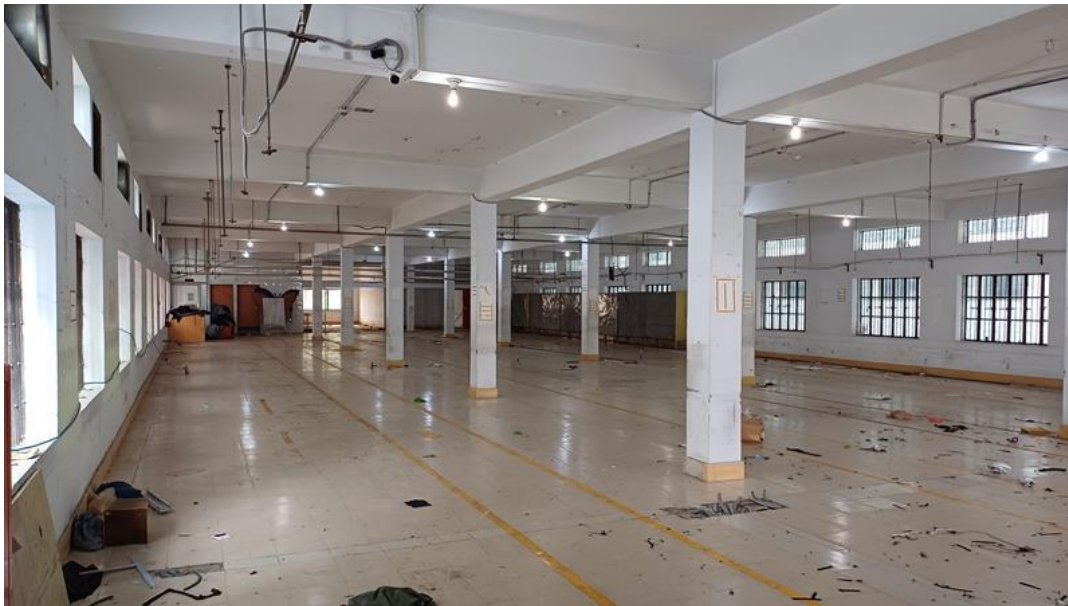


Column layout plan



live load considered 2 kPa

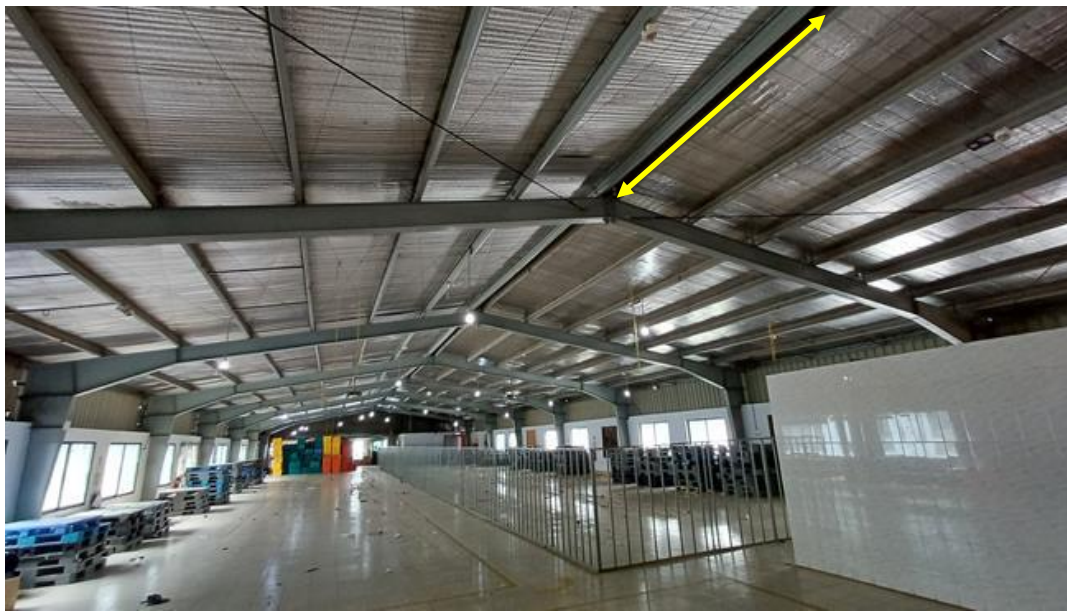
Cursory calculation indicates that columns in the marked area found stresses above the normal design limit considering NTPA live load requirements. Live load considered on typical floor 2 kPa. Building engineer is required to review the design, load and column stresses.



During inspection, no load plan was found on floors. Building engineer is required to produce load plan as part of EA and actively implement floor loading plan by posting on each floor and maintaining loadings.

No load plan observed

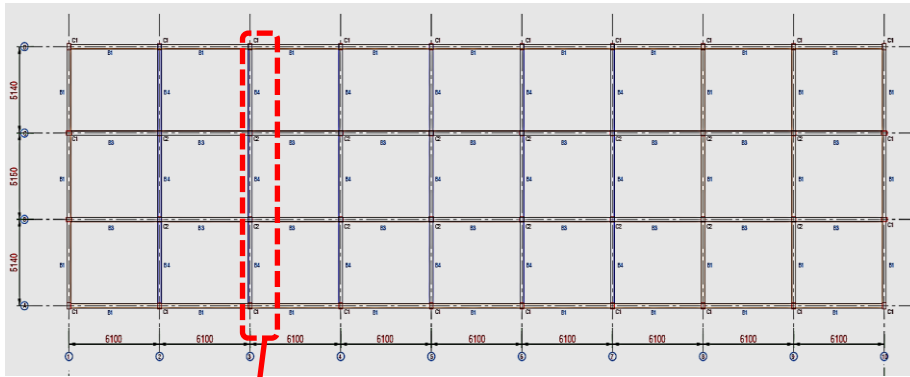
Incomplete lateral stability system



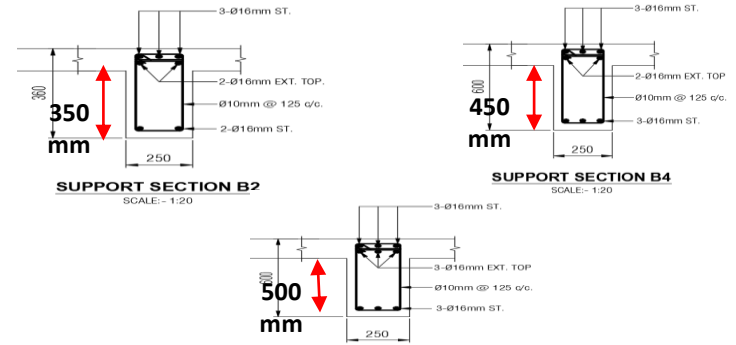
No load transfer media provided

During inspection, roof bracing were found at some locations, but load transfer media was not provided from frame to frame to transfer the lateral loads. Therefore, lateral stability system of the steel frame is apparently incomplete. Building engineer is required to check the stability of the structure against lateral forces.

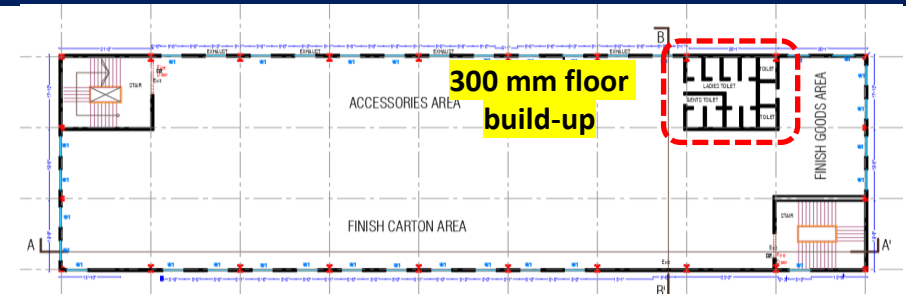
Discrepancies and missing information in as-built drawing



Tie beam at First floor was not shown in the as-built drawing.



Discrepancy found in beam depths at several locations (both in 1st Floor and Ground Floor). Down stand depth in B-2 beam found 350 instead of 235, for B-3, 500 instead of 475 and in B-4, 450 instead of 475.



300mm floor build-up found in toilet zone of 3rd floor which is not mentioned in the as-built drawings

Building engineer is required to update the drawing as per actual site condition and submit it to RSC for further review.

Inconsistencies in design report

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CONCRETE LABORATORY

BRTC
 Bureau of Research
 Testing & Consultancy

BRTC No. : 1102-45902/21-22/CE; Dt: 4/11/2021
 Sent by : Engr. Tuhin Shuvra Das, R.S.B Industrial Ltd
 Plot No #32-35, Sector #4, Chittagong Export Processing Zone, Chittagong
 Ref. No. : Letter; Dt: 25/10/2021
 Project : RSB Industrial Ltd. CPEZ, Chattogram

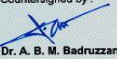
Sample : Concrete Cylinder [Aggregate Type: Stone chips]
 Location : 4th Floor Column [Mix proportion(as quoted): Not mentioned]
 [Admixture Added (as per letter): Armix Emmeconcrete PC-10]

Test : Compressive Strength Test of Concrete Cylinder [ASTM C39]
 Date of Test : 7/11/2021

TEST REPORT							
SL No.	Date of Casting as per the letter	Specimen Designation/ Frog Mark	Specimen Area (sq. in)	Maximum Load (lb)	Crushing Strength (psi)	Average Crushing Strength	Mode of Failure
1	26/5/2021	-	12.92	89,824	6,952	7250 psi	Combined *
2	(165 days test)	-	12.42	89,375	7,196	(50 MPa)	Combined *
3		-	12.42	94,309	7,593	(510 kg/cm ²)	Combined *

* Combined = Mortar and Aggregate Failure.

Note: Samples were received in sealed condition.

Countersigned by:

 Dr. A. B. M. Badruzzaman
 Professor
 Department of Civil Engineering
 BUET, Dhaka-1000, Bangladesh

Test Performed by:

 Tausif-E-Elahi
 Lecturer
 Department of Civil Engineering
 BUET, Dhaka-1000, Bangladesh

07-11-21

Important Notes: Samples as supplied to us have been tested in our laboratory. BRTC does not have any responsibility as to the representative character of the samples required to be tested. It is recommended that samples are sent in a secure and sealed cover/pack/container under signature of the competent authority. In order to avoid fraudulent fabrication of test results, it is recommended that all test reports are collected by duly authorized person, and not by the Contractor/Supplier.

Parameters		Values	References/Remarks
Seismic Zone		2	BNBC-2006
Zone Factor, Z		0.15	(Zone 2, Fig.6.2.10, BNBC-2006, Seismic Zoning Map of Bangladesh
Over strength Factor, R	For RCC Structure	8	iMRF, Table 6.2.24, BNBC-2006
Importance Factor		1	Standard Occupancy, Table 6.2.23, BNBC
Ct	For RCC Structure	0.073	BNBC-2006
Soil Profile		S4	BNBC-2006, Table 6.2.25

Response modification co-efficient, R value considered as 8 for IMRF but no calculation/justification is provided for the

2.2 Material Strength Estimation:

The following material strength has been considered for the evaluation.

Compressive Strength of Concrete for Foundation and Column, $f'_c = 4000 \text{ lb/in}^2$

Inadequate number of concrete cylinder test reports was found on site to confirm the design strength of 4000 psi.

Non-engineered RO Shed



Non-engineered RO shed was observed on the roof.
Building engineer is required to check the stability of the uplift forces.

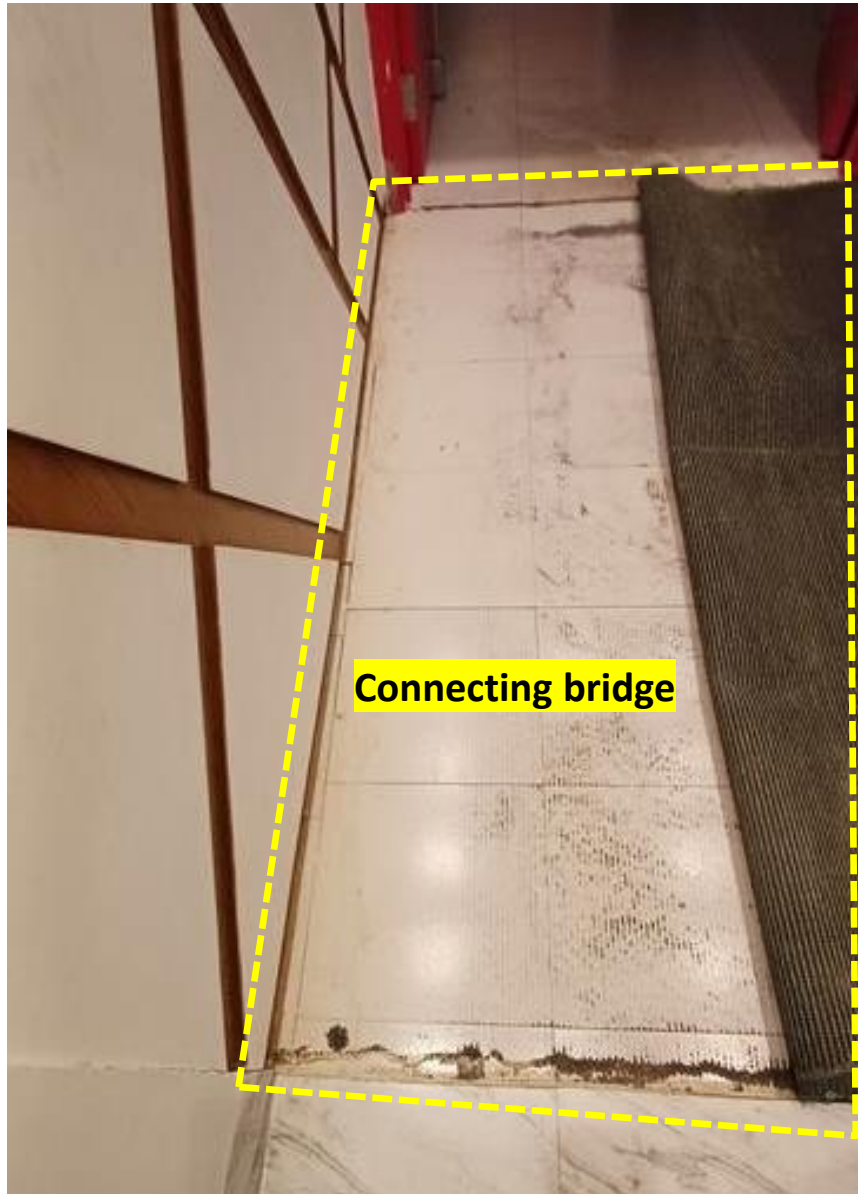
Absence of design documents



Building-04

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 as per BNBC. At the time of inspection, design documents (including design report, load plan and material test reports) were not available which are required to be prepared in compliance with section 1.9.1 (part-6, BNBC).

Missing information in as-built drawings



During inspection, connecting bridge found between building-03 and building-04 which is not shown in the as-built drawings. The bridge is connected with building-04. Building engineer is required to update the design documents as per actual site condition and submit it to RSC for further review.

Apparently inadequate connection against uplift pressure

Observation: Generator Shed-02

Apparently inadequate connection against uplift pressure were observed at the lightweight roof of the single storied shed. The building engineer to check the connection adequacy of the lightweight roof against the uplift pressure of wind and suggest suitable remedial method. Otherwise, replace with an engineered shed.



Generator Shed-02



Non-engineered connection

Exposed rebar at roof



Exposed rebar on roof

Exposed rebar observed on roof which is prone to corrosion. The factory is required to provide anti-corrosive coating on the exposed rebar.

Observation: Utility building-02

Inconsistencies in as-built drawing

Observation: Ancillary structures

The factory has provided a set of drawings which match partially with the as-built structures. The building engineer is required to survey the whole structure and prepare a full set of as-built drawings in compliance with section 1.9, part 6 of BNBC.



Generator Shed-02



Utility building-02



Fire Hydrant Pump Room

**Observation: Generator Shed-02, Utility building-02,
Fire Hydrant Pump Room**



Chemical Room



Security Room-02

The factory has provided a set of drawings which did not match fully with the as-built structures. The building engineer is required to survey the whole structure and prepare a full set of as-built drawings in compliance with section 1.9, part 6 of BNBC.

Problems Observed

A level of non-exhaustive list of key concerns are:

RSB Building no. 02:

Item 01: High stress in column

Item 02: Incomplete lateral stability system.

Item 03: Discrepancies and missing information in as-built drawing.

RSB Building no. 03:

Item 04: Inconsistencies in design report.

Item 05: Non-engineered RO Shed.

RSB Building no. 04:

Item 06: Absence of design documents.

Item 07: Missing information in as-built drawings.

Generator Shed-02:

Item 08: Apparently inadequate connection against uplift pressure.

Utility building-02:

Item 09: Exposed rebar at roof.

Ancillary Structures:

Item 10: Inconsistencies in as-built drawing.

Priority Actions

Item No.	Observation	Recommended Action Plan	Recommended Timeline
01	High stress in column. (RSB Building no. 02)	Maintain floor live load within 2 kPa until finalization of allowable floor load plan and completion of remedial works (if required).	Immediate
02	High stress in column. (RSB Building no. 02)	The building engineer is required to conduct Detail Engineering Assessment (DEA) to review the design, load and column stresses. Prepare a set of floor live load plan based on foundation, column & floor capacity of the building.	6-weeks
03	High stress in column. (RSB Building no. 02)	Carry out suggested remedial works. Implement load management system (post allowable floor live load plan on each floor level, mark storage height & areas and maintain floor loading accordingly).	6-months
04	Incomplete lateral stability system. (RSB Building no. 02)	Building engineer is required to check the stability of the structure for lateral loading.	6-weeks
05	Incomplete lateral stability system. (RSB Building no. 02)	Carry out suggested remedial works if required.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
06	Discrepancies and missing information in as-built drawing. (RSB Building no. 02)	Building engineer is required to update the drawings as per actual site condition and submit it to RSC for further review.	6-weeks
07	Discrepancies and missing information in as-built drawing. (RSB Building no. 02)	Carry out suggested remedial works.	6-months
08	Inconsistencies in design report. (RSB Building no. 03)	Building engineer is required to address the inconsistencies in the design report and submit revised design documents including software-based analysis model to RSC to complete the review.	6-weeks
09	Inconsistencies in design report. (RSB Building no. 03)	Complete implementation of any remedial works deemed necessary by the design report.	6-months
10	Non-engineered RO Shed. (RSB Building no. 03)	Building engineer is required to check the stability against the uplift forces.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
11	Non-engineered RO Shed. (RSB Building no. 03)	Carryout remedial works where required.	6-months
12	Absence of design documents. (RSB Building no. 04)	Building engineer is required to prepare design documents (including design report, load plan and material test reports) in compliance with section 1.9.1 (part-6, BNBC).	6-weeks
13	Absence of design documents. (RSB Building no. 04)	Carry out suggested remedial works.	6-months
14	Missing information in as-built drawings. (RSB Building no. 04)	Building engineer is required to update the drawings as per actual site condition and submit it to RSC for further review.	6-weeks
15	Missing information in as-built drawings. (RSB Building no. 04)	Carry out suggested remedial works.	6-weeks

Item No.	Observation	Recommended Action Plan	Recommended Timeline
16	Apparently inadequate connection against uplift pressure. (Generator Shed-02)	Building engineer is required to check the connection of the steel roof for the uplift pressure of wind.	6-weeks
17	Apparently inadequate connection against uplift pressure. (Generator Shed-02)	Complete implementation of remedial works if required. Otherwise replace the sheds with an engineering one.	6-months
18	Exposed rebar at roof. (Utility building-02)	The factory is required to provide anti-corrosive coating on the exposed rebar.	6-months
19	Inconsistencies in as built drawings. (Generator Shed-02, Utility building-02, Fire Hydrant Pump Room, Chemical Room, Security Room-02)	Building engineer is required to prepare a full set of structural drawings in compliance with section 1.9.1.2, part-6 of BNBC and submit it to RSC for review.	6-weeks

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.