

Rahmat Sweaters (BD) Ltd Logos Printing & Design Ltd

Telirchala, Mouchak, Kaliakoir, Gazipur
(24.03152N, 90.30217E)

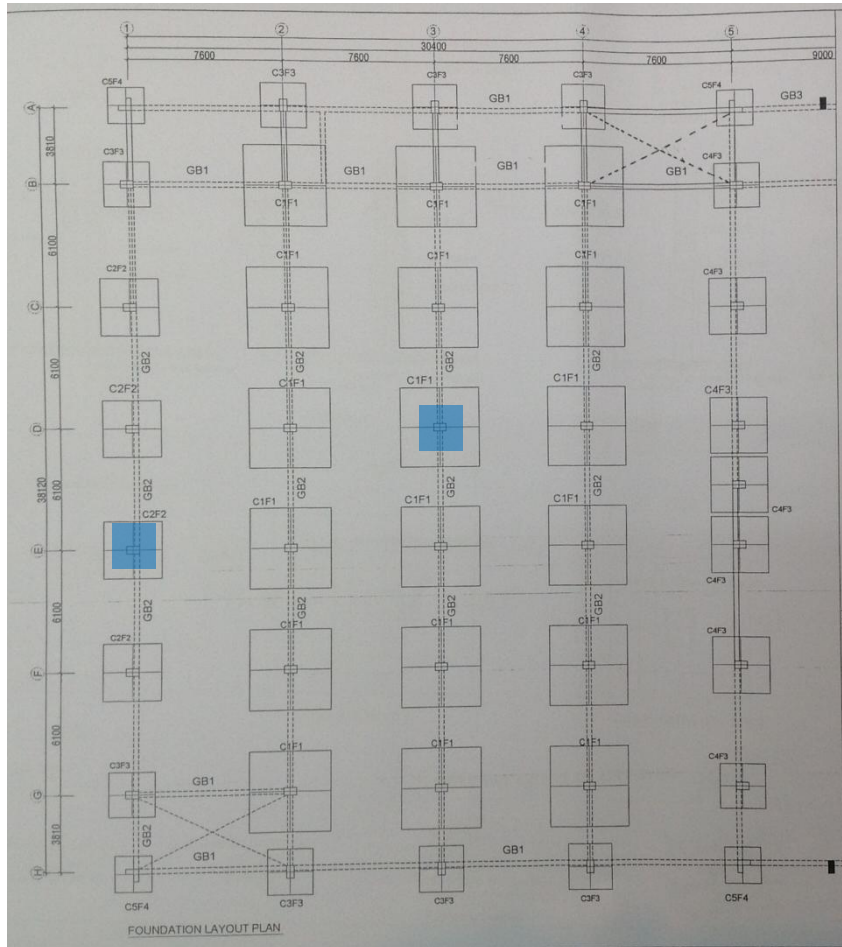
9th April 2014



Observations

Stress Levels in Columns

Cursory calculations indicate that the working stresses of the columns are at a very high level. Detail Engineering Assessment required.



Ground Floor Plan

Construction of the 6-storey factory building began in 2004 and was completed in 2005. A lightweight structure on RC columns was erected to provide a Dining area at Roof level, but was removed in 2013 to comply with fire regulation requirements.

Brick aggregate was observed in the RC columns, which coincides with the information gathered during the interview that brick chips were used in all concrete elements. Mild steel reinforcement ($f_y = 40000\text{psi}$) was noted in the Structural Drawings, and the number of bars shown in the drawings coincides with the number of bars observed at Ground Floor level using the Ferros scanner. The size of the columns measured on site also appears to coincide with the drawings.



Tested Column D/3 (Brick)



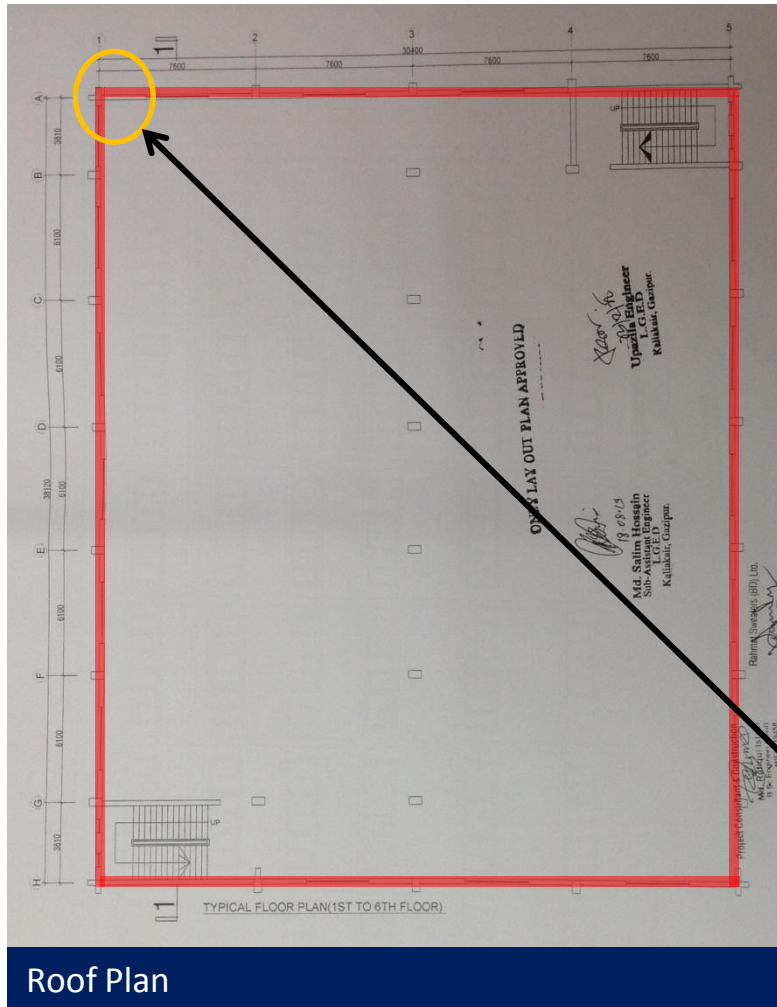
Tested Column E/1 (Brick)

Tested Columns

Column strength

High freestanding walls at Roof Level

There is a concern about the lateral stability of the free-standing wall to the perimeter of the 6th Floor Roof (typically 5m high). Furthermore, what appears to be a ring beam at the top of the wall is incomplete. Building Engineer to investigate lateral stability of the wall for lateral loading, and to carry out any remedial works as required.



Roof Plan

— Perimeter Wall ○ Incomplete Ring Beam



5m high wall to perimeter of Roof level



Exposed reinforcement to section of gable-end ring beam

Hairline cracking in beams and some slab soffits at 2nd to 5th Floor levels

Hairline cracks were noted to the underside of beams and slabs at 2nd, 3rd, 4th and 5th Floor levels. Building Engineer to investigate and carry out remedial works to the structure as required.



Cracking to underside of 5th Floor slab



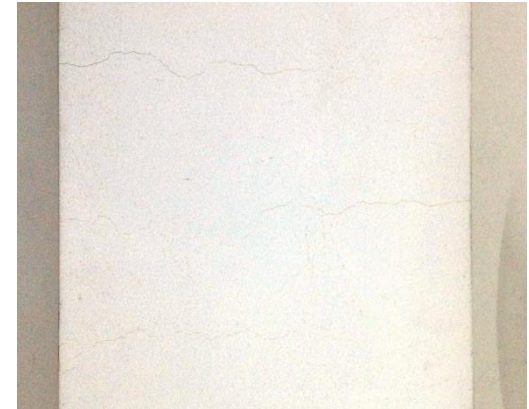
Cracking to 5th Floor beam



Cracking to 3rd Floor beam



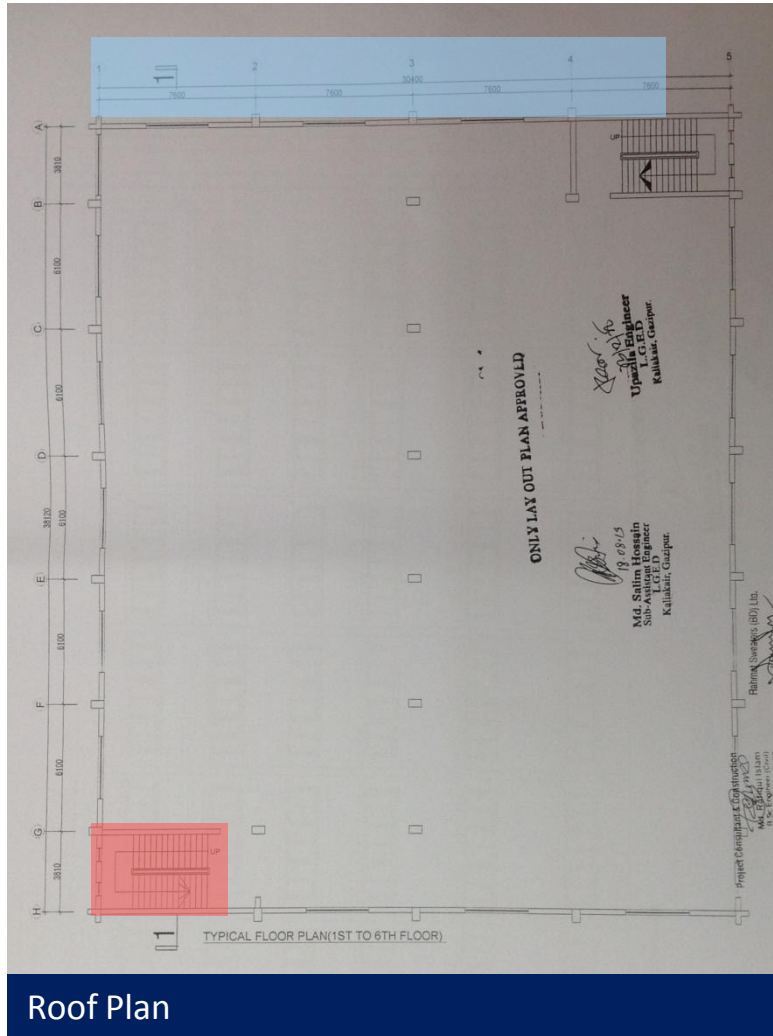
Cracking to 2nd Floor beam



Cracking to 3rd Floor beam

Apparently non-engineered roof structures

Building Engineer to review the design of the lightweight roof structures to the Ground Floor Boiler / Chemical rooms to the West of the building and to the South-East staircore roof, and to implement any upgrade works as required.



Lightweight Roof to Staircore



Lightweight Roofs to Boiler / Chemical Rooms



Lightweight Steel Roofs

Priority Actions

Problems Observed

1. Stress levels in Columns.
2. High freestanding walls at Roof Level.
3. Hairline Cracking in beams and some slab soffits at 2nd to 5th Floor levels.
4. Apparently non engineered roof structures

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Stress levels in Columns	Factory Engineer to review design, loads and columns stresses in all columns.	Immediate - Now
2	Stress levels in Columns	Verify insitu concrete stresses either by 100mm diameter cores or existing cylinder strength data for cores from min. 4 no. columns. Verify grade of steel reinforcement used.	Immediate - Now
3	Stress levels in Columns	A Detail Engineering Assessment of Factory to be commenced, see attached Scope	Immediate - Now
4	Stress levels in Columns	Detail Engineering Assessment to be completed.	6-weeks
5	Stress levels in Columns	Make structural alterations as advised by Engineer.	6-weeks
6	Stress levels in Columns	Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.	6-weeks
7	Stress levels in Columns	Continue to implement load plan	6-months
8	High freestanding walls at Roof Level.	Factory Engineer to investigate the structural capacity of the freestanding external walls at roof level, as part of the Detail Engineering Assessment.	6-weeks
9	High freestanding walls at Roof Level.	Complete concrete beam on gable with exposed reinforcement, and make any other structural alterations as advised by the Engineer.	6-months

Detail Engineering Assessment

This Schedule develops a minimum level of information, Analysis and testing expected as part of a Detail Engineering Assessment.

The Building(s) have been visually assessed and it is deemed necessary that a detailed engineering assessment be carried out by a competent Engineering Team employed by the factory Owner.

This Request should be read in conjunction with the BUET developed Tripartite Guideline document for Assessment of Structural Integrity of Existing RMG Factory Buildings in Bangladesh (Tripartite Document), the latest version of this document should be referenced. This document also gives guidance on required competency of Engineering Team.

We expect that the following will be carried out:

1. Development of Full Engineering As-Built Drawings showing Structure, loading, elements, dimensions , levels, foundations and framing on Plan, Section and Elevation drawings .
2. The Engineering team are to carry out supporting calculations with a model based design check to assess the safety and serviceability of the building against loading as set out in BNBC-2006, Lower rate provisions can be applied in accordance with the Tripartite Guidelines following international engineering practice, justification for these lower rate provisions must be made.
3. A geotechnical Report describing ground conditions and commenting on foundation systems used/proposed.
4. A report on Engineering tests carried out to justify material strengths and reinforcement content in all key elements studied.
5. Detailed load plans shall be prepared for each level showing current and potential future loading with all key equipment items shown with associated loads.
6. The Engineering team will prepare an assessment report that covers the following:
 - As-Built drawings including
 - Plans at each level calling up and dimensioning all structural components
 - Cross sectional drawings showing structural beams, slabs, floor to floor heights, roof build-ups and Basic design information of the structure
 - Highlight any variation between As-built compared to the designed structure
 - Results of testing for strength and materials
 - Results of geotechnical assessment and testing/investigation
 - Details of loading, inputs and results of computer modelling
 - Commentary on adequacy/inadequacy of elements of the structure
 - Schedule of any required retrofitting required for safety or performance of Structure

Any proposals for Retrofitting to follow guidance developed in the Tripartite Document

Item No.	Observation	Recommended Action Plan	Recommended Timeline
10	Hairline cracking in beams and some slab soffits at 2nd to 5th Floor levels	Factory Engineer to investigate if the cracking is structural or exists only in the render, as part of the Detail Engineering Assessment.	6-weeks
11	Hairline cracking in beams and some slab soffits at 2nd to 5th Floor levels	Carry out any remedial work as directed by the Engineer.	6-months
12	Apparently non-engineered roof structures.	Factory Engineer to check the capacity of the lightweight roofs and make any necessary alterations.	6-months