## **R. B. Knitwears**

65/11, Nayamati, Narayangonj. (23.61205N, 90.50308E) 01 March 2015





#### **Executive Summary (continued)**

We have important and urgent concerns in relation to the column stresses in the building. Columns appear to be stressed to levels that require <u>immediate</u> actions, as follows:

- Pending outcome of the Detail engineering Assessment, the area (denoted in blue) must be vacated at 3 suspended floors and the water tank must be emptied (access permitted to stairs)
- In all other areas, Live loads are to be limited to
  **1,5 kPa** pending the outcome of a Detail
  Engineering Assessment.
- A Detail Engineering Assessment is required for the Buildings, as outlined at the end of this report. No further vertical or horizontal extension to the building shall take place without having been fully considered and justified in the Detail Engineering Assessment.



If the building owners are not in a position to carry out these actions immediately, the building should be classified as Category Red and evacuated.



### **Observations**



#### High stress levels in the columns









#### Calculated columns

Cursory calculations indicate column working stress is at high risk level.





Brick aggregate



**Observations** 

# Discrepancies between drawings, the As-built structure and the construction of 3 additional floors.







7 Structural system

Factory Building





Presented permit drawing do not match the building layout and address .



Presented As-Built architectural drawing which matches with the existing building layout.





#### **Uncontrolled storage and heavy loading**







Roof – concrete water tank 15 000L capacity on top of the stairs case









6<sup>th</sup> floor - Toilet build up 200mm















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Observations

#### **Cracks in beams and slab**







#### 6<sup>th</sup> floor - Hair line crack found on beam and slabs







# Possible modifications to structural elements on the 3rd floor







Some of the structural elements have possibly been modified - these could indicate issues with the existing structure.

Observations



Larger beam then others



Apparently larger column





# Apparently non-engineered lightweight steel roof structures and steel stairs









Non-engineered light weight steel roof structure Observations



stair



#### **Problems Observed**

- 1. High stress levels in the columns
- 2. Discrepancies between drawings the As-built structure and the construction of 3 additional floors.
- 3. Uncontrolled storage and heavy loading
- 4. Cracking in beams and slabs
- 5. Possible modification of structural element on the 3<sup>rd</sup> floor
- 6. Apparently non-engineered lightweight steel stair structures



ltem No.	Observation	Recommended Action Plan	Recommended Timeline
1	High stress levels in the columns	Area around staircase to be emptied at 3 floors and water tank at roof to be empited – see page 3 for details.	Immediate - Now
2	High stress levels in the columns	Live load to be limited to 1.5kPa elsewhere, pending outcome of Detail Engineering Assessment.	Immediate - Now
3	High stress levels in the columns	Building Engineer to review design, loads and column stresses in all columns.	Immediate - Now
4	High stress levels in the columns	Verify in-situ concrete stresses by 100mm dia. cores from 4 min. columns.	Immediate - Now
5	High stress levels in the columns	A Detail Engineering Assessment of both Buildings to be commenced, see attached Scope.	Immediate - Now
6	High stress levels in the columns	Detail Engineering Assessment to be completed	6-weeks
7	High stress levels in the columns	Produce and actively manage a loading plan for all floor plates within the Building, giving consideration to floor capacity and column capacity.	6-weeks
8	High stress levels in the columns	Actions identified in the Detail Engineering Assessment to be implemented.	6-months
9	High stress levels in the columns	Continue to implement the load management plan.	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. T his 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	Discrepancies between drawings, As-built structure and the construction of 3 additional floors	As part of the Detail Engineering Assessment (see Item 1), Building Engineer to survey the as-built structure, including as-built roof structures and floor finishes thickness. The engineering robustness and stability of the additional extensions to be investigated as well their effect on the supporting structures.	6-weeks
11	Discrepancies between drawings, As-built structure and the construction of 3 additional floors	Building Engineer to produce accurate as-built drawings.	6-months
12	Discrepancies between drawings, As-built structure and the construction of 3 additional floors	Repair or remove the additional rooftop structures as directed by the Building Engineer.	6-months
13	Discrepancies between drawings, As-built structure and the construction of 3 additional floors	Carry out any structural works as required.	6-months
14	Uncontrolled storage and heavy loading	Pending the outcome of the Detail Engineering Assessment, live loads to be removed or reduced as noted in Item 1	Immediate - Now
15	Uncontrolled storage and heavy loading	As part of the Detail Engineering Assessment (see Item 1), Building Engineer to confirm design loading of slabs and incorporate it into the loading plan for all floor plates within the Building.	6-weeks
16	Uncontrolled storage and heavy loading	Continue to implement the load management plan	6-months



ltem No.	Observation	Recommended Action Plan	Recommended Timeline
17	Cracks in the building	Building Engineer to investigate damage to beam and cracking, and determine cause.	6-weeks
18	Cracks in the building	As part of the Detail Engineering Assessment (see Item 1), Building Engineer to carry out full design check of all floor slabs and beams to confirm their load capacity, taking into account the cracking.	6-weeks
19	Cracks in the building	Carry out any structural repairs as necessary to beams and slabs.	6-months
20	Possible modifications of structural elements on the 3rd floor	As part of the Detail Engineering Assessment (see Item 1), Building Engineer to carry out investigation of these enlargements and to define the reasons and the status of the structure inside.	6-weeks
21	Possible modifications of structural elements on the 3rd floor	Reconstruct or/and repair the highlighted structures to ensure their adequacy.	6-months
22	Apparently non-engineered lightweight steel stair structures	As part of the Detail Engineering Assessment (see Item 1), Building Engineer to carry out full design check on lightweight steel stairs and the support and connections to the main building structure.	6-weeks
23	Apparently non-engineered lightweight steel stair structures	Reconstruct or repair lightweight steel stairs as necessary to ensure adequacy to withstand code vertical and wind loads.	6-months

