Pawla Knitwear Ltd

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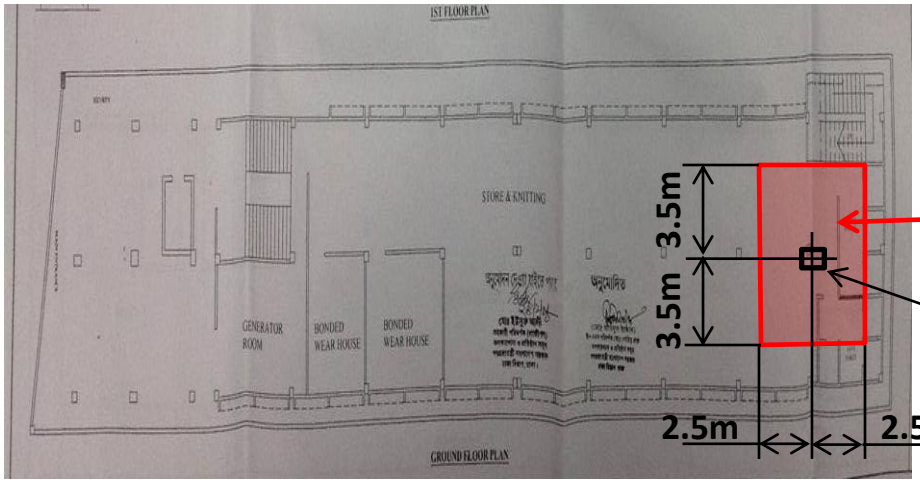
(23.633828,90.492207)
19th April 2014

ACCORD on Fire and Building Safety in Bangladesh

ARUP

Executive Summary (continued)



We would recommend that the Detail Engineering Assessment for the building be completed within 6 weeks of receiving this report.

If the building owners are not in a position to complete these actions **immediately**, the building should be re-classified as **Category Red** and evacuated.

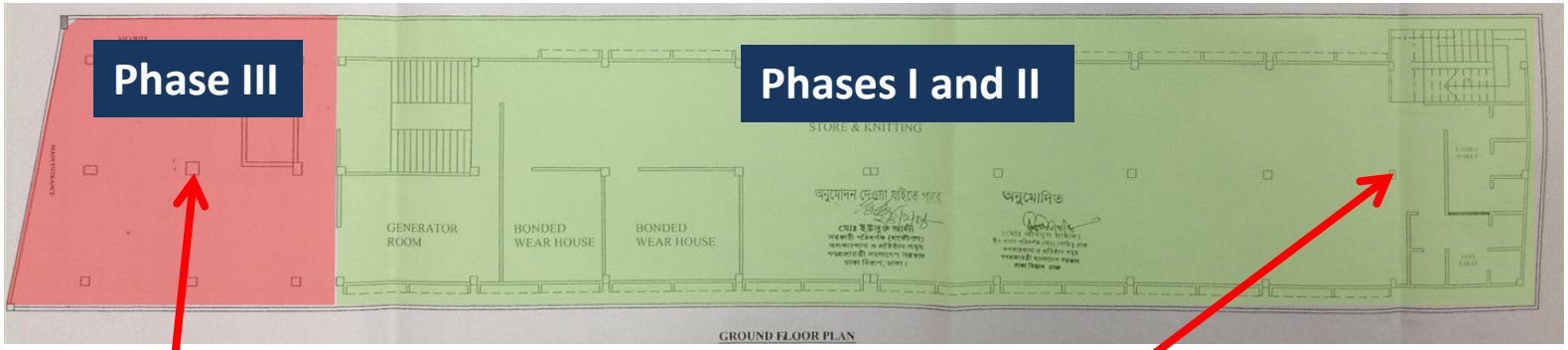
Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

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

- Highly stressed columns.
- Building lateral stability.
- Discrepancies between design and construction.
- Localised areas of high loading.
- Columns susceptible to vehicle impact.
- Façade stability.

Observations

Highly-stressed columns



Typical column layout

Phase III: Tested Ground Floor Column – Stone Aggregate

Phases I & II: Tested Ground Floor Column – Brick Chip Aggregate

Immediate actions outlined in Executive Summary

Preliminary calculations indicate that column working stress is at a high level in all parts of the buildings.

Column Stresses

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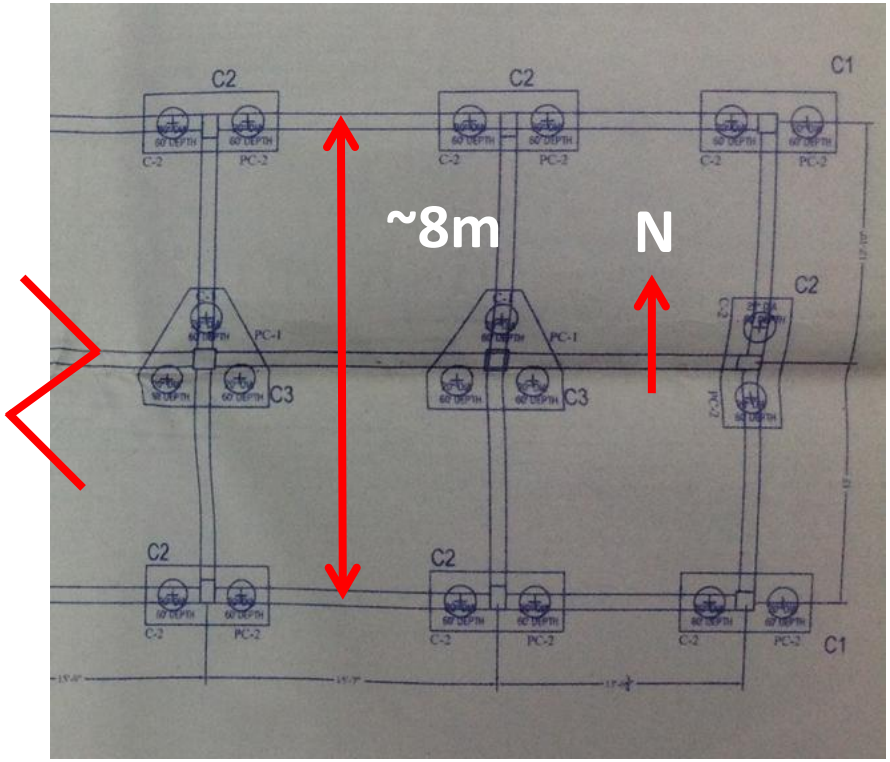
Building lateral stability



Height to north-south plan width ratio > 3. Additional vertical load expected in existing highly-stressed columns during an extreme hazard event.

Lateral stability of structure

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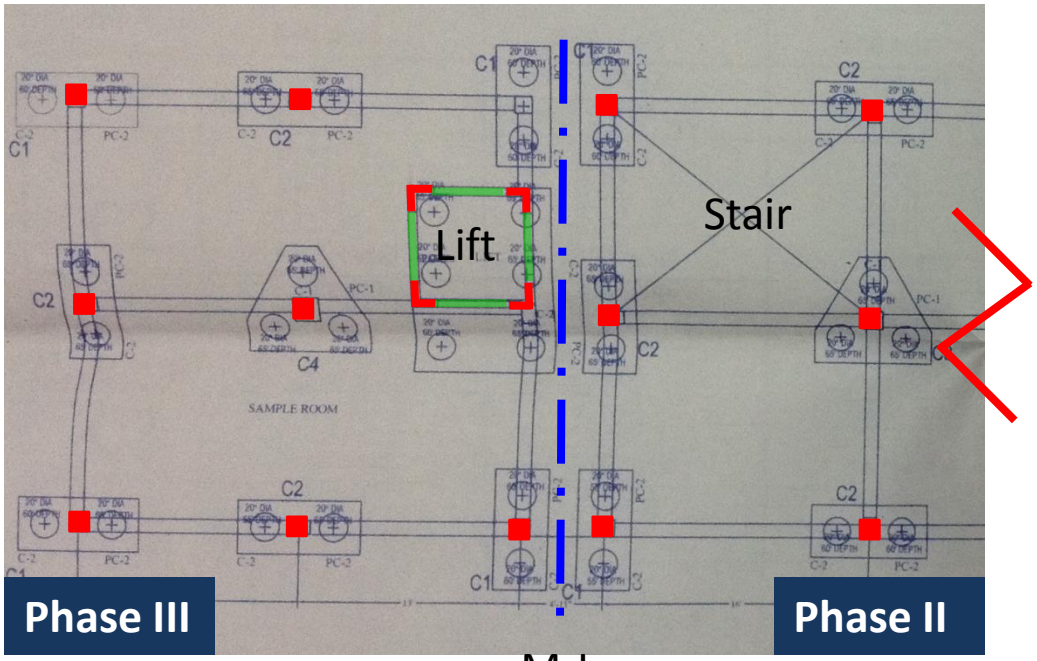

Vertically continuous masonry Infill

Reinforced concrete

No reinforced concrete shear walls. Limited vertically continuous non-structural masonry infill walls. Primary lateral load path relies on floor column moment frame action.

Phases I, II and III are separated by movement joints. It should be noted that:

- Movement joints have been filled with non-structural material.
- Pounding may occur where joints have been filled.
- Movement joints reduce redundancy of complete building structure.

Lateral stability of structure

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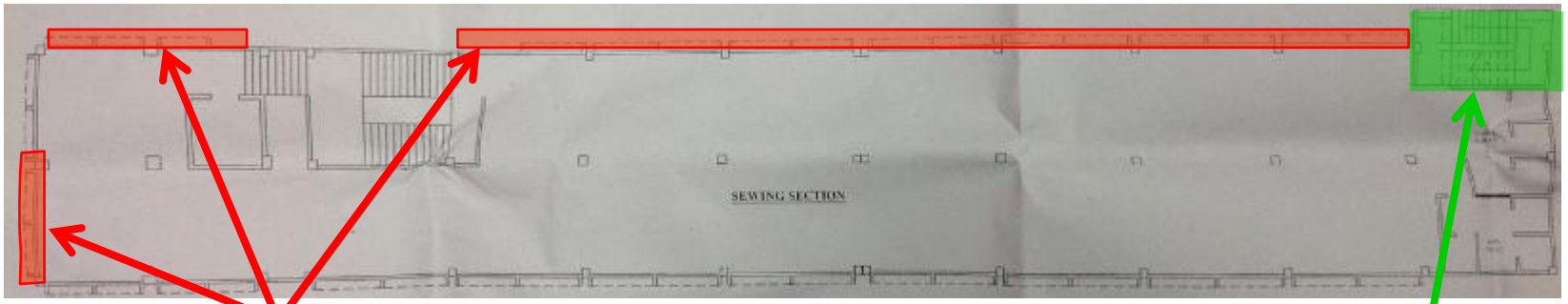
Discrepancies between design and construction



Typical plan showing areas where cantilevers do not appear on the permit / structural drawings on some levels.

Steel stair not documented on structural drawings.

Adequate documentation does not exist for any structure above Level 7.

Mezzanine floor does not appear on the structural drawings.

Incomplete structural drawings do not reflect the constructed building.

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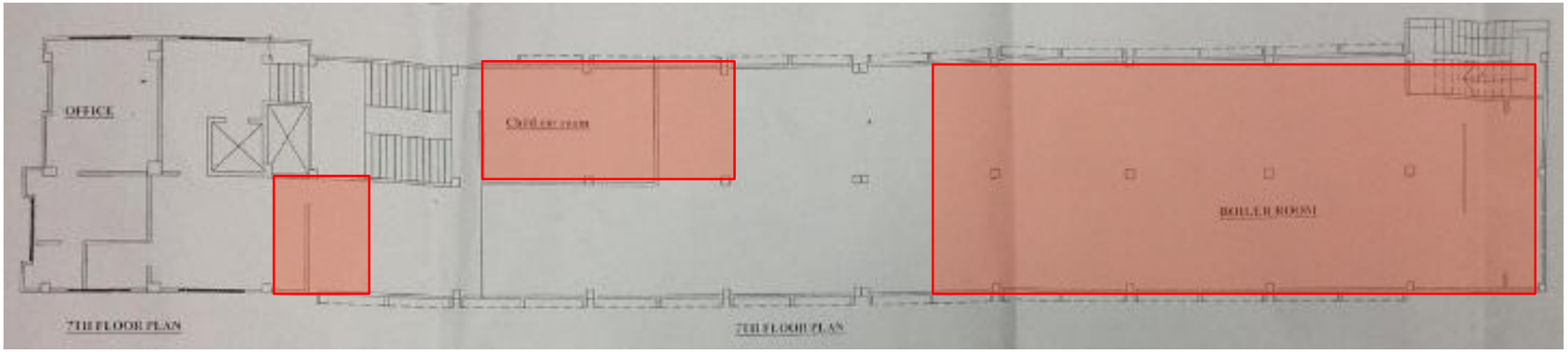

Roof plan showing steel shed locations shaded in red.

Limited tie down for wind uplift.
No roof or wall in-plane bracing observed.

Non-engineered truss.
Steel columns do not support truss at node point.

Steel roofs above level 7

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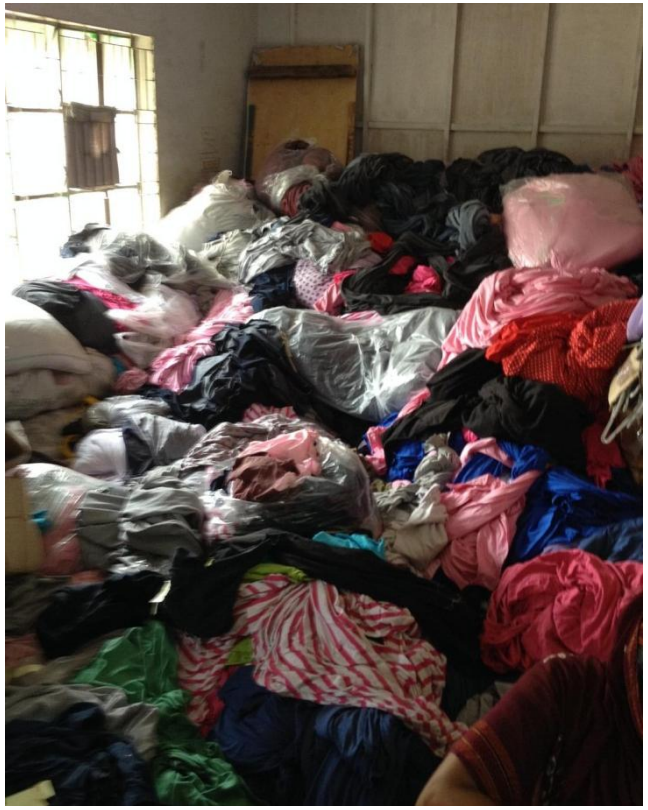
Localised areas of high loading



Floor load management system incomplete as no loading plans were observed at the suspended floors.

Localised areas of uncontrolled high storage loading observed.

A high density of heavyweight internal brick partitions constructed on Phase III suspended floors.

Columns susceptible to vehicle impact

Columns at ground floor level susceptible to impact loading from vehicles. Existing protection is not robust.

Visible damage observed in columns, may have been caused by vehicular impact.

Vehicle impact loading

Façade stability

Cracking was evident at a number of positions around the façade particularly near openings for windows.

Severe corrosion and concrete spalling was evident with rebar exposed at some locations.

Façade stability

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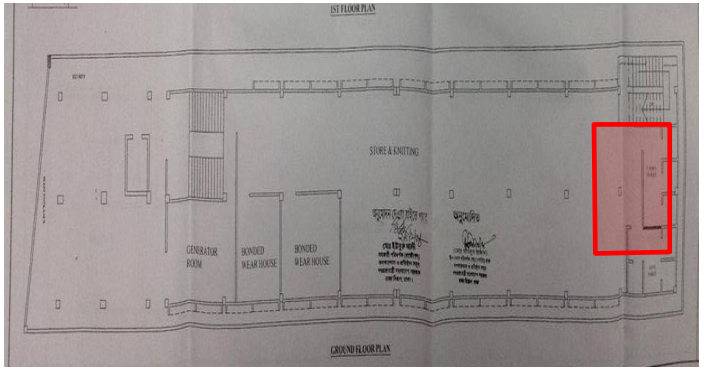
Problems Observed

1. Highly stressed columns.
2. Building lateral stability.
3. Discrepancies between design and construction.
4. Localised areas of high loading.
5. Columns susceptible to vehicle impact.
6. Façade stability.

Item 1 and actions

Highly-stressed columns



See Page 4 for exact dimensions of restricted zone.

Priority 1

(Immediate - Now)

- The area highlighted above is to be vacated of all storage and personnel at Levels 1 to 7. Personnel access to the toilets is permitted.
- Ensure the live load in all other areas at Levels 1 to 7 is limited to **1.5kPa**.
- Verify insitu concrete stresses by min. 4 no. 100mm dia. cores
- A **Detail Engineering Assessment** of the building to be commenced, see attached Scope

Priority 2

(within 6-weeks)

- Produce and actively manage a loading plan for all floor plates within the building, giving consideration to floor capacity and column capacity.
- Detail Engineering Assessment to be completed

Priority 3

(within 6-months)

- Carry out any remedial actions arising from Detail Engineering Assessment.
- Continue to implement load plan.

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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 Elevational 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 2 and actions

Building lateral stability

Priority 1 (Immediate - Now)	• A **Detail Engineering Assessment** of the building is to be commenced, as Item 1. Ensure that lateral stability forms part of the assessment.
Priority 2 (within 6-weeks)	• Detail Engineering Assessment to be completed, as Item 1
Priority 3 (within 6-months)	• Carry out any remedial actions arising from Detail Engineering Assessment. • Continue to implement load plan.

Item 3 and actions

Discrepancies between design and construction.

Priority 1 (Immediate - Now)	• As part of Detail Engineering Assessment (see Item 1), ensure that accurate as-built documentation and drawings are produced.
Priority 2 (within 6-weeks)	• Detail Engineering Assessment to be completed, as Item 1. • Issue accurate as-built documentation and drawings.
Priority 3 (within 6-months)	• None required.

Item 4 and actions

Localised areas of high loading.

Priority 1 (Immediate - Now)	• None
Priority 2 (within 6-weeks)	• Building engineer to produce loading plans to be displayed at each floor level. Allowable load allowance to be calculated considering existing super-imposed dead loads (e.g. floor finishes and partition walls), live load, floor and column capacity. • Factory manager to actively manage floor usage in accordance with the loading plan.
Priority 3 (within 6-months)	• Continue to implement load plan.

Item 5 and actions

Stability of Façade

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• Building engineer to review façade and advise if any remediation is necessary to ensure structural sufficiency for the full design life. • As a minimum, exposed rebar should be protected against further corrosion and area of damaged concrete should be repaired.
Priority 3 (within 6-months)	• Continue to monitor façade for signs of distress and take appropriate action to ensure stability.

Item 6 and actions

Columns susceptible to vehicle impact.

Priority 1 (Immediate - Now)	• Place temporary warning/protection (e.g. traffic cones, sand filled barrels as deemed appropriate by building engineer) at 1m from column faces.
Priority 2 (within 6-weeks)	• Building engineer to design appropriate impact protection for columns within loading dock.
Priority 3 (within 6-months)	• Construct and maintain protection to columns within loading dock and continue to assess likelihood of vehicle impact to critical elements.