Tanzila Textile Ltd.

Baroypara, Ashulia, Savar, Dhaka.
(24.017986, 90.243410)
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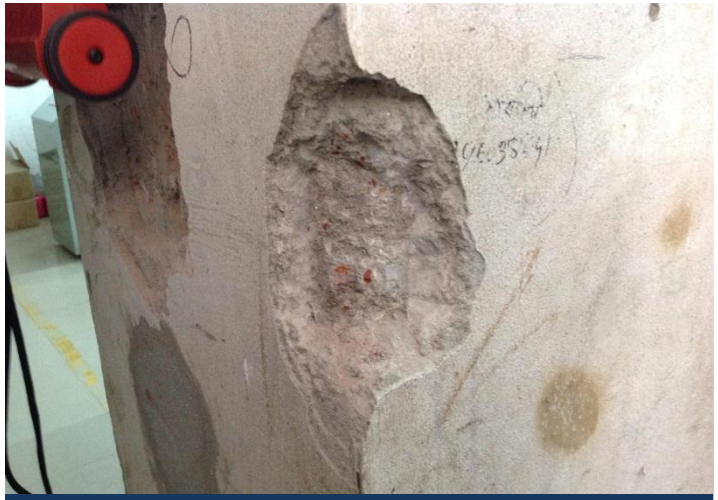
Observations

Highly Stressed Columns (Building 03)

Cursory calculations indicate column at high working stress



Brick Aggregate

Engineer is to perform detailed calculations and concrete tests to prove column as built is sufficient. Pending results of this assessment, reduce loads by removing fabric stored on suspended floors.

Highly stressed column

Localised Areas of High Loading (Building 1, 2 & 3)

Areas of localised high loading on suspended structure observed in all 3 buildings (including brickwork partition & toilet block loads).

Localised High Loading

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The structural arrangement for a typical bay is used to support loading from additional build-up on slab, solid partition walls and secondary ceiling slab in toilet areas.

Cracking evident along interfaces with masonry infill.

Localised High Loading

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Single Storey Industrial Building
Structural Issues
(Building 3)

Lateral Stability:

- No in plane roof cross bracing observed
- No out of plane lateral bracing to portal frames other than partial height masonry infill walls

Connections

- No capping plate at apex endplate connection
- Engineering design intent unclear at eaves haunch

Design Information

- No design information for the steel frame included in structural drawings
- No foundation for central column shown on drawings

Structural Lateral Stability of Single Storey Industrial Building (Building 2)

Building 2:
No in plane roof bracing observed.

Building stability appears to rely on RC columns and masonry infill perimeter walls cantilevering approx. 6.23m from the foundation. Foundation type is unknown.

Evidence of distress within masonry infill perimeter wall at interface with RC structure.

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Evidence of Distress and Unspecified Aggregate in Structural Beams and Slabs (Building 1)

Signs of distress and repair of cracking on finish to structural beams, slabs and masonry infill panels. Broken glass at cantilevered façade.

Evidence of Distress

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3. CONCRETE :

a) TYPE : ALL CONCRETE COMPRESSIVE STRENGTH CONSIDERED AS FOLLOWS :

1) f'c = MINIMUM 4000 PSI (COLUMN FOR GROUND FLOOR) , 3500 PSI (COLUMN FOR ALL OTHER)

2) f'c = MINIMUM 3500 PSI (FOR FOOTING)

3) f'c = MINIMUM 3000 PSI (FOR GRADE BEAM , FLOOR BEAM & SLAB)

4) f'c = MINIMUM 2500 PSI (FOR ALL OTHER)

5. CONCRETE AGGREGATE

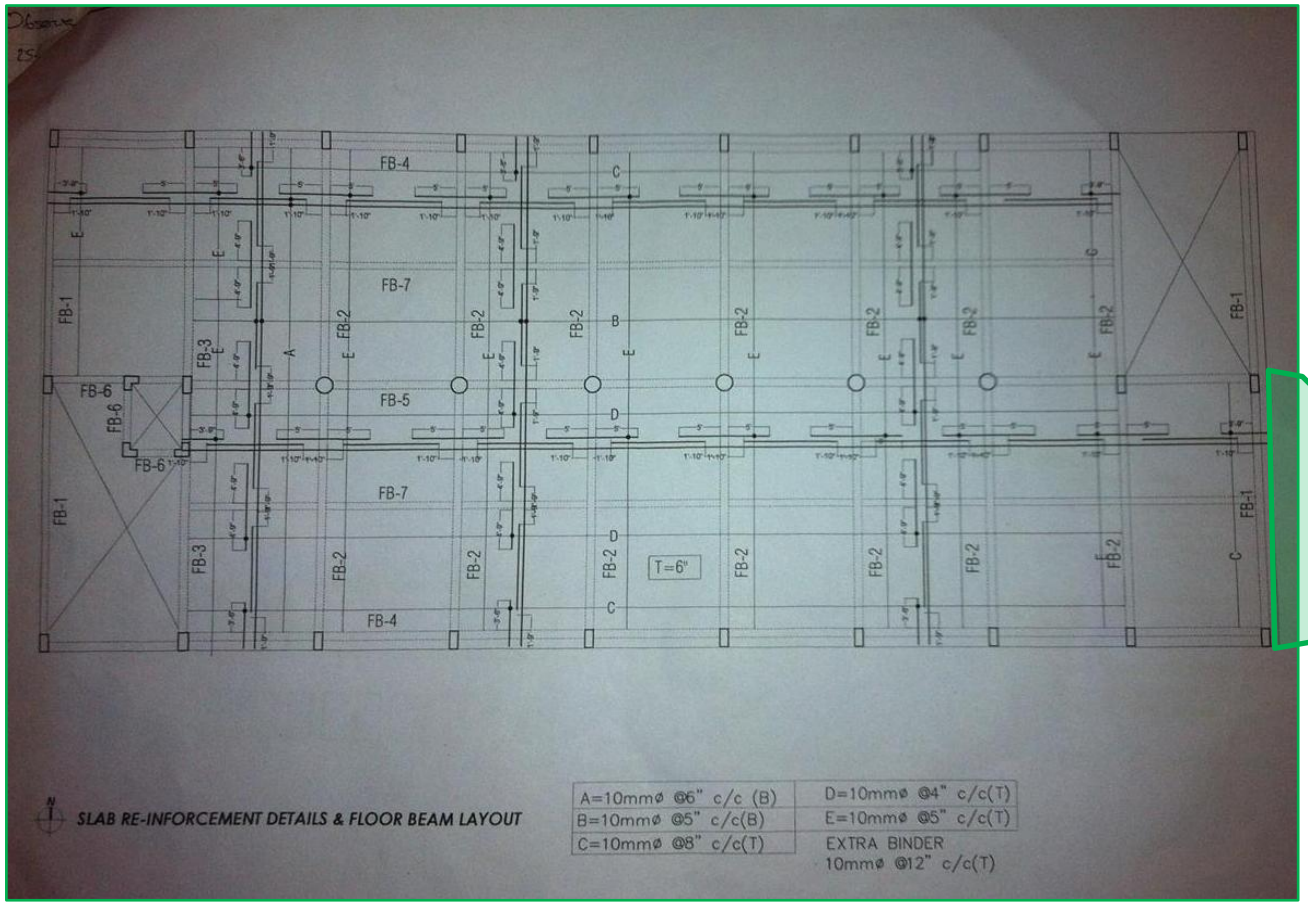
a) FINE AGGREGATES : SAND OF F.M 2.50---- 1.5

b) COARSE AGGREGATES : 20mm DOWN WELL GRADED STONE CHIPS TO BE USED AS COARSE AGGREGATE

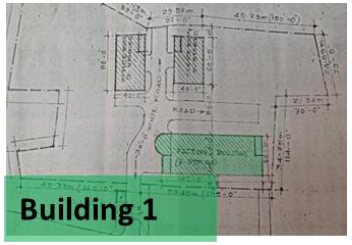
Structural design documents specify stone chip aggregate.
Brick chip aggregate observed at a number of locations in the slab.
Not clear if brick chip aggregate concrete achieves minimum compressive strength required by design.
May be manifested as cracking and excessive deflection.

Unspecified aggregate in slabs

Lack of Relevant Documentation
Discrepancies between Design & Construction



Cantilever on 4 floors not shown on structural drawings



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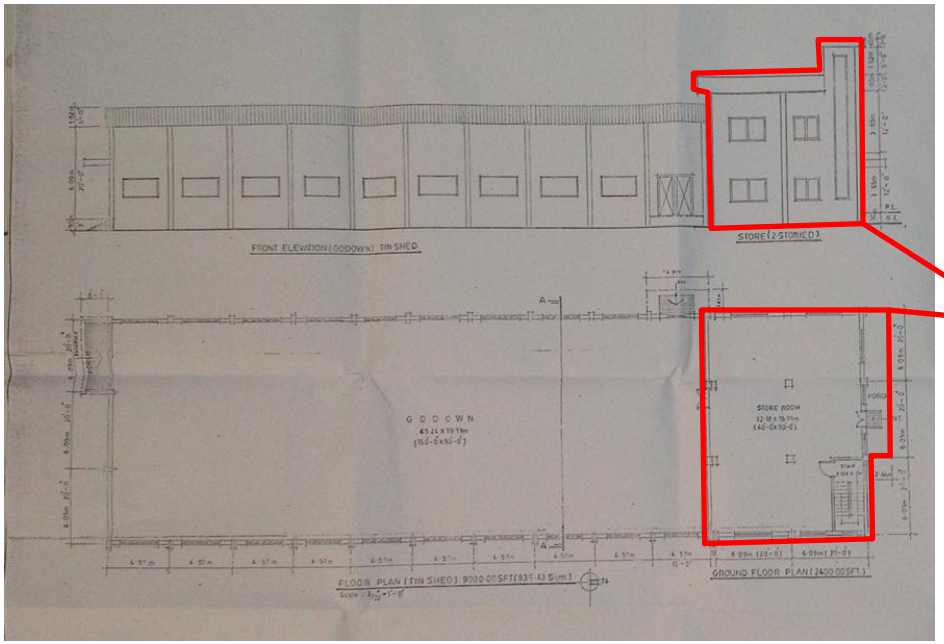
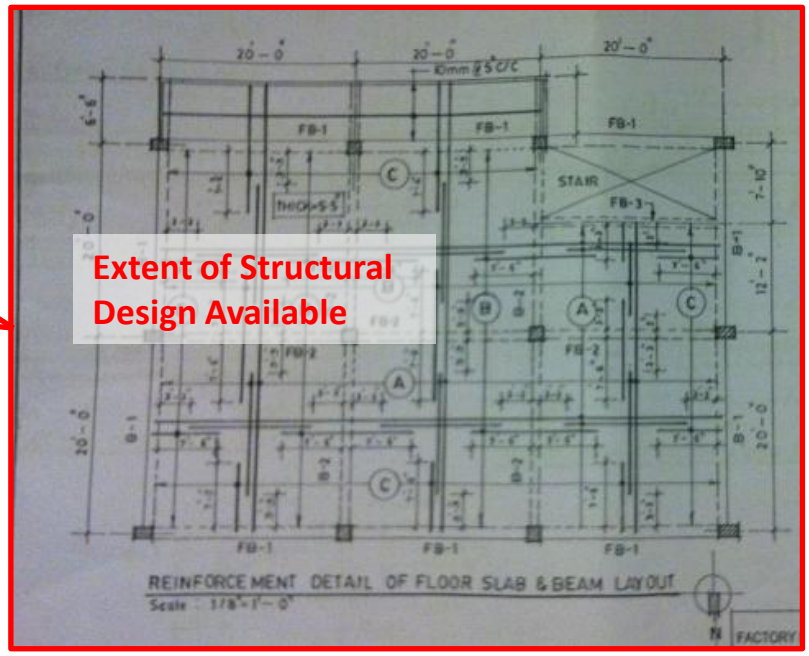
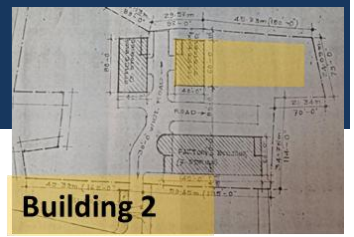




Undocumented Vertical Extension

Non-exhaustive items noted:

- **No relevant details for significant steel and concrete structure including trusses, connection details, reinforced concrete structure, foundations, ground floor slab details.**
- **Concrete strength fc' = 3000psi specified for design, brick chip aggregate observed in slabs and columns.**



Building 2

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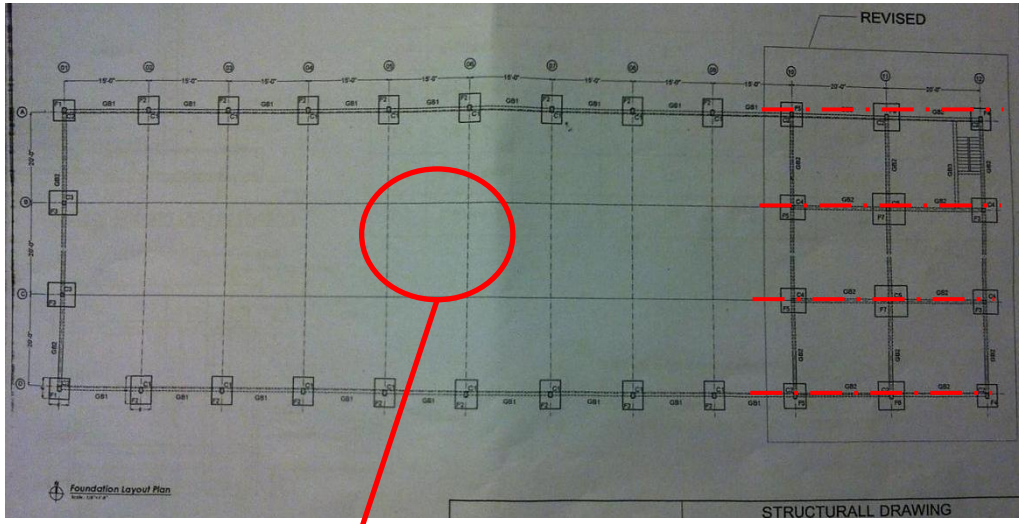
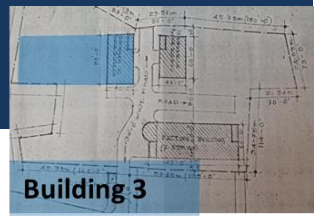


Non-exhaustive items noted:

- Incorrect general arrangement for concrete structure (number of bays does not match construction).
- No relevant details for significant steel structure.
- No foundations detailed for central column to portal frame.
- Well graded stone specified, brick chip aggregate observed in slabs and columns.
- Stairs not constructed as per design drawings (position of landing beam).
- Toilet extension not recorded.



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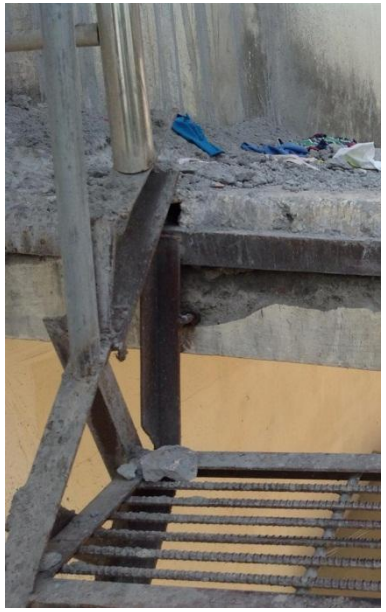
Undocumented and Non-engineered Ancillary Structures and Stairs

External steel stairs do not appear to be engineered.
Fixed to structure by tack welds to rebar.



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Non-engineered external buildings used for a number of support functions. Some fixings to principal structures. Distress visible on a number of elements.

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Priority Actions

Problems Observed

1. Highly stressed column (Building 3).
2. Localised areas of high loading (Building 1, 2 & 3).
3. Single storey industrial building structural issues (Building 3)
4. Structural lateral stability of single storey industrial building (Building 2)
5. Evidence of distress and unspecified aggregate in structural beams and slabs (Building 1)
6. Lack of relevant documentation, discrepancies between design & construction
7. Undocumented and non-engineered structures and stairs.

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Highly Stressed Columns – Building 3	Remove fabric storage at level 1	**Immediate - Now**
2	Highly Stressed Columns – Building 3	Ensure no additional loads relating to construction work are added (e.g. finishing or roof screeds) prior to confirmation of column capacity by the building Engineer	**Immediate - Now**
3	Highly Stressed Columns – Building 3	Factory Engineer to review design, loads and columns stresses in all Building 3 columns taking cognisance of as built structural arrangement and construction materials used	**6-weeks**
4	Highly Stressed Columns – Building 3	Verify in-situ concrete stresses either by cores or existing cylinder strength data for the internal columns in Buildings 3	**6-weeks**
5	Highly Stressed Columns – Building 3	Implement loading plans as developed in relation to Item 2	**6-months**
6	Highly Stressed Columns – Building 3	Carry out actions arising from building engineer's review.	**6-months**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
7	Localised Areas of high loading	Maintain current use of the floors and do not change use or increase occupation or loading prior to completion of safe loading plans by the building engineer	**Immediate - Now**
8	Localised Areas of high loading	Building Engineer to create controlled loading plans for all floors, which account for existing solid partition loads, extra finishes, heavy fixed items etc. and are based on the structural capacity of supporting slabs, beams and columns.	**6-weeks**
9	Localised Areas of high loading	Factory management to display plans and educate all relevant factory management on implementation	**6-weeks**
10	Localised Areas of high loading	Continue to implement load plan	**6-months**
11	Single Storey Industrial Building Structural Issues (Building 3). Structural Lateral Stability of Single Storey Industrial Building (Building 2)	Undertake Detailed Engineering Assessment of Building 3. Particular attention to structural stability, steelwork connection details, the as built concrete frame and determining the foundation systems used is required	**6-weeks**
12	Single Storey Industrial Building Structural Issues (Building 3). Structural Lateral Stability of Single Storey Industrial Building (Building 2)	Carry out all recommendations from the Detailed Engineering Assessment	**6-months**
13	Single Storey Industrial Building Structural Issues (Building 3). Structural Lateral Stability of Single Storey Industrial Building (Building 2)	Finalise appropriate structural as built drawings with incorporating the completed structural frame	**6-months**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
14	Evidence of distress and brick chip aggregate in structural beams and slabs (Building 1)	Building engineer to organise sufficient coring (100mm min) to determine the in-situ strength of reinforced concrete beams and slabs	**6-weeks**
15	Evidence of distress and brick chip aggregate in structural beams and slabs (Building 1)	Building engineer to review design of all beams and slabs on the basis of actual in-situ strengths and advise appropriate load limits and strengthening if required	**6-weeks**
16	Evidence of distress and brick chip aggregate in structural beams and slabs (Building 1)	Building engineer to design any strengthening works required.	**6-weeks**
17	Evidence of distress and brick chip aggregate in structural beams and slabs (Building 1)	Consider findings of capacity assessment when creating load plans required as per Item 2.	**6-weeks**
18	Evidence of distress and brick chip aggregate in structural beams and slabs (Building 1)	Carry out any strengthening or remedial details recommended by the building engineer	**6-months**
19	Evidence of distress and brick chip aggregate in structural beams and slabs (Building 1)	Record as built materials for structural elements on as built drawings.	**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 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 No.	Observation	Recommended Action Plan	Recommended Timeline
20	Lack of Relevant Documentation Discrepancies between Design & Construction	Undertake a detailed as built survey of building 1, 2 and 3 recording all undocumented structures and extensions	**6-weeks**
21	Lack of Relevant Documentation Discrepancies between Design & Construction	Record relevant materials used in construction	**6-weeks**
22	Lack of Relevant Documentation Discrepancies between Design & Construction	Verify existing structural drawings where possible to incorporate into as built structural drawings	**6-weeks**
23	Lack of Relevant Documentation Discrepancies between Design & Construction	Complete as-built drawings for all buildings, incorporating any remedial or strengthening works undertaken	**6-months**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
24	Undocumented and non-engineered structures and stairs	Prop all external steel escape stairs at steel stringer adjacent to connection to concrete landing. Building engineer to supervise propping immediately	**Immediate - Now**
25	Undocumented and non-engineered structures and stairs	Building Engineer to review escape stairs structural elements and all connection details for full access loads on stairs	**6-weeks**
26	Undocumented and non-engineered structures and stairs	Building engineer to design appropriate strengthening works as required	**6-weeks**
27	Undocumented and non-engineered structures and stairs	Factory manager to manage and co-ordinate any strengthening works with fire escape strategy for all areas	**6-weeks**
28	Undocumented and non-engineered structures and stairs	Factory Engineer to review single storey support buildings, taking account of loads applied to principal structures and advise on any strengthening works required.	**6-weeks**
29	Undocumented and non-engineered structures and stairs	Complete strengthening works and appropriate as built drawings for single storey structures	**6-months**