

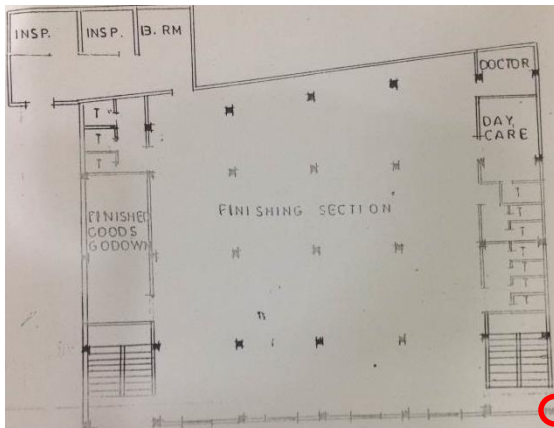
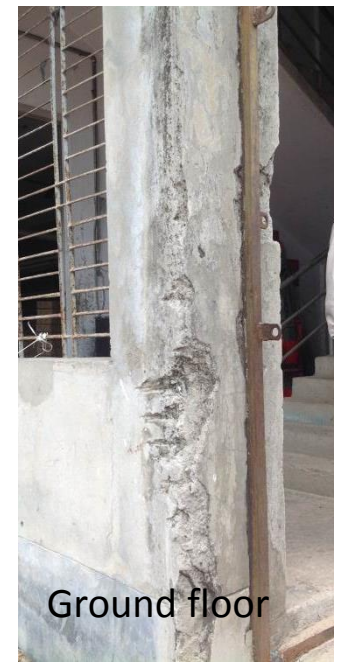
IFS Texwear (PVT) Ltd. 5S Composite Ltd.

PLOT NO. 631, KUTUBPUR, FATULLAH, NARAYANGANJ, BANGLADESH
(23.647089N, 90.500948E)
29 APRIL 2014



Observations

Cracking and damage to corner column

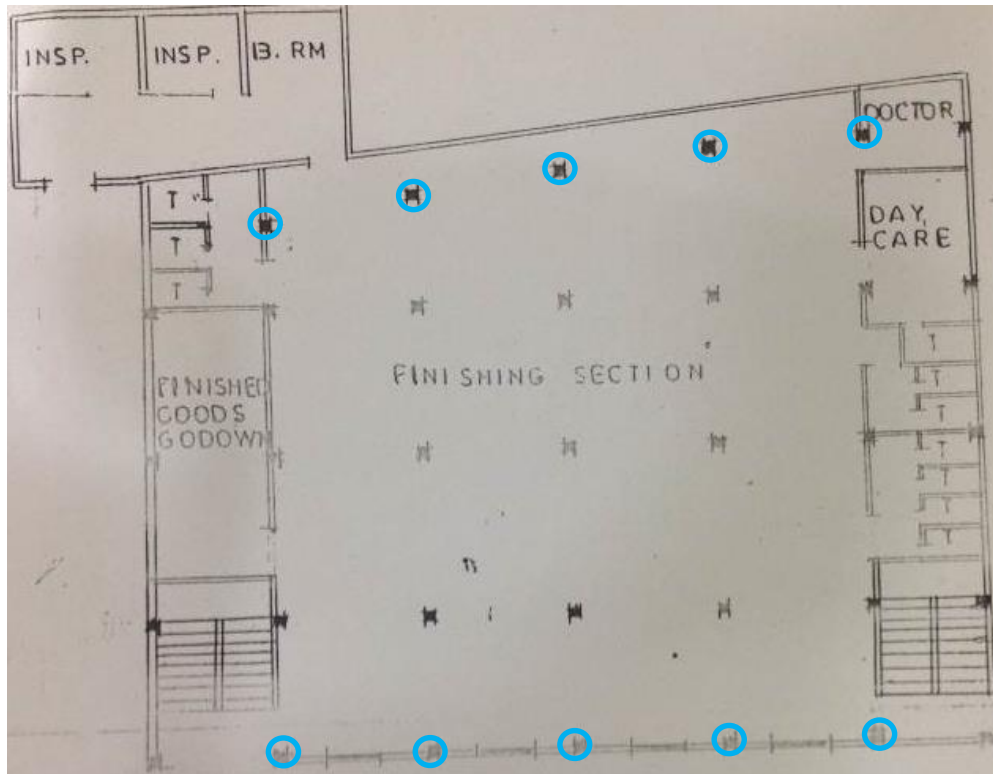


- Significant cracking and damage identified in corner column at three levels shown.
- Crack was opened up at fourth floor level confirming that it extended into the column.
- Similar cracking was observed at second floor level.
- At ground level damage was identified.

The corner column needs additional temporary support installed and removal of water tank loading.

Cracking in corner column

Column loads in excess of design loads

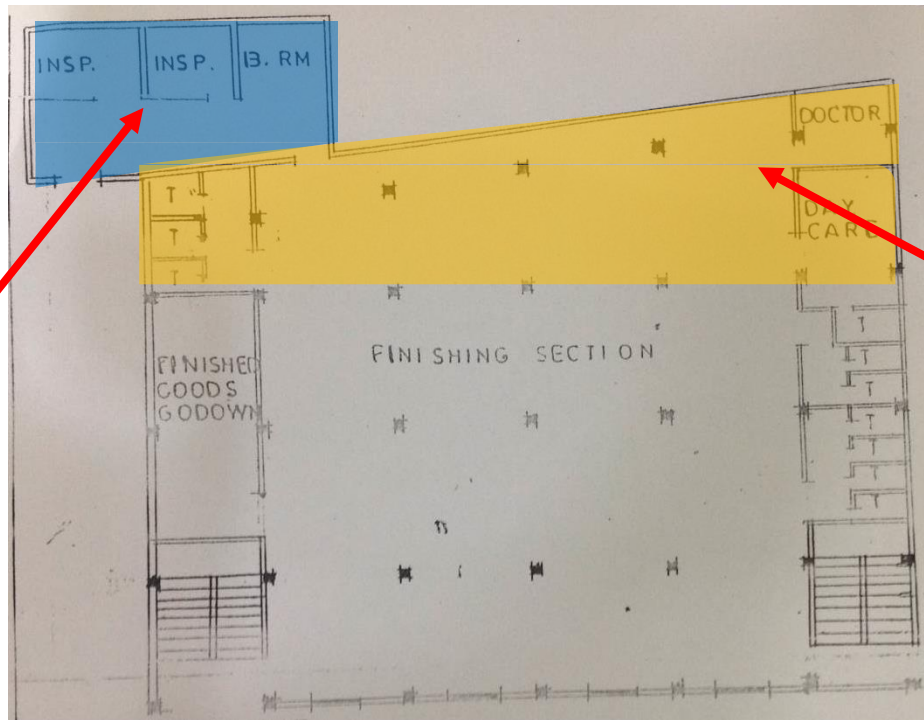


- Preliminary calculations indicate that the working stress for these columns is above that recommended by the code for the given materials and observed loading

Column loads in excess of design loads

Discrepancies between documentation and as-built structure

On ground floor only – not shown on structural drawings



Full height of building – not shown on structural drawings

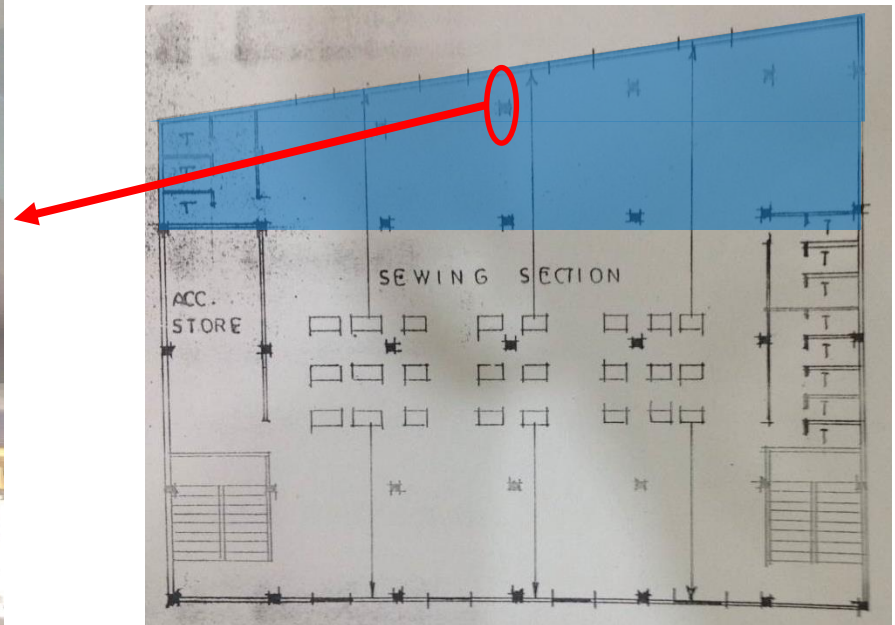
- An additional bay extending out the back of the building was constructed over the entire height of the building.
- There was also an extension constructed to the back at ground level only.
- Both these items were present on the layout drawings but not on the structural drawings.
- It was also observed that grid layout, beam and column sizes on the structural drawings did not match with what had been constructed.

Discrepancies between documentation and as-built structure

Beam & column cracking in undocumented area (North)



- Cracking was found in beam and column due to cantilevering slab in undocumented area shown below.
- This cracking appears to be due to deflection of the cantilever beam

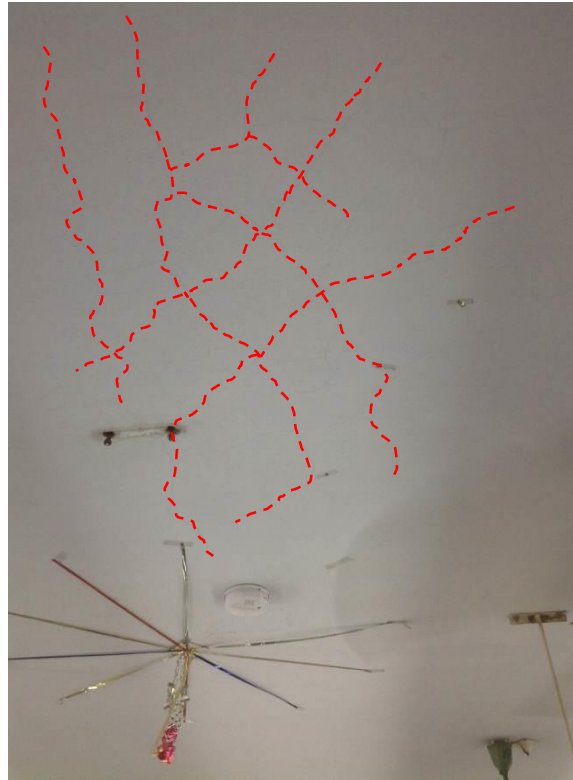


Beam & column cracking in undocumented area

Cracking in beams & slabs at all levels



Beam cracking



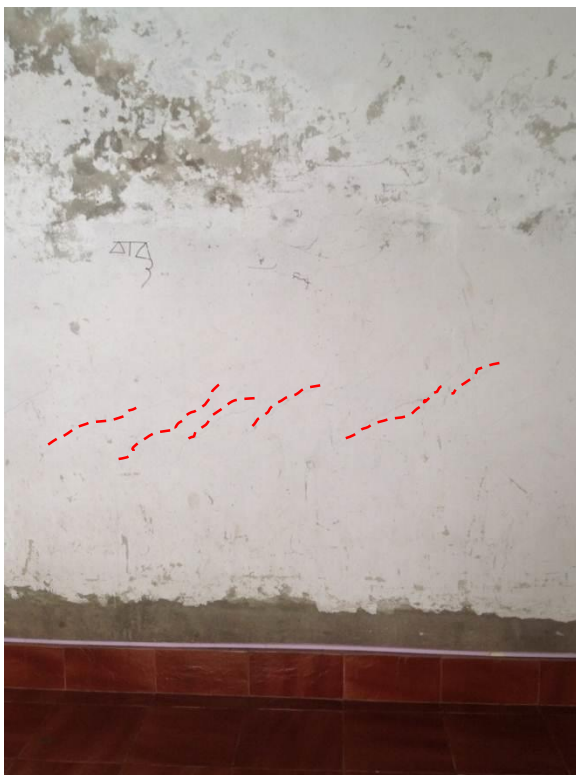
Slab cracking

Cracks were observed in the beams and slabs on all floor levels.

- They occurred on each side of the beam throughout its length. In many locations these cracks extended through the soffit and up both sides of the beam.
- Cracks in the soffit of the floor slab were typically observed in and around the centre of the span. These were particularly visible on the soffit of the second floor.

Cracking in beams & slabs at all levels

Cracking in walls throughout both stairwells



Stairwell side



Workshop side

Cracks were observed in the walls at most levels in both stairwells of the building.

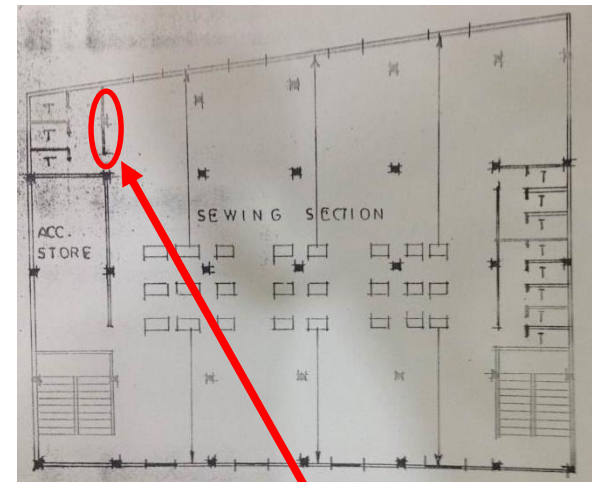
- These cracks were predominately diagonal and extended through the wall to both faces.
- A possible reason for these cracks is due to significant deflection on the inner beam of the stairwell compared with the outer beam. However, this could not be confirmed from visual inspection.

Cracking in walls throughout both stairwells

Non-engineered metal roof structure



- At 4th floor level, a metal roof has been constructed with a brick façade all around.
- Poor horizontal stability due to lack of moment-carrying connections or bracing.
- Roof appears to be non-engineered.



No internal column located in this region at fourth floor level, therefore higher load in edge column. This column bears directly on façade wall.

Non-engineered metal roof structure

Cracking at cantilevers to front of building



Horizontal cracking over windows



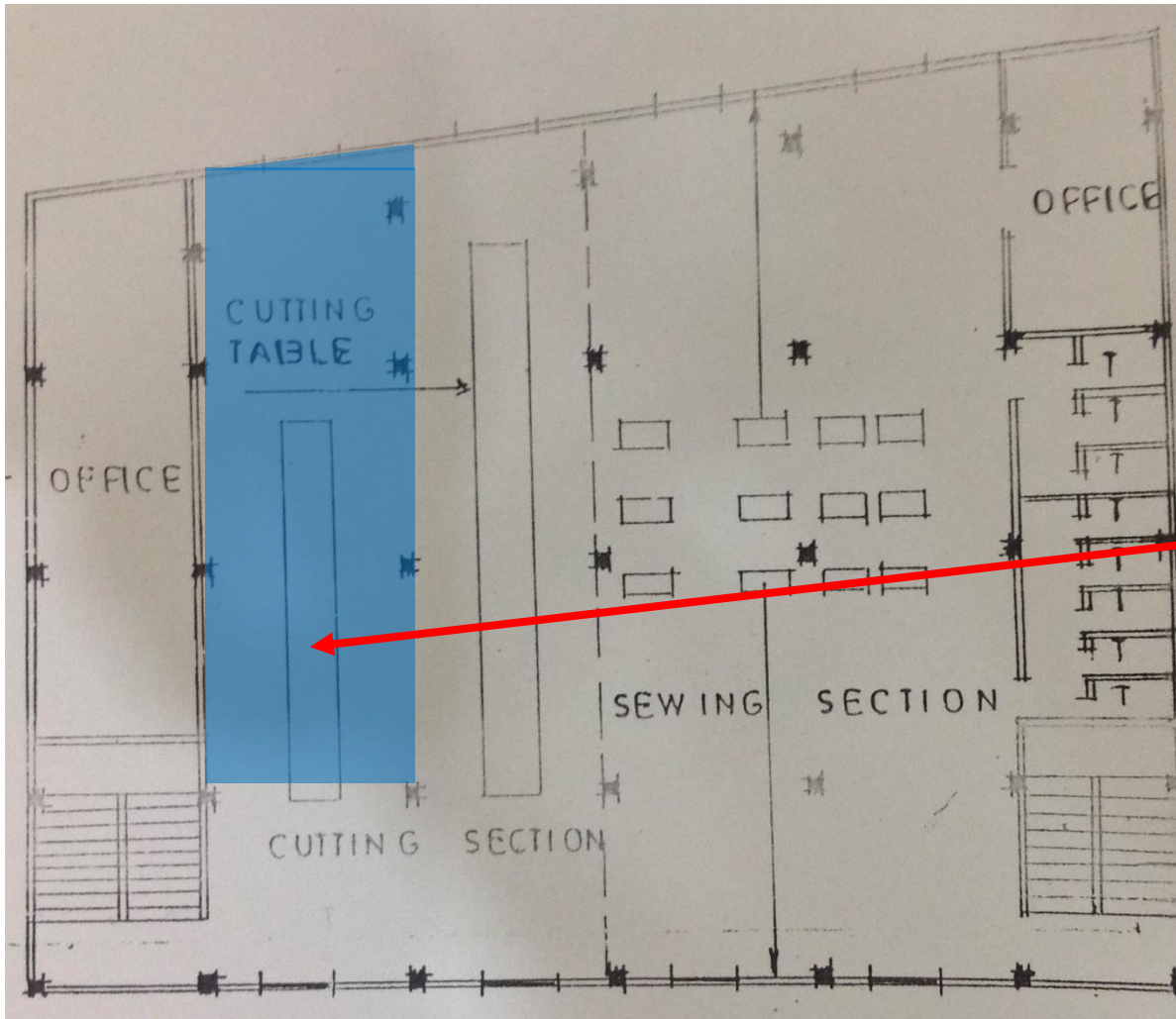
Vertical cracking at intersecting walls/floors

- Significant cracking evident in cantilever area on all upper levels at the front of the building.
- This appears to be due to deflection of the cantilever floors as a result of the parapet loads.



Cracking at cantilevers to front of building

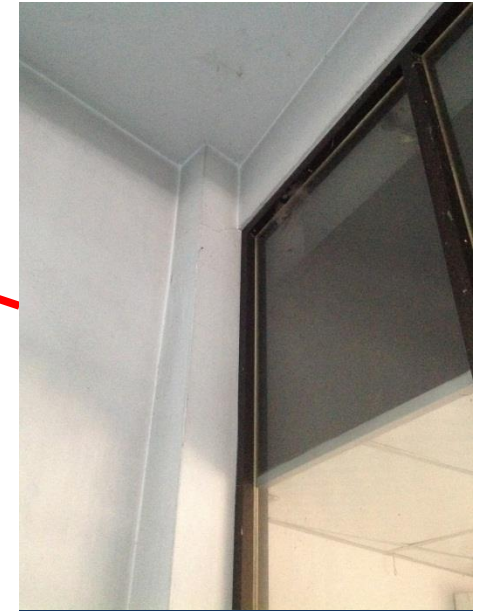
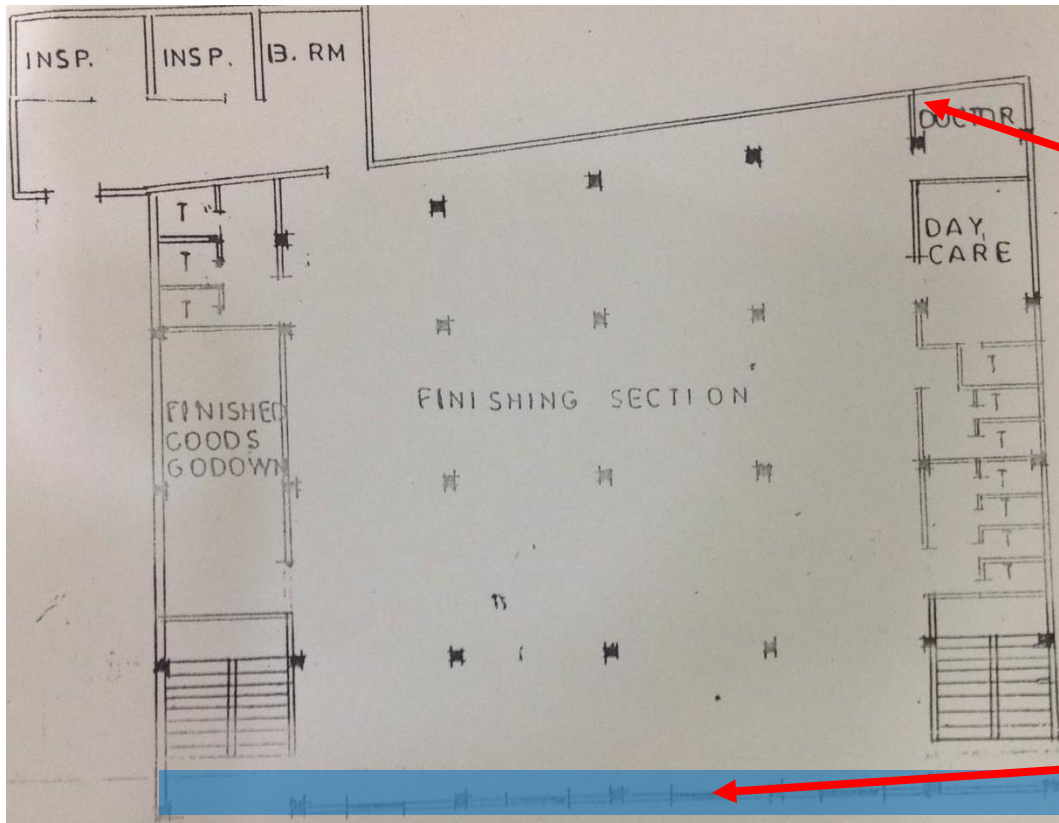
Brick partitions in office area



Brickwork cubicle partitions were found in office area shown

Brick partitions in office area

Misalignment between beams and columns



Column not centred
below beam

Beam along front face
of building in line with
outside face of column

Misalignment between beams and columns

Cracking in toilet areas

Toilet doorway



Toilet block ceiling



- Cracking was observed in the soffit of the slab over each toilet on each floor. This slab was cast directly over each of the toilet areas and is not connected to the floor.
- Significant cracking was also noticed over the doorway leading into the toilets.

Cracking in toilet areas

Flat slab over ground floor extension



- The roof slab over the undocumented area on ground level was constructed as a flat slab.
- After discussion with building owner it appears that this slab was non-engineered.
- Both the slab thickness and rebar quantities are unknown.

Flat slab over ground floor extension

Priority Actions

Problems Observed

1. Cracking in corner column
2. Highly-stressed columns at front and rear facades
3. Discrepancies between documentation and as-built structure
4. Beam & column cracking in undocumented area
5. Cracking in beams & slabs at all levels
6. Cracking in walls throughout both stairwells
7. Non-engineered metal roof structure
8. Cracking at cantilevers to front of building
9. Brick partitions in office area
10. Misalignment between beams and columns
11. Cracking in toilet areas
12. Non-engineered flat slab over ground floor extension

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Cracking in corner column	Drain water from tanks over stairwell to reduce load carried by columns.	Immediate - Now
2	Cracking in corner column	A Detail Engineering Assessment on the 5-storey building to be commenced immediately, see attached scope.	Immediate - Now
3	Cracking in corner column	If necessary, replace column while providing temporary support to the slabs. Any temporary propping to be designed by Building Engineer.	6-weeks
4	Cracking in corner column	Detail Engineering Assessment to be completed	6-weeks
5	Cracking in corner column	Implement actions arising from Detail Engineering Assessment, including possible strengthening or replacement of column as required.	6-months
6	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	Factory Engineer to review design, loads and column stresses supporting cantilevers at front and rear facades.	Immediate - Now
7	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	Verify insitu concrete stresses by 100mm diameter cores from min. 4 perimeter columns. Cores to be taken at Ground Floor.	Immediate - Now
8	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	A Detail Engineering Assessment of Factory to be commenced as noted in Item 1.	Immediate - Now

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 Elevational drawings .
2. The Engineering team are to carry out supporting calculations with a model based design checks 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
9	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.	6-weeks
10	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	Detail Engineering Assessment to be completed.	6-weeks
11	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	Continue to implement load plan	6-months
12	Highly-stressed columns at front and rear elevations Verify concrete strengths in columns for all 400 x 280 columns (front and rear facades)	No further levels to be built (metal sheet roof of shed not to be replaced with concrete roof)	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
13	Discrepancies between documentation and as-built structure	As part of Detail Engineering Assessment (see Item 1), ensure structural as-built drawings are produced for the building extent.	6-weeks
14	Discrepancies between documentation and as-built structure	Design calculations for the building should be undertaken, with a proposed load plan produced.	6-weeks
15	Discrepancies between documentation and as-built structure	Continue to implement load plan.	6-months
15	Beam & column cracking in undocumented area	As part of Detail Engineering Assessment (see Item 1), check capacity of the cantilever beams and the supporting columns.	6-weeks
15	Beam & column cracking in undocumented area	Implement actions arising from Detail Engineering Assessment.	6-months
15	Cracking in beams & slabs at all levels	As part of Detail Engineering Assessment (see Item 1), investigate if cracks penetrate the building structure.	6-weeks
15	Cracking in beams & slabs at all levels	Implement actions arising from Detail Engineering Assessment, including any concrete repairs or strengthening required to beams or slabs.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
15	Cracking in walls throughout both stairwells	As part of Detail Engineering Assessment (see Item 1), Identify the cause(s) of the cracking.	6-weeks
15	Cracking in walls throughout both stairwells	Rectify the cause(s) of the cracking.	6-months
15	Cracking in walls throughout both stairwells	Repair cracks as recommended by the Detail Engineering Assessment	6-months
15	Non-engineered metal roof structure	Stability system in metal roof to be checked as part of Detail Engineering Assessment (see Item 1).	6-weeks
15	Non-engineered metal roof structure	The structural behaviour in the area highlighted above is to be checked, including perimeter wall supporting the column.	6-weeks
15	Non-engineered metal roof structure	Implement actions arising from Detail Engineering Assessment.	6-months
15	Cracking at cantilevers at front of building	As part of Detail Engineering Assessment (see Item 1), check the capacity of the cantilever slab to withstand the façade loads.	6-weeks
15	Cracking at cantilevers at front of building	Implement actions arising from Detail Engineering Assessment.	6-months

Item No.	Observation	Recommended Action Plan	Recommended Timeline
15	Brick partitions in office area	As part of Detail Engineering Assessment (see Item 1), consider additional load placed on floor by brick partitions.	6-weeks
15	Brick partitions in office area	Implement actions arising from Detail Engineering Assessment.	6-months
15	Misalignment between beams and columns	As part of Detail Engineering Assessment, ensure the eccentricity of the beam/column connections is considered.	6-weeks
15	Misalignment between beams and columns	Capacity of the columns in these locations to be calculated.	6-weeks
15	Misalignment between beams and columns	Implement actions arising from Detail Engineering Assessment.	6-months
15	Cracking in toilet areas at all levels	As part of Detail Engineering Assessment (see Item 1), check design of overhead slab in all toilet blocks.	6-weeks
15	Cracking in toilet areas at all levels	Implement actions arising from Detail Engineering Assessment.	6-months
15	Non-engineered flat slab over ground floor extension	As part of Detail Engineering Assessment (see Item 1), carry out check on design of flat slab.	6-weeks
15	Non-engineered flat slab over ground floor extension	If found to be inadequate, Building Engineer to propose strengthening works	6-weeks
15	Non-engineered flat slab over ground floor extension	Implement actions arising from Detail Engineering Assessment.	6-months