Divine Design Ltd.
Alamode Apparels

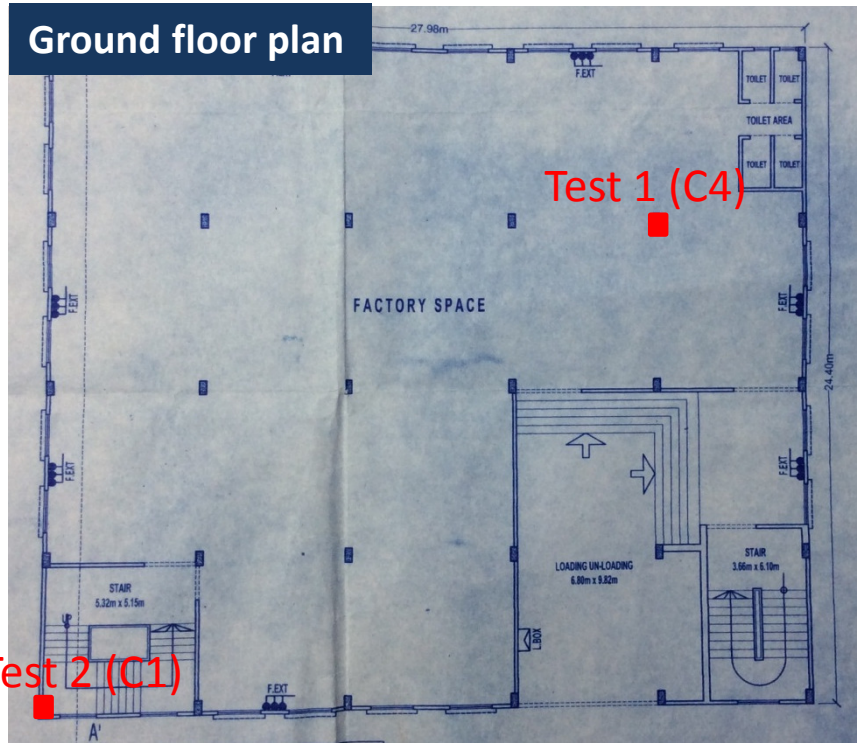
Chittagong, Bangladesh
(22°22'55.5"N 91°51'53.5"E)

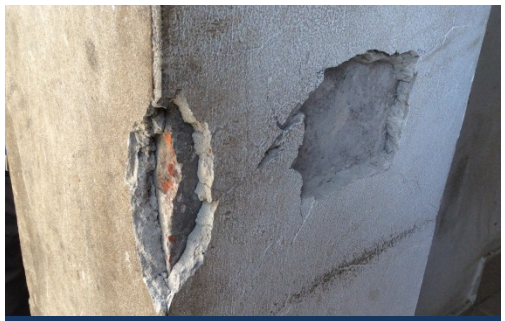
20 APRIL 2014

Observations

Highly-stressed columns at Ground Floor

Ground floor plan





Tested Ground Floor Column – Brick Chips

Specific design check to be carried out on all columns

Cursory calculations indicate that columns are stressed in excess of normal design limits. Reasons for this may stem from the following:

- Cantilever increases load on the first column particularly when loaded with storage.
- Internal partition walls in brickwork adding to the general live load.
- 8 floors in parts of the building. Whilst the building appears to have a permission for 8 floors this may not have been taken account of in the original design.
- Storage load in excess of usual 3kPa, the design load for slabs according to code.
- Brick aggregate found in the columns instead of stone aggregate as suggested on structural drawings.

Highly Stressed Columns at Ground Floor

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High loadings on slab
(storage, toilet areas with brick partitions)

Toilet Build-up + partition walls

Storage 6th floor

Storage 2nd floor

Building Engineer to prepare controlled loading plans, based on floor slab and column capacity, for all floors which will designate maximum permitted storage density and where storage may be placed.

High loadings on slab

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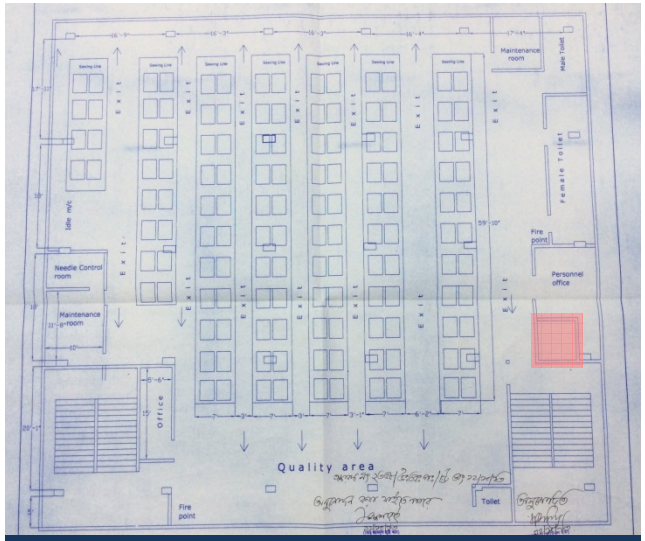
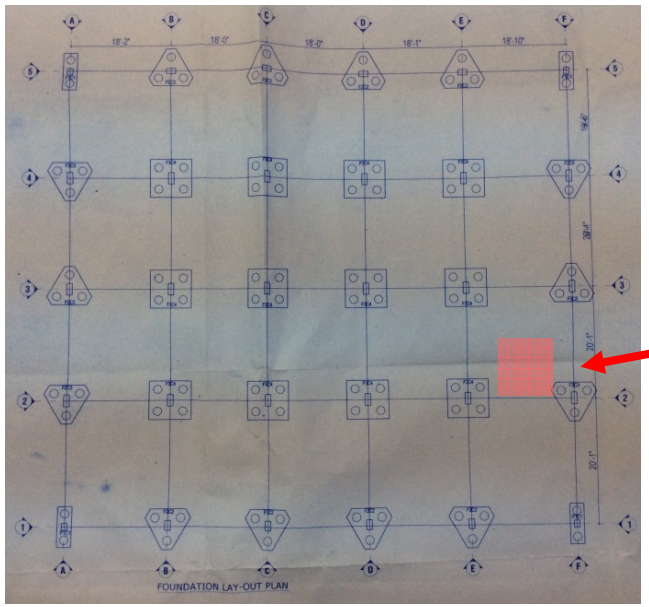
Structure of unused lift shaft not clear



Lift shaft on architectural drawing

Water tank on top of lift shaft



No information about lift shaft on structural drawings:

- No foundation shown,
- Not clear if brick or concrete,
- Not clear if borne by each slab on each level or actually load-bearing

Unused lift shaft

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Cantilever slabs on all sides of the building

(Repaired) cracks: indication of high deflection of cantilever

Flat slab cantilever

High load on cantilever

Cantilever slabs on all sides of the building

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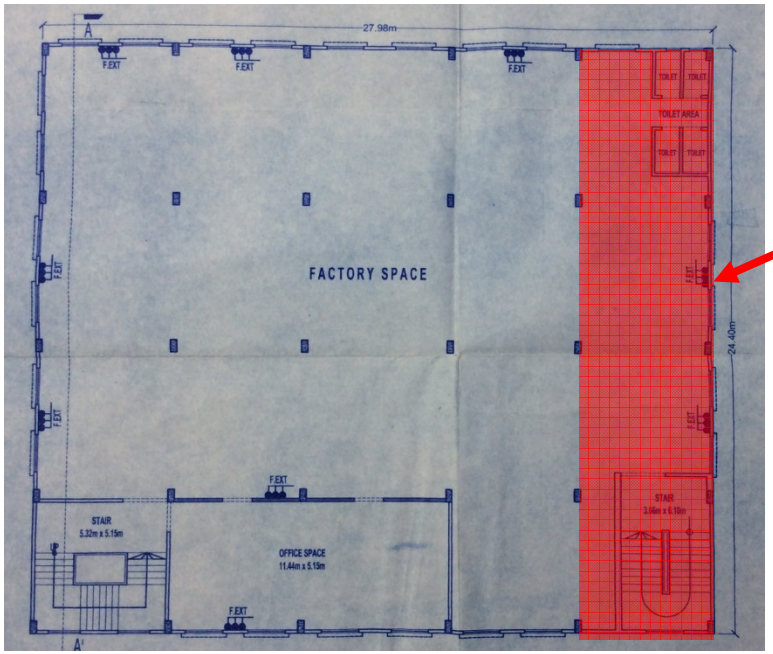
Additional RC Structure at roof level across one full bay



Additional structure of one bay on roof (not shown on drawings)

High loads on additional structure: 3 plastic water tanks and one concrete water tank

Additional structure on roof

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Lintel beam detail on level 1

Partly removed lintel beam resulting in unsafe brickwork

Lintel beam detail on level 1

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Eccentric beam-column connection

Eccentric beam-column connection
on every floor
(not shown on structural drawings)

Eccentric beam-column-connection

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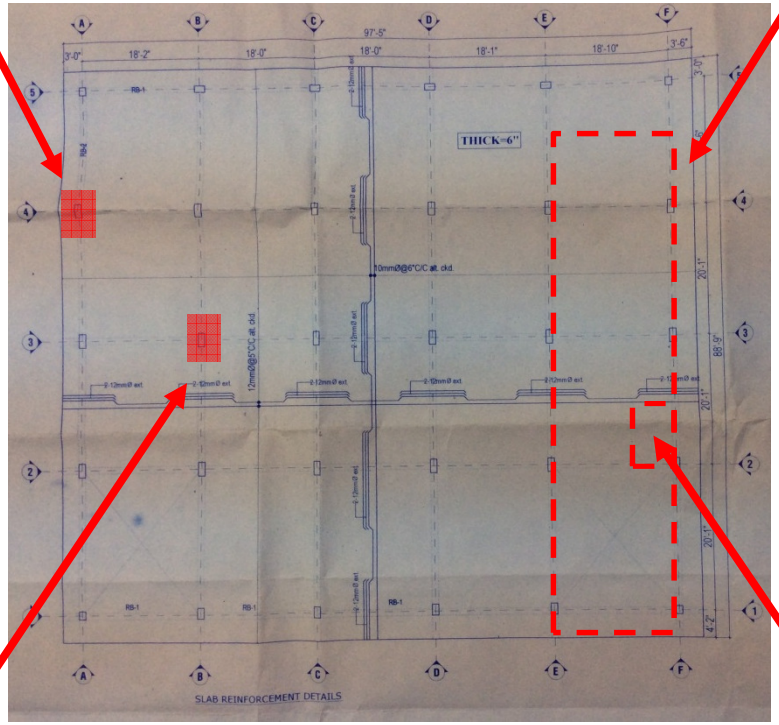
Inaccurate drawing information provided

Different column size for columns C3

Additional structure of one bay on roof not shown on drawings



Eccentric beam-column connection not shown on drawings

Lift shaft not shown on drawings

Inaccurate drawing information provided

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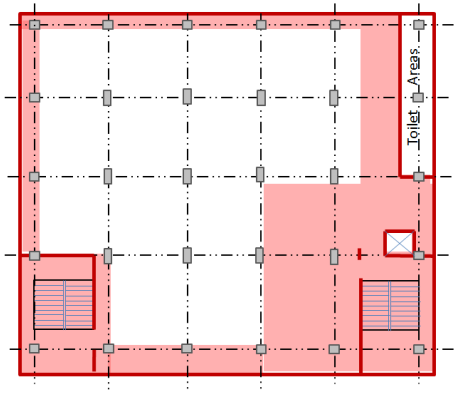
Problems Observed

1. Highly stressed columns.
2. High loadings on slab.
3. Unused lift shaft – lack of information.
4. Cantilever loading.
5. Additional RC structure over part of roof.
6. 1st floor lintel beam.
7. Inaccurate structural drawings.

Actions

Item 1 and actions

Check column stresses and verify concrete strengths in columns surrounding stair core



Priority 1

(Immediate - Now)

- Only lightweight operations (max. 100kg/m² - 1kPa) or access ways / escape routes are permitted in shaded zones at all levels. No storage allowed.
- Verify insitu concrete stresses by cores (100mm diameter) at min. 4 no. non-critical columns on ground floor.
- **Detail Engineering Assessment to be commenced immediately, see attached scope.**

Priority 2

(within 6-weeks)

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

Priority 3

(within 6-months)

- Reduce dead load / live load or carry out strengthening as required.

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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 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 2 and actions

High loadings on slab (storage, toilet areas with brick partitions)

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• Extent of floor build-up and partition walls and their respective loads onto the slab to be surveyed / identified and compared against the capacity of floor slab which will be assessed as part of Detail Engineering Assessment (Refer to Item 1)
Priority 3 (within 6-months)	• Reduce dead load / live load or carry out strengthening of floor slab as required.

Item 3 and actions

Unused lift shaft (water tank on top but no foundation shown, not clear if brick or concrete, not clear if borne by each slab on each level or self-bearing)

Priority 1 (Immediate - Now)	• Should be kept unused.
Priority 2 (within 6-weeks)	• As part of Detail Engineering Assessment (refer to Item 1), Building Engineer to commence re-survey of as-built structure and check foundation for the unused lift shaft.
Priority 3 (within 6-months)	• Take actions as required by the results of the Detail Engineering Assessment.

Item 4 and actions

Cantilever slabs on all sides of the building

Priority 1 (Immediate - Now)	• Remove storage from cantilever slabs.
Priority 2 (within 6-weeks)	• Create controlled loading plans for all floors designating where storage can / cannot be placed along cantilevering edges. • Provide calculations showing the structural adequacy of the cantilever slab, taking into account the loading plans, facade and all built structure, including additions beyond the original design, as part of Detail Engineering Assessment (refer to Item 1).
Priority 3 (within 6-months)	• Reduce live load or carry out strengthening as required.

Item 5 and actions

Additional RC Structure at roof level across one full bay

Priority 1 (Immediate - Now)	• None required.
Priority 2 (within 6-weeks)	• Provide calculations showing the structural adequacy of the roof, columns underneath to carry the extra loading as part of the Detail Engineering Assessment (refer to Item 1).
Priority 3 (within 6-months)	• Remove additional RC structure if required.

Item 6 and actions

Lintel beam detail on the 1st floor

Priority 1 (Immediate - Now)	• Provide temporary propping to lintel.
Priority 2 (within 6-weeks)	• Restore lintel beam.
Priority 3 (within 6-months)	• None required.

Item 7 and actions

Eccentric beam-column connection

Priority 1 (Immediate - Now)	• None required.
Priority 2 (within 6-weeks)	• Provide calculations showing the structural adequacy of the building taking into account the eccentricity of the beam-column connection as part of the Detail Engineering Assessment (refer to Item 1).
Priority 3 (within 6-months)	• None required.

Item 8 and actions

Structural drawings provided were incomplete and do not represent the as-constructed building structure

Priority 1 (Immediate - Now)	• As part of Detail Engineering Assessment (refer to Item 1), Building Engineer to commence re-survey of as-built structure and update drawings including a verification of the column sizes, lift shaft, beam-column connection etc.
Priority 2 (within 6-weeks)	• Complete as-built survey and Detail Engineering Assessment • Produce and actively manage a loading plan for all floors within the Factory giving consideration to floor capacity and column capacity. (Refer to Item 1)
Priority 3 (within 6-months)	• Continue to implement load plan

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