Cherry Intimate Ltd

Plot No 105 Dhaka Export Processing Zone, Ganakbar, Ashulia, Savar, Dhaka
Bangladesh
(23.952002N, 90.266265E)
04 May 2014

ACCORD on Fire and Building Safety in Bangladesh

ARUP

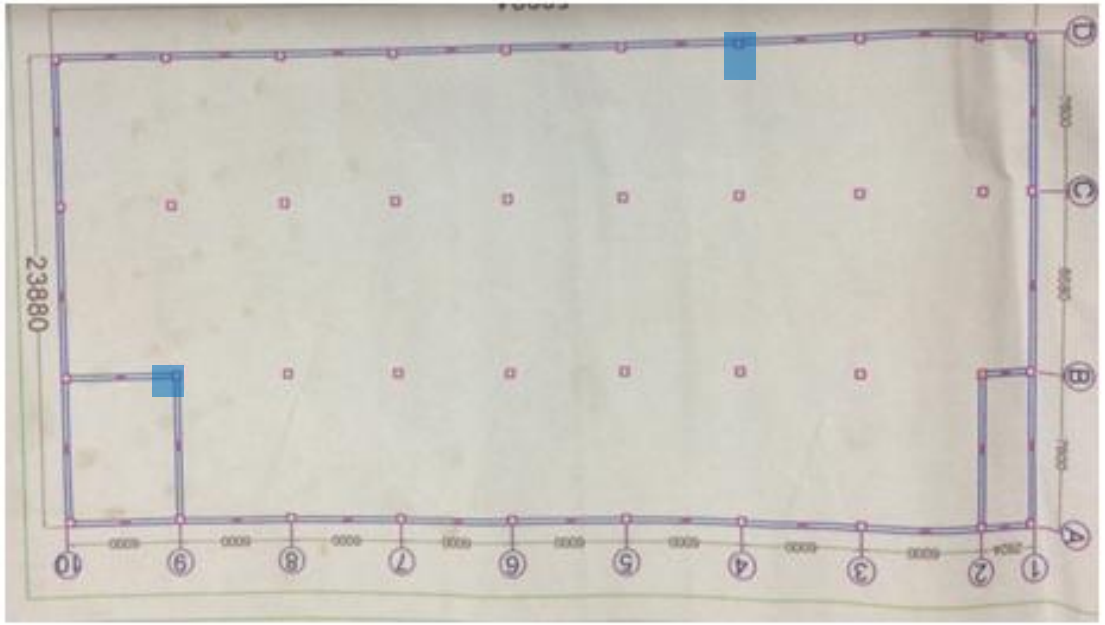
Observations

Stress Levels in Columns

Column investigations indicated stone aggregate. Reinforcement was investigated using a ferroscanner. Cursory calculations indicate that the working stress in the columns are at a high level.

Tested Column showing brick aggregate.

Reinforcement investigation



Ground Floor: Floor Plan

Tested Columns

Observations

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Numerous cracks and evidence of crack repair in primary and secondary beams

Numerous cracks and evidence of crack repair was observed in primary and secondary beams at every Floor level.

Cracks Repaired to side of the beam

Cracks Repaired to side of the beam

Cracks Repaired to underside and side of the beam

Observations

Differences between actual construction and information on design drawings

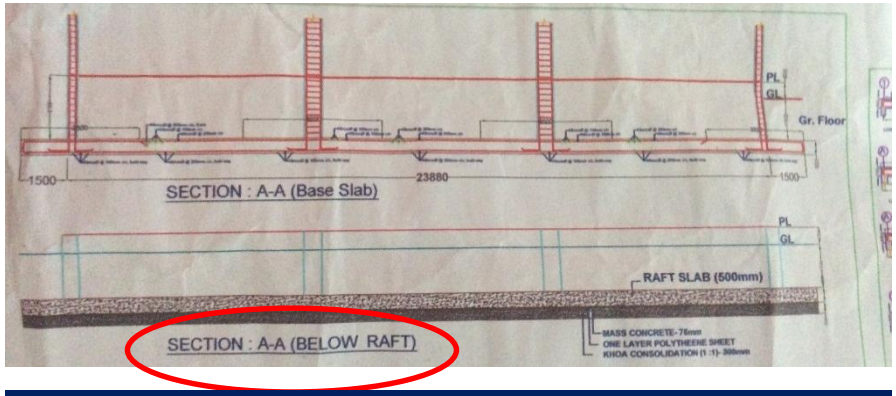
A set of Structural Drawings (updated) by Consulting Engineer named Md. Zahid Hassan were made available for review on the day of inspection along with other drawings which were unmarked. They appeared to be the original structural drawings for the building. There are a number of inconsistencies between drawings and the constructed building. A non-exhaustive list of issues include:

- Inconsistent column sizes were shown on different drawings. Both 500X500 and 400X400mm columns were shown. Actual column size is 430X430 mm with plaster

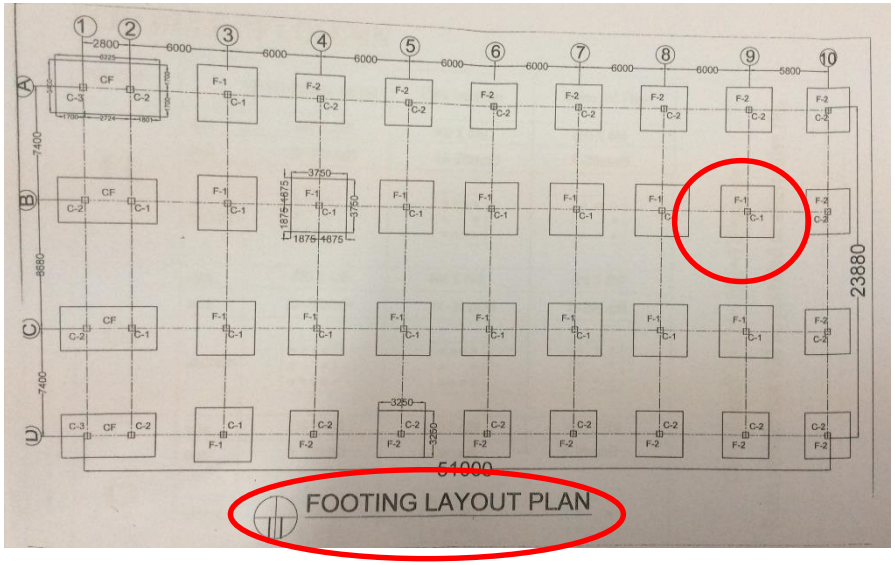
- There is confusion about the foundation type in the building. Different structural drawings provided, showed both raft foundation and isolated pad foundation systems.

Observations

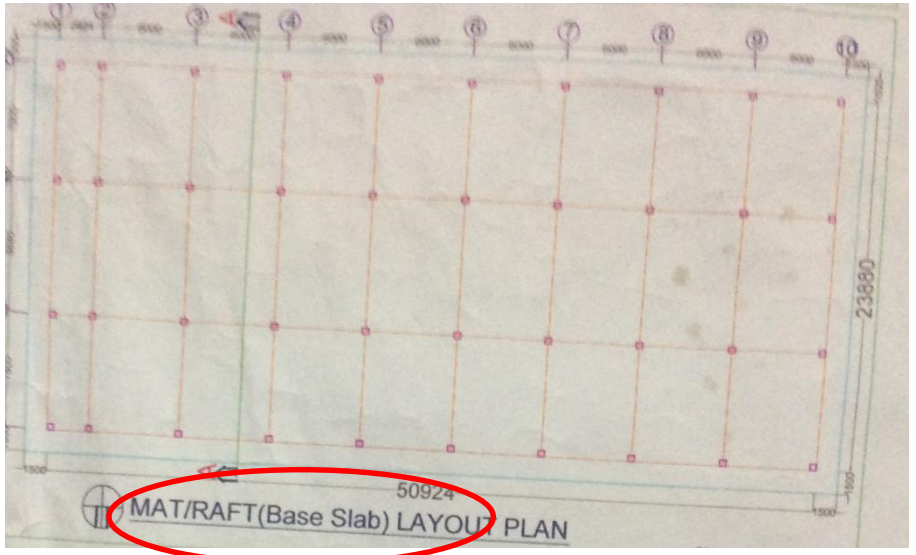
Conflicting foundation drawings are shown below



Section of mat/raft foundation



Plan of isolated pad foundations



Plan of mat/raft foundation

Observations

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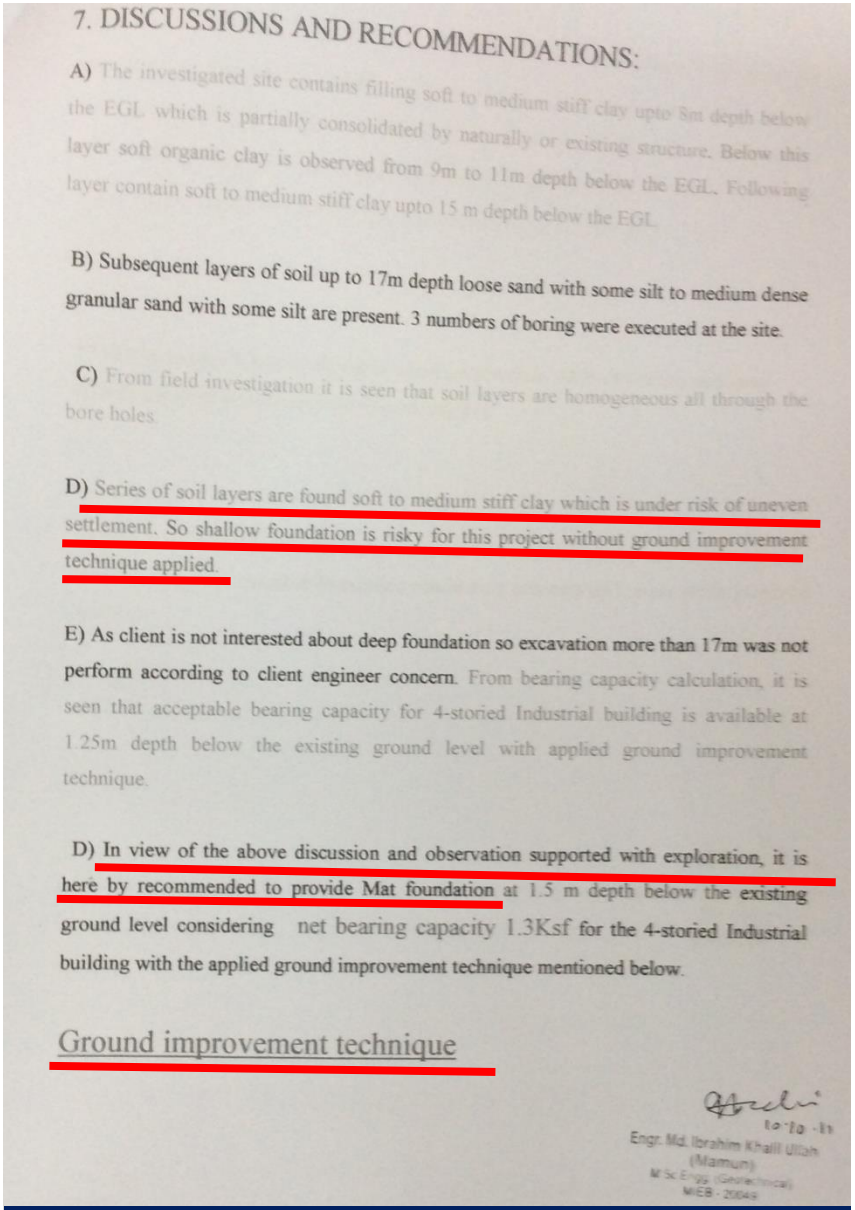
Foundation construction may not comply with recommendations of site investigation report



7. DISCUSSIONS AND RECOMMENDATIONS:

A) The investigated site contains filling soft to medium stiff clay upto 8m depth below the EGL which is partially consolidated by naturally or existing structure. Below this layer soft organic clay is observed from 9m to 11m depth below the EGL. Following layer contain soft to medium stiff clay upto 15 m depth below the EGL.

B) Subsequent layers of soil up to 17m depth loose sand with some silt to medium dense granular sand with some silt are present. 3 numbers of boring were executed at the site.

C) From field investigation it is seen that soil layers are homogeneous all through the bore holes.

D) Series of soil layers are found soft to medium stiff clay which is under risk of uneven settlement. So shallow foundation is risky for this project without ground improvement technique applied.

E) As client is not interested about deep foundation so excavation more than 17m was not perform according to client engineer concern. From bearing capacity calculation, it is seen that acceptable bearing capacity for 4-storied Industrial building is available at 1.25m depth below the existing ground level with applied ground improvement technique.

D) In view of the above discussion and observation supported with exploration, it is here by recommended to provide Mat foundation at 1.5 m depth below the existing ground level considering net bearing capacity 1.3Ksf for the 4-storied Industrial building with the applied ground improvement technique mentioned below.

Ground improvement technique

Engr. Md. Ibrahim Khalil Ullah (Mamun)

Site investigation report: Discussion and recommendation

Site Investigation recommended a Mat foundation with ground improvement techniques.

Type of foundation was confirmed by building contractor as isolated pad foundations which may not comply with the recommendations in the Site Investigation Report.

It is not clear if any ground improvement was undertaken.

Observations

Light weight roof structures lack bracing and appear non-engineered

Building Engineer to review the design of the lightweight structure on roof and over ground level wastage material storage area to the west of the building. Light weight roof structures lack bracing and appear non-engineered

Apparently non-engineered connections at base of steel roof structure.

Light weight metal sheeting at Roof level.

Observations

Priority Actions

Problems Observed

ITEM 1: Stress levels in Columns
ITEM 2: Numerous crack repairs in primary and secondary beams.
ITEM 3: Differences between actual construction and information on design drawings.
ITEM 4: Foundation construction may not comply with recommendations of Site Investigation Report.
ITEM 5: Lightweight roof structures lack bracing and appear non-engineered.

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Stress levels in Columns	Factory Engineer to review design, loads and columns stresses in all columns.	**Immediate - Now**
2	Stress levels in Columns	Verify insitu concrete strength either by 100mm diameter cores from 4 columns or existing cylinder strength data. Verify grade of steel reinforcement used.	**Immediate - Now**
3	Stress levels in Columns	A Detailed Engineering Assessment of Factory to be commenced, see attached Scope.	**Immediate - Now**
4	Stress levels in Columns	Detailed Engineering Assessment to be completed.	**6-weeks**
5	Stress levels in Columns	Make structural alterations as advised by Engineer.	**6-weeks**
6	Stress levels in Columns	Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.	**6-weeks**
7	Stress levels in Columns	Continue to implement load plan	**6-months**
8	Numerous cracks and evidence of crack repair in primary and secondary beams	Building Engineer to investigate if the cracking is structural or exists only in the render and to carry out flexural and shear checks on the beams, as part of the Detailed Engineering Assessment.	**6-weeks**
9	Numerous cracks and evidence of crack repair in primary and secondary beams	Carry out any remedial work as directed by the Building Engineer.	**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	Differences between actual construction and information on design drawings	Engage an Engineer to prepare full “as built” engineering drawings , as part of the Detailed Engineering Assessment (refer to Priority Action 1 above).	**6-weeks**
11	Foundation construction may not comply with recommendations of Site Investigation Report	Building Engineer to investigate if the applied loading can be safely carried by the foundations as constructed, as part of the Detailed Engineering Assessment.	**6-weeks**
12	Foundation construction may not comply with recommendations of Site Investigation Report	Carry out any remedial work as directed by the Building Engineer.	**6-months**
13	Lightweight roof structures lack bracing and appear non-engineered	Building engineer to check the capacity and stability system of the lightweight roofs and stairs and make any necessary alterations.	**6-months**