Aman Knittings Ltd.

Nijim Nagor, Singair Road, Hemeyetpur, Saver, Dhaka
(23.794351N, 90.269603E)
30th April 2014

ACCORD on Fire and Building Safety in Bangladesh

ARUP

Observations

Floor Finishes Cracking Around Column Perimeter

Slab Cracking Around Column Perimeter

We observed cracking on the floor finishes all around the column at 4th to a lesser extent on 3rd floor, but did not observe any on 2nd & 1st floors.

Floor Finishes Cracking

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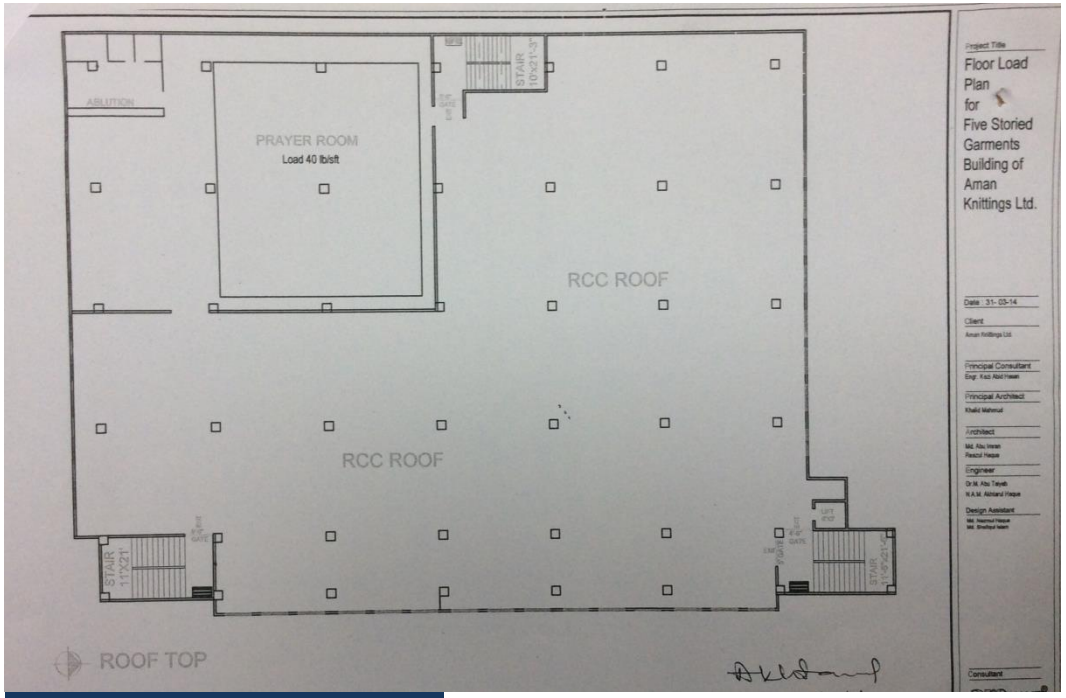
Columns appear to be stressed in excess of normal design limits



Typical Column Layout

Tested Ground Floor Columns – Brick Aggregate

Cursory calculations indicate column working stress is in excess of normal design limits.

Building Engineer is to perform detailed calculations including a Detail Engineering Assessment (See attached scope) and concrete tests to prove column size and (if required):

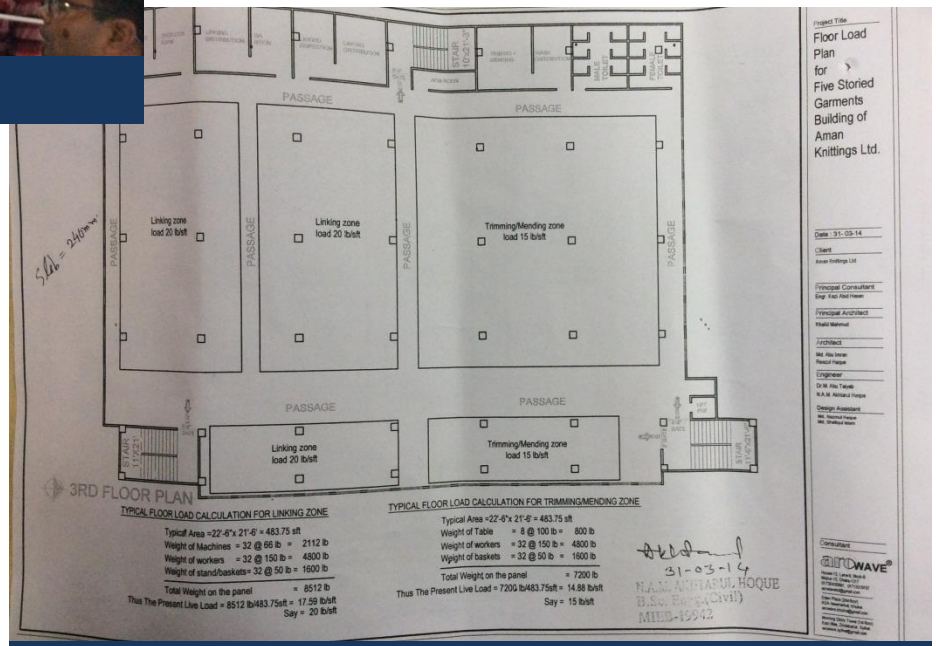
- Reduce loads by vacating floors
- Reinforce columns

Column Strength

Uncontrolled Loads

Storage loading at 3rd floor

We observed a small area with uncontrolled loading at 3rd floor over one cantilever span. Management should maintain the loading limits.



3rd floor Load calculations

Uncontrolled Loads

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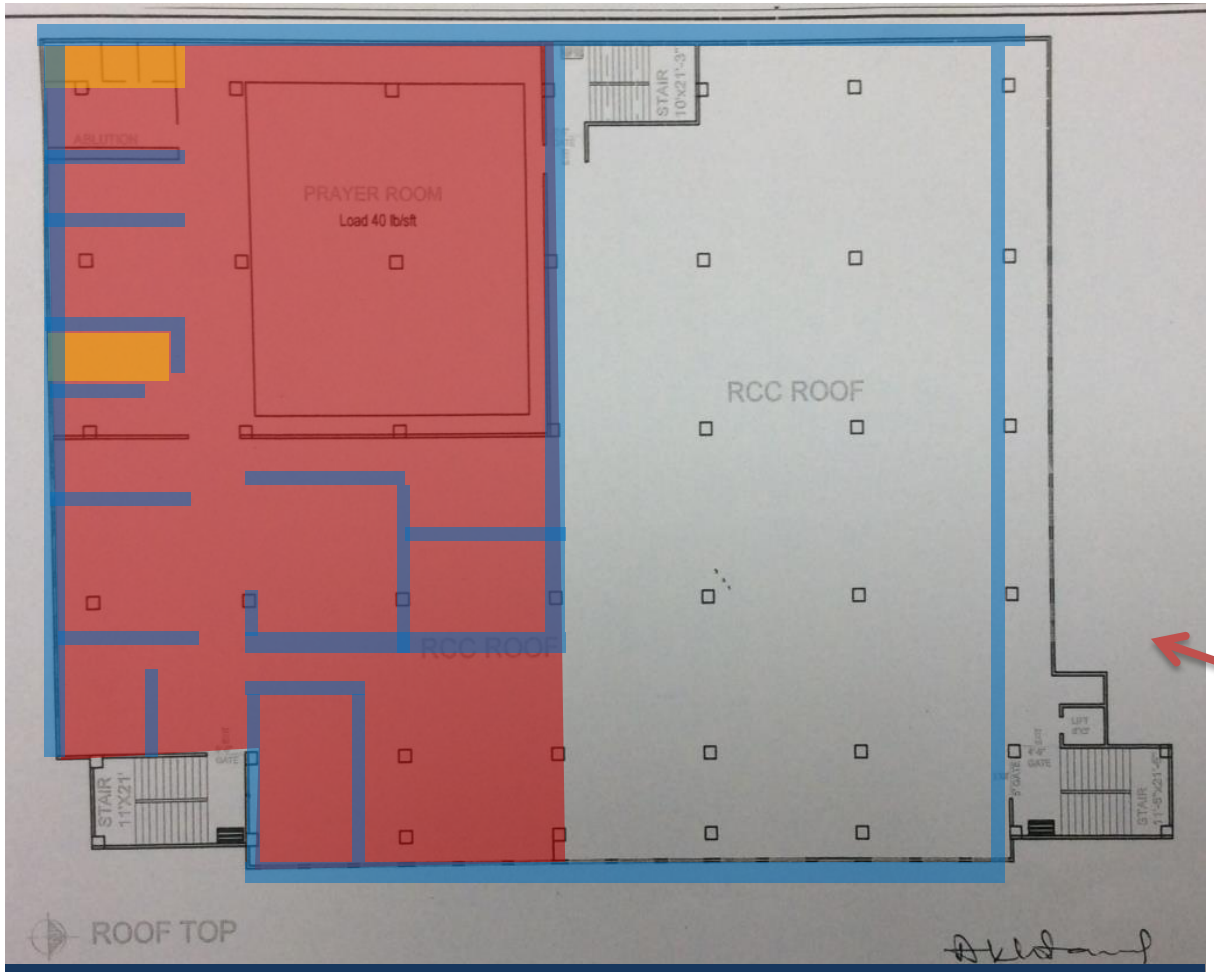
Difference between General Arrangement drawings and As built



Roof plan: Existing Brick work and steel shed

Existing Brick Work at roof level

Build-up inside the toilet

Steel roof cover

General arrangement drawing. Highlighted areas are as built.

Difference between Permit and As built

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Main Building Roof

Building permit drawing shows a 5 storey building. A 6th level was added but has now been partly demolished on instruction of BGMEA, the Fire Brigade and Civil Defence. What remains of the 6th storey are rooms enclosed by brick walls with steel roof spanning onto concrete columns, part of which serves as a prayer room. Areas formed by remaining internal brick walls under roof cover, provide other usable areas inside the existing shed.

Difference between Permit and As built

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Non-Engineered steel roofs

Steelwork over Dining: Shed 1

Steel work over Boiler room: Shed 3

Non-Engineered steel roofs

We observed some non engineered light weight steel structures at roof level of the steel sheds and main building with RC columns. Building Engineer to verify the stability of these steel structures.

Steel work over Bobbin production: Shed 2

Steel work over Prayer room: Roof of Main Building

Non-Engineered steel roofs

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Priority Actions

Problems Observed

ITEM 1: Cracking on slab around the perimeter of the columns

ITEM 2: Columns appears to be stressed in excess of normal design limits

ITEM 3: Uncontrolled loads on cantilever on the Eastern side of the building

ITEM 4: Confirm stability of the non-engineered roofs over all sheds.

ITEM 5: Difference between general arrangement drawings and observed arrangement

Item No.	Observation	Recommended Action Plan	Recommended Timeline
1	Cracking on slab around the perimeter of the columns	Detail Engineering Assessment of as built structure to be commenced as per attached scope. Using verified concrete strength and existing reinforcement of slabs, determine punching shear capacity of slabs at all levels	**Immediate - Now**
2	Cracking on slab around the perimeter of the columns	Detail Engineering Assessment to be completed	**6-weeks**
3	Cracking on slab around the perimeter of the columns	If punching shear capacity not justified with present arrangement, define strengthening detail around columns	**6-weeks**
4	Cracking on slab around the perimeter of the columns	Produce and actively manage a loading plan for all floors within the building giving consideration to floor slab and column capacity.	**6-weeks**
5	Cracking on slab around the perimeter of the columns	Continue to implement load plan	**6-months**
6	Cracking on slab around the perimeter of the columns	Implement strengthening measures where required by the DEA	**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
7	Building columns appear to be stressed in excess of normal design limits	Detail Engineering Assessment of as built structure to be commenced as per attached scope. Verify insitu concrete strengths (using min. 4 no. 100mm dia. Cores and/or assessment of available concrete strength data)	**Immediate - Now**
8	Building columns appear to be stressed in excess of normal design limits	Existing reinforcement for all columns to be confirmed as high yield steel.	**Immediate - Now**
9	Building columns appear to be stressed in excess of normal design limits	See 'Cracking on slab around the perimeter of the columns'	**Immediate - Now**
10	Building columns appear to be stressed in excess of normal design limits	Detail Engineering Assessment to be completed	**6-weeks**
11	Building columns appear to be stressed in excess of normal design limits	Produce strengthening detail for columns where necessary	**6-weeks**
12	Building columns appear to be stressed in excess of normal design limits	Produce and actively manage a loading plan for all floors within the building giving consideration to floor and column capacities	**6-weeks**
13	Building columns appear to be stressed in excess of normal design limits	Continue to implement load plan	**6-months**
14	Building columns appear to be stressed in excess of normal design limits	Factory Engineer to review design, loads and columns stresses in area identified above.	**6-months**
15	Building columns appear to be stressed in excess of normal design limits	Implement all strengthening measures required by the DEA	**6-months**

Item No.	Observation	Recommended Action Plan	Recommended Timeline
16	Uncontrolled loads on the Eastern cantilever of the building	Reduce loading on the eastern side of the building where necessary. Produce and actively manage a loading plan for all floors within the building giving consideration to floor capacity and column capacity.	**6-weeks**
17	Uncontrolled loads on the Eastern cantilever of the building	Continue to implement load plan	**6-months**
18	Confirm stability of the non-engineered roofs over all sheds	Building Engineer to carry out design check to confirm stability of the steel roofs on all sheds.	**6-months**
19	Confirm stability of the non-engineered roofs over all sheds	If required, strengthen to support code loading.	**6-months**
20	Difference between permit drawings and as built construction	As part of the DEA required under Item 1, prepare as-constructed layouts of both buildings and resolve permitting inconsistencies.	**6-weeks**