Revision: Issue 1
Date: 9th June 2014

Category Amber

DEA

Spotfame Apparels Ltd.

Chamudda, Mirar Bazar, Pubail, Gazipur Sarar, Gazipur.
(23.936673N, 90.444452E)

25th May 2014

Structural Inspection Report

Observations & Actions

Author: Robert Read
Checked by: Aidan Madden
Approved by: John Flaherty

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Executive summary

On Sunday 26th May 2014 Mr. Robert Read of Arup carried out a visual structural survey of **Spotfame Apparels Ltd.** at the address and coordinates shown on the cover of this report. He met with Mr. Emdadul Haq Milon (General Manager) and Mr. Md. Talab Ali (General Manager – Production).

Spotfame Apparels Ltd. occupy a compound with three buildings. We were able to inspect all areas of the buildings.

The main production building is a steel shed with a mezzanine floor covering approximately half of the floor area, there is also a small generator shed and dining building. The ground floor of the production building is used for sewing while the mezzanine is used for cutting, storage, sampling and offices.

The main production building was constructed in 2008. An industrial permit drawing approved in 2009 by the industrial authority was available although this did not match the building that was inspected. Undated structural drawings which appeared to match the frame were available. These drawing were signed by Engr. Mushfiqur Rahman. Two soils reports were available from May 2011 and June 2013, these appeared to be the same. They suggested the use of pad foundations which corresponds with the structural drawings that were available.

There were no drawings available for the dining shed which was formed of small concrete posts with timber rafters.

Executive summary (Continued)

The main production building appears to be in sound structural condition. There was no evidence of overloading, distress, damage, excessive deflections or settlements.

We do have some concerns that need to be addressed within 6 weeks. Neither the production nor dining sheds appear to have been designed for the loads that may be applied to them. A Detailed Engineering Assessment (DEA) should be carried out for both building to confirm that they have sufficient capacity for the horizontal and vertical design loads stated in BNBC 2006.

Below is a high level and non exhaustive list of our key concerns:

- The hollow steel sections appear to be supported by brick columns, not 3.0m RC columns as shown on the drawings (the columns face was exposed on site).
- The steel to steel connections appear to be spot welded only.
- The roof trusses appear to have simply been cast into the RC columns at roof level.
- There is no restraint to the bottom boom of the roof trusses, the compression element is therefore unrestrained under uplift.
- There is no bracing in either the roof plane or the elevations of the building.
- The mezzanine slab is very thin (varying between 40 and 90mm) there are cracks in some locations
- The secondary trusses supporting the mezzanine are larger than the primaries in some locations.

We see no reason to suspend operations in the facility due to these concerns (subject to the required actions noted at the end of this report).

Executive summary (Continued)

Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

We have reviewed the property from an outline seismic perspective and would consider that the building along with many others in the Dhaka region to have a significant risk in a major Seismic event.

Our Limitations and Assumptions are also noted at the end of this report.

Building Extents

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Site Location Map- Spotfame Apparels Ltd.

Building Extents

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Generator Shed

Production Shed

Building Extents

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Child Care & Doctor's Chamber

Dining Shed

Building Extents

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South Elevation

North Elevation

East Elevation

West Elevation

Building Extents-Production Shed

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Structural System

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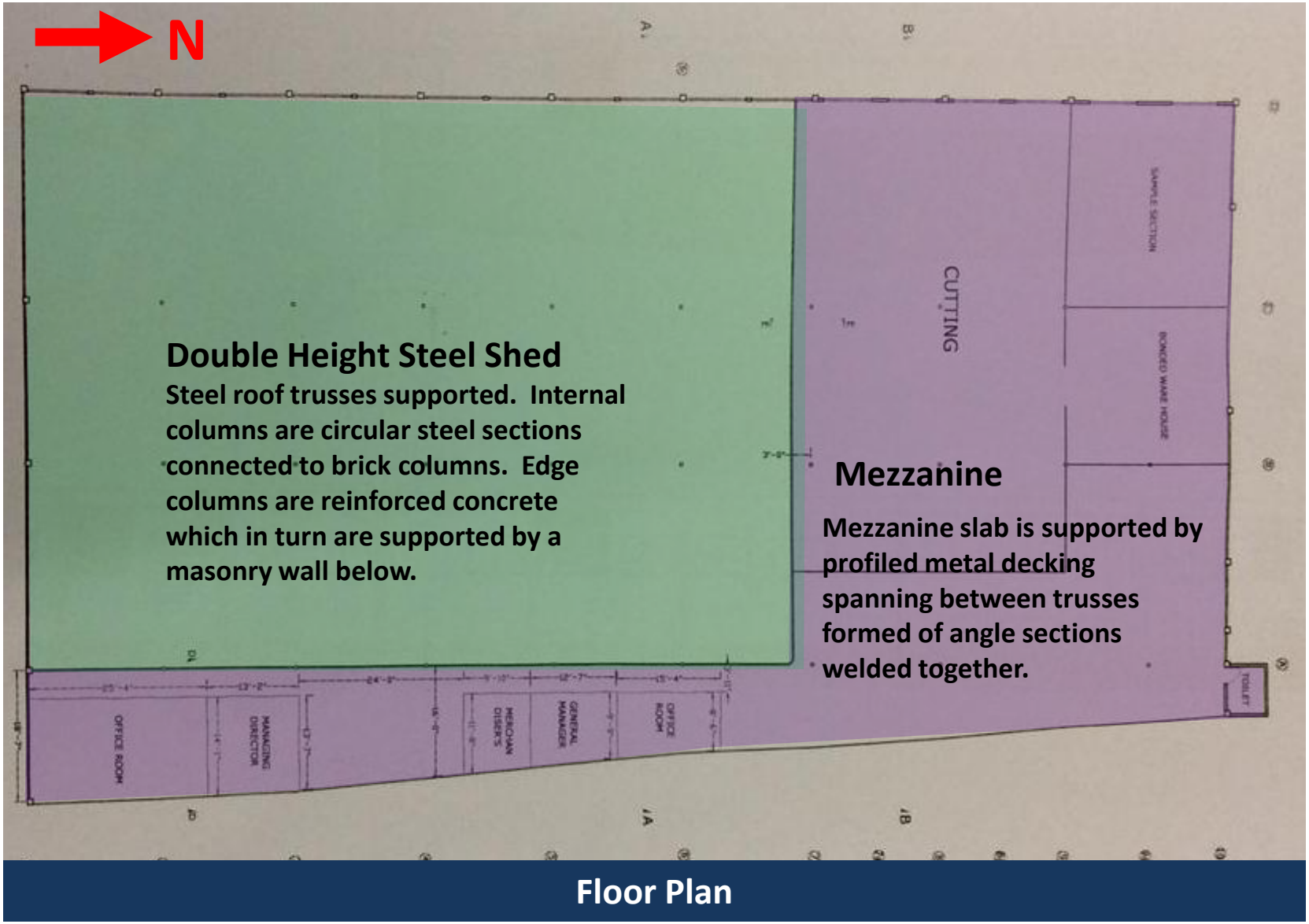

Floor Plan

Structural System –Production Shed

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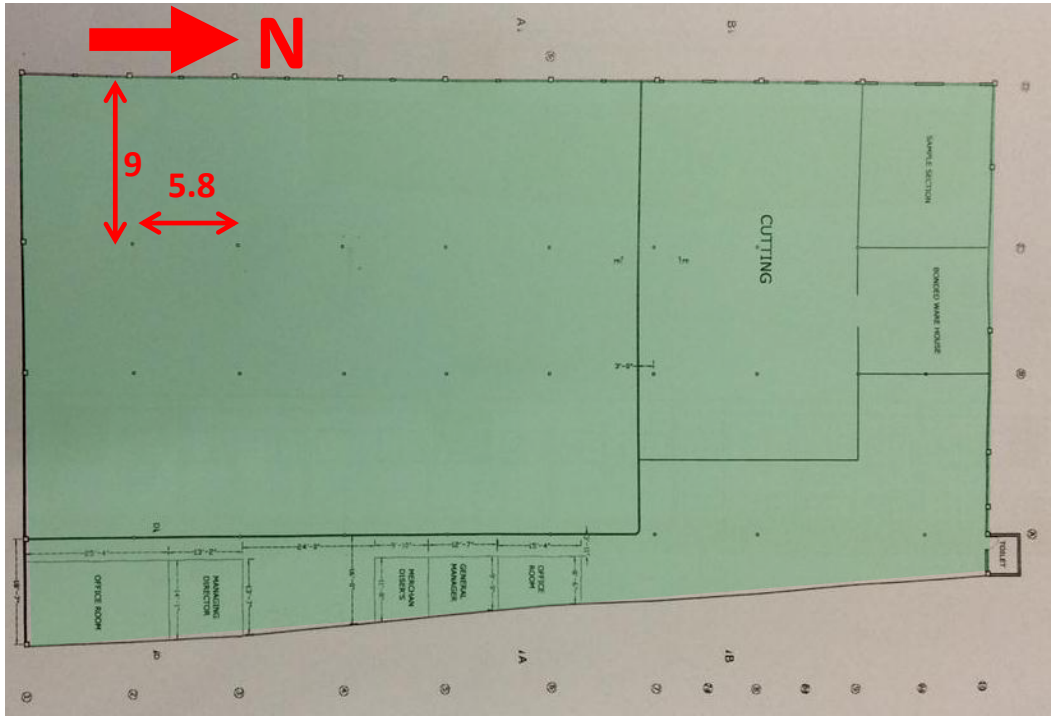

Structural System:
Steel roof trusses supported on circular steel sections connected to brick columns.

Maximum Grid: 9x5.8m

Typical Internal Columns: Circular section of 100mm dia. connected to brick columns
Typical Edge Columns: RC edge columns 275mm x 155mm supported by a masonry wall.

Concrete Aggregate:
Brick observed in edge columns.

Steel trusses supported on circular sections connected to brick columns

Structural System – Production Shed

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Steel trusses supported on circular sections

Trusses supported on RC columns at edge

Structural System – Production Shed

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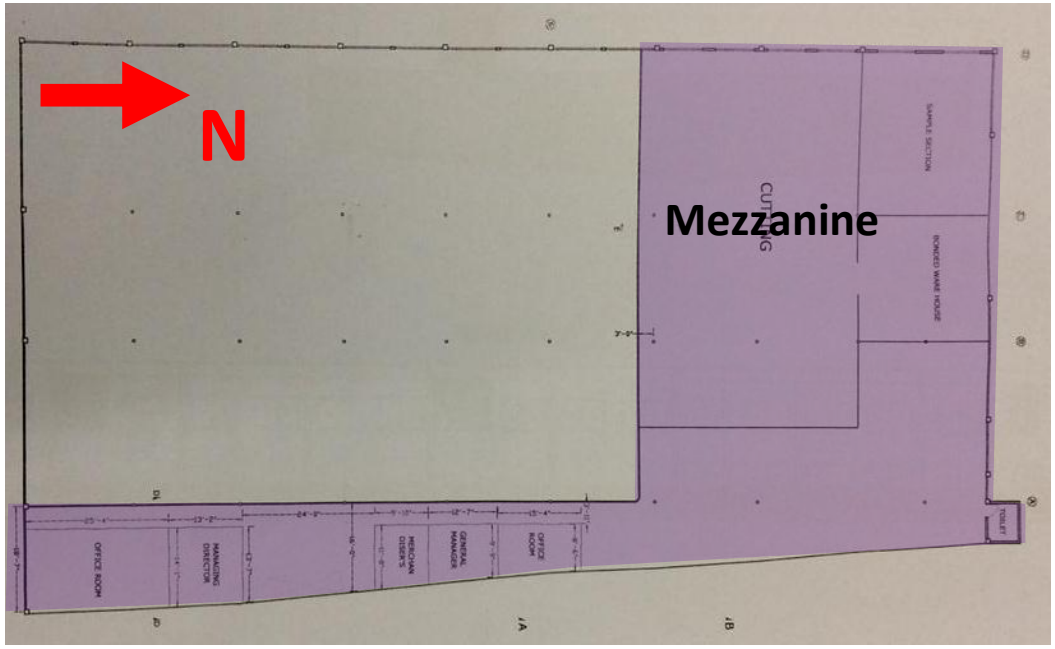

Steel trusses supported on brick columns

RC slab at the mezzanine

Fabricated steel beams/trusses in both directions

Structural System – Production Shed

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Timber rafters supported on timber & concrete posts in dining shed

Steel sheeting supported steel angle rafters with load bearing masonry walls

Structural System – Dining & Generator Shed

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Observations

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Circular steel columns supporting roof trusses and mezzanine appear to be supported by brick columns

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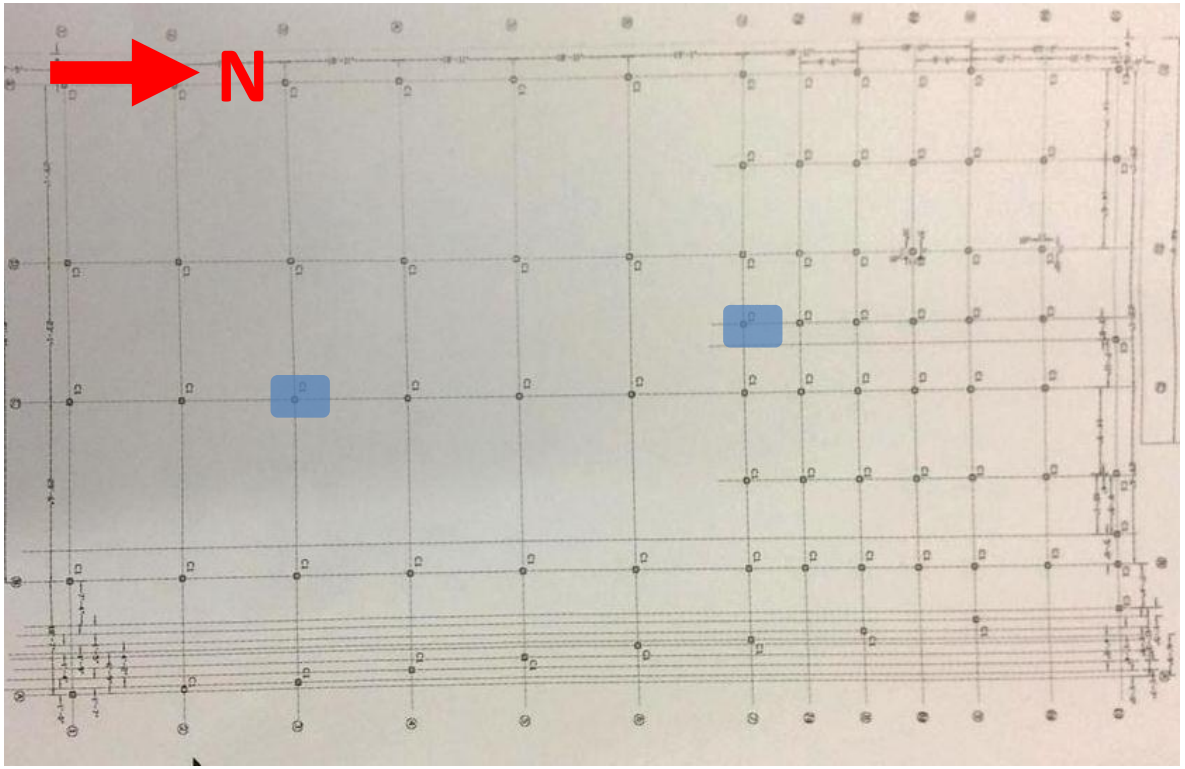

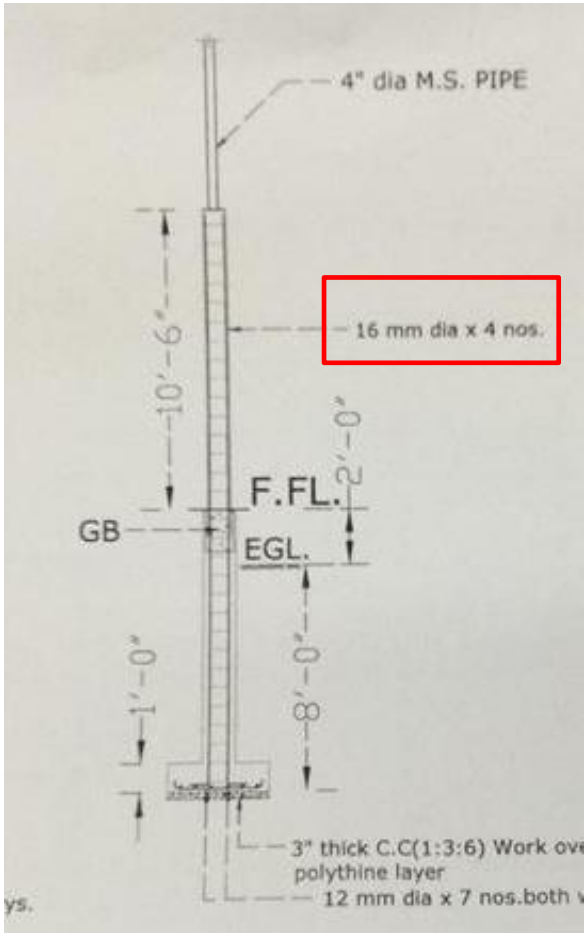

The structural drawings indicate that the circular steel columns are cast into RC columns with 4 no. 16mm diameter bars. During the survey the columns were exposed in two locations and found to be masonry columns with no reinforcement. It is likely that the footings are made of reinforced concrete as some RC columns were found outside the shed.

Brick columns supporting roof

Brick columns found after removing tiles

RC columns found outside the shed where the factory plans to build an extension.

Brick columns

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Connections of the structural components

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At the edge steel trusses are cast into concrete. Steel-RC connections need to be checked against the applied loads.

The connection between the steel trusses and columns are spot welded only and do not ‘node out’.

Connections of structural components

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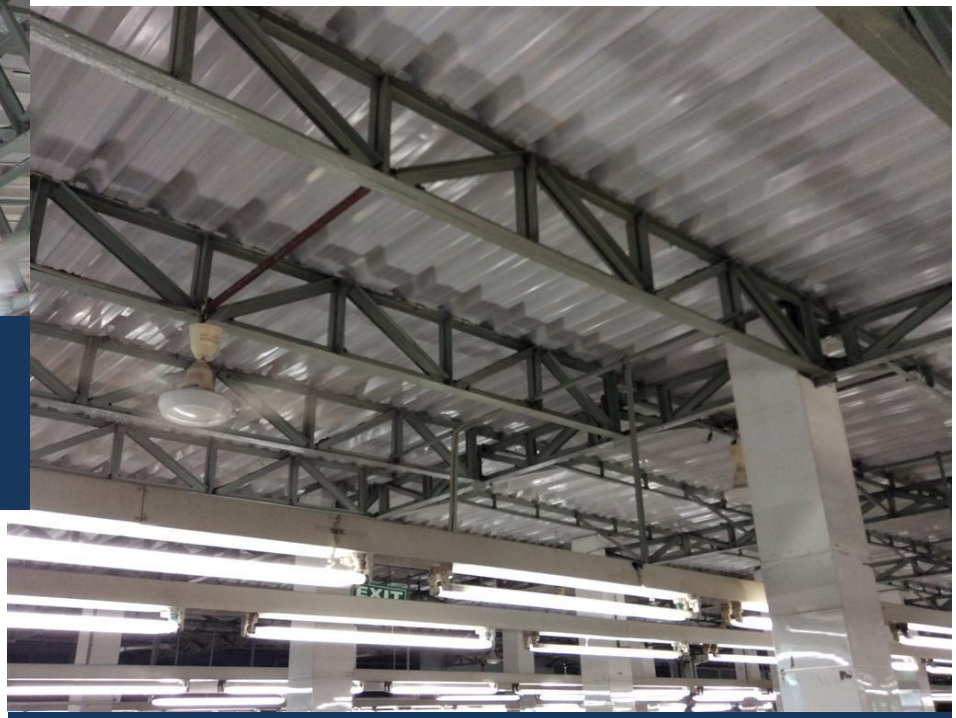
Connection to mezzanine put moment on brick columns. Engineer to confirm the column has sufficient capacity



Secondary trusses are larger than primary trusses in some locations

Connections of structural components

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Roof stability

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No lateral bracing in roof plane or in vertical bays. Under uplift the compression members of the roof trusses are unrestrained.

Roof stability and restriant

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Cracking in the mezzanine slab

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Cracks were observed at several spots in the slab at the mezzanine. Slab thickness varies from 40mm at the crown to 90mm at the trough.

Cracking in slab of mezzanine

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Non-engineered structures

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Non engineered dining shed and water tank support.

Non-engineered structures

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Lightweight steel staircases

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The design of the steel stair should be checked against the loading for emergency evacuation

Lightweight stair

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Discrepancies in documentation

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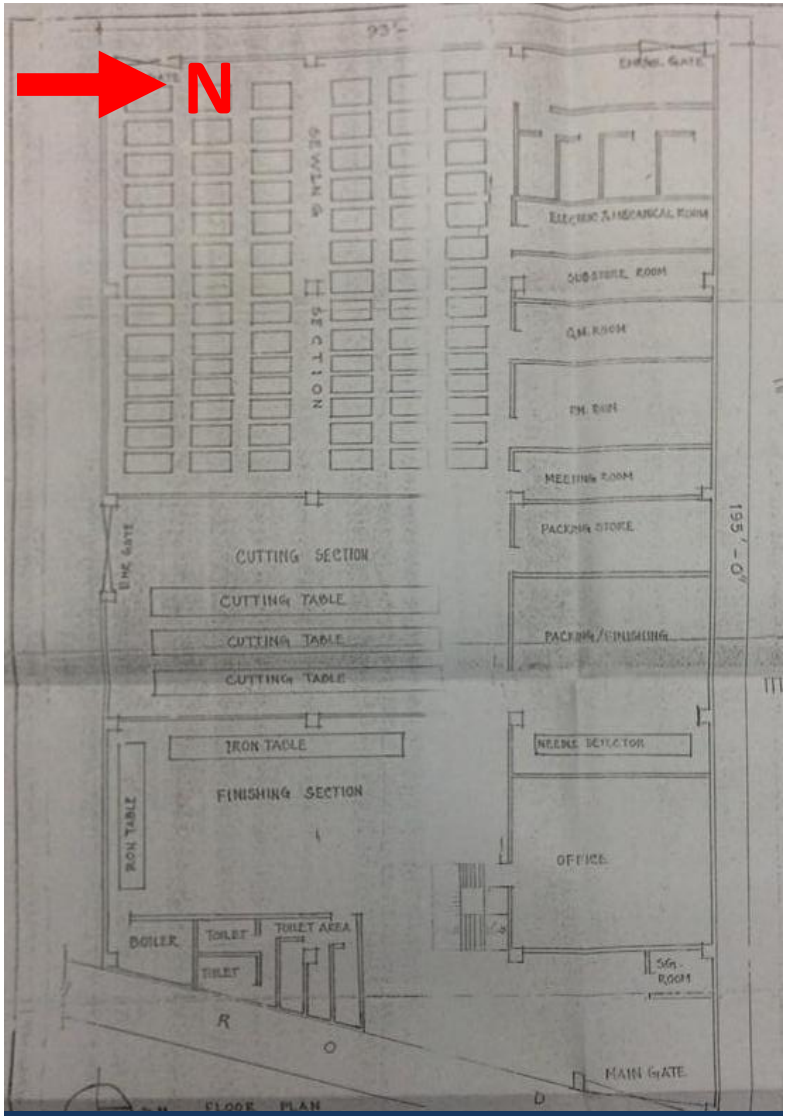
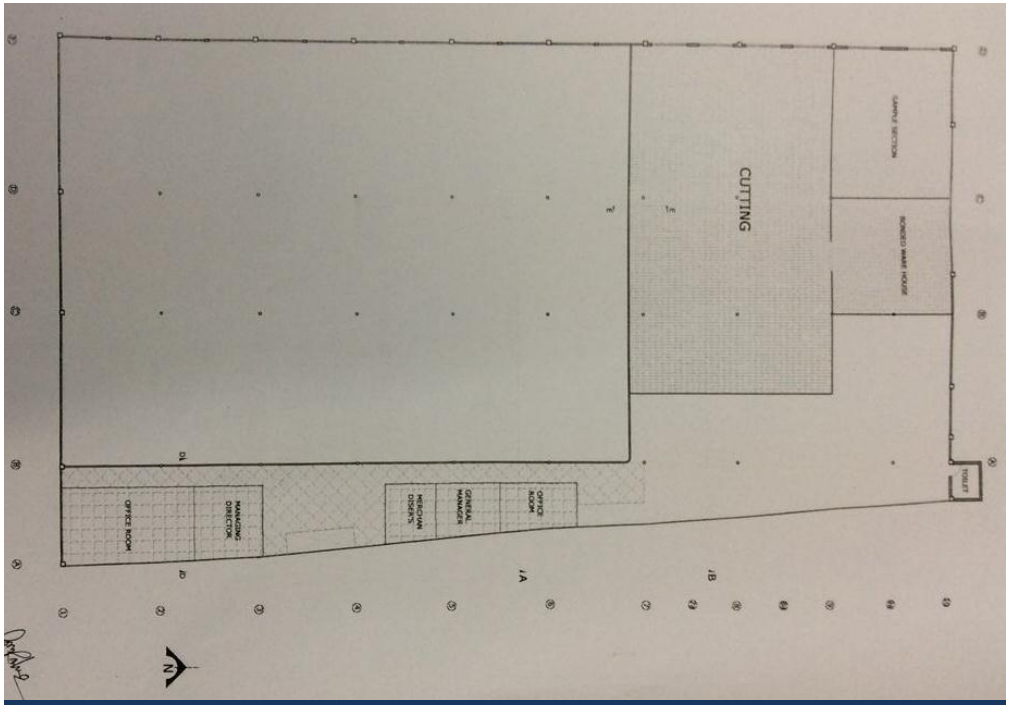


Factory layout approval drawing



As built layout

The approval drawing for factory layout does not match with the as built layout.

Discrepancies in documentation

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Problems Observed

ITEM 1: Production and dining sheds appear to be non - engineered

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Item 1 and actions

Both the production and dining sheds do not appear to be engineered, the capacity of the members and connections should be confirmed

Priority 1

(Immediate - Now)

- A Detailed Engineering Assessment (DEA) should be started immediately for the main production building, see scope overleaf. This should be carried out by a suitably qualified Structural Engineer and should consider both the horizontal and vertical design loads that are stated in BNBC 2006 with particular attention being paid to:
  - The capacity of the roof trusses, especially under uplift where the compression boom is not restrained
  - The capacity of the beams supporting the mezzanine slab, primary beams are smaller than secondary beams in some cases.
  - The capacity of the hollow steel columns which are cantilevering above their base.
  - The detail of the connection between the steel hollow columns and the brick columns. The capacity of the brick columns should be confirmed.
  - The connection design. Steel-steel connection appear to have been spot welded while steel-concrete connections have been made by casting the trusses into the RC columns.
  - The capacity of the 40/90mm profiled slab to span between the mezzanine floor beams should be confirmed
- A Detailed Engineering Assessment (DEA) should be started immediately for the dining shed considering both the horizontal and vertical design loads that are stated in BNBC 2006

Priority 2

(within 6-weeks)

- The Detailed Engineering Assessment should be completed.
- Remedial works should be carried out as required.
- Suitably qualified Structural Engineer to check, collect information and produce accurate and complete as-built documentation as soon as possible.
- A loading plan should be developed to show the maximum allowable floor loads on the mezzanine.

Priority 3

(within 6-months)

- The loading plan should be continuously implemented

Detailed 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 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

Survey Limitations and Assumptions

This report is for the private and confidential use of Accord for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of Arup.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual inspection of the building.

This Report is not intended to be treated as a generalised inspection and does not cover the deterioration of structural members through dampness, fungal or insect attack, nor does it deal with problems and defects of a non-structural nature. Other non structural aspects of the building such as fire safety have not been assessed in this survey.

Except as otherwise noted, drains and other services were not viewed or tested during our inspection and are therefore similarly excluded from this Report. We have not inspected any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External inspection of the façade walls has generally been carried out from ground level only by visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the structure and in particular foundations. Strengths of materials and components are untested and we recommend that the factory owners Building Engineer carries out insitu testing over and above those suggested to satisfy themselves with the material strengths and component details.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed. This report does not interfere with the factory owners Building Engineers responsibility for the structural performance of this building, The Building Engineer remains fully responsible for the structural adequacy of the building. **Structural Engineering to be undertaken by a suitably qualified Engineer who meets the competency guidelines in the BUET developed Tripartite Guideline document for Assessment of Structural Integrity of Existing RMG Factory Buildings in Bangladesh.**

This report does not comment in detail on the future seismic performance of the building and only highlights the fact that the building may experience significant damage or collapse in a seismic event along with many others in the Dhaka region.

The observations in this report are based on the Engineering Judgement of the lead surveyor/engineer at the time of the survey. We assume in making these observations that no covering up of faults defects, filling or plastering over cracking or significant repair work has been carried out by the building owner. Any future alteration or additional work by the building owner will void this report.