



Uttara Knitwears Ltd Uttara Knitting and Dyeing Ltd

South Panisail, Jirani Bazar, Gazipur
(23.98892N, 90.25913E)

07 June 2014

Structural Inspection Report

Authors: James Duggan/Coco van Egeraat

Reviewed by: Hugh Griffin

Approved by: Hugh O'Dwyer



Executive Summary

On Saturday 07 June 2014 Mr. James Duggan (lead) and Ms. Coco van Egeraat of Arup carried out a visual structural survey of the **Uttara Knitwears Ltd** factory at the address and co-ordinates given on the cover page of this report.

We met with Alamgir Kabir (General Manager Finance & Administration), Bishwajit Baidya (Asst. Manager Admin and HR), Md. Faruque Hossain (Asst. General Manager Dyeing), Md. Shahnawaz Bulbul (Manager Maintenance and Utility) and Engr. Md. Shafiqur Rahman (Managing Director Buildtech, Building Engineer).

The complex containing **Uttara Knitwears Ltd** also contains a sister company called **Uttara Knitting and Dyeing Ltd** and comprises the following buildings:

- Building 1 - Dyeing Factory – single storey steel and concrete structure with partial mezzanine.
- Building 2 – Knitting Factory – 3 storey RC structure with a light steel structure forming a partial 3rd floor.
- Building 3 – Single storey Utility building constructed from both steel and reinforced concrete.
- Building 4 – Cutting and Printing – single storey light steel structure
- Buildings 5 to 10 – miscellaneous Ancillary Buildings generally comprising 1 storey steel, concrete and masonry structures.

We were advised that the complex was constructed in phases between 1996 and 2013.

The buildings are used for factory operations including offices, dining, cutting, sewing, dyeing, finishing and finished goods.

Executive Summary (continued)

We were presented with 2 Permit drawings for the Complex. These were Industrial Permit Drawings . One was apparently signed in 1996 and the other in 2013. We were presented with Architectural and Structural Drawings for all the buildings. In general the drawings presented reflected what we reviewed on site. We did note one anomaly where an additional section appears to have been constructed to the north west side of Building 4.

Soils Reports dated 2013 and 2014 were presented to us. The reports indicate that spread foundations would be appropriate for the site.

We do have important and urgent concerns in relation to the structural adequacy of Building 2, (Knitting Factory). A Detailed Engineering Assessment (for Building 2) should be carried out and this needs to be addressed immediately to cover the following items:

- High Column stresses noted on the columns to Building 2

We would recommend that the Detailed Engineering Assessment for this building be completed **within 6 weeks** of receiving this report.

Executive Summary (continued)

A high level and non exhaustive list of further key concerns are:

- Design Check required for the structure supporting the water tanks in Building 2
- Design check required for the loading from the toilet plinths in Building 2.
- Design check required for the structures supporting the water chiller and water tanks as noted.
- Design check required for the light steel roofs as noted.

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

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 buildings along with many others in the Dhaka region to have a significant risk in a major Seismic event.

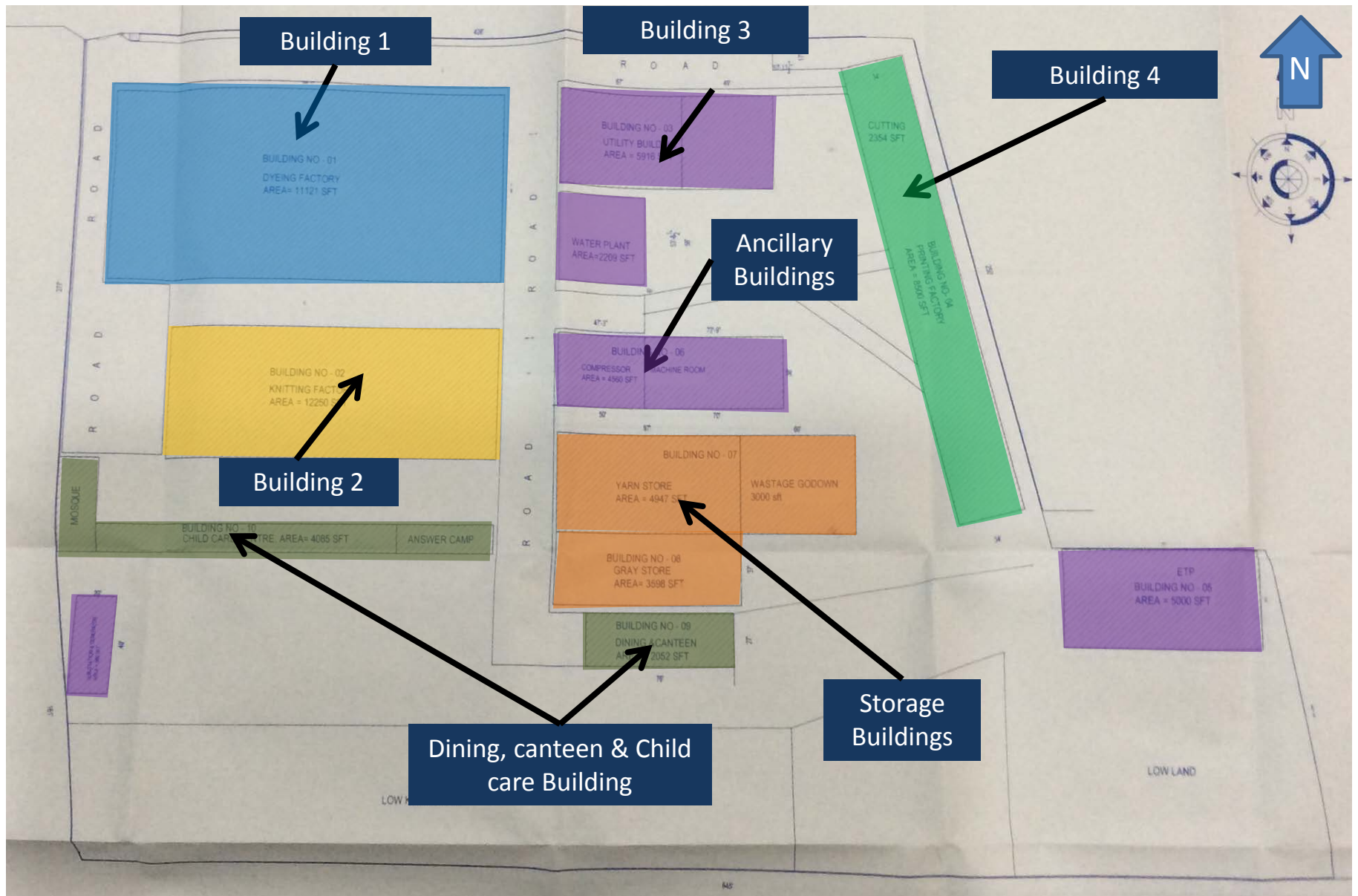
Our Limitations and Assumptions are also noted at the end of this report.

Building Extents



Uttara Knitwears Ltd.— Factory Site Location

Building Extents





1 storey building with a partial mezzanine and a steel truss roof

3 storey concrete building with a partial 4th storey steel structure

Generally 1 storey light steel structures

1 and 2 storey concrete beam and slab buildings

Building Extents



9 Building Extents



Storage Building (North Elevation)



ETP – North Elevation



Child Care Building (North Elevation)



Building 4 (West Elevation)

Building Extents

Structural System



Structural System –Building 1

250 mm x 250 mm excl. finishes



Beam column frame system ground to roof



Portal frame system for steel roof structure

Structural System:

1. Ground Floor to Roof

RC beam and column frame with 2 way spanning slabs.
Ground bearing slab and pad foundations.

2. Roof Steel Structure

Steel portal frame with steel sheeting on walls and roof.

Lateral Stability System:

Moment frame action in the beam slab structure. Portal Frame action for the roof structure.

Typical Grid & Column Sizes:

4.8mx 6.8m (maximum)

External 500mm x 250mm – excl. render

Internal 375mm x 250mm – excl. render

Slab thickness:

190 mm including finishes (average)

Beam sizes:

400d/s X 290mm; 250d/s x 290mm

Structural System- Building 2



Steel truss supported on steel column: Building 4



Steel roof supported on steel trusses: Building 3



Concrete beam /slab and column system : Building 3

Structural System - Building 3&4

Typical Structural System:

Light steel structures with light steel roof or
Concrete structures with columns, beams and slabs.

Typical Lateral Stability System:

Light steel structures are generally un-braced or rely
solely on masonry infill walls when present.
Frame action in the concrete structures



Light steel structure - storage



Light steel trusses on masonry walls - Dining



Concrete frame + light steel roof - ETP



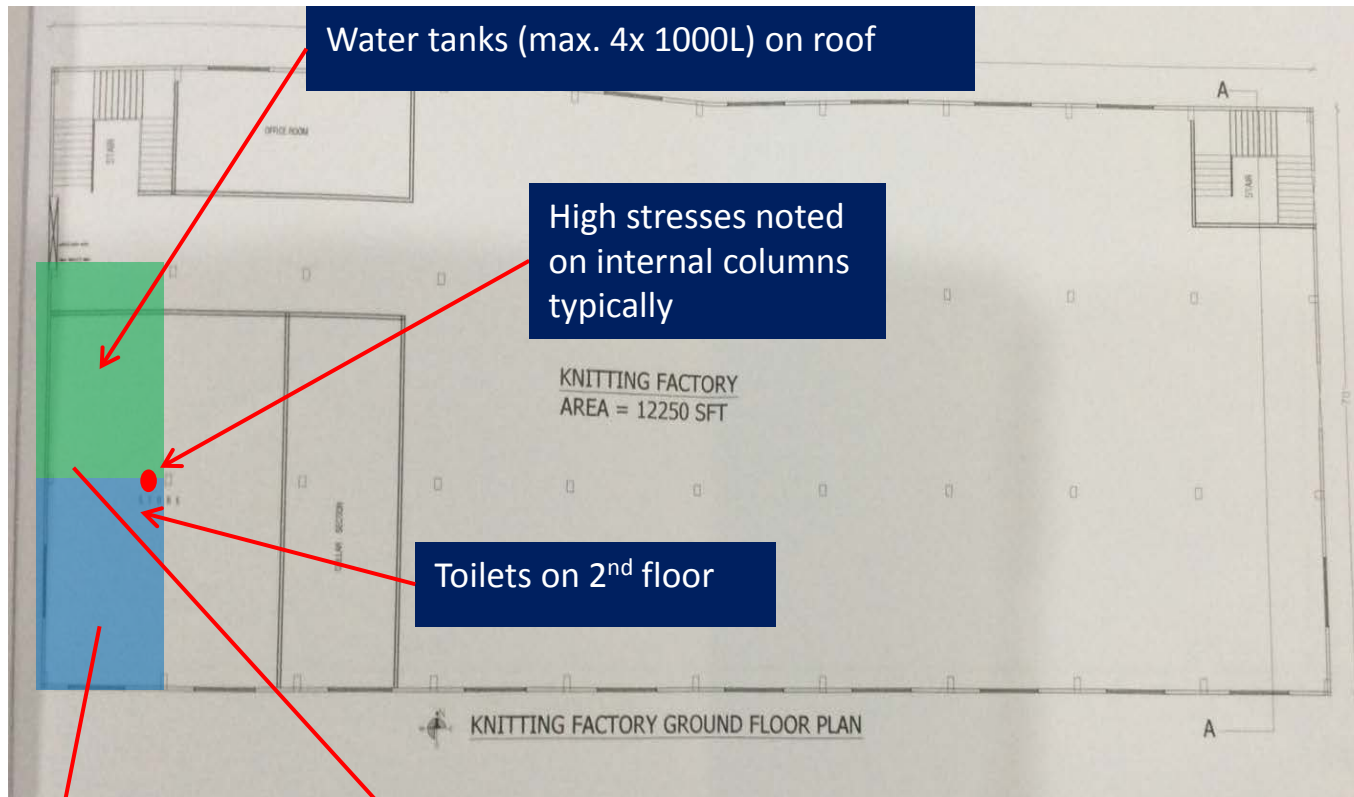
Light Steel Structure - storage

Structural System – Ancillary Buildings

Observations

High Column stresses in the columns to Building 2

Item 1 – High column stresses in the columns to Building 2



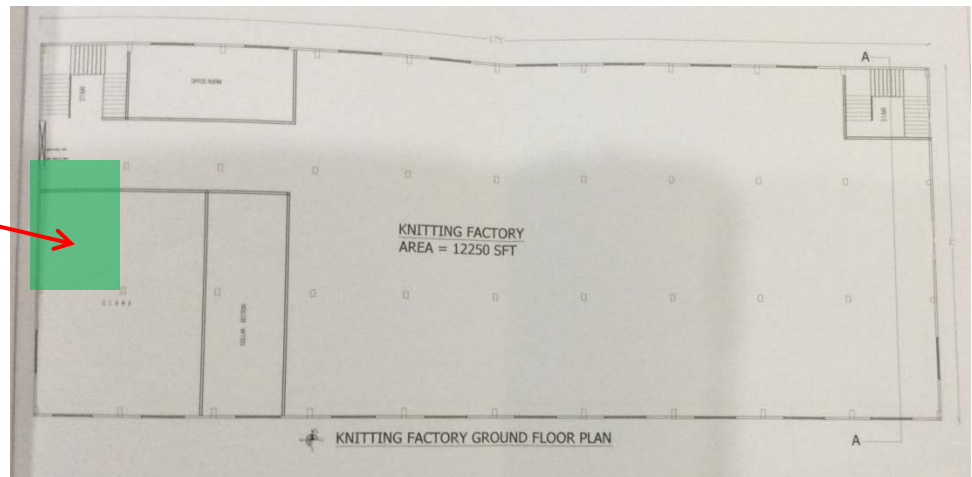
Design Check required for the structure supporting the water tanks in Building 2

Item 2 – Design check required for the structure supporting the water tanks in Building 2



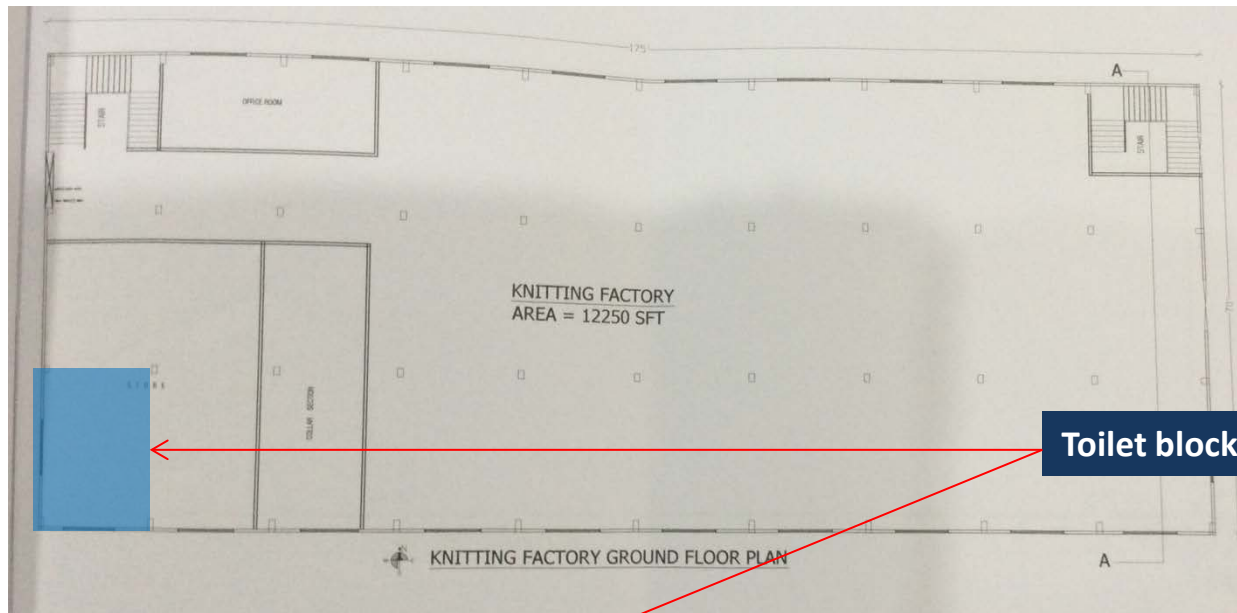
Structure supporting 4x 1000L water tanks

Water tanks (max. 4x 1000L) on mezzanine at underside of roof



Design check required for the loading from the toilet plinths in Building 2.

Item 3 – Design check required for the loading from the toilet plinths in Building 2



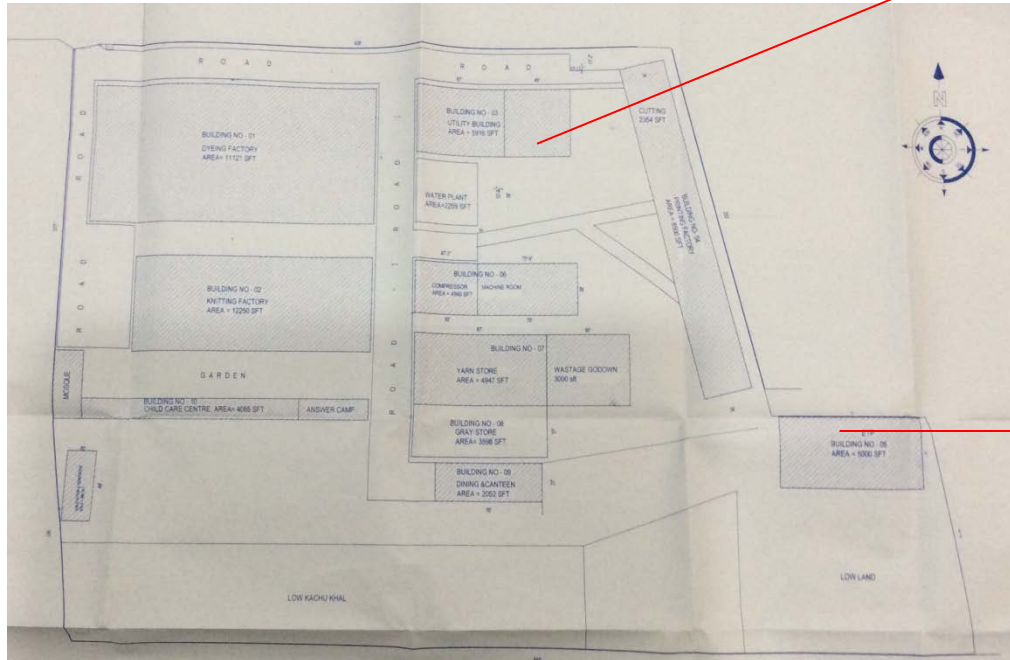
Toilet block on 2nd floor

Plinth in toilet block



**Design check required for the structures
supporting the water chiller and water tanks
as noted.**

Item 4 – Design check required for the structures supporting the water chiller and water tanks as noted



**Design check required for the light steel roofs
as noted.**

Item 5 – Design check required for the light steel roofs as noted – generally observed to have little bracing



**Steel roof
structures**



Priority Actions

Problems Observed

ITEM 1: High Column stresses in the columns to the Building 2.

ITEM 2: Design Check required for the structure supporting the water tanks in the Building 2.

ITEM 3: Design check required for the loading from the toilet plinths in the Building 2.

ITEM 4: Design check required for the structures supporting the water chiller and water tanks as noted.

ITEM 5: Design check required for the light steel roofs as noted.

Item 1 and actions

High Column stresses in **all columns in Building 2**.

Priority 1

(Immediate - Now)

- Maintain the current use of the floors and don't change use or increase occupation, either of which could increase loading.
- The Building Engineer is to review design, loads and column stresses in all columns in the Building 2.
- Verify insitu concrete strength either by taking 100mm diameter cores from 4 columns (minimum) or by using existing cylinder strength data for cores. Reinforcement quantities also to be confirmed.
- A Detailed Engineering Assessment of Building 2 is to be carried out to the scope attached.

Priority 2

(within 6-weeks)

- Complete the Detailed Engineering Assessment for Building 2.
- Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.

Priority 3

(within 6-months)

- Continue to implement floor loading plan

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 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 2 and actions

Design Check required for the structure supporting the water tanks in Building 2.

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- The Building Engineer is to carry out a Design check to confirm the structural adequacy of the supporting structure as part of the Detailed Engineering Assessment.
- Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.

Priority 3

(within 6-months)

- None required

Item 3 and actions

Design check required for the loading from the toilet plinths in Building 2.

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- The Building Engineer is to carry out a Design check to confirm the structural adequacy of the supporting floor structure as part of the Detailed Engineering Assessment.
- Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.

Priority 3

(within 6-months)

- None required

Item 4 and actions

Design check required for the structures supporting the water chiller and water tanks as noted.

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- None Required

Priority 3

(within 6-months)

- The Building Engineer is to check the structural capacity of the floor and roof structures supporting the chiller and water tanks to transfer the loading to the columns.
- Produce and actively manage a loading plan for all floor plates within the building giving consideration to floor capacity and column capacity.

Item 5 and actions

Design check required for the light steel roofs as noted.

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- None Required

Priority 3

(within 6-months)

- No bracing noted in most of the light weight steel roofs and structures viewed on site.
- The Building Engineer is to assess the adequacy of the structures to resist wind loading (pressure, suction & uplift). The installation of bracing and any other remedial measures to be carried out as directed by the Building Engineer.

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.

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.