

Alliance Garments Ltd.

House No 8 & 10, Road No 3, Section No 7, Mirpur Industrial Estate, Dhaka
(+23.81775N 90.36447E)

20 May 2014

Structural Inspection Report

Observations & Actions

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Reviewed by: Hugh O'Dwyer

Approved by: Hugh O'Dwyer



Executive Summary

On Tuesday 20th May 2014 Mr Hugh O'Dwyer of Arup carried out a visual structural survey of the **Alliance Garments Ltd** factory at the address and coordinates given on the cover page of this report.

We met with factory management including Tarikul Islam Rajib (Managing Director) and the building structural engineer. Representatives from Guldenpfennig including Najmeen Akther were also present during the inspection.

The factory, which occupies two building plots and was constructed in 1996/1998, comprises 6 storeys. Alliance Garments Ltd purchased the building in 2011 having partially occupied the building since 2000. Alliance Garments Ltd now occupy all floors which are used for light factory operations including offices, cutting, sewing and finishing. A bonded warehouse and store is located on the ground floor. We inspected all areas of the building.

We were presented with Permit drawings for the factory building which were approved by RAJUK in August 1998. This permit allows for construction of the factory, on both building plots, to include a total of 6 storeys. Factory layout plans were also provided as approved by the Government Factory Inspectorate.

Executive Summary (Continued)

Structural 'as-constructed' drawings and Floor Loading Plans were presented. Whilst some discrepancies were noted, the information shown on the structural drawings was generally in-line with the structure as viewed during the inspection. It was not possible to readily interpret the information shown on the Floor Loading Plans as colour copies were not available to enable the legend to be related to the floor plans.

We were also provided with Soils Reports for each of the two building plots dated April 1998. Spread foundations are shown on the structural drawings.

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

- Columns, within the eastern section of the factory, appear to be stressed in excess of normal design limits
- Design check on structure supporting roof top water tanks
- Management of floor loads and design check on capacity of floor slab to support floor build-up loads in toilet areas
- Cracking to beams at underside of roof
- Remedial work to building movement joint

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



Alliance Garments Ltd occupy a 6 storey building constructed on two adjoining building plots.



6 Storey Factory Building

Building Extents

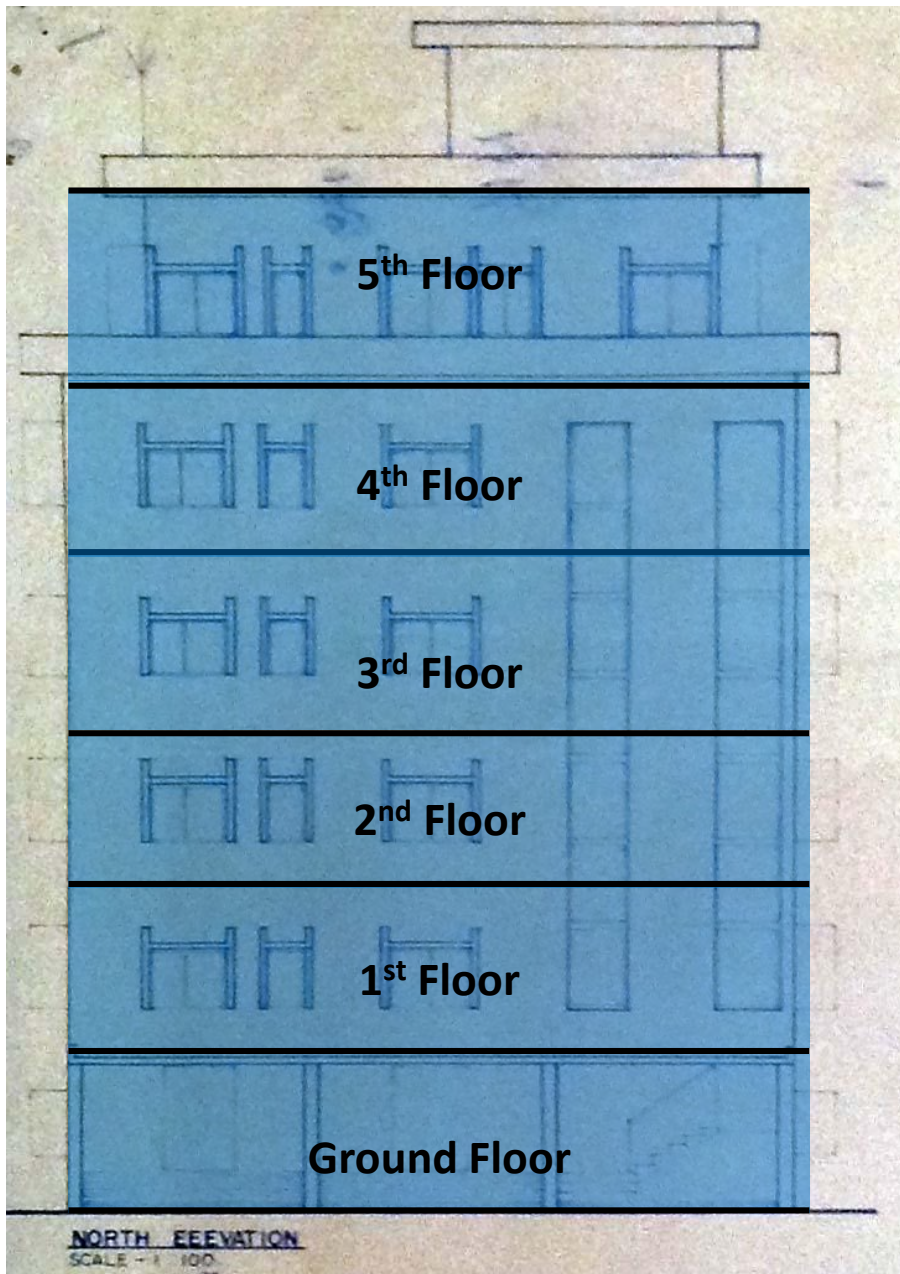


South Elevation



North Elevation

Building Extents



Building Extents

Floor Usage

Sewing & Finished Goods

Sewing

Finishing

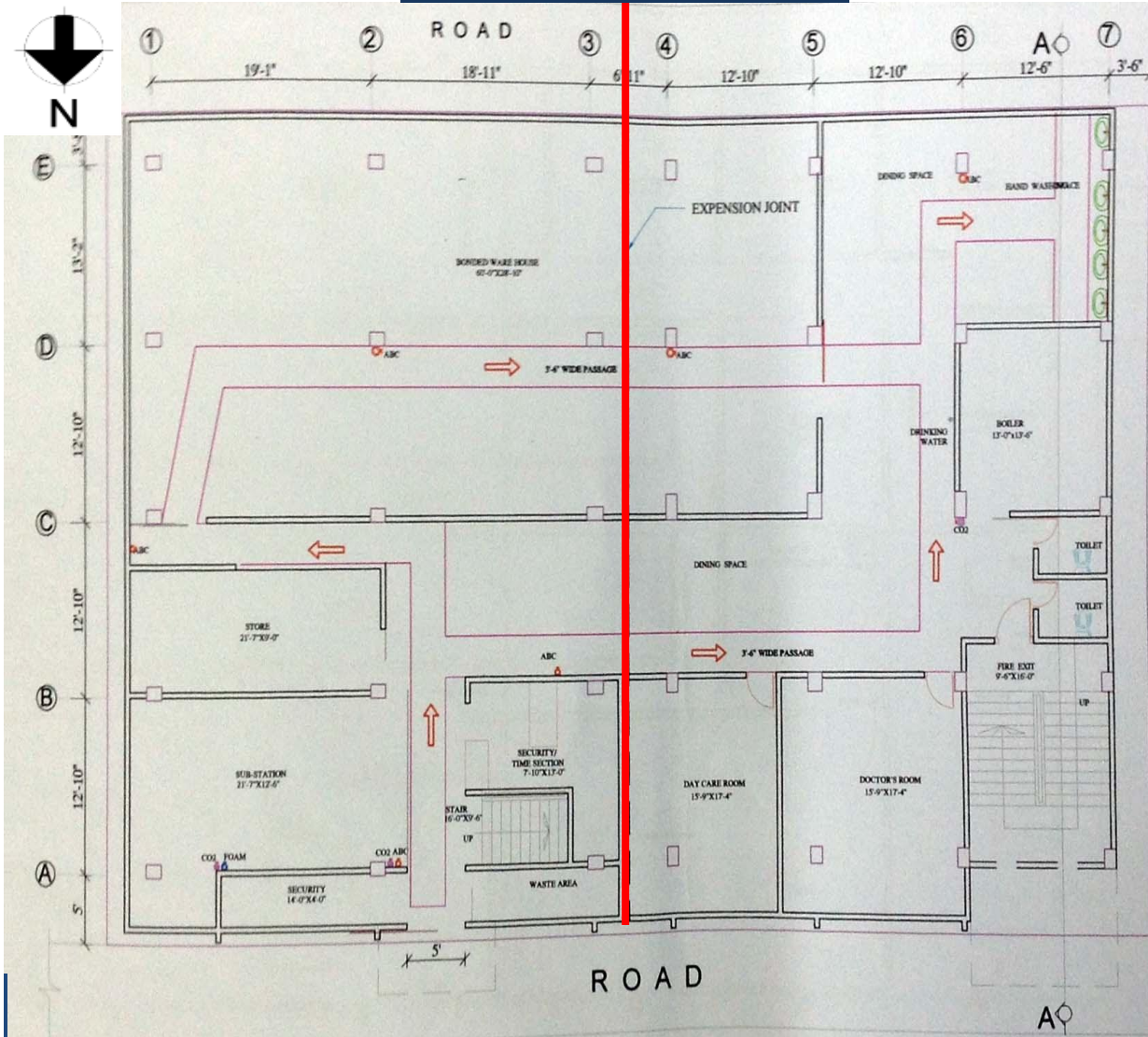
Sewing

Offices, Cutting & Sample

Boiler, Dining, Store & Bonded Warehouse

Structural System

Building Structural Joint



R.C. Beams and 2-way solid slabs typical at each floor.

Stability System:
Provided by moment frame action and brick infill walls.

Slab thickness: 170mm average including finishes

Column Aggregate: Brick Chips

Grid size:
5.8 x 3.9m and 3.9 x 3.9m

RC Column size :
Internal 275 x 400 mm
External 275 x 400mm

Beam size:
Long span 280 x 400mm d/stand
Short span 280 x 300mm d/stand



R.C. Beams and 2-way solid slabs typical at each floor.

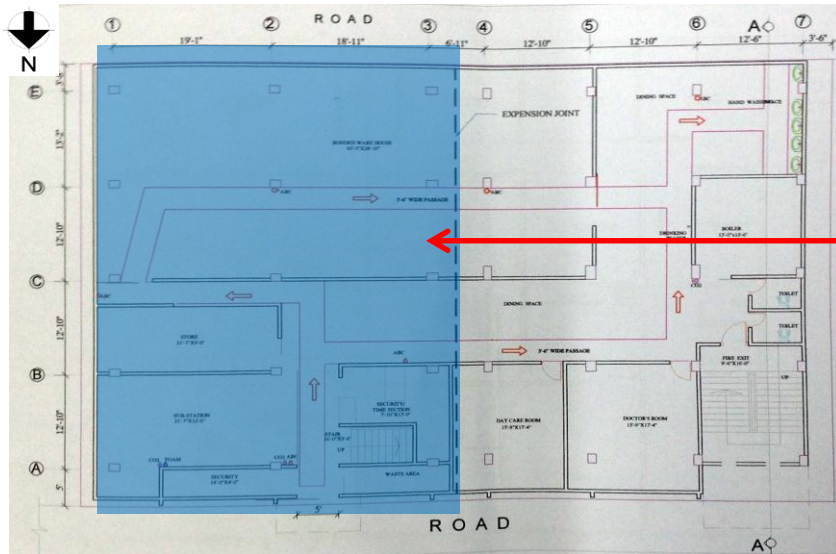


R.C. Beams and solid slabs typical at each floor – with deeper beams at u/side of 2nd floor

Structural System

Observations

Columns, within the eastern section of the factory, appear to be stressed in excess of normal design limits



Floor Plan

Design check to be carried out on all concrete columns in the highlighted area



Checked Ground Floor Column – Brick Chips

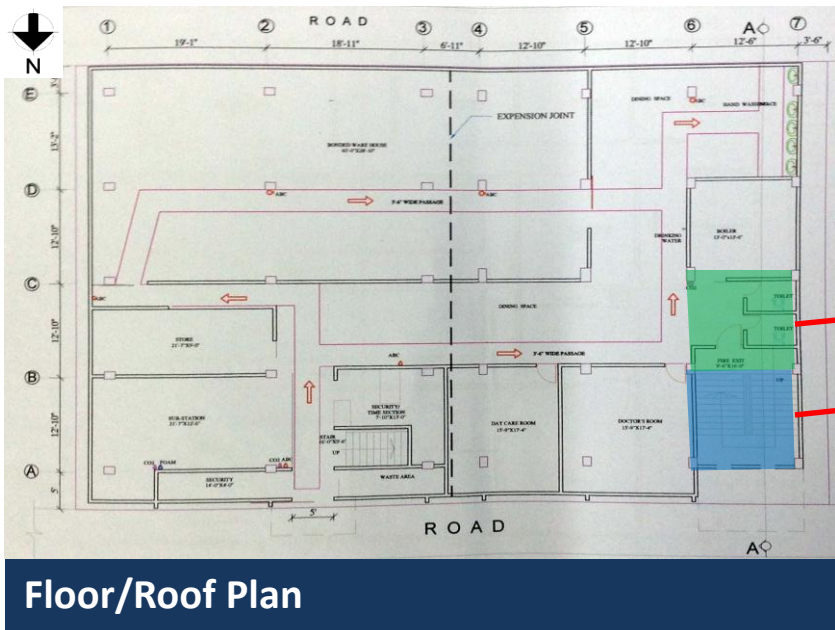
Outline calculations indicate that column working stress, within the area highlighted on the above floor plan, is in excess of normal design limits

Building Engineer is to perform detailed calculations and concrete tests to prove column size and (if required):

- Reduce loads by vacating floors
- Reinforce columns

Existing reinforcement in columns to be verified on site by Building Engineer

Design check on structure supporting roof top water tanks



Cracking on the walls below the water tanks

Building Engineer to review structural support to concrete and plastic water tanks and confirm the adequacy of this support.



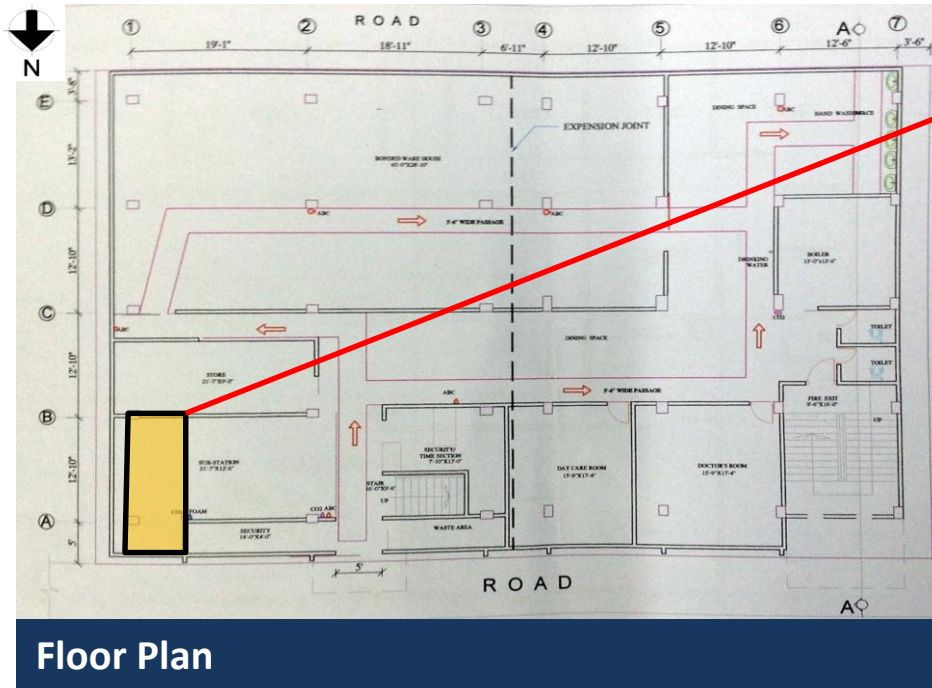
Management of floor loads and design check on capacity of floor slab to support floor build-up loads in toilet areas



5th Floor Storage



Toilet Floor Build up

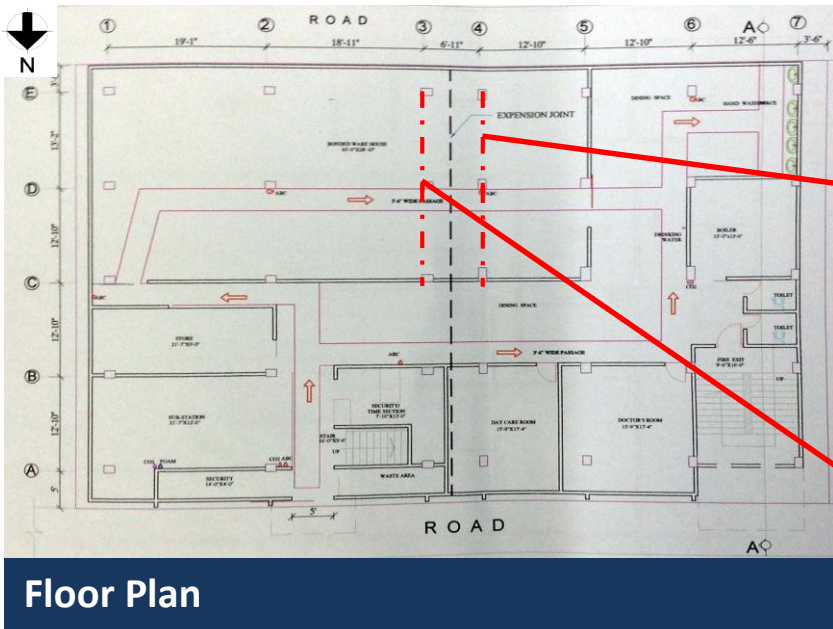


Floor Plan

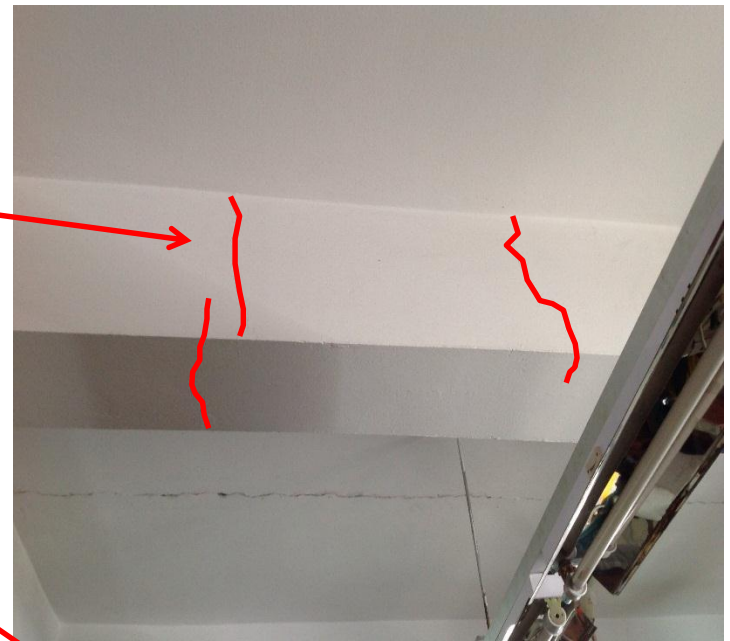
Building Engineer to prepare controlled loading plans, based on floor slab and column capacity, for all floors which will designate allowable storage density and where storage may be placed.

Management of Floor Loads

Cracking to beams at underside of roof



Floor Plan

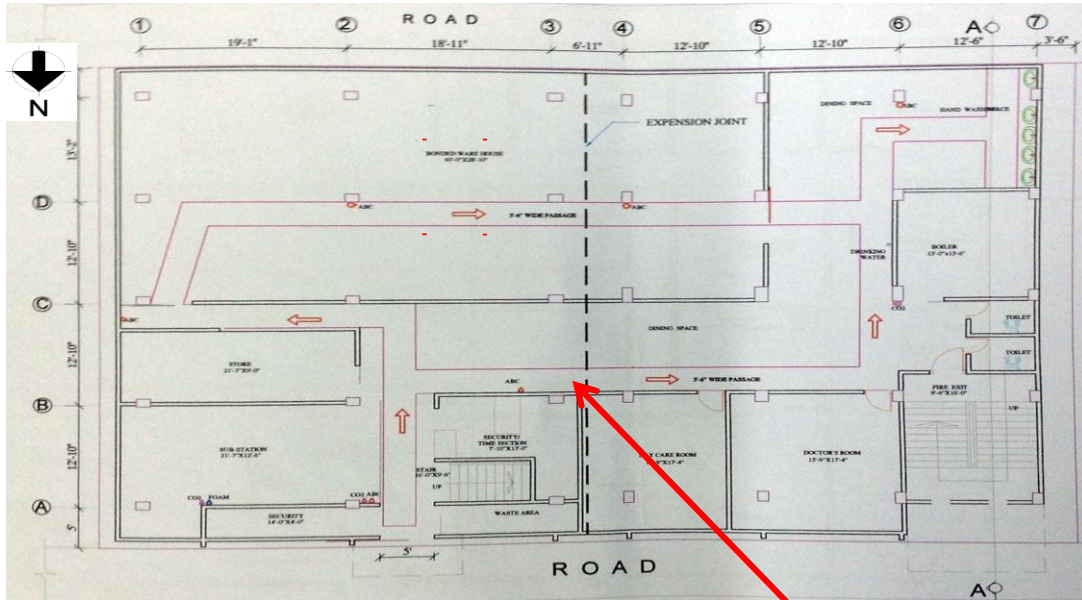


Cracking of beams on the soffit of the roof to be reviewed, by removing plaster, to confirm that cracks do not extend into the structure.



Cracking on Soffit of Roof Beams

Remedial work to building movement joint



Floor Plan



Movement joint evident at all floors

Movement Joint – recommend re-weathering externally to prevent future rainwater ingress



Building Movement Joint

Priority Actions

Problems Observed

ITEM 1: Columns, within the eastern section of the factory, appear to be stressed in excess of normal design limits

ITEM 2: Design check on structure supporting roof top water tanks

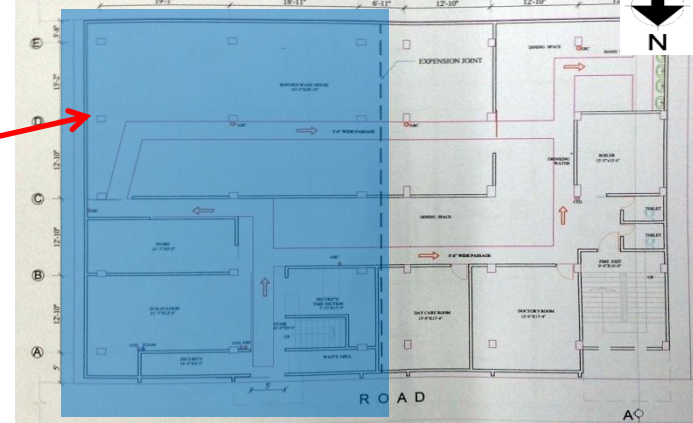
ITEM 3: Management of floor loads and design check on capacity of floor slab to support floor build-up loads in toilet areas

ITEM 4: Cracking to beams at underside of roof

ITEM 5: Remedial work to building movement joint

Item 1 and actions

Columns, within the eastern section of the factory, appear to be stressed in excess of normal design limits



Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- Factory Engineer to review design, loads and column stresses in area identified above.
- Verify insitu concrete strengths (using min. 4 no. 100mm dia. Cores) and existing reinforcement for all columns.
- Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.
- Update existing floor loading plans to distinguish between allowable and actual imposed floor loads

Priority 3

(within 6-months)

- Continue to implement load management plan

Item 2 and actions

Design check on structure supporting roof top water tanks

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- Extent of roof loading, including concrete and plastic water tanks and water tank support structure, to be surveyed and capacity of roof slab and support system to be assessed to confirm that they are structurally adequate.
- 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)

- Implement loading plans on an on-going basis.

Item 3 and actions

Management of floor loads and design check on capacity of floor slab to support floor build-up loads in toilet areas

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- Produce and actively manage a loading plan for all floor plates and the roof of the factory giving consideration to floor capacity and column capacity.

Priority 3

(within 6-months)

- Continue to implement load plan

Item 4 and actions

Cracking to beams at underside of roof

Priority 1

(Immediate - Now)

- None required.

Priority 2

(within 6-weeks)

- Sections of plaster finish to soffit of the cracked roof beams to be removed to investigate if cracks penetrate the building structure.

Priority 3

(within 6-months)

- Building Engineer to carry out design check on beams to confirm that these cracks are non-structural.

Item 5 and actions

Remedial work to building movement joint

Priority 1

(Immediate - Now)

- None required

Priority 2

(within 6-weeks)

- None required

Priority 3

(within 6-months)

- Building Engineer to inspect internal line of building movement joint and prepare a schedule of areas which require remedial works to prevent risk of falling plasterwork.
- Carry out making good works per Building Engineer schedule including re-weathering of joint line externally to prevent any rainwater ingress.

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.