Revision: Issue 2

Date: 10th Nov 2019

Category Yellow

Pacific Cotton Ltd

Cotton Dyeing & Finishing Mills Ltd

10 No. Habirbari PO, Seed Store Bazzar Thana, Valuka, Mymensing, Dhaka

(+24.315N, 90.38389E)

10 May 2014

Structural Inspection Report

Observations & Actions

Authors: Hugh O'Dwyer / Orlando Dulay

Reviewed by: Hugh O'Dwyer

Approved by: Hugh O'Dwyer

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Executive Summary

On Saturday 10th May 2014 Mr Hugh O'Dwyer and Orlando Dulay of Arup carried out a visual structural survey of the **Cotton Dyeing & Finishing Mills Ltd** complex at the address and coordinates given on the cover page of this report.

We met with Cotton Group and factory management including M.M. Rahman (Director), Mir Azizul Karim (Executive Director) and Abdur Rahman (Vice President Construction Department). Representatives from Guldenpfennig and the structural engineers for the Cotton Group were also present during the pre-survey meeting and inspection.

As part of this structural survey of the **Cotton Dyeing & Finishing Mills Ltd** complex we inspected all areas of the following buildings;

- **Garments Building** which comprises a 2 storey factory constructed in the period 2003 to 2007 with a western and eastern extension of 3 and 2 storeys respectively. Both these extensions were constructed circa 2007.

- **Knitting & Dyeing Building** which comprises 2 storeys and was constructed circa 2007. This building has permit approval for construction to 6 storeys.

We inspected all areas of the Garments Building and Knitting & Dyeing Building. We did a cursory walk-through of the Chemical Godown Shed, Utility Building, Yarn Store and Toilet Block only to look for conditions concerning imminent danger to people, and identified none. We did not inspect the Water Treatment or Effluent Treatment Plants.

Executive Summary (Continued)

The **Garments Building** is used for light factory operations including cutting, sewing and finishing. Storage areas are located on the ground floor. The **Knitting & Dyeing Building** is used primarily for knitting, dyeing and printing. A Dining Area is located on the upper floor level.

We were presented with Permit drawings, dated September 2012, approved by the Local Government Engineering Division and the Factories & Establishments Department. These drawings include the Garments Building and Knitting & Dyeing Building.

Structural design drawings were provided for both buildings, including the extensions to the Garments Building, and the information shown on these drawings was generally in line with the structure as observed during the structural survey.

We were also presented with a Soils Report – dated January 2006 and this report recommends that piled foundations be provided to the Knitting & Dyeing Building. Spread foundations have been provided to the 2/3 storeys Garments Building and extensions.

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

<u>Garments Building</u>

- Incomplete bracing and inconsistent restraint detail to rafter of steel roof
- Cracking of floor finishes/slab and management of floor loads
- Cracking of building façade
- Missing drawings and discrepancies between drawings provided and the as constructed building

Executive Summary (Continued)

Knitting & Dyeing Building

- Cracking of floor finishes/slab and management of floor loads
- Cracking of external cantilever slab and building façade
- Discrepancies between drawings provided and the as constructed building
- It is noted that the building has permit approval for an additional 4 storeys. Any proposed additions to the existing building structure, including these additional storeys, should be reviewed by the Building Engineer.

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.) 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

Cotton Dyeing & Finishing Mills Ltd Complex

Building Extents

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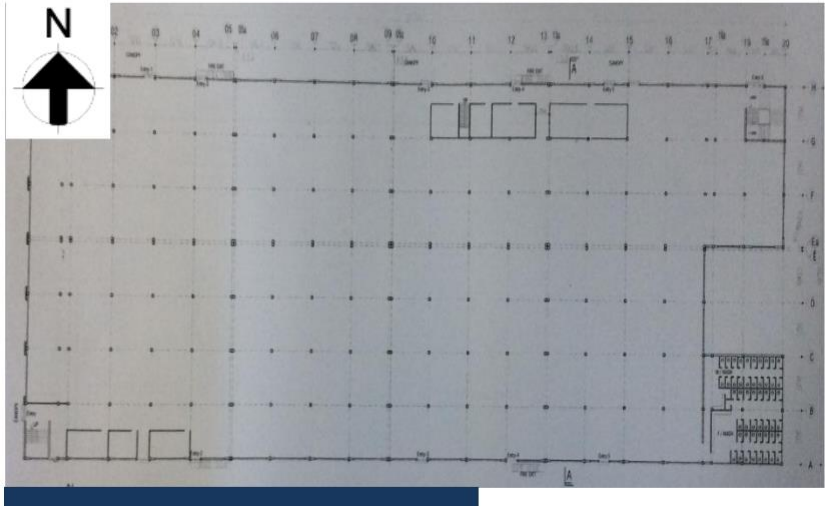
West Elevation

East Elevation

Garments Building

- Building is generally 2 storeys with a western extension of 3 storeys and an eastern extension of 2 storeys.
- Ground floor of main building constructed in 2003. Upper storey and both extensions added in 2007
- Permit dated Sept 2012 from LGED.



Typical floor layout

Building Extents-Garments Building

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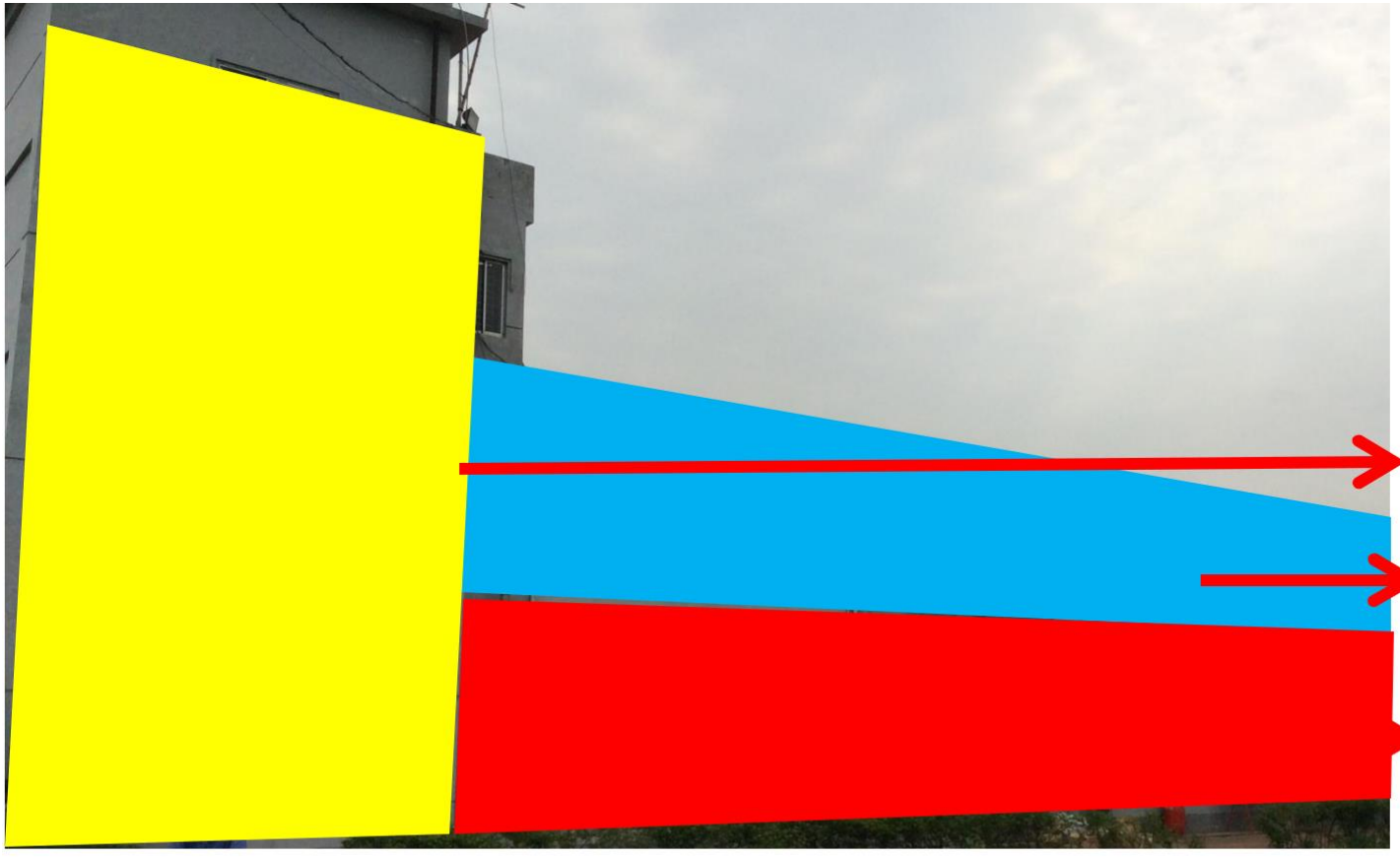

Garments Building
Building Section – Floor Usage

Building Extents-Garments Building

West Elevation

North Elevation

East Elevation

Knitting & Dyeing Building

- 2 storeys constructed in 2007.
- Permit for 6 storeys dated Sept 2012 from LGED.

Building Extents-Knitting & Dyeing

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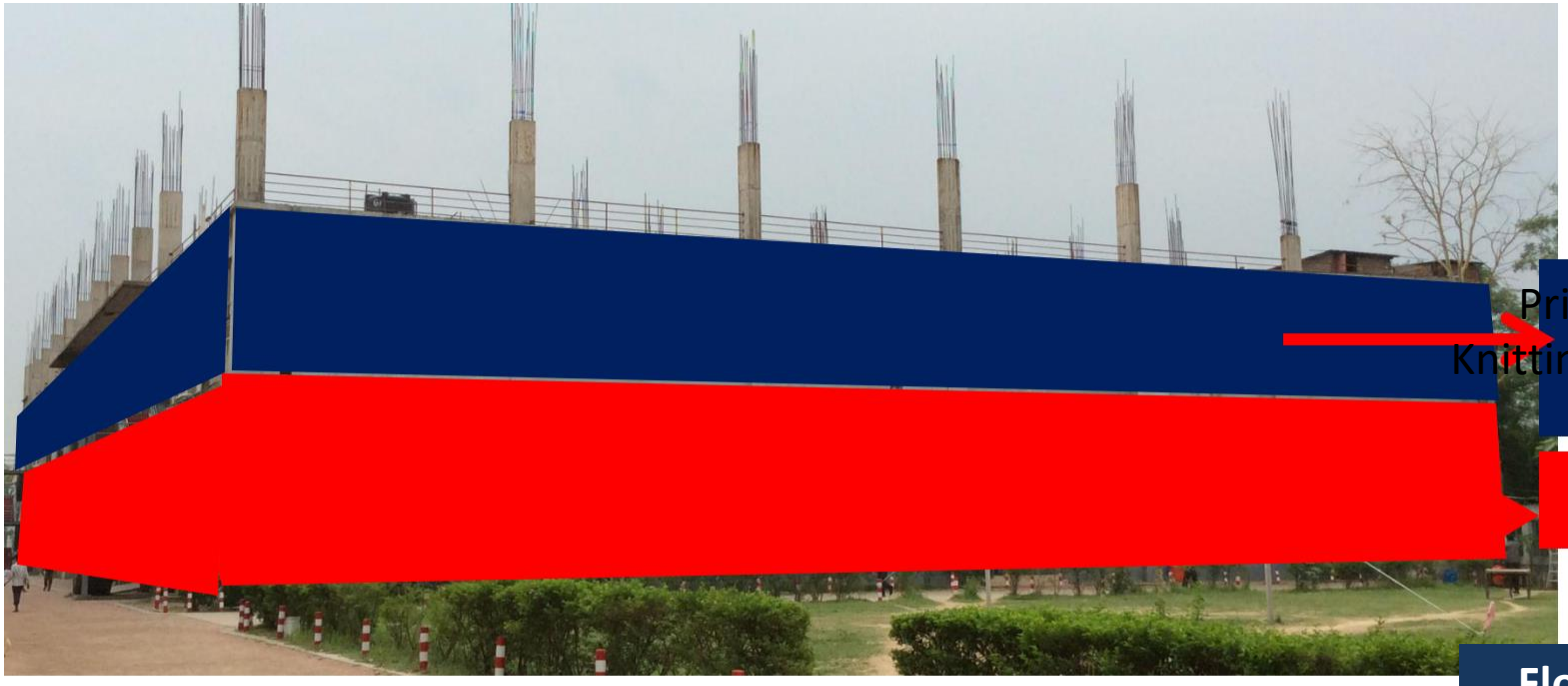
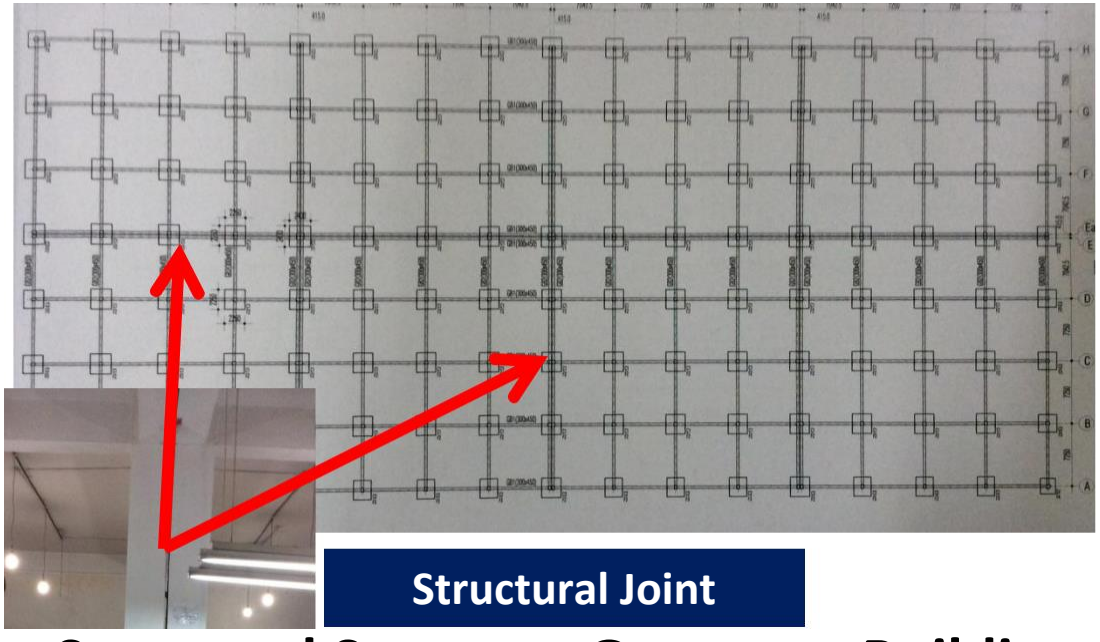


Knitting and Dyeing Building

Building Section – Floor Usage

Building Extents-Knitting & Dyeing

Structural System



Structural Joint

R.C. Beam and 2-way spanning solid slabs in ground floor and steel structure in 1st floor

Structural joint as shown in figure.

Lateral stability provided by moment frame action and brick infill walls. Portal steel roof partially braced.

Grid: 7.25 x 7.25 m Typical

Internal RC Columns- ground floor:
375 x 375mm Typical
Brick Chips

Floor slab thickness:
195mm including floor finishes

Foundations: Pad foundation

Structural System – Garments Building

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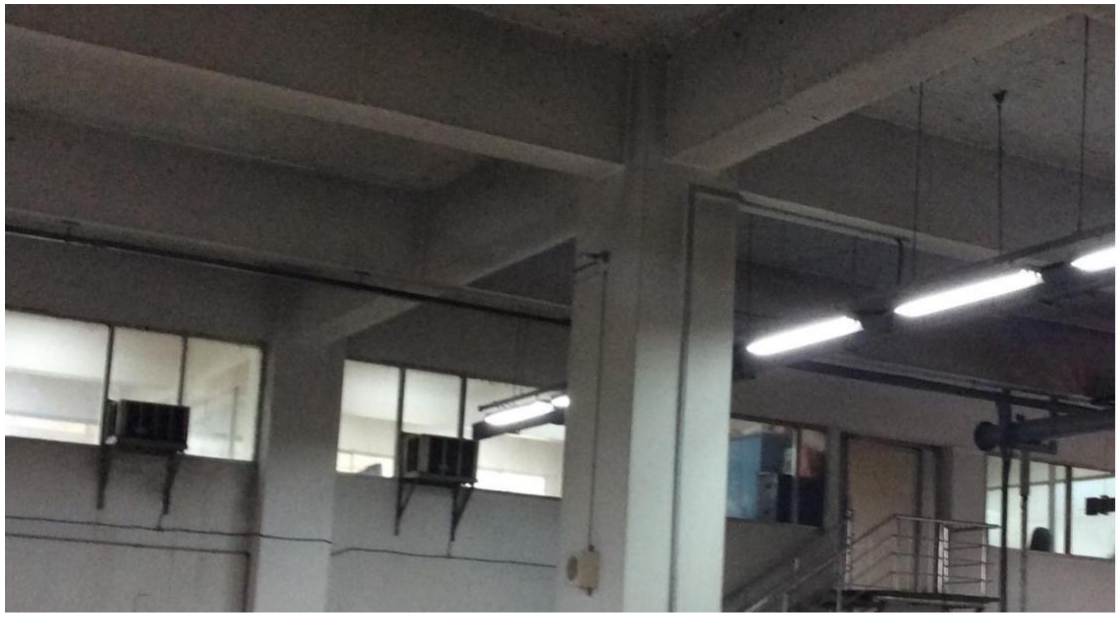

R.C. primary and secondary beams with 1-way spanning slabs

Lateral stability provided by moment frame action

Grid: 7.65 x 15.95 m Typical

Internal RC Columns:
675 x 900mm Typical
Stone Chips

Floor slab thickness:
240mm average including floor finishes

Foundations: Piled foundation

2 storeys constructed. Permit and structure include provision for a total of 6 storeys.

Structural System – Knitting & Dyeing

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Observations
Garments Building

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Incomplete bracing and inconsistent restraint detail to rafter of steel roof

Compression flange restraints for roof rafter steel are provided at a limited number of locations.

Building Engineer to review and confirm that these are provided in accordance with the design.

Roof horizontal bracing for lateral stability of steel roof structure is incomplete. Building Engineer to review horizontal and vertical bracing.

Structural steel columns do not correspond with sizes shown on building section drawing.

Building Engineer to review adequacy of steel roof structure.

Incomplete bracing and inconsistent restraint detail to steel rafter

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Cracking of floor finishes/slab and management of floor loads

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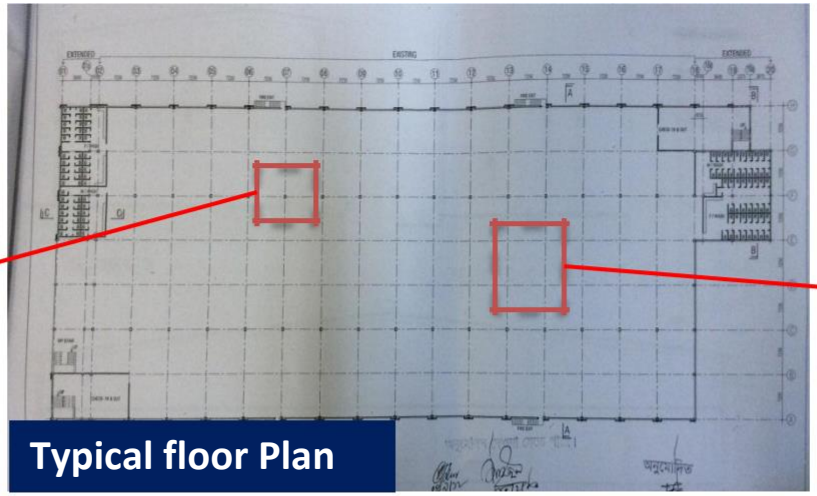
Cracks in 1st floor slab



Typical floor Plan

Cracks in Ground floor slab

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. Crack repairs to be carried out as necessary.

Cracking of floor finishes/slab and management of floor loads

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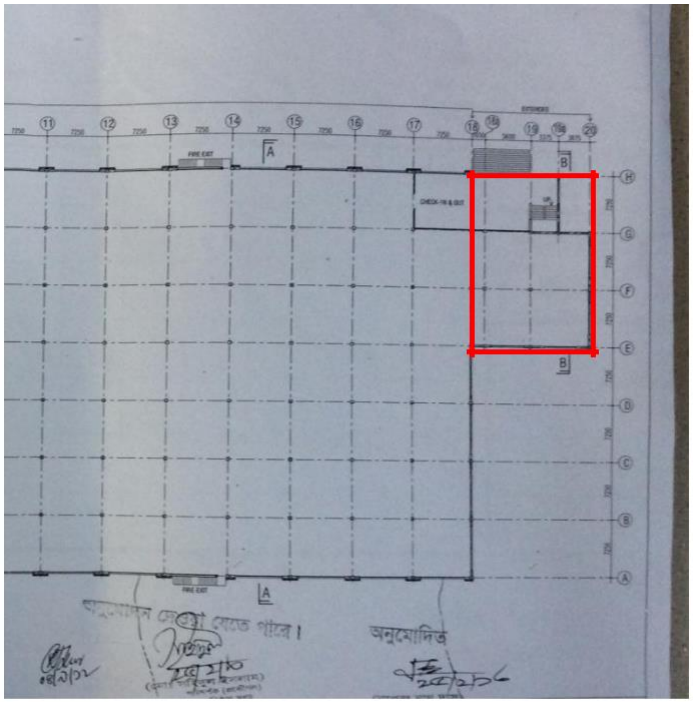
Cracking of Building Façade

Façade cracks visible on elevations of the Garments Building.

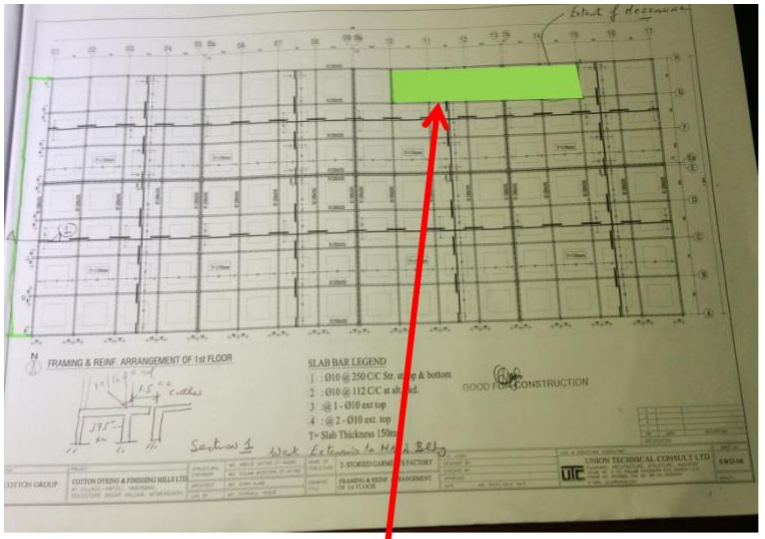
Building Engineer to conduct routine inspection and issue maintenance schedule for façade brick walls

Cracking of Building Façade

Missing drawings and discrepancies between drawings provided and the as constructed building



As constructed Eastern extension is rectangular on plan – this differs to layout shown on drawing



Missing drawings for the Mezzanine floor of the Garments Building

Building Engineer to check all drawings and update to match as constructed building.

Detailed structural steel drawings for steel roof and columns not provided.

Drawing Discrepancies

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Observations
Knitting and Dyeing Building

Cracking of floor finishes/slab and management of floor loads

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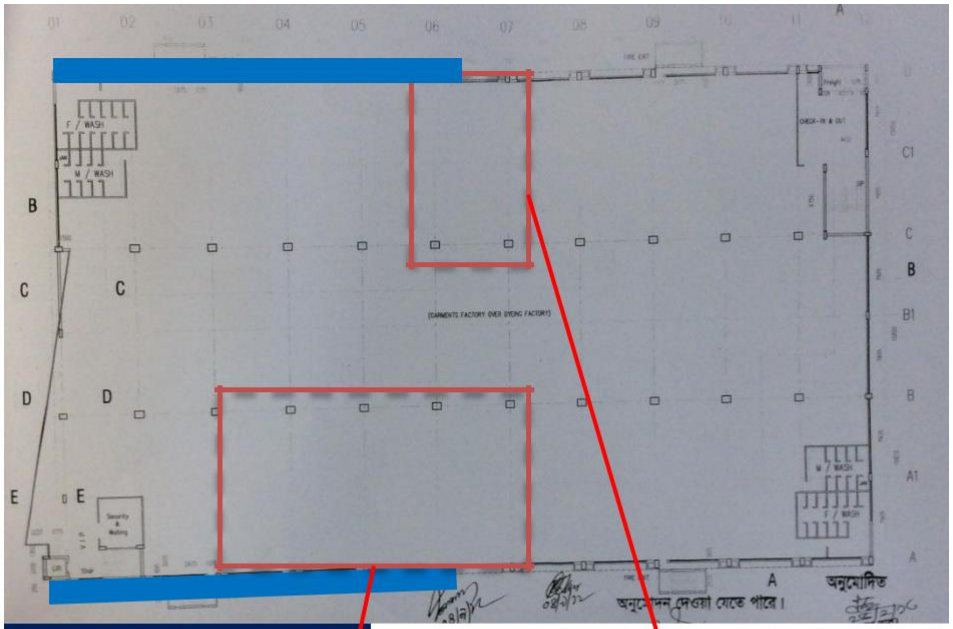

Typical Floor Plan

1st floor slab

2nd floor slab soffit

Water tanks loads

Equipment loads

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. Crack repairs to be carried out as necessary.

Cracking of floor finishes/slab and management of floor loads

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Cracking of external cantilever slab and building façade

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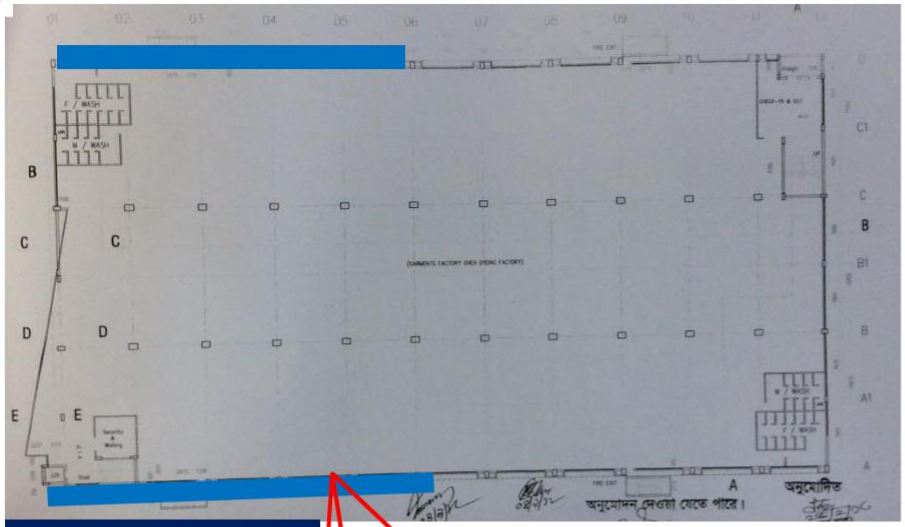

Typical Floor Plan

Façade cracking

Building Elevation

Cracks on the lower level cantilever

Cracks on the upper and lower cantilevers propagating from the column towards the tip of the cantilevers

Building Engineer to investigate reasons for cracking and implement repairs as necessary

Cantilever slabs

Cracking of external cantilever slab and building façade

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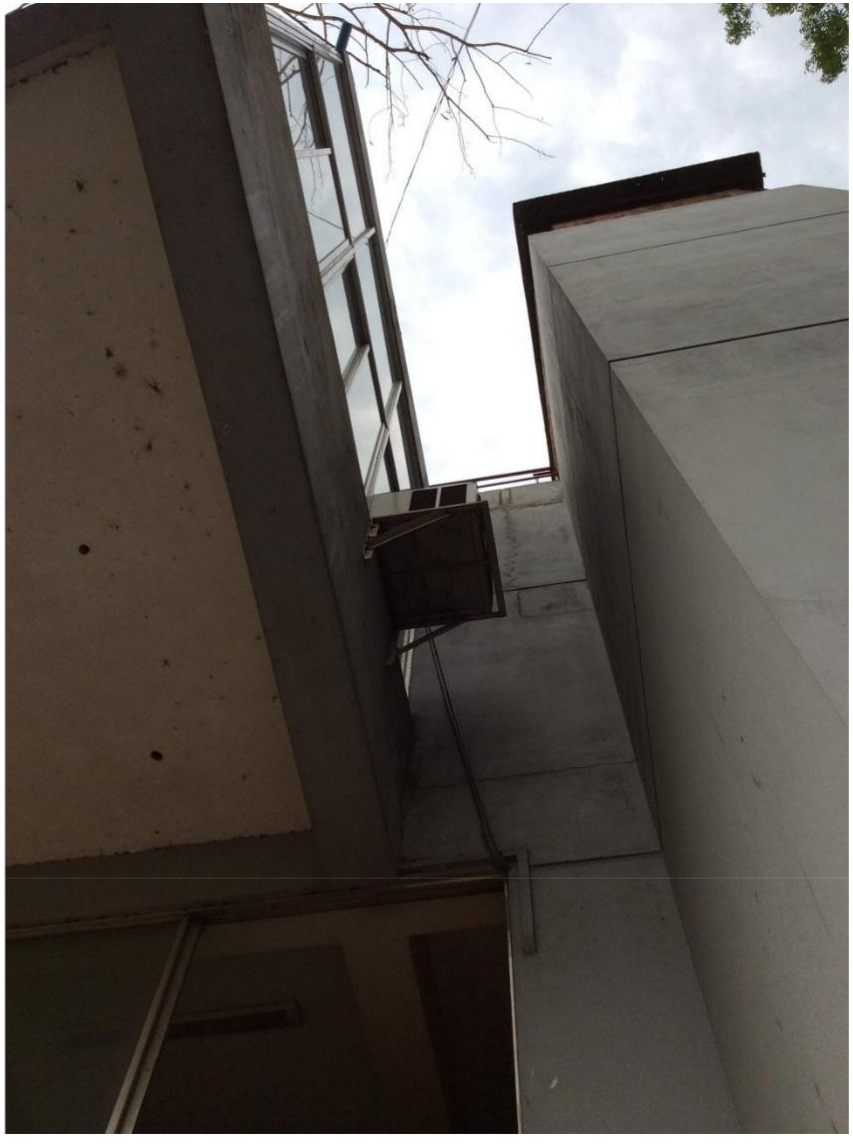

Façade cracks visible on elevations of the Knitting and Dyeing building.

Building Engineer to conduct routine inspection and issue maintenance schedule for façade brick walls

Cracks on façade brickwork walls

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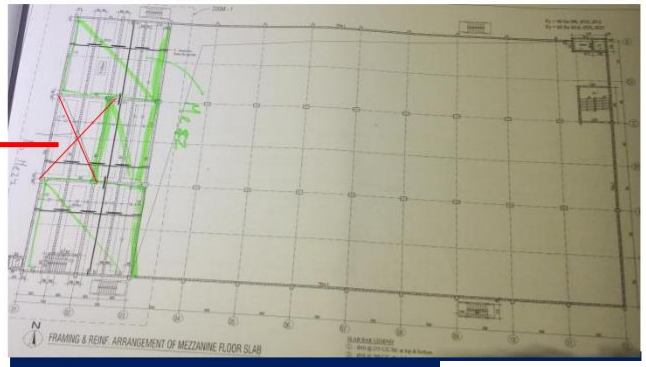
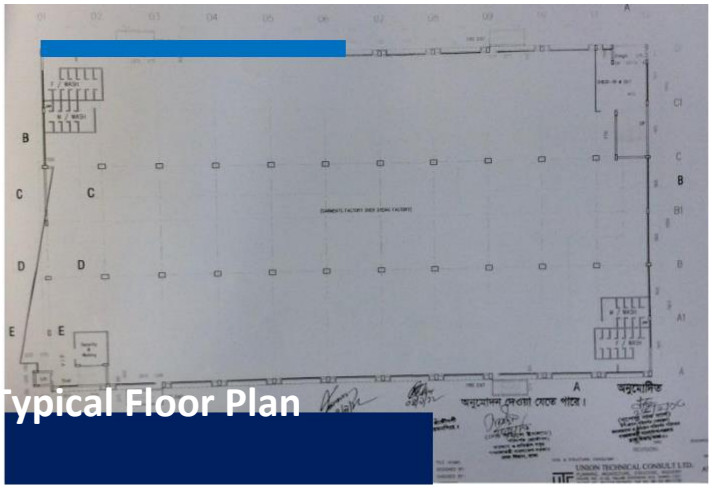
Discrepancies between drawings provided and the as constructed building



Mezzanine RC drawing



Typical Floor Plan

Mezzanine as constructed

Mezzanine is shown covering 2 full bays at the west end of the building on the RC drawing. As constructed it only covers 1 bay at the middle section of the mezzanine.

Cantilever slabs as constructed – not shown on drawings

Cantilever slabs

Building Engineer to check all drawings and update as constructed.

Discrepancies between the drawings and as constructed

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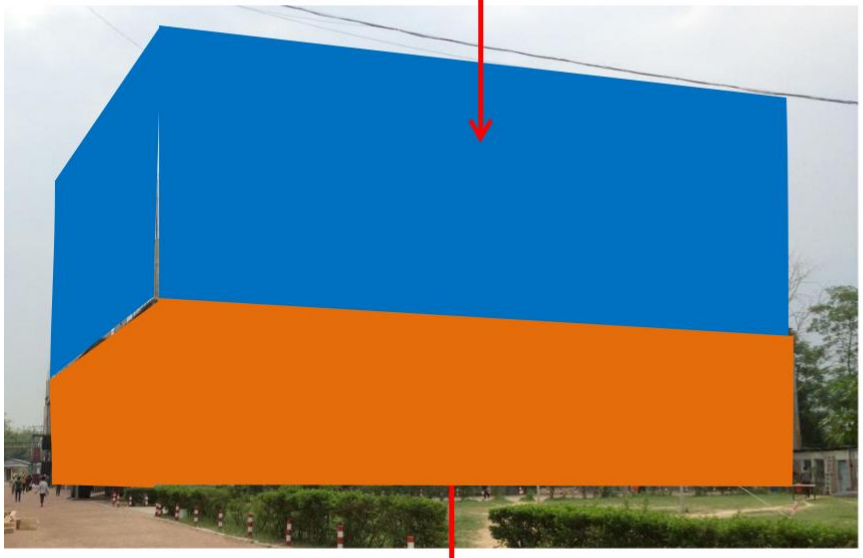
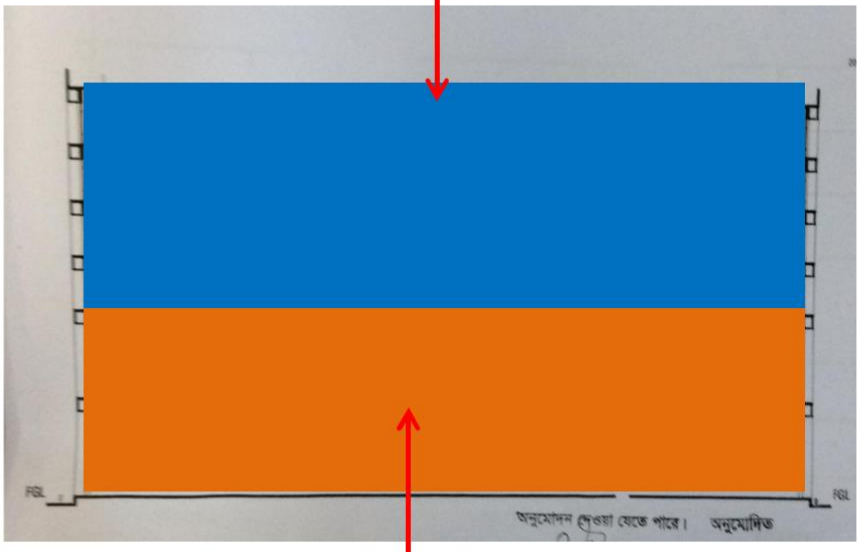
Any proposed additions to the existing building structure, including additional storeys, should be reviewed by the Building Engineer

Permit for 4 more storeys





Existing structure – 2 storeys

2 storeys currently constructed, permit drawings allow for 6 storeys. Building Engineer to review structural design and concrete strength within existing columns prior to commencing construction of any further building extension above the existing 2 storeys.

Additional Building Storeys

Priority Actions

Problems Observed

Garments Building

ITEM 1: Incomplete bracing and inconsistent restraint detail to rafter of steel roof
ITEM 2: Cracking of floor finishes/slab and management of floor loads
ITEM 3: Cracking of building façade
ITEM 4: Missing drawings and discrepancies between drawings provided and the as constructed building

Knitting and Dyeing Building

ITEM 5: Cracking of floor finishes/slab and management of floor loads
ITEM 6: Cracking of external cantilever slab and building façade
ITEM 7: Discrepancies between drawings provided and the as constructed building
ITEM 8: Any proposed additions to the existing building structure, including additional storeys, should be reviewed by the Building Engineer.

Item 1 and actions – Garments Building

Incomplete bracing and inconsistent restraint detail to rafter of steel roof

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• None required
Priority 3 (within 6-months)	• The design of the steel roof should be checked by the Building Engineer and, if required, upgraded to support code vertical and wind loads. Specifically the provision of roof bracing (horizontal and vertical) and compression flange restraints should be reviewed.

Item 2 and actions - Garments Building

Cracking of floor finishes/slab and management of floor loads

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity. • Building Engineer to review typical floor finish cracks at ground and 1st floors and confirm that cracking is in finishes only. Where required, remedial works to be carried out.
Priority 3 (within 6-months)	• Continue to implement load management plan

Item 3 and actions - Garments Building

Cracking of building façade

Priority 1 (Immediate - Now)	• None required.
Priority 2 (within 6-weeks)	• None required.
Priority 3 (within 6-months)	• Building Engineer to inspect area where cracking has occurred and propose a suitable repair to ensure that rainwater does not penetrate the building fabric. • Building Engineer to provide a method statement for the on-going maintenance of the external facades.

Item 4 and actions - Garments Building

Missing drawings and discrepancies between drawings provided and the as constructed building

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• None required
Priority 3 (within 6-months)	• Building Engineer to survey as constructed building. Updated drawings to be prepared showing the correct as constructed layout including the steel frame structure. • Update controlled loading plans for all floors designating allowable storage density and where storage may be placed.

Item 5 and actions–Knitting & Dyeing Building

Cracking of floor finishes/slab and management of floor loads

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity. • Building Engineer to review typical floor finish cracks and confirm that cracking is in finishes only. Where required, remedial works to be carried out.
Priority 3 (within 6-months)	• Continue to implement load management plan

Item 6 and actions-Knitting & Dyeing Building

Cracking of external cantilever slab and building façade

Priority 1 (Immediate - Now)	• None required.
Priority 2 (within 6-weeks)	• None required.
Priority 3 (within 6-months)	• Building Engineer to inspect area where cracking has occurred and propose a suitable repair to ensure that rainwater does not penetrate the building fabric and cantilever slab. • Building Engineer to provide a method statement for the on-going maintenance of the external facades.

Item 7 and actions-Knitting & Dyeing Building

Discrepancies between drawings provided and the as constructed building.

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• None required
Priority 3 (within 6-months)	• Building Engineer to survey as constructed building. Updated drawings to be prepared showing the correct as constructed layout. • Update controlled loading plans for all floors designating allowable storage density and where storage may be placed.

Item 8 and actions-Knitting & Dyeing Building

Any proposed additions to the existing building structure, including additional storeys, should be reviewed by the Building Engineer.

Priority 1 (Immediate - Now)	• None required
Priority 2 (within 6-weeks)	• None required
Priority 3 (within 6-months)	• If any additions to the building structure are proposed, the Building Engineer shall provide calculations showing the structural adequacy of all columns taking into account any additions to the existing structure, the loading plans and as built structure, including insitu concrete strength testing.

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.