The Delta Composite Knitting Ltd.
Zarun (south) Kashimpur, Gazipur, Bangladesh
(23.991894N, 90.319805E)

26th September 2013
Observations
Stability System on Buildings (II) and (IV)
Building (II) and (IV) have one direction moment frame stability system.

No obvious stability system in the opposite direction.

Building’s Engineer must carry out a stability analysis of both buildings and propose additional stability system if necessary.

Stability System Building (II)&(IV)
High density loading in temporary storage areas
Due to building works storage areas are changing their location to temporary areas in the building. Also construction material and machinery are stored following construction need.

Building´s Engineer to ensure the structure is not loaded beyond capacity.

High density loading
Overloading due to new finishes
Overloading due to new finishes

Existing screed below new finish.

A double screed layer produce and loading of 1.2 kN/m² reducing floor live load bearing capacity

Building’s Engineer to ensure old screed and finishes are removed before putting new one
Drainage and waterproofing on newly exposed roof slabs
Demolition works are still in progress, we assume after completion a waterproofing layer and a new drainage system will be built on newly exposed roof slab.

Building’s Engineer to ensure these works are developed properly.
Gables and walls stability affected by demolition
Gables and walls stability have been partially reduced removing roof structure. They have to be remove to avoid overturning risk.

Columns arising above slab provide enough temporally stability for demolition works.

Building’s Engineer to ensure this works are carried out in safe manner and keep a safety area on street around the buildings during the works

Gables and walls stability
Steel connection not properly carried out
Bent bolts
Supplementary plate may be required to fill the gap due to short beam
Building’s Engineer to check bolts are not damaged

Steel connections
Steel connections

Correct connection

Relocated connection
One bolt missing. Narrow distance between bolt holes and edge beam. Building’s Engineer to check connection capacity and provide reinforcement if necessary.
Connection problems
Big gap between steel plates reduces bolts capacity
Beam web does not get support bolt line. Big distance from beam edge to main beam web. Support connection built with a long thin steel plate.
Building’s Engineer to check connections capacity and provide reinforcement.

Steel connections
Exposed steel structure
We assume construction works are in progress at building (IV) and façade finishes are still pending.

We assume steel structure will be protected against corrosion before façade render.

Building’s Engineer to ensure these works are developed properly

Steel columns exposed
Horizontal stability of trusses in Buildings (VI)&(IX)
Building (VI) & (IX)
Concrete columns and beam providing vertical stability
Horizontal stability system on the roof plane required

Horizontal stability of trusses
Non engineered structures
Non engineered structures (VI) & (X)

- No vertical or horizontal bracing
- Weak and unstable columns supporting trusses
- High risk in case of impact
- Supports far from the trusses nodes
Documentation issues
Building (I) permit drawing was not shown. A drawing without permit stamp was shown instead.

Sheds structural drawings only show substructure to base plates.

Steel structure was not shown

New lift structure permit drawing was not shown

**Documentation issues**
Structural drawings are not in agreement with the arrangement of the building structure
Joint between buildings does not agree with the drawing

Both beams type “B” (same beams) | Dimension of beams and cantilever are not in agreement with the arrangement of beams
---|---
no cantilever | Additional cantilever
Beams with different depths

Structural drawings
Priority Actions
Problems Observed

ITEM 1: Concrete strength in columns for building I
ITEM 2: Concrete strength in columns for building III
ITEM 3: Concrete strength in columns for building V
ITEM 4: Stability system for building II and IV
ITEM 5: High density loading in temporary storage areas
ITEM 6: Potential overloading due to the new finishes
ITEM 7: Gable and lateral walls stability affected by demolition
ITEM 8: Steel connections
ITEM 9: Exposed steel structure
ITEM 10: Horizontal stability of trusses for buildings VI and IX
ITEM 11: Non engineered structures in building X and additional extension of building VI
ITEM 12: Drainage and waterproofing of newly exposed roof slabs
ITEM 13: Documentation issues
ITEM 14: Structural drawings are not in agreement with the arrangement of the building structure
<table>
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<tr>
<th>Item No.</th>
<th>Observation</th>
<th>Recommended Action Plan</th>
<th>Recommended Timeline</th>
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<tbody>
<tr>
<td>1</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>Maintain current use of the floors and don’t change use or increase occupation, either of which could increase loading</td>
<td>Immediate - Now</td>
</tr>
<tr>
<td>2</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>Factory Engineer to review design, loads and columns stresses in area identified above</td>
<td>Immediate - Now</td>
</tr>
<tr>
<td>3</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>Verify in situ concrete stresses either by cores or existing cylinder strength data for cores from 4 columns.</td>
<td>Immediate - Now</td>
</tr>
<tr>
<td>4</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>A Detail Engineering Assessment of Factory to be commenced, see attached Scope</td>
<td>Immediate - Now</td>
</tr>
<tr>
<td>5</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>6</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>Detail Engineering Assessment to be completed</td>
<td>6-weeks</td>
</tr>
<tr>
<td>7</td>
<td>Verify concrete strengths in internal columns of Building I (Apparels Building) from GF to 2nd floor</td>
<td>Continue to implement load plan</td>
<td>6-months</td>
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</table>
**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
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<tr>
<td>8</td>
<td>Verify concrete strengths in internal columns of Building III (Garments) from GF to 2nd floor</td>
<td>Factory Engineer to review design, loads and columns stresses in area identified above.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>9</td>
<td>Verify concrete strengths in internal columns of Building III (Garments) from GF to 2nd floor</td>
<td>Verify in situ concrete stresses either by cores or existing cylinder strength data for the identified columns.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>10</td>
<td>Verify concrete strengths in internal columns of Building III (Garments) from GF to 2nd floor</td>
<td>Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>11</td>
<td>Verify concrete strengths in internal columns of Building V (Composite RC Building) on GF</td>
<td>Factory Engineer to review design, loads and columns stresses in area identified above.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>12</td>
<td>Verify concrete strengths in internal columns of Building V (Composite RC Building) on GF</td>
<td>Verify in situ concrete stresses either by cores or existing cylinder strength data for the identified columns.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>13</td>
<td>Verify concrete strengths in internal columns of Building V (Composite RC Building) on GF</td>
<td>Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>14</td>
<td>Buildings (II) and (IV) stability systems are only one direction</td>
<td>Building engineer to carry out a stability analysis of the full 6 stories buildings and propose additional stability system if it is necessary</td>
<td>6-weeks</td>
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<tr>
<td>15</td>
<td>High density of loading in temporary storage areas</td>
<td>Building’s Engineer to ensure the structure is not loaded beyond capacity. We recommend limit stack height to 1.80m (1.50x1.50m area) and keep 0.60-0.70 m cleared strip around. Limit height to 1.80 m for loose clothing.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>16</td>
<td>Overloading due to the new finishes. New finishes placed on the old finishes</td>
<td>Building engineer to review load and if necessary all the old finishes should be removed before placing new finishes to avoid a overloading.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>17</td>
<td>Gable and lateral walls stability affected by demolition</td>
<td>Remove perimeter brick walls</td>
<td>6-months</td>
</tr>
<tr>
<td>18</td>
<td>Gable and lateral walls stability affected by demolition</td>
<td>Carry out demolition works in safe manner</td>
<td>6-months</td>
</tr>
<tr>
<td>19</td>
<td>Gable and lateral walls stability affected by demolition</td>
<td>Define a safe area on the street during the demolition process</td>
<td>6-months</td>
</tr>
<tr>
<td>20</td>
<td>Steel connection not carried out properly</td>
<td>Building engineer to check the steel connections, ensure that bolts are not damaged and propose an additional welding reinforcement if necessary.</td>
<td>6-weeks</td>
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<td>21</td>
<td>Exposed steel structure in building IV can accelerate the corrosion process and reduce the life of the building</td>
<td>Building engineer to ensure that all steel exposed structure will have been protected to avoid corrosion before finishing the facade render.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>22</td>
<td>Horizontal stability of trusses for buildings (VI) and (IX) (sheds)</td>
<td>Building engineer to carry out a stability analysis and provide additional stability system.</td>
<td>6-weeks</td>
</tr>
<tr>
<td>23</td>
<td>Non engineered structures in building (X) and additional extension in building (VI)</td>
<td>Building engineer to check the structures and propose additional reinforcements and stability system if required</td>
<td>6-weeks</td>
</tr>
<tr>
<td>24</td>
<td>Drainage and waterproofing of newly exposed roof slabs</td>
<td>Building engineer to ensure that a proper drainage system and waterproofing are placed on the roof after demolition works.</td>
<td>6-months</td>
</tr>
<tr>
<td>25</td>
<td>Permit drawings for building (I) and new lift structure were not shown</td>
<td>Building engineer to collect information and complete documentation soonest.</td>
<td>6-months</td>
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<td>Sheds structural drawings are not completed. Steel structures design were not shown</td>
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</tr>
<tr>
<td>26</td>
<td>Structural drawings are not in agreement with the arrangement of the building structure</td>
<td>Building Engineer to check the structural design and produce a set of “As-Built” drawings of the current structure.</td>
<td>6-months</td>
</tr>
</tbody>
</table>