

## **Summary of Preliminary Assessment on Structural, Fire and Electrical Safety**

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Name of the Factory	: TEX ASIA LIMITED
Address of the Factory	: Shibu Market, Sastapur, Fatullah, Narayanganj
Present Status of the Factory	: Under Operation.
Structural Assessment Conducted by	: TUV
Date of Structural Inspection	: 21 <sup>st</sup> March, 2015
Fire Assessment Conducted by	: TUV
Date of Fire Inspection	: 21 <sup>st</sup> March, 2015`
Electrical Assessment Conducted by	: TUV
Date of Electrical Inspection	: 21 <sup>st</sup> March, 2015
BKMEA Membership No.	: 616

### **BASIC INFORMATION:**

The assessed factory building is a 7 storey RCC building including a PEB profile shed on roof top which is supported by RCC columns. Structural system of the building is beam column frame and beam slab floor system for ground floor & flat slab frame with flat plate floor system for 1<sup>st</sup> floor to 6<sup>th</sup> floor. The following information was noted:

- |                               |   |
|-------------------------------|---|
| i. Building Usage Type        | : Garment Factory   |
| ii. Structural System         | : RCC beam column frame system for ground floor and RCC flat slab frame for 1 <sup>st</sup> floor to 6 <sup>th</sup> floor.                             |
| iii. Floor System             | : RCC beam slab for ground floor and flat plate floor for 1 <sup>st</sup> floor to 6 <sup>th</sup> floor.   |
| iv. Floor Area                | : Total floor area is 24,000 sq. ft. approx.  |
| v. No. of Stories             | : 7 storey. No basement floor.  |
| vi. Construction Year         | : Unknown.  |
| vii. Foundation Type          | : Shallow Foundation (Spread footing - As per structural drawing).  |
| viii. Design Drawings         | : Available (Approval document was available at the factory from Narayanganj Upozila Porishad on 17th October, 2001 for 6 storied Industrial building). |
| ix. Soil Investigation Report | : Available.  |
| x. Construction Materials     | : Stone Aggregated (Identified by removing Plaster).  |
| xi. Generator                 | : At ground floor.  |

### **RECOMMENDATIONS FOR CORRECTIVE ACTION:**

The recommendations of corrective action for both Structural and Fire & Electrical Safety comprises in Short Term, Mid Term and Long Term basis.

The recommendations for **Structural Safety** corrective action are:

- Short Term (Immediate) :
- Areas near to column grid-E1 not to be used for storage and overhead Water reservoir should be emptied.
  - Factory Engineer to review design, loads and columns stresses in area identified above.
  - Verify in-situ concrete stresses either by 100mm dia. cores or existing cylinder strength data for all the columns of type C2 and C3.

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- A Detail Engineering Assessment of Factory to be commenced, see attached Scope.

Mid Term (6-weeks)

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- Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.
- Detail Engineering Assessment to be completed.

Long Term (6-months)

:

- Continue to implement load plan
- As built engineering drawing to be prepared for PEB shed at 6th floor level and submitted for approval by appropriate authority. As part of this process building engineer will be required to make a number of checks on the as-built construction.
- Factory Engineer to review design of slab of all floors to measure the lateral capacity of structure.
- The connection of steel structure needs to be checked by building engineer and the bracing system is required to ensure the stability of the structure.

The recommendations for **Fire & Electrical Safety** corrective action are:

**(A): Recommendations for Fire Safety corrective actions:**

<p>Immediate</p> <p><i>(the factory should not continue to be occupied until these non-conformities have been rectified):</i></p>	<p>N/A</p>
<p>Short Term</p> <p><i>(Actions that must be incorporated into a Fire Safety Management Plan immediately (1 ~ 2 weeks) and should be a regular activity</i></p>	<ul style="list-style-type: none"> <li>• Remove all temporary items from all escape routes, aisles and passageway.</li> <li>• Provide aisle marking with arrow guiding and exit signage on all Evacuation pathways or provided with overhead signage fixed at ceiling level. - Illuminated exit sign should be posted above the exit door, - It should be clearly visible at all time, - Provide directional signs wherever necessary. - All exit doors should be clearly marked for easy identification. - Signage should be uniform.</li> </ul>
<p>Mid Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 weeks)</i></p>	<ul style="list-style-type: none"> <li>• Replace all existing exit doors on evacuation routes, exit doors with side hinged type door, which swing outward and in the direction of travel. Swinging of the door should not constrict the width of the corridor /</li> </ul>

	<p>passage below 0.9 meter.</p> <ul style="list-style-type: none"><li>• Remove all locking device from all egress door. All exit doors should be open-able from the side they serve without the use of a key.</li><li>• Provide handrails on both side of each stairway with height of 0.9m measured from the nose of stair to the top of the handrail.</li><li>• Doors in stair should be outward opening, side-swing, self-closing, non-lockable 2 hours fire rated doors in all stair way encloses.</li><li>• Prepare design for installation of fire rating smoke proof enclosure. 2 hours fire rating doors for exit should not be less than that of 4 hours fire resistance rating of the walls of the smoke proof fire rated entry lobby.</li><li>• Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated doors at ground floor generator, boiler &amp; substation room, which located at the adjacent to the final evacuation route.</li><li>• The egress paths should be illuminated with emergency lighting with power back-up supply &amp; illumination should be a minimum of 10 lux for all corridors &amp; exit doors. Aisles should be provided with a minimum 2 lux.</li><li>• The stairway should be illuminated with emergency lighting with power back-up supply &amp; illumination should be a minimum of 10 lux for stairway.</li><li>• Produce design and plan for automatic detection system with automatic fire alarm.</li><li>• Install Manual activation call point at all exit routes</li><li>• Provide adequate nos. of smoke detectors to cover the whole factory building.</li><li>• Prepare proper design and plan for dedicated fire pump with alternate backup power supply.</li><li>• Replace existing 1 inch hose pipe with 1.5 inch hose pipe to meet the requirement of RMG guideline.</li><li>• Prepare plan and design for dedicated water storage tank for firefighting operation as per RMG guideline.</li><li>• Prepare proper design and plan for fire lifts equipped with approved intercommunication (including two way</li></ul>
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	<p>voice communications) with the fire command station or control room on the ground floor lobby of the building.</p> <ul style="list-style-type: none"> <li>• Complete full design and plan for providing fire command station equipped with detailed floor plans along with clearly demarcated locations of fire detection and fighting devices and through the panel board able to detect fire alarm from any floor.</li> <li>• A suitable public address system should be provided for communicating to all floors as well as facilities to receive messages from all floors.</li> <li>• Obtain the boiler license from the proper issuing authority.</li> <li>• Obtain the boiler operator license from the proper issuing authority.</li> </ul>
<p>Long Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 months)</i></p>	<ul style="list-style-type: none"> <li>• Install smoke proof fire rated entry lobby at emergency stairways to separate from the area of incidence.</li> <li>• Provide 4 hours fire rated barriers with 2 hours fire rated doors at ground floor generator, boiler &amp; substation room, which located at the adjacent to the final evacuation route.</li> <li>• Install automatic detection system with automatic fire alarm.</li> <li>• Install dedicated fire pump with alternate backup power supply.</li> <li>• Stand pipe supplying first aid hose should have minimum pressure of 200 KPa.</li> <li>• Provide dedicated storage tank for firefighting operation</li> <li>• Install fire lifts equipped with approved intercommunication (including two way voice communications) with the fire command station or control room on the ground floor lobby of the building.</li> <li>• Provide fire command station equipped with detailed floor plans along with clearly demarcated locations of fire detection and fighting devices and through the panel board able to detect fire alarm from any floor.</li> </ul>

### ***(B): Recommendations for Electrical Safety corrective actions:***

<p>Immediate</p> <p><i>(the factory should not continue to be</i></p>	<ul style="list-style-type: none"> <li>• Over current protection devices (Circuit breakers) should be installed at all distribution panels.</li> </ul>
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<p><i>occupied until these non-conformities have been rectified):</i></p>	
<p>Short Term</p> <p><i>(Actions that must be incorporated into a Fire Safety Management Plan immediately (a week) and should be a regular activity</i></p>	<ul style="list-style-type: none"> <li>• All strands cables at exposed ends should be properly soldered / crimped and insulated.</li> <li>• Provide proper separate earthing/grounding to generator. Ensure that generator body frame to have two separate and distinct connections to the earth / ground.</li> </ul>
<p>Mid Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 weeks)</i></p>	<ul style="list-style-type: none"> <li>• 1. Provide updated SLD matching the existing installation at the factory.</li> <li>• 2. SLD to indicate exact positions of all points of switch boxes and other outlets.</li> <li>• 3. SLD to be approved by the engineer-in-charge.</li> <li>• 1. Provide updated Electrical layout drawing prepared after proper locations of all outlets for lamps, fans, fixed and transportable appliances, motors etc.</li> <li>• 2. Drawings to indicate exact positions of all points of switch boxes and other outlets to match existing installation.</li> <li>• 3. As built drawing to be approved by the engineer-in-charge.</li> <li>• Necessity and capacity of the electrical substation shall be set by regulations in the Electricity Act or by the relevant electrical utilities.</li> <li>• Refill the silica gel. Ensure that accessories of transformers like breathers, vent pipe, buchholz relay, and silica gel must be in order at substation.</li> <li>• All unwanted materials should be removed from transformer / Generator room.</li> <li>• Provide rubber mats of adequate size in front of all distribution panels.</li> <li>• Install smoke detection and provide firefighting equipment in the substation and generator room.</li> <li>• Provide and maintain clear and legible identifications numbers &amp; names on all incoming and outgoing circuits of HT / LT panels.</li> <li>• Adequate number of caution boards should be kept in</li> </ul>

	<p>the substation/ transformer room.</p> <ul style="list-style-type: none"><li>• 1. Exit signs should be illuminated either by lamps external to the sign or by lamps contained within the sign.</li><li>2. The source of illumination should be providing not less than 50 lux.</li><li>• 1. All stranded conductors &gt; 6mm<sup>2</sup> to be provided with cable sockets.</li><li>2 .All stranded conductors &lt; 6 mm<sup>2</sup>, at exposed end should be soldered / crimped.</li><li>• The electrical panels to be of metal case and should be marked with “Danger 415 Volts” and identified with proper phase marking and danger signage.</li><li>• Provide proper clearance of 0.8 - 1.0 m in front of all distribution panels/switchboards.</li><li>• Provide cable connections with properly soldered / welded lugs at (LT/MDB/DB/SDB)'s. Ensure that all the electrical connections are properly secured with lugs and glands.</li><li>• Select conductors and MCCB/MCB with adequate sizing without exceeding permissible current carrying capacity for insulation.</li><li>• Avoid looping and bunch of cable at MCCB/MCB or bus bar terminal, use individual circuit and over current device for every incoming and outgoing circuit at the distribution boards.</li><li>• Provide circuit diagram /circuit list with proper current ratings and fuse size, marking for DBs identifying end use load, voltage, number of phases.</li><li>• Provide cable joints of porcelain / PVC connectors with PIB tape wound around before placing the cable in the box.</li><li>• Seal the cable penetrations through walls adequately with fire resistive elements.</li><li>• Seal the opening of wall at wiring passing through wall/roof/floor partitions. Ensure that all cable penetrations though walls should be adequately sealed with fire resistive elements.</li></ul>
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	<ul style="list-style-type: none"> <li>• Provide adequate earthing to body and doors to all MDBs / DBs. Ensure that all electrical panels provided with proper and separate earth potential.</li> </ul>
<p>Long Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 months)</i></p>	<ul style="list-style-type: none"> <li>• Area of substation / transformer to meet requirements of Table 4.3 of RMG Guideline; the area should be 45 m<sup>2</sup>, or relocate the substation/ transformer room.</li> <li>• Maintain the minimum height of 3.6 m for the substation room. Increase the height or relocate it.</li> <li>• Provide 4 hour fire rated walls all around the transformer / generator room on ground level.</li> <li>• Modify Area of generator room to meet requirements of Table 4.4, RMG Guideline; the area should be 30 m<sup>2</sup>, or relocate the generator room.</li> <li>• Provide and maintain proper clearance in all sides of generator for ease of maintenance.</li> <li>• 1. Design to have proper segregation of different end used loads.</li> <li>2. Wiring design to have separate and distinct sub-circuits for power and heating system.</li> <li>3. All DBs to be placed conveniently.</li> <li>4. Wiring to be neat, tidy and located near ceiling.</li> <li>• Provide calibrated Ammeters / Voltmeters at distribution boards (LT/MDBs).</li> <li>• Relocate the MDBs with easy access. Ensure that all MDBs / SDBs should have easy accessibility.</li> <li>• For buildings &gt; 20m high, provide at least one vertical shaft of 200 x 400 mm for every 1500 sq.m. Floor area.</li> <li>• 1. Wooden switchboards / panel boards should be replaced by non-flammable materials.</li> <li>2. Prefer switchboards made of non-flammable materials.</li> <li>• Each circuit should have a separate neutral (use of common neutral for more than one circuit shall not be permitted).</li> <li>• Provide the wiring in PVC conduits or in metallic GI pipes. Ensure that all electrical wiring should be</li> </ul>

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	<p>covered in proper conduit pipes.</p> <ul style="list-style-type: none"><li>• Seal the cable entry-exit points of (LT/MDB/DB/SDB)'s with non-flammable materials. In addition:<ol style="list-style-type: none"><li>1. Ensure that HT / LT panels / Switchgears to be vermin / damp proof.</li><li>2. Ensure all unused holes / openings in DBs to be blocked properly.</li></ol></li><li>• <ol style="list-style-type: none"><li>1. Provide the ECC to meet minimum cross-sectional area as per table 4.5.</li><li>2. Ensure that a connection between conductors / equipment's provided to durable electrical continuity and adequate mechanical strength and protection.</li><li>3. The continuous earth connection is provided back to the main intake supply earth.</li></ol></li><li>• Provide adequate protection against lightning depending on the probability of a strike and acceptable risk levels at roof top of building.</li></ul>
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