

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Borax Apparels Ltd.
Address of the Factory	: 1/F, North-East Darussalam Road, Section-1, Mirpur, Dhaka
Present Status of the Factory	: Under operation.
Structural Assessment Conducted by	: TUV
Date of Structural Inspection	: 15 June, 2015
Fire Assessment Conducted by	: TUV
Date of Fire Inspection	: 15 June, 2015
Electrical Assessment Conducted by	: TUV
Date of Electrical Inspection	: 15 June, 2015
BGMEA Membership No.	: 1380

BASIC INFORMATION:

The assessed factory building is a 10 - Story R.C.C structure. The frame system of the building is flat plate-column framing at all floor level. The following information was noted:

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| i. Building Usage Type | : Garment Factory. |
| ii. Structural System | : R.C.C Flat Plate-Column Frame. |
| iii. Floor System | : Flat plate floor system. |
| iv. Floor Area | : Occupied area of the factory is 3,500 sft (approx.)
Total area of the building is 35,000 sft (approx.) |
| v. No. of Stories | : Ground Floor + 9 Floors (10 Storey), No Basement |
| vi. Construction Year | : 2005 |
| vii. Foundation Type | : Not Identified |
| viii. Design Drawings | : Available (approval from Rajdhani Unnayan Kartripakkha (RAJUK) for 10 storey industrial building on 2nd July, 1998) |
| ix. Soil Investigation Report | : Available |
| x. Construction Materials | : Stone aggregate. |
| xi. Generator | : Generator of Borax Apparels Ltd. is placed in ground floor. Another generator is placed on roof top and ownership of that generator could not be confirmed by factory management.. |

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:

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| Short Term (Immediate) | : 1. Empty the floors above the overstressed columns C1, F1, C7 & F7.
2. Factory Engineer to review design, loads and columns stresses in area identified above.
3. Verify in situ concrete stresses either by 100mm dia. cores or existing cylinder strength data for C1, F1, C7 & F7 or 100mm dia. cores from 4 columns. |
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	4. A Detail Engineering Assessment of Factory to be commenced, see attached Scope.
Mid Term (6-weeks)	: 1. Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity. 2. Detail Engineering Assessment to be completed. 3. As built architectural and structural drawing to be prepared. As part of this process building engineer will be required to make a number of checks on the structural design.
Long Term (6-months)	: 1. Continue to implement load plan. 2. Building engineer to verify the design of stability system. Lateral bracing is required to ensure the stability of the structure. 3. Generator needs to be removed from roof top and not to place any floor into the building above ground floor. 4. As built engineering drawing to be prepared 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 structural design.

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

(A): Recommendations for Fire Safety Corrective Actions:

Immediate <i>(the factory should not continue to be occupied until these non-conformities have been rectified):</i>	None
Short Term <i>(Actions that must be incorporated into a Fire Safety Management Plan immediately (1 ~ 2 weeks) and should be a regular activity</i>	<input type="checkbox"/> The minimum clear width of the pathway should be 0.9 meter <input type="checkbox"/> Rearrange the evacuation pathway to ensure the minimum width. <input type="checkbox"/> Remove all temporary items from all escape routes, aisles and passageway. <input type="checkbox"/> 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,

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	<ul style="list-style-type: none"> - 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 <input type="checkbox"/> Factory management should be checked alarm call points, alarm & detection system periodically and maintained the record properly. <input type="checkbox"/> Place the extinguisher near the path of exit travel & easily accessible <input type="checkbox"/> The first aid hose and standpipe performance should be checked periodically and properly tagged. <input type="checkbox"/> Combustible materials should keep away from electrical appliances and all the lighting in storage area must have protecting covers and wiring must be in conduits. <input type="checkbox"/> Fire drill should be conducted quarterly (4 times a year) in existing buildings as detailed under the Fire Safety Plan & should kept record properly.
<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"> <input type="checkbox"/> 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 / passage below 0.9 meter. <input type="checkbox"/> 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. <input type="checkbox"/> 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. <input type="checkbox"/> Doors in stair should be outward opening, side-swing, self closing, non-lockable 2 hours fire rated doors in all stair way encloses.(Also require fire rated door at the floor occupied by other tenants) <input type="checkbox"/> 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.(Also require same rating smoke proof enclosure at the floor occupied by other tenants) <input type="checkbox"/> Prepare proper plan and design for fire rated barrier for 2 hour fire rating separated corridor from stair-1 to exit-1 at ground floor. <input type="checkbox"/> Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated doors at ground floor substation and generator room, which located at the adjacent to final exit. <input type="checkbox"/> Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated door at 6th floor boiler room, which

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	<p>located at the adjacent to production area.</p> <ul style="list-style-type: none"> <input type="checkbox"/> The egress paths should be illuminated with emergency lighting with power back-up supply & illumination should be a minimum of 10 lux for all corridors & exit doors. Aisles should be provided with a minimum 2 lux. <input type="checkbox"/> The stairway should be illuminated with emergency lighting with power back-up supply & illumination should be a minimum of 10 lux for stairway. <input type="checkbox"/> Produce design and plan for automatic detection system with automatic fire alarm (Also needs to cover the floors occupied by other tenants). <input type="checkbox"/> Provide adequate nos. of smoke detectors to cover the whole factory building. <input type="checkbox"/> Prepare proper design and plan for dedicated fire pump with alternate backup power supply. <input type="checkbox"/> Replace existing 1 inch hose pipe replace with 1.5 inch hose pipe to meet the requirement of RMG guideline. <input type="checkbox"/> Prepare plan and design for dedicated water storage tank for firefighting operation as per RMG guideline. <input type="checkbox"/> Prepare proper design and plan for 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. <input type="checkbox"/> 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. <input type="checkbox"/> A suitable public address system should be provided for communicating to all floors as well as facilities to receive messages from all floors. <input type="checkbox"/> Power backup supply should be provided for alarm call point, alarm & detection system. <input type="checkbox"/> Visual alarm should be placed at the generator room. <input type="checkbox"/> Obtain fire license with mention area from issuing authority <input type="checkbox"/> Implement to a single fire safety management system with approvals from all tenants in the factory building
<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"> <input type="checkbox"/> Install smoke proof fire rated entry lobby at emergency stairways to separate from the area of incidence (Also require same rating smoke proof enclosure at the floor occupied by other tenants). <input type="checkbox"/> All stairway to have direct access to outside of the factory building, which requires 2 hour fire rated construction from stair-1 to exit-1 at ground floor for fire separated corridor. <input type="checkbox"/> Provide 4 hours fire rated barriers with 2 hours fire rated

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	<p>doors at ground floor substation and generator room, which located at the adjacent to final exit.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Provide 4 hours fire rated barriers with 2 hours fire rated door at 6th floor boiler room, which located at the adjacent to production area. <input type="checkbox"/> Install automatic detection system with automatic fire alarm.(Also needs to cover the floors occupied by other tenants) <input type="checkbox"/> Install dedicated fire pump with alternate backup power supply. <input type="checkbox"/> Stand pipe supplying first aid hose should have minimum pressure of 200 KPa. <input type="checkbox"/> Provide dedicated storage tank for firefighting operation <input type="checkbox"/> 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. <input type="checkbox"/> 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.
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(B): Recommendations for Electrical 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>None</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"> <input type="checkbox"/> All strands cables at exposed ends should be properly soldered / crimped and insulated. <input type="checkbox"/> Provide proper separate earthing/grounding to generator. Ensure that generator body frame to have two separate and distinct connections to the earth / ground.
<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"> <input type="checkbox"/> 1. Provide updated SLD matching the existing installation at the factory. 2. SLD to indicate exact positions of all points of switch boxes and other outlets. 3. SLD to be approved by the engineer-in-charge. <input type="checkbox"/> 1. Provide updated Electrical layout drawing prepared after proper locations of all outlets for lamps, fans, fixed and transportable appliances, motors etc. 2. Drawings to indicate exact positions of all points of switch

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	<p>boxes and other outlets to match existing installation.</p> <p>3. As built drawing to be approved by the engineer-in-charge.</p> <ul style="list-style-type: none"><input type="checkbox"/> Provide adequate illumination for generator room<input type="checkbox"/> All unwanted materials should be removed from Generator room.<input type="checkbox"/> Provide rubber mats of adequate size in front of all distribution panels.<input type="checkbox"/> Install smoke detection and provide firefighting equipment in the generator room.<input type="checkbox"/> Exit signs should be illuminated either by lamps external to the sign or by lamps contained within the sign.<input type="checkbox"/> Individual Fuse protection should be provided to every 15/20 A socket.<input type="checkbox"/> 1. All stranded conductors > 6mm² to be provided with cable sockets.2. All stranded conductors < 6 mm², at exposed end should be soldered / crimped.<input type="checkbox"/> Provide suitable & non-flammable protected supports and shades for hanged light fittings/fixtures.<input type="checkbox"/> 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.<input type="checkbox"/> Provide cable connections with properly soldered / welded lugs at (DB/SDB)'s. Ensure that all the electrical connections are properly secured with lugs.<input type="checkbox"/> Select conductors and MCCB/MCB with adequate sizing without exceeding permissible current carrying capacity for insulation.<input type="checkbox"/> Avoid bunch of cable at bus bar terminal, use individual circuit and over current device for every incoming and outgoing circuit at the distribution boards.<input type="checkbox"/> Provide circuit diagram /circuit list with proper current ratings and fuse size, marking for DBs identifying end use load, voltage, number of phases.<input type="checkbox"/> Provide cable joints of porcelain / PVC connectors with PIB tape wound around before placing the cable in the box.<input type="checkbox"/> Seal the cable penetrations through walls adequately with fire resistive elements.<input type="checkbox"/> Provide separate earthing connection to electrical equipments. Ensure that earth potential provided for all parts of equipment / installation (other than live parts) and that continuous earth connection is provided back to the main intake supply earth.
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	<ul style="list-style-type: none"> <input type="checkbox"/> Provide adequate earthing to body and doors to all DB / Ensure that all electrical panels provided with proper and separate earth potential.
<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"> <input type="checkbox"/> Provide 4 hour fire rated walls all around the transformer / generator room on ground level. <input type="checkbox"/> Modify Area of generator room to meet requirements of Table 4.4, RMG Guideline; the area should be 20m², or relocate the generator room. <input type="checkbox"/> Provide and maintain proper clearance in all sides of generator for ease of maintenance. <input type="checkbox"/> For buildings > 20m high, provide at least one vertical shaft of 200 x 400 mm for every 1500 sq.m. floor area. <input type="checkbox"/> Review capacity of standby generator on basis of loads for essential lighting / AC / Equipment / Services. Replace generator with larger capacity or install second generator if review indicates existing unit is too small. <input type="checkbox"/> 1. Wooden switchboards / panel boards should be replaced by non-flammable materials. 2. Prefer switchboards made of non-flammable materials. <input type="checkbox"/> Each circuit should have a separate neutral (use of common neutral for more than one circuit shall not be permitted). <input type="checkbox"/> Provide the wiring in PVC conduits or in metallic GI pipes. Ensure that all electrical wiring should be covered in proper conduit pipes. <input type="checkbox"/> Seal the cable entry-exit points of (DB)'s with non-flammable materials. In addition: <ul style="list-style-type: none"> 1. Ensure that HT / LT panels / Switchgears to be vermin / damp proof. 2. Ensure all unused holes / openings in DBs to be blocked properly. <input type="checkbox"/> 1. Provide the ECC to meet minimum cross-sectional area as per table 4.5. 2. Ensure that connections between conductors / equipments provided to durable electrical continuity and adequate mechanical strength and protection. 3. The continuous earth connection is provided back to the main intake supply earth. <input type="checkbox"/> Provide adequate protection against lightning depending on the probability of a strike and acceptable risk levels at roof top of building.