

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

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Name of the Factory	: Diamond Knitwear Ltd.
Address of the Factory	: 2058, Moti Market, Bahir Signal, Arakan Road, Chandgaon, Chittagong
Present Status of the Factory	: Under operation.
Structural Assessment Conducted by	: TUV
Date of Structural Inspection	: 25 November, 2015
Fire Assessment Conducted by	: TUV
Date of Fire Inspection	: 25 November, 2015
Electrical Assessment Conducted by	: TUV
Date of Electrical Inspection	: 25 November, 2015
BGMEA Membership No.	: 2616

### **BASIC INFORMATION:**

The assessed factory building was a 3-Storey RCC building. The following information was noted:

- i. Building Usage Type : Garment Factory.
- ii. Structural System : RCC beam column system.
- iii. Floor System : RCC Beam slab.
- iv. Floor Area : The typical plinth area of 3 storied RCC building is 5492 sft. Total operational area is 16476 sft
- v. No. of Stories : 3-Storey building, No basement
- vi. Construction Year : 1997
- vii. Foundation Type : Not Identified.
- viii. Design Drawings : Not Available
- ix. Soil Investigation Report : Not Available
- x. Construction Materials : Brick aggregate.
- xi. Generator : The generator room is located at the ground floor of the factory building..

### **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) | : N/A  |
| Mid Term (6-weeks)     | : 1. As built architectural & 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 as built construction.<br>2. Building engineer to check the affected area, verify the corrosion of rebar and provide necessary cover ensuring anti corrosion treatment. |
| Long Term (6-months)   | : 1. Sections of plaster finish to slabs and beams concrete to be removed to investigate if dampness penetrates into the building structure. Investigation needed to determine why dampness occurring.   |

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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>None</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><input type="checkbox"/> The minimum clear width of the pathway should be 0.9 meter</li> <li><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.</li> <li>- Illuminated exit sign should be posted above the exit door,</li> <li>- It should be clearly visible at all time,</li> <li>- Provide directional signs wherever necessary.</li> <li>- All exit doors should be clearly marked for easy identification.</li> <li>-Signage should be uniform</li> <li><input type="checkbox"/> Provide sufficient no of fire extinguisher at all floor.</li> <li><input type="checkbox"/> Place the extinguisher near the path of exit travel &amp; easily accessible</li> <li><input type="checkbox"/> Provide additional firefighting equipment like sand &amp; water buckets near exit or easily accessible area for first phase fire fighting.</li> <li><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.</li> <li><input type="checkbox"/> Fire drill should be conducted quarterly (4 times a year) in existing buildings as detailed under the Fire Safety Plan &amp; should kept record properly</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><input type="checkbox"/> Prepare proper plan and design for one more exit in a way not to exceed the maximum travel distance.</li> <li><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.</li> <li><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.</li> <li><input type="checkbox"/> Exit door should have minimum clear width 0.9 meter.</li> <li><input type="checkbox"/> Prepare proper plan &amp; design for exit door.</li> </ul>

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	<ul style="list-style-type: none"><li>- Minimum clear width should be 0.9 meter.</li><li><input type="checkbox"/> Prepare proper plan &amp; design for another staircase.</li><li>- Minimum clear width should be 0.9 meter.</li><li><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.</li><li><input type="checkbox"/> Doors in stair should be outward opening, side-swing, self closing, non-lockable 0.75 hours fire rated doors in all stair way encloses.</li><li><input type="checkbox"/> Provide 1 hour fire rated construction at unprotected opening window, which is adjacent to external staircase.</li><li><input type="checkbox"/> Prepare proper plan and design for fire rated barrier for 1 hour fire rating separated corridor with 0.75 hrs fire rated door at ground floor.</li><li><input type="checkbox"/> Prepare proper plan and design for 2 hours fire rated barriers with 1.5 hours fire rated doors at ground floor fabric store, which located at the adjacent to main evacuation routes.</li><li><input type="checkbox"/> Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated door at ground floor generator &amp; boiler room, which located at the adjacent to production area.</li><li><input type="checkbox"/> 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><input type="checkbox"/> 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><input type="checkbox"/> Produce design and plan for automatic detection system with automatic fire alarm.</li><li><input type="checkbox"/> Install Manual activation call point at all exit routes</li><li><input type="checkbox"/> Prepare proper design and plan for dedicated fire pump with alternate backup power supply.</li><li><input type="checkbox"/> Prepare plan and design for dedicated water storage tank for firefighting operation as per RMG guideline.</li><li><input type="checkbox"/> Permit all floor area in fire license from issuing authority.</li><li><input type="checkbox"/> Obtain building approval from issuing authority</li><li><input type="checkbox"/> Implement to a single fire safety management system with approvals from all tenants in the factory building.</li><li><input type="checkbox"/> Obtain the boiler license from the proper issuing authority.</li><li><input type="checkbox"/> Obtain the boiler operator license from the proper issuing authority.</li></ul>
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<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><input type="checkbox"/> Implement the plan and design for one more exit.</li> <li><input type="checkbox"/> Install exit door as per plan and design. <ul style="list-style-type: none"> <li>- Minimum clear width should be 0.9 meter.</li> </ul> </li> <li><input type="checkbox"/> Install another staircase as per plan and design. <ul style="list-style-type: none"> <li>- Minimum clear width should be 0.9 meter.</li> </ul> </li> <li><input type="checkbox"/> All stairway to have direct access to outside of the factory building, which requires 1 hour fire rated construction with 0.75 hrs fire rated door at ground floor for fire separated corridor.</li> <li><input type="checkbox"/> Provide 2 hours fire rated barriers with 1.5 hours fire rated doors at ground floor fabric store, which located at the adjacent to main evacuation routes.</li> <li><input type="checkbox"/> Provide 4 hours fire rated barriers with 2 hours fire rated door at ground floor generator &amp; boiler room, which located at the adjacent to production area.</li> <li><input type="checkbox"/> Install automatic detection system with automatic fire alarm</li> <li><input type="checkbox"/> Install dedicated fire pump with alternate backup power supply.</li> <li><input type="checkbox"/> Provide sufficient number of hose pipe with respect to area and travel distance as per RMG guideline.</li> <li><input type="checkbox"/> Provide dedicated storage tank for firefighting operation</li> </ul>
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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>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Over current protection device (MCB/MCCB) was not installed for outgoing circuit at Bus Bar Box Panel.</li> </ul>
<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><input type="checkbox"/> All strands cables at exposed ends should be properly soldered / crimped and insulated.</li> <li><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</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><input type="checkbox"/> All unwanted material should be removed from Generator room.</li> <li><input type="checkbox"/> Provide rubber mat of adequate size in front of Bus Bar Box panel.</li> <li><input type="checkbox"/> Install smoke detection and provide firefighting equipment in</li> </ul>

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	<p>the generator room.</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Exit signs should be illuminated either by lamps external to the sign or by lamps contained within the sign.</li> <li><input type="checkbox"/> 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><input type="checkbox"/> 1. Remove all the inflammable materials from surrounding of electrical circuitry.</li> <li>2. Ensure that all electric circuitry clean of inflammable materials.</li> <li>3. Conduct periodic maintenance and maintain the records.</li> <li><input type="checkbox"/> 1. Wiring design should have separate and distinct sub-circuits for power and heat source.</li> <li>2. Switchboards / wiring to be located away from steam / heat pipelines.</li> <li><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.</li> <li><input type="checkbox"/> Provide cable connections with properly soldered / welded lugs. Ensure that all the electrical connections are properly secured with lug.</li> <li><input type="checkbox"/> Select conductors and MCCB/MCB with adequate sizing without exceeding permissible current carrying capacity for insulation.</li> <li><input type="checkbox"/> Avoid looping at MCCB terminal, bunch of cable at MCCB terminal, use individual circuit and over current device for every incoming and outgoing circuit.</li> <li><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.</li> <li><input type="checkbox"/> Provide cable joints of porcelain / PVC connectors with PIB tape wound around before placing the cable in the box.</li> <li><input type="checkbox"/> Provide separate earthing connection to electrical equipment. 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.</li> <li><input type="checkbox"/> Provide adequate earthing to body and doors to Bus Bar Box. 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</i></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> 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</li> </ul>

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<p>months)</p>	<p>and other outlets.</p> <ol style="list-style-type: none"><li>3. SLD to be approved by the engineer-in-charge.</li></ol> <ul style="list-style-type: none"><li><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.</li></ul> <ol style="list-style-type: none"><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></ol> <ul style="list-style-type: none"><li><input type="checkbox"/> Provide 1.5 hour fire rated door of the generator on ground level.</li><li><input type="checkbox"/> Provide and maintain proper clearance in all sides of generator for ease of maintenance.</li></ul> <ul style="list-style-type: none"><li><input type="checkbox"/> 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></ul> <ul style="list-style-type: none"><li><input type="checkbox"/> Provide calibrated Ammeter &amp; Voltmeter at Bus Bar Box Panel.</li><li><input type="checkbox"/> Review capacity of standby generator on basis of loads for essential lighting. Replace generator with larger capacity or install second generator if review indicates existing unit is too small.</li></ul> <ul style="list-style-type: none"><li><input type="checkbox"/> 1. Wooden switchboards Base should be replaced by non-flammable materials.</li><li>2. Prefer switchboards made of non-flammable materials.</li></ul> <ul style="list-style-type: none"><li><input type="checkbox"/> Each circuit should have a separate neutral (use of common neutral for more than one circuit shall not be permitted).</li><li><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.</li><li><input type="checkbox"/> Seal the cable entry-exit points of (DB)'s with non-flammable materials. In addition:<ol style="list-style-type: none"><li>1. Ensure that DB panels / Switchgears to be vermin / damp proof.</li><li>2. Ensure all unused holes / openings in DBs to be blocked properly.</li></ol></li></ul> <ul style="list-style-type: none"><li><input type="checkbox"/> 1. Provide the ECC to meet minimum cross-sectional area as per table 4.5.</li><li>2. Ensure that connections between conductors / equipment</li></ul>
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	<p>provided to durable electrical continuity and adequate mechanical strength and protection.</p> <p>3. The continuous earth connection is provided back to the main intake supply earth.</p> <p><input type="checkbox"/> Provide adequate protection against lightning depending on the probability of a strike and acceptable risk levels at roof top of building.</p>
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