

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

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Name of the Factory	: Creslan Sweaters Ltd.
Address of the Factory	: Khan Complex 107/108, Dewanhat, Chittagong
Present Status of the Factory	: Under operation.
Structural Assessment Conducted by	: VEC
Date of Structural Inspection	: 26 August, 2015
Fire Assessment Conducted by	: VEC
Date of Fire Inspection	: 26 August, 2015
Electrical Assessment Conducted by	: VEC
Date of Electrical Inspection	: 26 August, 2015
BGMEA Membership No.	: 3851

### **BASIC INFORMATION:**

The factory building is a three storied RCC building with beam and column system and flat slab system. The following information was noted:

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|-------------------------------|--|
| i. Building Usage Type        | : Garment Factory.   |
| ii. Structural System         | : RCC beam column system.  |
| iii. Floor System             | : RCC Beam slab.   |
| iv. Floor Area                | : 11850 sft  |
| v. No. of Stories             | : 6- storied   |
| vi. Construction Year         | : 2000-2001  |
| vii. Foundation Type          | : Pile foundation as per drawing.  |
| viii. Design Drawings         | : Available: Approval plan and structural design drawing<br>Not Available: soil test report, floor load plan, test report of materials and architectural design drawing. |
| ix. Soil Investigation Report | : Not Available  |
| x. Construction Materials     | : Stone chips (Column).  |
| xi. Generator                 | : 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:

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|------------------------|--|
| Short Term (Immediate) | : N/A  |
| Mid Term (6-weeks)     | : N/A  |
| Long Term (6-months)   | : 1. Remedial action to be undertaken to prevent the seepage of water from pipes and other sources.<br><br>2. Building Engineer need to survey this factory. Prepare soil test report, floor load plan and prepare/update calculations showing the structural adequacy of the floor system taking into account the factory design imposed loading and the as built structure |

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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>	<ul style="list-style-type: none"> <li>• Factory needs to remove all temporary obstruction from escape route for emergency and safe evacuation</li> </ul>
<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>• Fire drill shall be conducted quarterly (4 times a year) under the Fire Safety Plan. A record of such drills shall be kept in writing for at least 3 years for the inspection of fire brigade whenever called for.</li> <li>• All the firefighting equipment's need to test with proper documents.</li> <li>• Factory needs to have marked aisles in all working floor according to 0.9m for one side seat and 1.0m for both side seat.</li> <li>• Lights in storage area needed to be installed with protective covers and conduits.</li> <li>• Propagation of fire, smoke, gas or fume through the opening of fire resistive floors and walls need to be restricted by sealing such opening with an approved material which needs to have a minimum 2 hours fire resistance rating of the walls.</li> <li>• Combustibles are to be managed with good housekeeping. Storage facilities with no air-conditioning duct shall be minimum 2.9 m and when used as a storage facility there shall be a minimum clearance of one third the floor height from the ceiling to the top of the storage stack.</li> <li>• All required means of exit or exit access in buildings or areas requiring more than one exit shall be signposted. The signs shall be clearly visible at all times, where necessary supplemented by directional signs</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>• Factory needs to prepare as built drawing with floor machine layout showing means of escape with proper dimension.</li> <li>• Fire manager/Director need to have safety training from proper authority &amp; worker of the factory should as far as possible be trained for use fire extinguisher.</li> <li>• All the exit doors need to be replaced by side swinging so that un-lockable doors can be opened easily in the direction of evacuation without the use of a key.</li> <li>• Factory needs to provide handrail on both sides of all the stairways.</li> <li>• Factory needs to be installed with adequate illuminated emergency lighting in floors, exits &amp; stairs.(Escape</li> </ul>

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	<p>route).</p> <ul style="list-style-type: none"> <li>• Emergency back-up power needs to be connected for critical fire safety system and not less than 30 minutes in case of failure of power supply.</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>• Factory needs to have a proper pre-plan for fire department.</li> <li>• Final exit route-2(Stair-2 route) need to be protected (2 hours rated construction with 1.5 hours rated door) at each floor level entrance and need to be protected from generator and sub-station at ground floor by 4 hours rated construction with 2 hours rated door/opening, also need to have a protected escape route till to reach safe refuse area.</li> <li>• Storage area need to be protected with 2 hours rated construction and 1.5 hours rated opening or doors.</li> <li>• Generator:</li> <li>• Generator room need to be protected with 4 hours rated construction &amp; 2 hours rated opening / door from stair-2 as well as from the final exit route-2 located at ground floor.</li> <li>• Sub-station:</li> <li>• Sub-station room need to be protected with 4 hours rated construction &amp; 2 hours rated opening / door from stair-2 as well as from the final exit route-2 located at ground floor.</li> <li>• Boiler:</li> <li>• Boiler room need to be protected with 4 hours rated construction &amp; 2 hours rated opening / door from the working floor (Washing section) at 3rd floor of the building.</li> <li>• All the stairs need to be protected with fire and smoke resistant enclosures and opening (2 hours rated enclosure and 1.5 hours rated door)and provide a protected route from all though the stairway to the final exits.</li> <li>• Factory need to install centralized and automatic fire detection &amp; alarm system on all occupied floors, including other tenanted floors of the building as per NTPA Guideline.</li> <li>• The factory need to install manually operated electrical fire alarm system and automatic fire alarm system with single or multiple call boxes on all occupied floors, including other tenanted floors of the building.</li> <li>• Factory needs to install control panel for centralized automatic smoke detection &amp; fire alarm system according to NTPA Guideline.</li> </ul>

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	<ul style="list-style-type: none"> <li>• Install proper standpipe system having at least 100 mm dia of standpipe. First aid hose system (38 mm nominal) needs to be provided (Ref. Fire Service Standard # 9) in addition to Fire Aid Fire Fighting Appliances in existing high rise NTPA (20 m) buildings. In addition 50 mm or larger hose connection facility needs to be provided.</li> <li>• Factory need to install standard standpipe, hose and fire pump system to ensure required hose pressure as per NTPA Guideline.</li> <li>• Factory needs to be installed with Siamese connection for to the standpipe system located outside the building and accessible to the fire department connection.</li> <li>• Factory needs to install dedicated fire pump with sufficient capacity and backup power as per NTPA Guideline.</li> <li>• Factory need to have sufficient water storage capacity to get adequate pressure to feed fire-fighting equipment and at least 1900ltr x 75min=142500 liters water storage tank.</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>• Find out cause (improper cable selection, improper protective device selection, improper termination, rusted connection, heat source etc.) of burning sign/insulation damage and take proper action including replacing cable or equipment where necessary.</li> <li>• Find out the cause (improper cable/over current selection, over loading, improper lug, improper cable joints, rusted connection, insulation damage, multiple cables at single point, ) of overheating (&gt; ambient+ 40C) and take proper action.</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>• Ensure all distribution boards (including panel door) are earthed properly.</li> <li>• Remove all unused cables from distribution boards and make sure all necessary cables are properly terminated at its point of termination using appropriate size and type of lug.</li> <li>• Provide additional insulation for wiring exposed to external heat sources to protect cable.</li> <li>• Ensure overcurrent protection device (circuit breaker/fuse) for each circuit/branch circuit.</li> <li>• Ensure proper earthing connections at all electrical equipment Clean interior components from dust and debris and seal all openings within the enclosure to</li> </ul>

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	<p>prevent dust and debris from entering.</p> <ul style="list-style-type: none"> <li>• Ensure inspection of all earthing system is being completed and documented</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>• Install appropriate number and type of safety signage and fire-fighting equipment at substation and generator room. Also ensure graded rubber mats are provided in front of all distribution boards.</li> <li>• Provide Instruction board for first aid and artificial respiration in the substation room and generator room.</li> <li>• Ensure in the substations room and generator rooms have adequate illumination level as per standard.</li> <li>• Ensure that wet type transformer is not leaking and have appropriate oil levels.</li> <li>• Fill the transformer breather with fresh Silica gel and oil cup with fresh Oil.</li> <li>• Provide two separate and distinct connections of earthing for each generator.</li> <li>• Ensure distribution board has a minimum clearance of 1 m (39 in) in front.</li> <li>• Provide dedicated &amp; adequate size of earthing with proper identification for each circuit from the earth busbar of distribution boards and ensure continuous earth path is back to main building intake.</li> <li>• Rewire to ensure each incoming supply to an MCB has a dedicated supply from busbar. Avoid the use of multiple cables on outgoing side of MCB's.</li> <li>• Ensure all electrical cables are sized according to capacity of circuit breakers.</li> <li>• Provide adequate support or mechanical guards for electrical equipment and wiring where necessary.</li> <li>• Ensure cable joints are made in respect of conductivity, insulation and mechanical strength.</li> <li>• Seal the openings remaining after wiring system passes through the elements of building construction according to the degree of fire resistance.</li> <li>• Connect all metal in the building to the building earthing system.</li> <li>• Find out the cause (improper cable/over current selection, over loading, improper lug, improper cable joints, rusted connection, insulation damage, multiple cables at single point, ) of overheating { ambient+( 20C-40C)} and take proper action.</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>• Develop an electrical layout diagram and an as-built single line diagram detailing key components and capacity of the electrical system.</li><li>• Establish a periodical Insulation and earth Resistance Measurement Program and record the related testing data.</li><li>• Inspect electrical panel boards on an annual basis.</li><li>• Ensure substation room has minimum height &amp; area as per NTPA Table-4.3 respectively.</li><li>• Ensure the substation room has adequate fire separation from the production area.</li><li>• Provide adequate means of ventilation for the substation room based on the installed equipment considering fire barriers.</li><li>• Ensure all high tension cables are laid following standard cable laying techniques.</li><li>• Ensure the generator room has adequate fire separation from the main building.</li><li>• Provide adequate means of ventilation for the generator room based on the installed equipment and ensure that ventilation does not impact on fire barriers, e.g. fire dampers.</li><li>• Ensure distribution boards have no opening and all live internal components are concealed properly.</li><li>• Provide dedicated &amp; adequate size of neutral with proper identification for each applicable circuit.</li><li>• Ensure each distribution board is provided with a circuit list and means of identification is provided as per list.</li><li>• Provide adequate covers on cable channel.</li><li>• Provide proper cable terminator/connector for stranded conductors at its point of termination.</li><li>• Install separate distribution boards for lighting and power circuits.</li><li>• Install lightning protection system on the building.</li></ul>
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