

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

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Name of the Factory	: <b>Denim Processing Plant.</b>
Address of the Factory	: Zorpul, West Joinabari, Hemayetpur, Savar, Bangladesh
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 9-Mar-2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 9-Mar-2014

### **BASIC INFORMATION:**

The present garment factory comprises of one main building and one ancillary building. The following general information was noted:

- i. Building Usage Type : Garments Factory
- ii. Structural System : Main Building: RCC column frame flat slab with top floor steel shed roof.
- iii. Floor System : Flat slab
- iv. Floor Area : Total area of the main factory building is 17,521 SF.
- v. No. of Stories : Main factory building: 2 storied RCC building with Mezzanine floor
- vi. Construction Year : 2006-2007
- vii. Foundation Type : Unknown
- viii. Design Drawings : Available but not fully credible.
- ix. Soil investigation Report : Unknown.
- x. Construction Materials : Reinforced Concrete for RCC portion.
- xi. Generator : Unknown.

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

The recommendations of corrective action for Structural, Fire and Electrical Safety comprises of Short Term, Mid Term and Long Term basis are as follows:

#### **The recommendations for Structural Safety corrective actions are:**

Immediate : NA

Short Term: (3 Weeks) :

- i. "Designate a representative as the Factory Load Manager. The Factory Owner shall ensure that at least one individual, the Factory Load Manager who is located onsite full time at the factory, is trained in calculating operational load characteristics of the specific factory. The Factory Load Manager shall serve as an ongoing resource

Mid Term (6 Weeks) :

- ii. Have Assign a qualified structural engineer to provide further testing and analysis of distress, settlement, shifting, or cracking in columns or walls and provide a remediation plan to correct noted issues.

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- iii. "Have a qualified structural engineer provide further analysis and testing of the noted settlement and crack issues. If required, a remediation plan shall also be provided by the qualified structural engineer.
- iv. Engage a competent body for restoration work."
- v. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- vi. Produce, establish and enforce a written policy and procedure to ensure that the live loads, as detailed in the load plans for each floor, are not exceeded. The designated Load Manager shall oversee this program and ensure it is enforced.
- vii. Conduct ferro-scanning to confirm the reinforcement at all the structural members and prepare as-built drawing as per construction.
- viii. Engage a qualified structural engineer to develop the required documents to confirm the structural integrity of the buildings. Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
- ix. Engage qualified engineer to do the structural analysis to ensure that the water tank is not causing any stresses greater than those caused by a uniform load.
- x. Assign a qualified structural engineer to prepare document in compliance with the seismic and wind requirements stated in the 2006 BNBC.
- xi. Assign a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading and storm surge loadings. Prepare document in compliance with the requirements stated for wind loading and storm surge loadings as detailed in BNBC Part 6 Section 1.5.3.
- xii. Engage a qualified structural engineer to confirm satisfactory structural performance of the building under lateral loads.
- xiii. Assign a qualified structural engineer to prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xiv. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- xv. to RMG vendors and be responsible to ensure that the factory operational loads do not at any time exceed the factory floor loading limits as described on the Floor Loading Plans."
- xvi. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3. Load plans need to be prepared for each floor, detailing the maximum operational load for specific high load areas on the floor and the entire floor. These load plans should be posted throughout the assembly and production floors, at a conspicuous space near the specific high load areas and in the general floor areas.
- xvii. Load plans must be prepared by a qualified engineer and posted clearly on each floor and as necessary to distribute floor loads to comply with the floor loading plans as per Alliance Standard Part 8 Section 8.20.5.3
- xviii. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan. Provide the load plans, signage, plus highlight these areas by physical marking; using different contrasting

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colours or materials so they are easy to differentiate between the storage areas, the normal working sections and the means of egress pathways.

Long Term (6 Months) :

- i. Provide Certificates of Occupancy for review.

### The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	<p>Light fixtures without protective covers (otherwise known as naked lights) shall not be allowed in storage areas or in any area where the Inspector of the Factories Rules (1.6.3.7) Part 53 disallows these fixtures. Install signs posted in Bengali and English, indicating this prohibition at all entrances to these areas.</p> <p>Find out the causes of overheating and take proper action including replacing cable or equipment where necessary.</p>
Short Term (3 Weeks)	<p>Keep at least 1 m clearance in front all distribution panels for easy operation and maintenance. Access to all electrical panels shall be kept obstacle free.</p> <p>Emergency power sources should be provided for all kinds of emergency loads. All boxes and enclosures (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system.</p> <p>The required marking can be by color code, the words “emergency system,” or any other method that identifies the box or enclosure as a component of the emergency system.</p>
Mid Term (6 Weeks)	<p>Consult with a qualified electrical engineer and ensure electrical wiring/cables are sized according to capacity of circuit breakers.</p> <p>Have a qualified electrical engineer develop an as-built single line diagram detailing key components and capacity of the electrical system.</p> <p>Provide dedicated neutral for each circuit.</p> <p>Construct a 2 hour fire rated room for the generator. The required room area for the generator is minimum 48 sq m with adequate clearance around the generator on all sides. Assign a qualified engineer for designing the fire barrier or separation. Fire barrier material shall meet the testing requirements of ASTM E 119 and NFPA 221.</p>

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<p>Long Term (6 Months)</p>	<p>Complete thermographic scans at least on a three year cycle. Thermographic scans should be completed in accordance with the Standard for Infrared Inspection of Electrical Systems &amp; Rotating Equipment and NFPA70B or a comparable standard.</p> <p>Have a qualified electrical engineer design a lightning protection system according to the BNBC requirements. Have a licensed electrician install the designed system.</p> <p>Develop an Insulation Resistance Measurement Program that ensures deterioration of insulation resistance will be identified quickly. Testing should be in compliance with International Electrical Testing Association (NETA). All transformers, switchgears etc. shall be subject to an insulation resistance measurement test to ground after installation but before any wiring is connected. Insulation tests shall be made between open contacts of circuit breakers, switches etc. and between each phase and earth.</p> <p>Provide cable shaft for the whole building. Wiring and cables are arranged in shaft for ease of inspection and maintenance.</p>
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### The recommendations for Fire Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>N/A</p>
<p>Short Term (3 Weeks)</p>	<p>Remove all locking devices from all egress doors and means of egress components in accordance with Alliance Standard Section 6.8. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.</p>
<p>Mid Term (6 Weeks)</p>	<p>Install an automatic fire alarm and detection system for the facility. System shall comply with the Alliance Standard and NFPA 72. Consult a qualified fire protection engineer and/or authorized fire alarm company to design and install the system.</p> <p>Develop and execute an emergency evacuation plan which includes all necessary components required by the Alliance Standards. Provide sufficient communication and training of this plan to all employees.</p> <p>Post emergency egress maps at the entrance to all exit stairways and main points of egress.</p> <p>Develop a testing and maintenance program that ensures the emergency power for exit signs is verified at least once per year. If battery-operated signs are used, these signs shall be tested on a monthly basis. Functional testing of battery powered signs shall be provided for a minimum 90 min once per year.</p> <p>Establish a Periodic Programmed Maintenance (PPM) plan for the routine inspection, maintenance and periodic testing for all egress lighting systems at least once per year. If battery-operated lights are used, these lights shall be tested</p>

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	<p>on a monthly basis. Functional testing of battery powered lights shall be provided for a minimum 90 min once per year.</p> <p>Occupant load signage should be posted for every assembly and production floor, at a conspicuous space near the main exit or exit access doorway for the space.</p> <p>Training programs need to be implemented and documented in accordance with the Alliance Safety Training Curriculum.</p> <p>All applicable permits and licenses need to be obtained and kept up to date; including any waiver certificates from BERC.</p> <p>Post stair designation signs at each floor entrance at all stairs in English and Bengali. Signs shall indicate the name of the stairway, the floor level, where the exit discharges to and what floor it originates on. Signs shall be posted adjacent to the door in each floor landing.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Install identification signs at required locations with required components for standpipe system in accordance with NFPA 14.</p>
<p>Long Term (6 Months)</p>	<p>Replace the door with a side-hinged swinging type door, including door hardware, with the necessary fire resistance rating of 1 1/2 hours; relating the specific position requirements. Ensure the position the door so it shall open in the direction of egress without obstructing other paths of egress.</p> <p>In new construction and for newly constructed stairs, stairs shall have a minimum width of 1.5 m (60 in.) for all industrial occupancies. In existing construction, stairs shall have a minimum width of 0.9 m (35 in.).</p> <p>Replace all non-compliant doors and frames in the means of egress with sides swinging opening in the direction of egress type doors in accordance with Alliance Standard. Replacement doors shall be listed, approved, self-closing, fire rated door assemblies (door and frame) with latching panic hardware.</p> <p>Route exits directly to the exterior or provide an exit passageway in accordance with Alliance Standard Section 6.15 or an Egress Court in accordance with Alliance Standard Section 6.17.2 for non-compliant arrangements. Consult a qualified fire protection engineer to design and/or approve the required exit passageway or egress court.</p> <p>Consult an experienced fire protection specialist to aid in the site specific design requirements for the individual fire separation of each occupancy. This design should include the types of materials and installation methods necessary for</p>

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	<p>the correct separation and fire resistive ratings required. The design shall include all protective assemblies, doors, windows, penetrations etc. necessary for factory operation and the standards. Once the design is complete, purchase, construct, install, and certify rectification works.</p> <p>Provide fire-resistive rated construction barriers for exit enclosures in accordance with Alliance Standard Sections 4.5. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Install initiating devices and notification appliances as required by the Alliance Standard and NFPA 72. This includes electrical supervision of all valves controlling fire protection systems (sprinklers, fire pumps, water supplies, etc.). Connect devices to an automatic fire alarm and detection system for the facility. All fire alarm installations shall be submitted for review by the Alliance prior to commencement of installation.</p> <p>Provide certified training by an approved training provider, for the required number of workers necessary for the safe protection of your workers. The training shall cover firefighting, first aid and emergency rescue training including CPR. Additional CPR and advanced first aid training should be considered for electrical staff and those working with, or around dangerous equipment.</p> <p>Route exits directly to the exterior or provide an exit passageway in accordance with Alliance Standard Section 6.15 for non-compliant arrangements. Consult a qualified fire protection engineer to design and/or approve the required exit passageway.</p> <p>Install automatic fire detection and alarm system throughout the factory. Until that time a central station monitoring service or direct connection to the Fire Service and Civil Defence can be set up; a person needs to be assigned to contact the fire department in the event of fire alarm activation. An annunciator needs to be located in a constantly attended location to alert this person.</p> <p>Trouble or alarm notifications shall be indicated on the fire alarm control panel.</p> <p>Provide fire-resistive rated construction barriers between hazard types in accordance with Alliance Standard Sections 3.4 and 4.5. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Provide continuously illuminated exit signs per Alliance Standard Section 6.11. Signs shall be placed at all required exits and along egress paths, especially where there is a change in direction for the path of travel.</p> <p>Extend the parapet of these occupied roofs with same fire rating of outer wall of the building at a minimum height of 1067 mm (42 in.).</p> <p>Establish an inspection, testing and maintenance program for all fire extinguishers. Program must comply with the</p>
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	<p>requirements of NFPA 10.</p> <p>Install handrails on the both side of the stairs. A minimum height of 865 mm (34 in.) and a maximum height of 965 mm (38 in.) as measured from the leading edge of the tread need to be maintained when installing new handrails. The spacing between vertical members will not exceed 200 mm (8 inch). Also provide intermediate handrails when the stair width exceeds 2.2 m (87 in.).</p> <p>Provide fire department connections to allow fire department pumper vehicles to pump water into the standpipe system and another to draft water from ground-level or underground water storage tanks with identification mark in accordance with Alliance Standard. The Siamese connection shall be easily accessible to the fire engine. Connections shall match the Fire Service and Civil Defense hose thread standard.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B.</p> <p>Produce, establish and enforce a written policy and procedure for housekeeping to ensure scheduled cleaning of all floors, walls, ceilings, air ventilation systems and other building components. Ensure the timely removal of defective, waste and rubbish materials is included. As a general rule the maximum tolerable deposit thickness for loose fluffy lint is 13 mm (½ in.) over a maximum of 46.5 m<sup>2</sup> (500 ft<sup>2</sup>). Limit dense deposits to 6 mm (¼ in.) and oil saturated deposits to 3.2 mm (⅛ in.).</p> <p>Establish an inspection, maintenance, and testing program for the standpipe and hose system. Program shall comply with the requirements of NFPA 25.</p>
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