

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

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Name of the Factory	: <b>Arefin Textile Mills Ltd.</b>
Address of the Factory	: Plot # 20-24, BSCIC Industrial Area, Patiya, Chittagong, Bangladesh.
Present Status of the Factory	: <b>Under Operation</b>
Structural Assessment conducted by	: Alliance
Date of Structural Inspection	: 17 May 2014
Fire & Electrical Assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 28 Apr 2014
BGMEA Membership No	: 2154

### **BASIC INFORMATION:**

The Present Garment Factory is comprises of a 1 Main Buildings & no Ancillary Buildings. The following general information was noted:

- i. Building Usage Type : Garments Factory.
- ii. Structural System : RCC Frame structure system with in filled masonry.
- iii. Floor System : Beam Slab type in RCC Building.
- iv. Floor Area : 76,776 Sft.
- v. No. of Stories : Building has two parts: One part is three storied and another part is seven storied.
- vi. Construction Year : 2002-2010
- vii. Foundation Type : Unknown.
- viii. Design Drawings : Not Available.
- ix. Soil investigation Report : Not Available
- x. Construction Materials : RCC (Brick Chips).
- xi. Generator : Ground Floor

### **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 : N/A.

Short Term (3 Weeks) :

- i. Develop a program to ensure that all live loads for which a floor or roof has been designed for will not be exceeded. The designated Load Manager shall oversee this program and ensure it is enforced.
- ii. 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 to RMG vendors and be responsible to ensure that the factory operational loads do not at any time exceed the factory floor load limits as described on the Floor Load Plans.

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Mid Term (6 Weeks)

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- i. Under guidance from a qualified structural engineer arrange core test to validate the in-situ concrete compressive strength of the structural elements.
- ii. Have a qualified structural engineer provide further testing and analysis of cracking in beam or walls and provide a remediation plan to correct noted issues.
- iii. Conduct core test to validate the in-situ concrete compressive strength of the structural elements.
- iv. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- v. Have a qualified structural engineer document the factory's compliance with the seismic and wind requirements stated in the 2006 BNBC.
- vi. Engage a qualified structural engineer to develop the required documentation to confirm the structural integrity of the buildings. Documents must comply with Alliance Standard Part 8, Sections 8.19 and 8.20.
- vii. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standards.
- viii. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading. This should be reflected in the design report.
- ix. Provide signage or the appropriate markings at all areas used for storage of work materials and work products to indicate the acceptable loading limits, as detailed in the Load Plan for that floor.
- x. Have a qualified structural engineer prepare load plans for each floor, including the information required in Section 8.20 of the Alliance Standard. Floor load plans should be visibly posted on all levels of all buildings.
- xi. Have a qualified structural engineer prepare a load plan for each floor and have the floors marked for designating storage area as per the developed load plan.
- xii. The Geotechnical report should be signed properly with MIEB no of the engineer.

Long Term (6 months)

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- i. Apply for issuance of Certificate of Occupancy and pursue the matter.
- ii. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- iii. Provide a protective coating at the structural elements constructed with MCAC exposed to rainfall or other sources of water. Have protective coating approved by the Alliance or a qualified structural engineer. Or provide 2% slope on the exposed surfaces to prevent the accumulation of water.
- iv. Remove deteriorated expansion joint material, and provide new approved materials at the expansion joint.

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

Immediate (3 to 6 Days)	Remove combustible materials from the substation room.
Short Term (3 Weeks)	<p>Determine the cause of the leak and repair the transformer. Replenish oil reserve to appropriate levels. Only qualified personnel should complete the repair work.</p> <p>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. 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> <p>Provide additional light fixtures to increase illumination levels in the substation room, as provided in the BNBC.</p> <p>Provide cable joints with PVC connections with PIB tape wound around the joint.</p> <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>
Mid Term (6 Weeks)	<p>Develop and implement an electrical safety program. Include key topics such as lock out tag out procedures, personal protective equipment requirements, etc. Reference NFPA 70e for example program requirements.</p> <p>Survey all distribution boards and provide dead front construction at all locations. Consult a qualified electrical engineer to provide listing of suitable nonflammable materials to be utilized as part of the dead front construction.</p> <p>Survey the entire building to identify all locations of noncompliance. Connect all metal in the building to the building earthing/grounding system, such as metal rebar in concrete, metal frame of building, or metal water pipe. Consult a qualified electrical engineer to ensure remediation work is completed properly.</p> <p>Provide a means of cover for the conductors serving the generator to protect them from damage. Consult a qualified electrical engineer for required corrective work.</p> <p>Develop an Insulation Resistance Measurement Program that ensures deterioration of insulation resistance will be identified quickly. Testing should be in compliance with Inter National 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</p>

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	<p>breakers, switches etc. and between each phase and earth.</p> <p>Install telecommunication or antenna cables separately to the main point of service. Power and telecommunications cables must have separate entrances. Consult a qualified electrical engineer to provide direction on required corrective work.</p>
Long Term (6 Months)	<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>

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

Immediate (3 to 6 Days)	<p>Keep means of egress continuously free and clear of all obstructions or impediments to ensure full instant use of the means of egress in the case of a fire or other emergency.</p> <p>Immediately remove all combustibles that are being stored underneath the cutting tables at the noted locations.</p>
Short Term (3 Weeks)	<p>Remove all hasps, locks, slide bolts, or other locking devices at the noted locations. According to section 6.8.2.2, doors may be locked where the latch and lock are disengaged with one motion where the occupant load does not exceed 49 persons. Turning a door handle and disengaging a lock is considered two motions. According to section 6.8.2.2, doors may be provided with locking hardware from the ingress side, provided that a panic bar is installed on any door with an occupant load exceeding 49 persons. The re-entry provisions of section 6.8.3 must be met.</p>
Mid Term (6 Weeks)	<p>Develop a testing and maintenance program that ensures the emergency power for exit signs is tested at least once per year. If battery operated signs are used, these lights are tested on a monthly basis. Functional testing of battery powered signs is provided for a minimum 90 minutes once per year.</p> <p>Post the occupant load for every assembly and production floor in the facility in a conspicuous space near the main exit or exit access doorway for the space.</p> <p>Develop an emergency evacuation plan which includes the duties and responsibilities of various people and groups, interfacing between groups and the fire brigade, the process of headcounts and identification of trapped victims, how to provide for physically disabled people and their rescue, etc. The BNBC guidelines are in the Appendix.</p> <p>Fire drills are to be conducted on a quarterly basis, as outlined in BNBC Part 4 Appendix A, for all garment facilities. Fire drills shall be conducted under the direction of a Fire Safety Director. All other requirements for fire drills shall be carried out in accordance with BNBC Part 4, Appendix A.</p>

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	<p>Impart training in accordance with the Alliance Safety Training Curriculum, and keep record of the training with proper documentation.</p> <p>Develop a testing and maintenance program that ensures the emergency power for all egress lighting is verified at least once per year. If battery-operated lights are used, these lights shall be tested on a monthly basis. Functional testing of battery powered lights shall be provided for a minimum 90 min once per year.</p> <p>Arrange for the direct connection of the fire alarm system to a central monitoring station or Fire Service and Civil Defense. Until the time that monitoring can be set up, arrange a monitoring system using the factory's own central detection system and personnel. A person shall be assigned to contact the fire department in the event of fire alarm activation. An annunciator shall be located in a constantly attended location (such as a fire control room) to alert this person.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations in both Bengali and English.</p> <p>Install a complete standpipe system at required locations designed by a qualified fire protection engineer. Also, install required identification signs at the noted locations of the available standpipe system. Signage must comply with NFPA 14, Chapter 6.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Obtain all necessary licenses and permits from the proper issuing authority. Apply to the electricity license issuing board for an electrician's license and to the BERC for a waiver certificate.</p> <p>Apply to BSCIC for issuance of Certificates of Occupancy, and pursue the matter to expedite the process.</p>
Long Term (6 Months)	<p>Remove the existing aisle markings and draw new marking to fulfill the minimum aisle width requirements. Relocate the machines accordingly if necessary.</p> <p>Replace non-compliant doors and frames in the means of egress with side-swinging doors. Replacement doors shall be a minimum width of 0.8 m (32 in), and are listed, approved, self-closing, fire rated door assemblies (door and frame) with latching panic hardware.</p> <p>Replace all collapsible gates that are used as a means of egress with side-hinged, swinging type doors of a proper width and rating.</p> <p>Provide a fire resistance rated exit passageway with protective opening assemblies, as per clause 4.6 to connect the north (middle) stair to the exterior.</p> <p>Provide a rated exit passageway, i.e. a protected path of egress from the exit enclosure to the public way. The rating</p>

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	<p>of the exit passageway is to be equal to the fire rating requirement of the exit that is being served, and shall not be less than 1 hr fire-resistance rated.</p> <p>Train and certify at least 25 percent of workers in fire fighting, first aid, and rescue by the proper authorities.</p> <p>Provide fire resistance rated protections at all windows and other openings and penetrations on all the fire rated walls across the entire premises. If these openings are not required, close them.</p> <p>Install Class-III standpipe system at required locations designed by a qualified fire protection engineer. The system should comply with the requirements of NFPA 14. The hydraulic calculations should be reviewed by the Alliance, and the review is to be completed prior to the start of work.</p> <p>Provide 2 hr fire-resistive rated construction barriers at exit enclosures connecting the ground floor to the roof, and provide 1 hr fire-resistive rated construction barriers at exit enclosures connecting the ground floor to the 2nd floor. Fit side-swinging, self-closing, non-lockable fire doors of the required rating in all exit enclosures that swing in the direction of egress. Consult a qualified fire protection engineer to design the required rated construction barriers.</p> <p>Install a pump dedicated for fire fighting or fire protection, following the requirements of NFPA 20. Fire pump installation is to be tested for final acceptance in the presence of the Alliance, and a final inspection of the installation shall be conducted by the Alliance prior to the final acceptance, as per clause 5.5.5. Acceptance testing of the installation shall be in accordance with NFPA 20, 22, and 24 testing requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance.</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>Repair the cracks in the fire resistance rated beams and ceiling after a proper structural integrity investigation has taken place.</p> <p>Every door in a stair enclosure serving more than five stories shall be provided with re-entry unless it meets the following requirements. Stair doors may be permitted to be locked from the stair (ingress) side that prevents re-entry to the floor provided that at least two floors that allow re-entry to access another exit are provided, there are not more than four stories intervening between re-entry floors, re-entry is allowed on the top or next to top level, reentry doors are identified as such on the stair side, and locked doors shall be identified as to the nearest re-entry floors. When the discharge floor is determined to be a required re-entry floor</p>
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	<p>using the above requirements, re-entry does not have to be provided back into the building on this level.</p> <p>Provide parapets or guards for all occupied roofs with a minimum height of 1067 mm (42 in.).</p> <p>Provide fire-resistive rated construction barriers between hazard types, following Table 4.4.1 of the Alliance Standard or Table 4.1.1 from BNBC Part 4. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Provide handrails on both sides of each stairway. Provide an intermediate handrail when the stair width exceeds 2.2 m (87 inches).</p> <p>Install illuminated exit signs at entrances to exits and along the path of egress anywhere the continuation of egress is not obvious or there is a change in the direction of the path of travel.</p> <p>Provide an emergency power source, either by battery back up or by connecting the signs to the emergency power system, for illuminated exit signs that comply with the Alliance Standard.</p> <p>Portable fire extinguishers need to be installed throughout all new and existing facilities, in accordance with BNBC Part 4, Section 4.10 and NFPA 10. Foam type extinguisher need to be installed in the diesel storage room as per NFPA 10.</p> <p>Install fire department connections where required and in compliance with the Standard. Fire department outlet connections shall be provided to allow fire department pumper vehicles to draw water from ground-level or underground water storage tanks. Connections shall match the Fire Service and Civil Defense hose thread standard.</p> <p>Repave the walking surface to make the change in elevation less than 1/2 inch, or provide a 1 in 2 beveled slope.</p> <p>Fire extinguishers are to be inspected, tested, and maintained in accordance with NFPA 10, Chapter 7. Provide and maintain proper documentation.</p> <p>Establish an inspection, maintenance, and testing program for the fire pump. The program must comply with NFPA 25.</p> <p>Install a complete standpipe system at required locations designed by a qualified fire protection engineer.</p> <p>Establish an inspection, maintenance, and testing program for the available standpipe and hose system. The program must comply with the requirements of NFPA 25 Chapter 6, Table 6.1.1.2.</p> <p>Make sure all required exit signs are illuminated continuously at all times. Exit signs may be illuminated either by lamps external to the sign or by lamps contained within the sign. The source of illumination shall provide not less than 50 lux at the illuminated surface with a contrast of</p>
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	<p>not less than 0.5. Approved self-luminous signs which provide evenly illuminated letters having a minimum luminance of 0.2cd/m<sup>2</sup> may also be used.</p> <p>Establish written corporate and plant policies on housekeeping to ensure scheduled cleanings for floors, walls, ceilings, and supply and return air ventilation systems. Promptly reschedule skipped cleanings. Provide a documented line of authority for authorizing a cleaning delay and rescheduling. 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>Develop a hot-work permit program. The program must comply with the requirements of NFPA 51B. In general, this program should address the process of request and approval from authorities, necessary checks prior to approval, standby fire watch and fire fighting equipment, sounding of alarm procedure, duration and expiry of permit and re-approval procedures, etc.</p> <p>Create a Fire Safety Director position, and fill the position with an individual that has had sufficient training to be able to carry the required duties.</p> <p>The duties of the Fire Safety Director shall include the following:</p> <ol style="list-style-type: none"><li>(1) Establish internal and external rally points and communicate such to all employees in the building.</li><li>(2) Fire department pre-planning.</li><li>(3) Conduct safety inspections as outlined in Alliance standard 13.9.</li><li>(4) Ensure all testing of fire protection equipment is conducted in accordance with Alliance standard 13.10.</li></ol>
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