

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

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Name of the Factory	: <b>AKH Woven Group</b>
Address of the Factory	: 133-134 HEMAYETPUR, SAVAR, DHAKA, 0, BD, Bangladesh
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 12-March-14
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 12-March-14

### **BASIC INFORMATION:**

There is 01 main production building. The following general information was noted:

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|-------|---------------------------|--|
| i.    | Building Usage Type       | : Garments Factory.  |
| ii.   | Structural System         | : Reinforced Concrete Frame  |
| iii.  | Floor System              | : The irregular LLRS and Flat Slab configuration without any walls increases dependency of the building to rely on only perimeter beams. |
| iv.   | Floor Area                | : 157,880 sft.   |
| v.    | No. of Stories            | : 7 story RCC Main Production Building.  |
| vi.   | Construction Year         | : 2007~2008  |
| vii.  | Foundation Type           | : Unknown  |
| viii. | Design Drawings           | : Available.   |
| ix.   | Soil investigation Report | : Available  |
| x.    | Construction Materials    | : For Main RCC buildings of all members, stone chip aggregate have been used.  |
| 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 loading limits as described on the Floor Loading Plans.

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Mid Term (6 Weeks)

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- i. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads such as storage of materials, water tanks, and transmission tower. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- ii. Have a qualified structural engineer confirm that capacity to support the load is available. Load Plans complying with Alliance Standard Part 8 Section 8.20.4.3 should also be developed. It should be displayed in each section of the floor (particularly for the storage area it is very important).
- iii. The effect of this tower on the building needs to be assessed through a detailed analysis (to be performed by a QSEC appointed by the Factory Owner). Adequately anchor and brace all non-structural elements noted above to resist earthquake forces to comply with the BNBC and Alliance Standard.
- iv. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3
- v. Post load plans in each floor as per Alliance Standard Sections 8.10 and 8.20.5.3.
- vi. Provide signage or the appropriate markings at all areas used for storage such as ground floor storage area, 3rd Floor NE storage area, and 9th Floor Storage) to indicate the acceptable loading limits detailed in the Load Plan.

Long Term (6 Months)

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- i. Engage qualified structural engineer to conduct a detailed engineering assessment (DEA) of building within 6 weeks. DEA should include assessment of the strength of the concrete and quantity of the steel in the columns. Concrete strength shall be assessed by taking at least 4 nos. of 4 inch diameter cores from the area of concern. If cores are to be taken from column, it is advisable to take it from an upper level where the stresses are low (for practical reasons 3 inch cores may be taken from columns). In addition, UPV shall be used to have concrete strength in sufficient number of columns in the lower tiers so that a level of confidence is achieved. The calibrated results of core tests and UPV shall be used to determine a reliable value of concrete strength in columns. The size and diameter of steel rebar in most of the columns of two lowest tiers shall be authentically determined using a Ferro scanner or similar device. In order to confirm the diameter of embedded bars as obtained from Ferro scanner, the Assessor may have to remove the concrete cover in one or two locations.

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

Immediate (3 to 6 Days)	Install instruction board for first aid and artificial respiration in the generator and substation rooms.
	Install signage indicating the prohibition of light fixtures

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	without protective covers in all storage areas.
Short Term (3 Weeks)	Develop an electrical safety training program for all workers that may be exposed to electrical safety hazards.
Mid Term (6 Weeks)	<p>Install phase separators between terminal connections at the noted locations.</p> <p>Install switchboards and distribution boards in compliant locations so that operation is not hampered due to limited access.</p> <p>All distribution boards shall be marked with the purpose of the boards, individual ID's, and also be marked with the voltage and number of phases of the supply. Each board shall be provided with a circuit list describing each circuit and what is controls as well as the current rating for the circuit and size of fuse element. Switches and circuits should be properly labeled for quick identification.</p> <p>Consult with a qualified engineer to determine the proper wire gauge for the capacity of the circuit.</p> <p>Wiring inside panels must be arranged and fixed firmly along defined routes to prevent damages to the wires and safety to the operation and maintenance personnel. Cables and wires in panels must be dressed, tied, and follow defined routes without any sharp bends.</p> <p>Remove multi looping of wiring/cables at the noted circuit breakers and install correctly.</p>
Long Term (6 Months)	<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>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)	Remove all combustibles stored underneath the cutting tables at the noted locations as soon as possible.
Short Term (3 Weeks)	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.

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Mid Term (6 Weeks)	<p>Post the occupant load for all assembly and production floor areas in a conspicuous space near the main exit or exit access doorway for the space in accordance with Alliance Standard Section 6.4.4.</p> <p>Install signage adjacent to each stair door indicating the stair name (designate each stair with a unique name/ID) and the floor level at the noted locations in English and Bengali.</p>
Long Term (6 Months)	<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 doors assemblies (door and frame) with latching panic hardware.</p> <p>Provide fire-resistive rated penetration protection for rated floors, walls and assemblies in accordance with Alliance Standard Sections 4.6. Consult a qualified fire protection engineer to design the required penetration systems.</p> <p>Install an automatic sprinkler system throughout the building designed by a qualified fire protection engineer in accordance with NFPA 13. All sprinkler installations shall be submitted for review by the Alliance prior to commencement of installation.</p> <p>Provide fire-resistive rated construction barriers at exit enclosures. Provide minimum 1.5-hr fire rated doors and seal all unprotected openings (e.g. windows) to separate the exit stairs from work areas and other building spaces on all floor levels. Ensure that the fire doors are self-closing and positive latching and that they are provided with fire exit (panic) hardware where serving production floors. If fire doors are required to be held open for functional reasons, provide automatic-closing devices tied to the fire alarm system. Consult a qualified fire protection engineer to design the required rated construction barriers.</p> <p>Existing pump must be evaluated against requirements of NFPA 20 by a qualified fire engineer. Any deficiencies must then be rectified based on advice of engineer. All evaluations should be fully documented. All valves controlling fire pumps systems shall be electrically supervised by fire alarm system control unit.</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.). Devices should be part of an automatic fire alarm and detection system for the facility. Alarm system should initiate occupant notification upon activation of detectors in</p>

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	<p>addition to the manual fire alarm stations. All fire alarm installations shall be submitted for review by the Alliance for review prior to commencement of installation.</p> <p>Interior exit stairways and ramps shall terminate at an exit discharge except where terminating at an exit passageway is constructed to meet the same rating</p> <p>Requirement as the exit that is being served and shall not be less than 1 hr fire-resistance rated construction, therefore a fire rated exit passageway would need to be created. (NOTE: if sprinklers are installed as noted above, this installation will not be necessary per exemption of code)</p> <p>Interior exit stairways and ramps shall terminate at an exit discharge except where terminating at an exit passageway is constructed to meet the same rating</p> <p>Requirement as the exit that is being served and shall not be less than 1 hr fire-resistance rated construction, therefore a fire rated exit passageway would need to be created. (NOTE: if sprinklers are installed as noted above, this installation will not be necessary per exemption of code)</p> <p>Install emergency lighting at all paths of egress. Confirm through testing (light meter) or other certification that means of egress will have illumination of 10 lux for all corridors, exit doors, and stairways and no less than 30 min in the event of failure of normal lighting.</p> <p>During installation of fire rated door assemblies assure that every door in a stair enclosure serving more than 4 stories is provided with re-entry unless it meets the requirements of Alliance Standards Part 6 Section 6.8.3.1.</p> <p>Provide handrails on both sides of each exit stairway and ramp. New handrails shall have 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.</p> <p>Provide Fire Department (Siamese) connections in accordance with Alliance Standard Section 5.5.4. Connections shall match the Fire Service and Civil Defence hose thread standard. Signage for standpipe system is not in compliance with NFPA 14 Chapter 6 (e.g. no sign on Fire Department connection indicating STANDPIPE in 1 in lettering)</p> <p>Provide fire-resistive rated construction barriers between hazard types.</p> <p>Any room or space housing boilers or other heat producing equipment shall be separated from other occupancies by a</p>
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	<p>minimum 1 hour construction.</p> <p>Rooms used for the housing of oil-filled transformers shall be in compliance with BNBC Part 4 Section D 15 for high-rise buildings. Rooms used for storage of combustible materials shall be separated from the surrounding</p> <p>Occupancy with a minimum 1 hour construction. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Install Illuminated exit signs at path of egress were the continuation of egress is not obvious or there is a change in the direction of the path of travel (southwest stair, ground floor).</p> <p>Establish an inspection, testing, and maintenance program for the standpipe system. Program must comply with NFPA 25. The standpipe system needs to be evaluated for compliance with the design pressure and flow demands of NFPA 14 or BNBC as cited in 5.4.3. Standalone standpipe systems shall be confirmed to meet the local BNBC requirements with a minimum 450 kPa (65 psi) pressure at the hydraulically most remote hose connection or NFPA 14. This testing should be documented and available for review.</p> <p>Establish an inspection, maintenance, and testing program for the fire pump. Program must comply with NFPA 25.</p> <p>Additionally, all valves controlling fire pumps shall be electrically supervised by a listed fire alarm system control unit.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B</p>
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