

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

Name of the Factory	: <b>AMC Sweater Ltd</b>
Address of the Factory	: House# 158/283, Choydana, National University, Joydevpur, Gazipur, Bangladesh
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 16 Jun 2014
Fire & Electrical assessment conducted by:	Alliance
Date of Fire Inspection	: 10 Jun 2014
Date of Electrical Inspection	: 10 Jun 2014

### **BASIC INFORMATION:**

The present garment factory is a seven storied RCC building. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: 7 storied Beam Column Frame systems.
iii.	Floor System	: Beam slab.
iv.	Floor Area	: 41000 sft.
v.	No. of Stories	: 7 storied
vi.	Construction Year	: 2000-2002
vii.	Foundation Type	: Unknown
viii.	Design Drawings	: Not available
ix.	Soil investigation Report	: Not available
x.	Construction Materials	: Reinforced Concrete (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 : NA

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. Have a qualified structural engineer provide further analysis and investigation of the structural deficiencies. Structural engineer shall also provide remediation documents if required.
  - ii. Engage qualified structural engineering consulting to conduct detail assessment on this structure within 6 weeks. This should be done in accordance with AP D.5 and should include an investigation of the strength of the concrete and quantity of the steel in the columns in the building. 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). This investigation shall be completed within 6 weeks. In addition, ultrasonic pulse velocity technique (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. Maintain current use of the floors and don't change use or increase occupation, either of which could increase loading. Ensure no floor has more than 1kN/m<sup>2</sup> live load (Occupancy or storage)
  - iii. Have a qualified structural engineer assess the strength of the member constructed with MCAC in the building. 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, ultrasonic pulse velocity technique (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 other key structural members.
  - iv. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
  - v. 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.
  - vi. Develop engineered plans to brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard. Install anchor and braces as shown on approved plans.
  - vii. Detail assessment of columns should include Ferro scanning of each and every column of ground floor.
  - 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. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition.
  - x. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads. If

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provisions have not been made, have a qualified structural engineer develop a remediation plan.

- xi. 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.
- xii. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- xiii. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xiv. Provide Certificates of Occupancy for review.
- xv. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xvi. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3
- xvii. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard.
- xviii. Under guidance from a qualified structural engineer arrange geotechnical investigation at close vicinity of the structure and make the report available for review.

Long Term (6 months) : Necessary remediation after DEA.

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

Immediate (3 to 6 Days)	Remove impediments, obstructions, and stored materials from means of egress paths. Modify and mark the noted aisles to maintain the minimum required clear width of 0.9m (36 in) as necessary.
Short Term (3 Weeks)	<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>Store flammable chemicals away from combustible materials in designated areas and/or in a flammables cabinet or room with sufficient fire rated construction in accordance with Alliance Standard Section 3.4.2.1.6 and Section 3.4.2.1.8.</p> <p>Develop a smoking policy for the facility including designated smoking areas in accordance with the Alliance Standard.</p>

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Mid Term (6 Weeks)	<p>Install a new automatic fire alarm and detection system. Once installed, arrange for direct connection of the fire alarm and detection system to a central station monitoring service or the Fire Service and Civil Defense as per Alliance Standard Part 5 Section 5.7.5 Monitoring. Until that time that a central station monitoring service or direct connection to the Fire Service and Civil Defense can be set up, a person trained to contact the Fire Service and Civil Defense in the event of fire alarm activation shall be provided. An annunciator shall be located in a constantly attended location (such as a fire control room) to alert this person.</p> <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>Develop a testing and maintenance program that ensures the operation of 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>Complete and document fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level in English and Bengali at the noted locations.</p>
Long Term (6 Months)	<p>Provide fire-resistive rated construction barriers and associated opening protection 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>A standpipe system shall be provided for the building in accordance with the Alliance document Section 5.4 and NFPA 14. Any newly installed standpipe system needs to be evaluated for compliance with the design pressure and flow demands of NFPA 14 or BNBC Section 5.4.3.</p> <p>Install initiating devices and notification appliances as required by the Alliance Standard and NFPA 72. Devices should be part of 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>Install a dedicated fire pump for the facility in accordance with NFPA 20 to supply the demands of the connected fire protection systems along with a stored source of water sufficient to meet the demands in accordance with NFPA 22. Fire pump installation is to be tested for final acceptance in presence of Alliance and a final inspection of the installation shall be conducted by the Alliance prior to final acceptance of the installation by the Alliance as per clause 5.5.5. Acceptance testing of the installation shall be in accordance with NFPA 20, 22, and 25 testing</p>

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	<p>requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance by the Alliance.</p> <p>Provide proper aisles marking (clear width minimum 36 in.) and keep aisles free of storage. The path of egress travel along a means of egress shall not be interrupted by any obstruction. The capacity of the means of egress shall not be reduced along the path of travel.</p> <p>Provide fire-resistive rated penetration protection for rated walls and assemblies in accordance with Alliance Standard Sections 4.6 and 4.7. Consult a qualified fire protection engineer to design the required penetration systems.</p> <p>Provide Fire Department (Siamese) connections in accordance with Alliance Standard Section 5.5.4. Connections shall match the Fire Service and Civil Defense hose thread standard.</p> <p>Provide handrails on both sides of each stairway. Intermediate handrails shall be provided when the stair width exceeds 2.2 m (87 in.). Mount handrails at a height between 30 in. and 44 in.</p> <p>Install emergency lighting for all paths of egress in accordance with Alliance Standard Section 6.7. Illumination needs to be a minimum of 10 lux for all corridors, exit doors and stairways. Illumination for aisles needs to be a minimum of 2.5 lux. Egress lighting shall be provided with emergency power or supplemented with battery powered lights that provide a minimum of 10 lux for not less than 30 min. in the event of failure of normal lighting.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B.</p>
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### The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	Need to keep switchboards and/or distribution boards dirt and debris.
Short Term (3 Weeks)	<p>Establish a periodic inspection program to ensure the electrical systems are free from damage, debris, dirt, lint, etc. Maintain records concerning inspections and follow up actions.</p> <p>Need to joint cable through porcelain/PVC connectors with PIB tape wound around joint.</p> <p>Generator frame earthing shall be two points separately. This is a violation of Bangladesh Electricity rules 1937,</p>

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	<p>Clause 57 (2).</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>
<p>Mid Term (6 Weeks)</p>	<p>Develop and implement an electrical safety program. Include key topics such as lock out tag out procedures, personal protective equipment requirements, etc.</p> <p>Clear identification/markings must be available at LT, MDB and DB MCB/MCCB. Clear and permanent identification marks are required to be painted in all distribution boards, switchboards, sub main boards and switches as necessary.</p> <p>Remove multi looping of wiring/cables at circuit breakers within switchboards and/or distribution boards.</p> <p>Have a qualified electrical engineer develop as-built electrical drawings providing detailing key components of the electrical system.</p> <p>Higher rated MCCB/MCB is used to protect the lower rated cable in MDB/SDBs is a violation of section: 2.7.6.3 and 2.7.6.4 of BNBC-2006.</p> <p>Provide clearance of 1m (39in) in front of all switchboards and/or distribution boards.</p> <p>Provide protective devices (circuit breakers) for all circuits drawn for loads.</p> <p>Install phase separators between terminal connections at the noted locations.</p>
<p>Long Term (6 Months)</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>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>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, switchgear 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>