

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

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Name of the Factory	: <b>WARM FASHION LTD.</b>
Address of the Factory	: 1670/2091, West Sholoshahar, Aturer, Dipy, Chittagong
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 15 Jun 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 15 Jun 2014

### **BASIC INFORMATION:**

The present garment factory is comprises of a 1 Main Building. The following general information was noted:

- i. Building Usage Type : Garments Factory.
- ii. Structural System : First 6 Stories: Moment resisting frames with monolithic concrete beams, slabs and columns. Top Story: Concrete columns supporting structural steel roof truss. Foundation System: Unknown
- iii. Floor System : Beam slab type in RCC Building
- iv. Floor Area : 39,837 SF
- v. No. of Stories : 7 (Ground+6)
- vi. Construction Year : 2001 (First 6 Stories)
- vii. Foundation Type : Unknown.
- viii. Design Drawings : Available.
- ix. Soil investigation Report : 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 : 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 load limits as described on the Floor Load 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. Under guidance from a qualified structural engineer arrange Detail Engineering Assessment of the structure. This assessment should include destructive core testing to validate the in-situ concrete compressive strength of structural elements.
- iii. Engage a qualified structural engineer to provide additional investigation into the areas of distress, separations, or cracking and provide a remediation plan if required.
- iv. Have a qualified structural engineer provide further testing and analysis of the masonry wall cracking and provide a remediation plan to correct noted issues.
- v. As part of the detailed assessment and preparation of as-built structural drawings (both detailed elsewhere), utilize ferro-scanning to determine the in-situ reinforcing configuration within representative structural elements throughout the building for use during structural integrity calculations.
- vi. 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.
- vii. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition.
- viii. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- ix. 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.
- x. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- xi. As part of the detailed assessment outlined elsewhere, have a qualified structural engineer assess the durability aspects as suggested in Alliance Standard Part 7 Section 7.2 and take appropriate remedial measures. This assessment should include destructive core testing to validate the in-situ concrete compressive strength within structural elements.
- xii. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xiii. Complete further testing on areas of deterioration in order to understand the level of corrosion and potential weakening of the member and have a qualified structural engineer develop a remediation plan.

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- xiv. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- xv. Have a qualified structural engineer complete further analysis of the structure and develop a remediation plan if required. This analysis should focus on whether lateral bracing is required for the structural steel roof trusses.
- 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. Floor load plans should be visibly posted on all levels of all buildings.
- xviii. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xix. Under guidance from a qualified structural engineer arrange geotechnical investigation at close vicinity of the structure and make the report available for review.
- xx. Engage a qualified structural engineer to design an appropriate structural expansion joint using an appropriate expansion joint material (not just mortar). Remove the existing expansion joint material and install new expansion joint provisions per recommendations of the structural engineer..

Long Term (6 months) :

- i. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- ii. 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. Alternatively, provide a 2% roof slope on the exposed surface and drains with downspouts at low points to prevent accumulation of water
- iii. Provide Certificates of Occupancy for review

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

Immediate	<p>Ensure the generator room clean and free of stored combustible materials.</p> <p>Find out the cause of overheating, sign of burning and take proper action including replacing cable or equipment where necessary.</p> <p>Need to use non-combustible materials with enclosure.</p>
Short Term (3 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>Ensure light fixtures without protective covers are not</p>

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	<p>installed in storage areas or in any area where the Inspector of the Factories Rules disallows these fixtures.</p> <p>Provide clearance of at least 1 m (39 in) in front of distribution boards.</p>
Mid Term (6 Weeks)	<p>Consult with a qualified Electrical Engineer and ensure electrical 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 earthing of equipment at required locations and connect to required number of electrodes. Refer to the BNBC for required number of electrodes.</p> <p>Ensure overcurrent protection device (circuit breaker) for each and every loads.</p> <p>In order to avoid the effects of heat from external sources one of the following methods should be used to protect wiring systems: (1) shielding; (2) placing 900 mm (36 in.) from the source of heat; (3) local reinforcement or substitution of insulating material.</p> <p>Led telecommunication or antenna cables separately to the main point of service. Power and telecommunications cables must have separate entrance.</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> <p>Ensure appropriate size for generator room in order to properly access the generator to perform routine maintenance activities.</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>

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

Immediate	N/A
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.
Mid Term (6 Weeks)	<p>Post the occupant load for every assembly and production floor in a 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 all</p>

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	<p>components required by the Alliance Standards and communicate the plan to all employees. The evacuation plan shall include provisions to assist physically disabled persons. A list of all employees with physical disabilities shall be kept by the Fire Service Director.</p> <p>Impart training in accordance with Alliance Safety Training Curriculum and keep proper documentation.</p> <p>Provide an automatic fire alarm and detection system per NFPA 72 and arrange for direct connection of the system to a central station monitoring service or the Fire Service and Civil Defense. 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 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>Develop a testing and maintenance program that ensures the emergency power 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 30 min once per year.</p> <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 min once per year.</p> <p>Conduct fire drills on a quarterly basis as outlined in BNBC Part 4 Appendix A. Fire drills shall be conducted under the direction of a Fire Safety Director. All other requirements for fire drills shall be conducted in accordance with BNBC Part 4 Appendix A.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Apply to Bidyut Paridaptor for electrician license. Apply to Chittagong Development Authority (CDA) for approval for unapproved structure at 6th floor of main building. Apply to Bangladesh Energy Regularity Commission (BERC) for BERC license. Apply to Fire Service &amp; Civil Defense for a license that accommodated the additional area. Get a boiler license for boiler operator.</p> <p>Install a standpipe system at required locations designed by a qualified fire protection engineer. Install required identification signs at the noted locations. The standpipe system and signage must comply with NFPA 14 Chapter 6.</p> <p>Apply to FSCD for issuance of occupancy certificates and pursue the matter's expedition.</p>
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<p>Long Term (6 Months)</p>	<p>Replace all non-compliant doors and frames in the means of egress with doors that are listed, approved, automatic-closing, side-swinging, and fire rated in compatible fire rated frames with latching panic hardware.</p> <p>Seal the openings in the wall of generator room or provide opening protective assemblies to ensure 1 hour fire resistance of the walls.</p> <p>Train and certify at least 25 percent of workers in fire fighting, first aid and rescue by the proper authority.</p> <p>Provide 2 hr fire-resistive rated construction barriers at exit enclosures. Fit side-swinging, self-closing, non-lockable fire doors of 1.5 hr rating in all stairwell enclosures. Consult a qualified fire protection engineer to design the required rated construction barriers.</p> <p>Install dedicated fire pump following the requirements of NFPA 20. 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. 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 by the Alliance.</p> <p>Provide an automatic fire alarm and detection system. Pull stations at egress points, smoke detectors in air handling equipment, visual and audible devices must be spaced appropriately and directly connected to the fire alarm system for automatic activation based on occupancy type in accordance with NFPA 72.</p> <p>Provide fire-resistive rated opening or 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 opening protectives or penetration systems.</p> <p>Install class I standpipe system at required locations. Standpipe system must comply with NFPA 14.</p> <p>Provide 1.5 hr fire protective opening assemblies in 2 hr rated exit enclosures.</p> <p>Protect the exit passageway with protective opening assemblies in accordance with Alliance standard 6.14 and 6.15.</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 fire-resistive rated construction barriers between hazard types following Table 4.4.1 of Alliance Standard or Table 4.1.1 from BNBC Part 4. Consult a qualified fire protection engineer to design the required rated construction</p>
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	<p>barriers.</p> <p>Install fire extinguishers based on hazard type in accordance with BNBC Part 4 and NFPA 10.</p> <p>Establish an inspection, testing, and maintenance program for all fire extinguishers and prepare proper documentation. Program must comply with NFPA 10.</p> <p>Provide re-entry to floor levels from the stairwells in accordance with Alliance Standard Section 6.8.3.</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>Install emergency lighting for all paths of egress in accordance with Alliance Standard Section 6.7. Illumination shall be a minimum of 10 lux for all corridors, exit doors, and stairways. Aisles shall be provided with a minimum 2.5 lux.</p> <p>Ensure the backup power is provided with sufficient capacity and connected with the lamps contained inside the exit signs and functioning properly at all times. Also, the arrangement of the lamps inside the exit signs has to be appropriate for proper illumination.</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 new handrail at a height consistent with existing height (between 30 in. and 44 in).</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. 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 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> <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 of authorities, necessary checks prior to approval, standby fire watch and fire fighting equipment, sounding of alarm procedure, duration and expiry of permit and reapproval procedures, etc.</p> <p>Establish written corporate and plant policies on housekeeping to ensure scheduled cleaning for floor, wall, ceiling, 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</p>
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	<p>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>Install a standpipe system at required locations designed by a qualified fire protection engineer and institute an inspection, testing and maintenance program for the system.</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 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>
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