

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Tivoli Apparel Ltd
Address of the Factory	: C-13, South badda, Gulshan-1, Dhaka, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 22 May 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 22 May 2014

BASIC INFORMATION:

The present apparel factory is a five storied building. The following general information was noted:

- i. Building Usage Type : Apparel Factory.
- ii. Structural System : Beam-Column,Frame (Moment resisting frame.)
- iii. Floor System : Beam-Supported slab.
- iv. Floor Area : 24455.58 SF
- v. No. of Stories : 5 storied.
- vi. Construction Year : Date is not available.
- vii. Foundation Type : Isolated column footing.
- 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 (3 to 6 Days) :

- i. Immediately remove debris and undocumented brick enclosure structure the from roof level.
- ii. Correct issues noted in BGMEA assessment report. Rooftop debris shall be immediately removed. Have a qualified structural engineer provide further analysis of the identified brick facade cracks to determine the appropriate course of corrective action.

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

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operational loads do not at any time exceed the factory floor load limits as described on the Floor Load Plans.

Mid Term (6 Weeks)

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- iii. Engage a qualified structural engineer to do detail Engineering assessment of the structure with detailed NDT or SDT
 - iv. Engage a qualified structural engineer to provide additional investigation into the areas of distress, separations, or cracking and provide a remediation plan if required.
 - v. Have a qualified structural engineer provide further testing and analysis of distress, settlement, shifting, or cracking in columns or walls and provide a remediation plan to correct noted issues.
 - vi. Engage a qualified structural engineer to confirm structural performance of the structure.
 - vii. 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.
 - 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 further analysis of the structure and develop a remediation plan if required.
 - x. Appoint a qualified structural engineer to prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
 - xi. 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.
 - xii. Engage a qualified structural engineer to prepare standard design document compliance with the seismic and wind requirements stated in the 2006 BNBC.
 - xiii. Appoint a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind load and storm surge load.
 - xiv. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
 - xv. 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.
 - xvi. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
 - xvii. Have a qualified structural engineer for developing Floor Load Plans as per the requirements.

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- xviii. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard and have posted in all required location.
- xix. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xx. Engage a qualified structural/geotechnical engineer and arrange geotechnical investigation at close vicinity of the structure and make the report available for review.
- xxi. Organization is to apply for certificate of occupancy.
- xxii. Have a qualified structural engineer provide further analysis of the identified cracks to determine the appropriate course of corrective action.

Long Term (6 months)

- i. 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% slope on the exposed roof surface to prevent accumulation of water.
- ii. Necessary remediation after DEA.

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 allow full instant use in the case of fire or other emergency.</p> <p>Remove cooking arrangement from landing immediately.</p> <p>Remove all combustibles stored underneath the cutting tables at the noted locations.</p>
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>
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>Conduct fire drills 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.</p> <p>Once the system is installed, 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</p>

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	<p>alert this person.</p> <p>Post emergency egress maps/fire evacuation maps at the entrance to each exit stair or main point of egress.</p> <p>Develop an emergency evacuation plan which includes duties and responsibilities of various people/groups, interfacing between groups and fire brigade, headcount and identification of trapped victims, physically disabled people and their rescue, etc.</p> <p>Impart training in accordance with Alliance Safety Training Curriculum and keep record with proper documentation.</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>Develop a testing and maintenance program that ensures the operation of all exist signs is verified at least once per year. If battery-operated signs are used, these lights shall be tested on a monthly basis. Functional testing of battery powered signs shall be provided for a minimum of 90 min once per year.</p> <p>Complete 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 at the noted locations.</p> <p>Apply to authority for issuance of Certificates of Occupancy and pursue the matter's expedition.</p> <p>Apply to Biddyut Paridaptor for BERC waiver certificate.</p>
<p>Long Term (6 Months)</p>	<p>Provide an automatic fire alarm and detection system per the Alliance Standard. 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>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 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>Install a standpipe system at required locations designed by a qualified fire protection engineer. The system is to be compliant with the requirements of NFPA 14. The hydraulic calculations should be reviewed by Alliance and reviewed to be completed prior to start of work. All</p>

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	<p>standpipe system installations shall be submitted for review by the Alliance for review prior to commencement of installation. System design should also account for the two additional stories currently under construction. Testing of the installation shall be conducted in accordance with NFPA 14 acceptance testing requirements. Documentation of all testing shall be submitted for review by the Alliance. Final inspection and testing of the installation shall be witnessed by the Alliance.</p> <p>Install outward opening, 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>Replace the existing non-compliant doors with 1.5 hr rated fire doors of width 0.8 m or greater.</p> <p>Close all openings across the span of the stair and 10 feet on each side from ground level to roof.</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 occupied roof with the minimum number of exits (2) required.</p> <p>Replace all non-compliant doors and frames in the means of egress with doors that are listed, approved, automatic-closing, side-swinging, fire rated doors in compatible fire rated frames with latching panic hardware.</p> <p>Provide protective opening assemblies of required rating as per clause 4.6.</p> <p>Replace the existing exterior steel stair with a new one that satisfies the minimum width requirement.</p> <p>Install fire door at egress point of production area.</p> <p>Provide opening protections at all unprotected openings on all the fire rated walls in the premises. If these openings are not required, close these.</p> <p>Remove all items blocking aisles to satisfy requirement that means of egress be kept clear.</p> <p>Remove existing aisle markings and draw new markings on the 2nd floor to fulfill the minimum aisle width requirement. Provide aisle marking on 4th floor.</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>Provided parapets or guards for all occupied roofs of a minimum height of 1067 mm (42 in).</p> <p>Install emergency lighting for all paths of egress.</p>
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	<p>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>Provide an emergency power source, either by battery backup or by connecting to the emergency power system for compliantly illuminated exit signs.</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>Raise the electrical lighting to ensure that projections from ceiling are not less than 2.03 m clear of the floor.</p> <p>Fire extinguishers are to be inspected, tested, and maintained in accordance with NFPA 10 Chapter 7.</p> <p>Repave the walking surface to make the change in elevation less than 1/2 inch and keep beveled slope 1 in 2. Try to keep walking surface mostly level.</p> <p>Provide handrails on both sides of each stairway. Provide handrails of height between the range 865 mm (34 in) and 965 mm (38 in).</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 barrier.</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">(1) Establish internal and external rally points and communicate to all employees in the building.(2) Fire department pre-planning.(3) Conduct safety inspections as outlined in Alliance standard 13.9.(4) Ensure all testing of fire protection equipment is conducted in accordance with Alliance standard 13.10. <p>Develop a hot-work permit program. The program must comply with the requirements of NFPA 51B. In general, this program should address 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 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 for loose fluffy lint is 13 mm (1/2 in.) over a maximum of</p>
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	46.5 m ² (500 ft ²). Limit dense deposits to 6 mm (¼ in.) and oil saturated deposits to 3.2 mm (⅛ in.).
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The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	<p>Ensure the generator room clean and free of dirt, debris, and improperly stored materials.</p> <p>Find out the cause of burning and take proper action.</p> <p>Ensure distribution boards free of dirt and debris.</p> <p>Remove all dirt, debris, lint and improperly stored materials from the substation room.</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 proper identification of emergency power switchboards, distribution boards, and circuits.</p> <p>Ensure Lighting fixtures are supported from the structure and seismic bracing is installed as required.</p>
Mid Term (6 Weeks)	<p>Have a qualified electrical engineer develop an as-built single line diagram detailing key components and capacity of the electrical system.</p> <p>Remove multi looping of wiring/cables at circuit breakers within distribution boards.</p> <p>Ensure distribution boards are metal enclosed with a dead front construction.</p> <p>Provide emergency power connection for life safety loads (fire alarm, emergency lighting, exit signage, etc.).</p> <p>Consult with a qualified Electrical Engineer and ensure electrical wiring/cables are sized according to capacity of circuit breakers.</p>
Long Term (6 Months)	<p>Ensure the generator room properly rated and physically separated from the remainder of the building.</p> <p>Install lightning protection system on the building.</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).</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 & Rotating Equipment and NFPA70B or a comparable standard. Maintain the record of thermal scanning.</p>

