

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Bonny Apparels (PVT) Ltd - Unit 2
Address of the Factory	: 1 Chowdhurypara (3rd floor) D.I.T. Road Dhaka, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 17 April 2014
Fire & Electrical assessment conducted by:	Alliance
Date of Fire & Electrical Inspection	: 17 April 2014

BASIC INFORMATION:

The present garment factory comprises of two buildings: one 7-storied building and one single storied shed. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: 7-storied RCC beam column frame structure and one steel shed on roof
iii.	Floor System	: Beam Supported slab system
iv.	Floor Area	: 10,500 sft.
v.	No. of Stories	: 7 storied RCC + one shed on roof
vi.	Construction Year	: 1993
vii.	Foundation Type	: Unknown
viii.	Design Drawings	: Not available
ix.	Soil investigation Report	: Not available
x.	Construction Materials	: Reinforcement (brick chips), steel beam and truss
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. Operations in the building can continue; however, the live load during the operations shall not exceed 1 kN/m² (20 psf) and no storage load (above 20 psf) shall be allowed except on the ground floor.
- ii. All interior brick walls within the building shall be rearranged immediately in order to reduce the Dead Loads within the building.
- iii. The operations on the roof (Al -Amin Fashion) must be removed and all installations from the roof must be removed and emptied immediately.

Short Term (3 Weeks) :

- i. 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

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trained in calculating operational load characteristics of the specific factory.

- ii. 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.

Mid Term (6 Weeks)

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- i. Detailed Engineering Assessment (DEA) shall be started immediately and completed within 6 weeks under the supervision of a certified professional structural engineer. This assessment should include destructive core testing to validate the in-situ concrete compressive strength of structural elements
- ii. Engage a qualified structural engineer to provide additional investigation into the noted beam cracks and provide a remediation plan if required.
- iii. The compressive strength of columns using MCAC shall be investigated by an appropriate program of in-situ testing and representative destructive testing of core samples by a qualified structural engineer.
- iv. Have a qualified structural engineer complete a detailed engineering analysis of the structure (as mentioned elsewhere) and develop a remediation plan if required.
- v. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- 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. 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.
- viii. Remove the undocumented roof top structure or have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition.
- ix. 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.
- x. 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.
- xi. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind and storm surge loading.
- xii. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.

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- xiii. 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 the building.
- xiv. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan (noted elsewhere).
- xv. 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 : Depending on the findings of the DEA, permanent remedial measures should be taken for the safety of the building.

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.
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>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 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 to alert this person.</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>Post maximum occupant load for all areas (near exit). As noted elsewhere, floor loads must be limited to the available capacity of the exit stairs.</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>Develop a training program that is implemented and documented in accordance with the Alliance Safety</p>

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	<p>Training Curriculum. All employees should receive at least awareness level training on fire safety.</p> <p>Create and post revised evacuation plans that detailed map of each floor of the facility and includes location of all emergency exits, escape routes, safety equipment and hazardous areas.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations in English and Bengali.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Upon installation of compliant standpipe system, include required identification signs at the noted locations. Signage must comply with NFPA 14.</p>
<p>Long Term (6 Months)</p>	<p>Revise the design of the stairs and landings to assure the effective width of the egress pathway is not reduced at any point along the path. Consult with structural and fire engineer to determine options for redesign (e.g. increase of landing width). Alternatively, per Section 6.9.2.2 of the Alliance Standard, existing landings that are less than the stair width shall reduce the overall capacity of the stair, which in turn may reduce the allowable maximum occupant load for a floor(s). Reduce and enforce the allowable maximum occupant load for the floor to the occupancy allowable by the reduced stair width.</p> <p>Design and install a second exit from occupied floors with sufficient width based on predicted occupancy. Consult with qualified structural and fire engineer to determine options for alternative exit.</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 doors assemblies (door and frame) with latching panic hardware.</p> <p>Revise exit approach to allow for landing in front of exit doorway (as noted elsewhere this door to exit enclosure will require fire rated door assembly that will swing out on landing). It is likely the door assembly will need to be set back from stair landing to prevent reduction in stair egress due to door swing. Consult with qualified structural and fire engineer regarding re-design.</p> <p>Revise design of stair and landing so as landings are provided with the same width in the direction of egress travel as the stair clear width. Consult with qualified structural and fire engineer regarding proper design. Alternatively, per Section 6.9.2.2 of the Alliance Standard, existing landings that are less than the stair width shall reduce the overall capacity of the stair, which in turn may reduce the allowable maximum occupant load for a floor(s). Reduce and enforce the allowable maximum occupant load for the floor to the occupancy allowable by the reduced stair width.</p>

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	<p>Install automatic fire sprinkler systems throughout the facility. System shall comply with Alliance Standards and NFPA 13. All sprinkler installations shall be submitted for review by the Alliance prior to commencement of installation.</p> <p>Install a standpipe system designed by a qualified fire protection engineer. System should include rated fire pump and Class III standpipe hose connections (65 mm) in each stairwells at each floor level including occupiable roofs. Standpipe system must comply with NFPA 14.</p> <p>Factory will need to install fire rated door assemblies at all exits to protected egress (stairwells) (1.5 hour rating). Fire doors assemblies shall conform to NFPA 252. Doors must remain in closed position or be of self-closing type.</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 requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance by the Alliance.</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. All fire alarm installations shall be submitted for review by the Alliance for review prior to commencement of installation. In the interim, review and confirm the working order of existing manual alarm system.</p> <p>Install parapet or guard on the roof with a minimum height of 1067 mm (42 in.).</p> <p>Handrails shall be provided 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. Handrails with a circular cross section shall have an outside diameter of at least 1 1/4 inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than 6 1/4 inches (160 mm) with a maximum cross-section dimension of 2 1/4 inches (57 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).</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</p>
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	<p>Alliance Standards Part 6 Section 6.8.3.1.</p> <p>Install guard at edge of sub-stairs. New guards shall have a minimum height of 1067 mm (42 in.).</p> <p>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 2.5 lux for aisles for no less than 30 min in the event of failure of normal lighting.</p> <p>Remove undocumented structure from roof or provide sufficient fire resistance materials/protection to comply with BNBC fire code for this type of building.</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>Remove sliding door rails and concrete impediments in all paths of egress. Installation of side swing doors (as noted elsewhere) may require the removed of sliding doors in any case.</p> <p>The boiler room shall be separated from other occupancies by a minimum 1 hour construction. It is recommended to retain the services of a qualified fire engineer to design the construction barrier. The cooking area shall be separated from other occupancies by a minimum 1 hour construction. It is recommended to retain the services of a qualified fire engineer to design the construction barrier.</p> <p>Establish an inspection, testing, and maintenance program for all fire extinguishers. Program must comply with the requirements of NFPA 10. All extinguishers must be reviewed for applicable maintenance dates.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B.</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.</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>Once new standpipe system is installed, establish an inspection, testing, and maintenance program for the standpipe system. Program must comply with NFPA 25. 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>Provide continuously illuminated exit signs at all required exits and along egress paths, especially where path has a</p>
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	change of direction. 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 ² may also be used. Assure that all exit signs meet this requirement at all times.
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The recommendations for Electrical Safety corrective actions are:

Immediate	NA
Short Term (3 Weeks)	<p>Develop an electrical safety training program for all workers that may be exposed to electrical safety hazards. Training program should be in line with NFPA 70E: STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE or equivalent standard. Agenda, materials, and attendance should be documented and kept on file for review.</p> <p>The generator frame shall be earthed by two separate and distinct connections to earth.</p> <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>Install signage indicating the prohibition of light fixtures without protective covers in all storage areas.</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 the MDB. Each breaker should service a single circuit. It is necessary to connect the single cable in a single port of the system.</p> <p>Provide a dedicated neutral for each circuit.</p> <p>Provide electrical insulation mats in front of all switchboards and distribution boards.</p>
Long Term (6 Months)	<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>Thermographic scanning should be part of the electrical maintenance program. 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.</p>