

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Stylo Fashion Garments Ltd.
Address of the Factory	: Nanduain, Masterbari, Bhawal, Mirzapur, Gazipur, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 13 May 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 28 May & 13 May 2014

BASIC INFORMATION:

The factory comprises of four buildings. Main building is of 4 stories with beam-column frame system (GF & 1st floor) and concrete slab on metal deck at top structural steel beam (2nd & 3rd floor). 2 storied ancillary building is with beam-column frame system. Other 2 nos of ancillary buildings are of single story as shed. The following general information was noted:

i. Building Usage Type	: Garments Factory
ii. Structural System	: Main Building: Monolithic concrete beam and slab system with beams spanning both directions between columns at the ground & first floor. Concrete slab on metal deck atop structural steel beams at the second and third floors. Daycare/Security: Building frame structure (Column-beam frame). Generator Building: Prefabricated steel frame structure with tin roof. Dining shed: Prefabricated steel frame structure with tin roof.
iii. Floor System	: RC beam supported slab
iv. Floor Area	: Main Building: 1,80,000 sft Ancillary Building: 12,275 sft
v. No. of Stories	: Main Building: 4 story + Shed on roof (Dismantled) Ancillary Building : 1 & 2 storied
vi. Construction Year	: Main Building: 2004
vii. Foundation Type	: Column-footing (shallow foundation- spread footing)
viii. Design Drawings	: Not Available
ix. Soil investigation Report	: Available
x. Construction Materials	: Reinforced concrete (Brick chips with rebar)
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) :
- The top surface of the structural framing elements exposed to weather must be completely sealed from water intrusion by a well maintained protective coating. Alternatively, create a positive drainage slope of at least 2% and provide drains with downspouts

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

at low points to prevent water ponding, then the requirement for complete sealing of the top surface may be waived. All columns (for extensions) should be provided with proper protective coating if they remain exposed.

- ii. Clear water from rooftops. If necessary install positive drainage slope on the roof of at least 2% with drains and downspouts at low spots to prevent ponding or reseal rooftop (detailed elsewhere) and maintain protective coating.

Short Term: (3 Weeks)

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- 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.

Mid Term: (6 Weeks)

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- i. Have a qualified structural engineer provide analysis of the identified cracking to determine the cause of the cracking. Repair as deemed necessary.
- ii. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard. All elements in all buildings must be evaluated and included in drawings including a detailed design report.
- iii. The compressive strength of structural elements constructed with MCAC shall be investigated by an appropriate program of in-situ testing and representative destructive testing of core samples
- iv. Engage a qualified structural engineer to develop the required documents to confirm compliance with building code. Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
- v. 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.
- vi. 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 and should be displayed in each section of all floors (particularly for the storage areas).
- vii. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading. Compliance may be waived if the Factory Owner provides satisfactory evidence of a cyclone operations plan that includes full evacuation of the factory in advance of any approaching cyclone.
- viii. Complete the removal of the rooftop shed as planned. Alternatively, have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition and make changes according to recommendations.

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

- ix. Organize storage on racking systems. Adequately anchor and brace all non-structural elements such as rack systems and water tanks as noted above to resist earthquake forces to comply with the BNBC and Alliance Standard.
- x. All construction including demolition shall require a permit. Permits shall also be obtained from relevant organizations for service connections and other facilities. A demolition plan should be available for review. This should include any follow up disconnections or other work that will need to occur.
- xi. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.
- xii. 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.
- xiii. 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).

Long Term : NA

The recommendations for Fire Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>Remove all stored materials under the stairwells at the noted locations. Establish and enforce housekeeping policies to keep stairs clear of storage.</p> <p>Remove all combustibles stored underneath the cutting tables at the noted locations. Establish and enforce a housekeeping policy to keep these areas clear of storage.</p>
<p>Short Term (3 Weeks)</p>	<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>For maximum occupants load 4 possible alternatives: 1. Add one more stair with width 2.3 m; 2. Renovate any existing stair width to meet requirement; 3. Limit number of workers in any floor to not exceed 712; 4. Install automatic sprinkler protection in this factory which will allow an increase to a maximum of 1,138 persons.</p> <p>Construct a chemical storage room following the requirements of BNBC Part 3 Section 2.4 (2 or 4 hour rated construction depending on the total volume and classification of chemicals stored) or alternatively move chemical storage to a segregated area separate from other occupancy types.</p>
<p>Mid Term (6 Weeks)</p>	<p>Post the occupant load for every assembly and production floor in the facility in a conspicuous space near the main exit or exit access doorway for the space.</p>

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>Upon installation of compliant standpipe system, include required identification signs at the noted locations. Signage must comply with NFPA 14.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations as per Alliance Standard Part 6 Section 6.9 Stairs.</p> <p>Signage for standpipe system is not in compliance with NFPA 14 Chapter 6.</p> <p>Upon installation of automatic alarm system and accompanying alarm panel, arrange for direct connection to monitoring service or Fire Service and Civil Defense. If connection is not possible, until that time that it is, 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>Long Term (6 Months)</p>	<p>Remove all sliding or rolling doors at and within the exit stairs and along all portions of the means of egress. Replace with side-hinged swinging type doors in compliance with Standard. As noted elsewhere, exit enclosures require fire rated door assemblies (which should be side-hinged).</p> <p>Remove existing gates and unrated doors in the means of egress. Install approved fire rated doors that are listed, permanently labeled, automatic-closing, in compatible fire rated frames with latching hardware.</p> <p>Factory will need to install fire rated door assemblies at all exits to exterior stairs other than south-east (1.5 hour rating) in order to maintain required separation (see elsewhere regarding exterior stairs). Fire doors assemblies shall conform to NFPA 252, BS 476 Part 22, EN 1364-1, GB 12955-2008, or IS 3614. Part II. Doors must remain in closed position or be of self-closing type. Protect all egress stairs with a shaft enclosure including 2-hour fire-rated construction.</p> <p>Installation of approved standpipe (mentioned elsewhere) will require the installation of rated fire pump. Install the fire pumps in accordance with NFPA 20. Consult with a qualified fire engineer to properly design and install pump system. Arrange water storage tank according to NFPA 22. Submit product data, drawings and hydraulic calculations and secure Alliance approval before purchase and construction.</p> <p>Install automatic fire alarm system with sufficient smoke/heat detectors as per NFPA 72. Automatic detectors should be tied into the fire alarm system. Alarm system should initiate occupant notification upon activation of detectors in 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>Install or revise existing standpipe system at required</p>

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>locations designed by a qualified fire protection engineer. System should include rated fire pump and Class III standpipe hose connections (65 mm) in each stairwell at each floor level including occupiable roofs.</p> <p>Revise exit approach to allow for landing in front of exit doorway. The door assembly may 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>Provide a fire-resistive rated assembly between the exterior exit stairs and the building to achieve the required separation. Exterior exit stairs shall be separated from the building with a minimum 2-hr fire-resistance rating. This means all doors and windows next to the stairs up to the top of the stairs will need appropriate fire rated assemblies. The rating of the exterior wall shall extend 3.05 m (10 ft) beyond the ends of the stair structure. The rated assembly should be approved and/or designed by a qualified fire protection engineer.</p> <p>Boiler should separate from other occupancies by a minimum 1 hour construction. Penetrations such as windows must have appropriate fire rated assemblies (.75 hour). It is recommended to retain a qualified fire engineer to design enclosures or install fire rated assemblies. Storage: Store materials in designated storage areas. Storage Areas shall be separated from the surrounding occupancy with a minimum 1 hour construction (NOTE: In process storage open to the surrounding occupancy is not required to be separated when the floor is provided with automatic sprinkler protection.</p> <p>Install appropriate means of illumination at all exit locations. 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 uninterruptible power supply (UPS/IPS) for all Level I life safety systems (where delay of 20 sec. is insufficient to protect human life) such as emergency exit lighting, fire alarm, etc.</p> <p>Upon installation of compliant standpipe system, fire department (Siamese) inlet connections should be installed to allow fire department pumper equipment to supplement the fire protection systems. 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>Provide a uniform lip at the noted locations (slope should not exceed 1in 20in the direction of travel). Any protrusions or lips must be smoothed down to less than 1/4".</p> <p>Handrails shall be provided on both sides of each exit</p>
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Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>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. Provide directional signs in stairwell and at exterior egress route to lead workers to assembly areas.</p> <p>Any newly installed 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>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. As a general rule the maximum tolerable deposit thickness for loose fluffy lint is 13 mm (1/2 in.) over a maximum of 46.5m²(500ft²). Limit dense deposits to 6mm (1/4in.) and oil saturated deposits to 3.2mm (1/8 in.).</p>
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The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	<p>Panels should be marked with appropriate "electronic danger/caution" signs. WARNING should be used on the outside of the transformer or substation and DANGER signs and labels for the inside of a transformer, for equipment on the inside of a substation.</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>Remove all Cable Splices and make all connection should be without cable splices or provide appropriate cable joints (porcelain/PVC connectors with PIB tape wound around joint)</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>Complete an oil analysis on applicable transformers at appropriate intervals based on voltage and power.</p>

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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, including electrical equipment layout, distribution schedule, and grounding riser plan.</p> <p>Install over current protection device in all appropriate location. All DB boards circuits must have over current protection device.</p> <p>Connect the emergency lighting, fire alarm, exit signage to an uninterruptible power supply rather than an auto start generator as it provides near-instantaneous protection and is not dependent on a transfer switch or manual start.</p> <p>Install phase separators between terminal connections at the noted locations.</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>Inspect electrical switchgear and panel boards on an annual basis to ensure that the equipment is in good working condition. Document all inspections.</p>