

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Combined Apparels Ltd.
Address of the Factory	: 1670/ 2091 West Sholashahar, Aturar Depot, Chittagong, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 21 May 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 21 May 2014

BASIC INFORMATION:

The factory comprises of two buildings. 6 storied main building with beam-column frame system (3rd and 5th floor used by factory) and single storied ancillary shed. The following general information was noted:

i. Building Usage Type	: Garments Factory
ii. Structural System	: RC beam column frame system.
iii. Floor System	: RC beam supported slab
iv. Floor Area	: Main Building: 1,82,000 sft Ancillary Building: 200 sft
v. No. of Stories	: Main Building: 6 storied Ancillary Building : 1 storied
vi. Construction Year	: Main Building: 1995 & 2001
vii. Foundation Type	: Strip Foundation
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 : 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.

Mid Term: (6 Weeks) :

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

- i. Engage a qualified structural engineer to confirm structural performance of the structure.
- 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. This detailed assessment should be completed within 6 weeks.
- iii. 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.
- iv. Have a qualified structural engineer to complete an analytical evaluation of the structural impact of the addition.
- v. Relocate the water tanks from cantilever portion immediately under guidance of a qualified structural engineer. 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. 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. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard
- viii. Have a qualified structural engineer to prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- ix. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- x. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- xi. Have a qualified structural engineer to develop Floor Loading Plans as 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 and have it posted in all required location.
- xiii. Have a qualified structural engineer prepare a load plan for each floor and have the floors marked for designating storage area as per the developed load plan
- xiv. Organization is to apply for certificate of occupancy and obtain same as soon as possible from the concerned authority.

Long Term (6 Months)

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- i. Necessary remediation after DEA.
 - ii. Have a qualified structural engineer provide further analysis of the building joint to determine the appropriate course of corrective action. If necessary, structural engineer should include recommendations for installing an expansion joint where one does not currently exist.

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

- iii. Repair the exterior façade system to prevent water intrusion.

The recommendations for Fire Safety corrective actions:

Immediate (3 to 6 Days)	Means of egress must be full free and clear from impediments, obstructions, and stored materials immediately.
Short Term (3 Weeks)	Remove all hasps, locks, slide bolts, or other locking devices at the noted locations. Remove all combustibles stored underneath the cutting tables at the noted locations.
Mid Term (6 Weeks)	Occupancy certificate (mention occupancy type) for each building. Make aisles marking with proper direction and provide minimum clear width of 36 inch. Keep aisles free of obstruction. Training programs need to be implemented and documented in accordance with the Alliance Safety Training Curriculum. 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. Conduct fire drills on a quarterly basis as outlined in BNBC Part 4 Appendix A for all garment facilities with record keeping .These fire drills need to be conducted under the direction of a Fire Safety Director. Post occupant loads for every assembly and production floor in a conspicuous space near the main exit or exit access doorway for the space. Stair designation signs are provided at each floor entrance from the stair to the floor in English and Bengali. Signs indicate the name of the stair and the floor level. Signs are posted adjacent to the door. Complete and document fire department pre-planning activities with the local Fire Service and Civil Defense.
Long Term (6 Months)	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 door assemblies (door and frame) with latching panic hardware. Install an automatic fire alarm and detection system for the facility. System shall comply with the Alliance Standard

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

and NFPA 72. Consult a qualified fire protection engineer and/or authorized fire alarm company to design and install the system.

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 door assemblies (door and frame) with latching panic hardware.

Provide fire-resistive rated opening and 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 protective and penetration systems.

Install standpipe system at required locations. Standpipe system must comply with NFPA 14. The hydraulic calculations should be submitted and reviewed by Alliance prior to start of work. All standpipe system installation activities shall be submitted for reviewed by the Alliance prior to commencement of installation in accordance with Section 5.4.3.2.

Provide fire-resistive rated construction barriers and associated opening protection for exit enclosures in accordance with Alliance Standard Sections 4.5 and 4.6. Consult a qualified fire protection engineer to design the required rated construction barrier.

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. The pump is to be connected to an alternative power source such as a generator. The generator is to be configured with an ATS (auto starter).

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.). Connect devices to an automatic fire alarm and

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>detection system for the facility. All fire alarm installations shall be submitted for review by the Alliance prior to commencement of installation.</p> <p>Provide handrails on both sides of each stairway. Provide intermediate handrails when the stair width exceeds 2.2m (87 inch). Provide handrails of height between the range 865 mm (34 in.) and 965 mm (38 in).</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>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 Defence as per Alliance Standard Section 5.7.5. Until that time, a person trained to contact the Fire Service and Civil Defence 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>Provide Fire Department (Siamese) connections in accordance with Alliance Standard Section 5.5.4. Connections shall match the Fire Service and Civil Defence hose thread standard.</p> <p>Day care occupancies which are accessory to other occupancies shall be located on the ground floor with a maximum travel distance of 9 m (30 ft). If located on a higher floor, direct access to an exit enclosure shall be provided as per Alliance standard part 3 section 3.4.2.1.1. Either relocate the Day care occupancy to the ground floor, or provide direct access to an exit.</p> <p>Provide fire-resistive rated construction barriers between hazard types in accordance with Alliance Standard Sections 3.4 and 4.5. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Install appropriate means of illumination at the noted locations. The means of egress paths shall be illuminated at all times the building is occupied. 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. 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 mins in the event of</p>
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Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>failure of normal lighting.</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 hot-work permit program. The program must comply with the requirements of NFPA 51B.</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/m² may also be used.</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>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. Install required identification signs in compliance with NFPA 14 Chapter 6.</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>Install class III standpipe system at required locations designed by a qualified fire protection engineer. The system is to be compliant with the requirements of NFPA 14. Then establish an inspection, maintenance, and testing program for the standpipe and hose system in compliance with NFPA 25 Chapter 6 Table 6.1.1.2.</p> <p>Install a pump dedicated for fire fighting or fire protection following the requirements of NFPA 20. Then establish an inspection, maintenance, and testing program for the fire pump. Program must comply with NFPA 25.</p>
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The recommendations for Electrical Safety corrective actions are:

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Immediate (3 to 6 Days)	Immediately Ensure the generator room clean and free of dirt, debris, and improperly stored materials.
Short Term (3 Weeks)	<p>Ensure proper identification of emergency power switchboards, distribution boards and circuits.</p> <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>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.</p> <p>Ensure inspection, maintenance, and testing procedures of the IPS and UPS are completed and documented.</p> <p>Ensure equipment and safety signage posted within the room.</p> <p>Provide two separate points earthing (grounding) provided for generator.</p>
Mid Term (6 Weeks)	<p>Ensure meters and other electrical devices installed on the main electrical equipment are operational.</p> <p>Have a qualified electrical engineer develop an as-built single line diagram, detailing key components and the capacity of the electrical system.</p> <p>Consult with a qualified Electrical Engineer and ensure electrical wiring/cables are sized according to capacity of circuit breakers.</p> <p>Remove multi looping or multi looping of wiring/cables at circuit breakers within switchboards and/or distribution boards.</p> <p>Provide dedicated neutral for each circuit.</p>
Long Term (6 Months)	<p>Consult with an expert electrical engineer and make sure your system is secured against lightning.</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.</p>