

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

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Name of the Factory	: <b>Z 3 Composite Knitwear Ltd.</b>
Address of the Factory	: 62,Kathgara, Zirabo,Ashulia, Savar, Dhaka, Bangladesh
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 26 Aug 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 27 Mar 2014

### **BASIC INFORMATION:**

The factory comprises of 8 buildings in factory premises among which three are main production buildings and five are ancillary. Those are- 1) Main Building (Z-3 Composite Knitwear), 2) Elastic Section, 3) Embroidery Section, 4) Security Post, 5) Gas Meter reading room, 6) Generator and Compressor Room, 7) Generator Room, 8) Boiler Room.. The following general information was noted:

i. Building Usage Type	: Garments Factory
ii. Structural System	: 1. Main Building: This building is a Flat plate structure system. 2. Elastic Section : The structures is single storied steel Sheds with RCC column. 3. Embroidary Section : The structures is single storied steel Sheds with RCC column .
iii. Floor System	: RC beam supported and flat plate slab.
iv. Floor Area	: 1,63,695.21 Sft
v. No. of Stories	: 1) Main Building: 6 Storied, 2) Elastic Section – Single Storied, 3) Embroidery Section: Single Storied, 4) Security Post: Single Storied, 5) Gas meter reading room: Single Storied, 6) Generator and Compressor room:2 Storied, 7) Generator Room: Single Storied, 8) Boiler Room: Single Storied.
vi. Construction Year	: 2004-2007
vii. Foundation Type	: Isolated 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	: 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 and appoint a factory load manager.

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- 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 loading limits as described on the Floor Loading Plans.

Mid Term (6 weeks) :

- i. Engage a qualified structural engineer and carry out structural assessment to identify what remedial action is appropriate, which may include retrofitting. Under guidance from a qualified structural engineer, arrange Detail Engineering Assessment of the structure within 6 weeks, including core testing to assess concrete strength. Reduction of load is required before any other remedial action is undertaken based on detailed structural assessment.
- ii. Conduct detailed structural assessment by qualified structural engineer and carry out remedial action as necessary. Conduct core testing for concrete to obtain the concrete strength.
- 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 complete further analysis of the structure 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. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- vii. Engage a qualified structural engineer and identify the impact of the reduced number and diameter of rebar on the integrity of the structure.
- 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. Engage a qualified structural engineer to evaluate the impact of the vertical expansion of the building.
- x. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading and storm surge.
- xi. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- xii. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate these water tanks. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- xiii. Have a qualified structural engineer document compliance with the seismic and wind requirements stated in the 2006 BNBC.

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- xiv. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.
- xv. 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.
- xvi. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xvii. Have a qualified structural engineer provide further analysis of the identified cracks to determine the appropriate course of corrective action.
- xviii. Apply for issuance of Certificate of Occupancy for all main building and pursue the matter to obtain the same.

### Long Term (6 months)

- i. Necessary remediation after DEA
- 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. Otherwise, provide 2% slope on the exposed surface to prevent accumulation of water.
- iii. Have the exterior façade repaired to ensure prevent dampness.

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

Immediate	NA
Short Term	NA
Mid Term (6 Weeks)	<p>Arrange for direct connection of the fire alarm system as per Alliance Standard Part 5 Section 5.7.5 Monitoring. Until that time that monitoring 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>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 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. and all 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>

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	<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 90 min once per year.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations.</p> <p>Install a standpipe system at required locations designed by a qualified fire protection engineer. Then install required identification signs at the noted locations. Signage must comply with NFPA 14.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Apply to proper authority for issuance of occupancy certificate and pursue the matter to expedite.</p>
Long Term (6 Months)	<p>Provide 2 hr fire-resistive rated construction barriers at exit enclosures of main building. Fit 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>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 review to be completed prior to start of work. All standpipe system installations shall be submitted for review by the Alliance for review prior to commencement of installation according to 5.4.3.2. Standalone standpipe systems shall meet the local BNBC requirements with a minimum 450 kPa (65 psi) pressure at the hydraulically most remote hose connection or NFPA 14. This requirement is as per clause 5.4.3.</p> <p>At main building Provide 1.5 hr fire protective opening assemblies in 2 hr rated exit enclosure as required in accordance with section 6.3.1.2.2 and 4.6.</p> <p>Install a centralized automatic fire alarm and smoke/heat detection system with control panel following the requirement of NFPA 72 throughout all new and existing buildings and structures.</p> <p>Replace all collapsible, sliding, roll-down gates and shutters in means of egresses with side-hinged swinging type doors of proper width and rating.</p> <p>Installed a pump dedicated for firefighting or fire protection following the requirements of NFPA 20 as mentioned in Alliance Standard Section 5.5.1. 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</p>

	<p>24 testing requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance by the Alliance. This pump is to be connected to an alternative power source such as a generator provided with ATS (auto transfer switch).</p> <p>Remove all hasps, locks, slide bolts, or other locking devices at the noted locations. According to section 6.8.2.2 doors may be locked where the latch and lock are disengaged with one motion where the occupant load does not exceed 49 persons. Turning a door handle and disengaging a lock is considered two motions.</p> <p>Close all windows and other openings on all the fire rated wall across the entire premise.</p> <p>Initiating devices shall include either smoke or fire detection devices spaced in accordance with NFPA 72. When complete sprinkler protection is provided throughout a floor with water flow devices designed to initiate the alarm notification, smoke and fire detection devices can be eliminated throughout that floor as per Alliance Standard Part 5 Section 5.7.3.1.</p> <p>Different occupancies need 3 hr fire-resistive rated construction barrier according to Alliance Standard Part 4 Section 4.5 and BNBC Table 3.2.1 (pg-10352). 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>Provide handrails on both side of each stairway. Provide intermediate handrail when the stair width exceeds 2.2m (87 inch). Provide handrail of height between the range 865 mm (34 in.) and 965 mm (38 in.).</p> <p>Every door in a stair enclosure serving more than 5 stories shall be provided with re-entry unless it meets the following requirements. Stair doors may be permitted to be locked from the stair (ingress) side that prevents re-entry to the floor provided at least two floors allowing re-entry to access another exit are provided, there are not more than 4 stories intervening between re-entry floors, re-entry is allowed on the top or next to top level, reentry doors are identified as such on the stair side, and locked doors shall be identified as to the nearest re-entry floors. When the discharge floor is determined to be a required re-entry floor using the above requirements, re-entry does not have to be provided back into the building on this level.</p> <p>Install a standpipe system at required locations designed by a qualified fire protection engineer.</p> <p>Install fire department connections where required and in compliance with the Standard. According to Alliance Standard 5.5.4 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</p>
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	<p>Defense hose thread standard.</p> <p>Fire extinguishers are to be inspected, tested, and maintained in accordance with NFPA 10 Chapter 7 as demanded in Alliance Standard Part 13 Section 13.10.3.</p> <p>Install a standpipe system at required locations designed by a qualified fire protection engineer.</p> <p>Then establish an inspection, maintenance, and testing program for the standpipe and hose system. Program must comply with the requirements of NFPA 25.</p> <p>Installed a pump dedicated for firefighting or fire protection following the requirements of NFPA 20 as mentioned in Alliance Standard Section 5.5.1. Then establish an inspection, maintenance, and testing program for the fire pump. Program must comply with NFPA 25.</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"> <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 process of request and approval authorities, necessary checks prior approval, standby fire watch and firefighting equipment, sounding of alarm procedure, duration and expiry of permit and reapproval procedure 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 (½ in.) over a maximum of 46.5 m2 (500 ft2). Limit dense deposits to 6 mm (¼ in.) and oil saturated deposits to 3.2 mm (⅛ in.).</p>
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### The recommendations for Electrical Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>Find out the cause of overheating and take proper action.</p> <p>Remove all dirt, debris, lint, water, oil, and improperly stored materials from the substation room.</p> <p>Ensure switchboards and/or distribution boards free of dirt and debris.</p>
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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>Provide two separate points earthing (grounding) provided for generator.</p> <p>Ensure cable joints through porcelain/PVC connectors with PIB tape wound around joint.</p> <p>Ensure Signage indicating the prohibition of light fixtures without protective covers is installed at required locations.</p> <p>Ensure inspection, maintenance, and testing procedures of the UPS are not completed and documented.</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, including electrical equipment layout, distribution schedule, and grounding riser plan.</p> <p>Connect all metal in the building to the building earthing/grounding system such as metal rebar in concrete, metal frame of building, or metal water pipe.</p> <p>Ensure proper ventilation for generator room.</p> <p>Install distribution boards in compliant locations so that operation is not hampered due to limited access.</p> <p>Provide capacity information labels (Maximum current rating, no of circuit breakers etc.) for Switchboards and/or distribution boards.</p> <p>Provide dedicated neutral for each circuit.</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>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). All transformers, switchgears etc. shall be subject to an insulation resistance measurement test to ground after installation but before any wiring is connected. Insulation tests shall be made between open contacts of circuit breakers, switches etc. and between each phase and earth.</p>