

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Zaber & Zubair Fabrics Ltd.
Address of the Factory	: Pagar, Tongi, Gazipur Dhaka Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 31-May-14
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 19-May-14 & 20-May-14
BGMEA Membership No	: 4934

BASIC INFORMATION:

There are 01 Main building in the factory premises out of which 01 is main production building. The following general information was noted:

- i. Building Usage Type : Garments Factory.
- ii. Structural System : 1)RCC stitching building-1,2)RCC stitching building-2,3)NFL garments & folding building,4)Home dyeing shed-1, 5)Home dyeing shed-2,6)Home dyeing shed-3,7)Fashion dyeing shed-1,8)Fashion dyeing shed-2,9)RCC marketing building,10)RCC admin building, 11) Chemical store-1,12)Chemical store-2,13)Generator & substation shed,14)Boiler shed,15) Prefab mechanical workshop,16)RCC medical building,17)Egli ETP building,18)Panta rei ETP building,19) Simem ETP building,20)Prefab finished goods godown.
- iii. Floor System : 5 numbers of RCC frame structure with infilled masonry. The foundation of almost all the buildings are isolated column footing. In case of three RCC buildings the frame include slab with monolithic-ally casting beam. Floor framing:- RCC slab with beam ,Foundation system:- Individual footing, Structural framing members:-Columns Framing regularity:-Regular in both direction, Roof framing:- regular. Stitching building 2 has two different structural systems: beam slab and flat plate. The structural configuration of the NFL building has a drop panel column with a flat slab system. Maximum portion is beam slab system. Other structures are PEB shed.
- iv. Floor Area : 18,09,297.0 sft
- v. No. of Stories : 1) Four story RCC marketing building: Stories above grade: 4, Stories below grade: 0, 2) Four story RCC admin building: Stories above grade: 4, Stories below grade: 0, 3) Two story RCC medical building: Stories above grade: 1, Stories below grade: 0, 4) Single story RCC egli ETP building: Stories above grade: 1, Stories below grade: 0, 5) Single story RCC panta rei ETP building: Stories above grade: 1, Stories below grade: 0, 6) Single story RCC simem ETP building: Stories above grade: 1, Stories below grade: 0, All the PEB sheds are single storied.
- vi. Construction Year : Factory personnel informed the date of construction as follows: 1) RCC stitching building-1: Finished in 1995,2) RCC stitching building-2: Finished in 2009,3) NFL garments & folding building: Finished in 2003,4) Home

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- dyeing shed-1: Finished in 1998,5) Home dyeing shed-2: Finished in 2003,6) Home dyeing shed-3: Finished in 2000,7)Fashion dyeing shed-1: Finished in 2008,8) Prefab fashion dyeing shed-2: Finished in 2008,9)RCC marketing building: Finished in 1998,10)RCC admin building: Finished in 2000,11) Prefab chemical store-1: Finished in 2011,12)Prefab chemical store-2: Finished in 2011,13) Prefab generator & substation shed: Finished in 2008,14) Prefab boiler shed: Finished in 2003,15)Prefab mechanical workshop: Finished in 2011, 16)RCC medical building: Finished in 2011,17) Egli ETP building: Finished in 2007,18) Panta rei ETP building: Finished in 2009,19) Simem ETP building: Finished in 2012,20)P refab finished goods godown: Finished in 2008.
- vii. Foundation Type : 5 numbers of RCC frame structure with infilled masonry. The foundation of almost all the buildings are isolated column footing. In case of three RCC buildings the frame include slab with monolithic-ally casting beam. Floor framing:- RCC slab with beam ,Foundation system:- Individual footing, Structural framing members:-Columns Framing regularity:-Regular in both direction, Roof framing:- regular. Stitching building 2 has two different structural systems: beam slab and flat plate. The structural configuration of the NFL building has a drop panel column with a flat slab system. Maximum portion is beam slab system. Other structures are PEB shed.
- viii. Design Drawings : Partially Available.
- ix. Soil investigation Report : Partially Available.
- x. Construction Materials : RCC brick chips Admin and marketing buildings, some are RC stone chips, steel frame.
- 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.

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. Reduction of load is required before any other remedial action is undertaken based on a detailed structural assessment. This assessment should include destructive core testing to validate the in-situ concrete compressive strength of structural elements

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- ii. "Have a qualified structural engineer provide further analysis and investigation of the structural deficiencies. A structural engineer shall also provide remediation documents if required."
- iii. 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.
- iv. "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."
- v. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- vi. 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.
- vii. 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 of structural elements
- viii. Have a qualified structural engineer document compliance with the seismic and wind requirements stated in the 2006 BNBC.
- ix. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading and storm surge loading.
- x. "Have a qualified structural engineer complete further analysis of the structure and develop a remediation plan for the required building."
- xi. Have a qualified structural engineer prepare credible as-built documents (structural drawings of steel structures & a design report) based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xii. "Have a qualified structural engineer develop a remediation plan."
- xiii. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standards.
- xiv. 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
- 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. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the water tank
- xvii. Follow the Construction Practices and Safety requirements of Section 9
- xviii. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the

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- Alliance Standard. Floor load plans should be visibly posted on all levels of all buildings.
- xix. "Remove deteriorated expansion joint material and provide new approved material at the expansion joint."
 - xx. Repair the exterior façade system to prevent water intrusion.
 - xxi. Have a qualified structure engineer identify the locations where an expansion joint is needed and then have a remediation plan developed.
 - 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. Depending on the findings of the Detail Engineering Assessment, permanent remedial measures should be conducted for the safety of the building.
- ii. The organization is to apply for a certificate of occupancy and obtain it as soon as possible from the concerned authority. Provide Certificates of Occupancy for review.

The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	<p>Find out the cause of overheating and take proper action</p> <p>Remove all combustible materials within 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>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>Switchboards and/or distribution boards should have capacity information labels e.g current carrying capacity of bus bar, rating of main incoming breaker, size of panel and permitted no. of CB, maximum permitted load connection capacity, etc.</p> <p>Review previous assessment thermal report and complete identified action items beginning with highest priority items.</p>
Mid Term (6 Weeks)	<p>Have a qualified electrical engineer develop as-built electrical drawings detailing key components of the electrical system.</p> <p>Provide cable sockets for stranded conductors having a nominal cross-sectional area 6mm² or greater.</p> <p>Ensure the means of identification is obtained by separate color coding, marking tape, tagging, or other approved means</p>
Long Term (6 Months)	<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</p>

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	<p>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> <p>Make sure the lightning protection ground terminals are bonded to the building or structure grounding..</p>
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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)	<p>Immediately reduce 111 occupants from 2nd floor and 110 occupants from 1st floor of 5 Story Stitch building-1 to satisfy the available means of egress (stair) capacity or provide an additional stair with minimum width 0.9 m or provide automatic sprinkler system throughout the building. If additional stair or sprinkler system not provided then occupant load shall not be exceeded 327 in any floor (except ground floor) under any condition.</p> <p>Immediately reduce 2 occupants from 5th floor of NFL garments & folding building to satisfy the available means of egress capacity (Stair). At present scenario maximum allowable occupant load at any floor is 447.</p>
Mid Term (6 Weeks)	<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>Develop a testing and maintenance program that ensures the emergency power for exit signs is tested at least once per year. Functional testing of generator powered signs must be provided for a minimum of 90 min once per year.</p> <p>Develop a testing and maintenance program that ensures the operation of all existing signs is verified at least once per year. If battery-operated signs are used, these signs 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>Fire drills shall be conducted under the direction of a Fire Safety Director. All other requirements for fire drills shall be conducted in accordance with BNBC requirements.</p> <p>Renew the acid licenses from DC office.</p> <p>Install the required identification signs at the noted locations.</p>

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	<p>Obtain Occupancy Certificates from RAJUK.</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 in both English and Bengali.</p>
<p>Long Term (6 Months)</p>	<p>Install a centralized automatic fire alarm and smoke/heat detection system with a control panel following NFPA 72 requirements throughout all new and existing buildings and structures.</p> <p>Provide 1.5 hr fire rated doors on 2 hr rated exit enclosures in RCC buildings as these are more than three stories.</p> <p>Provide fire rated doors and protections at all the required non-rated doors or openings in all the assessed buildings. If possible, close all these openings with fire rated barriers. Protect all the penetrations along the fire restrictive rated assemblies with a listed through penetration fire-stop system tested in accordance with ASTM E81. Consult a qualified fire protection engineer for required solutions.</p> <p>Seal the penetration of slab by ensuring a proper rating, as fire-resistive rated construction barriers are required among the floors following Table 4.4.1 of Alliance Standards. Consult a qualified fire protection engineer to design the rated construction barrier.</p> <p>Fit doors that open in the direction of egress, side-swinging, self-closing, non-lockable fire doors of a 1.5 hr rating in all stairwell enclosures. Consult a qualified fire protection engineer to design the required rated construction barriers.</p> <p>Provide hydraulic calculation of the installed fire pump and standpipe system. If it does not meet the requirements of NFPA 14 then replace the existing fire pump. The 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 24 testing requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance by the Alliance.</p> <p>Provide an automatic fire alarm and detection system per the Alliance Standards. Pull stations at egress points, smoke detectors in the air handling equipment, visual and audible devices must be spaced appropriately based on the</p>

	<p>occupancy type in accordance with NFPA 72.</p> <p>Train and certify at least 25 percent of workers in fire fighting, first aid and rescue by the proper authorities.</p> <p>Install a NFPA 14-compliant Class III standpipe system at required locations designed by a qualified fire protection engineer. All standpipe system installations and hydraulic calculations shall be submitted for review by the Alliance prior to commencement of installation.</p> <p>Provide a rated exit passageway i.e. a protected path of egress from the exit enclosure to the public way. The rating of the exit passageway is to be equal to the fire rating requirement of the exit that is being served and shall not be less than 1 hr fire-resistance rated.</p> <p>1) Provide a rated exit passageway i.e. a protected path of egress from the exit enclosure to the public way. The rating of the exit passageway is to be equal to the fire rating requirement of the exit that is being served and shall not be less than 1 hr fire-resistance rated. Also provide fire door with required rating. Consult with a qualified fire protection engineer regarding this issue.</p> <p>2) Always Keep all the exit discharges free from any kind of obstacle to ensure a safe escape path.</p> <p>Provide fire-resistive rated assemblies at the required exit access corridors. The rated assembly should be approved and/or designed by a qualified fire protection engineer. Exit access corridors serving an occupant load exceeding 30 are to be separated by walls having a fire resistance rating of 1 hr in accordance with the Alliance Standard unless provided with automatic sprinkler protection throughout the story or building. Window and glass block assemblies are to be tested for fire rating following NFPA 257.</p> <p>Keep means of egress continuously free and clear of all obstructions or impediments to full instant use in the case of fire or other emergency.</p> <p>Protect the shaft in accordance with Alliance standard 4.5.7.</p> <p>Replace all sliding doors in the means of egresses with side-hinged swinging type doors of proper width and fire rating.</p> <p>Remove all hasps, locks, slide bolts, or other locking devices at the noted locations. Doors may be locked where the latch and lock are disengaged with one motion and the occupant load does not exceed 49 persons as recommended in Alliance Standard 6.8.2.2 .</p>
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	<p>Install the 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.</p> <p>Provide fire-resistive rated construction barriers and required opening protections (for doors/windows) between all the hazard types in all the assessed buildings following Table 3.2.1 of the BNBC. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Install fire department (Siamese) inlet connections to allow fire department pumper equipment to supplement the fire protection systems.</p> <p>Every door in a stair enclosure serving more than 5 story 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>Provide handrails on both sides of each stairway and a mounting height of the handrail should be within the range of 865 mm (34 in.) and 965 mm (38 in.).</p> <p>Select fire extinguishers based on potential fire class and hazards following NFPA 10 requirements. A minimum of two dry chemical powder (DCP) type fire extinguishers shall be provided at both open and covered locations where combustible and flammable materials are stored. In a store of inflammable and/or fire-sensitive materials a 5 kg dry powder fire extinguisher conforming to accepted standards shall be kept at an easily accessible position.</p> <p>Repave the walking surface to make the slope of the surface 1 in 2 and keep change in elevation less than 1/2 inch.</p> <p>Fire extinguishers are to be inspected, tested, and maintained in accordance with NFPA 10 requirements.</p> <p>Fire extinguishers shall be installed in accordance with BNBC Part 4 Section 4.10 and NFPA 10.</p>
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	<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>Impart training in accordance with the Alliance Safety Training Curriculum and keep records with proper documentation.</p> <p>Arrange for the direct connection of the fire alarm system to a central monitoring station or Fire Service and Civil Defense as per the Alliance Standard. Until that time that monitoring can be set up, arrange a monitoring system using a central detection system and personnel. 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>Establish required inspection, maintenance and testing program for the fire pump.</p> <p>Establish required inspection, maintenance, and testing program for the standpipe and hose system.</p> <p>Develop a NFPA 51B-compliant hot-work permit program. In general, this program should address the process of request and approval of authorities, necessary checks prior to approval, standby fire watch and fire fighting equipment, sounding of alarm procedures, duration and expiry of permit and reapproval procedure, etc.</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.(4) Ensure all testing of fire protection equipment is conducted in accordance with Alliance Standard.
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