

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

---

Name of the Factory	: <b>Clear Tex Industries Ltd (Expansion)</b>
Address of the Factory	: Nazir Saleh Complex, 314/358, DT Road, Eidgah, Chittagong, Bangladesh .
.Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 3 May 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 3 May 2014

### **BASIC INFORMATION:**

The present garment factory is comprises of a 1 Main Buildings & 1 Ancillary Buildings. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: Reinforced concrete moment resisting frames with slabs between beams and beams between columns.
iii.	Floor System	: Beam slab type in RCC Building
iv.	Floor Area	: 34948 SF
v.	No. of Stories	: 5
vi.	Construction Year	: 2000-2004
vii.	Foundation Type	: Isolated Footing Foundation.
viii.	Design Drawings	: Not Available.
ix.	Soil investigation Report	: Available
x.	Construction Materials	: RCC (Brick Chips)
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. 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 load limits as described on the Floor Load Plans.

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

---

Mid Term (6 Weeks)

:

- i. Engage a qualified structural engineer to provide additional investigation into the areas of distress, separations, or cracking noted and provide a remediation plan if required.
- ii. Based on FoS for central columns, engage qualified engineer to assess the strength of the concrete and quantity of the steel in the columns. Concrete strength shall be assessed by taking at least 4 nos. of 4 inch diameter cores from the area of concern. If cores are to be taken from column, it is advisable to take it from an upper level where the stresses are low (for practical reasons 3 inch cores may be taken from columns). In addition, UPV shall be used to have concrete strength in sufficient number of columns in the lower tiers so that a level of confidence is achieved. The calibrated results of core tests and UPV shall be used to determine a reliable value of concrete strength in columns. The size and diameter of steel rebar in most of the columns of two lowest tiers shall be authentically determined using a Ferro scanner or similar device.
- iii. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- iv. 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
- v. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition of additionally 2 floors. Obtain approval (structural impact on the entire structure must be ascertained) or remove unauthorized roof structure (e.g. canteen).
- vi. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads such as for storage, heavy equipment, and water tanks. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- vii. 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.
- viii. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- ix. The compressive strength of columns and floor framing using MCAC shall be investigated by an appropriate program of in-situ testing and representative destructive testing of core samples.
- x. Have a qualified structural engineer provide and detailed design report and complete further analysis of the structure assuring clear and redundant load path.
- xi. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xii. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3
- xiii. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard.
- xiv. Have a qualified structural engineer provide further analysis of the identified cracks to confirm that are non-structural in nature.

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

- xv. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.

Long Term (6 months) :

- i. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues noted including:
- Repair pipe leak resulting in water on roof. Assure roof is properly sloped and drained
  - Investigate and repair the source of dampness at toilet walls. Remove and replace damaged plaster as needed.
  - Enclose rebar by temporary concrete or other appropriate protection (e.g. epoxy coating) immediately to protect from weathering or other degradation.
  - Corrosion proof coating should be provided and CI sheet should be waterproof to prevent corrosion.

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

<p>Immediate (3 to 6 Days)</p>	<p>Find out the cause of overheating, overloading, or signs of burning and take proper action.</p> <p>Need to clean the generator room from dirt, debris, and improperly stored materials.</p> <p>Ensure switchboards and/or distribution boards are free from dirt and debris according to Alliance Standard.</p>
<p>Short Term (3 Weeks)</p>	<p>Provide mechanical guards for electrical equipment where required.</p> <p>Provide generator frame earthing at two points separately by proper size of conductors and sufficient number of earth electrodes.</p>
<p>Mid Term (6 Weeks)</p>	<p>Have a qualified electrical engineer to develop as-built electrical drawings providing detailing key components of the electrical system.</p> <p>Provide a minimum of 1 m (39 inch) in front of each panel board for maintenance in accordance with the Alliance standard.</p> <p>After complete electrical installation, provide earthing of equipment at required locations and connect to the required number of electrodes for all equipment.</p> <p>Provide a readily accessible single point of disconnect for each main electrical service feed.</p> <p>Ensure appropriate size over-current protection device (circuit breaker) is provided for all circuits and sub-circuits against short circuit and over current.</p> <p>Install proper sized wiring according to the breaker capacity as per Alliance Standard.</p> <p>Connect all metal in the building to the building earthing system such</p>

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

	<p>as metal rebar in concrete, metal frame of building, or metal water pipe according to the Alliance Standard.</p> <p>Provide cable sockets for stranded conductors larger than 6mm<sup>2</sup>. Provide soldering (or crimp with sleeve/ferrules) for stranded conductors smaller than 6mm<sup>2</sup> at the exposed ends.</p> <p>Install phase separators between terminals connections in accordance with the Alliance Standard.</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>Transformers, switchgears and other electrical elements, etc. shall be subject to an insulation resistance measurement test to ground after installation but before any wiring is connected. Testing should be in compliance with the International Electrical Testing Association (NETA). Insulation tests shall be made between open contacts of circuit breakers, switches, etc. and between each phase and earth.</p> <p>After complete the electrical installation thermographic scans should be completed in accordance with the Standard for Infrared Inspection of Electrical Systems &amp; Rotating Equipment and NFPA 70B or a comparable standard.</p> <p>Provide appropriate size for generator room in order to properly access the generator to perform routine maintenance activities.</p>

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

Immediate (3 to 6 Days)	<p>Means of egress need to be cleared immediately. This means removing the cartoon boxes from the stair landing and keeping the space free from any obstructions.</p> <p>Remove all stored materials in and under the stairwells at the noted locations.</p> <p>Remove all combustibles stored underneath the cutting tables at the noted locations.</p>
Short Term (3 Weeks)	<p>Remove all hasps, locks, slide bolts, or other locking devices all doors to exits / means of egress. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.</p> <p>A flammable liquids storage cabinet is recommended for the storage of thinner and other flammable spot cleaning chemicals.</p>
Mid Term (6 Weeks)	<p>Installation of automatic fire alarm system (as noted elsewhere) should include an fire alarm control panel/annunciator. 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>Post maximum occupant load for all areas (near exit). Floor loads must be limited to the available capacity of the exit stairs.</p> <p>Post emergency egress maps at the entrance to each exit stair or</p>

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

	<p>main point of egress. When developing diagrams, Sumerra recommends following the ASTM E2238 - 12 Standard Guide for Evacuation Route Diagrams. It is also recommended that Master copies of plans should be kept on file as part of your emergency action plan. Plans should be reviewed at least annually and revised as necessary.</p> <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.</p>
<p>Long Term (6 Months)</p>	<p>Exit Doors and exit pathways need to be constructed to maintain a width of .8m (32 in)at minimum.</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>Interior exit stairways and ramps shall terminate at an exit discharge except where terminating at an exit passageway is constructed to meet the same rating requirement as the exit that is being served and shall not be less than 1 hr fire-resistance rated construction, therefore a fire rated exit passageway would need to be established for east stair discharge. As noted elsewhere appropriate separations much be designed and implemented for generator and storage areas.</p> <p>Factory should appropriately seal the penetrations through wall assembly appropriate materials to meet fire rating of walls. Penetrations of fire resistive rated assemblies shall be protected with a listed through penetration firestop system tested in accordance with ASTM E814.</p> <p>Install a standpipe system at required locations 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.</p> <p>Rooms used for storage of combustible materials shall be separated from the surrounding occupancy with a minimum 1 hour construction. Factory should consider alternate area for storage that is appropriately separated from production areas.</p> <p>Factory will need to install fire rated door assemblies at all exits to stairs (1.5 hour rating). 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. Doors may be provided with locking hardware from the ingress side provided that a panic bar is installed on any door with an occupant load exceeding 49 persons.</p> <p>Install properly rated fire construction at west-north wall. This can be accomplished by installing fire rated window assemblies (1.5 hour), sealing windows completely with fire rated construction materials (2 hour), or sealing exit enclosure with fire rated construction materials (2 hour). Consult a qualified fire protection engineer to design the required rated construction barriers.</p>

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

	<p>Installation of approved standpipe 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.</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>Revise egress path so as means of egress is not reduced at any point along the path of travel. Consult with fire engineer on alternative egress configurations.</p> <p>Provide a uniform lip at the noted locations (slope should not exceed 1 in 20 in the direction of travel). Any protrusions or lips must be smoothed down to less than 1/4 in.</p> <p>Install exit signs along the path of egress where the continuation of egress is not obvious (east stair) or there is a change in the direction of the path of travel.</p> <p>Install parapet or guard on the roof with a minimum height of 1067 mm (42 in.).</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. Signage for standpipe system is not in compliance with NFPA 14 Chapter 6 (e.g. no sign on Fire Department connection indicating STANDPIPE in 1 in lettering).</p> <p>Repair or replace leaking hoses, upon installation of compliant standpipe system assure piping is leak free.</p> <p>Generator sets shall be separated from all other occupancy areas by a minimum 2 hour construction. Consult with fire engineer for proper design of fire rated enclosure.</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>Daycare 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.</p>
--	---

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

---

	<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 (½ in.) over a maximum of 46.5 m<sup>2</sup> (500 ft<sup>2</sup>). Limit dense deposits to 6 mm (¼ in.) and oil saturated deposits to 3.2 mm (⅛ in.)."</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>
--	---