

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Clear Tex Industries Ltd.
Address of the Factory	: Nazir Saleh Complex, 314/358, DT Road, Eidgah, Chittagong, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 03 May 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 03 May 2014

BASIC INFORMATION:

The factory is a 4 storied main building with beam-column frame system and tin shed at roof. 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	: 20,023 sft
v. No. of Stories	: 4 storied + tin shed at roof
vi. Construction Year	: 2004
vii. Foundation Type	: Unknown.
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)	: Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues noted including:
	i. Repair pipe leak resulting in water on roof. Assure roof is properly sloped and drained
	ii. Investigate and repair the source of dampness at toilet walls. Remove and replace damaged plaster as needed.
	iii. Enclose rebar by temporary concrete or other appropriate protection (e.g. epoxy coating) immediately to protect from weathering or other degradation.
	iv. Corrosion proof coating should be provided and CI sheet should be waterproof to prevent corrosion.

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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) :

- 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. Have a qualified structural engineer provide and detailed design report and complete further analysis of the structure assuring clear and redundant load path.
- iv. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- v. 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.
- vi. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- vii. 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
- viii. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition of additional 2 floors.
- ix. 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.

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

- x. 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.
- xi. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- 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. 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).
- xv. Provide Certificates of Occupancy indicating approved use as industrial building for review
- xvi. Have a qualified structural engineer provide further analysis of the identified cracks to confirm that are non-structural in nature.

Long Term : NA

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

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>direction of a Fire Safety Director.</p> <p>Post occupant loads for every assembly and production floor in a conspicuous space near the main exit or exit access doorway for the space.</p> <p>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.</p> <p>Complete and document fire department pre-planning activities with the local Fire Service and Civil Defense.</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>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 fire stop 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 stairwell 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>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>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>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</p>

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>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> <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>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>A flammable liquids storage cabinet is recommended for the storage of thinner and other flammable spot cleaning chemicals.</p> <p>Install parapet or guard on the roof with a minimum height of 1067 mm (42 in.).</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>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>"Installation of automatic fire alarm system (as noted elsewhere) should include an fire alarm control panel/annunciator. Until that time that a central station</p>
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Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>monitoring service or direct connection to the Fire Service and Civil Defence 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>Repair or replace leaking hoses, upon installation of compliant standpipe system assure piping is leak free.</p> <p>Upon installation of compliant standpipe system, include required identification signs at the noted locations. Signage must comply with NFPA 14.</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>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>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 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>Disconnect the panel from the electrical service and clean interior components of all dust and debris. Seal all openings within the enclosure to prevent dust and debris from entering. Place covers on cable trays to prevent dust accumulation.</p> <p>Find out the cause of overheating, overloading, or signs of burning and take proper action.</p> <p>Install instruction board for first aid and artificial respiration</p>
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Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

	<p>in the generator area.</p>
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>The generator frame shall be earthed by two separate and distinct connections to earth.</p> <p>Install signage in all storage areas or other areas of combustibles indicating no use of light fixtures without protective covers as per Alliance Standard 10.15.2</p>
Mid Term (6 Weeks)	<p>Ensure distribution boards are metal enclosed with a dead front construction.</p> <p>Install overcurrent protection on generator.</p> <p>Provide a capacity information label which contains the current carrying capacity and size of main cable, rated capacity of circuit breaker and the busbar (with dimension). Display panel schedules posted on panels' door (inner side).</p>
Long Term (6 Months)	<p>Ensure the generator room properly rated and physically separated from the rest of the construction and keep a fire barrier from generators and electrical equipments.</p> <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>Develop an Insulation Resistance Measurement Program that ensures deterioration of insulation resistance will be identified quickly. Testing should be in compliance with Inter National 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> <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> <p>Provide cable shaft for the whole building. Wiring and cables are arranged in shaft for ease of inspection and maintenance.</p>