

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Turag Garments & Hosiery Mills Ltd
Address of the Factory	: South Panishail, Zirani Bazar, Kashimpur, Gazipur, Dhaka, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 10-June-14
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 10-June-14
BKMEA Membership No	: 395

BASIC INFORMATION:

There are 08 building in the factory premises in which 03 main production building and 5 are ancillary buildings. The buildings are named as: 3 Main Buildings: 1. ETP Building, 2. Dying Building, 3. Admin & Medical Building. The following general information was noted:

i.	Building Usage Type	: Garment Factory.
ii.	Structural System	: ETP Building and Admin & Medical Building: Concrete beam & slab system with beams spanning both directions between columns. Foundation & lateral load resisting system are moment resisting concrete frame. Dying Building: Moment resisting prefabricated steel building with concrete slab. Ancillary Buildings: Tin Shed Buildings (simple metal frame with metal roof).
iii.	Floor System	: RCC beam column and Moment resisting prefabricated steel building with concrete slab
iv.	Floor Area	: Building 1: 195,750 Sft (approx); Building 2: 26,320 Sft. Building 3: 7,200 Sft; Building 4: 19,680 Sft. Ancillary area: 31109 sft (Total)
v.	No. of Stories	: ETP building is B+7. Admin Building is 8, Dying building is 3
vi.	Construction Year	: 1. ETP Building - 2009, 2. Dying Building - 2008, 3. Admin & Medical Building - 2009
vii.	Foundation Type	: Unknown
viii.	Design Drawings	: Available.
ix.	Soil investigation Report	: Available.
x.	Construction Materials	: Reinforced Concrete frame and prefabricated steel building.
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 : N/A

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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 loading limits as described on the Floor Loading Plans.

Mid Term (6 Weeks) :

- i. ETP Building, Admin & Medical Building - Engage qualified structural engineer to conduct a detailed engineering assessment (DEA) of building within 6 weeks. DEA should include assessment of 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. In order to confirm the diameter of embedded bars as obtained from Ferro scanner, the Assessor may have to remove the concrete cover in one or two locations.
- ii. Follow recommendations of NTC Review Panel.
- iii. ETP Building, Admin & Medical Building: 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.
- iv. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads of the noted equipment/machinery. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- v. 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. It should be displayed in each section of the floor (particularly for the storage area it is very important).
- vi. ETP Building, Admin & Medical Building: Have a qualified structural engineer document compliance with the seismic and wind requirements stated in the 2006 BNBC.
- vii. ETP Building, Admin & Medical Building: Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading. Compliance may be waived if the Factory Owner provides satisfactory evidence of a cyclone operations plan that includes full evacuation of the factory in advance of any approaching cyclone.

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- viii. Adequately anchor and brace all non-structural elements such as the rack systems to resist earthquake forces to comply with the BNBC and Alliance Standard.
- ix. ETP Building, Admin & Medical Building: As part of the detailed assessment outlined elsewhere, the compressive strength of structural elements constructed using MCAC shall be investigated by an appropriate program of in-situ testing and representative destructive testing of core samples.
- x. ETP, Admin & Medical: Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xi. Have a qualified structural engineer develop Floor Loading Plans 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. Floor load plans should be visibly posted on all levels of all buildings.
- xiii. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xiv. Have a qualified structural engineer assess the durability aspects as suggested in Alliance Standard Part 7 Section 7.2 and take appropriate remedial measures.

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. Provide Certificates of Occupancy for review.

The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	Find out the cause of overheating, overloading, or signs of burning and take proper action. Consider replacement of equipment immediately if necessary.
Short Term (3 Weeks)	Ensure proper identification of emergency power switchboards, distribution boards, and circuits .Provide two separate points of earthing (grounding) by distinct connections for each generator.
Mid Term (6 Weeks)	Provide means of ventilation for the substation room. Consult a qualified electrical engineer to determine the required ventilation rates based on the installed equipment. Provide capacity information labels (Maximum current rating, no of circuit breakers etc.) for switchboards and/or distribution boards.

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<p>Long Term (6 Months)</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>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>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> <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>Establish an inspection testing, and maintenance program for the Uninterruptable Power Supply (UPS) and associated components. The program must based on the following:</p> <ol style="list-style-type: none"> (1) Manufacturer's recommendations (2) Manufacturer's instruction manuals (3) Minimum Requirements of NFPA 111 Chapter 8 (4) Minimum Requirements of NFPA 70B Chapter 28
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The recommendations for Fire Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>Organize in process storage and equipment so it does not block aisles/egress. Keep all storage areas well organized with well defined aisle ways between materials stacks.</p>
<p>Short Term (3 Weeks)</p>	<p>Remove all hasps, locks, slide bolts, or other locking devices at the noted locations as per Alliance Standards Part 6 Section 6.8 Doors and Gates</p> <p>Remove all stored materials in the stairwells at the noted locations.</p> <p>Remove all combustibles stored underneath the cutting tables at the noted locations.</p>
<p>Mid Term (6 Weeks)</p>	<p>Post maximum occupant load for all areas (near exit) as per Alliance Standards Part 6 Section 6.4.4 Posting of Occupant Load.</p>

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	<p>Provide records of functional testing of emergency light for 90 minutes.</p> <p>For all new and existing sprinkler systems, install identification signage at the required locations. The five basic types of identification signs are as follows:</p> <p>Type A- Control Valve Sign</p> <p>Type B- Multi-Purpose Text Signs</p> <p>(See Below)</p> <p>Type D- Fire Alarm Sign</p> <p>Type E- Hydraulic Calculation Sign</p> <p>Reference NFPA 13 for signage requirements.</p> <p>Designate/name all stairs. Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations as per Alliance Standard Part 6 Section 6.9 Stairs.</p>
<p>Long Term (6 Months)</p>	<p>Replace existing exit doors with side hinged swinging type doors per Alliance Standards Part 6 Section 6.8 Doors and Gates.</p> <p>Revise egress route so that route is uniform and not obstructed by elevated sewerage covers.</p> <p>Provide a fire-resistive rated assembly between the exterior exit stairs and the building to achieve the required separation. The rating of the exterior wall shall extend 3.05 m (10 ft) beyond the ends of the stair structure. The rated assembly should be approved and/or designed by a qualified fire protection engineer. Four stories or more require a 2-hr rating.</p> <p>Factory will need to install fire rated door assemblies at all exits to stairs in buildings 1-6 (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.</p> <p>Install fire rated door assemblies on horizontal connections (ETP / Dying Building).</p> <p>Fire doors must never be wedged open. Doors must remain closed or must have automatic release devices that will automatically let door close in case of fire.</p> <p>Confirm that under-door (threshold) gaps are in accordance with the manufacturers' installation instructions for the particular door set design. This documentation must be provided.</p> <p>Provide certification / documentation on the fire rating of existing "Fire Doors" (e.g. ETP Building, East Stair)."</p> <p>ETP & Admin/Medical Buildings: Install an automatic sprinkler system throughout the buildings designed by a</p>

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	<p>qualified fire protection engineer.</p> <p>Factory should either:</p> <ol style="list-style-type: none">1) Appropriately seal the floor to floor penetrations with appropriate materials to meet fire rating of floors. All penetrations through fire rated assemblies shall be protected/sealed with a listed through penetration firestop system tested in accordance with ASTM E814. Confirmation should be provided that any materials used can conform to standard.2) Create a 2- hour fire rated shaft around the riser. <p>Design and install exit passageways in the noted locations with fire resistance-rated construction and opening protectives, to provide a protected path of egress in a horizontal direction to the exit discharge.</p> <p>It should also be noted that a maximum of 50 percent of the number and capacity of the exit enclosures can discharge through areas on the level of exit discharge where all of the following are met:</p> <ol style="list-style-type: none">(1) Automatic sprinkler protection is provided throughout the level of exit discharge (as recommended elsewhere to be installed) or portion of the level of discharge where separated from nonsprinklered portions of the floor by fire barriers with the same fire resistance rating as the exit enclosure.(2) The interior discharge is not through a storage or hazardous occupancy.(3) The entire area of the level of exit discharge is separated from areas below by construction having a fire resistance rating not less than that required for the exit enclosure.(4) The way to the exterior shall be free and unobstructed and shall be readily visible and identifiable from the point of discharge of the interior exit. <p>During installation of door assemblies assure that every door in a stair enclosure serving more than 4 stories is provided with re-entry unless it meets the requirements of Alliance Standards Part 6 Section 6.8.3.1.</p> <p>Storage: Store materials in designated storage areas. Storage Areas shall be separated from the surrounding occupancy with a minimum 1 hour construction (NOTE: In process storage open to the surrounding occupancy is not required to be separated when the floor is provided with automatic sprinkler protection as required in both buildings).</p> <p>Generator/Substation: Separated from all other occupancy areas by a minimum 2 hour construction.</p> <p>Installed fire rated assemblies (1.5 hour) on penetrations (doors/windows) facing the one storied sheds or otherwise meet separation requirements of Part 3 of BNBC.</p> <p>In all cases, retain a qualified fire engineer to design the</p>
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	<p>required separations.</p> <p>ETP Bulding: South East Doors. Remove bottom frame piece as it is a trip hazard. A properly designed and rated door should not need bottom frame piece (see comments elsewhere regarding door gap threshold).</p> <p>For all new and existing sprinkler systems, provide electrically supervised devices on the valves controlling the automatic sprinkler systems. Devices are to be supervised by a listed fire alarm system control unit.</p> <p>Install handrail on other side of ramp.</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. Intermediate handrails shall be provided when the stair width exceeds 2.2 m (87 in.), such as in west stair of ETP Building.</p> <p>Provide secure parapets or guards with a minimum height of 1067 mm (42in)</p> <p>Ensure all hangers, bracing, and restraints are properly installed and fully support the system piping (no sagging)</p> <p>Add materials to steps to make slip resistant or provide weather protection (cover).</p> <p>Install an approved audible device connected to every automatic sprinkler system and activated by waterflow equal to the flow of one sprinkler. Where a fire alarm system is installed, activation of the waterflow shall activate the fire alarm system.</p> <p>Establish an inspection, maintenance, and testing program for the fire pump. Program must comply with Reference NFPA 25 Chapter 8 Fire Pumps.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B as per Alliance Standards Part 13 Section 13.4 Hot Work Permit and NFPA 51B</p> <p>For all new and existing sprinkler systems, establish maintenance program that includes the requirements established in NFPA 25.</p>
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