

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Transworld Sweaters Ltd.
Address of the Factory	: Bahadurpur, Banglabazar, Rajendrapur, Bhawal, Mirzapur, Gazipur ,Dhaka, Bangladesh.
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 05 Nov 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 08 Nov 2014
BGMEA Membership No	: 3794

BASIC INFORMATION:

The present garment factory is comprises of a 3 Main Buildings 2 Ancillary Buildings. The following general information was noted:

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| i. | Building Usage Type | : Garments Factory. |
| ii. | Structural System | : Beam column supported RC frame |
| iii. | Floor System | : Beam slab type in RCC Building and PEB sections used in 3 Storied Prefab Shed. |
| iv. | Floor Area | : Office:3000 Old:54000 New:50000 |
| v. | No. of Stories | : Main 6, Warehouse: 3 Generator:2 |
| vi. | Construction Year | : Office: Unknown Old: 2004 New: 2012 |
| vii. | Foundation Type | : isolated footing foundation. |
| viii. | Design Drawings | : 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.

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Mid Term (6 Weeks)

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- i. "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. "
- ii. Engage qualified structural engineering consulting to conduct investigation of the strength of the concrete and quantity of the steel in the columns in the building. Concrete strength shall be assessed by taking at least 4 nos. of 4 inch diameter cores from the area of concern. It is advisable to take it from ground level column with ensuring safety by proper propping (for practical reasons 3 inch cores may be taken from columns). In addition, ultrasonic pulse velocity technique (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. Maintain current use of the floors and don't change use or increase occupation, either of which could increase loading. Ensure no floor has more than 1.5kN/m² live load (Occupancy or storage)
- iii. Have a qualified structural engineer assess the strength of the member constructed with MCAC in the building. 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 ground floor with proper propping (for practical reasons 3 inch cores may be taken from columns). In addition, ultrasonic pulse velocity technique (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 other key structural members.
- iv. "Complete further testing on areas of deterioration and have a qualified structural engineer develop a remediation plan. "
- v. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- vi. Engage a qualified structural engineer to develop the required documents to confirm the accurate number of rebar in each column of factory buildings.
- 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. "
- ix. 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.
- x. Have a qualified structural engineer document compliance with the seismic and wind requirements stated in the 2006 BNBC.
- xi. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.

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- xii. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- xiii. Remove deteriorated expansion joint material and provide new approved material at the expansion joint. Movement joint to be established
- 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. Floor load plans should be visibly posted on all levels of all buildings.
- 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. "

Long Term (6 months) :

- i. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- 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.
- iii. Provide Certificates of Occupancy for review.

The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	<p>Remove all dirt, debris, lint, water, oil, and improperly stored materials from the substation room.</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>
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>All boxes and enclosures (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system. The required marking can be by color code, the words "emergency system," or any other method that identifies the box or enclosure as a component of the emergency system.</p> <p>Clear identification/markings must be available at LT, MDB and DB MCB/MCCB. Clear and permanent identification</p>

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	<p>marks are required to be painted in all distribution boards, switchboards, sub main boards and switches as necessary.</p> <p>Provide generator frame earthing (grounding) at two separate points.</p> <p>Complete an oil analysis on applicable transformers at appropriate intervals based on voltage and power.</p>
Mid Term (6 Weeks)	<p>Have a qualified electrical engineer update the as-built diagrams detailing key components and capacity of the electrical system.</p> <p>Provide earthing of equipment at required locations and connect to required number of electrodes. Refer to the BNBC for required number of electrodes.</p> <p>Ensure switchboards and/or distribution boards are provided with physical means to prevent the installation of more over current devices than that number for which the panel board was designed, rated, and listed following NFPA 70 section 408.54.</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 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>

The recommendations for Fire Safety corrective actions are:

Immediate (3 to 6 Days)	None
Short Term (3 Weeks)	Remove all hasps, locks, slide bolts, or other locking devices at the noted locations.
Mid Term (6 Weeks)	<p>The incomplete automatic fire alarm and detection system shall be commissioned as per approved design. The design should be approved by QAF. The system shall comply with the Alliance Standard and NFPA 72. Engage a qualified and experienced engineer for supervision of installation works for complying the Alliance standard.</p> <p>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</p>

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	<p>powered signs is provided for a minimum 90 min once per year.</p> <p>Develop a testing and maintenance program that ensures the emergency power for all egress lighting is tested at least once per year. If battery operated lighting are used, these lights are tested on a monthly basis. Functional testing of battery powered lighting is provided for a minimum 90 min once per year.</p> <p>Training programs should be implemented and documented in accordance.</p> <p>Occupant load signage should be posted for every assembly and production floor, at a conspicuous space near the main exit or exit access doorway for the space.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Apply to appropriate authority in an expeditious manner for issuance of the Certificates of Occupancy for each building and ancillary structure according to building use.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations in both English and Bengali.</p> <p>Install required identification signs at the noted locations. Signage must comply with NFPA 14.</p>
<p>Long Term (6 Months)</p>	<p>"Building shall be provided with a means of egress system for all occupants to safely evacuate from buildings and structures. They need to install fire rated doors with the proper rating (1.5 hr). As per Alliance Standard 6.5.6.1, doors in an existing means of egress shall have a minimum width of 0.8 m (32 in.)".</p> <p>Replace non-compliant doors and frames in the means of egress with side-swinging doors. Replacement doors shall be a minimum width of 0.8 m (32 in), and are listed, approved, self-closing, fire rated doors assemblies (door and frame) with latching panic hardware.</p> <p>Provide fire-resistive rated penetration protection for rated walls and assemblies in accordance with Alliance Standard Sections 4.6 and 4.7. Consult a qualified fire protection engineer to design the required penetration systems.</p> <p>Provide fire-resistive rated construction barriers and associated opening protection for exit enclosures in accordance with Alliance Standard Section 6.3.1.2. . Consult a qualified fire protection engineer to design the required rated construction barriers.</p> <p>Train and certify the required number of people in fire fighting, first aid, and rescue training by the appropriate authority in accordance with the Alliance Safety Training Curriculum in accordance with the Alliance Safety Training</p>

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	<p>Curriculum.</p> <p>The capacity of the pumps needs to be checked and validated by qualified fire protection engineer.</p> <p>Install Illuminated exit signs at entrances to exits and along the path of egress anywhere the continuation of egress is not obvious or there is a change in the direction of the path of travel.</p> <p>Install emergency lighting for all paths of egress in accordance with Alliance Standard Section 6.7. Illumination needs to be a minimum of 10 lux for all corridors, exit doors and stairways. Illumination for aisles needs to be a minimum of 2.5 lux. Egress lighting shall be provided with emergency power or supplemented with battery powered lights that provide a minimum of 10 lux for not less than 30 mins in the event of failure of normal lighting.</p> <p>Establish an inspection, testing, and maintenance program for all fire extinguishers. Program must comply with the requirements of NFPA 10.</p> <p>Provide fire-resistive rated construction barriers between hazard types. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Create a Fire Safety Director position and fill that position ASAP with an individual that has had sufficient training and experience to be able to carry the required duties.</p> <p>Produce, establish and enforce a written policy and procedure for housekeeping to ensure scheduled cleaning of all floors, walls, ceilings, air ventilation systems and other building components. Ensure the timely removal of defective, waste and rubbish materials is included. 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> <p>A hot work permit system program shall be enacted for all RMG facilities in accordance with NFPA 51B.</p> <p>Establish an inspection, testing, and maintenance program for the fire pump. Program must comply with NFPA 25.</p> <p>Establish an inspection, maintenance, and testing program for the standpipe and hose system. Program must comply with the requirements of NFPA 25.</p>
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