Name of the Factory	: A.N. Sweaters Ltd.
Address of the Factory	: Plot-6594-95 South Halishahar, Chittagong, Bangladesh.
Present Status of the Factory	: Under Operation.
Structural Assessment Conducted by	: TUV
Date of Structural Inspection	: 29th May, 2015
Fire Assessment Conducted by	: TUV
Date of Fire Inspection	: 29th May, 2015
Electrical Assessment Conducted by	: TUV
Date of Electrical Inspection	: 29th May, 2015
BGMEA Membership No.	: 3728

BASIC INFORMATION:

The assessed factory building is a 6 - Storey RCC building with a partial extension floor at the 6th floor level. The building houses multiple garments factories: The ground floor of the building is occupied by BHB Embroidery; the 1st floor by Aeries Fashion Ltd., the 2nd & 3rd floors by Maxim Fashion, the 4th floor by A.N. Sweaters Ltd. and the 5th floor by R.S Sweater Ltd. A.N Sweaters Ltd. operates in the factory on a rental basis. The structural system of the building is beam column frame and beam slab floor system. The following general information was noted:

i.	Building Usage Type	: Garment Factory.
ii.	Structural System	: RCC beam column frame system structure.
iii.	Floor System	: RCC Beam-slab floor system.
iv.	Floor Area	: Operational floor area of the factory is approx. 10,673 sft.
v.	No. of Stories	: 6 Storey + partial extension floor.
vi.	Construction Year	: 1997.
vii.	Foundation Type	: Isolated footings foundation.
viii.	Design Drawings	: Available (Chittagong Development Authority, on 19th March, 2006 for a 6 storey commercial building)
ix.	Soil Investigation Report	: Available.
x.	Construction Materials	: Brick Aggregated in columns.
xi.	Generator	: Situated at ground floor.

RECOMMENDATIONS FOR CORRECTIVE ACTION:

The recommendations of corrective action for both Structural and Fire & Electrical Safety comprises in Short Term, Mid Term and Long Term basis.

The recommendations for **Structural Safety** corrective action are:

Short Term (Immediate) : None.

Mid Term (6-weeks) :

- A Detail Engineering Assessment of Factory to be commenced, see attached scope.
- Factory Engineer to review design, loads and columns stresses in area identified above.
- Sections of plaster finish to columns mentioned to be removed to investigate if cracks penetrate the building structure.

- Verify in-situ concrete stresses by 100mm dia. cores from columns at D5, A7 & F4.
- Detail Engineering Assessment to be completed.

Long Term (6-months) :

- Carry out any remedial actions as directed by the Building Engineer regarding cracks on columns.
- Proper roof drainage system needs to be implemented following the guidance of building engineer to avoid water stagnation on roof top.
- As built architectural and engineering drawing to be prepared and submitted to proper authority for approval. As part of this process building engineer will be required to make a number of checks on the structural design.

The recommendations for **Fire & Electrical Safety** corrective action are:

(A): Recommendations for Fire Safety corrective actions:

Immediate (*the factory should not continue to be occupied until these non-conformities have been rectified*):	• None.
Short Term (*Actions that must be incorporated into a Fire Safety Management Plan immediately (1 ~ 2 weeks) and should be a regular activity*	• The minimum clear width of the pathway should be 0.9 meter • Provide aisle marking with arrow guiding and exit signage on all Evacuation pathways or provided with overhead signage fixed at ceiling level. • Provide back-up power supply with IPS or battery for emergency lighting • Factory management should be checked alarm call points, alarm & detection system periodically and maintained the record properly. • The first aid hose and standpipe performance should be checked periodically and properly tagged. • Fire drill should be conducted quarterly (4 times a year) in existing buildings as detailed under the Fire Safety Plan & should kept record properly.
Mid Term (*The remedial works indicated must be carried out within a period of 6 weeks)*	• Replace all existing exit doors on evacuation routes, exit doors with side hinged type door, which swing outward and in the direction of travel. Swinging of the door should not constrict the width of the corridor / passage below 0.9 meter. • Remove all locking device from all egress door. All exit

	doors should be open-able from the side they serve without the use of a key. • Provide handrails on both side of each stairway with height of 0.9m measured from the nose of stair to the top of the handrail. • Doors in stair should be outward opening, side-swing, self-closing, non-lockable 1.5 hour fire rated doors with 2 hours rated barrier in all stair way to encloses for all floor with other tenants. • Prepare proper plan and design for fire rated barrier for 2 hour fire rating separated corridor at ground floor. • Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated doors at ground floor generator room, which located at the adjacent to final exit. • Prepare proper plan and design for 2 hrs fire rated barrier with 1.5 hrs fire rated door for storage area. • Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated door at ground floor generator room, which located at the adjacent to final access route. • Produce design and plan for automatic detection system with automatic fire alarm at all floor with other tenants. • Automatic alarm systems must be provided throughout the factory with power back-up system; the alarm must be automatically triggered on detection of a fire. • Provide adequate nos. of smoke detectors to cover the whole factory building. • Prepare proper design and plan for dedicated fire pump with alternate backup power supply for all floors. • Prepare plan and design for dedicated water storage tank for firefighting operation as per RMG guideline. • Power backup supply should be provided for fire alarm system. • Visual alarm should be placed at the generator room. • Implement to a single fire safety management system with approvals from all tenants in the factory building.

Long Term (*The remedial works indicated must be carried out within a period of 6 months)*	• All stairway to have direct access to outside of the factory building, which requires 2 hour fire rated construction at ground floor for fire separated corridor. • Provide 4 hours fire rated barriers with 2 hours fire rated doors at ground floor generator room, which located at the adjacent to final exit. • Provide 2 hrs fire rated barrier with 1.5 hrs fire rated door for storage area. • Install automatic detection system with automatic fire alarm at all floor with other tenants. • Install dedicated fire pump with alternate backup power supply. • Provide sufficient number of hose pipe with respect to area and travel distance as per RMG guideline. • Provide dedicated storage tank for firefighting operation.

(B): Recommendations for Electrical Safety corrective actions:

Immediate (*the factory should not continue to be occupied until these non-conformities have been rectified*):	• None.
Short Term (*Actions that must be incorporated into a Fire Safety Management Plan immediately (a week) and should be a regular activity*	• All strands cables at exposed ends should be properly soldered / crimped and insulated.
Mid Term (*The remedial works indicated must be carried out within a period of 6 weeks)*	• All unwanted materials should be removed from the Generator room. • Provide electrical graded rubber mats of adequate size in front of all distribution panels. • Install smoke detection and provide firefighting equipment in the generator room. • 1. Remove all the inflammable materials from surrounding of electrical circuitry at DB. 2. Ensure that all electric circuitry clean of inflammable materials.

	3. Conduct periodic maintenance and maintain the records. • The electrical panels to be of metal case and should be marked with "Danger 415 Volts" and identified with proper phase marking and danger signage. • Provide cable connections with properly soldered / welded lugs at DBs. Ensure that all the electrical connections are properly secured with lugs and glands. • Select conductors and MCCB/MCB with adequate sizing without exceeding permissible current carrying capacity for insulation. • Avoid bunch of cable at MCCB/MCB or bus bar terminal, use individual circuit and over current device for every incoming and outgoing circuit at the distribution boards. • Provide circuit diagram /circuit list with proper current ratings and fuse size, marking for DBs identifying end use load, voltage, number of phases. • Provide cable joints of porcelain / PVC connectors with PIB tape wound around before placing the cable in the box. • Provide proper separate earthing/grounding to generator. Ensure that generator body frame to have two separate and distinct connections to the earth / ground. • Provide adequate earthing to body and doors to all MDBs / DBs. Ensure that all electrical panels provided with proper and separate earth potential.
Long Term (*The remedial works indicated must be carried out within a period of 6 months)*	• 1. Provide updated SLD matching the existing installation at the factory. 2. SLD to indicate exact positions of all points of switch boxes and other outlets. 3. SLD to be approved by the engineer-in-charge. • 1. Provide updated Electrical layout drawing prepared after proper locations of all outlets for lamps, fans, fixed and transportable appliances, motors etc. 2. Drawings to indicate exact positions of all points of switch boxes and other outlets to match existing

	installation. 3. As built drawing to be approved by the engineer-in-charge. • Provide 4 hour fire rated walls all around the transformer / generator room on ground level. • Modify Area of generator room to meet requirements of Table 4.4, RMG Guideline; the area should be 26 m2, or relocate the generator room. • Provide and maintain proper clearance in all sides of generator for ease of maintenance. • 1. Design to have proper segregation of different end used loads. 2. Wiring design to have separate and distinct sub-circuits for power and heating system. 3. All DBs to be placed conveniently. 4. Wiring to be neat, tidy and located near ceiling. • For buildings > 20m high, provide at least one vertical shaft of 200 x 400 mm for every 1500 sq.m. floor area. • Review capacity of standby generator on basis of loads for essential lighting / AC / Equipment / Services. Replace generator with larger capacity or install second generator if review indicates existing unit is too small. • Provide and maintain easy access and proper height of switchboard / panel boards (< 2m from floor level). • 1. Wooden switchboards / panel boards should be replaced by non-flammable materials. 2. Prefer switchboards made of non-flammable materials. • Each circuit should have a separate neutral (use of common neutral for more than one circuit shall not be permitted). • Provide the wiring in PVC conduits or in metallic GI pipes. Ensure that all electrical wiring should be covered in proper conduit pipes. • Seal the cable entry-exit points of (DB/COS) with non-flammable materials. In addition:

	1. Ensure that DB panels / Switchgears to be vermin / damp proof. 2. Ensure all unused holes / openings in DBs to be blocked properly. • 1. Provide the ECC to meet minimum cross-sectional area as per table 4.5. 2. Ensure that connections between conductors / equipments provided to durable electrical continuity and adequate mechanical strength and protection. 3. The continuous earth connection is provided back to the main intake supply earth. • Provide adequate protection against lightning depending on the probability of a strike and acceptable risk levels at roof top of building.