Name of the Factory	: Cardinal Apparels Ltd.
Address of the Factory	: 514, Chotopool, Agrabad, Chittagong, Bangladesh.
Present Status of the Factory	: Under Operation.
Structural Assessment Conducted by	: TUV
Date of Structural Inspection	: 30th June, 2015
Fire Assessment Conducted by	: TUV
Date of Fire Inspection	: 30th June, 2015
Electrical Assessment Conducted by	: TUV
Date of Electrical Inspection	: 30th June, 2015
BGMEA Membership No.	: 3887

BASIC INFORMATION:

The assessed factory building was a 5-Storey RCC building with 4 nos. single storied sheds where the sheds were not using as production house. There were unapproved vertical extensions on roof top of the building supporting by RCC columns. The structural system of the building is beam column frame and beam slab floor system. Cardinal Apparels Ltd. occupied on this building as ownership basis. The following general information was noted:

i.	Building Usage Type	: Knit wear Factory
ii.	Structural System	: RCC Beam-Column Frame.
iii.	Floor System	: RCC beam slab floor system.
iv.	Floor Area	: The typical plinth area of 5 storied RCC building is 6600 sft. Total operational area is 32,700 sft.
v.	No. of Stories	: 5 Storey.
vi.	Construction Year	: 1995-1996
vii.	Foundation Type	: Unknown.
viii.	Design Drawings	: Available (Approval for five storied from Chittagong Development Authority (C.D.A) on 20th January, 1994 for commercial use).
ix.	Soil Investigation Report	: Available.
x.	Construction Materials	: Brick aggregate. (Identified by removing plaster)
xi.	Generator	: The generator room is located at the ground floor of the north-west zone of the factory premises.

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) :

- Sections of plaster finish to column to be removed to investigate if cracks penetrate into the building wall. Investigation needed why it is occurring.

Long Term (6-months) :

- Carry out any remedial actions as directed by the Building Engineer for cracks on columns.

- As-built architectural and structural drawings of entire building containing extended construction to be prepared and submitted for approval by appropriate authority. As part of this process the building engineer will be required to make a number of checks on the inconsistencies between the structural design and the as-built construction.

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 • Factory management should be checked alarm call points & manual alarm system periodically and maintained the record properly. • The first aid hose and standpipe performance should be checked periodically and properly tagged.
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. • Exit door should have minimum clear width 0.9 meter. • 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 hours fire rated doors in all stair way encloses. • Prepare proper plan and design for 4 hours fire rated barriers with 2 hours fire rated door at 2nd floor boiler area, which located at the adjacent to iron section. • The egress paths should be illuminated with emergency lighting with power back-up supply & illumination should be a minimum of 10 lux for all corridors & exit

	doors. Aisles should be provided with a minimum 2 lux. • The stairway should be illuminated with emergency lighting with power back-up supply & illumination should be a minimum of 10 lux for stairway. • Produce design and plan for automatic detection system with automatic fire alarm. • Install Manual activation call point at all exit routes • 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. • Prepare plan and design for dedicated water storage tank for firefighting operation.
Long Term (*The remedial works indicated must be carried out within a period of 6 months)*	• Provide 4 hours fire rated barriers with 2 hours fire rated door at 2nd floor boiler area, which located at the adjacent to iron section. • Install automatic detection system with automatic fire alarm. • 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. • Stand pipe supplying first aid hose should have minimum pressure of 200 KPa. • 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*	• None.

regular activity	
Mid Term (*The remedial works indicated must be carried out within a period of 6 weeks)*	• 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 adequate illumination for Generator room. • All unwanted materials should be removed from Generator room. • Provide rubber mats of adequate size in front of all distribution panels. • Install smoke detection and provide firefighting equipment in the generator room. • 1. All stranded conductors > 6mm2 to be provided with cable sockets. 2. All stranded conductors < 6 mm2, at exposed end should be soldered / crimped. • Provide cable connections with properly soldered / welded lugs at (LT/MDB/DB/SDB)'s. Ensure that all the electrical connections are properly secured with lugs. • Select conductors and MCCB/MCB with adequate sizing without exceeding permissible current carrying capacity for insulation. • Avoid bunch of cable at MCB, 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. • Seal the opening of wall at wiring passing through wall. Ensure that all cable penetrations though walls should be adequately sealed with fire resistive elements. • 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 MDB. 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)*	• Modify Area of generator room to meet requirements of Table 4.4, RMG Guideline; the area should be 36m2, 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. • Provide calibrated Ammeters and Voltmeters at distribution boards (MDBs). • 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 (COS)'s with non-flammable materials. In addition: 1. Ensure that HT / LT 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.