

## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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Name of the Factory	:	<b>CHITTAGONG FASHION SPECIALIZED TEXTILES LTD</b>
Address of the Factory	:	Plot # 26, Sector # 1, Road # 4, CEPZ, Chittagong, Bangladesh
Dhaka Present Status of the Factory	:	<b>Under Operation</b>
Structural assessment conducted by	:	Accord (Full report available at bangladeshaccord.org)
Date of Structural Inspection	:	11 February, 2014
Fire & Electrical assessment conducted by	:	Accord (Full report available at bangladeshaccord.org)
Date of Fire & Electrical Inspection	:	23 June, 2014

**Basic Information:** The present garment factory is a commercial building with beam-column frame system. The following general information was noted:

i.	Building Usage Type	:	Garment factory
ii.	Structural System	:	RC two-way spanning slab supported by RC beams and columns
iii.	Floor System	:	Beam slab
iv.	Floor Area	:	Total floor area of the building is 72,000 sq.ft.
v.	No. of Stories	:	7 storied
vi.	Construction Year	:	1997
vii.	Foundation Type	:	Unavailable
viii.	Design Drawings	:	Available (Approved by CEPZ in 2013)
ix.	Soil investigation Report	:	Available (1997)
x.	Construction Materials	:	Unavailable
xi.	Generator	:	In a separate Utility Building

**Recommendations for Corrective Action:** The recommendations of corrective action for both Structural and Fire & Electrical Safety are as follows:

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

Immediate (Now): NA

Mid Term (Within 6 Weeks):

1. Factory engineer to review design, loads and column stresses identified above.
2. Verify insitu concrete strengths either by cores or existing cylinder strength data for 8 building columns.
3. Building Engineer to survey building structure and compare with structural drawings to identify any discrepancies.
4. Building Engineer to review structure and carry out design calculations to verify the load capacity that this floor system can safely carry.
5. Allowable floor loading to be advised to ensure that storage loads comply with this restriction.
6. Steel roof to the East Block should be designed by the Building Engineer including the provision of a lateral stability system and, if required, upgraded to support code vertical and wind loads or the area should be vacated and removed.
7. Sections of plaster finish to slab to be removed to confirm that cracking is associated with lines of fin beams within waffle slab.
8. Building Engineer to confirm that waffle slabs have been utilized.

## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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9. Walkways to be provided within all storage areas
10. Building Engineer to produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.
11. Building Engineer to carry out design calculations to verify the load capacity of the external escape stairs for crowd loading in the event of use in an emergency.
12. Construction rubble / demolition material to be removed from building roof.

### Long Term (Within 6 Months):

1. Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.
2. Building Engineer to review the design calculations and confirm that the design (or an updated design if required) corresponds with the as-built structure.
3. As-constructed layout and structural drawings to be issued.
4. On-going monitoring of loading required.
5. Building Engineer to confirm how waffle slab in-fills are restrained in position to ensure that the cracking pattern does not develop further.
6. Roof drainage system to be installed and concrete slab to be waterproofed at locations where the slab has been damaged.

### **The recommendations for Fire Safety corrective actions are:**

#### Immediate (Within 1 month):

1. Reduce occupant load to not more than available exit capacity (359). Provide additional exits in the future to increase occupant load.
2. Remove locking features from all egress doors and gates. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.
3. Keep egress paths and stairs clear of storage.
4. Remove all storage from exit stairs and egress paths.
5. Replace all gates and sliding doors along the means of egress with side-hinged, swinging egress doors. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.
6. Regularly test the emergency lighting system on each floor and replace and repair emergency lighting system including the alternative Instant Power Supply as needed.
7. Remove manual on/off switches from emergency lighting and exit signage units to prevent them from being switched off.

#### Short Term (Within 3 Months):

1. Provide minimum 1.5-hr fire rated doors and seal all unprotected openings to separate the exit stairs from work areas and other building spaces on all floor levels. Ensure that the fire doors are self-closing and positive latching and that they are provided with fire exit (panic) hardware where serving production floors. If fire doors are required to be held open for functional reasons, provide automatic closing devices tied to the fire alarm system.

## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

---

2. Provide a minimum 2-hr fire rated shaft to separate the utility risers from each floor level.
3. Separate the boiler, generator, transformer and EMR room by a minimum 2-hr fire-rated construction. Seal and protect all openings to maintain the required fire separations.
4. Provide dedicated storage rooms separated by minimum 1-hr fire-rated construction.
5. Provide defined storage areas and limit the storage arrangement as follows:
  - Maximum height of 2.4m and maximum area of 23 m<sup>2</sup>.
  - Separate areas of unenclosed combustible storage by a minimum clear distance of 3 m.
6. Provide minimum aisle widths of 36-in.
7. Relocate day-care room on ground floor with maximum travel distance of 9m (30 ft).
8. Provide additional means of egress.
9. Inspect, test and maintain the fire alarm system, and keep written records on-site, in accordance with NFPA 72.
10. Inspect, test and maintain the emergency lighting system in accordance with The ACCORD standard. Keep written records on-site.
11. Test the emergency lighting system on each floor and provide additional emergency fixtures to provide adequate illumination along the means of egress. Provide a minimum illumination of 10 lux at the floor level within exit stairs and exit discharge paths and minimum 2.5 lux along exit access aisles.

### Mid Term (within 6 Months):

1. Provide 2-hr fire-rated exit passageway leading directly outside (vestibules to separate any storage areas).
2. Remove single station smoke alarms. Provide automatic smoke detection throughout the building in accordance with NFPA 72.

### Long Term (More than 6 months):

1. Replace the fire alarm system with a new, listed addressable fire alarm system in accordance with NFPA 72.

### **The recommendations for Electrical Safety corrective actions are:**

#### Immediate (Within 1 month):

1. HT cable dropping from HT pole must be protected in rigidly fixed steel pipe of required size at least 2m from the ground level to protect the cable from any physical damage. The cable should be supported on covered tray or ladder throughout its length up to the HT panel base-plate (except the part of the cable laid underground at a depth of at least 1 meter).
2. Cables must be protected from possibility of damage by panel edges or sharp objects. Panel base plates must be installed and cable(s) entering panel must be firmly fixed with cable gland. Support HT cable inside panel using appropriate cable boot clamp. Suitable HRC fuse of correct rating must be installed.
3. Establish a routine cleaning program to keep neat and clean the transformer and transformer room. Shut the power of the transformer and clean the exterior of the transformer at scheduled period. Assign a transformer servicing consultant to replace silica gel and fill up

## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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- breather oil cup with transformer oil. Perform a routine maintenance program to check and maintain smooth operation of all equipment.
4. Generator Batteries should be placed inside the steel frame (battery rack). Remove diesel and other combustible cans and barrels from generator room.
  5. Cables must be protected, supported and installed through safe routes. Cables passing through window and ventilators must be removed immediately. Install the cables on the ladder/tray. Ensure the cables are tightly latched inside the ladder and provide covers made of non-combustible material.
  6. Cables shall be connected to terminals only by soldered/welded lugs according to cable size. Phase barriers between different phases supplied by the breaker manufacturer must be installed to avoid arc flashing.
  7. Arrange periodic inspection & thermal scan to identify the overloading, loose connection, unbalanced load which may cause the excessive heat-rise and take action accordingly. Burnt MCCB must be replaced with a new one.
  8. Protective devices should be encased in metal casing made of 20 SWG thickness metal sheets painted with enamel paint. Multiple cables connecting at a MCCB terminal must be removed. Individual circuit breaker must be used for each load according to the respective cable-size.
  9. Cables terminating at both side of MCCB must match in size. Check the cables and circuit-breaker to find out the higher rated circuit-breakers. Choose the circuit-breaker according to the cable-size such as the rating of the device does not exceed the current carrying capacity of the cable.
  10. Rearrange the wirings by using PVC cable duct for routing cables inside the panel. All wire terminations must be made at the bus-bars or terminals of control/protection devices and it's strongly recommended not to use any temporary connections for any permanent use. Remove the extension of temporary connections.
  11. All electrical installations, including wiring and cabling must be protected against heat induced from the boiler. Heat resistant industrial graded flexible conduit should be used inside the boiler room.

### Short Term (Within 3 Months):

1. Cables in trench must be supported & arranged on trays inside trench. Install separate cable tray with protective cover for HT and LV cables; Latch the HT cable properly avoiding acute bend.
2. Enlarge the transformer room to provide necessary clearance around it. The room area for the transformer should be 13 sq m according to BNBC 2006, Section-2.6.3. Make sure that the transformer room should be fire rated and separated from other occupancy.
3. Enlarge the existing generator room to provide sufficient working clearance around or keep sufficient clearance around the generator (1 meter preferably). Install vertical and horizontal cable tray from the generator terminal box to changeover switch to protect and support the generator output cables laid on the floor.
4. Use steel pipe/cable tray to ensure the mechanical protection of the cable laid on floor otherwise cable insulation may damage due to falling object or stepping of occupants onto it. Cables drawn on walls must be supported by cable riser or cable tray.
5. Cables in trench must be supported & arranged on trays inside trench. Metallic cover (checkered plate) must be installed on cable trench to prevent any damage to cables.

## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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6. Install the cable tray/ladder/ duct up to the cable entry of the panel in order to support the cables. Ensure the cables are tightly latched with the ladder and provide covers made of non-combustible material preferably metallic sheet to protect the cables' insulation from any physical damage as well as prevent ingress of debris, dust and lint. Provide cable gland for every cable entry and exit hole.
7. All panels must be connected to earth at least at two points for guaranteed earth connection. All metal parts of electrical appliances and devices must be connected to earth. Panel doors and other metal parts used must be connected with earth bond. Provide base plate/top plate of panels, make circular hole and provide cable gland according to the respective cable size for cable entry and exit so that the cables are not stressed on the sharp edges of the hole of panels. Provide covers (of noncombustible material) if any additional gap remains after installing cable glands.
8. Clean all dust and debris of all interior components. Establish a periodic cleaning program and maintain records of the activities to prevent ingress of dust and lint in future. Rearrange the wirings by using PVC cable duct for routing cables inside the panel and protect and support adequately.
9. Cables supported in ducts must be arranged and easily separable for maintenance. Do away from temporary joints in the ducts. Cables must be tightly covered to prevent ingress of lint and dust. Clean the cable ducts before rearranging the cables and install with protective covers.
10. Lightning arrestor must be installed (according to BNBC Part 8, section 2.9.) with proper size air termination network, down conductors and earth termination.

Mid Term (Within 6 months):      NA

Long Term (More than 6 months): NA