

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: BARNALI FABRICS LTD
Address of the Factory	: West Mukterpur, Munshigonj, Bangladesh
Dhaka Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Accord (Full report available at bangladeshaccord.org)
Date of Structural Inspection	: 9 August, 2014
Fire & Electrical assessment conducted by	: Accord (Full report available at bangladeshaccord.org)
Date of Fire & Electrical Inspection	: 23 July, 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	: steel beam, RC beam and slab
iii.	Floor System	: Beam slab
iv.	Floor Area	: The building 1 is 21.8m tall and each floor measures a total area of 16500sqft
v.	No. of Stories	: 6 & 2 storied
vi.	Construction Year	: 2010-2011
vii.	Foundation Type	: Unavailable
viii.	Design Drawings	: Available (Permit drawing)
ix.	Soil investigation Report	: Unavailable
x.	Construction Materials	: Unavailable
xi.	Generator	: South of Building 2, west of Shed 1

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):

Mid Term (Within 6 Weeks):

1. The factory Structural Engineer needs to verify the steel grade and carry out an Engineering Assessment to determine the structural capacities of all structural members.

Long Term (Within 6 Months):

1. The as-built drawings need to be re-produced to accurately reflect what has been built.
2. The cross bracing needs to be altered so that it reflects the intentions of the original design.
3. Steel beams need to be provided to connect to the columns together.
4. Fire proofing needs to be applied with minimum 1-2 hours resistance based on the BNBC codes.
5. Provide a proper waterproof layer on the roof.
6. Truss bracing systems need to be provided in longitudinal direction, in accordance with normal structural convention.
7. Either demolish the building and re-build it properly to a full Structural design, or strengthen in accordance with a Structural Engineer's recommendations.

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8. The factory Engineer should survey the actual conditions and reproduce the as-built drawings for all buildings as early as possible.

The recommendations for Fire Safety corrective actions are:

Immediate (Within 1 month):

1. Immediately reduce the occupant load to not more than the available exit capacity (474). Alternately, provide additional exit.
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. Remove all storage from exit stairs and egress paths.
4. 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.
5. Provide exit signs above all exits to the exterior and all doors to the exit stairs.
6. Regularly test the emergency lighting system on each floor and replace/repair lights as needed.
7. Provide lighted exit signs above all exits to the exterior and all doors to the exit stairs. Remove the exit sign on the south side of the building.

Short Term (Within 3 Months):

1. Provide dedicated storage rooms separated by minimum 1-hr fire-rated construction. Where separate storage rooms may not be feasible, provide defined storage areas and limit the storage arrangement as follows:
 - Maximum height of 2.4m and maximum area of 23m²
 - If sprinkler protected: maximum height of 3.66m and maximum area of 93m².Separate areas of unenclosed combustible storage by a minimum clear distance of 3m.
2. 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.
3. Seal all penetrations and openings in floor/ceiling assemblies to maintain the fire separation.
4. Seal all penetrations and openings in exit stair enclosure walls to maintain the fire separation.
5. Enclose all exit stairs in 2-hr fire-rated construction.
6. Separate the diesel fuel storage from Generator 1 by 2-hr fire-rated construction.
7. Separate the hazardous materials/flammable liquid storage room by a minimum 2-hr fire-rated construction. Seal and/or protected all openings to maintain the required fire separations.
8. Provide a 1-hr fire rated hatch. Alternately, seal the opening with 2-hr fire-rated construction.
9. Provide minimum aisle widths of 36-in.

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10. Reconfigure the egress arrangement to reduce the maximum common path of travel to not more than 100 ft. and the travel distance to not more than 200 ft.
11. Provide a minimum 2-hr fire rated exit corridor between the day-care room and exit stair. (Vestibules to separate any storage areas). Alternately, relocate the day-care room to a location with maximum travel distance of 9m (30 ft) to the exit discharge.
12. The rooms need to not discharge inside the exit stairs once they are enclosed. Either relocate the rooms or provide access to the rooms by means other than through the exit stair enclosure.
13. Inspect, test and maintain the fire alarm system, and keep written records on-site, in accordance with NFPA 72.
14. Based on ceiling configuration, provide additional detectors where needed, and space them in accordance with NFPA 72.
15. Inspect, test and maintain the emergency lighting system in accordance with The ACCORD standard. Keep written records on-site.
16. 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.
17. Provide manual firefighting equipment and emergency evacuation plans in accordance with The ACCORD standard.

Mid Term (within 6 Months):

1. Provide 2-hr fire-rated exit passageway leading directly outside (vestibules to separate any storage areas). Alternately, provide sprinkler protection for discharge floor in accordance with NFPA 13.
2. Provide additional notification appliances such that the fire alarm system is audible throughout the building in accordance with NFPA 72.
3. Provide additional remote exit. Alternately, provide sprinkler protection for the entire ground floor in accordance with NFPA 13.
4. Based on ceiling configuration, provide interconnected smoke detectors where needed, and space them 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.
2. Provide fire alarm system components throughout the building, connected to the addressable fire alarm panel in accordance with NFPA 72.

The recommendations for Electrical Safety corrective actions are:

Immediate (Within 1 month):

1. Control devices must be encased in the casing made of noncombustible material and opening must be sealed off.

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2. Remove all the oil drum from generator room, any kind of combustible materials cannot be stored inside the generator room and near any electrical panel. Establish a routine cleaning program to keep the generator room neat, clean and dry.
3. Provide earth connection for body and doors of metallic distribution boards using green cables preferably braid so that the metallic door remains at zero potential all the time.
4. Remove lint and dust from the panel and make a periodical cleaning program.
5. Remove all the combustible materials which are near to the distribution panel as soon as possible.
6. Multiple cable/wires terminating at a terminal in bus-bars must be separated.
7. Provide earth connection for body and doors of metallic distribution boards using green cables preferably braid so that the metallic door remains at zero potential all the time.

Short Term (Within 3 Months):

1. Make circular hole at the base plate/top plate of panels 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.
2. The earth loop impedance must be maintained below 1 ohm or equivalent.
3. Every item of installation shall be arranged so as to facilitate its operation, inspection, maintenance & access. Access of the changeover switch must be kept obstacle free for easy operation & maintenance.
4. Change over switch door must be installed to prevent ingress of lint/dust.
5. Install separators between different phases of MCCB. Standard separators provided by the MCCB manufacturer must be used.
6. Cables shall be connected to terminals only by soldered/welded lugs according to cable size.
7. Cable terminating at Generator output terminal box must be supported on riser and protected. Existing cables laid on floor may be installed in cable trench or on trays.
8. Need to connect single cable in single port.
9. Cables passing through permanent walls must be protected in cable tray/steel pipe /PVC pipes and remaining space after passage must be sealed with suitable fittings. The wires must be drawn in the rigid conduits and must be supported along the ladder.

Mid Term (Within 6 months): NA

Long Term (More than 6 months):

1. The factory must have As-built electrical SLD with electrical wiring layout designs and drawings. Any changes in load, protection system, conductors, Generation and supply system must be reflected in the As-built SLD and drawings.
2. Thermo graphic scanning of the entire electrical system must be performed on tri-annual basis and recorded.

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3. Insulation resistant test of all the cables must be performed once every 5 year cycle and recorded.
4. Electrical safety training and awareness program for the electrical personal and workers must be initiated and recorded.
5. Make circular hole at the top plate of panels and provide cable gland according to the respective cable size for cable entry and exit.
6. Cable must be arranged and latched properly on the cable tray. Provide cover made of noncombustible material preferably metallic sheet to protect the cables' insulation from physical damage as well as prevent the ingress of debris, dust and lint. Keep 30% free inside cable tray/channels/ducts for proper heat dissipation. Install another duct/tray to accommodate all the cables.
7. Install cable tray with protective cover to route and protect the LT cables safely i.e. protect the cable insulation from physical damage due to falling objects and stepping of maintenance personnel.