

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: BP Wears
Address of the Factory	: B-189, BSCIC Industrial Estate, Tongi, Gazipur, Dhaka, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 07 May 2014
Fire & Electrical assessment conducted by:	Alliance
Date of Fire & Electrical Inspection	: 07 May 2014

BASIC INFORMATION:

The present garment factory is a four storied RCC building with one steel shed on roof. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: 4 storied RCC Frame system + steel shed on roof
iii.	Floor System	: Beam Supported slab.
iv.	Floor Area	: 61,394 sft.
v.	No. of Stories	: 4 storied RCC + steel shed on roof
vi.	Construction Year	: 2002-2004
vii.	Foundation Type	: Unknown
viii.	Design Drawings	: Available
ix.	Soil investigation Report	: Available
x.	Construction Materials	: Reinforced Concrete (brick chips).
xi.	Generator	: Unknown

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 (3 to 6 Days) :

- i. The top surface of the structural framing elements exposed to weather must be completely sealed from water intrusion by a well maintained protective coating. Alternatively, create a positive drainage slope of at least 2% and provide drains with downspouts at low points to prevent water clogging, then the requirement for complete sealing of the top surface may be waived.
- ii. All columns (for extensions) should be provided with proper protective coating if they remain exposed.
- iii. Remove undocumented tin shed structure on roof immediately or otherwise retain a qualified structural engineer to analytically evaluate the impact on the structure and determine any necessary provisions to support the additional loads.

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Short Term: (3 Weeks)

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- 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.

Mid Term (6 Weeks)

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- i. Have a qualified engineer provide analysis and remediation recommendations for columns along grid line B at Levels 1, 2 and 3. It is likely that jacketing will be required such as has been done at these columns on the Ground Level.
 - ii. Engage a qualified structural engineer to conduct a detailed engineering assessment (DEA) of building within 6 weeks. DEA should include assessment of the strength of the concrete and quantity of the steel in the columns. 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 an upper level where the stresses are low (for practical reasons 3 inch cores may be taken from columns). In addition, 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. The size and diameter of steel rebar in most of the columns of two lowest tiers shall be authentically determined using a Ferro scanner or similar device. In order to confirm the diameter of embedded bars as obtained from Ferro scanner, the Assessor may have to remove the concrete cover in one or two locations.
 - iii. Have a qualified structural engineer provide further analysis and investigation of the structural deficiencies resulting in the vertical beam cracks. As noted elsewhere, the column size on these floors was deemed insufficient for the current load based on visual observations. Additionally, there are loads such as an undocumented roof structure, and storage loads that may not have been considered. The structural engineer shall also provide remediation documents if required as per Alliance Standards Part 8 Structural Design Section 8.2 Structural Integrity.
 - iv. As part of the detailed engineering assessment outlined elsewhere, the compressive strength of structural elements constructed of MCAC shall be investigated by an appropriate program of in-situ testing and representative destructive testing of core samples.
 - v. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard. All elements must be evaluated and included in drawings.

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- vi. Engage a qualified structural engineer to develop the required documents to confirm compliance with building code. Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
- vii. Any planned vertical extension must be analytically confirmed and approved by a qualified structural engineer prior to construction.
- viii. Have a qualified structural engineer confirm that capacity to support the noted storage load is available. Load Plans complying with Alliance Standard Part 8 Section 8.20.4.3 should also be developed.
- ix. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading. Compliance may be waived if the Factory Owner provides satisfactory evidence of a cyclone operations plan that includes full evacuation of the factory in advance of any approaching cyclone.
- x. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads such as water tanks and production equipment. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- xi. Develop engineered plans to brace storage racks to resist earthquake forces to comply with the BNBC and Alliance Standard. Install anchor and braces as shown on approved plans as per Alliance Standards Part 8 Section 8.18.
- xii. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard.
- xiii. Provide the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan (noted elsewhere).

Long Term (6 months) : Depending on the findings of the DEA, permanent remedial measures should be taken for the safety of the building.

The recommendations for Fire Safety corrective actions are:

Immediate (3 to 6 Days)	<p>Remove all store materials in the stairwells at the noted locations. Implement a housekeeping program to keep the stairs and egress paths free of storage and impediments.</p> <p>Remove all combustibles stored underneath the cutting tables.</p>
Short Term (3 Weeks)	<p>Remove all locking devices from all egress doors and means of egress components in accordance with Alliance Standard Section 6.8. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.</p>
Mid Term (6 Weeks)	<p>Post the occupant load for every assembly and production floor in a conspicuous space near the main exit or exit access doorway for the space.</p> <p>A factory should install automatic fire detection system. Arrange for direct connection of the fire alarm and</p>

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	<p>detection system to a central station monitoring service or the Fire Service and Civil Defense as per Alliance Standard Part 5 Section 5.7.5 Monitoring. Until that time that a central station monitoring service or direct connection to the Fire Service and Civil Defense can be set up, a person shall be assigned to contact the fire department in the event of fire alarm activation. An annunciator shall be located in a constantly attended location to alert this person.</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 powered signs is provided for a minimum 90 min once per year.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations.</p>
<p>Long Term (6 Months)</p>	<p>Install an automatic fire alarm system per NFPA 72, including a listed Fire Alarm Control Panel. Install sufficient smoke/heat detectors per NFPA 72. Automatic detectors should be tied into the fire alarm system. Alarm system should initiate occupant notification upon activation of detectors in addition to the manual fire alarm stations. Include listed pull stations at all entrances to exits. Install strobes and horns for complete notification. Automatic area smoke detectors are required throughout G2 buildings per Section 5.7.3.6. All fire alarm installations shall be submitted for review by the Alliance for review prior to commencement of installation.</p> <p>Installation of approved standpipe will require the installation of rated fire pump. Install the fire pumps in accordance with NFPA 20. Consult with a qualified fire engineer to properly design and install pump system. Arrange water storage tank according to NFPA 22. Submit product data, drawings and hydraulic calculations and secure Alliance approval before purchase and construction.</p> <p>Protect all egress stairs with a shaft enclosure including 2-hour fire-rated construction. Factory will need to install fire rated door assemblies at all exits to stairs (1.5 hour rating). Fire doors assemblies shall conform to NFPA 252, BS 476 Part 22, EN 1364-1, GB 12955-2008, or IS 3614. Part II. Doors must remain in closed position or be of self-closing type. Doors may be provided with locking hardware from the ingress side provided that a panic bar is installed on any door with an occupant load exceeding 49 persons.</p> <p>Install or revise existing standpipe system at required locations designed by a qualified fire protection engineer. System should include rated fire pump and Class I standpipe hose connections (65 mm) in each stairwell at each floor level including occupiable roofs.</p> <p>Modify stairs so that discharge is directly to the exterior or construct rated exit passageways to connect stair shafts to exterior discharge exits. Submit drawings for approval before construction.</p>

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	<p>Interior exit stairways and ramps shall terminate at an exit discharge except where terminating at an exit passageway is constructed to meet the same rating requirement as the exit that is being served and shall not be less than 1 hr fire-resistance rated construction, therefore a fire rated exit passageway would need to be established for both stair discharges.</p> <p>Remove all sliding or rolling doors at and within the exit stairs and along all portions of the means of egress. Replace with side-hinged swinging type doors in compliance with Standard. As noted elsewhere, exit enclosures require fire rated door assemblies (which should be side-hinged).</p> <p>Provide fire-resistive rated assemblies at the required exit access corridors. The rated assembly should be approved and/or designed by a qualified fire protection engineer.</p> <p>Provide a uniform slope/ramp at the noted locations (slope should not exceed 1 in 20 in the direction of travel). Any protrusions or lips must be smoothed down to less than 1/4 in.</p> <p>Illumination shall be a minimum of 10 lux for all corridors, exit doors and stairways. Illumination for aisles shall be a minimum of 2.5 lux.</p> <p>Repair or replace damaged piping at the noted locations. Repairs and replacements must comply with NFPA14 & NFPA25.</p> <p>Upon installation of compliant standpipe system, fire department (Siamese) inlet connections should be installed to allow fire department pumper equipment to supplement the fire protection systems. Fire department outlet connections shall be provided to allow fire department pumper vehicles to draw water from ground-level or underground water storage tanks. Connections shall match the Fire Service and Civil Defense hose thread standard.</p> <p>Handrails shall be provided on both sides of each exit stairway and ramp. New handrails shall have a minimum height of 865 mm (34 in.) and a maximum height of 965 mm (38 in.) as measured from the leading edge of the tread.</p> <p>Install fully anchored parapets or guards with a minimum height of 1067 mm (42 in.) on occupied roof areas.</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>It is recommended to retain the services of a qualified fire engineer to design segregation as follows: Boiler room: Separated from other occupancies by a minimum 1 hour construction. Generator Room: Generator sets shall be separated from all other occupancy areas by a minimum 2 hour construction. Transformer: Oil filled transformers for non high-rise buildings shall be separated by a minimum 2 hour fire resistive rated construction. Storage Rooms:</p>
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	<p>Rooms used for storage of combustible materials shall be separated from the surrounding occupancy with a minimum 1 hour construction. Install fire doors in doorways through all rated walls. Close unused openings with rated construction. Install listed firestop systems at every penetration through fire rated walls and floors.</p> <p>Establish written corporate and plant policies on housekeeping to ensure scheduled cleaning for floor, wall, ceiling, supply and return air ventilation systems. Promptly reschedule skipped cleanings. Provide a documented line of authority for authorizing a cleaning delay and rescheduling. 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>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B.</p> <p>Any newly installed or revised standpipe system needs to be evaluated for compliance with the design pressure and flow demands of NFPA 14 or BNBC as cited in 5.4.3. Standalone standpipe systems shall be confirmed to meet the local BNBC requirements with a minimum 450 kPa (65 psi) pressure at the hydraulically most remote hose connection or NFPA 14. This testing should be documented and available for review. Establish an inspection, maintenance and testing program for the standpipe and hose system. Program must comply with the requirements of NFPA 25.</p> <p>Create a Fire Safety Director position and fill the position with an individual that has had sufficient training to be able to carry the required duties.</p>
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The recommendations for Electrical Safety corrective actions are:

Immediate	NA
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>Ensure light fixtures without protective covers are not installed in storage areas or in any area where the Inspector of the Factories Rules disallows these fixtures.</p> <p>Provide two separate points earthing (grounding) provided for generator.</p>
Mid Term (6 Weeks)	<p>Power and telecommunications cables must have separate entrance.</p> <p>All cables connecting switch boards and equipment must be</p>

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	<p>identified (cable tags). Phase, line, neutral, etc. should be easily identifiable by the use of approved color coding or cable tags and codes. Where not indicated by color, every cable core of a fixed wiring installation should be identifiable at its terminations and its length by appropriate labels or coding.</p> <p>Installed wiring/cable guards at change over box in generator room.</p> <p>Have a qualified electrical engineer develop an as-built single line diagram detailing key components and capacity of the electrical system.</p>
Long Term (6 Months)	<p>Have a qualified electrical engineer design a lightning protection system according to the BNBC requirements. Have a licensed electrician install the designed system.</p> <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>