

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

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Name of the Factory	: Aryan Knitwear
Address of the Factory	: 65 Nayamati, Narayangonj-1400, Bangladesh.
Present Status of the Factory	: Under Operation.
Structural Assessment Conducted by	: VEC
Date of Structural Inspection	: 30 <sup>th</sup> June, 2015
Fire Assessment Conducted by	: VEC
Date of Fire Inspection	: 30 <sup>th</sup> June, 2015
Electrical Assessment Conducted by	: VEC
Date of Electrical Inspection	: 30 <sup>th</sup> June, 2015
BGMEA Membership No.	: 2494
BKMEA Membership No.	: 50

### **BASIC INFORMATION:**

The assessed factory building is eight storied dual system, RCC Beam-Column frame structure (Ground to 3<sup>rd</sup> and 5<sup>th</sup> to 7<sup>th</sup> floor) except 4<sup>th</sup> floor which is flat plate system. Aryan Knitwear occupies only 4<sup>th</sup> floor of the building, on rental basis. The other floors are occupied by several RMG factories. The following general information was noted:

i. Building Usage Type	: Garment Factory.
ii. Structural System	: Dual system (RCC beam column and flat plate system)
iii. Floor System	: RCC beam slab and flat plate slab system.
iv. Floor Area	: Total floor area 60,000 sft.
v. No. of Stories	: 8 Storey.
vi. Construction Year	: 2007-2008.
vii. Foundation Type	: Pile foundation.
viii. Design Drawings	: Available: Approval drawing, structural drawing, machine layout plan. Not available-Full set of Architectural drawing, floor load plan, material test report.
ix. Soil Investigation Report	: Available.
x. Construction Materials	: Stone aggregate in column.
xi. Generator	: Separate structure (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)	: <ul style="list-style-type: none"><li>• Verify in-situ concrete stresses either by 100mm dia. cores or existing cylinder strength data. Cores to be taken from 4 different areas of slab at different level.</li><li>• The Building Engineer shall provide calculations showing the structural adequacy of all columns taking into account any additions to the existing structure, the loading plans and as built structure.</li></ul>

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Long Term (6-months) :

- Building Engineer to survey and prepare as-built drawings.

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

**(A): Recommendations for Fire Safety corrective actions:**

<p>Immediate</p> <p><i>(the factory should not continue to be occupied until these non-conformities have been rectified):</i></p>	<p>N/A</p>
<p>Short Term</p> <p><i>(Actions that must be incorporated into a Fire Safety Management Plan immediately (1 ~ 2 weeks) and should be a regular activity</i></p>	<ul style="list-style-type: none"> <li>• Factory need to have proper testing plan &amp; record of fire safety equipment.</li> <li>• Lights in storage area needed to be installed with protective covers and conduits.</li> <li>• Combustibles are to be managed with good housekeeping. Storage facilities with no air-conditioning duct shall be minimum 2.9m and when used as a storage facility there shall be a minimum clearance of one third the floor height from the ceiling to the top of the storage stack and need to reduce or minimize fire hazard, good housekeeping within and outside shall be strictly maintained by the occupants and owner of the building.</li> </ul>
<p>Mid Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 weeks)</i></p>	<ul style="list-style-type: none"> <li>• Factory needs to prepare as built drawing with floor machine layout showing means of escape with proper dimension.</li> <li>• All the exit doors need to be replaced by side swinging so that un-lockable doors can be opened easily in the direction of evacuation without the use of a key.</li> <li>• Minimum width of exit door should be 0.9m.</li> <li>• Need to arrange both sides handrail for all the stairs.</li> <li>• Factory needs to be installed with adequate illuminated emergency lighting in floors, exits &amp; stairs. (Escape route).</li> <li>• Factory need to install suitable public address system having communication to all floors as well as facilities to receive messages from all floors.</li> </ul>
<p>Long Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6</i></p>	<ul style="list-style-type: none"> <li>• Fire department pre-plan needs to be developed.</li> <li>• Final exit route-1&amp;3(Stair-1&amp;3 route) need to be protected by 4 hours rated construction with 2 hours fire</li> </ul>

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<p>months)</p>	<p>rated door/opening at each floor level entrance including ground floor and need to have the protected escape route till to reach safe refuse area.</p> <ul style="list-style-type: none"><li>• Final exit route-2(Stair-2 route) need to be protected by 4 hours rated construction with 2 hours fire rated door/opening at each floor level entrance including ground floor and need to be protected from generator room at ground floor by 4 hours rated construction with 2 hours rated door/opening, also need to have the protected escape route till to reach safe refuse area.</li><li>• Child care room is need to be protected from the finished goods store &amp; Doctors rooms of 3rd floor of the building by 3 hours fire rated construction with 3 hours fire rated door.</li><li>• All Storage area need to be protected with 2 hours rated construction &amp; 1.5 hours rated opening or doors.</li><li>• Generator:  Generator room need to be protected yb 4 hours rated construction with 2 hours rated opening / door also from stair-2 to as well as from the final exit route-2 located at ground floor need to be fire protected route having direct access outside of the building.</li><li>• Boiler:  Boiler room need to be protected with 4 hours rated construction with 2 hours rated opening / door from iron section at 4th floor of the building and having direct access outside of the building.</li><li>• All the staircases(stair-1,2 &amp;3) need to be protected bp fire and smoke resistant enclosures with lobby) 4 hours rated enclosure and 2 hour rated door at entrance of each floor including ground floor level) and provide the protected route from all though the stairway to the final exits.</li><li>• Factory needs to provide 3 hours rated construction between dining and cutting section.</li><li>• Factory needs to protect the lift with 2 hours rated enclosure &amp; 1hour rated auto closing fire door.</li><li>• Factory need to install fire lift with backup power including having 1 hour fire rated &amp; auto closing fire door in 2 hours fire rated lift core with backup power &amp;</li></ul>
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	<p>having minimum capacity of 545 kgs.</p> <ul style="list-style-type: none"><li>• All the stairs need to be protected with a 4 hours fire resistant and smoke proof lobby (4 hours rated enclosure and 2 hour rated door) at each floor entrance and provide the protected route from all though the stairway to the final exits.</li><li>• Factory need to install centralized and automatic fire detection &amp; alarm system on all occupied floors, including other tenanted floors of the building as per NTPA Guideline.</li><li>• Factory needs to install control panel for centralized automatic smoke detection &amp; fire alarm system according to NTPA Guideline.</li><li>• Factory needs to install proper standpipe system having at least 100mm diameter of riser according to NTPA guideline.</li><li>• Install 1 riser per 1000 m<sup>2</sup> of floor area &amp; Install adequate number of hose in floor area and the minimum hose diameter is 38 mm, or 1.5" preferably fabric hose with variable nozzle to be used in both of the stairways covering the floor area.</li><li>• Ensure the minimum pressure for standpipes supplying a 50mm or larger hose shall be at least 300 Kpa. For standpipe supplying first aid hose (38mm nominal) may have a minimum pressure of 200 Kpa.</li><li>• Factory needs to be installed with Siamese connection for to the standpipe system located outside the building and accessible to the fire department connection.</li><li>• eactorp need to have adequate width of internal road to access the maneuver fire engine according to NTPA Guideline.</li><li>• eactorp needs to have dedicated fire pump with backup power system &amp; sufficient capacity for achieve required pressure in the remote place of the factory.</li><li>• Factory needs to establish command station on the entrance lobby and equipped with detailed floor plans along with clearly demarcated locations of fire detection and fighting devices and through the panel board able to detect fire alarm from any floor. It needs to be manned with properly trained personnel having</li></ul>
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	responsibility of maintenance and operating firefighting facilities within the building.
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### **(B): Recommendations for Electrical Safety corrective actions:**

<p>Immediate</p> <p><i>(the factory should not continue to be occupied until these non-conformities have been rectified):</i></p>	<ul style="list-style-type: none"> <li>Remove all unused cables from distribution boards and make sure all necessary cables are properly terminated at its point of termination using appropriate size and type of lug.</li> </ul>
<p>Short Term</p> <p><i>(Actions that must be incorporated into a Fire Safety Management Plan immediately (a week) and should be a regular activity</i></p>	<ul style="list-style-type: none"> <li>Discharge the generator exhaust to the exterior of the building in a safe location.</li> <li>Ensure all distribution boards (including panel door) are earthed properly.</li> <li>Ensure over current protection device (circuit breaker/fuse) for each circuit/branch circuit.</li> <li>Ensure proper earthing connections at all electrical equipment.</li> <li>Clean interior components from dust and debris and seal all openings within the enclosure to prevent dust and debris from entering.</li> <li>Provide provision for inspection of all earthing system and ensure inspection is being completed and documented.</li> </ul>
<p>Mid Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 weeks)</i></p>	<ul style="list-style-type: none"> <li>Ensure graded rubber mat is provided in front of distribution board.</li> <li>Provide Instruction board for first aid and artificial respiration in the generator room.</li> <li>Provide two separate and distinct connections of earthing for each generator.</li> <li>Provide dedicated &amp; adequate size of earthing with proper identification for each circuit and ensure continuous earth path is back to main building intake.</li> <li>Rewire to avoid the use of multiple cables from incoming and outgoing side of MCB's/MCCB's.</li> <li>Ensure all electrical cables are sized according to capacity of circuit breakers.</li> <li>Provide mechanical guards for electrical equipment</li> </ul>

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	<p>where necessary.</p> <ul style="list-style-type: none"> <li>• Ensure cable joints are made in respect of conductivity, insulation and mechanical strength.</li> <li>• Connect all metal in the building to the building earthing system.</li> <li>• Find out the cause (improper cable/over current selection, over loading, improper lug, improper cable joints, rusted connection, insulation damage, multiple cables at single point, ) of overheating { ambient+( 20<sup>0</sup>C-40<sup>0</sup>C)} and take proper action.</li> </ul>
<p>Long Term</p> <p><i>(The remedial works indicated must be carried out within a period of 6 months)</i></p>	<ul style="list-style-type: none"> <li>• Develop an electrical layout diagram and an as-built single line diagram detailing key components and capacity of the electrical system.</li> <li>• Establish a periodical Insulation and earth Resistance Measurement Program and record the related testing data.</li> <li>• Inspect electrical panel boards on an annual basis.</li> <li>• Ensure appropriate generator room size in order to properly access the generator to perform routine maintenance activities.</li> <li>• Ensure distribution boards have no opening and all live internal components are concealed properly.</li> <li>• Provide dedicated &amp; adequate size of neutral with proper identification for each circuit.</li> <li>• Ensure each distribution board is provided with a circuit list and means of identification is provided as per list.</li> <li>• Provide covers on cable channel properly.</li> <li>• Provide proper cable terminator/connector for stranded conductors at its point of termination.</li> <li>• Install separate distribution boards for lighting and power circuits.</li> <li>• Install lightning protection system on the building.</li> </ul>