

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

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Name of the Factory	: Arna Tex Ltd.
Address of the Factory	: ChatoGadir Char, Madhabdi, Narsingdi, Bangladesh.
Present status of the factory	: <b>Under Operation</b>
Structural Assessment Conducted by	: <b>VERITAS Engineering&amp; Consultant</b>
Date of Structural Inspection	: 2015-05-07
Fire Assessment Conducted by	: <b>VERITAS Engineering&amp; Consultant</b>
Date of Fire Inspection	: 2015-05-07
Electrical Assessment Conducted by	: <b>VERITAS Engineering&amp; Consultant</b>
Date of Electrical Inspection	: 2015-05-07
BGMEA Membership No.	: 5813

### **BASIC INFORMATION:**

The main factory building is four storied RCC building, Arna Tex Garments Ltd occupied entire floor of the building. The following general information was noted:

i. Building Usage Type	: Garment Factory.
ii. Structural System	: RCC beam column frame.
iii. Floor System	: RC Beam slab.
iv. Floor Area	: 52,000 square feet
v. No. of Stories	: 4 storied and one non-engineered shed over roof.
vi. Construction Year	: 2011-2013.
vii. Foundation Type	: RCC Isolated footing foundation.
viii. Design Drawings	: Available: As built machine layout plan ,an architectural plan Not Available: Approval plan ,structural design drawing, architectural design drawing, material test report and floor load plan.
ix. Soil Investigation Report	: Available.
x. construction Materials	: Stone chips(Columns) and Bricks chips(Beam and Slab)
xi. Generator	: Separate building.

### **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) : N/A

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

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Mid Term (6-weeks) : N/A

Long Term (6-months) : 1. Structural engineer to prepare full set of structural as built drawing and prepare/update calculations showing the structural adequacy of the floor system taking into account the factory design imposed loading and the as built structure.  
2. Develop set of as-built drawings showing structure details, loading, dimensions, levels, foundations and framing on Plan, Section and Elevation drawings.

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

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

Immediate  <i>(the factory should not continue to be occupied until these non-conformities have been rectified):</i>	N/A
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## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

<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>• Ensure minimum width of aisles as follows: <ul style="list-style-type: none"> <li>(a) Seats on both sides of the aisle 1 m</li> <li>(b) Seats on one side of the aisle 0.9 m</li> </ul> </li> <li>• Factory needs to have sufficient total width of marked aisles (5mm per occupant) at all floor of the building.</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 2.9 m 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.</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 have as built drawing with proper dimensions showing all the means of escape.</li> <li>• Fire license need to coverage full area of factory.</li> <li>• Fire manager/Director need to have safety training from proper authority &amp; worker of the factory should as far as possible be trained for use fire extinguisher.</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>• Factory needs to provide both side hand rails on every stair.</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>• Factory needs to have a proper pre-plan for fire department.</li> <li>• Need to more exit to comply travel distance.</li> <li>• Storage area need to be protected with 2 hours rated construction &amp; 1.5 hours rated opening or doors.</li> <li>• Boiler room &amp; Sub station room needs to be fire separated with 4 hour fire rated construction and 2 hour rated enclosure.</li> <li>• Stairs need to be protected with 2 hour fire rated and smoke resistant lobby and enclosure, also having 1.5</li> </ul>

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

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	<p>hour rated opening or door and provide a protected route from all though the stairway to the final exits.</p> <ul style="list-style-type: none"><li>• Each bay shall be considered as separate compartment and detectors shall be installed considering each bay an independent compartment.</li><li>• The factory need to install manually operated electrical fire alarm system and automatic fire alarm system with single or multiple call boxes on all occupied floors, including other tenanted floors of the building.</li><li>• Factory needs to install control panel for detection and alarm system at required location.</li><li>• Install proper standpipe system having at least 100 mm dia of standpipe. First aid hose system (38 mm nominal) shall be provided (Ref. Fire Service Standard # 9) in addition to Fire Aid Fire Fighting Appliances in existing high rise NTPA (20 m) buildings. In addition 50 mm or larger hose connection facility shall be provided.</li><li>• Factory need to ensure the minimum pressure for standpipes supplying a 50mm or larger hose shall be at least 300 kPa and standpipe supplying first aid hose (38mm nominal) may have a minimum pressure of 200 kPa.</li><li>• with installed Siamese connection for to the standpipe system located outside the building and accessible to the fire department connection.</li><li>• Factory needs to install dedicated fire pump with sufficient capacity &amp; backup power.</li><li>• Factory needs to have sufficient water storage capacity to get adequate pressure to feed fire-fighting equipment and at least 1900 ltr x 75 min=142500 liters water storage tank.</li><li>• Factory needs to have sufficient water storage capacity to get adequate pressure to feed fire-fighting equipment and at least 1900ltr x 75min=142500 liters water storage tank.</li></ul>
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## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

### (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>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 (&gt; ambient+ 400C) and take proper action.</li> </ul>
<p>Short Term (Actions that must be incorporated into a Fire Safety Management Plan immediately (a week) and should be a regular activity)</p>	<ul style="list-style-type: none"> <li>Ensure all distribution boards (including panel door) are earthed properly.</li> <li>Isolate/make safe all unused cables first and then remove from distribution boards. If necessary make sure cables are properly terminated at its point of termination using appropriate size and type of lug.</li> <li>Ensure over current protection device (circuit breaker/fuse) for each circuit/branch circuit.</li> <li>Ensure proper earthing connections at all electrical.</li> <li>Isolate the panel from the electrical service and clean interior components from dust and debris. 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>Install appropriate number and type of safety signage and fire-fighting equipment at substation and generator room. Also ensure graded rubber mats are provided in front of all distribution boards.</li> <li>Provide Instruction board for first aid and artificial respiration in the substation room and generator room.</li> <li>Fill the transformer breather oil cup with fresh Oil.</li> <li>Ensure distribution boards are installed in compliant locations in terms of height, access and surrounding weather.</li> <li>Ensure distribution boards have a minimum clearance of 1 m (39 in) in front.</li> <li>Install switchboards and/or panel boards in proper way or proper place to ensure safe installation.</li> <li>Provide dedicated &amp; adequate size of earthing with proper identification for each circuit from the earth busbar of distribution boards and ensure continuous earth path is back to main building intake.</li> <li>Rewire to ensure each incoming supply to an MCB has a dedicated supply from busbar.</li> </ul>

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

	<ul style="list-style-type: none"> <li>• Avoid the use of multiple cables on outgoing side of MCB's.</li> <li>• Ensure all electrical cables are sized according to capacity of circuit breakers.</li> <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 such as metal rebar in concrete, metal frame of building, or metal water pipe etc.</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 to ensure that the equipment is in good working condition.</li> <li>• Ensure the substation room has adequate fire separation from the production area.</li> <li>• Provide adequate means of ventilation for the substation room based on the installed equipment and ensure that ventilation does not impact on fire barriers, e.g. fire dampers.</li> <li>• Ensure the generator room has adequate fire separation from the production area.</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 adequate support or mechanical guards for wiring where necessary.</li> <li>• Provide adequate covers made of non-combustible materials on cable trenches and channel.</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> </ul>

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

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	<ul style="list-style-type: none"><li>• Install lightning protection system on the building.</li></ul>
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