

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

Name of the Factory	: Angels Composit Knitting Inds.(Pvt) Ltd. (RCC Building).
Address of the Factory	: 3/A, Badam, Tongi, Gazipur., Bangladesh.
Present Status of the Factory	: Under Operation.
Structural Assessment Conducted by	: VEC
Date of Structural Inspection	: 25 <sup>th</sup> March, 2015
Fire Assessment Conducted by	: VEC
Date of Fire Inspection	: 25 <sup>th</sup> March, 2015
Electrical Assessment Conducted by	: VEC
Date of Electrical Inspection	: 25 <sup>th</sup> March, 2015
BGMEA Membership No.	: 2500

### **BASIC INFORMATION:**

There are two factory buildings in the premises. There is a four storied RCC beam column frame structure and one storied pre-fabricated (Dyeing) shed. The Angels Composit Knitting Inds.(Pvt) Ltd. is occupied with the entire building. It has a non-engineered shed at 3rd floor. The following general information was noted for RCC Building:

i. Building Usage Type	: Garment Factory.
ii. Structural System	: RCC beam column frame system structure.
iii. Floor System	: RCC Beam-slab floor system.
iv. Floor Area	: Total floor area 40,000 sft.
v. No. of Stories	: 4 Storey
vi. Construction Year	: Building was constructed in two phase. Phase-1 is in 1996 which up to 1 <sup>st</sup> floor and Phase-2 is in 2004-2005 which up to rest.
vii. Foundation Type	: Unknown.
viii. Design Drawings	: Available: Approval plan, Not available: structural drawing, soil test report, as built machine layout plan, Architectural Working Drawing, material test report and floor load plan.
ix. Soil Investigation Report	: Unavailable.
x. Construction Materials	: Brick aggregate.
xi. Generator	: Separate structure.

### **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>• Factory Engineer to review design loads and column stresses in the areas identified above.</li><li>• Distribute the concentrated loading of storage over the larger area.</li></ul>
Long Term (6-months)	:

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- Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.
- Develop set of as-built drawings showing structure details, loading, dimensions, levels, foundations and framing on Plan, Section and Elevation drawings.
- Continue to implement load management plan.

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>• Ensure adequate numbers of fire drills under the Fire Safety Plan.</li> <li>• Factory needs to have sufficient number and width (0.9 m) of marked aisles in the factory.</li> <li>• Factory needs to have sufficient total width of marked aisles (5 mm per occupant) of the factory.</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> <li>• (a) The color and design of lettering, arrows and other symbols on exit signs shall be in high contrast with their background. (b) The source of illumination, contrast, intensity and luminance needs to be at least 50 lux, 0.5, 5.0 foot-candles and 0.2 cd/m<sup>2</sup> respectively.</li> <li>• (a) Illuminated emergency light needs to be covered in floor, exits and aisles. (b) The intensity of illumination by means of escape lighting needs to be equal or more than 10 lux. The aisles need to be illuminated with escape lighting to a level of not less than 2.5 lux at floor level.</li> <li>• Potable fire extinguisher is needed to be of an approved type and installed as per manufacturer's instruction and placed near the path of exit travel and easily accessible</li> </ul>

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	<p>place. Fire hazard areas of a building like kitchen, public area, storage, electrical distribution point etc. need to be installed with portable fire extinguishers.</p>
<p>Mid Term <i>(The remedial works indicated must be carried out within a period of 6 weeks)</i></p>	<ul style="list-style-type: none"> <li>• Need to have as built drawing with floor machine layout showing means of escape.</li> <li>• Factory manager or director needs to arrange fire safety training for the workers of the factory from proper authority time to time.</li> <li>• All the firefighting equipment's need to test with proper documents.</li> <li>• All the exit doors need to be replaced by side swinging so that un-lockable fire rated doors can be opened easily in the direction of evacuation without the use of a key.</li> <li>• Provide handrail on both sides of the stairways.</li> <li>• Boiler, generator, sub-station and chemical room need to have a 4 hours fire resistance wall and entry also needs to have 2 hours fire rated door.</li> <li>• Kitchen needs to be protected from other floors and make available fixed temperature type detectors and portable extinguishers.</li> <li>• Propagation of fire, smoke, gas or fume through the opening of fire resistive floors and walls need to be restricted by sealing such opening with an approved material which needs to have a minimum 2 hours fire resistance rating of the walls.</li> <li>• Flammable liquids need to be stored in conformity with relevant regulations. Stacks need not be piled so high as to make them unstable under fire fighting conditions and in general they shall not be more than 4.5 m in height.</li> <li>• (a) Every portion of building needs to be covered and all effectively enclosed spaces need to be considered separately based on the limits of spacing for types of detectors concerned. Staircases need to be covered by detectors on each floor. (b) Each bay shall be considered as separate compartment and detectors shall be installed considering each bay an independent compartment. (c) Hoist, elevators and similar openings, windows, doors, ventilators and inlet ducts of an air-conditioning system shall be covered by detector.</li> </ul>

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	<ul style="list-style-type: none"> <li>• Manual as well as automatic fire detection and alarm system need to be installed in the factory building.</li> <li>• Factory needs to install control panel for detection and alarm system at required location.</li> <li>• Emergency back-up power needs to be connected for critical fire safety system and not less than 30 minutes in case of failure of power supply.</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>• Storage area need to be protected with 2 hours rated construction and 1.5 hours rated opening or doors.</li> <li>• Factory needs to ensure fire protected route from stair-1 to final exit -1 to safely discharge outside of the 4-storied main factory building.</li> <li>• All the exits connecting to the staircases need to be protected with fire and smoke resistant enclosures and opening (4 hours rated enclosure and 2 hour rated door) and provide a protected route from all though the stairway to the final exits.</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</li> <li>• 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>• Install proper standpipe system having at least 100 mm dia of standpipe. First aid hose system (38 mm nominal) needs to be provided (Ref. Fire Service Standard # 9) in addition to Fire Aid</li> <li>• Fire Fighting Appliances in existing high rise NTPA (20 m) buildings. In addition 50 mm or larger hose connection facility needs to be provided.</li> <li>• Install standard standpipe and hose system as well as fire pump system to ensure required hose pressure at the highest and most remote part of the building.</li> <li>• Factory need to installed Siamese connection after installation of stand pipe and hose system and fire</li> </ul>

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	<p>pump.</p> <ul style="list-style-type: none"> <li>• Factory needs to install dedicated fire pump with sufficient capacity and backup power.</li> <li>• Factory need to have sufficient water storage capacity to get adequate pressure to feed fire-fighting equipment.</li> </ul>
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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>• 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 (<math>&gt; \text{ambient} + 40^{\circ}\text{C}</math>) and take proper action.</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>• Ensure all distribution boards (including panel door) are earthed properly.</li> <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> <li>• Ensure overcurrent protection device (circuit breaker/fuse) for each circuit/branch circuit.</li> <li>• Ensure proper earthing connections at all electrical equipment.</li> <li>• Use nonflammable shades for light fittings. Avoid using Celluloid shade under any circumstance.</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>• Ensure inspection of all earthing system 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>• Ensure in the substations room all working place, exit light and escape light have adequate illumination level</li> </ul>

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	<p>as per standard.</p> <ul style="list-style-type: none"><li>• Fill the transformer breather with fresh Silica gel and oil cup with fresh Oil.</li><li>• Provide two separate and distinct connections of earthing for each generator.</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>• Provide dedicated &amp; adequate size of earthing with proper identification for each circuit from the earth bus-bar of distribution boards 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>• Replace wooden boxes and base with metal clad construction for mounting the lighting boards, circuit breaker and switch controls.</li><li>• Ensure all electrical cables are sized according to capacity of circuit breakers.</li><li>• Provide adequate support or mechanical guards for electrical equipment where necessary.</li><li>• Ensure cable joints are made in respect of conductivity, insulation and mechanical strength.</li><li>• Provide emergency power connection for life safety loads (emergency lighting, exit signage, etc.) temporarily within 6 weeks and find out a permanent solution within 6 months.</li><li>• Connect all metal in the building to the building earthing system.</li><li>• Ensure Lighting fixtures are supported from the structure properly.</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+(</li></ul>
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	20°C-40°C)} and take proper action.
<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 switchgear and panel boards on an annual basis.</li> <li>• Ensure the substation room has adequate fire separation from the main building.</li> <li>• Provide adequate means of ventilation for the substation room based on the installed equipment considering fire barriers.</li> <li>• Ensure the generator room has adequate fire separation from the main building.</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>• Use non-combustible material to make channel and provide adequate covers on cable channel.</li> <li>• Ensure surface/exposed wiring are run either horizontally or vertically with proper mechanical support and avoid wiring at an angle or hanging way with improper support.</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>