

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: Angel Sweater (Bd) Ltd.
Address of the Factory	: Angel Tower, Matuail, Dakhan Para, Rayerbagh, Jatrabari, Dhaka, Bangladesh.
Present Status of the Factory	: Under Operation.
Structural Assessment Conducted by	: VEC
Date of Structural Inspection	: 11 th February, 2015
Fire Assessment Conducted by	: VEC
Date of Fire Inspection	: 11 th February, 2015
Electrical Assessment Conducted by	: VEC
Date of Electrical Inspection	: 11 th February, 2015
BGMEA Membership No.	: 4555.

BASIC INFORMATION:

The assessed factory building was a 3 Storey RCC building. The structural system of the building is RCC beam column frame and beam slab floor system. All floors of the building is occupied by the assessed factory. The following general information were noted:

i. Building Usage Type	: Garment Factory.
ii. Structural System	: RCC beam column frame system.
iii. Floor System	: RCC beam slab floor system.
iv. Floor Area	: Total floor area is 30,000 sft. (Ground to 2nd floor)
v. No. of Stories	: 3 Storey.
vi. Construction Year	: 2002-2014 (three phases).
vii. Foundation Type	: Unknown.
viii. Design Drawings	: Available: approval plan, machine layout plan, partial structural design drawing (without column design schedule and foundation drawing) Not available: Full set of structural design drawing, architectural design drawing, soil test report and floor load plan.
ix. Soil Investigation Report	: Unavailable.
x. Construction Materials	: Brick aggregate.
xi. Generator	: 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">• Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.
Long Term (6-months)	: <ul style="list-style-type: none">• Continue to implement load plan.

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- Structural engineer to prepare full set of as built structural drawing, soil test report 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.

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>	<ul style="list-style-type: none"> • None.
<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"> • Factory needs to conduct fire drill quarterly (4 times a year) under the fire safety plan and needs to kept the written record of such drills for at least 3 years for the inspection of fire brigade whenever called for. • Factory need to have proper testing plan & record of fire safety equipment. • Factory needs to have marked aisles in all working floor according to 0.9m for one side seat and 1.0m for both side seat. • Lights in storage area are needed to be installed with protective covers and conduits. • 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. • Combustibles are to be managed with good housekeeping. Storage facilities with no air-conditioning duct need to be minimum 2.9 m and when used as a storage facility there needs to have a minimum clearance of one third the floor height from the ceiling to the top of the storage stack. • All required means of exit or exit access in buildings or areas requiring more than one exit shall be signposted. The signs shall be clearly visible at all times, where necessary supplemented by directional signs.
<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"> • Factory needs to prepare as built drawing with floor machine layout showing means of escape with proper dimension.

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	<ul style="list-style-type: none"> • Fire manager/Director need to have safety training from proper authority & worker of the factory should as far as possible be trained for use fire extinguisher. • All the exit doors need to be replaced by side swinging so that unlockable doors can be opened easily in the direction of evacuation without the use of a key. • Factory needs to provide handrail on both sides of all the stairways. • Factory needs to be installed with adequate illuminated emergency lighting in floors, exits & stairs. (Escape route). • 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.
<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"> • Factory needs to have a proper pre-plan for fire department. • Final exit route-1(Stair-1 route) need to be protected hour rated 1) (rated door hour 0.75 construction with at each floor level entrance including ground floor and need to be protected with generator 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. • Final exit route-2 (Stair-2 route) need to be protected (1 hour rated construction with 0.75 hour rated door) at each floor level entrance and need to be protected from working floor at ground floor by 1 hour rated construction with 0.75 hour rated door/opening, also need to have a protected escape route till to reach safe refuse area. • Storage area need to be protected with 2 hours rated construction and 1.5 hours rated opening or doors. • Generator room needs to be fire separated with 4 hours fire rated enclosure and 2 hour rated opening having direct access from outside. • Boiler room needs to be fire separated with 4 hours fire rated enclosure and 2 hour rated opening having direct access from outside. • All the exits connecting to the staircase-1&2 need to be protected with fire and smoke resistant enclosures and

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	<p>opening (1 hours rated enclosure and 0.75 hour rated door) and provide a protected route from all though the stairway to the final exits.</p> <ul style="list-style-type: none"> • Factory need to install centralized and automatic fire detection & alarm system on all occupied floors, including other tenanted floors of the building as per NTPA Guideline. • 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. • Factory needs to install control panel for centralized automatic smoke detection & fire alarm system according to NTPA Guideline. • Factory needs to install proper standpipe system with having at least 75mm dia of riser. • Factory need to be installed by 1riser per 1000sqm of floor area with at least 38mm dia of hoses. • Factory need to 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. • Factory needs to be installed with Siamese connection for to the standpipe system located outside the building and accessible to the fire department connection. • Factory needs to have dedicated fire pump with backup power system & sufficient capacity for achieve required pressure in the remote place of the factory. • 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.
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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"> • Find out the cause (improper cable selection, improper protective device selection, improper termination, rusted connection, heat source etc.) of burning sign and take proper action including replacing cable or equipment where necessary.
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	<ul style="list-style-type: none"> 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 ($> \text{ambient} + 40^{\circ}\text{C}$) and take proper action.
<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"> Provide two separate and distinct connections of earthing for each generator. Ensure all distribution boards (including panel door) are earthed properly. 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. Provide additional insulation for wiring exposed to external heat source to protect cable. Ensure overcurrent protection device (circuit breaker/fuse) for each circuit/branch circuit. Ensure proper earthing connections at all electrical equipment. Clean interior components from dust and debris and seal all openings within the enclosure to prevent dust and debris from entering. Provide provision for inspection of all earthing system and ensure inspection is being completed and documented.
<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"> Provide Instruction board for first aid and artificial respiration in the generator room. Ensure distribution boards are installed in compliant locations in terms of access. Ensure distribution board has a minimum clearance of 1 m (39 in) in front. Provide dedicated & 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. Rewire to ensure each incoming supply to an MCB/MCCB has a dedicated supply from bus bar. Avoid the use of multiple cables on outgoing side of

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	<p>MCB's/MCCB's and bus bar.</p> <ul style="list-style-type: none"> • Install circuit breaker using metal enclosure and replace wooden bases with metal clad construction for mounting the lighting boards and switch controls. • Ensure all electrical cables are sized according to capacity of circuit breakers. • Provide adequate mechanical guards for electrical equipment where necessary. • Ensure cable joints are made in respect of conductivity, insulation and mechanical strength. • Connect all metal in the building to the building earthing system. • Ensure Lighting fixtures are supported from the structure properly. • 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°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"> • Develop an electrical layout diagram and an as-built single line diagram detailing key components and capacity of the electrical system. • Establish a periodical Insulation and earth Resistance Measurement Program and record the related testing data. • Inspect electrical panel boards on an annual basis. • Ensure overhead service connections to the building are led via adequate size and type of service masts. • Ensure the generator room has adequate fire separation from the production area. • Replace distribution board with metal enclosed body. • Ensure distribution boards have no opening and all live internal components are concealed properly. • Provide dedicated & adequate size of neutral with proper identification for each circuit. • Ensure each distribution board is provided with a circuit

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	<p>list and means of identification is provided as per list.</p> <ul style="list-style-type: none">• Ensure wiring systems are selected and erected so that no damage is caused by the ingress of water.• 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.• Provide proper cable terminator/connector for stranded conductors at its point of termination.• Install separate distribution boards for lighting and power circuits.• Install lightning protection system on the building.
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