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| Name of the Factory | : | Vertex Fashion Ltd. (Building-4) |
| Address of the Factory | : | Sweden Plaza, Plot # 2, Block # B, Mirpur-1, Dhaka |
| Present Status of the Factory | : | Under operation. |
| Structural Assessment Conducted by | : | VEC |
| Date of Structural Inspection | : | 28 October, 2015 |
| Fire Assessment Conducted by | : | VEC |
| Date of Fire Inspection | : | 28 October, 2015 |
| Electrical Assessment Conducted by | : | VEC |
| Date of Electrical Inspection | : | 28 October, 2015 |
| BGMEA Membership No. | : | 1186 |

**BASIC INFORMATION:**

The main factory building is a nine storied RCC beam column frame structural system. The following information was noted:

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| i. | Building Usage Type | : | Garment Factory. |
| ii. | Structural System | : | RCC beam column system. |
| iii. | Floor System | : | RCC Beam slab. |
| iv. | Floor Area | : | Floor area is (2700 sft x 9) = 24,300 sft for main RCC factory building-04 |
| v. | No. of Stories | : | 9-stories |
| vi. | Construction Year | : | 1090-1991 as informed factory representative |
| vii. | Foundation Type | : | Mat foundation as shown in structural drawing but could not be verified with soil test report since soil test report was not available. |
| viii. | Design Drawings | : | Available documents: approval plan, structural design drawing.<br>Not available: Architectural drawing, soil test, machine layout plan, floor loading plan and material test report. |
| ix. | Soil Investigation Report | : | Not Available |
| x. | Construction Materials | : | Stone 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:

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| Short Term (Immediate) | : | 1. A Detail Engineering Assessment of Factory to be commenced |
| Mid Term (6-weeks) | : | 1. Produce and actively manage a loading plan for all floor plates within the factory giving consideration to floor capacity and column capacity.<br>2. Detail Engineering Assessment to be completed. |
| Long Term (6-months) | : | 1. Continue to implement load plan.<br>2. Building Engineer need to survey this factory and prepare as |

built architectural drawing, section drawing, soil test report and floor load plan.

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

***(A): Recommendations for Fire Safety Corrective Actions:***

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| Immediate<br><br>(*the factory should not continue to be occupied until these non-conformities have been rectified*): | N/A |
| Short Term<br><br>(*Actions that must be incorporated into a Fire Safety Management Plan immediately (1 ~ 2 weeks) and should be a regular activity* | All the firefighting equipment's need to test with proper documents.<br><br>Factory needs to have sufficient number and width of marked aisles in all floors of the building where aisles need not be less than the most restrictive of the following: (a) 1.1 m where serving an occupant load of more than 50; (b) 0.9 m where serving an occupant load of 50 or less.<br><br>Factory needs to (a) ensure minimum of 2.3 m2 of space per occupant; (b) Reduce the occupants from the 4th floor of the buildings or shift occupants from 4th floor of the buildings to another floors.<br><br>Lights in storage area needed to be installed with protective covers and conduits.<br><br>Combustibles are to be managed with good housekeeping. Storage facilities with no air-conditioning duct need to be at least 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.<br><br>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 |
| Mid Term<br><br>(*The remedial works indicated must be carried out within a period of 6 weeks)* | Need to have as built drawing with floor machine layout showing means of escape.<br><br>Fire license needs to be updated for full occupied area.<br><br>Factory needs to provide at least two exits in each floor of the factory building including basement of an industrial building to discharge safely from upper floors to outside of the building.<br><br>All the exit doors need to be replaced by side swinging so |

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| | that un-lockable doors can be opened easily in the direction of evacuation without the use of a key.<br><br>Factory needs to provide handrail on both sides of stairways as per the requirements of NTPA guideline as well as BNBC 2006.<br><br>Factory needs to be installed with adequate illuminated emergency lighting in floors, exits & stairs.(Escape route). Public address system needs to have communicated to all floors as well as facilities to receive messages from all floors. |
| Long Term<br><br>(*The remedial works indicated must be carried out within a period of 6 months)* | Factory needs to have a proper pre-plan for fire department.<br><br>Factory needs to have sufficient total width of exits i.e. 4 mm per occupant at each floor of this factory or any existing RMG industrial buildings.<br><br>Factory needs to ensure total width of stair either 8 mm per occupant for any existing or any type RMG industrial buildings.<br><br>[a] Final exit routes (stair-1 to 5 route) need to be protected (2 hours rated construction with 1.5 hours rated door) at each floor level entrance including ground floor and need to be protected with generator at ground floor by 2 hours rated construction with 2 hours rated door/opening, also need to have the protected escape route till to reach safe refuse area.<br><br>Fire separation of final exit routes (above 23 m):<br>[b] Final exit route-6 of building-6 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 with substation 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.<br><br>Child care room is needed to be separated from other occupancies (market places) with 3 hours fire rated construction with 2 hours fire rated door.<br><br>Storage area need to be protected with 2 hours rated construction and 1.5 hours rated opening or doors.<br><br>Generator:<br>Generator room need to be protected by 4 hours rated construction with 2 hours rated opening / door from stair-1 |

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| | as well as from the final exit route-1 located at ground floor.<br><br>Boiler:<br>Boiler room need to be protected with 4 hours rated construction with 2 hours rated opening / door from stair-1 and generator room at ground floor of the building.<br><br>All the exits connecting to the staircases need to be protected with (a) 4 hours fire rated enclosures and 2 hours rated doors for factory building-6 (b); 2 hours fire rated construction and 1.5 hours rated doors for factory building-1 to building-5.<br><br>The minimum fire resistance rating of the walls separating the smoke proof enclosure by providing lobby or ventilated vestibule from the area of incidence needs to be 4 hours with no openings other than those required for fire doors for exit. The fire rating of the fire doors for exit needs 2 hours.<br><br>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.<br><br>Factory needs to install manually operated electrical fire alarm system with single or multiple call boxes as well as automatic fire alarm system including other tenants of the factory for centralized automatic fire detection and alarm system.<br><br>Factory needs to install control panel for centralized automatic smoke detection & fire alarm system according to NTPA Guideline<br><br>Factory needs to install proper standpipe system with having at least 100 mm dia of riser.<br><br>Install 1 riser per 1000 m2 of floor area and 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.<br><br>Factory need to ensure the minimum pressure for standpipes supplying a 50 mm or larger hose shall be at least 300 Kpa. For standpipe supplying first aid hose (38 mm nominal) may have a minimum pressure of 200 Kpa.<br><br>Factory needs to install dedicated fire pump with sufficient capacity and backup power. The fire pump needs to be so |

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| | designed that it shall satisfy the required pressures (300 kPa) and flow (1900 l/min) for fire-fighting equipment at the highest and most remote part of the protected premises during their peak demand hour or for roof storage tank.<br><br>The system needs to be tested for a pressure 25% in excess of the highest working pressure for at least 2 hours and able to maintain above test pressures (300 kPa). Also be tested for the required flow at the highest outlet.<br><br>Factory needs to have sufficient water storage capacity to get adequate pressure to feed fire-fighting equipment and at least 1900×75 = 142500 liters water storage tank.<br><br>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 responsibility of maintenance and operating firefighting facilities within the building. |

***(B): Recommendations for Electrical Safety Corrective Actions:***

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| Immediate<br><br>(*the factory should not continue to be occupied until these non-conformities have been rectified*): | Find out cause (improper cable selection, improper termination, rusted connection etc.) of burning sign/insulation damage and take proper action including replacing cable or equipment where necessary. |
| Short Term<br><br>(*Actions that must be incorporated into a Fire Safety Management Plan immediately (a week) and should be a regular activity* | Ensure all distribution boards (including panel door) are earthed properly.<br><br>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.<br><br>Ensure overcurrent protection device (circuit breaker/fuse) for each circuit/branch circuit.<br><br>Clean interior components from dust and debris and seal all openings within the enclosure to prevent dust and debris from entering.<br><br>Ensure inspection of all earthing system is being completed and documented. |

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| Mid Term<br><br>(*The remedial works indicated must be carried out within a period of 6 weeks)* | Install appropriate type of safety signage at generator room.<br><br>Also ensure graded rubber mats are provided in front of all distribution boards.<br>Provide Instruction board for first aid and artificial respiration in the generator room.<br><br>Provide two separate and distinct connections of earthing for generator.<br><br>Ensure distribution board is installed in compliant location in terms of height.<br><br>Ensure distribution boards have a minimum clearance of 1 m (39 in) in front.<br><br>Provide dedicated & 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.<br><br>Rewire to ensure each incoming supply to an MCB has a dedicated supply from busbar. Avoid the use of multiple cables on outgoing side of MCB's.<br><br>Ensure all electrical cables are sized according to capacity of circuit breakers.<br><br>Provide adequate support or mechanical guards for electrical wiring where necessary.<br><br>Ensure cable joints are made in respect of conductivity, insulation and mechanical strength.<br><br>Seal the openings remaining after wiring system passes through the elements of building construction according to the degree of fire resistance.<br><br>Connect all metal in the building to the building earthing system.<br><br>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+( 20ºC-40ºC)} and take proper action. |
| Long Term<br><br>(*The remedial works indicated must be* | Develop an electrical layout diagram and an as-built single line diagram detailing key components and capacity of the electrical |

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| *carried out within a period of 6 months)* | system.<br><br>Establish a periodical Insulation and earth Resistance Measurement Program and record the related testing data.<br><br>Inspect electrical panel boards on an annual basis.<br><br>Ensure overhead service connections to the building are led via adequate size and type of service masts.<br><br>Ensure the generator room has adequate fire separation from the production area/main building.<br><br>Ensure appropriate generator room size in order to properly access the generator to perform routine maintenance activities.<br><br>Ensure distribution boards have no opening and all live internal components are concealed properly.<br><br>Provide dedicated & adequate size of neutral with proper identification for each applicable circuit.<br><br>Ensure each distribution board is provided with a circuit list and means of identification is provided as per list.<br><br>Use noncombustible material to make cable channel and cable trench and provide adequate covers on cable trenches and cable channel.<br><br>Provide proper cable terminator/connector for stranded conductors at its point of termination.<br><br>Install separate distribution boards for lighting and power circuits.<br><br>Install lightning protection system on the building. |