Name of the Factory	: Aristo Fashions Ltd.
Address of the Factory	: 35/A, Hajiganj road, Narayanganj.
Present status of the factory	: **Under Operation**
Structural Assessment Conducted by	:**VERITAS Engineering& Consultant**
Date of Structural Inspection	: 2015-05-13
Fire Assessment Conducted by	: **VERITAS Engineering& Consultant**
Date of Fire Inspection	: 2015-05-13
Electrical Assessment Conducted by	: **VERITAS Engineering& Consultant**
Date of Electrical Inspection	: 2015-05-13
BGMEA Membership No.	: 4232

BASIC INFORMATION:

The present garment factory is a 5 storied RCC beam column frame structure and one non-engineered shed ove roof. 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	: Floor area is 15000sft (Aristo fashion ltd)). Total floor area 28,000 sft
v. No. of Stories	: 5 storied and one non-engineered shed over roof.
vi. Construction Year	: Building was built in one phase 1996-97.
vii. Foundation Type	: Unknown.
viii. Design Drawings	: Approval drawing and soil test report have been found Not available – as build structural design drawing, architectural design drawing, floor load plan, machine layout plan and test report of construction materials
ix. Soil Investigation Report	: Available.
x. construction Materials	: Brick chips (column, beam and slab) [on field check]
xi. Generator	: none.

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) : 1. Remove all floors live load from the area A/2 to B/4 panel.

2. Factory Engineer to review design, loads and columns stresses in the area identified above.
3. Verify in situ concrete stresses either by 100mm dia. Cores or existing cylinder strength data for [the identified columns] or [100mm dia. cores from 4 columns].
4. 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.
2. Detail Engineering Assessment to be completed. 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) : 1. Continue to implement load plan.
2. Building engineer to check and provide calculations showing the structural adequacy of supporting columns and slab.
3. Building Engineer to carry out design check on beams to confirm that these cracks are non-structural.

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

(A): Recommendations for Fire Safety corrective actions:

Immediate (*the factory should not continue to be occupied until these non-conformities have been rectified*):	N/A
Short Term (*Actions that must be incorporated into a Fire Safety Management Plan immediately (1 ~ 2 weeks) and should be a regular activity*	• Lights in storage area needed to be installed with protective covers and conduits. • Combustibles are to be managed with good housekeeping. Storage facilities with no air-conditioning duct shall be minimum 2.9 m andwhen 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.
Mid Term (*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. • Factory manager or director needs to arrange fire safety training for the workers of the factory from proper authority time to time. • All the firefighting equipment's need to test with proper documents. • All the exit doors need to be replaced by side swinging so that unlock able fire rated doors can be opened easily in the direction of evacuation without the use of a key. • Factory needs to maintain minimum width of exit 0.9 m and height 2m. • Factory needs to ensure at least minimum width of stair 0.9 m. • Provide handrail on both sides of stairways. • Factory need to close the opening and seal the penetration with 2hours fire rated construction materials for rated walls. • Illuminated emergency light needs to be covered in floor, exits and aisles. 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.
Long Term (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. • At south-east escape routes [which is stair-1 to final exit-1], also north portion escape routes [which is stair-2 to final exit-2], need to protect from ground floor area to provide protected paths of travel (2 hours fire rated construction with 1.5 hours fire rated opening) till to reach safe refuse area.

	• Childcare needs to be separated from finishing section with 3 hour rated construction and 2 hour rated opening or door. • (a) Storage areas need to be protected with 4 hour rated construction and 2 hour fire rated opening or doors, (b) Lobby is required to enter the storage areas where minimum length and width need to be 1.8 m and 1.1 m respectively and fire resistant rating of wall needs to be 4 hours with 2 hour fire rated doors. • Boiler and generator room need to have a 4 hour fire resistance wall and entry also need to have 2 hour fire rated door. • The entire exits connecting to the staircases(2 nos staircase) need to be protected with fire and smoke resistant enclosures and opening (2 hour rated enclosure and 1.5 hour rated door)and provide a protected route from all though the stairway to the final exits. • Fire separation needs to have a 3 hours fire resistance construction between dining and prayer room and entry also need to have also 3 hours fire rated door. • Factory need to Install centralized automatic fire and smoke detection system throughout the building to full occupied area according to 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 and automatic fire detection and alarm system at required location. • 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. • 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. • 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 1900liter x 75min=142500 liters water storage tank.

(B): Recommendations for Electrical Safety corrective actions:

Immediate (*the factory should not continue to be occupied until these non-conformities have been rectified*):	• Find out the cause of overheating (Temperature differences greater than40°C) and take proper actions (Make sure cables are not overloaded,properly terminated using proper lug, joints are made proper way, no rusted throughout the connection, proper cable bending, no insulation damage, singlecable at single point etc.).
Short Term (*Actions that must be incorporated into a Fire Safety Management Plan immediately (a week) and should be a regular activity)*	• Provide two separate and distinct connections of earthing for each generator. • Ensure all distribution boards (including panel door) are earthed properly using appropriate type and size of cables. • Ensure all electrical cable properly terminated at its point of termination using appropriate size and type of lug where necessary. • Ensure overcurrent protection device (circuit breaker/fuse) for each circuit/branch circuit. • Ensure proper earthing connections at all electrical equipment. • Ensure distribution boards are clean and all openings sealed. • Provide provision for inspection of all earthing system and ensure inspection is being completed and documented.
Mid Term (*The remedial works indicated must be carried out within a period of 6 weeks)*	• 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. • Provide Instruction board for first aid and artificial respiration in the generator room. • Provide dedicated & adequate size of earthing with proper identification for each circuit. • Rewire to ensure each incoming supply to an MCB has a dedicated supply from bus bar and avoid the use of multiple cables on outgoing side of MCB's. • Replace wooden boxes and panels with metal clad construction for mounting the energy meter, fuses and switch controls. • Ensure all electrical cables are sized according to capacity of circuit breakers. • Provide adequate covers on cable channels. • Ensure cable joints are made in respect of conductivity, insulation and mechanical strength. • Wiring system passes through elements of building construction the openings remaining after passage of the wiring system sealed according to the degree of fire resistance. • 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. • Find out the cause of overheating (Temperature differences of 21°C to 40°C) and take proper actions (Make sure cables are not overloaded,properly terminated using proper lug, joints are made proper way, norusted throughout the connection, proper cable bending, no insulation damage, single cable at single point etc.).
	• Develop an electrical layout diagram and an as-built single line diagram detailing key components and capacity of the electrical system.

Long Term (*The remedial works indicated must be carried out within a period of 6 months)*	• Develop an as-built electrical layout diagram and 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 to ensure that the equipment is in good working condition. • Ensure the generator room and the 30KVA generator has adequate fire separation from the production area. • Ensure appropriate generator room size in order to properly access the generator to perform routine maintenance activities. • 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 list and provide means of identification for cables accordingly. • Provide adequate support or mechanical guards for electrical equipment and wiring where necessary. • Ensure surface/exposed wiring is run either horizontally or vertically with proper mechanical support. • Ensure stranded conductors are terminated using proper terminators(cable sockets, ferrules, sleeves or a;; conductors at exposed ends are soldered together). • Install separate distribution boards for lighting and power circuits. • Provide individual fuse with suitable discrimination with backup fuse or miniature MCB for each 15/20A socket outlet. • Install lightning protection system on the building confirming requirements and adequacy of the system.