Name of the Factory	: **Sterling Denim Ltd.**
Address of the Factory	: Dania, Nayarhat, Ashulia, Savar, Dhaka
Present Status of the Factory	: **Under operation**
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 15-Mar-2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 15-Mar-2014
BGMEA Membership No	: 5325

BASIC INFORMATION:

There are one main building & 3 ancillary buildings in the factory premises. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: RCC Moment resisting frame structure.
iii.	Floor System	: Beam Supported slab.
iv.	Floor Area	: 220,540 sft
v.	No. of Stories	: Main building-B+ Eight storied, utility building-B+3
vi.	Construction Year	: 2005-2006
vii.	Foundation Type	: Strap footing
viii.	Design Drawings	: Available.
ix.	Soil investigation Report	: Available
x.	Construction Materials	: RCC Stone chips.
xi.	Generator	: Ground floor

RECOMMENDATIONS FOR CORRECTIVE ACTION:

The recommendations of corrective action for Structural, Fire and Electrical Safety comprises of Short Term, Mid Term and Long Term basis are as follows:

The recommendations for Structural Safety corrective actions are:

Immediate : NA

Short Term: (3 Weeks) :

i. Develop a program to ensure that all live loads for which a floor or roof has been designed for will not be exceeded. The designated Load Manager shall oversee this program and ensure it is enforced.

ii. Designate a representative as the Factory Load Manager. The Factory Owner shall ensure that at least one individual, the Factory Load Manager who is located onsite full time at the factory, is trained in calculating operational load characteristics of the specific factory. The Factory Load Manager shall serve as an ongoing resource to RMG vendors and be responsible to ensure that the factory operational loads do not at any time exceed the factory floor load limits as described on the Floor Load Plans.

Mid Term (6 Weeks) :

i. Engage a qualified structural engineer to confirm structural performance of the structure.
ii. Under guidance from a qualified structural engineer assessment of concrete strength to be done by taking at least 4 nos. of 3-4 inch diameter cores from the area of concern.
iii. Have a qualified structural engineer confirm that capacity to support the load is available. Load Plans complying with Alliance Standard Part 8 Section 8.20.4.3 should also be developed.
iv. Engage a qualified structural engineer to develop the required documents to confirm the structural integrity of the buildings. Documents must comply with the Alliance Standard Part 8 Sections 8.19 and 8.20
v. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
vi. Develop engineered plans to brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard. Install anchor and braces as shown on approved plans.
vii. Have a qualified structural engineer provide further analysis of the identified cracks to determine the appropriate course of corrective action.
viii. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.
ix. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard. Floor load plans should be visibly posted on all levels of all buildings.
x. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.

Long Term (6 Months) :

i. Depending on the findings of the Core test, permanent remedial measures should be conducted for the safety of the building.

ii. Apply for issuance of the Certificates of Occupancy and pursue the matter to obtain the same.

The recommendations for Electrical Safety corrective actions are*:*

Immediate (3 to 6 Days)	Keep the generator room and cable trench clean. Also provide cable trench with metal cover (checkered-plate preferably). Ensure switchboards and distribution boards are free of dirt. Remove all dirt, debris, lint, water, oil, and improperly stored materials from the substation room. Ensure light fixtures without protective covers are not installed in storage areas or in any area where the Inspector of the Factories Rules (1.5.3.5) Part 53 disallows these fixtures.
Short Term (3 Weeks)	Ensure proper ventilation for generator room. Ensure distribution boards are metal enclosed with a dead front construction.

	Provide shielding or additional insulation for exposed wiring within 36 inches to external heat sources. Ensure cable joints through porcelain/PVC connectors with PIB tape wound around joint. Provide additional light fixtures at substation room to increase illumination levels provided in the BNBC. Ensure generator room is properly illuminated with adequate number of lighting equipment. Provide covers for cables & electrical equipment where necessary. Install appropriate type and number of firefighting equipment according to fire class of the materials inside the generator room.
Mid Term (6 Weeks)	Provide earthing of equipment at required locations and connect to required number of electrodes. Connect all metal in the building to the building earthing/grounding system such as metal rebar in concrete, metal frame of building, or metal water pipe. Ensure emergency power switchboards, distribution boards, and circuits are permanently marked so they will be readily identified as a component of an emergency circuit or system. Consult with a qualified Electrical Engineer and ensure electrical wiring and cables are sized according to capacity of circuit breakers. Ensure all switchboards and distribution boards are in compliant locations. Remove multi looping of cables at circuit breakers within switchboards. Ensure wiring systems are selected and erected so that no damage is caused by the ingress of water. Complete an analysis/test on transformers to identify harmful substances. If it contains harmful substances, replace the transformer oil. Ensure the means of identification is obtained by separate color coding, marking tape, tagging, or other approved means. Provide covers to conceal all live internal components of switchboards and distribution boards. Establish a periodic inspection program to ensure the electrical systems are free from damage, debris, dirt, lint, etc. Maintain records concerning inspections and follow up actions. Install security measures to ensure access to the substation is restricted. Provide two separate earthing (grounding) points for the generator. Install phase separators between terminal connections at the noted locations. Lead telecommunication or antenna cables separately to the main point of service. Power and telecommunications cables must have separate

	entrance. Complete an oil analysis on applicable transformers at appropriate intervals based on voltage and power. Ensure inspection, maintenance, and testing procedures of the emergency generator are being completed and documented.
Long Term (6 Months)	Provide adequate fire rating for substation room and make it separated from rest of the building. Have a qualified electrical engineer develop an as-built single line diagram detailing key components and capacity of the electrical system. Ensure switchboards and distribution boards provided with physical means to prevent the installation of more over current devices than that number for which the panel board was designed, rated, and listed. Consult with a professional electrical engineer to design & install a lightning protection system, including risk index calculation and to make sure the system is secured against lightning. Provide grounding (earthing) for switchboards and distribution boards. Provide capacity information labels (Maximum current rating, no of circuit breakers etc.) for switchboards and distribution boards. Construct a wall to separate the boiler and generator, maintaining fire rated construction requirements. Develop an Insulation Resistance Measurement Program that ensures deterioration of insulation resistance will be identified quickly. Testing should be in compliance with International Electrical Testing Association (NETA). All transformers, switchgears etc. shall be subject to an insulation resistance measurement test to ground after installation but before any wiring is connected. Insulation tests shall be made between open contacts of circuit breakers, switches etc. and between each phase and earth Complete Thermographic scans at least on a three year cycle. Thermographic scans should be completed in accordance with the standard for Infrared Inspection of Electrical Systems & Rotating Equipment and NFPA 70B or a comparable standard. Develop and implement an electrical safety program. Include key topics such as lock-out/tag-out procedures, personal protective equipment requirements, etc. Keep records of completed training available on site. Provide adequate grounding (earthing) for transformer.

The recommendations for Fire Safety corrective actions are:

Immediate (3 to 6 Days)	Remove all combustibles stored underneath the cutting tables at the noted locations as soon as possible.
Short Term (3 Weeks)	Remove all locking devices from all egress doors and means of egress components. If locks are required for security reasons, utilize special door locking features complying with NFPA 101. Rearrange equipment and aisles in the laundry area of the ground floor to limit travel distance to an exit to 150 feet or less. Post the occupant load for all assembly and production floor areas in a conspicuous space near the main exit or exit access doorway for the space. Install signage adjacent to each stair door indicating the stair name and the floor level in both English and Bengali.
Mid Term (6 Weeks)	Replace non-compliant doors and frames in the means of egress with side-swinging doors. Replacement doors shall be a minimum width of 0.8 m (32 in), and are listed, approved, self-closing, fire rated doors assemblies (door and frame) with latching panic hardware. Add another exit stair to the production facility to increase the number of allowable occupants per floor to 1300 as reported for the Dining level. Alternately, reduce the number of occupants on all levels to 699 or fewer. Ensure through testing (light meter) or other certification that means of egress have sufficient illumination per Alliance Standards requirement for all corridors, exit doors, aisles and stairways. If non-compliant, install emergency lighting for all paths of egress. Illumination needs to be a minimum of 10 lux for all corridors, exit doors and stairways. Illumination for aisles needs to be a minimum of 2.5 lux. Egress lighting shall be provided with emergency power or supplemented with battery powered lights that provide a minimum of 10 lux for not less than 30 mins in the event of failure of normal lighting. Need to minimize the change in elevation to make the walking surface mostly level as per Alliance Standard. Need to install Illuminated exit signs with backup power and continuous graphics at entrances at exits and along the path of egress anywhere the continuation of egress is not obvious or there is a change in the direction of the path of travel. Provide parapets or guards with a minimum height of 1067 mm (42 in.). Parapets that are constructed on rated exterior construction shall be of the same rating as the exterior wall rating in accordance with BNBC Part 3 Section 3.1.15. Create a Fire Safety Director position and fill the position with an individual that has had sufficient training to be able to carry the required duties.

Long Term (6 Months)	Install initiating devices and notification appliances as required by the Alliance Standard and NFPA 72. Devices should be part of an automatic fire alarm and detection system for the facility. All fire alarm installations shall be submitted for review by the Alliance prior to commencement of installation. Provide minimum 2-hour fire-resistive rated continuous barriers at shaft enclosures with 1.5-hour fire-resistive opening protection at shaft opening(s). Consult a qualified fire protection engineer to design the required rated construction of shaft. Exit access corridors serving an occupant load exceeding 30 shall be separated by walls having a fire resistance rating of 1-hour and with 0.75-hour opening protection or provided with automatic sprinkler protection throughout the story or building as per NFPA 13. The rated assembly or sprinkler system need to be approved and/or designed by a qualified fire protection engineer. (NOTE: if sprinklers are installed as noted above, this installation will not be necessary per exemption of code). Provide a 1-hour fire-resistive rated assembly with 0.75-hour opening protection for openings to the stair and for a distance 3.05 m (10 ft) beyond the ends of the stair between the exterior exit stairs and the building to achieve the required separation. The rated assembly should be approved and/or designed by a qualified fire protection engineer. Interior exit stairways shall terminate at an exit discharge or outside the building except where terminating at an exit passageway that is constructed to meet the same rating requirement as the exit that is being served. Exits are not allowed to leave the building and then re-enter the building prior to reaching the exit discharge without maintaining the rating of the exit enclosure. The exit passageway of North-East corner stair is required to be 2 hour fire resistance rated construction. 2 hour fire resistance rated construction is required to separate generator room from exit passageway. Chemical container and fuel drums need to be removed from exit passageway. Consult a qualified fire protection engineer to design the required rated egress passageway. Create a gate through the back property wall so that egress is not under the building or exposed to the buildings. Provide fire-resistive rated opening and penetration protection for rated walls and assemblies in accordance with Alliance Standard Sections 4.6 and 4.7. Consult a qualified fire protection engineer to design the required rated opening protection or penetration systems. Provide fire-resistive rated construction barriers between hazard types in accordance with Alliance Standard Sections 3.4 and 4.5. Rooms used for housing of combustible materials, boiler need to be separated from the surrounding occupancy with a minimum 1-hour fire rated construction with 0.75-hour fire rated opening protection. Room used for housing of generator need to be separated from the surrounding occupancy with a minimum 2-hour fire rated construction with 1.5-hour fire rated opening protection. Consult a qualified fire protection engineer to design the required rated construction barrier. Install an automatic sprinkler system throughout the building designed by a qualified fire protection engineer. All sprinkler installations shall be submitted for review by the Alliance prior to commencement of installation. Modify or install a standpipe System to meet the requirements of

	Alliance Standard. Standpipe system must comply with NFPA 14. Consult a qualified fire protection engineer before modify or installing a new system. Seal the penetrations around conduits by proper fire rated sealing materials in accordance with Alliance Standard Sections 4.7. Consult a qualified fire protection engineer. Provide a dedicated fire pump in accordance with NFPA 20 to supply the demands of the connected fire protection systems along with a stored source of water sufficient to meet the demands per NFPA 22. Provide Fire Department (Siamese) connections in accordance with Alliance Standard Section 5.5.4. Connections shall match the Fire Service and Civil Defence hose thread standard. Provide 2-hour fire-resistive rated construction barriers at exit enclosures with 1.5-hour fire-rated opening protection (Door, window etc.) for main building. Provide 1-hour fire-resistive rated construction barriers at exit enclosures with 0.75-hour fire-rated opening protection (Door, window etc.) for utility building. The new fire rated door will side-hinging swinging outward opening type, with auto closure and panic bar and without locking arrangement. Minimum width of new fire rated door will be 1.00 m. Doors need to be free from general locking arrangements. Consult a qualified fire protection engineer to design the required rated construction barriers with opening protection. Need to get required number of people trained and certified in firefighting, first aid, and rescue training by the appropriate authority. Replace shed construction on 7th floor with fire resistance rated construction in accordance with Alliance Standard Section 3.6.2 or remove the non-rated structure. Install required fire doors and latching hardware. Provide re-entry hardware at least at the 3rd floor from the stairwells according to the Standard. Need to install handrails on the both side of the stairs. A minimum height of 865 mm (34 in.) and a maximum height of 965 mm (38 in.) Establish an inspection, testing, and maintenance program for all fire extinguishers. Program must comply with the requirements of NFPA 10. Develop an emergency evacuation plan which includes all components required by the Alliance Standards and communicate the plan to all employees. Complete fire department pre-planning activities with the local Fire Service and Civil Defense. Implement a hot work permit program. The program shall comply with the requirements of NFPA 51B. Establish an inspection, testing, and maintenance program for the standpipe system. Program must comply with NFPA 25.