Name of the Factory : **RSI Apparels Ltd (Bangladesh).**

Address of the Factory : 107/112 Nazrul Market, 1st & 2nd floor, Chawk Bazar, Chittagong, Bangladesh.

Present Status of the Factory : **Closed.**

Structural assessment conducted by : Alliance.

Date of Structural Inspection : 9 April, 2014.

Fire & Electrical assessment conducted by: Alliance

Date of Fire & Electrical Inspection : 9 April 2014

BASIC INFORMATION:

The present garment factory is a 6 storied building with beam-column frame system. The following general information was noted:

i.	Building Usage Type	: Mixed Use Building
ii.	Structural System	: RC frame (beam-column framing)
iii.	Floor System	: RC Beam supported slabs
iv.	Floor Area	: Total floor area is 51,320 sft.
v.	No. of Stories	: 6 storied.
vi.	Construction Year	: 1992.
vii.	Foundation Type	: Unknown.
viii.	Design Drawings	: Not available
ix.	Soil investigation Report	: No available
x.	Construction Materials	: Brick aggregate with 40 grade rebar.
xi.	Generator	: Separate building

RECOMMENDATIONS FOR CORRECTIVE ACTION:

The recommendations of corrective action for both Structural, Fire and Electrical Safety comprises in Short Term, Mid Term and Long Term basis.

The recommendations for Structural Safety corrective actions are:

Immediate (3 to 6 Days):

i. Production of all the factories within the building shall be stopped immediately.
ii. All workers and other occupants of the building shall be immediately withdrawn.
iii. In the present structural configuration, the building can no longer be used. In order to make the building usable, a complete structural reconfiguration has to be implemented.

Short Term (3 Weeks) : Total removal of the building contents has to be completed no later than 7 days following the original assessment.

Mid Term (6 Weeks) : DEA has to be completed.

Long Term (6 Months) : Necessary remediation after completion of DEA.

The recommendations for Fire Safety corrective actions are:

Immediate (3 to 6 Days)	Means of egress need to be maintained continuously free and clear of all obstructions or impediments to full instant use in case of fire or other emergency.
Short Term (3 Weeks)	Reduce the occupant load per the capacity of the floor and the available means of egress. Alternately, provide additional exit capacity or provide automatic sprinkler protection throughout the building. Remove all hasps, locks, slide bolts, or other locking devices from all doors.
Mid Term (6 Weeks)	Centralized fire alarm and detection system needs to be installed and the control panel of this system shall be monitored by a central station monitoring service or directly connected to the Fire Service and Civil Defense. Trouble or alarm notifications should be indicated on the fire alarm control panel. Until that time that a central station monitoring service or direct connection to the Fire Service and Civil Defense can be set up, a person need to be assigned to contact the fire department in the event of fire alarm activation. An annunciator needs to be located in a constantly attended location to alert this person. Stair designation signs need to be provided at each floor entrance from all stairs to the floor in English and Bengali. Signs need to be indicating the name of the stair and the floor level. Signs shall be posted adjacent to the door. Need to collect Occupancy certificate for each building and ancillary structure as per building use from approving authority. Install required identification signs at the noted locations. Signage must comply with NFPA 14. The occupant load needs to be posted for every assembly and production floor in the facility in a conspicuous space near the main exit or exit access doorway for the space. Need to provide emergency power connection or battery backup for illuminated exit signs. Develop a testing and maintenance program that ensures the emergency power for exit signs is tested at least once per year. If battery operated signs are used, these lights are tested on a monthly basis. Functional testing of battery powered signs is provided for a minimum 90 min once per year. It is recommended that equipment should be numbered, with inspections, deficiencies, and follow-up noted in a log. Need to develop an emergency evacuation plan which includes all components required by the Alliance Standards and communicate the plan to all employees. Post emergency egress maps at the entrance to each exit stair or main point of egress. Factory needs to have a valid waiver certificate for full

	capacity from BERC. Factory needs to have a valid boiler operator and electrician license. Need to complete fire department per-planning activities with the local Fire Service and Civil Defense.
Long Term (6 Months)	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 building as per NFPA 13. The rated assembly or sprinkler system need to be approved and/or designed by a qualified fire protection engineer. Aisles need to be provided with a minimum unobstructed clear width of 0.9 m (36 in.). Ensure the path of egress along the means of egress remain uniform as per requirement of occupant load. Provide stair having minimum width of 0.9 m. If new stair needs to be installed, building should also be assessed structurally so that the new construction does not put any adverse effect on the existing structure. All roll-down, collapsible, sliding gates and shutters in the means of egress need to be replaced with fire-rated, outward-opening, side-hinged swinging, self-closing type doors per Alliance Standard Section: 6.8. Doors must be free from general locking arrangements. Remove the collapsible gates from the above locations. Need to terminate both of these stair discharges directly outside the building or need to construct 1-hour rated exit passageway of both stairs which leading directly outside the building or need to provide with automatic sprinkler protection throughout the building as per NFPA 13. The rated assembly or sprinkler system need to be approved and/or designed by a qualified fire protection engineer. Interior exit stairways and ramps need to terminate at an exit discharge or outside the building. The exception is where an exit terminates at an interior exit passageway that is constructed to meet the same rating requirement as the exit stair. Alternately, 1/2 of the exits (capacity and number) can discharge inside the building where automatic sprinkler protection is provided throughout per NFPA 13. The rated assembly or sprinkler system need to be approved and/or designed by a qualified fire protection engineer. Need to install fire rated door assemblies at all exits. Provide fire-resistive rated (0.75-hour for boiler room and 1.5 hour for generator room) opening protection (Door, Window, Hatch Cover etc.) at opening and penetration through fire rated walls and/or assembly's protection or closed the unprotected openings by fire-restrictive rated barrier as per requirements. Consult a qualified fire protection engineer to design the required rated opening

	protection. Install a standpipe system at required locations designed by a qualified fire Protection engineer. Modify or install the standpipe System (Class-I and Class-II) to meet the requirements of Alliance Standard's Section 5.4. Consult a qualified fire protection engineer before modify or installing a new system. Provide 2-hour fire-resistive rated construction barriers at exit enclosures with 1.5-hour fire-rated opening protection (Door). 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 needs to 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. Provide 2-hour fire-resistive rated construction barriers at exit enclosures with 1.5-hour fire-rated opening protection (door, window etc.). The new fire rated door will be 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 1.0 m. Every door in a stair enclosure serving more than 4 stories needs to be provided with re-entry provision. 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. Provide a dedicated fire pump in accordance with NFPA 20 to supply the demands of water to the connected fire protection systems along with a stored source of water sufficient to meet the demands per NFPA 22. Consult a qualified fire protection engineer to design the pull stations at egress points, smoke detectors in air handling equipment, visual and audible devices spaced appropriately based on occupancy type. Exits need to be provided with a minimum clear width of 0.8 m (32 in.). Need to install Portable fire extinguishers per potential fire class and hazards in accordance with NFPA 10 Chapter 5. Install handrails on the both sides of the stairs. A minimum height of 865 mm (34 in.) and a maximum height of 965 mm (38 in.) as measured from the leading edge of the tread need to be maintained when installing new handrails. The spacing between vertical members should not exceed 200 mm (8 in.). Install appropriate means of illumination at required locations in the means of egress per the Alliance Standard. Upon installation, begin verification and testing of the emergency illumination. If battery operated lights are used, these lights shall be tested on a monthly basis. Functional testing of battery powered lights shall be provided for a

	minimum 90 min once per year. Factory building needs to be separated from the adjacent building at the stair exposures with a minimum 2 hour fire rated construction with 1.5 hour fire rated opening protection; Rooms used for storage 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 and for 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; Rooms used for storage of combustible materials need to be separated from the dining occupancy with a minimum 1 hour fire rated construction with 0.75 hour fire rated opening protection. Consult a qualified fire protection engineer to design the required rated construction barriers. Fire department (Siamese) inlet connections need to be provided to allow fire department pumper equipment to supplement the fire protection systems. Fire department outlet connections need to be provided to allow fire department pumper vehicles to pump water into the standpipe system and another to draft water from ground-level or underground water storage tanks. Connections need to match the Fire Service and Civil Defense hose thread standard. Also need to ensure reservation of the required amount of water for fire-fighting. Consult a qualified fire protection engineer to design this requirement. Repair or replace damaged piping. Repair and replacement must comply with NFPA 14 and NFPA 25. Any tread height exceeding more than 50% of the adjacent tread heights or 75 mm (3 in.), whichever is less need to be modified to be within this tolerance. Provide maximum height of riser of 215 mm (8 in). Reduce the change of elevation with beveled slope not exceeding 12.7 mm (1/2 in). Also mark with additional signage or floor markings. Guards need to be provided at the open side of means of egress that exceed 760 mm (30 in.) above the floor or finished ground level. New guard shall have a minimum height of 1067 mm (42 in.) and the spacing between the vertical members shall not exceed 200 mm (8 in.). Ensure a minimum ceiling height in the means of egress maintain minimum 2.3m (7 ft 6 in.) with projection from the ceiling not less than 2.03 m (6 ft 8 in.). Establish an inspection, testing, and maintenance program for all fire extinguishers. Program must comply with the requirements of NFPA 10. Install illuminated exit signs with backup power and continuous graphics at entrances to 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 an emergency power source, either by battery back or by connecting to the emergency power system. Emergency power for exit signs shall be verified at least once per year. If battery-operated signs are used, these lights shall be tested on a monthly basis. Functional testing of battery powered signs shall be provided for a minimum 90 min once per year. It is recommended that equipment should be numbered, with inspections, deficiencies, and follow-up noted in a log. Training programs need to be implemented and documented in accordance with the Alliance Safety Training Curriculum. Develop a hot work permit program. The program must comply with the requirements of NFPA 51B. Need to provide continuously illuminated exit signs in all required exits. Exit signs may be illuminated either by lamps external to the sign or by lamps contained within the sign. The source of illumination shall provide not less than 50 lux at the illuminated surface with a contrast of not less than 0.5. Approved self-luminous signs which provide evenly illuminated letters having a minimum luminance of 0.2cd/m2 may also be used. 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. Establish an inspection, testing, and maintenance program for the standpipe and hose system. Program needs to be compliant with the requirements of NFPA 25. Need to get training of required number of people and certified in firefighting, first aid, and rescue training by the appropriate authority. Establish written corporate and plant policies on housekeeping to ensure scheduled cleaning for floor, wall, ceiling, supply and return air ventilation systems. Promptly reschedule skipped cleanings. Provide a documented line of authority for authorizing a cleaning delay and rescheduling. As a general rule the maximum tolerable deposit thickness for loose fluffy lint is 13 mm (½ in.) over a maximum of 46.5 m2 (500 ft2). Limit dense deposits to 6 mm (¼ in.) and oil saturated deposits to 3.2 mm (⅛ in.).

The recommendations for Electrical Safety corrective actions are*:*

Immediate (3 to 6 Days)	Keep the generator room clean and free of unnecessary materials. Disconnect the panel from the electrical service and clean interior components of all dust and debris. Seal all openings within the enclosure to prevent dust and debris from entering.

Short Term (3 Weeks)	Make sure all the electrical connections are tight to prevent loose connections which can induce burning signs. Also, clean the bus bar to remove the burning sign from the surface to ensure sound electrical connectivity. Light fixtures without protective covers (otherwise known as naked lights) shall not be allowed in storage areas or in any area where the Inspector of the Factories Rules (1.6.3.7) Part 53 disallows these fixtures. Install signs posted in Bengali and English, indicating this prohibition at all entrances to these areas. Relocate the IPS to a suitable location. Install two distinct earth connections of minimum 35 sqmm for generator frame earthing. Develop and implement an electrical safety program. Include key topics such as lock out tag out procedures, personal protective equipment requirements, etc. Reference NFPA 70e for example program requirements.
Mid Term (6 Weeks)	Consult a qualified electrical engineer to design the required ventilation system with necessary exhaust fans and louvers, maintaining cross ventilation based on the installed equipment. Provide permanent identification marking mentioning name of panels (i.e. SDB-01, Sewing Floor) on a durable material sheet posted on the panels' door. For proper illumination levels in the event of an emergency, provide emergency lights in all places of the facility according to the requirements of the Alliance Standard. Move distribution boards at lower locations so that the top end of the boards do not go above 6' height from the ground. Install phase separators between terminal connections. Verify phase separators are installed at all remaining locations. Have a qualified electrical engineer develop an as-built single line diagram detailing key components and capacity of the electrical system.
Long Term (6 Months)	Complete thermographic scans at least once a three year cycle. Thermographic scans should be completed in accordance with the Standard for Infrared Inspection of Electrical Systems & Rotating Equipment and NFPA70B or a comparable standard. Check all the cables and circuit breakers and sort out the higher rated circuit breakers. The rated current of a protective device (MCB, MCCB and fuse) must not exceed the current carrying capacity of any conductor in the circuit. Have a qualified electrical engineer to design a lightning protection system according to the BNBC requirements. Have a licensed electrician install the designed system.

	Generator room shall be located near the load preferably to avoid voltage drop. Make sure at least 1m clearance is available around the generator for the ease of its operation and maintenance. As the generator room located in a marketplace, generator room shall have fire rated construction. Assign a qualified engineer for designing the generator room. 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.