Name of the Factory : **Denimach Ltd**

Address of the Factory : Kewa Mouja, Ward# 5, Gorgoria Masterbari, Sreepur, Gazipur, Dhaka, Bangladesh

Present Status of the Factory : **Under Operation**

Structural assessment conducted by : Alliance

Date of Structural Inspection : 22 May 2014

Fire & Electrical assessment conducted by: Alliance

Date of Fire Inspection : 12 Feb 2013

Date of Electrical Inspection : 24 Jun 2014

BASIC INFORMATION:

The present garment factory is a seven storied RCC building. The following general information was noted:

i.	Building Usage Type	: Garments Factory.
ii.	Structural System	: 7 storied Beam Column Frame systems.
iii.	Floor System	: Beam Supported slab.
iv.	Floor Area	: 427,000 sft.
v.	No. of Stories	: Main: G+6
vi.	Construction Year	: 2007
vii.	Foundation Type	: Unknown
viii.	Design Drawings	: Available
ix.	Soil investigation Report	: Available
x.	Construction Materials	: Reinforced Concrete (Stone chips).
xi.	Generator	: Unknown

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) : 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 loading limits as described on the Floor Loading Plans.

Mid Term (6 Weeks) :

i. Provide certified as-built drawings for Washing Building Extension, Steel Mezzanine Extension for AC System Support, Steel Roof at Utility Building, and Bridge between Main Building and Utility Building.

Provide letter from EOR indicating that the impact on the structure from these additions has been considered.

ii. 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.

iii. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.

iv. Have a qualified structural engineer complete further analysis of the structure and develop a remediation plan if required.

v. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.

vi. Provide letter from EOR indicating building code used for design

vii. Continue developing Floor Load Plans.

viii. Provide letter from EOR indicating seismic and wind criteria used for design

ix. Provide letter from EOR indicating wind loading and surge loading requirements used for design.

x. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3

xi. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard.

xii. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.

xiii. Provide Certificates of Occupancy for review.

Long Term : NA

The recommendations for Fire Safety corrective actions are:

Immediate (3 to 6 Days)	Remove all impediments, obstructions, and stored materials from the means of egress. Keep all elements of the means of egress (exit path, aisles, stairs, corridors, etc.) continuously free and clear of all obstructions. Permanently remove electrical equipment and all other foreign equipment from the stairs. Permanently remove all storage, trash, foreign material and foreign equipment out of the stairs. Implement a housekeeping program to keep the stairs and egress paths free of storage and impediments. Remove all storage from under cutting tables and similar obstructions.

Short Term (3 Weeks)	Limit the population of each floor to 904. Alternately, construct additional exit stairs to accommodate the occupant load. Remove all existing gates and doors from the stairs and exits including all locking devices. Install approved fire doors with compliant panic hardware that cannot be locked in the direction of egress under any conditions.
Mid Term (6 Weeks)	Arrange for direct connection of the fire alarm and detection system to a central station monitoring service or the Fire Service and Civil Defense. Assign a person to contact the fire department in the event of fire alarm activation until this connection is set up. Locate an annunciator to alert this person in a constantly attended location (such as a fire control room). 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.
Long Term (6 Months)	Install fire alarm system per NFPA 72. Include pull stations at all entrances to exit stairs, at ground floor exits, and at the entry points to enclosed storage rooms. Install strobes and horns for complete notification on all floors. Install smoke detectors that are part of the fire alarm system in locations required by Alliance standards. Provide contact points for releasing of automatic hold-open devices for egress stair doors and building ventilation windows. Protect all egress stairs with a shaft enclosure including 2-hour fire-rated construction. Install fire rated doors. Remove all existing doors and gates in the means of egress. Install side-hinged doors with approved hardware that swing in the direction of egress. Provide vertical opening protection for the three ventilation shafts in the Main Building by means of roll down shutters that cover each of the window openings in each ventilation shaft. These shutters should be mounted on the “occupied” side of the ventilation shafts (for ease of resetting) and would normally be in the “open” position. Upon activation of any fire detection device in the main building, the fire alarm control panel should release these shutters so that they will automatically close. Provide each of the elevators in the Main Building and the Washing Building with elevator doors at each floor level that provide a 2-hour fire protection rating. Provide 2-hour fire resistive rating for all vertical shafts (primarily plumbing and electrical shafts). The protection means can either be at each floor penetration or by the provision of a fire rated shaft enclosure. Install automatic fire sprinkler systems throughout the facility. Manufacturing areas and storage less than 12 feet high is classified Ordinary Hazard (Group 2). Sprinkler systems should be designed to deliver 0.20 gpm/ft2 over the most remote 1500 square feet. 250 gpm hose allowance. 90

	minute water supply duration. Install listed firestop systems at every penetration through floors. Enclose the exit stairs in the Main Building and the Washing Building on each level such that once an occupant enters the stair enclosure they remain in a fire rated enclosure until they reach an exit discharge directly to the outside. Install rated exit access corridors to connect stairs to exterior discharge. Remove all existing gates and doors in the means of egress. Install fire doors at the stairs that and are listed, approved, swinging, automatic-closing, in compatible fire rated frames with latching panic hardware. Rearrange the stair from the daycare center to allow people coming down from upper floors to have full use of the width of the stair (the facility reports that a new stair is already planned for the daycare center). Install listed firestop systems at every penetration through fire rated walls and assemblies. Enclose the exit stairs in the Main Building and the Washing Building on each level such that once an occupant enters the stair enclosure they remain in a fire rated enclosure until they reach an exit discharge directly to the outside. Install rated exit access corridors to connect stairs to exterior discharge. Provide required fire rated construction 10 ft beyond the ends of the exterior stairs. Enclose any openings (windows, etc.) with required fire rated construction within that 10 ft wall section. Install a Class I standpipe system in the building with fire department valves at the floor landings in each stair. The standpipe will be part of the combined standpipe/sprinkler system supply. Cross aisles need to be added in the production floors (especially on floors 3 – 6) to assure workers have direct access to an exit. There are several areas in the production line that require workers to go well past an exit stair before being able to turn to the exit. Provide a second means of egress in areas of the washing building that only have one. Design and install a listed, approved fire pump to supply the calculated demand of the new sprinkler and class I standpipe system, per NFPA 20. Install approved fire doors with latching panic hardware. Provide re-entry to floor levels from the stairwells according to the standard. Separate storage and hazardous areas from the rest of the building with 1-hour fire-rated construction. Install fire rated doors. Provide handrails on both sides of each stairway. Mount

	handrails at a height between 30 in. and 44 in. Provide continuously illuminated exit signs. Signs shall be placed at all required exits and along egress paths, especially where there is a change in direction for the path of travel. Provide handrails on both sides of all ramps. Revise slope of ramp to not exceed a slope of 1 in 12. 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. Improve housekeeping policies. Properly dispose of trash. Store combustibles only in rated store rooms. Clear congested areas.

The recommendations for Electrical Safety corrective actions are*:*

Immediate (3 to 6 Days)	Remove all combustible materials within the substation room. Find out cause of overheating and take proper action including replacing cable or equipment where necessary. Ensure distribution boards free of dirt.
Short Term (3 Weeks)	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. Ensure proper identification of emergency power switchboards, distribution boards, and circuits. 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. Ensure cable joints through porcelain or PVC connectors with PIB tape wound around joint.
Mid Term (6 Weeks)	Ensure distribution boards are metal enclosed with a dead front construction. 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. Provide clearance of at least 1 m (39 in) in front of distribution boards. Consult with a qualified Electrical Engineer and ensure electrical cables are sized according to capacity of circuit

	breakers. Remove multi looping of cables at circuit breakers within distribution boards. Provide capacity information labels (Maximum current rating, no of circuit breakers etc.) for distribution boards.
Long Term (6 Months)	Have a qualified electrical engineer design a lightning protection system according to the BNBC requirements. Have a licensed electrician install the designed system. 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 NFPA70B or a comparable standard.