

Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

Name of the Factory	: RUPA KNITWEAR (PVT) LTD.
Address of the Factory	: Kunia, Board Bazar, Gazipur, Bangladesh
Present Status of the Factory	: Under Operation
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 29 May 2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 22 May 2014

BASIC INFORMATION:

The factory comprises of seven buildings. 11(B+10) storied main building with edge beam-column frame system, 4(B+3) storied main building with beam-column frame system, 3(B+2) storied main building with beam-column frame system and 2(B+1) storied main building with beam-column frame system at basement and steel frame at ground floor. Single storied utility (ancillary) building is with beam-column frame system and other ancillary buildings are with non-rated structure. The following general information was noted:

i. Building Usage Type	: Garments Factory
ii. Structural System	: RCC flat slab system with edge beam, RCC moment resisting frame system and special structural system (RCC moment resisting frame at basement and pre-engineered steel frame structure above grade).
iii. Floor System	: RCC flat slab system with edge beam and RC beam supported slab
iv. Floor Area	: Main Buildings: 2,35,000 sft Ancillary Building: 12,000 sft
v. No. of Stories	: Main Buildings: 2, 3, 4 and 11 storied Ancillary Building: 1 storied
vi. Construction Year	: Main Buildings: Unknown Ancillary Buildings: Unknown
vii. Foundation Type	: Strip foundation and pile foundation
viii. Design Drawings	: Not Available
ix. Soil investigation Report	: Available
x. Construction Materials	: Reinforced concrete (stone chip aggregate with rebar)
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

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Short Term: (3 Weeks)

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- 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.

Mid Term: (6 Weeks)

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- i. Under guidance from a qualified structural engineer arrange Detail Engineering Assessment of Building-01. This assessment should include destructive core testing to validate the in-situ concrete compressive strength of structural elements.
- ii. Engage a qualified structural engineer to develop the required documents to confirm the structural integrity of the buildings. Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
- iii. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the addition.
- iv. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads. If provisions have not been made, have a qualified structural engineer develop a remediation plan.
- v. 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.
- vi. Have a qualified structural engineer document compliance with the seismic and wind requirements stated in the 2006 BNBC.
- vii. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.
- viii. Have a qualified structural engineer complete further analysis of the Building 1 structure and develop a remediation plan if required.
- ix. Have a qualified structural engineer prepare as-built drawings for Building 4 and provide the IEB membership number of the structural engineer of record for Building 3 as well as design reports for all buildings based on the requirements of Part 8 Section 8.19 of the Alliance Standard.
- x. Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- xi. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- xii. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.
- xiii. Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard.

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Floor load plans should be visibly posted on all levels of all buildings.

- xiv. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.
- xv. Provide Certificate of Occupancy for review.

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

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.
Short Term (3 Weeks)	Remove all locking devices from all egress doors and means of egress components in accordance with Alliance Standard Section 6.8. If locks are required for security reasons, utilize special door locking features complying with NFPA 101.
Mid Term (6 Weeks)	<p>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 to be tested on a monthly basis. Functional testing of battery powered signs is provided for a minimum 90 min once per year.</p> <p>Arrange for direct connection of the fire alarm and detection system to a central station monitoring service or the Fire Service and Civil Defense as per Alliance Standard Section 5.7.5. Until that time, a person trained to contact the Fire Service and Civil Defense in the event of fire alarm activation shall be provided. An annunciator shall be located in a constantly attended location (such as a fire control room) to alert this person.</p> <p>Develop an emergency evacuation plan which includes duties and responsibilities of various people/groups, interfacing between groups and fire brigade, headcount and identification of trapped victims, physically disabled people and their rescue, etc. and all components required by the Alliance Standards and communicate the plan to all employees. The evacuation plan shall include provisions to assist physically disabled persons. A list of all employees with physical disabilities shall be kept by the Fire Service Director.</p> <p>Implement training in accordance with Alliance Safety Training Curriculum and keep record with proper documentation.</p> <p>Post the occupant load for every assembly and production floor in a facility in a conspicuous space near the main exit or exit access doorway for the space.</p> <p>Develop a testing and maintenance program that ensures the operation of all egress lighting is verified at least once per year. If battery-operated lights are used, these lights shall be</p>

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	<p>tested on a monthly basis. Functional testing of battery powered lights shall be provided for a minimum 90 min once per year.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level in English and Bengali at the noted locations.</p> <p>Apply to Gazipur City Corporation or proper approval authority in an expeditious manner for issuance of the Certificates of Occupancy for each building and ancillary structure is according to building use.</p> <p>Apply to BERC for 1.064 MW power generation license. Apply to Bidyut Paridaptor for electrician license.</p> <p>Install a standpipe system at required locations designed by a qualified fire protection engineer. The system is to be compliant with the requirements of NFPA 14. Install required identification signs at the noted locations. Signage must comply with NFPA 14 Chapter 6.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p>
Long Term (6 Months)	<p>Provide fire-resistive rated assemblies at the required exit access corridors. The rated assembly should be designed and/or approved by a qualified fire protection engineer. Exit access corridors serving an occupant load exceeding 30 are to be separated by walls having a fire resistance rating of 1 hr in accordance with Alliance Standard Section 4.5 unless provided with automatic sprinkler protection throughout the building. Openings are to be fitted with rated barriers.</p> <p>Provide proper aisles marking (clear width minimum 36 in.) and keep aisles free of storage. Relocate the machines if necessary to provide proper width. The path of egress travel along a means of egress shall not be interrupted by any obstruction. The capacity of the means of egress shall not be reduced along the path of travel.</p> <p>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 door assemblies (door and frame) with latching panic hardware.</p> <p>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 door assemblies (door and frame) with latching panic hardware.</p> <p>Route exits directly to the exterior or provide an exit passageway in accordance with Alliance Standard Section 6.15 for non-compliant arrangements. Consult a qualified fire protection engineer to design and/or approve the required exit passageway or egress court.</p>

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	<p>Provide fire-resistive rated opening protection for rated walls and assemblies in accordance with Alliance Standard Section 4.6. Consult a qualified fire protection engineer to design the required opening protection. If these openings are not required, enclose them with appropriate fire rated construction.</p> <p>Install an automatic sprinkler system throughout the building designed by a qualified fire protection engineer. The hydraulic design of the sprinkler system shall be submitted for approval by the CoE of the Alliance prior to the start of work. All installation and design requirements outlined in BNBC Part 4 Chapter 4 shall be replaced by the requirements of NFPA 13. Pipe schedules shall not be used to size pipe. All systems shall be hydraulically calculated to meet the required NFPA 13 design requirements.</p> <p>Install a standpipe system at required locations designed by a qualified fire protection engineer. The system is to be compliant with the requirements of NFPA 14. The hydraulic calculations should be reviewed by Alliance and review to be completed prior to start of work. All standpipe system installations shall be submitted for review by the Alliance for review prior to commencement of installation according to 5.4.3.2. Testing of the installation shall be conducted in accordance with NFPA 14 acceptance testing requirements. Documentation of all testing shall be submitted for review by the Alliance. Final inspection and testing of the installation shall be witnessed by the Alliance as per clause 5.4.3.3.</p> <p>Provide fire-resistive rated penetration protection for rated assemblies in accordance with Alliance Standard Section 4.7. Consult a qualified fire protection engineer to design the required penetration systems.</p> <p>Get at least 25 percent of workers trained and certified in fire fighting, first aid, and rescue training by the proper authority.</p> <p>Provide fire-resistive rated construction barriers and associated opening protection for exit enclosures in accordance with Alliance Standard Sections 4.5 and 4.6. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Install a dedicated fire pump for the facility 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 in accordance with NFPA 22. Fire pump installation is to be tested for final acceptance in presence of Alliance and a final inspection of the installation shall be conducted by the Alliance prior to final acceptance of the installation by the Alliance as per clause 5.5.5. Acceptance testing of the installation shall be in accordance with NFPA 20, 22, and 25 testing</p>
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	<p>requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance by the Alliance. The pump is to be connected to an alternative power source such as a generator. The generator is to be configured with an ATS (auto starter).</p> <p>Remove aisle marking and mark aisles again so that these are not blocked by any permanent element like column. Remove movable things blocking aisles. Satisfy total width requirement for aisles/corridor/ramp, stairway and exit door as per BNBC Part 4 Table 4.3.2 or Alliance Standard Part 6 Section 6.5.4.</p> <p>Provide re-entry to floor levels from the stairwells in accordance with Alliance Standard Section 6.8.3.</p> <p>Provide handrails on both side of each stairway. Provide intermediate handrail when the stair width exceeds 2.2 m (87 inches). Provide handrail height between the range of 865 mm (34 in.) and 965 mm (38 in.).</p> <p>Establish an inspection, testing, and maintenance program for all fire extinguishers and prepare proper documentation. Program must comply with NFPA 10.</p> <p>Provide fire-resistive rated construction barriers between hazard types in accordance with Alliance Standard Sections 3.4 and 4.5. Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>Provide parapets or guards for all occupied roofs of a minimum height of 1067 mm (42 in.) as required by Alliance Standard Section 6.12.2.4.</p> <p>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.</p> <p>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.</p> <p>Install Class I standpipe system at required locations designed by a qualified fire protection engineer. Then establish an inspection, maintenance, and testing program for the standpipe and hose system. Program must comply with the requirements of NFPA 25 Chapter 6 Table 6.1.1.2.</p> <p>Provide a compliant fire pump and establish an inspection, maintenance, and testing program for the fire pump. Program must comply with NFPA 25.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B.</p>
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The recommendations for Electrical Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>Remove all dirt, debris, lint, water, oil, and improperly stored materials from the substation room and Generator room.</p> <p>Ensure switchboards and distribution boards free of dirt and debris</p>
<p>Short Term (3 Weeks)</p>	<p>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.</p> <p>Connect all metal in the building to the building earthing/grounding system such as rebar in concrete, metal frame of building, or metal water pipe.</p> <p>Provide emergency power connection for life safety loads (fire alarm, fire pump, elevators).</p> <p>Ensure generator room is properly illuminated.</p> <p>Ensure Signage indicating the prohibition of light fixtures without protective covers is installed at required locations.</p>
<p>Mid Term (6 Weeks)</p>	<p>Have a qualified electrical engineer; develop an as-built single line diagram detailing key components and capacity of the electrical system.</p> <p>Provide electrical insulation mats of adequate size in front of distribution boards.</p> <p>Install phase separators between terminal connections at the noted locations.</p> <p>Ensure proper ventilation for generator room.</p> <p>Ensure distribution boards are metal enclosed with a dead front construction.</p> <p>Provide proper clearance around equipment.</p> <p>Ensure over current protection device (circuit breaker) for each and every load.</p> <p>Provide dedicated neutral for each circuit.</p> <p>Consult with a qualified Electrical Engineer and ensure electrical wiring and cables are sized according to capacity of circuit breakers.</p> <p>Remove multi looping of wiring, cables at circuit breakers within distribution boards.</p> <p>Provide clear and permanent identification marks are painted on all distribution boards, switchboards, sub main boards, and switches.</p> <p>Ensure meters and other electrical devices installed on the main electrical equipment are operational.</p>

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Long Term (6 Months)	<p>Consult with an expert engineer to have details design and drawing of lightning protection system and ensure your building is secured.</p> <p>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.</p>
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