

## Summary of Preliminary Assessment on Structural, Fire and Electrical Safety

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Name of the Factory	: <b>ARTISTIC APPARELS LIMITED</b>
Address of the Factory	: 50,New Chaktai(4th & 5th Floor), Haji Delaware Hosen Sowdagar Market,Chittagong,Bangladesh.
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 5-May-14
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 5-May-14

### **BASIC INFORMATION:**

The present garment factory is a one Main Buildings. The following general information was noted:

- i. Building Usage Type : Garments Factory.
- ii. Structural System : RCC frame (Column & Beam) structure with monolithic 5" slab and 5" brick wall and telecommunication guy supported tower.
- iii. Floor System : Beam Supported slab type in RCC Building.
- iv. Floor Area : 8,837 SF.
- v. No. of Stories : 6 Storied Building (Ground + 5).
- vi. Construction Year : 1997.
- vii. Foundation Type : Unknown.
- viii. Design Drawings : Not Available.
- ix. Soil investigation Report : Available
- x. Construction Materials : Reinforced Concrete (brick 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. Adequately anchor and brace all non-structural elements such as the rack systems to resist earthquake forces to comply with the BNBC and Alliance Standard.
- iii. 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

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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.

- iv. Mid Term (6 Weeks) :
- v. The foundation system should be evaluated by a qualified structural engineering team. Results should be compared to existing (or revised) soil test and geotechnical recommendations. Recommendations for retrofitting or otherwise strengthening the foundation system should follow as necessary.
- vi. Based on the Review Panel investigation, the following recommendations are made by the Panel and should be implemented by the factory:
  - 1. Proper 'Propping' on both Eastern and Western part of the building (areas shown in the attached drawing) up to 2nd floor (ground to 2nd floor) should be ensured immediately under the supervision of a certified professional structural engineer.
  - 2. 1st and 2nd floors of the building shall be kept totally vacated (as it is now) and kept completely empty.
  - 3. Operations in the building can only be continued after completing the propping as mentioned In recommendation no 1. However the live load during the operations shall not exceed 1 kN/m<sup>2</sup> (20 psf) and no storage load (above 20 psf) shall be allowed except on the ground floor.
  - 4. All loads as well as equipment from the Cantilevers (East and West side) must be removed immediately.
  - 5. RCC water tanks (02 no east and west) must be kept empty immediately and a new plastic tank may be used and kept at the interior part of the roof.
  - 6. The billboard located at the roof (Eastern side) to be removed
- vii.
  - 7. A detailed engineering assessment (DEA) shall be started immediately and completed within 6 weeks under the supervision of a certified professional Structural engineer.
  - 8. Depending on the findings of the DEA, permanent remedial easures should be commenced within a very short period of time for the safety of the building.
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7. A detailed engineering assessment (DEA) shall be started immediately and completed within 6 weeks under the supervision of a certified professional Structural engineer.
8. Depending on the findings of the DEA, permanent remedial measures should be commenced within a very short period of time for the safety of the building.
- ix. Engage a qualified structural engineer to provide additional investigation into the cracking at the cantilever slabs and provide a remediation plan if required.
- x. Engage a qualified structural engineer to confirm structural performance of the structure, particularly regarding the stress on the beams. This should be conducted as part of detailed engineering assessment noted elsewhere.
- xi. As noted elsewhere, a Detailed Engineering Assessment should be conducted. The size and diameter of steel rebar in most of the columns of the two lowest tiers shall be authentically determined which may require removal of the concrete cover in one or two locations. Additional, strapping may be required based on recommendations of engineer.
- xii. Engage a qualified structural engineer to develop the required documents to confirm compliance with building code. Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
- xiii. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate these concentrated loads. If provisions have not been made, have a qualified structural engineer develop a remediation plan or it may be necessary to remove the concentrated loads.
- xiv. 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.
- xv. Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading. Compliance may be waived if the Factory Owner provides satisfactory evidence of a cyclone operations plan that includes full evacuation of the factory in advance of any approaching cyclone.
- xvi. The top surface of the framing must be completely sealed from water intrusion by a well maintained protective coating. Alternatively, create a positive drainage slope of at least 2% and provide drains with downspouts at low points to prevent water ponding, then the requirement for complete sealing of the top surface may be waived.
- xvii. As part of the detailed engineering assessment outlined elsewhere, the compressive strength of structural elements constructed using MCAC shall be investigated by an appropriate program of in-situ testing and representative destructive testing of core samples.

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- xviii. Have a qualified structural engineer complete further analysis of the structure and the irregular design elements and develop a remediation plan if required. See additional recommendations for Detailed Engineering Assessment found elsewhere.
- xix. Review this report for current recommendations (some of which are similar to the report from other engineer). Proceed with repairs as needed.
- xx. Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard. All elements for all buildings must be evaluated and included in drawings.
- xxi. Repair water pipe leakage and clean/clear roof of ponded water and debris. Evaluate the condition of any existing slab coating. Re-coat as necessary or alternatively create a positive drainage slope of at least 2% with drains containing downspouts at low spots to prevent ponding. Enclose exposed roof reinforcing with temporary concrete or other appropriate protection (e.g. epoxy coating) immediately to protect from weathering or other degradation.
- xxii. As noted elsewhere, rebar should be covered by temporary concrete or other appropriate protection (e.g. epoxy coating) immediately to protect from weathering or other degradation. Prior to any expansion (lateral or horizontal), approval regarding the condition of this reinforcing must be granted by a qualified structural engineer.
- xxiii. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.
- xxiv. 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 the building.
- xxv. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan (noted elsewhere).
- xxvi. Have a qualified structural engineer provide further analysis of the identified cracks to determine the appropriate course of corrective action.

Long Term (6 months) :

- i. Have a qualified structural engineer provide analysis of the identified cracks to determine the cause of the cracking. Repair as deemed necessary.
- ii. Repair the exterior façade system to prevent water intrusion.

**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.
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<p>Short Term (3 Weeks)</p>	<p>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.</p> <p>Install storage racks or other organization system. All materials stored in tiers shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling or collapse.</p>
<p>Mid Term (6 Weeks)</p>	<p>Installation of automatic fire alarm system (as noted elsewhere) should include an fire alarm control panel/enunciator. Until that time that a central station monitoring service or direct connection to the Fire Service and Civil Defence can be set up, a person shall be assigned to contact the fire department in the event of fire alarm activation. An annunciator shall be located in a constantly attended location to alert this person.</p> <p>Post maximum occupant load for all areas (near exit). Furthermore, floor loads must be limited to the available capacity of the exit stairs.</p> <p>Provide Certificates of Occupancy indicating approved use as industrial building for review</p> <p>Upon installation of compliant standpipe system, include required identification signs at the noted locations. Signage must comply with NFPA 14.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations.</p>
<p>Long Term (6 Months)</p>	<p>Install automatic fire alarm system with sufficient smoke/heat detectors as per Alliance standard. Automatic detectors should be tied into the fire alarm system. Alarm system should initiate occupant notification upon activation of detectors in addition to the manual fire alarm stations. All fire alarm installations shall be submitted for review by the Alliance for review prior to commencement of installation. Include listed pull stations at all entrances to exits. Install strobes and horns for complete notification. Automatic area smoke detectors are required throughout G2 buildings per Section 5.7.3.6.</p> <p>Installation of approved standpipe will require the installation of rated fire pump. Install the fire pumps in accordance with NFPA 20. Consult with a qualified fire engineer to properly design and install pump system. Install a listed fire pump system to supply the standpipe system per NFPA 20. Arrange water storage tanks according to NFPA 22. Submit product data, drawings and hydraulic</p>

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	<p>calculations and secure approvals before construction</p> <p>Provide minimum 1.5-hr fire rated doors and seal all unprotected openings to separate the west side exit stairs from work areas and other building spaces on all floor levels. Ensure that the fire doors are self-closing and positive latching and that they are provided with fire exit (panic) hardware where serving production floors. Fire doors assemblies shall conform to NFPA 252, BS 476 Part 22, EN 1364-1, GB 12955-2008, or IS 3614 Part II. Retain the services of qualified fire engineer to assist in specifying and installing fire rated assemblies.</p> <p>Penetrations shall be protected/sealed with a listed through penetration fire stop system tested in accordance with ASTM E814. Confirmation should be provided that any materials used can conform to standard as per Alliance Standard Section 4.7 Penetrations</p> <p>Remove all sliding or rolling doors at and within the exit stairs and along all portions of the means of egress. Replace with side-hinged swinging type doors in compliance with Standard. As noted elsewhere, exit enclosures require fire rated door assemblies (which should be side-hinged).</p> <p>Remove all existing gates and unrated doors in the means of egress. Install approved fire rated doors that are listed, permanently labeled, automatic-closing, in compatible fire rated frames with latching hardware.</p> <p>Provide a protected pathway from stair discharge to final exterior discharge. This may be accomplished by providing sufficient door assembly or vestibule and a fire rated passageway. The exit passageway must be constructed to meet the same rating requirement as the exit that is being served and shall not be less than 1 hr fire-resistance rated construction.</p> <p>Install a standpipe system designed by a qualified fire protection engineer. System should include rated fire pump and Class I standpipe hose connections (65 mm) in each stairwells at each floor level including occupiable roof.</p> <p>Upon installation of compliant standpipe system, fire department (Siamese) inlet connections should be installed to allow fire department pumper equipment to supplement the fire protection systems.</p> <p>Fire department outlet connections shall be provided to allow fire department pumper vehicles to draw water from ground-level or underground water storage tanks. Connections shall match the Fire Service and Civil Defense</p>
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	<p>hose thread standard. Signage for standpipe system is not in compliance with NFPA 14 Chapter 6 (e.g. no sign on Fire Department connection indicating STANDPIPE in 1 in lettering)</p> <p>Handrails shall be provided on both sides of each exit stairway and ramp. New handrails shall have 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.</p> <p>During installation of fire rated door assemblies assure that every door in a stair enclosure serving more than 4 stories is provided with re-entry unless it meets the requirements of Alliance Standards Part 6 Section 6.8.3.1.</p> <p>Remove slider rails or provide a uniform slope/ramp at the noted locations (slope should not exceed 1 in 20 in the direction of travel). Any protrusions or lips must be smoothed down to less than 1/4 in.</p> <p>It is recommended to retain the services of a qualified fire engineer to design segregations as follows: Boiler room: Separated from other occupancies by a minimum 1 hour construction.</p> <p>Generator Room: Generator sets shall be separated from all other occupancy areas by a minimum 2 hour construction.</p> <p>Storage Areas: Rooms used for storage of combustible materials shall be separated from the surrounding occupancy with a minimum 1 hour construction. (In process storage open to the surrounding occupancy is not required to be separated when the floor is provided with automatic sprinkler protection)</p> <p>Day care should be relocated to ground floor with a maximum or provided direct access to an exit enclosure.</p> <p>Any newly installed or revised standpipe system needs to be evaluated for compliance with the design pressure and flow demands of NFPA 14 or BNBC as cited in 5.4.3. Standalone standpipe systems shall be confirmed to meet the local BNBC requirements with a minimum 450 kPa (65 psi) pressure at the hydraulically most remote hose connection or NFPA 14. This testing should be documented and available for review.</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.</p>
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	<p>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 m<sup>2</sup> (500 ft<sup>2</sup>). Limit dense deposits to 6 mm (¼ in.) and oil saturated deposits to 3.2 mm (⅛ in.).</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:

Immediate	NA
Short Term (3 Weeks)	<p>Develop and implement an electrical safety program include key topic such as lock out tag out procedures, personal protective equipment requirements, etc. Reference NFPA 70E for example program requirements.</p> <p>Provide electrical insulation mats in front of all live front switchboards, panels, and distribution boards. As per NFPA 70e, mats of insulating rubber or other suitable floor insulation shall be provided for the operator where the voltage to ground exceeds 150.</p> <p>All boxes and enclosures (including transfer switches, generators, and power panels) for emergency circuits shall be permanently marked so they will be readily identified as a component of an emergency circuit or system.</p> <p>The required marking can be by color code, the words “emergency system,” or any other method that identifies the box or enclosure as a component of the emergency system.</p>
Mid Term (6 Weeks)	Have a qualified electrical engineer; develop as-built electrical drawings providing detailing key components of the electrical system.
Long Term (6 Months)	<p>Generator sets shall be separated from all other occupancy areas by a minimum 2 hour construction. Penetrations must have fire rated assemblies.</p> <p>Have a qualified electrical engineer design a lightning protection system according to the BNBC requirements. Have a licensed electrician install the designed system.</p> <p>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.</p>