

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

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Name of the Factory	: CHITTAGONG ASIAN APPAREL LTD
Address of the Factory	: 132, Nasirabad Area, Chittagong.
Present Status of the Factory	: Under Operation.
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 22-May-14
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 19-May-14
BGMEA Membership No	: 3940

### **BASIC INFORMATION:**

There is one building in the factory premises. The following general information was noted:

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|-------|---------------------------|---|
| i.    | Building Usage Type       | : Garments Factory.   |
| ii.   | Structural System         | : RCC Moment resisting frame structure & Prefab Steel Str   |
| iii.  | Floor System              | : Beam Supported slab for RCC Structures.   |
| iv.   | Floor Area                | : 174246 sft  |
| v.    | No. of Stories            | :<br>1) Main production Building-1: Six storied.<br>2) Main production building-2: Four story<br>3) Medical and childcare building: Two storied.<br>4) Prefab fabric store shed: Single story<br>5) Prefab generator shed: Single story<br>6) Substation building: Single story |
| vi.   | Construction Year         | : 2006-2008   |
| vii.  | Foundation Type           | : Isolated footing  |
| viii. | Design Drawings           | : Not Available.  |
| ix.   | Soil investigation Report | : Not Available   |
| x.    | Construction Materials    | : RCC brick chips.  |
| xi.   | Generator                 | : Ground floor (Separate building)  |

### **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:**

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|-----------------------|----|---|
| Immediate             | :  |   |
|                       | i. | Have a qualified structural engineer provide further testing and analysis of distress, settlement, shifting, or cracking in columns or walls and provide a remediation plan to correct noted issues.    |
| 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. |

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- 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)

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- i. For Building-01:  
Before any addition of floors conduct detail engineering assessment including destructive core testing to validate the in-situ concrete compressive strength of structural elements. No extension is allowed before conducting DEA.  
For Building-02:  
-For Existing Condition: Conduct destructive core testing to validate the in-situ concrete compressive strength of structural elements.  
-For Future Extension: Before any addition of floors conduct detail engineering assessment including destructive core testing to validate the in-situ concrete compressive strength of structural elements. No extension is allowed before conducting DEA. As part of the detailed assessment outlined elsewhere via the column FoS question, assign a qualified structural engineer to determine the compressive strength of the concrete by core cutting test.
- ii. Have a qualified structural engineer complete an analytical evaluation of the structural impact of the structural steel frame roof structure and the additional occupancy space at the roof level.
- iii. 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.
- 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. Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.
- vii. Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.
- viii. 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.
- ix. Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.

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Long Term (6 Months)

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- i. Provide a protective coating to all structural elements that are constructed with MCAC and exposed to rainfall or other sources of water. Have the protective coating approved by the Alliance or a qualified structural engineer. In the alternative, provide a 2% slope on the exposed surfaces to prevent accumulation of water.
  - 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)	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)	<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>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. 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> <p>Provide two separate points of earthing (grounding) for the generator.</p> <p>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 disallows these fixtures. Install signs posted in Bengali and English, indicating this prohibition at all entrances to these areas.</p>
Mid Term (6 Weeks)	<p>Change the direction of such utilities, so that they are not routed through the substation room.</p> <p>Ensure proper ventilation for the generator room.</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>Ensure that wet type transformers are not leaking and have appropriate oil levels.</p> <p>Consult with a qualified Electrical Engineer and ensure electrical wiring/cables are sized according to the capacity of circuit breakers.</p> <p>Remove multi looping of cables at circuit breakers within switchboards and distribution boards.</p>

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<p>Long Term (6 Months)</p>	<p>Have a qualified electrical engineer, design a lightning protection system and installed according to the requirements.</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> <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 &amp; Rotating Equipment and NFPA70B or a comparable standard.</p> <p>Inspect electrical switchgear and panel boards on an annual basis to ensure that the equipment is in good working condition.</p>
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### The recommendations for Fire Safety corrective actions are:

<p>Immediate (3 to 6 Days)</p>	<p>Keep the means of egress continuously free and clear of all storage materials to full instant use in the case of fire or another emergency. Remove all locks or other devices installed on a means of egress component that would prevent any occupant from having safe egress from the building or structure.</p> <p>Remove all combustibles stored underneath the cutting tables.</p>
<p>Short Term (3 Weeks)</p>	<p>Remove all hasps, locks, slide bolts, or other locking devices at the noted locations.</p> <p>Smoking shall be prohibited in any garment factory building, separate storage building, or any building or area where the Inspector of the Factories Rules (1.6.3.7) Part 53 requires that smoking be prohibited. If an owner creates a designated smoking area outside the buildings, information on the location of these designated areas shall be posted on the signs required in Section 13.5.2</p>
<p>Mid Term (6 Weeks)</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.</p> <p>Impart training in accordance with the Alliance Safety Training Curriculum and keep records with proper</p>

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	<p>documentation.</p> <p>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).</p> <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 tested on a monthly basis. Functional testing of battery powered signs is provided for a minimum 90 minutes once per year.</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 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 of 90 minutes once per year.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p> <p>Install required identification signs at the noted locations. Signage must comply with NFPA 14 Chapter 6.</p> <p>Install signage adjacent to each stair door indicating the stair name and the floor level at the noted locations.</p> <p>Apply to CDA for issuance of occupancy certificate and pursue the matter to expedite.</p>
<p>Long Term (6 Months)</p>	<p>Provide rated exit passageway i.e. protected path of egress from the exit enclosure to the public way. The rating of the exit passageway is to be equal to fire rating requirement of the exit that is being served and shall not be less than 1 hr fire-resistance rated.</p> <p>Provide rated exit passageway, i.e. protected path of egress from the exit enclosure to the public way. The rating of the exit passageway is to be equal to the fire rating requirement of the exit that is being served and shall not be less than 1 hr fire-resistance rated.</p> <p>Protect the penetrations of fire resistive rated assemblies with a listed through penetration fire stop system tested in accordance with ASTM E814.</p> <p>Provide 2 hr fire-resistive rated construction barriers at exit enclosures. Fit outward opening, side-swinging, self-closing, non-lockable fire doors of 1.5 hr rating in all</p>

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	<p>stairwell enclosures. Consult a qualified fire protection engineer to design the required rated construction barriers.</p> <p>Replace all collapsible, sliding, roll-down gates and shutters in means of egresses with side-hinged swinging type doors of proper width and rating.</p> <p>Occupied roofs shall be provided with the minimum number of exits required.</p> <p>The system is to be compliant with the requirements of NFPA 14. The hydraulic calculations should be reviewed by the Alliance and a review is to be completed prior to the start of work. All standpipe system installations shall be submitted for review by the Alliance prior to commencement.</p> <p>Provide an opening protective at all windows and other openings on all the fire rated walls across the entire premises. If those openings are not required then close them.</p> <p>Provide 1 hr fire protective opening assemblies in 1 hr rated exit enclosure. Provide 1.5 hr fire protective opening assemblies in 2 hr rated exit enclosure. Exits connecting three or fewer stories shall be enclosed with a minimum 1-hr fire-resistance rating. Exits connecting four or more stories shall be enclosed with a minimum 2-hr fire-resistance rating.</p> <p>Provide fire-resistive rated assemblies at the required exit access corridors. The rated assembly should be approved and/or designed by a qualified fire protection engineer. Windows and glass block assemblies are to be tested for a fire rating following NFPA 257.</p> <p>Remove existing aisle marking and draw new markings fulfilling the minimum aisle width requirement. Relocate the machines accordingly if necessary.</p> <p>Train and certify at least 25 percent of workers in fire fighting, first aid and rescue by the proper authority.</p> <p>Dedicated fire pump installation should follow the requirements of NFPA 20. Fire pump installation is to be tested for final acceptance in the presence of the Alliance and a final inspection of the installation shall be conducted by the Alliance prior to final acceptance of the installation. Acceptance testing of the installation shall be in accordance with NFPA 20, 22, and 24 testing requirements. Documentation of all testing shall be submitted to the Alliance for review prior to final acceptance by the Alliance. This pump is to be connected to an alternative power source like a generator. And the generator is to be connected with ATS (auto starter).</p> <p>Provide fire-resistive rated construction barriers between hazard types following Table 4.4.1 of Alliance Standard or Table 4.1.1 from BNBC Part 4. Consult a qualified fire protection engineer to design the required rated construction barrier.</p>
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	<p>Every door in a stair enclosure serving more than 5 stories shall be provided with re-entry unless it meets the following requirements. Stair doors may be permitted to be locked from the stair (ingress) side that prevents re-entry to the floor provided at least two floors allowing re-entry to access another exit are provided, there are not more than 4 stories intervening between re-entry floors, re-entry is allowed on the top or next to top level, reentry doors are identified as such on the stair side, and locked doors shall be identified as to the nearest re-entry floors. When the discharge floor is determined to be a required re-entry floor using the above requirements, re-entry does not have to be provided back into the building on this level.</p> <p>Provide handrails on both sides of each stairway. Provide intermediate handrails when the stair width exceeds 2.2 m (87 inch). Provide a handrail of height between the range 865 mm (34 in.) and 965 mm (38 in.).</p> <p>Install fire department connections where required and in compliance with the Standard. 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 hose thread standard.</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.</p> <p>Provide parapets or guards for all occupied roofs at a minimum height of 1067 mm (42 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>Establish an inspection, maintenance, and testing program for the standpipe and hose system. The program must comply with the requirements of NFPA 25 Chapter 6 Table 6.1.1.2.</p> <p>Install a pump dedicated for fire fighting or fire protection following the requirements of NFPA 20. Then establish an inspection, maintenance, and testing program for the fire pump. Program must comply with NFPA 25.</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. 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>
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