

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

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Name of the Factory	: <b>Stitch Well Designs Ltd unit 2</b>
Address of the Factory	: BSCIC Industrial Estate, Plot no. A102, Tongi, Gazipur, Bangladesh
Present Status of the Factory	: <b>Under Operation</b>
Structural assessment conducted by	: Alliance
Date of Structural Inspection	: 12-Mar-2014
Fire & Electrical assessment conducted by	: Alliance
Date of Fire & Electrical Inspection	: 12 Mar 2014

### **BASIC INFORMATION:**

The present garment factory is a six storied building with one semi basement. The following general information was noted:

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|-------|---------------------------|---|
| i.    | Building Usage Type       | : Garments Factory.                                       |
| ii.   | Structural System         | : RC Beam-Column frame structure                          |
| iii.  | Floor System              | : Beam Supported slab                                     |
| iv.   | Floor Area                | : 153,676 sft   |
| v.    | No. of Stories            | : 6 storied building and a partial basement               |
| vi.   | Construction Year         | : Up to 6th floor in 2007-2009 and remaining in 2009-2013 |
| vii.  | Foundation Type           | : Spread Footing  |
| viii. | Design Drawings           | : Available   |
| ix.   | Soil investigation Report | : Available   |
| x.    | Construction Materials    | : Reinforced Concrete.                                    |
| xi.   | Generator                 | : In Ground Floor   |

### **RECOMMENDATIONS FOR CORRECTIVE ACTION:**

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

#### **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. 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) :

- i. Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads. If

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provisions have not been made, have a qualified structural engineer develop a remediation plan.

- ii. Prepare Load plans and Redistribute floor loads to comply with the floor loading plans
- iii. Under the guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
- iv. Have a qualified structural engineer confirm that capacity to support the load is available. Load plants complying with Alliance Standard Part 8 Section 8.20.4.3 should also be developed
- v. Develop engineered plans to brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard. Install anchor and braces as shown on approved plans.
- vi. Have a qualified structural engineer develop Floor Loading Plans as per the requirements of Part 8 Section 8.20.5.3
- vii. Have a qualified structural engineer prepare load plans including the information required in section 8.20 of the Alliance Standard
- viii. Prepare a floor load plan and provide signage or appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the load plan.

Long Term : NA

### The recommendations for Fire Safety corrective actions are:

Immediate (3 to 6 Days)	Means of egress shall be free from impediments, obstructions, and stored materials at all times.  Keep areas beneath cutting tables clear of combustibles as all times.
Short Term (3 Weeks)	Remove the kitchen from the factory building.  Doors shall be kept lock free in the direction of egress under all conditions. All hasps, locks, slide bolts, and other locking devices shall be removed where installed.  Daycare occupancies which are accessory to other occupancies need to be located on the ground floor with a maximum travel distance of 9 m (30 ft). If located on a higher floor, direct access to a safe exit enclosure needs to be provided.
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. Until that time a central station monitoring service or direct connection to the Fire Service and Civil Defense can be set up, a person needs to be assigned to contact the fire department in the event of fire alarm activation. An

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	<p>annunciator needs to be located in a constantly attended location to alert this person.</p> <p>Develop an emergency evacuation plan which includes all components required by the Alliance Standards and communicate the plan to all employees.</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 shall be tested on a monthly basis. Functional testing of battery powered signs shall be provided for a minimum 90 min once per year. Functional testing of battery powered signs shall be provided for a minimum 90 min once per year.</p> <p>Develop a testing and maintenance program that ensures the operation of all exit signs is 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.</p> <p>The occupant load shall be posted 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>Training programs shall be implemented and documented in accordance with the Alliance Safety Training Curriculum.</p> <p>Provide stair designation signs at each floor of each stair throughout the building in English and Bangla in accordance with the Alliance Standard.</p> <p>Collect Occupancy certificate for each building and ancillary structure as per building use from approving authority.</p> <p>Complete fire department pre-planning activities with the local Fire Service and Civil Defense.</p>
Long Term (6 Months)	<p>Provide 2-hours fire-resistive rated continuous barriers at shaft enclosures and 1.5-hours fire-resistive opening protection at shaft opening(s). Consult a qualified fire protection engineer to design the required rated construction of shaft.</p> <p>Create a 1-hr. fire resistance rated exit passageway to extend the exit enclosure to the exterior of the building or install automatic sprinklers throughout the Ground Floor.</p> <p>Install required fire rated doors at all exits. Fire doors shall be side-hinged that swing in the direction of egress with automatic closers, latching hardware, and no locking</p>

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mechanisms. The doors shall have a minimum clear width of 1 m (39 in.). Required total width of the fire rated door needs to be calculated per Alliance Standard Section 6.5. Every door in a stair enclosure serving more than 5 stories shall be provided with re-entry provision. Consult a qualified fire protection engineer to design the required rated construction barriers with opening protection.

All collapsible gates, wooden door, steel swinging gates in the means of egress shall be replaced with required fire rated outward-opening, side-hinged swinging, self-closing type doors as per Alliance Standard Section 6.8. Doors shall be free from general locking arrangement.

Provide 2-hour fire-resistive rated construction barriers at exit enclosures with 1.5-hour fire-rated opening protection (door, window, etc.). Fire doors shall be side-hinged that swing in the direction of egress with automatic closers, latching hardware, and no locking mechanisms. The doors shall have a minimum clear width of 1 m (39 in.). Required total width of the fire rated door needs to be calculated per Alliance Standard Section 6.5. Every door in a stair enclosure serving more than 5 stories shall be provided with re-entry provision. Consult a qualified fire protection engineer to design the required rated construction barriers with opening protection.

Modify or install the standpipe System (Class-I and Class-II) to meet the requirements of Alliance Standard Section 5.4. Consult a qualified fire protection engineer before modifying or installing a new system.

Install fire rated door assemblies at all exits. Provide fire-resistive rated (1.5-hour for generator and substation room and 0.75-hour for store) opening protection (Door, Window, Hatch Cover etc.) at openings and penetrations through fire rated walls and/or assemblies. Consult a qualified fire protection engineer to design the required rated opening protection.

Install a dedicated fire pump in accordance with NFPA 20 to supply the water demands for the fire protection systems along with a stored source of water to meet the demands per NFPA 22.

Design and install automatic fire detection and alarm system by a qualified fire protection engineer throughout the building. Notification devices shall be spaced appropriately based on NFPA 72.

Provide training for the required number of people certified in firefighting, first aid, and rescue training by the

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	<p>appropriate authority.</p> <p>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 needs to be maintained when installing new handrails. Guards, where required shall be provided in accordance with Alliance Standard Section 6.3.7.</p> <p>Rooms used for housing of combustible materials, boiler, shall be separated from the surrounding occupancy with a minimum 1-hour fire rated construction with 0.75-hour fire rated opening protection (doors, windows, etc.). Room housing generator shall be separated from surrounding occupancy with a minimum 2-hour fire rated construction with 1.5-hour fire rated opening protection (doors, windows, etc.). Fire doors shall be of the side-hinged, swinging type and shall swing in the direction of egress. Doors shall have a minimum clear width of 1 m (39 in.). Consult a qualified fire protection engineer to design the required rated construction barrier.</p> <p>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. Ensure reservation of the required amount of water for fire-fighting. Consult a qualified fire protection engineer to design this requirement.</p> <p>Provide parapet in every occupied roof with a minimum height of 1067 mm (42 in.).</p> <p>Ducts penetrating fire-resistance rated assemblies shall be protected with listed fire dampers. Dampers shall be 1.5-hour rated dampers when penetrating a 2-hour or less fire resistance rated assembly.</p> <p>Provide guards at the open side of means of egress that exceed 760 mm (30 in.) above the floor or finished ground level. New guards shall have a minimum height of 1067 mm (42 inch) and the spacing of the vertical members shall not exceed 200 mm (8 in.).</p> <p>Install Portable fire extinguishers as per potential fire class and hazards in accordance with NFPA 10 Chapter 5.</p> <p>Establish an inspection, testing, and maintenance program</p>
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	<p>for all fire extinguishers. Program needs to comply with the requirements of NFPA 10 Chapter 7.</p> <p>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.</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> <p>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/m<sup>2</sup> may also be used.</p> <p>Establish an inspection, testing, and maintenance program for the standpipe and hose system. Program needs to comply with the requirements of NFPA 25.</p> <p>Develop a hot work permit program. The program must comply with the requirements of NFPA 51B.</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>
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### The recommendations for Electrical Safety corrective actions are:

Immediate (3 to 6 Days)	Remove all dirt, lint and improperly stored materials from the substation room.
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>Establish a periodic inspection program to ensure the electrical systems are free from damage, debris, dirt, lint, etc. Maintain records concerning inspections and follow up</p>

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	<p>actions.</p> <p>Connect all metals of the building to the building's earthing/grounding system.</p> <p>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.</p>
Mid Term (6 Weeks)	<p>Ensure distribution boards are metal enclosed with a dead front construction.</p> <p>Remove multi looping of cables at circuit breakers within distribution boards.</p> <p>Ensure clear and permanent identification marks are painted in all distribution boards, switchboards, sub main boards and switches.</p> <p>Provide cable socket or lug sized same as the cable for termination of the particular connection.</p> <p>Install phase separators between terminal connections. Verify phase separators are installed at all locations (MCCB).</p> <p>Provide mechanical guards for electrical equipment where necessary.</p> <p>Complete an oil analysis on applicable transformers at appropriate intervals based on voltage and power.</p> <p>Provide capacity information labels for distribution boards.</p>
Long Term ( 6 Months)	<p>Higher rated MCCB/MCB is used to protect the lower rated cable in MDB/DBs and many SDBs in all floors of the factory.</p> <p>Ensure proper ventilation for generator room.</p> <p>Ensure the generator room properly rated and physically separated from the remainder of the building.</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>Assign an electrical engineer to select the appropriate down conductor size and install according to code of Alliance Standards Part 10 Section 10.11 Lightning Protection.</p>