INITIAL STRUCTURAL INTEGRITY ASSESSMENT REPORT (SIAR)

Factory Name:	**Turag Garments & Hosiery Mills Ltd**
Address:	**South Panishail, Zirani Bazar Kashimpur, Gazipur Gazipur Dhaka Bangladesh**
Assessor:	**Sumerra**
Date:	**10 Jun 2014**

Introduction to the Report

The following report contains a site profile and summary of non-conformities identified during an onsite assessment commissioned by the Alliance for Bangladesh Worker Safety (Alliance) and conducted by a third-party Qualified Assessment Firm (QAF). The assessment was conducted against the Alliance for Bangladesh Worker Safety Assessment Protocols (APs) and Fire Safety and Structural Integrity Standard, which is harmonized with the factory assessment guidelines developed by Bangladesh University of Engineering and Technology (BUET) for the Bangladesh National Tripartite Plan of Action (NTPA). The goal of the Alliance process is to provide clear and practical technical requirements by which Bangladeshi Ready Made Garment (RMG) Factories producing for Alliance members may be consistently and fairly evaluated for fire, structural, and electrical safety in a non-duplicative manner. Each assessment will prompt action plans that will be used by RMG factories to systematically and sustainably improve safety conditions for garment workers. Beyond tracking and reporting on action steps taken in a transparent manner, the Alliance organization and its members will seek to further support factory improvements through technical assistance, training, implementation support for functional Worker Committees, and in some cases financial assistance and wage support for workers if factories are closed for remediation.

The contents of the report do not constitute a guarantee of compliance with the applicable laws, the Alliance Standard or the absolute or continued safety against fire, electrical and/or structural integrity issues that may lead to injury or loss of life. The report is designed to provide a non-exhaustive summary of risk issues, based on a limited sampling and duration of time onsite by the named QAF. Neither the QAF nor the Alliance can certify or guarantee the quality, outcome, or effectiveness of actions taken in response to the report.

For more information and report feedback please go to: www.bangladeshworkersafety.org.

GENERAL INFORMATION

General Information	
Factory Name:	Turag Garments & Hosiery Mills Ltd
Address:	South Panishail, Zirani Bazar Kashimpur, Gazipur Gazipur Dhaka Bangladesh
Country:	Bangladesh
Province:	Dhaka
City:	Gazipur
Zip Code:	
Audit Duration:	3 Days
Re-Audit:	Re-Audit After 0 Months
Draft Report Date :	July 16, 2014
Final Report Date :	October 20, 2014
Are all Action Items From Previous Assessment Completed?:	N/A
Buildings in Complex :	3 Main Buildings: 1. ETP Building, 2. Dying Building, 3. Admin & Medical Building
Number of Building Levels (Stories) :	1. ETP Building - 7 Story, 2. Dying Building - 3 Story, 3. Admin & Medical Building - 8 Story
Approximate Building Area (SF) :	1. ETP Building - 162,544; 2. Dying Building - 76,043; 3. Admin & Medical Building - 36, 784
Date of Building Construction :	1. ETP Building - 2009, 2. Dying Building - 2008, 3. Admin & Medical Building - 2009
Date of Last Building Renovation/Addition :	No renovations
Is the Building mixed use?:	No
Ancillary Structures in Complex :	5 Tin Shed Buildings
Number of Ancillary Levels (Stories) :	All 1 (Ground) story
Approximate Ancillary	31109 sft (Total)

Structures Area (SF) :	
Number of Occupants :	2836
Exterior Facade Description :	ETP Building: RCC structural frame building with brick masonry infill. Dying Building: Structural steel frame building with brick masonry infill. Admin & Medical Building: RCC structural frame building with brick masonry infill. Ancillary Buildings: Brick masonry infill.
Structural System Description :	ETP Building and Admin & Medical Buliding: Concrete beam & slab system with beams spanning both directions between columns. Foundation & lateral load resisting system are moment resisting concrete frame. Dying Building: Moment resisting prefabricated steel building with concrete slab. Ancillary Buildings: Tin Shed Buildings (simple metal frame with metal roof).
Issues were not found during the structural integrity assessment that required the Emergency Escalation Protocol (and referral to NTC Review Panel)?:	Yes

ASSESSMENT FINDINGS

Structural System Design		
Question:	Are the available FoS for the columns adequate based on Preliminary calculation?	
Priority Level:	High	
Non-Compliance Level:	2	
Description:	ETP Building: 42psf Central 1.55 Corner 1.96 Edge 1.49 Edge 1.34 20psf Central 1.76 Corner 2.08 Edge 1.62 Edge 1.47 Admin & Medical Building 42psf Corner 1.74 Edge 1.29 20psf Corner 1.82 Edge 1.39 FoS 1.25 to 1.5 (for 42 psf live load) indicates inadequate safety margin. Dying Building 42psf Central 1.78 Corner 3.32 Edge 2.41 20psf Central 2.18 Corner 3.78 Edge 2.83	
Source of Findings:	Uploaded Document: Stress Calculations	
Suggested Plan of Action:	ETP Building, Admin & Medical Building - Engage qualified structural engineer to conduct a detailed engineering assessment (DEA) of building within 6 weeks. DEA should include assessment of the strength of the concrete and quantity of the steel in the columns. Concrete strength shall be assessed by taking at least 4 nos. of 4 inch diameter cores from the area of concern. If cores are to be taken from column, it is advisable to take it from an upper level where the stresses are low (for practical reasons 3 inch cores may be taken from columns). In addition, UPV shall be used to have concrete strength in sufficient number of columns in the lower tiers so that a level of confidence is achieved. The calibrated results of core tests and UPV shall be used to determine a reliable value of concrete strength in columns. The size and diameter of steel rebar in most of the columns of two lowest tiers shall be authentically determined using a Ferro scanner or similar device. In order to confirm the diameter of embedded bars as obtained from Ferro scanner, the Assessor may have to remove the concrete cover in one or two locations.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Provide results of preliminary calculations in space provided. a) column capacity; FoS > 1.86 - Safe b) column capacity; FoS 1.5 -1.86 - Needs Evaluation c) Column capacity; FoS 1.25-1.5 - Needs Evaluation d) Column capacity; FoS <1.25 - Unsafe In case of a critically low FoS (<1.25), consider Immediate Escalation Protocol	
Question:	Are credible structural design documents available for review and kept on site?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	ETP Building: The structural documents for this building were prepared by Engr. Shahriar parvez (M - 23758), Consultant - Shahriar Parvez & Associates House - 5/2, Block - A, Lalmatia, Mohammadpur, Dhaka. In these structural documents, the engineer mentioned incomplete design criteria that did not	

	include loading criteria. Furthermore, the architectural plans for this building were prepared by the structural engineer, not an architect. Admin & Medical: The structural documents of this factory building was provided by Engr. Shahriar parvez (M - 23758), Consultant - Shahriar Parvez & Associates House - 5/2, Block - A, Lalmatia, Mohammadpur, Dhaka. In structural document Engineer mentioned design criteria but did not mention any kind of load (Live load, Dead load, Wind load, Seismic load). They have details Architectural plan which is done by engineer but which should be done by Architect.	
Source of Findings:	Document Review: ETP, Admin & Medical: No load criteria mentions and architectural plans not created by architect.	
Suggested Plan of Action:	ETP, Admin & Medical: Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standard Part 8 Section 8.19 Required Structural Documentation for New and Existing Factories	
Question:	Can credible structural documentation indicating general conformance with 2006 BNBC or other comparable applicable international model building code be produced?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	ETP Building, Admin & Medical Building: The available structural documents do not contain information regarding conformance to a building code.	
Source of Findings:	Document Review: ETP, Admin & Medical: No declaration of building code.	
Suggested Plan of Action:	ETP Building, Admin & Medical Building: 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.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Reference Alliance Standards Part 8 Section 8.2 Structural Integrity of Existing Factory Buildings	
Question:	If built after 2006, can documented compliance with the seismic and wind requirements of the 2006 BNBC be provided?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	ETP Building, Admin & Medical Building: The available structural documents do not contain information regarding compliance wind BNBV seismic and wind design requirements.	

Source of Findings:	Document Review: ETP, Admin & Medical: Design criteria but not any kind of load (Live load, Dead load, Wind load, Seismic load).	
Suggested Plan of Action:	ETP Building, Admin & Medical Building: Have a qualified structural engineer document compliance with the seismic and wind requirements stated in the 2006 BNBC.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standards Part 8 Section 8.17 Design for Lateral Loads and 2006 BNBC Part 6 Section 1.5	
Question:	Can documentation be provided that the building is compliant with the requirements for wind loading and storm surge loadings as detailed in BNBC Part 6 Section 1.5.3?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	ETP Building, Admin & Medical Building: The available structural documents contain design criteria but this information is incomplete and does not contain wind load design information.	
Source of Findings:	Document Review: ETP, Admin & Medical: Design criteria but not any kind of load (Live load, Dead load, Wind load, Seismic load).	
Suggested Plan of Action:	ETP Building, Admin & Medical Building: 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.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	2006 BNBC Part 6 Section 1.5. 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"	
Question:	Have provisions been made in floors or decks for a concentrated load (such as heavy equipment, water tanks, stored materials, etc) applied at a location wherever this load acting upon an otherwise unloaded floor would produce stresses greater than those caused by a uniform load?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	The following areas have concentrated loads where it is unknown (no load plans or info available) if provisions are sufficient: ETP Building: Ground Level (top of basement), 3 Fabric Machines	
Source of Findings:	Photograph: ETP Building: GF (top of basement), Fabric Machines	

Suggested Plan of Action:	Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate concentrated loads of the noted equipment/machinery. If provisions have not been made, have a qualified structural engineer develop a remediation plan.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standard Part 8 Section 8.13 and 8.14	
Question:	Where density of operations, storage of materials, or equipment weights require live load capacity in excess of 2.0 kN/m2 (42 psf), do the design documents confirm that the required load capacity exists? Or has the load capacity been analytically confirmed and certified by an Alliance-qualified structural engineer?	  
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	The following areas have not been considered for load capacity: ETP Building: 1st Floor, Accessories and Fabric Store (calculated load > 132 psf); 2nd Floor, Fabric Store (calculated load > 65 psf) Dying Building: 1st Floor, Cutting Section Fabric (calculated load > 112 psf)	
Source of Findings:	Photograph: Photos of areas of potential overload	
Suggested Plan of Action:	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. It should be displayed in each section of the floor (particularly for the storage area it is very important).	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standards Part 8 Section 8.15 Minimum Floor Design Loads	
Question:	Are Certificates of Occupancy available for review?	
Priority Level:	Low	
Non-Compliance Level:		
Description:	ETP: As per As Built approved plan this is 7 storied with single Basement Factory building which was approved by Sub Astt. Engineer, Executive Engineer, Urban Designer & Mayor of Gazipur Puroshava, Gazipur dated 17th January 2013. This building also approved by Nripendraw Nath Das, factory Deputy Chief Inspector as a factory dated 7th April 2013 Dyeing: As per As Built approved plan this is 3 storied prefabricated steel structural Factory building with mezzanine floor which was approved by Sub Astt. Engineer, Executive Engineer, Urban Designer & Mayor of Gazipur Puroshava, Gazipur dated 17th January 2013. This building also approved by Nripendraw Nath Das, factory Deputy Chief Inspector as a factory dated 7th April 2013 Admin & Medical: As per As Built approved plan this is 8 storied Factory building which was approved by Sub Astt. Engineer, Executive Engineer, Urban Designer & Mayor of Gazipur Puroshava, Gazipur dated 17th January 2013. This building also approved by Nripendraw Nath Das, factory Deputy Chief Inspector as a	

	factory dated 7th April 2013	
Source of Findings:		
Suggested Plan of Action:	Provide Certificates of Occupancy for review.	
Suggested Deadline Date:		
Standard:	Alliance Standard Part 8 Section 8.3 Preliminary Structural Assessment	
Structural System Construction		
Question:	If yes, have the structural members constructed with MCAC been investigated by an appropriate program of in-situ testing and representative destructive testing or core samples?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	ETP Building, Admin & Medical Building: No documentation of in-situ testing and representative destructive testing or core samples of MCAC was available.	
Source of Findings:	Document Review: No testing documents available	
Suggested Plan of Action:	ETP Building, Admin & Medical Building: As part of the detailed assessment outlined elsewehre, 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.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Reference Alliance Standards Part 7 Building Materials Section 7.2 Masonry-chip aggregate concrete (MCAC)	
Question:	Are all non-structural elements suspended from, attached to, or resting atop the structure adequately anchored and braced to resist earthquake forces?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	The following structures are not properly braced/anchored: ETP Building: 1st Floor, Accessories Store (Steel Zipper); 2nd Floor, Left Over Floor. Admin & Medical Building: 3rd Floor, Sewing Section Racks.	
Source of Findings:	Photograph: Accessories storage racks	
Suggested Plan of Action:	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.	

Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standards Part 8 Section 8.18 Seismic Bracing of Key Non-Structural Elements and 2006 BNBC Part 6	
Question:	Was masonry-chip aggregate concrete (MCAC) used in the construction of the building?	
Priority Level:		
Non-Compliance Level:		
Description:	ETP Building: Yes Dying Building: No (Steel) Admin & Medical Building: Yes	
Source of Findings:		
Suggested Plan of Action:	Have a qualified structural engineer assess the durability aspects as suggested in Alliance Standard Part 7 Section 7.2 and take appropriate remedial measures.	
Suggested Deadline Date:		
Standard:	Reference Alliance Standards Part 7 Building Materials Section 7.2 Masonry-chip aggregate concrete (MCAC)	
Structural Safety Programs		
Question:	Is a program in place to ensure that the live loads for which a floor or roof is or has been designed will not be exceeded?	
Priority Level:	Medium	
Non-Compliance Level:	3	
Description:	No program in place to ensure that the live loads for which a floor or roof is or has been designed will not be exceeded.	
Source of Findings:	Document Review: No program available	
Suggested Plan of Action:	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.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standard Part 13 Section 13.7 and Part 8 Section 8.9.	
Question:	Have Load Plans been prepared for each floor documenting the actual maximum operational loading that is intended and/or allowable on each floor.	
Priority Level:	Low	
Non-Compliance Level:	3	

Description:	Floor load plans have not been prepared.	
Source of Findings:	Document Review: No load plans available for review	
Suggested Plan of Action:	Have a qualified structural engineer develop Floor Loading Plans per the requirements of Part 8 Section 8.20.5.3.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standard Part 8 Section 8.10 Floor Loading Plans (Load Plans)	
Question:	Are Floor Load Plans posted as required?	
Priority Level:	Low	
Non-Compliance Level:	3	
Description:	Floor load plans have not been prepared or posted.	
Source of Findings:	Visual Assessment: No load plans observed	
Suggested Plan of Action:	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.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standard Part 8 Section 8.20.5.3	
Question:	Are areas used for storage of work materials and work products, clearly marked to indicate the acceptable loading limits as described in the Load Plan for that floor?	
Priority Level:	Low	
Non-Compliance Level:	3	
Description:	Storage areas have not been marked to indicate acceptable loading limits.	
Source of Findings:	Visual Assessment: No load limit markings	
Suggested Plan of Action:	Provide signage or the appropriate markings at all areas used for storage to indicate the acceptable loading limits detailed in the Load Plan.	
Suggested Deadline Date:	15 Dec 2014	
Standard:	Alliance Standard Part 8 Section 8.11 Floor Load Markings	
Question:	Is a designated representative (Factory Load Manager), who is onsite full time, trained regarding the structural floor capacity, and serves as an ongoing vendor resource and monitor of operational factory floor loadings?	

Priority Level:	Low
Non-Compliance Level:	3
Description:	No factory load manager has been designated.
Source of Findings:	Worker Interviews: Management confirms no Load Manager appointed
Suggested Plan of Action:	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.
Suggested Deadline Date:	15 Dec 2014
Standard:	Alliance Standards Part 8 Section 8.9 Factory Load Manager