INITIAL STRUCTURAL INTEGRITY ASSESSMENT REPORT (SIAR)

Factory Name:	**Trouser Line Ltd**
Address:	**Toyebpur, Yarpur, Ashulia, Savar Ashulia, Savar Dhaka Bangladesh**
Assessor:	**Walter P. Moore**
Date:	**01 Mar 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:	Trouser Line Ltd
Address:	Toyebpur, Yarpur, Ashulia, Savar Ashulia, Savar Dhaka Bangladesh
Country:	Bangladesh
Province:	Dhaka
City:	Ashulia, Savar
Zip Code:	
Audit Duration:	1 Days
Re-Audit:	Re-Audit After 0 Months
Draft Report Date :	June 10 2014
Final Report Date :	November 21 2014
Are all Action Items From Previous Assessment Completed?:	No
Buildings in Complex :	1 Factory building
Number of Building Levels (Stories) :	Three + Penthouse (Ground + 2 + Partial Third Elevated Dining Level)
Approximate Building Area (SF) :	Not provided
Date of Building Construction :	Circa 2005
Date of Last Building Renovation/Addition :	Not applicable
Is the Building mixed use?:	No
Ancillary Structures in Complex :	None
Number of Ancillary Levels (Stories) :	N/A
Approximate Ancillary	N/A

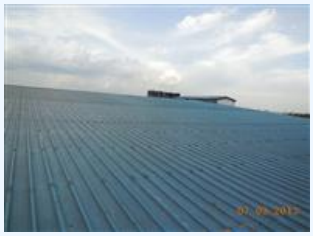
Structures Area (SF) :	
Number of Occupants :	1500
Exterior Facade Description :	The perimeter façade of the building consists of masonry infill walls between the exposed concrete fill over metal deck floor plates. In general, the masonry infill is abutted tightly against the building structure.
Structural System Description :	The structure is composed of structural steel framing including wide flange columns, girders, and beams. The structural floor system generally consists of concrete fill over metal deck in combination with composite steel beams. The building lateral force resisting system for wind and seismic loads appears to be tension-only steel rod bracing.

ASSESSMENT FINDINGS

Structural System Design		
Question:	Has evidence of structural integrity been provided using a Preliminary Structural Assessment?	
Priority Level:	High	
Non-Compliance Level:	3	
Description:	A previous letter report describes the factory building structure as "marginally safe" for use as a garment factory and indicates a design floor live load on the order of 50 psf, but we were not provided with documentation from the building structural engineer of record to confirm this. The factory owner should not that this live load limit does not align with the Alliance Standard guideline of 42 psf which is the typical assumption for floor load capacity in the absence of original design criteria documentation.	
Source of Findings:	Document Review: Document review	
Suggested Plan of Action:	Factory operations should be managed to limit floor live loads to 50psf maximum. Material storage and operating equipment should be continuously monitored to avoid floor loads that may exceed the floor design capacity. Techniques to manage the storage loads might include reducing the height of the stacks of materials, increasing the aisle widths between the stacks, and/or mixing lighter materials with the heavier materials.	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Reference Alliance Standards Part 8 Section 8.2 Structural Integrity of Existing Factory Buildings	
Question:	Are the available FoS for the columns adequate based on Preliminary calculation?	
Priority Level:	High	
Non-Compliance Level:	3	
Description:	Column FoS calculations were conducted by EIMS following the site visit by Walter P Moore. FoS calculations were performed assuming a steel yield strength of 44 ksi. FoS results are listed below. 3-Story Portion, 42 psf live load: Central Column - 1.37 Corner Column - 2.79 Edge Column - 3.02 4-Story Portion, 42 psf live load: Central Column - 1.13 Corner Column - 1.84 Edge Column - 1.31 4-Story Portion, 20 psf live load: Central Column - 1.36 Corner Column - 2.11 Edge Column - 1.56 As part of their follow up work, EIMS collected from the factory representatives BUET steel tensile strength testing completed in May 2014 (following the site visit by Walter P Moore). These testing results indicated an average steel yield strength of 44 ksi which differs from the 50 ksi yield strength indicated in the as-built structural drawings reviewed by EIMS during their follow up work. Due to this inconsistency, the previous BUET testing results should be disregarded during the Detailed	

	Engineering Assessment recommended herein.	
Source of Findings:	Uploaded Document: Column FoS calculations, BUET Test Results for Steel Strength	
Suggested Plan of Action:	Under guidance from a qualified structural engineer arrange Detail Engineering Assessment of the structure. This assessment should be conducted within 6 weeks and should include destructive testing to validate the in-situ tensile strength of structural steel elements.	
Suggested Deadline Date:	15 Jan 2015	
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:	Is a clear and redundant load path to resist lateral loads provided?	
Priority Level:	Medium	
Non-Compliance Level:	3	
Description:	The lateral load resisting system and lateral load path for the resistance of seismic and wind forces is unclear. We are unable to determine if the tie-rod bracing observed in the building has been designed with the intent to resist wind or seismic loads or if it is a remnant of temporary erection bracing.	
Source of Findings:	Visual Assessment: Visual assessment	
Suggested Plan of Action:	Structural documents, if available, should be made available for review. If structural drawings are not available, provide letter from the structural engineer responsible for the design describing the lateral load resisting system(s) and lateral load path(s).	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Alliance Standards Part 8 Section 8.17 Design for Lateral Loads and 8.3.3. 2006 BNBC Part 6 Section 1.5	
Question:	Are credible structural design documents available for review and kept on site?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	Complete structural documentation was not available for our review and reference. No concrete details were available for foundations.	
Source of Findings:	Document Review: Document Review	
Suggested Plan of Action:	Structural and architectural documents, if available, should be provided for review.	

Suggested Deadline Date:	15 Jan 2015	
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:	It is uncertain but generally assumed that the building was designed in accordance with the Bangladesh National Building Code (BNBC) 1993.	
Source of Findings:	Document Review: Document review	
Suggested Plan of Action:	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 Jan 2015	
Standard:	Reference Alliance Standards Part 8 Section 8.2 Structural Integrity of Existing Factory Buildings	
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:	It has not been confirmed that the building was designed in accordance with the Bangladesh National Building Code (BNBC) 1993, which specifies design criteria for seismic and wind lateral loads including Seismic Zone 2 and a basic wind speed of 210 km per hour. It is unclear if the diagonal steel rod bracing observed in the building has been designed with the intent to resist wind or seismic loads or if it is a remnant of the temporary erection bracing from construction.These rod braces are not shown on the structural steel drawings provided for review, are not taut in some locations, and appear to have been removed in other locations.	
Source of Findings:	Document Review: Document review and visual inspection, Visual Assessment: Document review and visual inspection	
Suggested Plan of Action:	Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings under wind loading.	
Suggested Deadline Date:	15 Jan 2015	

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:	If the structure has been previously expanded, was the structural impact on the entire structure analytically evaluated and confirmed by a qualified structural engineer.	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	We observed a steel roof structure that occurs over a portion of the building plan that is not documented on the construction drawings.	
Source of Findings:	Visual Assessment: Visual observation	
Suggested Plan of Action:	The capacity of the building structure to safely support the additional loads applied by the added roof structure should be confirmed. The factory owner should obtain from the building structural engineer of record evidence that the roof as designed is adequate to resist these loads. Alternately the rooftop structure can be removed.	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Reference Alliance Standards Part 8 Section 8.1 Applicability of Building Code.	
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:	We observed from a distance water tank tanks that may be located on the roof level of the building. These tanks were not documented on the available drawings, so it is assumed the design of the building structure has not accounted for the resulting loads. If the tanks are located on the roof, it is likely the structure at these locations is subject to loads greater than that for which it was designed.	
Source of Findings:	Visual Assessment: Visual assessment	
Suggested Plan of Action:	If verified that the observed water tanks are located on the factory building, the capacity of the structure to safely support the resulting loads should be confirmed. The Factory Owner should obtain from the building structural engineer of record evidence that the roof and building structure was designed to safely accommodate the loads applied by these tanks, or the tanks should be removed from the roof.	
Suggested Deadline Date:	15 Jan 2015	

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:	1	
Description:	Certificates of occupancy are not available for review.	
Source of Findings:	Document Review: Document review	
Suggested Plan of Action:	Provide Certificates of Occupancy for review.	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Alliance Standard Part 8 Section 8.3 Preliminary Structural Assessment	
Structural System Construction		
Question:	Are structural steel members free of corrosion, physical damage or other types of deterioration?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	It is unclear if the diagonal steel rod bracing observed in the building has been designed with the intent to resist wind or seismic loads or if it is a remnant of the temporary erection bracing from construction. These rod braces are not shown on the structural steel drawings provided for review, are not taut in some locations, and appear to have been removed in other locations.	
Source of Findings:	Visual Assessment: Visual assessment	
Suggested Plan of Action:	If structural drawings are not available, the Factory Owner should provide a letter from the structural engineer responsible for the design describing the lateral load resisting system(s) and lateral load path(s) with supporting documentation.	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Alliance Standard Part 8 Section 8.26	
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:	Various non-structural elements are not adequately anchored and braced to	

	resist earthquake forces. These include the following: Water Tanks and Other Equipment	
Source of Findings:	Visual Assessment: Visual assessment	
Suggested Plan of Action:	Adequately anchor and brace all non-structural elements to resist earthquake forces to comply with the BNBC and Alliance Standard.	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Alliance Standards Part 8 Section 8.18 Seismic Bracing of Key Non-Structural Elements and 2006 BNBC Part 6	
Question:	If the building is currently being renovated or expanded, are the Construction Practices and Safety requirements of Section 9 being followed?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	There is a steel roof structure erected over the southwest portion of the main roof level to create a dining area. This roof structure is not shown on the steel fabrication drawings provided for our review.	
Source of Findings:	Visual Assessment: Visual observation	
Suggested Plan of Action:	The capacity of the building structure to safely support the additional loads applied by the added roof structure should be confirmed. The factory owner should obtain from the building structural engineer of record evidence that the roof as designed is adequate to resist these loads. Alternately the rooftop structure can be removed.	
Suggested Deadline Date:	15 Jan 2015	
Standard:	Alliance Standard Part 9 Construction Practices and Safety.	
Structural Safety Programs		
Question:	Are floor loads in compliance with posted plans?	
Priority Level:	Medium	
Non-Compliance Level:	2	
Description:	There are no posted plans.	
Source of Findings:	Visual Assessment: Visual assessment	
Suggested Plan of Action:	Once floor loads plans are posted redistribute floor loads to comply with the Floor Loading Plans.	
Suggested Deadline Date:	15 Jan 2015	

Standard:	Alliance Standard Part 8 Section 8.10 Floor Loading Plans (Load Plans).	
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:	2	
Description:	There is not 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.	
Source of Findings:	Document Review: Document review	
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 Jan 2015	
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:	2	
Description:	Load Plans been have not been prepared for each floor documenting the actual maximum operational loading that is intended and/or allowable on each floor.	
Source of Findings:	Visual Assessment: Visual assessment	
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 Jan 2015	
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:	2	
Description:	Floor Load Plans are not posted as required.	
Source of Findings:	Visual Assessment: Visual assessment	
Suggested Plan of Action:	Have a qualified structural engineer prepare load plans including the information required in Section 8.20 of the Alliance Standard.	

Suggested Deadline Date:	15 Jan 2015	
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:	2	
Description:	Areas used for storage of work materials and work products, are not clearly marked to indicate the acceptable loading limits as described in the Load Plan for that floor.	
Source of Findings:	Visual Assessment: Visual assessment	
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 Jan 2015	
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:	1	
Description:	There is not 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.	
Source of Findings:	Document Review: Document review	
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 Jan 2015	
Standard:	Alliance Standards Part 8 Section 8.9 Factory Load Manager	