

INITIAL STRUCTURAL INTEGRITY ASSESSMENT REPORT (SIAR)

Factory Name: **LALMAI FOOTWEAR LTD**
Address: **DHANPUR, CHAPAPUR, KOTWALI, COMILLA
3500,Area 2,46500 COMILLA Chittagong Bangladesh**
Assessor: **Sumerra**
Date: **16 Apr 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:	LALMAI FOOTWEAR LTD
Address:	DHANPUR, CHAPAPUR, KOTWALI, COMILLA 3500,Area 2,46500 COMILLA Chittagong Bangladesh
Country:	Bangladesh
Province:	Chittagong
City:	COMILLA
Zip Code:	3500
Audit Duration:	2 Days
Re-Audit:	Re-Audit After 0 Months
Draft Report Date :	May 23, 2014
Final Report Date :	October 8, 2014
Are all Action Items From Previous Assessment Completed?:	N/A
Buildings in Complex :	17 Total Buildings Building #1 - 4 Story Building #2 - 3 Story Building #3 - 5 story Sheds #1 - 14 - 1 story
Number of Building Levels (Stories) :	Building #1 - 4 Story Building #2 - 3 Story Building #3 - 5 story Sheds #1 - 14 - 1 story
Approximate Building Area (SF) :	Building #1 - 24000 sqf Building #2 - 26400 sqf Building #3 - 100864 sqf Sheds #1 - 14 - Various
Date of Building Construction :	Building #1 - 1989 Building #2 - 2005 Building #3 - 2007 to 2010 Sheds - 1989
Date of Last Building Renovation/Addition :	Building #1 - 3rd Floor added 2013
Is the Building mixed use?:	No
Ancillary Structures in Complex :	All structures listed above.
Number of Ancillary Levels (Stories) :	Not applicable
Approximate Ancillary	Not applicable

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Structures Area (SF) :	
Number of Occupants :	Approximately 1600
Exterior Facade Description :	All buildings: brick infill.
Structural System Description :	Building #1 - Concrete beam & slab system with beam spanning both directions between column. Foundation & lateral load resisting system are moment resisting concrete frame. Building #2 - Structural steel frame building with concrete slab on metal deck atop structural steel beams. Building #3 - Concrete beam & slab system with beam spanning both directions between column. Foundation & lateral load resisting system are moment resisting concrete frame. Sheds #1 - 14: R.C.C Column with steel truss roofing.



ASSESSMENT FINDINGS

Structural System Design



Question:	Are the available FoS for the columns adequate based on Preliminary calculation?	
Priority Level:	High	
Non-Compliance Level:	3	
Description:	Building 1: 42psf live load Central 1.68 Corner 2.45 Edge 1.85 20 psf Live load Central 1.95 Corner 2.61 Edge 2.03 Building 2 (Steel): 42psf live load Central 2.92 Corner 5.15 Edge 3.71 20 psf Live load Central 3.62 Corner 5.80 Edge 4.28 Building 3: 42psf live load Central 1.31 Corner 1.88 Edge 1.30 20 psf Live load Central 1.50 Corner 2.02 Edge 1.43 FoS 1.5 to 1.86 indicates some doubts about safety (Building 1 Central and Edge Column) FoS 1.25 to 1.5 indicates inadequate safety margin (Building 3, Central and Edge Column)	
Source of Findings:	Uploaded Document: Stress Calculations	
Suggested Plan of Action:	Building 1: Engage a qualified engineering firm to evaluate 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 noted above. 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. Building 3: Engage a qualified engineering firm to conduct a detailed engineering assessment of the building (including similar strength confirmation as noted above). This assessment should be conducted within 6 weeks.	
Suggested Deadline Date:	30 Nov 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:	3
Description:	Building #1: Structural plans and details were not signed/approved by structural engineer. Building #3: Structural plans and details were not signed/approved by structural engineer. Actual as-built building configuration does not match with the available structural design drawings with regards to the building plan. In the available drawings, the north side of the building floor plan is shown as 45 feet of open space, but we observed a column line constructed in this area. Sheds #1-14: Plans are not approved/signed by structural engineer. No design report available.
Source of Findings:	Document Review: Review of design documents indicates deficiencies, Photograph: Additional column line in Building 3
Suggested Plan of Action:	Building #1: Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard. Building #3: Have a qualified structural engineer prepare credible as-built documents based on the requirements of Part 8 Section 8.19 of the Alliance Standard. Sheds #1-14: 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:	30 Nov 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:	3
Description:	As noted elsewhere, signed and approved design drawings were not available for Building 1, 3 and Shed buildings and therefore general conformance with 2006 BNBC or other comparable applicable international model building code cannot be confirmed.
Source of Findings:	Document Review: Signed and approved design drawings were not available for Building 1, 3 and Shed buildings
Suggested Plan of Action:	Engage a qualified structural engineer to develop the required documents to confirm the structural integrity of the buildings (Building 1, 3 and Shed buildings). Documents must comply with Alliance Standard Part 8 Section 8.19 and 8.20.
Suggested Deadline Date:	30 Nov 2014
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:	3	
Description:	Building #1: Design drawings did not include information on wind or storm surge loadings and therefore compliance with the requirements for wind loading and storm surge loadings as detailed in BNBC Part 6 Section 1.5.3 could not be confirmed. Building #2: Design drawings did not include information on wind or storm surge loadings and therefore compliance with the requirements for wind loading and storm surge loadings as detailed in BNBC Part 6 Section 1.5.3 could not be confirmed. Shed Buildings: Design drawings did not include information on wind or storm surge loadings and therefore compliance with the requirements for wind loading and storm surge loadings as detailed in BNBC Part 6 Section 1.5.3 could not be confirmed.	
Source of Findings:	Document Review: Design documents for building 1 and sheds did not include wind and storm loadings..	
Suggested Plan of Action:	Engage a qualified structural engineer to confirm satisfactory structural performance of the buildings (building 1, 2 and shed buildings) under wind loading.	
Suggested Deadline Date:	30 Nov 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:	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:	3	
Description:	Buildings 1 & 2: In the east side of building from Ground floor to 3rd floor approx. 16 sqft slab was cut in floor/ceiling decks to accommodate a conveyor for moving goods. However, no analysis was conducted on the impact of the slab cuts and installation of conveyor system and design drawings do not indicate installation. Shed #2: Extension of pre-fabricated steel truss was not properly designed and documented. No analysis was conducted for the structural impact. Building #1: A new stair is being constructed and no analysis was conducted for the structural impact. Building #2: Top of roof is being changed to concrete slab on metal deck from truss. No analysis was conducted for the structural impact.	 
Source of Findings:	Photograph: Photo of conveyor and slab penetrations	
Suggested Plan of	Have a qualified structural engineer complete an analytical evaluation of the	




Action:	structural impact of the slab penetrations and conveyor installation.	
Suggested Deadline Date:	30 Nov 2014	
Standard:	Reference Alliance Standards Part 8 Section 8.1 Applicability of Building Code.	
Question:	Is a clear and redundant load path to resist lateral loads provided?	
Priority Level:	Medium	
Non-Compliance Level:	3	
Description:	All buildings: Due to the lack of an accurate structural design report, details concerning the building load paths could not be confirmed.	
Source of Findings:	Document Review: Accurate structural design drawings indicating load paths were not available for review.	
Suggested Plan of Action:	Have a qualified structural engineer complete further analysis of the structure as part of detailed engineering assessment (also recommended elsewhere) and provide accurate As-Built drawings.	
Suggested Deadline Date:	30 Nov 2014	
Standard:	Alliance Standards Part 8 Section 8.17 Design for Lateral Loads and 8.3.3. 2006 BNBC Part 6 Section 1.5	
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:	3	
Description:	Water tanks were observed at the roof levels of Buildings 1 and 3. No documentation was available to indicate that the structural impact of these concentrated loads had been considered.	
Source of Findings:	Photograph: Rooftop water tanks	
Suggested Plan of Action:	Engage a qualified structural engineer to confirm and document that provisions have been made to accommodate the concentrated loads of the water tanks. If provisions have not been made, have a qualified structural engineer develop a remediation plan.	
Suggested Deadline Date:	30 Nov 2014	
Standard:	Alliance Standard Part 8 Section 8.13 and 8.14	
Question:	Are Certificates of Occupancy available for review?	



Priority Level:	Low
Non-Compliance Level:	3
Description:	No official occupancy certificates signed by relevant authority were available for any of the factory buildings.
Source of Findings:	Document Review: No official occupancy certificates signed by relevant authority were available
Suggested Plan of Action:	Provide Certificates of Occupancy for review.
Suggested Deadline Date:	30 Nov 2014
Standard:	Alliance Standard Part 8 Section 8.3 Preliminary Structural Assessment

Structural System Construction

Question:	Is the structural system free of settlement cracking, excessive perimeter separations, and unlevel floors attributable to foundation settlements?	
Priority Level:	High	
Non-Compliance Level:	2	
Description:	Building #2: Several cracks were observed in the ground level slab.	
Source of Findings:	Photograph: Building 2 ground level slab cracking	
Suggested Plan of Action:	Have a qualified structural engineer provide further analysis and testing of the cracking at the ground level of Building 2. If required, a remediation plan shall also be provided by the qualified structural engineer.	
Suggested Deadline Date:	30 Nov 2014	
Standard:	Reference Alliance Standards Part 8 Structural Design Section 8.2 Structural Integrity of Existing Factory Buildings	
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:	3	
Description:	Drawings indicate MCAC was used in the construction of all buildings in columns and footings. No program of in-situ testing and representative destructive testing or core samples has been conducted.	
Source of Findings:	Document Review: Drawings indicate MCAC usage	
Suggested Plan of	As part of the detailed assessment outlined elsewhere, the compressive	



Action:	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:	30 Nov 2014	
Standard:	Reference Alliance Standards Part 7 Building Materials Section 7.2 Masonry-chip aggregate concrete (MCAC)	
Question:	Are any structural elements constructed with MCAC exposed to rainfall or other sources of water sealed with a protective coating to prevent water intrusion?	
Priority Level:	Medium	
Non-Compliance Level:	3	
Description:	Roofing and other structures constructed with MCAC were not observed to be water sealed with a protective coating.	
Source of Findings:	Visual Assessment: Exposed MCAC not sealed.	
Suggested Plan of Action:	Provide a protective coating at the structural elements constructed with MCAC exposed to rainfall or other sources of water. Have protective coating approved by the Alliance or a qualified structural engineer.	
Suggested Deadline Date:	30 Nov 2014	
Standard:	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 non-structural elements were not adequately anchored and braced to resist earthquake forces: - Building 1, Ground Floor, Center, Storage Racks - Building 1, Roof top, water tanks - Building 3, Roof top, water tanks	
Source of Findings:	Photograph: Building 1 - Storage Racks	
Suggested Plan of Action:	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.	
Suggested Deadline Date:	30 Nov 2014	
Standard:	Alliance Standards Part 8 Section 8.18 Seismic Bracing of Key Non-Structural Elements and 2006 BNBC Part 6	





Question:	Have all areas of needed maintenance, including areas with efflorescence, dampness, standing water on rooftops, and corrosion been addressed.
Priority Level:	Medium
Non-Compliance Level:	1
Description:	Building #2: On the Ground floor North side near steel roof beam that is connected to shed # 1 there is water drain which is leaking and causing dampness on surrounding structural materials. Shed #1: Columns on the south side are damp due to water leakage.
Source of Findings:	Photograph: Areas of dampness
Suggested Plan of Action:	Under guidance from a qualified structural engineer, address all areas of needed maintenance by correcting the identified issues.
Suggested Deadline Date:	30 Nov 2014
Standard:	Alliance Standard Part 8 Section 8.26 Durability and Maintenance



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 is 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:	Worker Interviews: Management confirms no load program in place
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 (see additional recommendation on Load Manager).
Suggested Deadline Date:	30 Nov 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:	Load Plans 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:	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:	30 Nov 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:	No floor load plans are posted as required.	
Source of Findings:	Visual Assessment: No floor 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.	
Suggested Deadline Date:	30 Nov 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:	Areas used for storage of work materials and work products are not clearly marked to indicate the acceptable loading limits.	
Source of Findings:	Visual Assessment: No load limits observed.	
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 (noted elsewhere).	
Suggested Deadline Date:	30 Nov 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?	

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Priority Level:	Low	
Non-Compliance Level:	3	
Description:	No factory load manager has been designated.	
Source of Findings:	Worker Interviews: Management confirms no factory load manager has been designated.	
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:	30 Nov 2014	
Standard:	Alliance Standards Part 8 Section 8.9 Factory Load Manager	