LABS Foundation

LABS Initiative

Methodology for Preliminary Safety Assessments in Cambodia

Issue 6| 22 April 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Archetype
Phnom Penh Centre,
Corner of Sihanouk & Sothearos Blvd.,
Entrance I, GF,
Phnom Penh, Cambodia
www.archetype-group.com

DOCUMENT VERIFICATION

Document title	Methodology for preliminary safety Assessments in Cambodia			
Revision	**Date**	**Prepared by**	**Checked by**	**Approved by**
V1	29th November 2021	Pichmuny Youk (Structural Engineer) Jaime Quilala (MEP Engineer) Dilip Abye (Architect)	Chantha Ny (HSE engineer)	Dilip Abye
V2	20th December 2021	Pichmuny Youk (Structural Engineer) Jaime Quilala (MEP Engineer) Dilip Abye (Architect)	Chantha Ny (HSE engineer)	Dilip Abye
V3	31st December 2021	Pichmuny Youk (Structural Engineer) Jaime Quilala (MEP Engineer) Sopha So (Architect)	Chantha Ny (HSE engineer)	Dilip Abye
V4	5th January 2022	Pichmuny Youk (Structural Engineer) Jaime Quilala (MEP Engineer) Sopha So (Architect)	Chantha Ny (HSE engineer)	Dilip Abye
V5	11th March 2022	Pichmuny Youk (Structural Engineer) Jaime Quilala (MEP Engineer) Sopha So (Architect)	Chantha Ny (HSE engineer)	Dilip Abye
V6 FINAL	22nd April 2022	Dilip Abye (Architect)	Dilip Abye (Architect)	Dilip Abye

Contents

Appendices

Appendix A
Pre-Assessment Preparation

Appendix B
Assessment Testing Equipment

Appendix C
Garment, Apparel, Footwear, Bags and Accessories Factory Loading Guidance

Appendix D
Structural Safety Assessment Checklist

Appendix E
Fire Safety Assessment Checklist

Appendix F
Electrical Safety Assessment Checklist

Appendix G
Structural Issues Categorization and Prioritization

Appendix H
Fire Issues Categorization, Prioritization and Typical Actions

Appendix I
Electrical Issues Categorization and Prioritization

Appendix J
Safety Assessment Report Formats - Templates

Appendix K
Safety Assessment Report Formats - Sample Reports

Appendix L
Quality Control Flowchart

1 Introduction

1.1 Purpose and Intended Readership

This document sets out the methodology for undertaking and reporting on Preliminary Safety Assessments in Ready-Made Garment (RMG), Apparel, Footwear, Bags and Accessories Factories for the LABS Initiative in Cambodia.

This methodology was commissioned by LABS Foundation for the LABS Initiative for use on affiliated factories.

The intended readership for this document includes:

- Factory building owners and managers who are responsible for building safety in LABS-affiliated factories
- Suitably qualified Engineering professionals and consultancy firms who are engaged in the production and delivery of Preliminary Safety Assessment reports
- Suitably qualified Engineering professionals and consultancies who are engaged in training, QA/QC of the Preliminary Safety Assessment program
- Technical/Engineering staff in oversight and review roles within LABS
- Technical/Engineering staff in oversight and review roles within brands who are LABS members

Readers should note the following key sections of the document:

Chapter 1: Introduction – all readers

Chapter 2: Pre-Assessment Preparation – all readers

Chapter 3: General Assessment Methodology – all readers

Chapter 4: Structural Assessment Methodology – readers who require detailed information on the conduct of the Structural Assessments

Chapter 5: Fire Assessment Methodology – readers who require detailed information on the conduct of the Fire Assessments

Chapter 6: Electrical Assessment Methodology – readers who require detailed information on the conduct of the Electrical Assessments

Chapter 7: Overall Categorization by Factory – all readers

Chapter 8: Preliminary Safety Assessment Reports – all readers; separate sections for each of Structural, Fire and Electrical Reports

The purpose of the document is to:

- Establish a nationally applicable process for the Assessment of existing RMG, Apparel, Footwear, Bags and Accessories factory buildings in accordance with best international practice and in line with the spirit and intent of the Cambodia Building Code/Construction Regulations.
- Provide a general introduction to the Preliminary Safety Assessment process
- Assist in commissioning an appropriate and consistent scope of works from a qualified Engineering consultancy firm
- Provide guidance on pre-assessment activities to facilitate the successful application of the

methodology

- Provide guidance on the nature of the Assessment required in the factory to ensure that the Preliminary Safety Assessments are implemented and documented in a consistent manner
- Provide general advice and guidance on the relevant assessment and design checks which are required, ensuring that report outcomes are robust and technically appropriate.
- Provide guidance on the preparation of the Preliminary Safety Assessments in a clear and consistent manner, with standardized categorizations of findings

1.2 LABS Initiative and Standard

The core purpose of the LABS Initiative is to improve the life safety of workers in the international Ready-Made Garment (RMG), Apparel, Footwear, Bags and Accessories sectors. Crucial to achieving this aim is improving the structural, fire and electrical safety of RMG, Apparel, Footwear, Bags and Accessories factories. The LABS Initiative Standard for Fire, Electrical and Structural Safety in the RMG, Apparel, Footwear, Bags and Accessories Sector will help guide those improvements and will contribute to a safer garment sector for workers.

The key objective of this Standard is to address critical life safety issues in the RMG, Apparel, Footwear, Bags and Accessories factories. It is a minimum standard for RMG, Apparel, Footwear, Bags and Accessories factories, designed to address those issues which create the biggest risk to the life safety of the workers. It is based on international best practices for Fire, Electrical and Structural Engineering life safety assessment of existing buildings. Compliance with the Standard does not infer compliance with any other national codes, standards or statutory requirements that may prevail.

1.3 Preliminary Safety Assessments

One of the core components of the Standard is the requirement to carry out a preliminary assessment of each factory that is part of the LABS Initiative, as the first step in the wider program of improving life safety for the workers. These are called Preliminary Safety Assessments, which cover Structural, Fire and Electrical

life safety aspects of each factory. There are a number of important features of these Preliminary Safety Assessments, which are designed to:

- Be rapid – to allow the maximum number of factories to be meaningfully inspected in a short time frame. In this regard, good quality relevant preliminary information provided by suitably qualified engineers/assessors as a first step in the program is prioritized over highly accurate and detailed
information which would require much more time and resources to prepare.
- Be non-destructive – they do not require destructive or invasive testing which would be unnecessary and more time consuming
- Identify the critical structural, fire and electrical life safety issues which exist in the factories
- Prioritize the actions required to address the issues which have been identified
- Make the actions time-bound to facilitate a clear follow-up strategy

1.4 Methodology and Program Implementation

This Preliminary Assessment Methodology has been prepared to provide clear guidance on how these Preliminary Safety Assessments shall be carried out in Cambodia as the first step in the program.

The implementation of the Preliminary Safety Assessments requires the following components, in addition to this Methodology document:

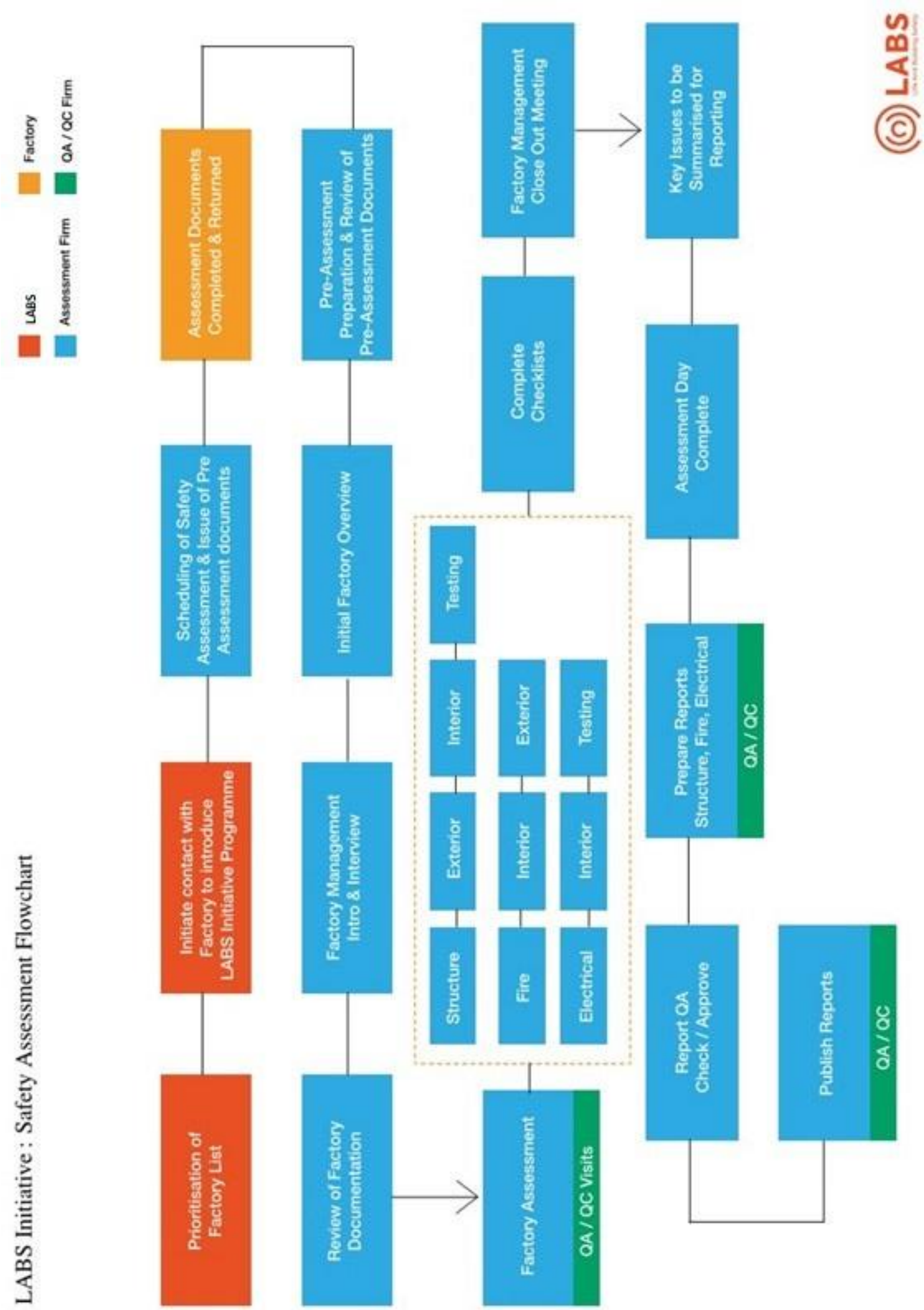
- Presentation of the Methodology
- Training of relevant consultants/Assessors
- Ongoing QA/QC

1.5 Estimated Manpower Requirement

Typically, inspecting the factory will require one person-day per discipline. Reporting will typically take 0.5-1 person/days per discipline

1.6 Flow Chart

Figure 1 Preliminary Safety Assessment Flowchart



1.7 Disclaimer

This guidance has been developed by Archetype Group for the purpose of carrying out Preliminary Safety Assessments in Cambodia for the LABS Initiative. The guidance must be interpreted and adapted to a specific factory by a qualified professional who is familiar with the context and has experience of existing buildings. The appointed qualified professional will retain full responsibility for their work; specifically, Archetype Group will bear no responsibility for how the guidance is interpreted and applied.

2 Pre-Assessment Preparation

2.1 Factory Liaison and Scheduling of Assessments

LABS Initiative will be responsible for prioritizing lists and initiating contact with the factory. This will include briefing Factory Management on the purpose of visit and their requirements for facilitating the assessment, including provision of access to all areas of the building.

The assessment firm will then follow up to schedule the assessment. In scheduling assessments, it is advisable that assessors work on the following basis (or similar).

Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**
Assessment	Assessment	Report	Assessment	Assessment	Report

2.2 Pre-Assessment Questionnaire

The assessment firm will issue a Pre-Assessment Questionnaire, Documents Checklist and Pictorial Guide of Activities to each factory for completion and return to the assessment firm two weeks in advance of the assessment.

The questionnaire, when completed, provides basic information about the factory including the number of buildings, size of each building, and building permit details. The Pre-Assessment Checklist informs the Factory Management of the building documentation which it is expected they will provide to the assessment team during the Factory Manager's interview, which is held at the commencement of the assessment.

Refer to Appendix A1 for details.

2.3 Planning the Assessment

Prior to departing for the factory, the assessment team should ensure that they have obtained and reviewed the completed Pre-Assessment Questionnaire. Information such as the building size and number of buildings on the site will be indicated, which will help to establish a plan for the assessment. Note that some of the information included in the questionnaire may be incorrect – entire floors of buildings or buildings themselves are often not included.

If the exact location of the factory is known, the site can be viewed on Google Maps to gain some further knowledge in advance. It may also be possible to use historical imagery on Google Earth to view construction phases. If the Pre-Assessment Questionnaire indicates that the facility comprises a number of buildings, a view should be taken on the extent of the assessment which can reasonably be provided within the assessment day e.g., 2 days needed. This initial opinion on the assessment scope should be confirmed by the Assessor during the initial meeting at the factory or perhaps as the assessment progresses and a realistic timescale can then be set. The priority should be to assess buildings which accommodate a large number of workers, reflecting the life-safety focus of this assessment program. If the timescale allows, low rise and plant/equipment buildings may also be assessed by a cursory walk-through only to look for conditions concerning imminent danger to people.

3 General Assessment Methodology

3.1 Overview

The purpose of this section is to set out the assessment methodology proposed for the LABS Initiative Structure, Fire and Electrical Preliminary Safety Assessments in Cambodia. A definition of the required experience of the assessment team is provided and a description of how to carry out a rapid visual assessment is outlined.

This methodology has been written to cater for the assessments being carried out either as individual discipline assessments (i.e., Structure, Fire or Electrical assessments) or for some or all discipline assessments to be carried out simultaneously. This section includes all of the methodology aspects that are common across all disciplines. Further sections of the methodology describe the discipline-specific issues which need to be considered during and after the assessments.

The assessment day is sequentially described under the following headings:

- Pre Assessment Preparation
- Factory Assessment Day
- Factory Management Introductions
- Factory Management Interview
- Building Assessment (Exterior and Interior)
- Testing
- Close out Meeting
- Return and Team Summary Review

Assessment Team Personnel and Qualifications

In general, most factories in Cambodia may be assessed by the following team:

Structure: the minimum qualification and experience of the individual senior engineer nominated as Qualified Structural Engineering Consultant (QSEC) shall be as follows:

- Shall hold a Bachelor's degree in Civil/ Structural Engineering from a university recognized by the National Engineering Institute or equivalent international professional qualifications.

- Shall have a minimum 10 years of structural design experience or experience in carrying out assessments of existing buildings.

- Shall hold a valid Professional Engineer License in the Discipline of Civil and Industrial Engineering, issued by the Ministry of Land management, Urban Planning and Construction. Equivalent international qualifications such as Membership of the Institution of Structural Engineers will also be recognized as fulfilling this requirement ideally experience of at least three existing building assessments in the last two years.

- The assessor must be competent in carrying out the following tasks:

  - Carrying out existing building assessments (as opposed to audits) to arrive at a judgment-based decision on the overall structural condition of the building. This will require both quantitative and qualitative analysis

  - Carrying out a visual assessment of an existing building and be able to diagnose the cause and potential impact of structural defects

  - Preparing load takedowns on critically loaded columns, assessing existing loads and preparing capacity checks on existing structural elements

  - Identifying outline solutions in principle to structural issues highlighted during the assessment

  - Preparing concise, graphical reports which summarize clearly the key issues identified during the assessment

These requirements are to ensure that the QSEC is suitably qualified to prepare, check, approve and certify a Preliminary Structural Safety Assessment Report. For the avoidance of doubt, certification shall comprise an official company stamp from the assessment firm and the signature of the QSEC who will retain responsibility for the existing building report.

In the case of a multi-story RC structure in excess of two stories, a second Structural Engineer may be included in the team. The qualifications of this Structural Support Engineer shall be as follows:

- Shall hold a Bachelor's degree in Civil/ Structural Engineering from a university recognized by the Board of engineer in Cambodia or equivalent international professional qualifications.

- Shall have a minimum 2 years of structural design experience.

- Ideally experience of at least three existing building assessments in the last two years

Fire: the minimum qualification and experience of the individual senior Fire Safety Assessor nominated as Qualified Fire Safety Consultant (QFSC) shall be as follows:

- Shall hold a Bachelor's degree in Architecture or Civil, Industrial, Mechanical or Electrical from a university recognized by the Ministry of Land management, Urban Planning and Construction.

Shall have a minimum 10 years of design experience or experience in carrying out assessments of existing buildings and be familiar with key fire safety principles in industrial buildings.

- Shall hold a valid License to Practice as an Architect or Engineer issued by the Ministry of Land management, Urban Planning and Construction or

- Shall hold certifications in Fire prevention and protection and Fire Safety design from recognized institutes.

- Ideally experience of at least three existing building assessments in the last two years

- The Fire Safety assessor must be competent in carrying out the following tasks:

  - Carrying out existing building assessments (as opposed to audits) to arrive at a judgement-based decision on the overall fire safety condition of the building.

  - Assessing the number, distribution, and activities of the building occupants and evaluating whether adequate means of escape are provided from all areas to safely exit the building in the event of fire.

  - Identifying areas in the building where the occurrence of fire could place occupants in the same or adjacent spaces at unacceptable risk before being able to exit the building.

  - Noting the presence, type, and coverage of the fire safety systems provided and assessing whether they complement the building layout measures to provide an adequate level of safety for occupants in the event of fire.

  - Assessing the provision for first aid firefighting measures in the building, and identifying provisions for the fire services to assist with evacuation if necessary and for firefighting in the building.

  - Identifying outline solutions in principle to the fire safety deficiencies highlighted during the assessment

  - Preparing concise, graphical reports which summarize clearly the key issues identified during the assessment

These requirements are to ensure that the QFSC is suitably qualified to prepare, check, approve and certify a Preliminary Fire Safety Assessment Report. The QSEC will sign and retain responsibility for the existing building report.

Electrical: the minimum qualification and experience of the individual senior engineer nominated as Qualified Electrical Engineering Consultant (QEEC) shall be as follows:

- Shall hold a Bachelor’s degree in Electrical Engineering from a university recognized the Ministry of Land management, Urban Planning and Construction

- Shall have a minimum 10 years of electrical design experience or experience in carrying out assessments of existing buildings and be familiar with key electrical safety principles in industrial buildings.

- Shall hold a valid License to Practice as an Engineer in the Discipline of Electrical Engineering, issued by the Ministry of Land management, Urban Planning and Construction

- Ideally experience of at least three existing building assessments in the last two years

- The assessor must be competent in carrying out the following tasks:
  - Carrying out existing building assessments (as opposed to audits) to arrive at a judgement-based decision on the overall electrical safety condition of the building. This will require both quantitative and qualitative analysis.
  - Read and understand electrical schematic and layout drawings
  - Be able to confirm (at a high level) that installed equipment and their configuration matches the electrical schematic and layout drawings.
  - Be able to identify from schematic drawings if cables are not adequately protected by breakers (fuse, MCBs etc.)
  - Be able to identify from a visual inspection if cables are not adequately protected by breakers (fuse, MCBs etc.)
  - Read and understand various styles of electrical load estimates
  - Be able to carry out electrical conversions
  - Converting between kW → kVA & A → kVA or kW
  - Check life safety load versus generator capacity
  - Be able to describe the fundamental principles of the operation of a generator (fuel supply, combustion, heat rejection, ventilation requirements)
  - Be able to operate thermographic camera (separate training may be required by camera vendor or other). Be able to describe how the emissivity of different materials affects results
  - Be able to describe the fundamentals of a LABS Standard lighting protection system. Know and understand the difference between a faraday cage and other types of systems
  - Be able to list typical life safety systems normally found within a factory that could require a back-up power supply

3.1.1 Equipment

Each team should have an assessment kit bag containing the following items:

- iPad/tablet with charger, cable and lanyard/ protective case
- Digital camera

- Schmidt hammer
- Hilti PS250 Ferro scanner and screen (or equivalent) which must be capable of providing reinforcement bar diameters. The results of the Ferro scan must be capable of being read in advance of departing the factory.
- Thermal Camera (Fluke or equivalent)
- Thermometer (to measure ambient temperature)
- Geological hammer and/or chisel
- 5m tape
- Laser measure
- Binoculars
- Torch
- First aid kit
- PPE (gloves, goggles, mask)
- Clipboard
- Paint scraper
- Calipers
- Crack ruler
- AAA batteries
- Tyvek suit

3.1.2 Electronic Equipment

Make sure all equipment is fully charged the evening before the assessment. Check laser measures, torches and any other equipment requiring batteries and bring spares if necessary.

3.1.3 iPad / Tablet

In order to ensure you have sufficient battery power for any tablet device during the assessment, follow these guidelines:

- Ensure you charge overnight
- Turn off 3G and Wi-Fi when on site
- Reduce screen brightness
- Ensure all other apps are closed (double tap home button to see open apps)

Other advice includes:

- Set up factory visit the day before the assessment
- In the event that the tablet does not work, the assessment should be recorded on paper, with photos to provide evidence.

3.2 Factory Assessment Day

3.2.1 Travel

The Assessment Team should arrive at the factory early in the day at a time pre- arranged with the Factory Management. Consideration should be given to local travel and traffic conditions to enable an early start, which is important to the completion of the assessment work.

Before setting out to the factory, the assessors will be responsible for having contact details for a person in the factory who can be contacted in route if necessary.

3.2.2 Arrival at Building

A brief observation of the building perimeter should be undertaken before you enter the factory. As you arrive at the factory take the opportunity to view the outside of the building and to gather some initial thoughts on the condition and arrangement of the building – new build, built in phases, near a river, upper levels under construction, separation distances between buildings, road access to buildings, external pole-mounted transformer, fire exits, etc. You will have a further opportunity to walk outside the building later in the assessment; however, gathering some initial thoughts is useful prior to carrying out the Factory Manager interview.

View the exterior before entering, noting the number of stories, any rooftop additions or signs of additional floors. There may be confusion on floor naming convention (common to call Ground Floor “Level 1”). For this reason, it is useful to have knowledge of the number of floors prior to discussions with the Factory Management. It is also useful to take in as much about the building as you walk through to the meeting room.

3.3 Factory Management Introductions

On arrival at the factory and after your quick external review of the building, the assessment team will be taken directly to the factory office area to meet with the factory management representatives. This may include the Factory Manager, Compliance Manager and possibly the Factory Engineer (usually not the original building designer).

Business cards should be used as part of the introduction process. It is useful to establish who the factory key contact person is in relation to the assessment work.

A formal introduction should then be offered to the Factory Management as follows:

- Assessment is being carried out on behalf of the LABS Initiative
- Refer to the Pre-Assessment Questionnaire/Checklist and request that all relevant requested documentation (e.g., Building Permits/Architectural/Structural/Electrical drawings and Soils reports) be brought to the meeting. This avoids delay at a later stage as the Factory Management will quite often not provide documents unless requested to do so. Clarify the extent of documentation available, as this may inform the follow-up questions.
- Document review will be carried out at a later stage in this process. Explain that the assessment process is essentially the collection and verification of
- information, visual observations and some limited testing.
- Remind the factory that previously requested assistance will be required for activities as follows, where relevant:
    - Provision of ladder access to elements at height
    - Removal of plaster locally to selected structural elements

- Opening of electrical panels by suitably qualified personnel
- Lifting of ceiling tiles when requested

- **Highlight to Factory Management that observations noted during the assessment will normally not be discussed unless there are particular serious safety concerns**. A full debrief on all observations and issues noted during the visit will not be possible. However, some key safety findings will be discussed if necessary. Further details are given in Section 3.6 close-out meeting.
- An agenda for the assessment should then be described as follows
  - Factory Management Interview – the assessment process will involve a review of the pre-assessment information, the Factory Manager interview, review of Building Permits, all relevant drawings available calculations, material and systems tests and any reports from previous assessments
- Walk around the building exterior as required
- Walk down of the interior of the building with access being provided to all rooms and spaces. Note that where more than one discipline Assessment is to be undertaken, the Assessment teams will carry out their work separately
- and the factory management will need to provide the relevant number of people to accompany the Assessment teams.
- Carry out testing as required, relevant to the specific Assessment
- Close out meeting

3.3.1 Structural Specific Issues for Introduction

- For concrete buildings, explain that, subject to the Factory Manager’s permission, the intention is to carry out some tests on concrete columns at the lowest floor level – i.e. ground floor or basement where present. Explain that the Ferro scan is a non-destructive test and that the Schmidt Hammer involves removal of plasterwork only.
- Request also that any structural design reports, calculations, material test certificates, soils reports and any other structural assessment reports be provided.

3.3.2 Fire Specific Issues for Introduction

- Explain that the Electrical Assessor, as explained in the pre-assessment briefing note, will carry out a fire alarm test and an emergency lighting test. This will be coordinated with the Fire Safety Assessor so that he/she can witness this test as well. A time that suits the factory and minimizes disruption should be set for the carrying out of these tests prior to commencement of the assessment
- Request to see the Factory Planning Certificate and note what Authority signed off on that.
- Request to see a copy of the Fire License and note the date of the latest issue and validity period.
- Request that records of the last year’s Fire Police inspection reports be provided
- Request that maintenance records for fire detection, alarm, emergency lighting and water pumps be provided
- Request that documentation of fire safety drills and other training be provided, and note the dates.
-

3.3.3 Electrical Specific Issues for Introduction

- Explain that each electrical panel will be tested and a competent person is required to open panels; flash guards and panels covers should be removed before the Assessment while the panel is isolated. The details of the assistance required from the factory is covered in the pre-assessment briefing note.
- Explain that a fire alarm test and an emergency lighting test will be carried out, as explained in the pre-assessment briefing note. A time that suits the factory and minimizes disruption should be set for the carrying out of these tests prior to commencement of the assessment
- Request that maintenance records for transformers, low voltage and medium voltage switchgear, generators, fire detection, alarm, emergency lighting and fire hose pump(s) be provided.

3.4 Factory Management Interview

3.4.1 Factory Details

At the outset of the factory management interview, some basic factory overview information should be obtained. This includes:

- Year of completion of the building(s)
- Names and functions of each building, on a floor-by-floor basis
- No. of works per floor, per building (approximate)
- How many shifts are in operation?
- Any previous modifications/alterations
- Is there any concerns relate to safety?

Where more than one discipline assessment is being carried out, it is advisable to complete all questions relevant to all disciplines before separating. Once the basic information has been gathered, the disciplines can work separately to review the documents provided and ask any follow-up questions to the Factory Management.

3.4.2 Review of Documentation

Having obtained responses to queries and recorded these, a desktop review of the available building documentation is then carried out.

Typically, review and ensure that there is a clear understanding of the following:

- Site plan of factory compound showing all buildings.
- Scope of buildings/phasing of construction
- Date of construction of buildings and all relevant phase
- Building permit documentation – Basic Design, Detailed Design or Construction Permits; Architectural layouts, Factory Inspectorate Licensing drawings, Occupancy permits. Do these differ from as-built situation/ design drawings? Are any extensions or additions captured on the permit drawings? provided?
- Architectural plans and building section – are these design statuses or as-built?
- Do they capture extensions and additions?
- Do all drawings show consistent information?

- Documentation relating to building inspections carried out by the Authorities, factory emergency situation planning and training, maintenance records for technical systems and housekeeping procedures.

In general, any documentation should be validated during the building assessment where possible, as opposed to relying on the documentation provided.

Where limited documentation is available the assessor should try and make some basic layout sketches to assist with explanations in the report.

Discipline specific issues that should be addressed are as follows:

3.4.2.1 Structure

- Structural drawings - are these design status or as-built? Do they capture extensions and additions?
- Geotechnical/ Soils Report – does this report show the recommended foundation solution and describe the nature of the ground conditions? Check that the recommended foundation solution has been included on the design drawings.
- Review any design reports and material test certificates, if available.
- Review reports on previous structural assessments or letters/certificates in relation to structural load capacity/structural integrity. These are particularly useful to highlight specific issues for which we should watch out.
- Check if floor plans are available to confirm the allowable imposed loads for suspended floors.

It is important to crosscheck the dates on each document to ensure a logical progression from Geotechnical/Soils Report to structural drawings, year of construction and permit drawing approval. Photographs of all relevant documents provided should be recorded

On completion of this review, the Structural Engineer(s) should have a good understanding of the extent of the building, the structural system, sizes of principal structural members, grid spacing, design reinforcement and the results of previous structural assessments or material testing.

3.4.2.2 Fire Safety

- Factory production layout drawings – do these reflect the activities in the different parts of the factory?
- Do the architectural drawings clearly show which areas are physically separated from other uses?
- What are the stated occupancy numbers in each area of the building?
- Do the drawings show all levels, including mezzanines that may have been added after completion of the building, and connections between levels?
- Determine presence, type and location of fire safety systems such as fire detection and alarm, emergency lighting, fire hydrants, fire hose reels, automatic suppression systems (e.g., sprinklers) etc.
- Ensure that information is obtained on type and location of any dedicated Storage area, Generator, Boiler, Transformer, Chemical storage and any other high fire risk installation.
- Check the sources for supply of firefighting water, volume and location of site storage and location of pump rooms.

- Check for evidence of Emergency Planning and responsibilities, regular safety drills and training of selected personnel.
- Evidence of maintenance records for fire detection and alarm systems, emergency lighting and fire water pumps and hoses.

On completion of this review, the Fire Safety Assessor should have a good understanding of the layout of the factory, the different uses, locations and distribution of workers throughout the factory complex. It is important at this stage to identify where the main production activities take place, the number of people involved with these activities and the locations of high-risk areas that they may expose to, such as Boilers, generators, Storage areas, etc.

3.4.2.3 Electrical

- Electrical drawings - are these design statuses or as-built?
- Do the electrical drawings reflect the current installation? Do they capture extensions and additions?
- Does the Building Load Estimate reflect the current installation? Is the maximum load less than the size of the main transformer?
- Generator(s) annual maintenance records
- Transformer(s) annual maintenance records
- High voltage switchgear annual maintenance records
- Low voltage switchgear annual maintenance records
- Lightning protection system annual Assessment records
- Previous thermographic Assessment reports
- Earthing system annual Assessment records
- Have thermographic surveys taken place before? Have high or unusual temperatures in electrical panels/or equipment been recorded. A thermographic survey shall still be carried out irrespective of previous inspections.

On completion of this review, the Electrical Safety Assessor should have a good understanding of the layout of the factory, locations of main plant items throughout the factory complex. In addition, the Assessor should know if there have been incidents (circuit faults, personal shocks, burns) due to the electrical installation.

3.4.2.4 Copies of Documents and Final Points of Review

- Some Assessors may wish to annotate drawings when carrying out the Assessment. If so, the Assessor should request a photocopy the required floor plans and a building cross-section to be used for handwritten notes, during the site Assessment. It is important to allow sufficient time for these copies to be made and to be clear on the requirements. We would suggest the minimum number of copies is made for expediency.

  These drawings must be included at the conclusion of the Assessment.
- Prior to concluding the interview, site records/photos and documentation review, the Assessor must set up the app template to suit the number of floors, buildings etc.
- Take photos of business cards and include in the tablet app.
- Take photos of drawings. You may need to place them on the floor to get an A1 drawing in the

tablet camera frame.

- Assessment teams should target completion of the introductions and Factory Manager's interview in a period of 1 hour or less.

3.5 General Building Assessment Notes

- Access should be provided to all areas of the building, including any areas which may not be in the control of the factory. If access is not available to a particular area, we should ensure that the factory representatives are aware that our assessment work requires access. If access is still not provided, we should note this in our report. If access to important areas is not available, consider whether the assessment should be deemed inconclusive and recommend it be rescheduled.
- **Under no circumstances during the Assessment, give the Factory Manager a sense or statement that the factory is "compliant" or similar. The conclusion of the Assessment will only be reached after the visit is complete and any follow up calculations or appraisals are undertaken.**
- In carrying out the site assessments, a number of factory representatives will normally accompany the assessment team to assist where possible. In order to manage your time effectively, you may need to politely ask that one or two people only accompany you.
- It is best to acknowledge and where possible use the assistance of factory representatives, but not to engage in discussions about particular observations unless you specifically have a question.
- Whilst carrying out any external assessment it is useful to identify landmarks which can be used to aid orientation when inside the building. When inspecting large square buildings with symmetrical grids and repetitive floor layouts it can be quite easy to become disorientated. For this, reason it is
- useful to confirm which direction is north and to locate a reference point on the horizon or in the building.
- Ensure that you know the grid dimensions for each of the buildings, as these provide an easy aid to judging areas and distances while carrying out the assessments.
- Whilst at the factory, ensure that you obtain the GPS coordinates for the factory location). These coordinates are required as input to Assessment report and can be difficult to retrieve later.

In the case where more than one engineer per discipline is present, they should aim to stay together during the assessment as much as possible, or at least be in the line of sight of colleagues. Look for issues and review these with your team members.

3.6 Close-out Meeting

On completion of the relevant assessment and any tests, all assessment disciplines should hold a brief joint close out meeting with the Factory Management. At the meeting, thank the Factory management and restate the assessment steps that we carried out noting that we have collected the information necessary to produce our reports. Generally, advise the Factory Management that full conclusions and actions will be included in the reports

However, if urgent action is required, e.g., crumbling concrete in critical structural elements, critical fire safety issues or exposed live cables, discuss this with the Factory management and make copies of instructions for inclusion in the final report. Advise them that the final reports will be published on LABS FFC Platform within 05 working days from the date of the assessment (Fire, Electrical and Structural).

We can use this meeting on occasions to seek clarification on any issues, if we suspect that an unclear response may have been provided earlier.

4 Structural Assessment Methodology

4.1 General Points

The summary of the building structural system, to be prepared as part of the Preliminary Structural Safety Assessment Report, requires the completion of key data that the Assessors should be familiar with before commencing assessment work. Review of the structural documents and the factory assessment both externally and internally enable the Assessors to determine the specific information required for each building within the factory complex.

In addition, completion of high-level design checks and calculations, particularly on concrete elements such as cantilevers, key transfer elements or highly loaded columns requires an accurate record of element sizes and estimated floor loading. It is important that necessary dimensions and estimated loads be recorded in a systematic manner for structural areas of concern.

4.2 Assessment of Building Exterior

On completion of the Factory Management Interview and the documentation review, the site assessment of the building exterior commences. The assessment normally commences by walking the perimeter of the building and inspecting all elevations. The exterior assessment should typically be used to:

- Confirm the number of stories – (check, recheck and check again)
- Confirm number of structural grids
- Locate building movement joints
- Confirm if there is a basement under the building
- Assess condition and locations of adjacent buildings and site conditions
- Identify construction joints or indicators of phased construction
- Check if additional stories have been added
- Check if upper floors are still under construction
- Identify if floors or roof has previously been removed
- Identify evidence of settlement
- Identify building cantilevers
- Identify cracking in façade
- Identify Key Elements, e.g., exposed columns in trafficked areas.
- Identify any vertical or plan irregularities

Binoculars are to be included in the assessment kit to inspect the building façade for cracking particularly at movement joints and between brick panels and reinforced concrete elements. Assessment of the building exterior should also identify any areas where concrete reinforcement has become exposed and corroded. All recorded comments and photographs should be included in the assessment app or otherwise recorded and kept.

In addition to recording evidence of any issues of concern, the key to this phase of the assessment is to gain a full understanding of the scale of the building, links to adjacent buildings and the overall building structural system looking for extensions and signs of ongoing construction.

4.3 Assessment of Building Interior

4.3.1 Type of Factory Building

It is expected that, in Cambodia, the main factory buildings will broadly fall into one of the two following categories:

- Type 1: Concrete framed buildings comprising three or more stories with factory operations spread over the various floor levels. The external façade typically comprises plastered brick walls. Note: for one or two story concrete structures, the same methodology will apply; however, it will not always be necessary to carry out the column capacity checks. This will be at the discretion of the engineer
- Type 2: One and two story steel framed factories with large open plan areas. Typically, the structure of these factories comprises a braced steel portal frame or trusses with structural steel or reinforced concrete columns. The second story, (if present), generally accommodates offices, warehouse storage or ancillary factory operations. The external façade typically comprises plastered brick walls/reinforced concrete panels/metal panels.

Where a factory building falls outside the description of the previous two categories, engineering judgement will be required.

4.3.2 Type 1: Concrete or Steel Frame Greater than Three Stories

Factory buildings comprising three or more stories should be inspected from the top down. The assessment team should work methodically through the building (floors can look the same and can be numbered differently – i.e., is 1st at ground level or is it “ground +1”?). Determine a logical numbering system (the lowest factory floor might not be ground in a shared building).

In the case of concrete buildings, steel structures may have been added at roof level. A visual assessment should be carried out to check for bracing of the steel structure and to form a view if we should request a design check on the steel structures. Action items to be highlighted by the assessment team may include.
removal of construction materials, repair of roof slab to prevent water damage and installation of a roof drainage system.

Water tanks (plastic or concrete) located at roof or suspended levels also merit review and recording. Depending on the number and size of tanks and their location on the structure, these may merit a design check by the Building Structural Engineer.
Following assessment at roof level, the assessment team works sequentially down to the ground floor. It is useful to agree to meet at the same exit on each floor so that the team can leave the floor together. Fire escape plans are normally provided at the entry point to each floor. It is useful to take a photo of each of these plans as the assessment progresses. This provides a useful ‘bookmark’ in the camera roll.

A typical floor plate is chosen (normally one or two floors below roof level) for a detailed assessment which will take longer than the other floors. On this floor, we typically establish the structural system, carry out a detailed check on dimensions of structural members and follow this with a thorough assessment of the floor area looking for evidence of any structural distress. The detailed check on the structural system and dimensions should include the following:

- Verify column grid spacing and number of grids versus drawings provided. Ensure that all dimensions are center to center of column.
- Record observed structural system including building stability system

- Measure a sample of internal and external columns by comparison with the drawings provided. If, as is normal the columns are plastered, ensure that recorded dimensions are reduced to allow for a total of 15 to 25mm plaster and note that this is the measured RC section excluding plaster.
- If floor slab construction is beam and slab, measure floor to soffit of slab and soffit of beam thus providing down stand beam dimension and beam width.
- Check and measure any floor slab cantilevers and note if significant loads are present in these areas.
- Measure floor thickness at a minimum of two locations – including finishes through an electrical floor opening (if possible) and at landings to stairs. Ensure that extrapolation of the landing thickness to the floor slab thickness within the working area allows for any step in the soffit or top of the floor slab. This is a critical piece of data for multi-story buildings, as column stresses are usually dominated by building self-weight.
- Measure finishes if visible, normally 12mm tile on 28-35mm screed.
- Record any additional floor build-ups (e.g., at toilets or in washing areas)
- Measure Floor to Floor Height, ideally at stairwell.
- Estimate observed floor loads noting in particular any storage loads or floor build-up for washing areas or similar. Record any areas where excess storage loads on each floor are vertically above one another.
- Note where building movement joints are provided. Crosscheck these with the design drawings. Establish if there are slab cantilevers at the movement joint thus concentrating load on the adjacent column. This column may require a particular design check.
- Check external wall thicknesses in order to estimate applied loading to slab edges.

On completion of the above the assessment team progresses with the visual assessment of the floor recording any evidence of cracking/ over loading or other structural issues on the tablet app. It is also useful to record a series of general floor photographs showing the building structure as an aide-memoire to the estimate of imposed floor load.

If a defect is noted, do not stop and point. Have a discussion with your teammate at a separate location on the floor and return briefly to the defect if necessary.
It is noted that most buildings are likely to display some visual hairline cracking. The lead Assessor should use his/her experience to identify the cause of the cracking, when it is of concern and when it is worth recording as an observation. Do not try to record every crack in the building if they are not of concern. **Cracking in columns, however, should always be carefully assessed and recorded**.

Having completed the assessment at the initial floor, the team should work down through the building, tracking and understanding the load paths to the foundations. A similar methodology to the above is carried out at each floor level. At these floors, the focus is more on the visual assessment and recording of observations on the tablet app. Generally, spot checks on grid dimensions and column / beam locations and element sizes will be adequate. The assessment team may wish to divide the floor plate between them to expedite progress.

The guidance above only applies to buildings, which do not have a transfer structure. If a transfer structure is present, it will be critical to determine and record the nature of the structural system at each level.

During the ground floor/lower floor assessment, dimensions of critical columns should be recorded. Particular columns where Ferro scan and Schmidt hammer tests will be carried out should also be identified.

4.3.3 Type 2 Low Rise Steel Framed Buildings

One and two story steel framed factory buildings typically have column-free large plan areas with factory production concentrated at ground floor level. Factory support operations such as offices and storage are typically located at mezzanine level. The extent of mezzanine areas may have been extended or the load capacity increased by strengthening works after construction of the factory structural frame.

Following completion of the assessment of the building exterior, the internal assessment should commence at a recognizable point within the building – preferably in the open high bay area. Fire escape plans are normally posted around the building. It is useful to take a photo of each of these plans as a useful 'bookmark' in the camera roll. Mezzanine floor areas should be inspected after the structural system has been established for the high bay main structure. Some overlap between assessment of the mezzanine and high bay areas is inevitable to determine local structural conditions.
Water tanks (plastic or concrete) located at roof or suspended levels also merit review and recording. Depending on the number and size of tanks and their location on the structure, these may merit a design check by the Building Structural Engineer.

The internal assessment initially establishes the structural system including a detailed check on structural spans, grid line centers and dimensions of principal structural members, e.g., portal frame columns and beams, bracing, etc. The second phase of the internal assessment involves a thorough assessment of all floor areas looking for evidence of any structural distress or unusual design details. The detailed check on the structural system and dimensions within the high bay and mezzanine areas should include the following:

- Verify column and frame grid spacing and number of grids versus drawings provided. Ensure that all dimensions are center to center of column. Check for primary and secondary steel roof trusses.
- Record observed structural system including dimensions or primary elements, in particular building stability system - in-plane roof bracing and vertical bracing. Does the perimeter wall form part of the frame stability system? Check for moment frames. Are bracing member's incomplete or sagging?
- Measure a sample of columns by comparison with the drawings provided. If columns are of concrete construction and plastered, ensure that recorded dimensions are reduced to allow for a total of 15 to 25mm plaster and note that this is the measured reinforced concrete section excluding plaster.
- If the suspended floor slab construction is beam and slab, measure floor to soffit of slab and soffit of beam thus providing down stand beam dimension and beam width.
- Check and measure any floor slab cantilevers and note if significant loads are present in these areas.
- Measure suspended floor thickness at a minimum of two locations – including finishes through an electrical floor opening (if possible) and at landings to stairs.
- Finishes to internal areas such as ceilings normally conceal elements of structure. Where feasible, access should be arranged by use of a ladder to carry out spot checks on the structure above. We should ensure that where access above ceilings is provided, all necessary safety measures are taken to eliminate potential risks. If in doubt, the requirement to carry out assessment
- above high ceilings should be included as a follow-on action for the Building Engineer.
- Measure height to eaves and apex of steel frame

- Estimate observed floor loads on the suspended floors noting, in particular, any storage loads or floor build-up for washing areas or similar. Record any areas where excess storage loads on each floor are vertically above one another.
- Note where building movement joints are provided. Crosscheck these with the design drawings. Establish if there are slab cantilevers at the movement joint thus concentrating load on the adjacent column. This column may require a particular design check.

On completion of the above, the assessment team progresses with the visual assessment of the high bay and mezzanine areas recording any evidence of structural distress, deflection, warping of structure or cracking/overloading on the tablet app. It is also useful to record a series of general floor photographs showing the building structure as an aide memoir to the estimate of imposed floor load on suspended floors.

If a defect is noted, do not stop and point. Have a discussion with your teammate at a separate location on the floor and return briefly to the defect if necessary.

It is noted that most buildings are likely to display some visual hairline cracking. The lead Assessor should use his/her experience to identify the cause of the cracking, when it is of concern and when it is worth recording as an observation. Record cracks in the building if they are of concern. **Cracking in columns, however, should always be carefully assessed and recorded.**

Having completed the assessment of the building interior, elements of concrete construction should be reviewed to determine if the structural capacity of particular columns should be investigated further by the use of Ferroscan and Schmidt hammer tests, where relevant.

Prior to any in-situ testing, check if permanent and safe access is readily available to the external roof area. This will enable an assessment to be carried out at the external roof level to identify any defects or potential for use of these areas and application of imposed loads.

4.4 Non-Destructive Testing

Structural tests are carried out on completion of the site assessment. The purpose of the tests on concrete elements is to establish an 'estimate' of concrete strength/quality and to determine the reinforcement in the critical structural elements of the building.

Testing of columns is typically carried out at the lowest floor level and involves both Ferro scan and Schmidt Hammer testing – ideally on two columns (those assessed as being more heavily loaded) in each building or construction phase of a building being inspected.

4.4.1 Using the Ferroscanner

This equipment, if used carefully, can give an indication of what steel reinforcement is inside a concrete element. This is critical information for concrete structures when carrying out column stress checks and assessing the building safety

The latest technology in Ferroscanner should be used such as PS250 from Hilti which allows us to estimate on a single concrete face:

- number and location of bars
- bar diameter
- concrete cover.

Note that the results are estimates and should be interpreted using your sound engineering judgment.

There are two types of tests that can be performed using the Ferroscan – a 'quick scan which beeps every time a bar is identified and a 'full test' which, using the Ferroscan screen, produces an indicative image of the reinforcement provided in an element.

Quick scans should be carried out to determine link spacing in at least two columns and two beams at the lowest levels. The aim is to establish if links have been provided at closer spacing at column/beam junctions, in accordance with good detailing practice.

A detailed description on the use of the Ferroscan is included in the Appendix B1. These tests should be carried out and the results checked prior to leaving the factory. It is advisable to try to calibrate these findings wherever possible by comparing the results with any exposed column reinforcement in columns within the building.

4.4.2 Using the Schmidt Hammer and Geological Hammer

The Schmidt or Rebound Hammer measures the surface hardness of concrete. It is not proposed to utilize the results from this test as an absolute measurement of concrete compressive strength but rather as an indicator subject to engineering assessment and to provide a good 'feel' for the concrete. The relative strength between elements can also provide a useful indicator.

The Schmidt Hammer has a useful role in aiding experienced structural engineers undertaking the assessments. The process of removing the render ensures that the engineer prepares the concrete (not the plaster) surface for the Schmidt Hammer test. After the render is removed, the Assessor should hammer the surface of the concrete, particularly at the corner of a column. Hammering the surface with a geological hammer provides an opportunity to get a feel for the concrete strength in advance of the Schmidt hammer test. Good concrete will be very difficult to break with a geological hammer but weak concrete can break away easily.

This process provides invaluable information to aid engineering judgement. Further guidance on structural testing is included in Appendix B2.

In addition, it is recommended that the reinforcement be exposed in a selected number of critical columns to identify the pattern of ribs on the steel reinforcement.

4.5 Checklist of Critical Structural Information

The critical information required for the completion of structural assessments is as per Appendix D1. Assessment teams should not leave the factory without establishing this information. Use this checklist at the interview, at each level and on the external walkover.

Always consider the primary structural arrangement first (i.e., load path and stability system) then start to look at condition/ defects.

Structural System

Number of Floors (measure floor to floor) Measured Structural Grid
Floor thickness Floor finishes depth
Column Sizes (without plaster) at lowest levels and critical areas

Concrete Strength – any observations following removal of plaster to columns and use of the Schmidt Hammer

Estimation of Reinforcement in critical concrete elements (Ferroscanner) Observed live loading at each level

Floor to ceiling heights

Typical down stand beam dimensions Movement joint locations

At the end of each floor assessment, the Engineer should review this list to ensure that all information has been obtained.

If a factory has been constructed in phases (extensions or additional buildings), the same information should be established for each phase.

4.6 Structural Appraisal and Calculations

This section offers general commentary and guidance on the appraisal by calculation in Cambodia. The details contained herein have been obtained by discussions with local practitioners, visual observations by the authors and research on published papers and text.

It is understood that the factories are predominantly steel framed structures and information on steel grades is included at the end of this section to allow preliminary calculation to be carried out on such structures, if necessary.

However, there are likely to be at least some multi-stories reinforced concrete (RC) structures, which will need further assessment. As the failure mode for RC columns may be brittle and give little warning of catastrophic failure, these checks are an important part of the methodology.

This section is developed to assist assessment teams on the ground in making initial assumptions on concrete strength, the impact of reinforcement content of columns and reaching a base level view of the working stresses and safety factors that may exist in columns during an assessment. The notes explain the background and the development of a working stress methodology for determining the ‘order of’ working stress and safety factor for the safety assessment.

4.6.1 Column Strength and Column Stress

An assessment purely on a visual basis will identify elements that may show signs of distress, sagging / deformation or cracking. The point of potential failure of elements can be difficult to judge particularly in a building that appears in reasonable condition. If building has had crack filling, re-plastering and been painted, distress features may not be observed.

Flexural members (beams and slabs) tend to fail in a ductile way (depending on strength and reinforcement content) and in many cases, will give reasonable warning with deflection and opening of cracks indicating potential collapse over a period of time.

However, columns can fail more suddenly and may give less warning as they approach failure. The primary focus of an assessment should therefore be to establish both the condition and dimensional properties of load-bearing columns and the applied loading for both existing and potential future scenarios.

It is generally accepted internationally that it is unreasonable to condemn existing buildings because of non-compliance with current building codes, as many such buildings have functioned reasonably well over time. A pragmatic system has been developed based on a rapid assessment approach to identify critical buildings early and prioritize actions. In order to allow the Structural Engineer carrying out the assessment to understand column condition; a working stress method has been adopted for the preliminary safety assessment.

This method is a rapid, order of magnitude approach and provides a way of establishing the working stress in an element and comparing this against generally expected capacities based on observed/estimated reinforcement content. The principle of the working stress method is to calculate the failure strength of concrete and the working stress (based on observed conditions) and from this calculate a Factor of Safety (FOS).
This provides a valuable indicator of the safety level of the structure, based on what can be reasonably observed from a factory visit. It is not a precise calculation of ultimate capacity to meet code requirements – consider it as the potential residual strength in the building.

Column factor of safety calculations steps are summarized below:

1. Identify critical columns (Columns supporting heavy finishes, partitions, additions at the roof, water tanks or live loads). Edge or corner columns may also be critical in terms of dimensions and loading. Typically, at least one internal, corner and edge column should be assessed.
2. Perform load takes down for the column. Refer to Garment, Apparel, Footwear, Bags and Accessories Factory Loading Guidance in Appendix C. Calculate the finishes as accurately as possible. Calculate working stress in column as per Section 4.6.7. Determine the factored dead plus live load for a column at the lowest floor level and calculate the factored stress in that column
3. Determine material strength for concrete and steel reinforcement based on construction year as described in Sections 4.6.3 and 4.6.4.
4. Calculate column working axial capacity using formula in Section 4.6.6.
5. Determine FOS = Working Capacity (Step 4) / Factored Stress (Step 2)
6. Assess the column for the recommended action items based on FOS level as described in 4.6.8.

4.6.2 Factors of Safety

Cambodia regulations and relevant International Code has both Material Factors and Load Factors and a limit state approach is adopted. The code stipulates that for concrete buildings with live load of $2kN/m^2$ or greater, load factors of 1.1 for dead load and 1.2 for live load should be applied when designing to ultimate limit state.

When appraising existing structures, international codes allow for the use of reduced load factors (or increased strength reduction factors in some cases). Such instances may be when:

- The live load can be more accurately assessed, observed and ultimately controlled
- Where it is possible to measure structural dimensions (i.e., the uncertainty in dead load is reduced).

Such an approach to the reduction of load factors for the appraisal of existing structures is set out in the "Appraisal of Existing Structures" by the Institution of Structural Engineers (2010).

However, it is our view that this is not appropriate for use in Cambodia, as the load factors are already very low in comparison with international codes. As such, the reduction in uncertainty due to recording of as-built structural element dimensions provides only a minor level of additional safety. This should not generally be taken into account in the preliminary assessments.

For a simplified concrete column acting solely in compression, the global factor of safety in the International code is approximately 1.7, taking into account of load factors and material factors.

4.6.3 Concrete Strength

The strength of concrete used in RC buildings is variable. During site visit, concrete strength is generally unknown so we need to have some idea of the order of magnitude of concrete strength.

Our recommended minimum characteristic concrete cube compressive strength figure (i.e., B Grade) is15MPa.

Please note that this strength figure is subject to change as new data and information becomes available.

4.6.4 Reinforcement Yield Strength (f_{yk})

The are many strengths of reinforcement used in Cambodia and they are related to original import. To identify grade of reinforcement we need to bring sample for testing.
In general, we summarize reinforcement strength in the table below:

Reinforcement				
Reinforcement grade	Plain bars	Deformed bar: type 1	Deformed bars: Type 2	Deformed bars: Type 3
Yield Strength (MPa)	230	295	390	500

4.6.5 Reinforcement Content

Every effort should be made to establish the area and percentage of reinforcement using a Ferroscanner.

If reinforcement areas cannot be established, but the number of bars can (by means of Ferroscanner), assume 12mm diameter bars and calculate percentage reinforcement from this.

If the use of the Ferroscanner cannot provide either the area or diameter of the reinforcement, then the main bars should be exposed by very careful removal of concrete cover locally in selected locations.

If none of the above is possible, assume a minimum reinforcement percentage of 0.1%. This is potentially very conservative, may have considerable implications for the factory, and as such, should be only adopted as an absolute last resort.

4.6.6 Column Working Capacity

For the working stress method, the column working capacity is calculated using the following formula:

$P = B(100-\rho)/100+\rho*f_{yk}/100$ Where:
P = column working capacity in MPa
B = characteristic compressive cube strength
ρ = reinforcement (as a % of cross-sectional area of column)
f_{yk} = characteristic yield strength of reinforcement

4.6.7 Factored Stress in Column

The factored stress for critical columns should be determined, using accurate load takedowns, considering the appropriate load factors. Such load takedowns need to consider the effect of infill masonry, floor build-ups and observed live loads. They should also consider building geometry and allow for continuity effects on first internal columns. An uplift of c. 10% of load should be considered for such situations.

4.6.8 Column Assessment

The working stress in the column should be compared to the working capacity to determine the likely global factor of safety inherent in the column design and actions identified as follows:

Factor of Safety (FOS) = Working Capacity/ Factored Stress

- If FOS > 1.7 – no further action
- If 1.7>FOS>1.25 – Priority 1 action item, leading to mandatory Amber color coding (refer to chapter on overall building risk classification)
- If 1.25> FOS – Priority 1 action item leading to mandatory Red color coding and building closure
- For any FOS < 1.7, the following actions are also mandatory:
  - Detailed Engineering Assessment (DEA) required as a follow-up action (refer to LABS Standard for details)
  - Concrete cores should be taken to validate the concrete strength in the columns (refer to LABS Standard for details)

4.6.9 Structural Steel Grades

The table below includes details of structural steel grades which should be adopted if required.

Structural Steel Grade	**SD235**	**SD295**	**SD390**	**SD500**
Yield strength (MPa)	235	295	390	500
Design strength (MPa)	235	295	390	500

4.6.10 Non-Structural Hazards

Non-structural hazards will be considered based on the following basic ASCE 41- 17 Non-structural Checklist. These items will be used as a guideline to highlight the potential non-structural items that could impact life safety. Observations will be summarized in one/two slides in the report and further detailed inspection on these items will be recommended as a further action if deemed necessary.

Typical issues which may be observed in RMG, footwear, Bags and Accessories factories can be summarized as follow:

- Any exterior falling hazard from buildings, such as elevated water tanks, signs, appendages, communication towers not properly anchored
- Equipment containing hazardous material not properly anchored to floor and freestanding
- Heavy light fixtures not supported properly to the slab soffit, but to suspended ceilings
- Fire suppression pipework not properly anchored or braced
- Brickwork/blockwork partitions walls not braced every 3m and prone to out- of-plane failure
- Suspended gypsum board ceilings which do not have attachments for every 1m^2 of area
- Metal/glass cladding elements not properly anchored at every 2m
- Laterally unsupported URM parapets with piers spaced not more than 2.5 m that has height to thickness ratio of more than 2.5 in regions with moderate, moderately high and high seismicity regions
- Storage racks/ cabinets that are prone to overturning, have lack of bracing and not anchored
- Canopies at building exits not properly anchored to the structure at spacing no greater than 3m

5 Fire Assessment Methodology

5.1 General Points

On completion of the Factory Manager's Interview and the documentation review, the site assessment of the building commences.

The aim of the assessment is to observe and record all fire safety omissions and non-compliances with the LABS Standard for fire safety in Garment, Apparel, Footwear, Bags and Accessories factory buildings.

During the Factory Management meeting detailed in Section 3 above, the following information should have been obtained:

- Use of each building or parts of building where building has different uses. Based on this information the Assessor will identify how many and which buildings will be individually classified in the assessment report.
- Number of occupants on each floor and in different parts of the floor or building.

5.2 Assessment of the Building

When carrying out the fire safety assessment of a building it is important to first get a good appreciation of the space and interconnections between principal and auxiliary occupancies (uses) in the building. The Assessor should also get a good understanding of the routes available to occupants from all areas in the building to outside via final exits.

During the preliminary meeting with management, the Assessor should be able to visualize these issues from the documentation provided, but before recording information about specific fire safety measures, the Assessor should walk around the building to complete the picture obtained during that meeting.

5.2.1 Assessment Procedure

For the assessment, the Fire Safety Assessor will need the following:

- Fire Safety checklist
- Camera to capture images of observations
- Laser meter and measuring tape

Before starting, it is recommended that the Assessor notes specific issues raised in the management meeting and identifies the areas of the building that will be covered and in what order they will do so, to facilitate the recording of information during the Assessment. e.g., Ground Floor, 1st Floor, etc. or if a large single story building, then split into different process areas and define these on a mark-up.
Once a basic understanding of the layout of the building, the locations of different uses and of the circulation routes in the building functions, then the Assessor should start recording observations in a systematic way to capture all the different fire safety provisions that combine to safeguard the occupants in the event of fire.

Given that there are a number of fire safety provisions that act together to provide the necessary safeguards, the Assessor should make use of the checklist provided (see Appendix E) to ensure that all aspects have been recorded before moving on to another area or building. The checklist should be used so that each of the different topics can be addressed in a systematic way. This is particularly important when dealing with all issues related to means of escape, interconnections between areas and levels, and identifying measures for fire-rated separation from higher risk areas.

The checklist follows the same order and uses similar headings to those provided in the sample report. The checklist is not an exhaustive list as to what observations need to be recorded, and cannot be used simply for a 'tick-box' exercise. The checklist items should be seen as prompts to the Fire Assessor to draw attention to the issues that need to be considered on site and for which relevant notes should be taken. The checklist will act as reminder of what aspects to consider and take note of in each building or part of building while doing the Assessment.

More detailed guidance on the application of the checklist during the Fire Safety Assessment is given in Section 5.3 below.

The notes taken during the Assessment corresponding to all the checklist issues will enable the Assessor to cover all the topics provided in the sample report. The Assessor should however note everything of relevance, and not rely exclusively on the checklist prompts.

5.2.2 Assessment of Building Interior

Using the checklist for guidance the Assessor should record data to enable reporting on the following issues:

- Number of occupants on each floor or parts of floor
- Number and widths of exits from each floor
- Type, size and condition of evacuation pathways leading to floor exits
- Types, widths and conditions of doors on evacuation paths leading to floor exits
- Distances to floor exits or distances between floor exits
- Types, widths and conditions of floor exit doors (normally doors to stairs)
- Types, widths and conditions of stairways
- Types, widths and conditions of Final Exit doors (normally doors to outside)
- Signage for evacuation paths
- Illuminated exit signs over floor exits
- Illumination of evacuation paths from all areas to floor exits
- Locations of high-risk areas (storage, generators, transformers, etc.)
- Fire-rated partition elements (walls, floors, shafts, service ducts)
- Type and coverage of detection system(s)
- Type and coverage of alarm systems(s)
- Type and coverage of emergency lighting system
- Back-up power supplies for emergency systems
- Are there any automatic extinguishing systems and if so, what areas do they protect?
- Firefighting systems – factory fire hose systems
- Hand-held extinguishers for first response firefighting
- Signage for first aid firefighting equipment
- Access into the interior of the building for fire fighters
- Presence and accuracy of emergency evacuation maps on each floor

5.2.3 Assessment of Exterior

Once the interior of the building or buildings has been carried out, the Assessor should record data to enable reporting on the following site-wide issues:

- Condition of routes for people to move from Final Exit doors to a safe place away from the building
- Muster areas to accommodate full factory population in the event of an emergency evacuation
- Water supplies for firefighting systems, municipal and site storage
- Pump systems for firefighting water
- Firefighting systems – external hydrants
- Access to the building for the fire fighting vehicles
- Location of separate external buildings housing central machine rooms (Boilers, Substations, Generators, Pump rooms, etc.)

5.3 Guidance on the Checklist Issues

The checklist orders the fire safety issues to assess under the headings 'Issue Type', 'Sub-Issue Type', and 'Sub-Issue Detail'. All the relevant checklist issues should be observed for each building or part of a building, before moving on to other areas. The 'Issue Types' covered by the checklist are as follows:

1. Means of Egress
2. Fire Safety Construction
3. Fire Safety Systems
4. Provisions for Fire Fighting
5. Maintenance and Housekeeping.

In the section below, under each 'Issue Type' heading, the 'Sub-Issue Type' items are presented and under the heading 'Sub-Issue Detail' a brief description is given as to the kind of issues related to that item that would be expected to be observed by the Assessor during the Assessment. This is not an exhaustive list of all the issues that the Assessor may encounter, but an attempt to document all the more common issues as a guide to the Assessor.

5.3.1 Means of Egress

Means of Escape and the Construction issues related to fire separation are the two topics that generally take the most time to record properly, and a good understanding of the building volume and interconnected spaces are necessary to identify and record all the issues in such a way that they can be adequately covered in the assessment report.

The key principles of escape from the fire can be summarized as follows:

- Sufficient exit routes to allow people to move away from danger,
- Exits should be of sufficient number and width to avoid congestion.
- The distance people need to travel to a 'place of relative safety' should be limited.
- A 'place of relative safety' should be adequately protected from the effects of fire and smoke.
- A 'place of relative safety' should lead directly to a 'final place of safety' outside of the

building

The sketch below can be used to illustrate that means of escape are typically made up of three components – see Figure 2 below – and described as follows:

Horizontal escape: escape from the occupied floor along an unprotected route to a story exit (either a protected stairway or corridor), or directly to outside in the case of a single story building. The provisions required for horizontal escape depend principally on the type of building (use), the number of occupants and travel distances to the story or floor exits.

Vertical escape (to a place of relative safety): vertical escape is related to protected stairs that lead occupants from upper floors to the discharge level, normally ground floor level. The number of occupants escaping to each stair will determine the required size of the stairway. The protected stairway or corridor is referred to as a 'place of relative safety', and provides a route protected from the effects of fire and smoke all the way to the exit from the building. For a small building or one with a few floors above ground floor level, an unprotected stair may be acceptable as part of the vertical escape.

Exit to the outside (ultimate 'place of safety'): escape from fire is not completed until occupants have reached outside and can move away from the affected building to the 'ultimate place of safety', which is typically an agreed muster point outside the building.

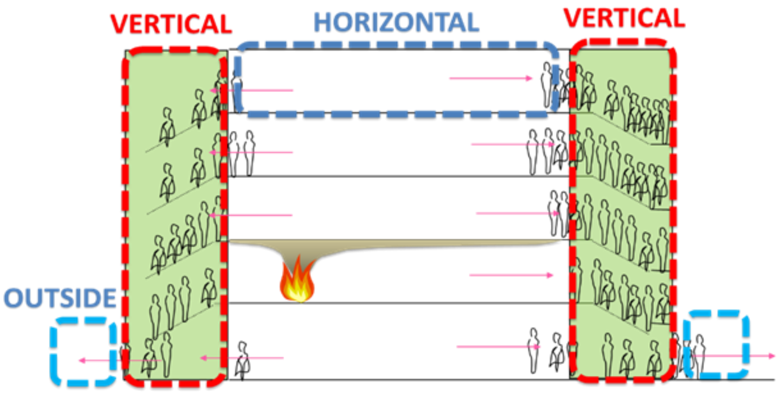


Figure 2 Three typical components of Means of Escape

5.3.1.1 Floor Exits

Generally, a minimum of two fire exits are required, but the actual number and locations of the fire exits are determined by number of occupants and travel distances.

The LABS Standard gives the following guidance on the minimum number of exits required based on occupant load:

- 500 people or less minimum of 2 exits
- 501-1000 people minimum of 3 exits
- More than 1000 people minimum of 4 exits

The number of final Exits will be noted and an estimate of the total exit width provided by all final Exits. Based on the occupancy numbers provided by management and visual observation a rough estimate can be made of whether the total exit width is sufficient for the number of people (based on 5mm width/ person). Note minimum width of any exit needs to be at least 800mm.

If it appears that the floor exit capacity is too little or close to not being sufficient, then accurate measurements should be taken of effective door widths to determine whether exit capacity needs to be increased and if so by how much.

Access to the Exits from all parts of the floor will be assessed, and distances to the Exits assessed, based on the existence of alternative paths of travel or single direction paths.

The maximum allowable travel distances to the nearest floor or building fire exit depends on the available routes to the exit. There are a number of possibilities that are discussed below in more detail:

- Alternative directions of travel
- Single direction or common path of travel
- Dead end routes

A general principle of design for means of escape is that persons should have alternative directions of escape. This is so that in the event of a fire, occupants can escape without having to approach the fire source.

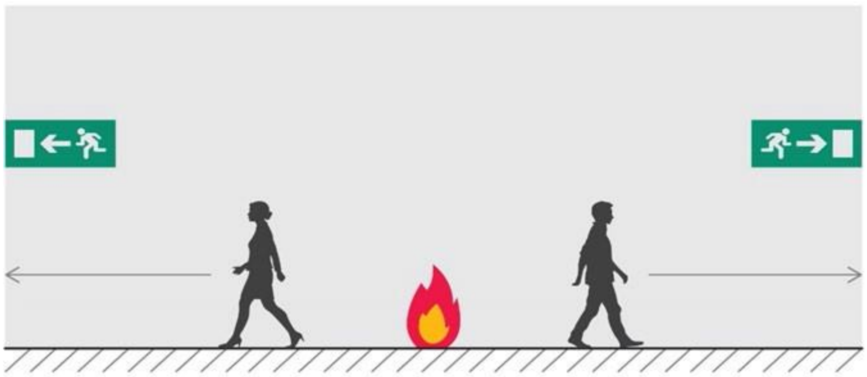


Figure 3 Alternative directions of escape

Even when there are alternative escape routes as illustrated above, the distance that people need to travel to reach a place of relative safety (e.g., protected stair core) must be limited.

In some special circumstances, it is considered reasonable for people to travel in a single direction provided the distance is limited accordingly. Based on these assumptions it is assumed that people can walk around the fire and reach a place of safety in short period of time, before the fire grows to a significant size.

The maximum travel distance in these cases for an existing Garment, Apparel, Footwear, Bags and Accessories factory building is set out in the LABS Standard for different situations.

Dead-end routes on aisles or corridors should have a limited travel distance. Approximate distances are generally good enough to make a decision as to whether they are excessive or not, and distances can often be assessed during the assessment by reference to typical dimensions of the structural grid or they can be measured by placing them out.

Escape from mezzanines should be given special attention to see whether additional routes off the mezzanine are required.

5.3.1.2 Escape Paths

Evacuation paths need to meet a number of other criteria to ensure they provide safe escape routes.

These include:

- All egress paths are to be unobstructed at all times
- All aisles along the egress paths must be able to accommodate the flow of occupants using that aisle and have a minimum width of 915mm.
- Pathways must have slopes of less than 1 in 10
- Escape routes should not pass-through places of special fire risk, adjacent spaces with high fire hazards
- If the escape route leads people through an adjacent space, the inter-leading doors must not be lockable or sliding doors, and path should not be obstructed

The physical condition of the escape paths will be noted; the available width, whether they are clear of obstacles or not and whether there are any dead-end conditions linked to these paths.

The clear height under all obstacles and through doorways will be noted.

5.3.1.3 Exit Signage

Exit signage must be provided to provide clear, unambiguous information to enable people to safely leave a building in an emergency.

Signposting shall be provided and should be consistent throughout the building. Signage should clearly guide occupants located anywhere on the floor to the available nearest Exits. In some instances, additional signage will be needed to supplement exits above each exit door; they may also be needed where there are changes in direction along escape paths.

Important points to note about signage are:

- The sign should contrast with the background and be clearly visible. The color and design of lettering, arrows and other symbols on exit signs shall be in high contrast
- Signs should be consistent throughout and ideally should be provided with symbols and not just text.
- Every escape route sign should, where necessary, incorporate, or be accompanied by a directional arrow. Arrows should not be used on their own
- If the escape route to the nearest exit is not obvious then it should be indicated by a sign(s)
- Signs should be positioned so that a person escaping will always have the next escape route sign in sight
- Signs should not be obstructed by structure, fit-out items or other signs.
- Signs should be sited at the same height throughout the escape route, so far as is reasonably practicable
- Viewing distance –the sign needs to be sized according to the distance that it needs to be viewed from (larger signs for longer distances).

Signage can be composed of both floor signage and overhead signage, and the combination and condition of both will be noted.

Signage needs to be illuminated. This can be done by internal lighting from within the unit or by external illumination. Importantly, the lighting to the signs needs to be fed from the mains but also have back-up power supply. This can be done via localized battery back-up or via fire rated cabling to another power source e.g., generator or remote battery back-up.

Each Exit door should have an illuminated exit sign, with consistent graphics and coloring throughout the building.

5.3.1.4 Exit Doors

In general, all Exit doors should meet the following requirements:

- No sliding or hanging door can be used on an escape route. This would include the lockable security gates observed in many existing Garment, Apparel, Footwear, Bags and Accessories factories.

All doors along the emergency exit paths should be easily openable in the direction of travel. It is particularly important to note the mechanisms provided at the final Exit doors. These doors normally have to be lockable from outside for security reasons, but they still need to be side swing doors capable of being opened from the inside, without the use of a key, for means of escape. When locked from the outside, the mechanism for opening the door from inside should override the lock.

Note should be taken of whether they are capable of being locked in such a way that does not comply with Exit door requirements.

It is also important to ensure that the exits widths are suitable for the number of occupants on that floor. Exits should be sized to ensure that:

- Occupants can enter into a place of relative safety within an acceptably short time, and
- There is sufficient capacity to avoid congestion and queuing to reach the place of relative safety

Horizontal exit widths for doors are based on a flow rate 5.0 mm/person according to the LABS Standard (with a minimum width of 810mm required).

5.3.1.5 Exit Stairs

Vertical escape to ground level from upper floors is normally via open or protected stairways.

Stair widths need to be wide enough so that they can accommodate the number of occupants escaping from all floors.

The required width of stairways according to the LABS Standard is typically based on a flow rate of 7.6 mm/person in a sprinkler or non-sprinkler building. This should be applied to the floor with the largest occupant load as this represents the worst case scenario.

The minimum width of stairways is 915mm for Garment, Apparel, Footwear, Bags and Accessories factory buildings.

At this stage, the Assessor will note the width and condition of the entry doors and the width of the stairs to see whether both can accommodate the expected occupant numbers adequately. The slope and consistency of riser will also be noted to determine whether these stairs should be discounted as part of the emergency escape path or not.

Handrails are needed for the emergency stairs. The extent of the handrails should comply with the dimensions shown in the Figure 6 below:

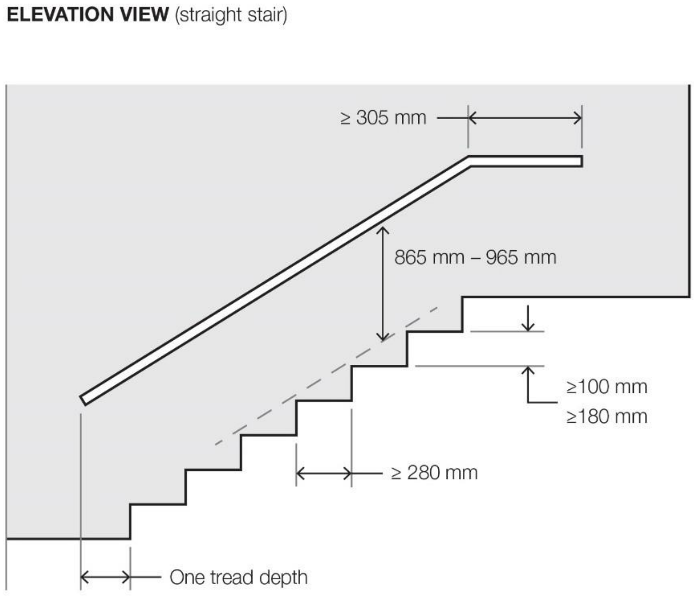


Figure 4: Extent of handrails on stairs

It is important to consider the effects of handrails in calculating stair widths, although if they do not intrude into the stair more than 100mm they can be ignored.

The Assessor should note where the stair discharges; does it discharge into another accommodation area or directly to outside. If the stair discharges into other accommodation, then the distance and condition of the path from discharge point to final Exit will be noted. This path to the final Exit may need to be protected, particularly if there are no alternative exits provided from the upper levels.

External stairs may be needed along the escape route, and the Assessor will note how these stairs are protected from the adjacent accommodation for the full length of the stairway.

5.3.1.6 Final Exits

The final place of safety for occupants is outside the building.

It is best design practice to provide escape stairs or final Exits that discharge to outside at ground level.

Additionally, it may be possible for occupants to escape to an adjacent building provided the building is:

- A separate fire compartments
- Of sufficient size to accommodate the occupants flowing in from the other building.
- Escape into the adjacent building will always be available and the building is under the same ownership as that from which occupants are escaping.
- The adjacent building has adequate escape stairs to allow for evacuation of the additional population to outside.

The total width of the final Exits will be determined and the capacity assessed

against the number of people on the exit level floor plus all those descending from other levels.

Once the occupancy, capacity and distribution of Exits have been noted, then the Assessor will check that people can move away from the building once through the Exit. If people need to move along the side of the building before moving away, then the protection offered by the façade wall along that route will be observed to see if some external protection is required.

5.3.2 Fire Safety Construction

After examining all the issues related to the evacuation routes to outside, the Assessor should observe all compartmentation and other fire separation issues. Areas with uses that need to be separated from each other should be noted, as well as vertical openings between floors.

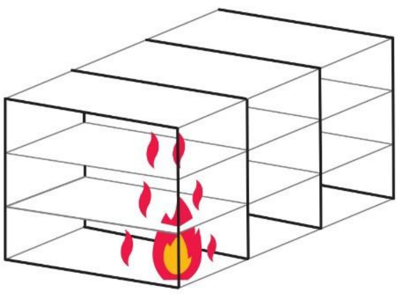
The goals and design solutions for providing fire protection measures to construction can be summarized as follows in the event of a fire:

Construction - Fire safety goal in the event of a fire	Design solution
	Providing fire resistance enclosures to areas in the building deemed as "places of relative safety"
	Sub-diving the building and high risk areas with fire resisting construction, enclosures, doors, etc.
	Providing fire resisting protection to load bearing structural elements
	Sealing services penetrations and concealed spaces, etc. with fire stopping systems

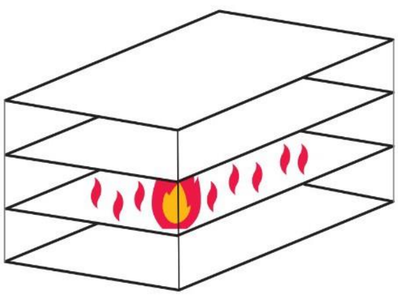
The construction fire protection measures necessary to achieve the fire safety goals outlined above are mostly passive. They consist in using materials (non- combustible, limited combustibility or combustible) to achieve the performance criteria set out in the LABS Standard.

The spread of fire within a building can be restricted by sub-dividing the entire volume into compartments separated from one another by walls and/or floors of fire-resisting construction. The objective is twofold:

- To prevent rapid fire spread which could trap occupants of the building and,
- To reduce the risk of fire becoming large, on the basis that large fires are more dangerous, not only to occupants and fire and rescue service personnel, but also to people in the vicinity of the building



Vertical compartmentation fire restricted in spread horizontally but can spread vertically via openings in floors



Horizontal compartmentation fire restricted in spread vertically but can spread horizontally throughout compartment

Figure 5: Sketch illustrating horizontal and vertical compartmentation
Compartmentation is required to separate different occupancies, basements, each floor and different uses as described in this section.

In addition, the same fire resistance principles are applied for separation of high risk enclosures and protection of escape routes.

5.3.2.1 Protection of Openings

The most common vertical openings between floors encountered in factory buildings are openings for communicating stairs. When a stairway communicates more than two floors then they need to be separated from the adjacent areas with fire rated construction.

The LABS Standard specifies that stair enclosures should be protected with 2 hours fire rated enclosures and that that the door openings leading to these enclosures must be 90 minutes fire rated doors, which shall also be provided with self-closing devices

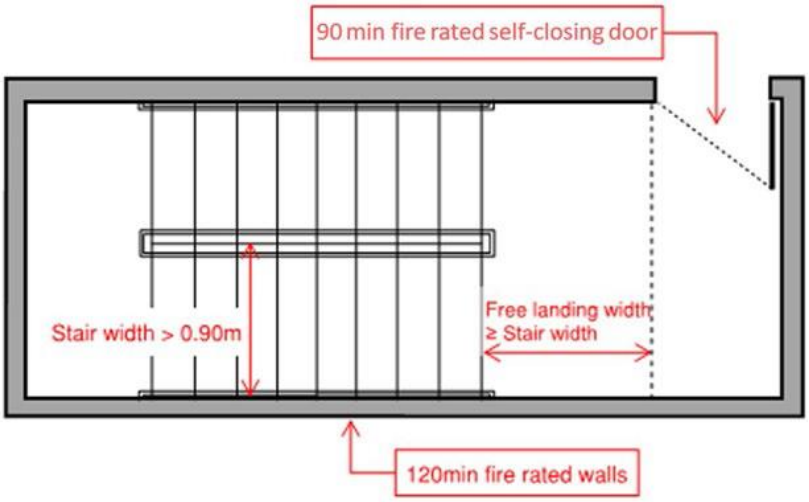


Figure 6 Typical arrangement for stair protection for a building

An exit stairway shall not be built around a lift shaft unless the enclosure of the lift shaft is solid and made of a material with fire resistance rating required for the type of construction of the building.

Any penetrations for services in fire separating elements need to be sealed with fire stopping systems or provided with dampers.

Other penetrations are doors and the Assessor will note whether fire rated doors have been provided and whether they have self-closing devices to ensure that they close automatically after use.

External escape staircases are also permitted provided that they lead directly to the ground, are separated from the building interior by fire resistive assemblies or walls and are constructed of non-combustible materials.

External stairs need to be provided with a level of fire protection to prevent flames and smoke spreading via the façade of the building and affecting people escaping using the stairs.

The figure below illustrate how adequate protection can be provided as per NFPA 5000 Clause 11.2.2.5. The façade itself and any windows and doors in the shaded areas would need to be protected with fire rated construction in the vicinity of the path of travel down the stair.

The fire resistance rating of the separation from the stairs is required to be minimum 1-hour fire rating where openings have not less than ¾ hour fire protection rating:

- Within 3.0m horizontally of the nonrated wall or unprotected opening.

- Extending from the finished ground level to a point 3.0m above the topmost landing of the stairs or to the roofline, whichever is lower.

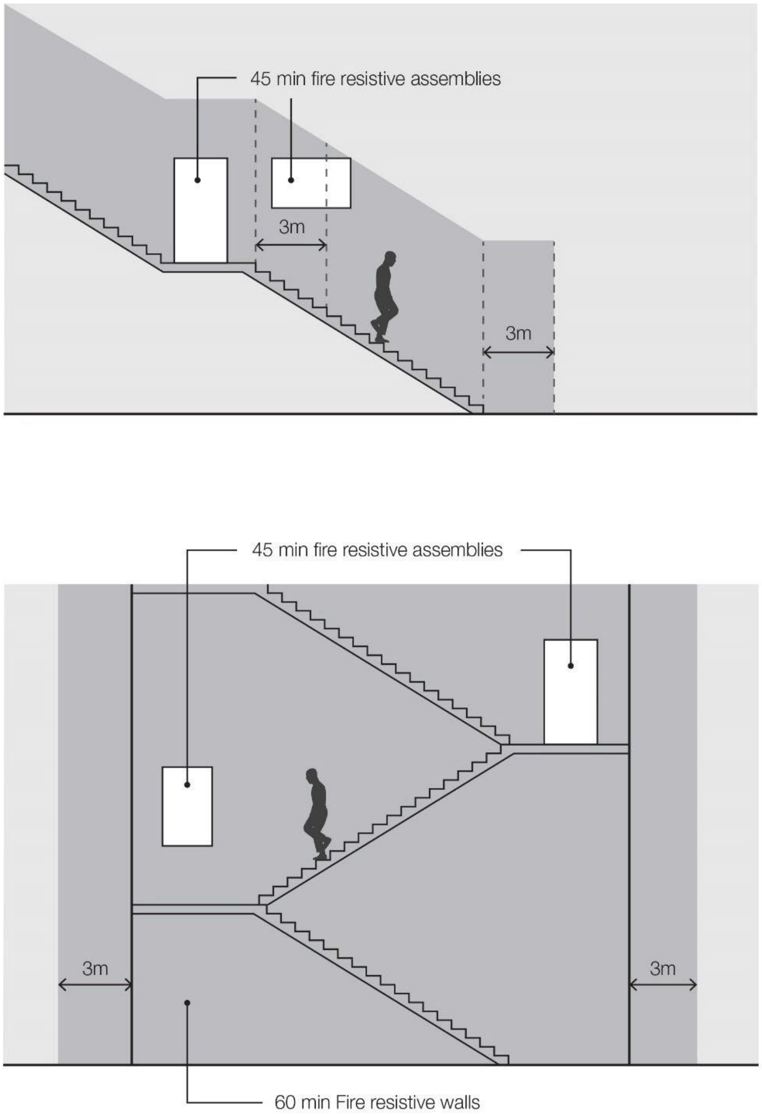


Figure 7 Protection of external escape stairs

Any other vertical penetrations, for lift shafts, service ducts or other functions, and the fire rated separation of these openings will be recorded to ensure that there are no unprotected vertical paths between compartment floors.

All compartmentation barriers and fire-resistant partitions, floor slabs and walls need to ensure that any penetration through them, be it for ducts, pipes, cables or any other object, are adequately protected. Depending on the type of penetration, there are different methods to avoid smoke and heat leakage through the penetrations made to accommodate these objects.

Basements need special protection from the upper floors, so the Assessor will note how this separation is achieved and particularly whether there is a vestibule provided as part of the separation mechanism for the stair penetration. This should be a fire rated separation with self-closing doors to stair and vestibule as shown in the Figure 10 below:

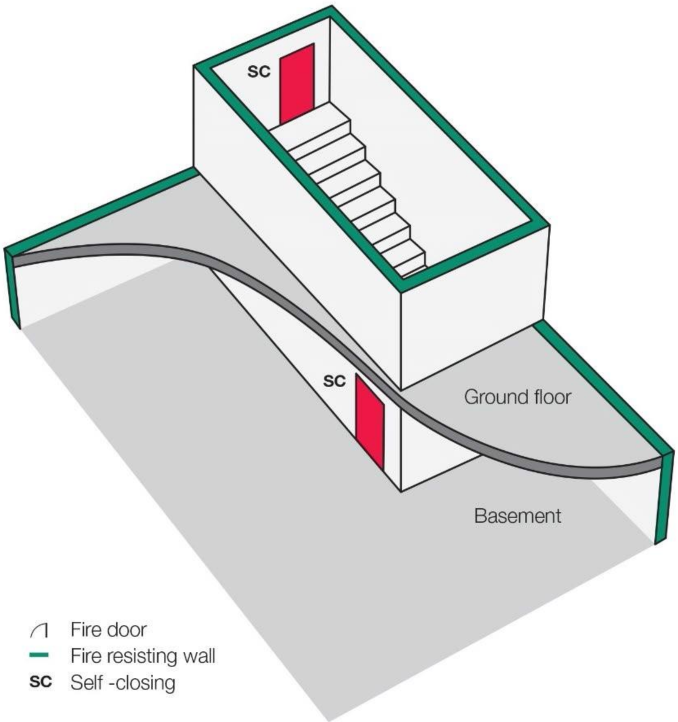


Figure 8 Sketch showing the basic requirements for protecting a basement opening

5.3.2.2 Separation of Occupancies

The fire safety measures required by the LABS Standard are defined by the Occupancy Classification of the building.

Garment, Apparel, Footwear, Bags and Accessories factory buildings are classified as 'General Industrial Occupancy' buildings.

Other occupancies typically found in a Garment, Apparel, Footwear, Bags and Accessories factory building are:

- Assembly occupancy in Dining Areas
- Business occupancy for Offices
- Storage occupancy

The LABS Standard requires that the other occupancies in a building classified overall as 'General Industrial' be separated from the industrial use and from each other with fire rated separating walls, unless certain conditions are met:

Where an occupancy can be defined as an 'incidental occupancy' then it need not be fire separated from the overall floor or building occupancy. Some examples of incidental occupancies are:

- Dining area for less than 50 people
- Childcare Centre for less than four people and with the maximum travel distance of 9m to a final exit.
- Offices occupying up to a maximum 10% of the production floor area
- Storage areas up to a maximum 25% of the production floor area, subject to the limitations given in the section. 5.3.2.3 below

Certain 'high risk areas' are always required to be enclosed with fire rated separation from the production areas, as described in section 5.3.2.4 below

5.3.2.3 Storage Areas

Areas for storage of materials are considered as areas of high fire load and as such should be separated from adjacent areas with fire rated construction. This construction should extend vertically up to the underside of the compartment floor, and needs to be checked particularly in the space between false ceilings and the slab soffit.

In-process or temporary storage is inherent to the operations of the Garment, Apparel, Footwear, Bags and Accessories factory and it is therefore necessary to store goods or materials adjacent to the production areas.

Temporary storage of materials is permitted without separation from the other occupancies provided that it meets the following criteria:

- The storage does not exceed 23m² and does not exceed 2.45m (8ft) in height in any one area for a non-sprinklered floor,
- The storage does not exceed 93m² and does not exceed 3.66m (12 ft.) in height in any one area on a sprinkler floor,
- Where temporary storage exceeds these criteria, the storage should be separated into 'blocks' of storage meeting these criteria, and with clear distances between 'islands' of at least 3m. (refer to LABS standard 3.11.5.6)
- The storage is incidental to the other occupancies i.e., the total area of temporary storage does not exceed 25% of the production area of the story in which they occur,

Where storage does not meet these criteria then it should be separated from other occupancies with 1-hour FR construction.

Application of these criteria is shown in the illustration below for the non-sprinklered case.

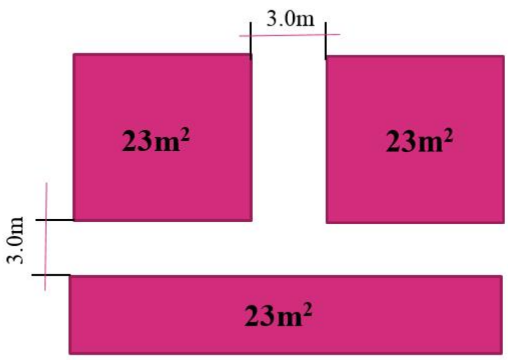


Figure 9 Temporary storage arrangements

The Assessor will note whether the area limits for 'blocks' of in-process storage are complied with, and also needs to note what percentage of the total floor area is occupied by 'blocks' of in-process storage.

Further restrictions on the maximum area of storage in any one compartment that may require fire rated separation walls, depending on construction type and number of stories, is given in Table 3.12.3 of the LABS Standard.

Cl. 5.3.2.2 of the LABS Standard provides some modifications to Table 3.12.3 by allowing up to 2.000m² area for non-sprinklered floors.

5.3.2.4 Other High-risk Areas

Some rooms located in the Garment, Apparel, Footwear, Bags and Accessories factory present a higher fire hazard due to their combustible loading and fire growth properties. High-risk areas often associated with Garment, Apparel, Footwear, Bags and Accessories factories are Generators, boilers, Compressors, Transformers and Chemical stores.

The high-risk classification principally depends upon the quantity and type of combustible materials, the speed at which fire is likely to develop and any processes that will produce particularly severe circumstances for fire propagation.

The principle is to protect and separate these spaces from the rest of the Garment, Apparel, Footwear, Bags and Accessories factory so that fire spread is limited or contained. In turn these spaces would not contribute or their contribution will be delayed in case a fire event develops outside these spaces.

The Assessor will note the location of these areas and if located facing into the production area or other occupied area, then they need to be separated from the adjacent areas with fire rated construction.

The doors to these separated rooms will also need to be fire rated and if they open onto protected stairs or corridors, need to be separated by a vestibule at the entry points.

5.3.2.5 Structure and Finishes

The LABS Standard defines the level of fire resistance required by Type of Construction as follows:

Classification by Type of Construction:

- Type 1: Highest degree of fire resistance
- Type 2: Intermediate degree of fire resistance
- Type 3: Lowest degree of fire resistance

Depending on the building height, an existing Garment, Apparel, Footwear, Bags and Accessories factory building can be either Type 1 or Type 2.

The type of construction needs to be noted and the Assessor will make a note of the structural materials used. For concrete, it will be assumed that the concrete itself will provide adequate fire protection but it should be noted where concrete, steel, timber or other structural materials are employed.

Surface finishes in Garment, Apparel, Footwear, Bags and Accessories factories are typically exposed concrete, plastered concrete or brickwork, and ceramic tiling; all of which are non-combustible Class A finishes. Therefore, fire spread along the walls, floors or ceilings is not normally a problem in these types of buildings.

Nevertheless, in certain areas partitions could be made from different materials, particularly for offices, meeting rooms and similar uses where false ceilings are installed.

Surface finishes covering the floors, ceilings, interior walls and exterior facades of Garment, Apparel, Footwear, Bags and Accessories factories can contribute to the fire as a fuel due to their properties and as such generate smoke and toxic products during a fire event. The choice of materials for walls and ceilings can significantly affect the spread of a fire and its rate of growth, even though they are not likely to be the materials first ignited.

It is particularly important in circulation spaces where linings may offer the main means by which fire spreads and where rapid spread is most likely to prevent occupants from escaping. Several properties of materials influence fire spread. These include the ease of ignition and the rate at which the lining material gives off heat when burning.

The surface finishes used for walls and ceilings need to be composed of materials that limit the spread of fire, so the Assessor will note the presence of any finishing materials (particularly plastics) used on walls and/or ceilings in the building.

5.3.3 Fire Safety Systems

Fire safety systems will be addressed by both the Fire and Electrical Safety Assessors, and the following notes what the Fire Assessor will need to address in the assessment and report.

The Fire report will address the type of detection and alarm system, the type of emergency lighting system and the coverage of these systems. It will also note how these systems are activated.

The Electrical assessment and report will cover the functioning of these systems in more detail, the back-up power supplies provided and links to the control panels. Testing of the alarms and emergency systems will be arranged as part of the Electrical assessment.

Adequate fire detection and alarm system are crucial to ensuring the life safety of occupants, and minimizing the potential for undetected fire spread. The main requirements for a fire detection system are the ability to:

- Respond to the likely products of combustion posing a threat to the building, its occupants and/or its processes;
- Discriminate between real fires and false alarms;
- Provide a signal to activate fire warning or control systems within an acceptable time period;
- Be sufficiently available and reliable to perform when required and as intended.

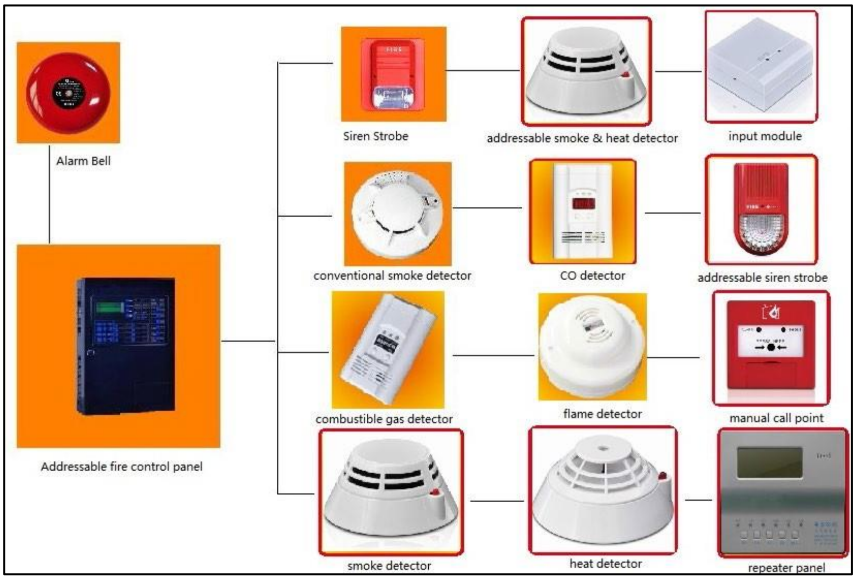


Figure 10 Typical components of a fire detection and alarm system

5.3.3.1 Fire Detection

A **conventional system** is a basic method of detecting a fire and are generally the most cost effective option. They are essentially simple switches that are either "on" or "off". They cannot distinguish between a real fire and the various non-fire phenomena that can trigger a false alarm such as cigarette smoke, dust and steam and they cannot indicate a specific location in that zone.

Analogue addressable fire alarm systems are in constant two-way communication with the fire control panel. Any abnormal rise in temperature or evidence of smoke is communicated to the fire panel which, after analyzing the signals, then makes the decision to trigger the alarm and shows which detector is indicating a fire in a specific part of the building.

An analog addressable system is usually installed in larger buildings where it is imperative to know the exact location of an alarm signal in a short period of time.

Addressable	Conventional
• Identify the location of fire much easier • Information is constantly relayed back to the control panel incl. faults so maintenance is easier.	• Each radial circuit will have a number of devices attached to it so identifying the location of the fire is limited to that circuit.

Figure 11 Key differences between an Addressable and Conventional alarm system

Due to their limitations, conventional systems should only be used for small, one story building. For multi-story buildings or facilities which require many detection points, an addressable system is more appropriate.

The type of fire detection system used for the building or space will be noted by the Assessor, as well as the coverage of the different detectors observed. When noting coverage, attention is to be given as to whether the spacing and location seems adequate for proper functioning of the system.

The Assessor will also note whether the detectors are local battery operated point detectors or whether they are wired to a power source, and the location of manual call points should be noted.

5.3.3.2 Fire Alarm

A critical part of the system is ensuring that once detection has occurred, all the occupants are alerted through audible and where necessary, visual devices.

This is normally through a sounder (bell or electronic sounder). In certain cases, voice alarm can be used but this is only really used in special circumstances where there is a large member of the public. It must be noted that such Public Address (PA) system can be used but cannot be relied upon. Therefore, a sounder will be required even if a PA system is provided.

In addition, a PA system must not be confused with a Voice Alarm (VA) system. A VA system broadcasts speech messages and/or warning signals in an emergency only and is designed accordingly, with fire protected cabling and speaker boxes, so that it can be relied upon in such a case.

It is very important that alarm will be heard so the sounders should provide a minimum sound level usually around 65dB throughout the building but importantly 5dBA above any background noise. This is particularly important in noisy places such as factories or places where people may have ear protection. In some circumstances the sounders would need to be augmented with visual strobes.

Figure 12 Example automatic sounder (left) and visual notified (right)

The system should incorporate at least two fire alarm sounders, even if the recommended sound pressure levels could be achieved with one sounder. At least one sounder should be provided in each fire compartment.

Visual alarm signals should be provided in areas where ambient noise levels exceed 90 dB(A) and in other areas where hearing protection is likely to be used under normal circumstances

The type of alarm should be noted – sounders, voice alarm speakers or visual alarms. The spacing of the alarms will be noted to assess whether they appear to provide the necessary decibel level to all parts of the building.

The Fire Assessor should note whether the alarm system is wired to operate automatically on fire detection, or whether only manual call points (MCPs) are provided for manual activation of the alarm system.

5.3.3.3 Emergency Lighting

Factory occupants must be able to find their way to a place of final safety if there is a fire by using escape routes that are adequately illuminated.

In simple single story premises, single 'stand-alone' escape lighting units may be sufficient and these can sometimes be combined with exit or directional signs. The level of general illumination should not be significantly reduced by the sign

In larger, more complex premises it is likely that a more comprehensive system of fixed automatic escape lighting will be needed to illuminate all the escape routes.

An efficient and effective method of illuminating escape routes in an emergency is by using spotlights. These are normally self-contained units consisting of a battery, switching mechanism and spotlights fitted to operate automatically on a circuit or mains failure. These self-contained units can be suspended from roofs, structural steelwork such as columns or beams, substantial fixed high racking or attached to walls, etc. and are capable of illuminating escape routes easily. They should be located at high level and point downward.

Emergency escape lighting (luminaires) can be stand-alone dedicated units or incorporated into normal light fittings.

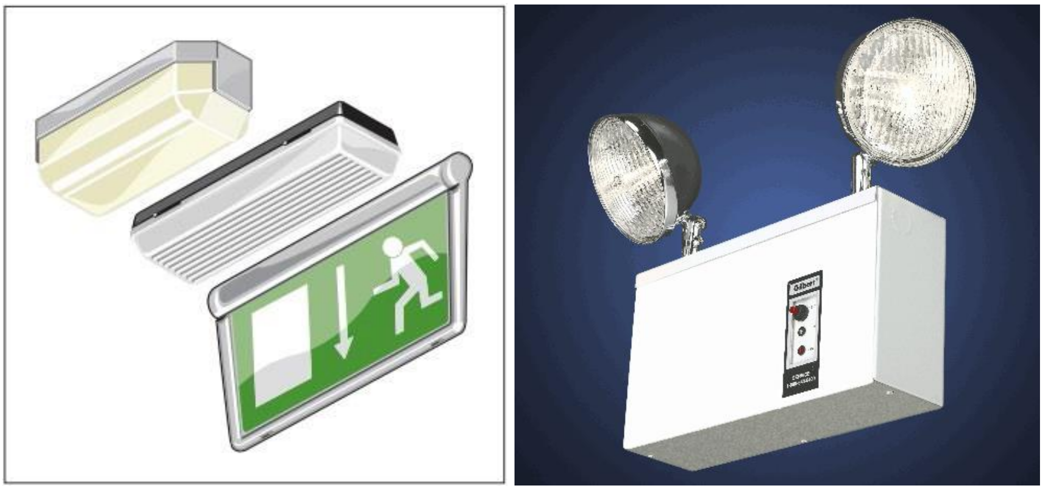


Figure 13 Example luminaire emergency escape lighting and illuminated escape sign (left) and standalone spotlight emergency light (usually battery powered)

The purpose of illumination of an escape route is to ensure safe evacuation or exit of people from the area and to enable them to locate fire protection and suppression equipment. In the case of aisles, the average illuminance level on the floor along the center line of the aisle should be at least 2.5 lux.

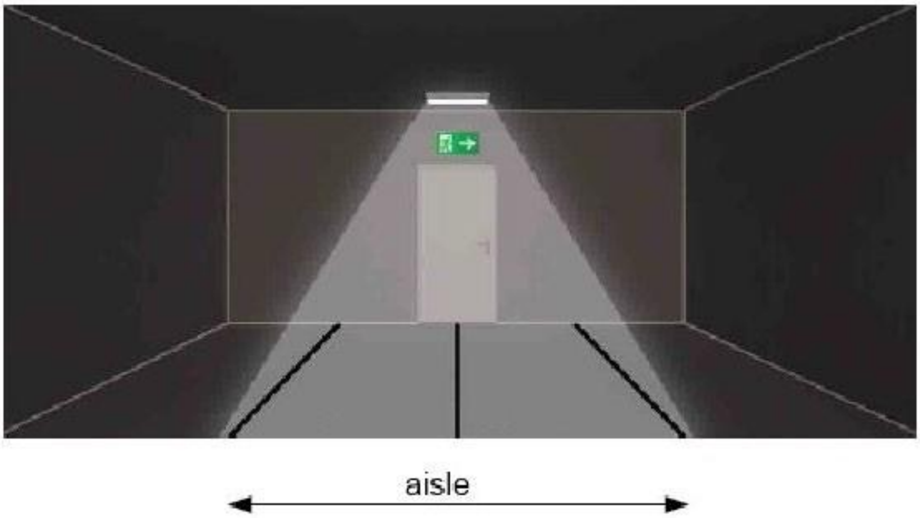


Figure 14 Illustration of escape route illumination

All other escape routes shall be illuminated with light with illuminance level not less than 10 lux.

If first aid points or firefighting equipment and fire alarm call points are not situated on the escape route or within the open area, they should be illuminated so that the illuminance level of at least 10lx is ensured on the floor close to these points.

Emergency lighting should be provided to provide a minimum lighting level along the entire escape route. The Fire Assessor will note whether emergency lighting is provided along the escape route and at the final Exits, or just at final Exits (which is a typical case).

5.3.4 Provisions for Firefighting

Internal firefighting systems will be concerned principally with the provision and distribution of hand-held fire extinguishers and fire hose systems. Externally the stored water and pump set for priming the fire hoses needs to be covered.

5.3.5 Water Supply

An adequate water supply is critical to:

- Ensure that standpipe and sprinkler systems have sufficient water to operate effectively
- Allow the fire brigade to suppress and extinguish a fire. The water supply may be used directly by the fire brigade using their own equipment, or where provided, via a standpipe system located inside the factory.

The Fire Assessor will ascertain whether there is a reliable supply of firefighting water available via the municipal mains systems. If this is not the case, then all firefighting water will need to be provided by a storage tank on the premises. Note should be taken of the capacity of this reservoir to enable the Assessor to report later on the supply versus required demand.

Fire pumps should be located in a dedicated room built of non-combustible construction. The room should have easy access to the fire brigade from outside, via protected corridors and stairs.

Fire pumps are essential for the correct operation of the sprinkler and fire hose systems, and as such their correct functioning in an emergency needs to be guaranteed as far as possible. This is achieved as follows:

- Two pumps of equal capacity are to be provided, each one capable of delivering the required water flow and pressure required by the fire protection system on its own. These two pumps operate in a “run and standby” arrangement, such that if one pump fails, the other pump takes over.
- Typically, the run pump shall be electric.
- The standby pump may be electric also, but must be supplied with an emergency power supply from an emergency generator. Alternatively, a diesel engine drive pump may be provided as the standby unit.

Diesel engines have significant ventilation requirements which need to be considered, as well as the fuel supply system.

The type of pump set to supply the fire hoses with firefighting water from the stored water reservoir should be noted, particularly the types and conditions of both main pump and backup pump.

It should also be noted whether the pumps are automatically activated on fire alarm, or whether they need to be manually activated.

5.3.5.1 Firefighting Systems

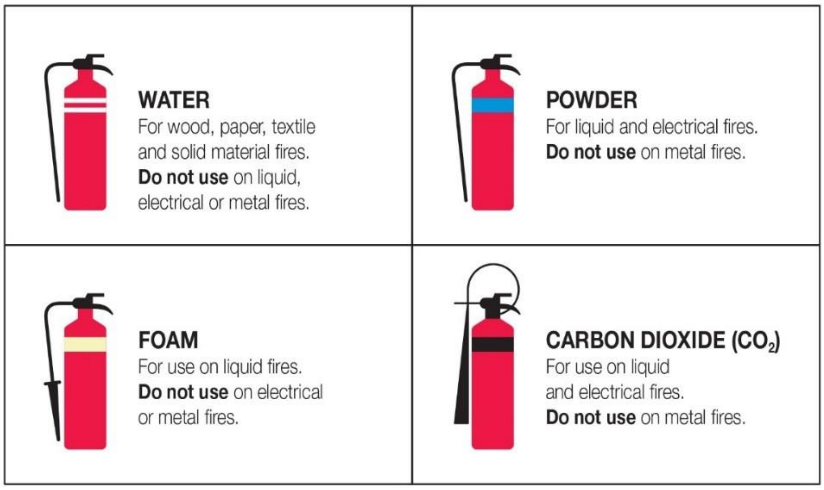
The Fire Assessor should note the type, location and condition of the fire hoses provided both internally and externally. These should be positioned close to the emergency Exits, as well as internally to provide full coverage of the building with the hose lengths provided.

Fire extinguishers provided should be appropriate to the specific risks found in the factory. The risks are typically grouped into different classes, based on the type of material that is likely to burn. These are described in the Table 1 below.

Table 1 Description of the different types of fire classes

Class of	Description
Class A	Class A fires are fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics.
Class B	Class B fires are fires in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.
Class C	Class C fires are fires that involve energized electrical equipment.
Class D	Class D fires are fires in combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium.
Class K (aka. Class	Class K fires are fires in cooking appliances that involve combustible cooking media (vegetable or animal oils and fats).

The main types of extinguishers and their color coding are shown in the image below – each extinguisher will cover different types of fire classes. Note: It is not safe to fight fires involving aerosols with fire extinguishers.



The contents of an extinguisher is indicated by a zon of colour on the red body.

Figure 15 Main types of extinguishers and their color coding

The type and distribution of portable fire extinguishers should be noted, and notes made on the adequacy of the type of extinguisher for the use of the space.

If there are any automatic suppression systems provided in the building, the Fire Assessor will note the type and coverage of each suppression system. This will normally be an automatic sprinkler system or an automatic powder ‘bomb’ discharge system.

The Fire assessment should note the condition and coverage of the fire hose system and its link to the fire pump.

The build-up of smoke and heat as a result of a fire can seriously inhibit the ability of the fire service to carry out rescue and fire-fighting operations within a building.

Products of combustion from basement fires tend to escape via stairways, making access difficult for fire service personnel. Providing outlets for smoke can reduce this problem. Venting can improve visibility and reduce temperatures, making search, rescue and fire-fighting more effective.

There may be a smoke ventilation system provided to assist firefighting, and if this is the case, the Fire Assessor should make a note of it.

5.3.5.2 Access for Emergency Vehicles

Local conditions and facilities typically define the access requirements, as these are generally dependent on the type of vehicles used by the local firefighting crews. Such requirements include:

- Emergency vehicle widths
- Turning circles
- External hydrant requirements

The fire Assessor will make a note of the roadways provided around the perimeter of the building, to be able to make an assessment of whether the access for firefighting vehicles is adequate to allow the fire brigade sufficient proximity to the building to act effectively.

The Fire Assessor should inspect the internal roadways in the factory complex and note the extent of perimeter access provided for fire trucks and other emergency vehicles.

5.3.6 Maintenance and Housekeeping

5.3.6.1 Legal documents

It should be noted whether the factory has a Fire License, even though this may not reflect the observed condition of the buildings.

In most jurisdictions the factory should have an up-to-date Fire Police inspection report that indicates instructions for improvements to fire safety systems if required by the local authority.

5.3.6.2 Maintenance

The best manner for the Fire Assessor to make a judgement on the performance of the fire safety systems observed during the assessment is to request to see the maintenance and testing records for the Fire Alarm and Emergency lighting systems, and testing of the fire pumps and flow through the Fire Hoses.

The Fire Assessor will ask to see these records and make a note of the dates and regularity with which these have been undertaken.

Any automatic extinguishing system should also have records of the maintenance carried out on them by third parties, and the Fire Assessor should take note of these.

5.3.6.3 Emergency Plan

There should be a designated Fire Safety Director responsible for the development of the fire evacuation plan. The evacuation plan shall also include provisions to assist physically disabled persons.

Fire evacuation maps are to be posted to each exit stair and should clearly indicate:

- Correct calling procedure to fire and rescue services
- Emergency exits
- Primary and secondary evacuation route
- Locations of fire extinguishers
- Fire alarm pull stations' location
- Assembly points
- Use of stairs in case of fire and not elevator

The factory should be able to produce an Emergency Plan for review by the Fire Assessor, and note should be taken of the training provided for the building occupants and the emergency duties assigned to selected personnel. These should ensure that all systems relying on manual activation are covered by personnel identified in the Emergency Plan.

Records of regular fire drills will also be requested to determine how well prepared the building occupants are in the event of an emergency.

5.3.6.4 Housekeeping

Good housekeeping is an essential element in fire safety management. It can reduce the chance of a fire starting, reduce the potential rate at which a fire can grow and the size it can reach, and ensure that the fire protection features in a building function as intended in the event of a fire.

There are two primary aspects to housekeeping which are:

- Reducing the chances of a fire developing or starting, and
- Protecting escape routes.

Regular safety inspections and associated remedial actions if any should ensure that the fire protection measures are available at all times.

Measures should be taken to control the risk from fire caused by the presence of combustible material, including as many of the following as are appropriate:

- Reduce the fire load, e.g. by reducing the amount of stock stored in a building.
- Alter the way goods are stored. A fire will grow significantly more quickly in goods stored vertically, such as pallets stacked on top of each other or in high bay storage, than goods stored over a greater horizontal area, such as on the floor of a warehouse.
- Only store goods and furnishings in an appropriate manner e.g. in dedicated store rooms.
- Ensure that all highly flammable substances are used and stored safely, and, if necessary, in appropriate storage containers.
- Control the amount and storage of rubbish, storing it in a safe location away from buildings, in a designated area.
- Remove redundant services, such as communication cables, particularly in voids, as these can constitute a significant fire load.
- Maintain or clean machinery and equipment adequately so that the build-up of dust and grease in equipment do not lead to ignition.

In order to ensure that escape routes are available for use at all times the following must be achieved:

- All escape routes, including refuges, shall be kept free and clear from obstruction at all times;
- Goods, materials, unwanted furniture, etc. should not be stored within escape routes. Any obstruction should be removed immediately;
- Fire doors that are intended to be kept closed should be closed and not obstructed;
- Fire doors on hold-open devices should be operable and should not be obstructed;
- The exterior of the building should be inspected to ensure that final exits and routes to assembly points are not blocked.

The fire Assessor should make a note of the level of housekeeping throughout all areas during the Assessment. Things to note in particular would be the general order and tidiness in the factory, the condition of escape paths and whether there are random obstacles blocking pathways and/or stairways.

Combustible materials, offcuts and rags, stored close to or hard up against potential heat sources are another thing that should be noted.

5.3.7 Questions to Answer Before Leaving Factory

A list is given below of questions that the Fire Safety Assessors should ask themselves before leaving the premises, as a further check that the information recorded using the checklist has given them an adequate understanding of the Fire Safety issues related to the factory buildings:

1. Are there an adequate number of escape routes and are they continuous and adequately protected from all floor areas to an exit to outside?
2. Are there stairways that lead back into the building at discharge level and if so, into what sort of areas do they discharge?
3. Conditions on the perimeter of the building(s) – can people easily move away from the building once they exit at ground level?
4. Have all high-risk areas been identified and the type of enclosure or lack of enclosure noted?
5. Have all vertical openings between floors been identified and noted whether effectively enclosed or not?
6. Are doors on escape routes easily openable in the direction of travel and free of lockable devices?
7. What is the condition of the factory regarding temporary storage and general tidiness; are there obstructions to paths of escape in corridors, stairwells, etc.?
8. Based on examination of the systems maintenance records, what is the level of maintenance and care shown by factory management?

   What is the procedure for fire brigade call-out to the factory; is it automated or not?
9. Have you seen the Emergency Evacuation Plan and are there records of drills having been performed for staff training?

In addition, the following information will be required to complete the Assessment report and should be obtained for reference when producing the report:

- Architectural layouts that show the actual condition and use of the factory building(s) and outbuildings
- Occupant numbers for all parts of buildings

5.4 Testing of Fire Safety Systems

The Fire Safety Assessor will not carry out any testing of systems as part of the Assessment procedure.

Functionality testing of a number of fire safety systems will be arranged by the Electrical Assessor, and the Fire Safety Assessor should liaise with the Electrical Assessor to ensure that they are present when the following tests are carried out:

- Activation of the Fire Alarm by detector activation or manual push button
- Activation of the Emergency Lighting system by cutting the main power supply
- Functionality demonstration of the fire pump set and activation procedure The Electrical Assessment report will make observations on the results of these tests.

6 Electrical Assessment Methodology

6.1 General Points

The summary of the building electrical system, to be prepared as part of the assessment report, requires completion of key data, with which the Electrical Assessors should be familiar before commencing assessment work. The Assessor should establish the number and location of main items of electrical equipment (substations, generators, electrical panels). A logical route should be planned to walk the facility. For most facilities it generally helps to start at the utility power connection and follow the power into and around the building.

6.2 Assessment of the Building

When carrying out the Electrical Safety Assessment of a building it is important to understand the systems that are in the building; for example, how does the utility power enter the site, where are the generators located and what are their functions.

Documentation, if available, should align with what has been advised by Factory Management during the Factory Management Interview.

Suitably qualified factory personnel shall carry out all electrical works, opening or closing of electrical panels or equipment.

The assessor:

- Will visually inspect only the electrical installation.
- Will not remove or replace covers or open or close cabinets containing electrical equipment.
- Will not measure electric loads of the equipment.
- Will not touch any inspected equipment and will maintain a safe distance from such equipment.
- Will comply with the safety practices and rules of the end user and applicable national safety standards.

6.3 Electrical Safety in Substations and Switch Rooms

When entering any space containing electrical distribution equipment the inspecting engineer(s) shall check for abnormal conditions. Persons authorized to enter a substation or switch room must have an understanding of what to look for. If any danger is suspected, the Assessment in that area should be aborted and an investigation carried out by someone who has the necessary knowledge and experience to be able to determine what actions may be necessary.

Abnormal warning signs are, but are not limited to:

- high temperature in the building
- presence of smoke
- smell of ‘hot’ substances (oil, compound etc.)
- audible discharges or arcing
- smell of rotten eggs
- nauseous odor (potentially indicative of a release of SF_6)
- signs of leaked oil in the vicinity of oil-filled equipment

- signs of fresh compound leaks, and
- distortion of or evidence of soot on enclosures.

This is a non-exhaustive list and the Engineer must satisfy themselves that they are complying with their firm's own and national/ local health and safety requirements.

6.4 Substation

Using the checklist in Appendix F for guidance the Assessor should record data to enable reporting on the following issues:

- Is there adequate identification and labelling of substation?
- Is there adequate display of warning and danger notices in substation?
- Is the main incoming power supply adequate for the power requirements of the building?
- Substation in a suitable location?
- Transformer room ventilation provided?
- Transformer catch pit for oil provided and properly sized?
- There are no signs of water ingress?
- The room is clean, tidy and not being used as storage space
- Services (lighting, sockets) are working
- Doors and windows are secure and, when required, locked
- There are no signs of damage to the equipment or room
- The room is not overgrown with vegetation, and access is acceptable
- There are no signs of rodent activity
- Ventilation (ventilation shall be designed to comply with the recommendations of the equipment manufacturer)
- Emergency first aid signage and equipment
- Soak pit for transformer with more than 2000 liters of oil.

6.5 Thermographic Survey

Qualified and trained personnel who have an understanding of infrared technology and electrical equipment maintenance, should perform thermographic surveys and be aware of the safety issues involved.

The following equipment shall be included and recorded in the survey:

- Transformers
- All electrical panels in the facility

For each item of equipment listed above the following items shall be surveyed:

- All cable connections,
- All circuit protective devices cable connections
- Protective devices
- Ancillary equipment within the panels i.e., contactors.

Testing should be carried out while the switchgear is on load. Flash guards may be installed in some or all panels. In the Pre-Assessment Checklist, the factory will have been asked to make arrangements for the flash guards to have been removed for the day of the assessment.

For existing construction, thermographic inspection of electrical equipment shall be provided on a tri annual basis. The survey shall be used to highlight potential over heating of components.

(1) Where temperatures exceed 60°C these shall be investigated further.

(2) Where temperatures exceed 70°C immediate action shall be taken to reduce the temperature

6.6 Generator

Where generators are used to supply power to life safety systems in conjunction with normal services the following shall be checked:

- The generators' ability to supply power to life safety services during a utility outage and
- The generators' condition and risk of starting or contributing to a fire
- The ambient temperature shall be taken as the temperature of the air surrounding the equipment being imaged.

Where the generator does not power life safety services the following shall be checked:

- The generators condition and risk of starting or contributing to a fire Proper ventilation of the generator room is necessary to support the engine combustion process, reject the heat produced during operation (engine heat, alternator heat, etc.), and purge odors and fumes.

Using the checklist for guidance the Assessor should record data to enable reporting on the following issues:

- Check that the type of generator is clearly stated in documents and on equipment
- Check that the capacity of generator is the same as stated in the power balance
- Electrical distribution, safety interlocking, earthling and changeover facilities made?
- Check that fuel storage requirements are adequate for the use
- Check for earthling connection from generator frame
- Check fuel storage for leaks
- If the generator fuel delivery relies on a fuel pump check the power to the pump is backed up
- Check that the generator battery is monitored (it can be done manually or automatically)
- Check for liquids leaking from generator, tank and pipework
- Check for signs of ventilation is adequate
- Check that fresh air inlet should be located as far from the sources of heat as practical and as low as possible.
- Check that ventilation air inlets and outlets should be positioned to prevent exhaust air from being drawn into the ventilation inlets (recirculation).

6.7 Supplies to Life Safety Services

Life safety sources are power sources for life safety services. Life safety services include:

- Emergency (escape) lighting

- Fire detection and alarm
- Fire pumps1 (sprinkler pumps, hose reel (Ø25 mm)
- Fire rescues services lift
- Evacuation systems
- Smoke extract systems
- Industrial safety systems
- Fire services communications systems
- CO detection and alarm

This list is not exhaustive and consideration of other systems should be given and their impact on occupants' safety. (Refer to LABS standards for further details).

A safety source is defined as:

- storage batteries,
- primary cells,
- generator sets independent of the normal supply.

In general, batteries will be used by most small systems (generally fire detection & alarm panels and emergency lighting). This section generally deals with systems where batteries are used as the life safety source (backup).

The following items shall be checked:

- Battery ventilation
- Battery charging functional
- Battery failure alarm i.e., if battery is disconnected from panel does panel display a fault and continue to operate

During the assessment, the testing should include switching off mains (primary) power to fire detection & alarm panels and emergency lighting to witness their function.

Functional testing of generator(s) does not need to form part of the assessment. However, if it is deemed beneficial and the Factory Management agree the generator can be tested.

Where generator support life safety system(s) they shall be tested.

6.8 Earthing and Bonding

The entire installation shall be properly and effectively earthed and bonded, with protective earthling and main and supplementary equipotential bonding provided throughout.

- From the as-built schematics, determine the type of earthing system installed.

  During the review of the as-built documentation, a check of the protective conductors shall be carried out against Table A54.7 from IEC 60364-5-54. A sample check of 10% of all circuits should be carried out.

Cross-sectional area of line conductors **S**	**Minimum cross-sectional area of the corresponding protective conductor**	
	If the protective conductor is of the same material as the line conductor	**If the protective conductor is not of the same material as the line conductor**
(mm^2)	(mm^2)	(mm^2)
S<=16	S	(k1/k2) x S
16<S<=35	16	(k1/k2) x 16
S>35	S/2	(k1/k2) x (S/2)

IEC 60364-5-54 Table A54.7
Minimum Cross-sectional Area of Copper Earth Conductors in Relation to the Area of Associated Phase Conductors

6.9 Earth Leakage Protection

The presence, rating and type of earth leakage protection shall be reviewed in each panel. It shall be recorded and actioned by the factory where earth leakage does not meet the LABS standard.

Confirm at each item of switchgear that an earth cable is installed and properly connected for each circuit.

Confirm bonding at each of the following:

- Main engineering services (gas & water pipes, HVAC ductwork, tanks, structural steel parts etc.) are bonded to the main earthing terminal.
- All tanks should be bonded using a minimum 16mm² earth cable.
- Metal sinks, basins etc. (including pipes) shall be bonded to the earth terminal of the nearest 13A socket outlet using minimum of 2.5mm² earth cable.
- Metal sinks, basins etc. (including pipes) shall be bonded to the earth terminal of the nearest 13A socket outlet using minimum of 2.5mm² earth cable.
- Bonding conductors and connections shall be installed so as to be clearly visible and shall not be covered by lagging or be otherwise obscured

Functional testing of earthing system(s) does not need to form part of the assessment.

6.10 Switchgear

No functional testing of switchgear shall form part of the assessment. Evidence of regular maintenance and testing should be sought during the meeting with Factory Management.

6.11 Equipment Quality

Assessor to check for devices that do not comply with any recognized product standard. Use of this equipment can cause serious damage, fire or death.

6.12 Conductors

During the visual assessment, the following should be checked:

- Check that cables are supported correctly
- Check that the cables have been laid in accordance with design?
- Current carrying capacity of the cable is appropriate for the application?
- Is there adequate identification and labeling of all distribution boards?
- Is there adequate identification and labeling of all circuits in DBs?
- Is there an adequate display of warning and danger notices in distribution boards?
- Is the protection of cable systems against other causes of damage and deterioration, e.g., heat, water adequate?
- Are any cables or conductors exposed due to damage, corrosion, missing covers etc.?
- Are there adequate barriers or enclosures against direct contact? Are those barriers or enclosures compromised, e.g., due to damage?
- Check for dust and lint in electrical panels
- Check for dust and lint on cables
- Are there damaged flexible conduits?
- Check for flammable material in electrical panels
- Are the cables properly segregated in cable trays?
- Load balance under normal conditions is provided?
- Load balance under emergency conditions is provided?
- Conductors shall be crimped or have cable sockets
- Conductors shall be crimped or have cable sockets

During the review of the single line diagram (SLD), a sample check of conductor sizes against protective devices shall be carried out to give an indication if there are unprotected cables.

Functional testing of conductors shall not form part of the assessment.

6.13 Lighting Protection System

The existence of a lightning protection system (LPS) installation should be discussed and records of annual testing reviewed during the Factory Management meeting.

If in place, the following elements should be inspected:

- Roof-level air termination network. This is generally provided by means of a metallic roof covering the building, tape meshes faraday cage conductors and/or vertical air rods.
- Are connections from the roof-level air termination network to dedicated down conductors?

  or
- Do the down conductors comprise structural steel columns or reinforcing steel within structural support columns and/or dedicated down tape conductors?
- Bonding the dedicated down conductors to adjacent earth electrode housings where earth rods shall be driven through to the earth source. Each down conductor shall have a separate earth termination.
- Check that test points are in place.

- Is bonding of all extraneous metalwork such as structural steelwork, metal gutters, down-pipes etc. and any roof mounted mechanical plant, boiler flues, AHUs, cable trays, railings, louvers, vent pipes etc. in place?
- Is there a connection via a test link to building main electrical earth bar?
- Are lightning protection installation layouts available and up to date?
- Check strike counter and number of strikes.

Functional testing of LPS shall not form part of the assessment.

6.14 Voltage Drop

Maximum allowable voltage drop limits for LV installations are given in IEC 60364-1. These generally are difficult to determine during an assessment visit and should not distract from other elements to be inspected. During the meeting with the Factory Management, they should be asked if there have been any times where equipment has malfunctioned or failed to start for unexplained reasons.

Where the safety of occupants relies on life safety services which have experienced issues described above, this should be noted in the assessment report for follow up action.

6.15 Testing of Fire Safety and Firefighting Systems

Functionality testing of a number of fire safety systems will be arranged by the Electrical Assessor, and the Fire Safety Assessor should liaise with the Electrical Assessor to ensure that they are present when the following tests are carried out:

TEST	EXPECTED OUTCOME
Activation of the Fire Alarm by detector activation or manual push button.	Alarm sounders are activated.
During the test primary power to the alarm panel is switched off so that panel operates on backup power (usually batteries).	Sounders can be heard from all areas of the facility (this can be approximated by listening at a selected number of areas) Alarm continues to operate on backup power (usually batteries)
Activation of the Emergency Lighting system by cutting the main power supply.	Emergency lights switch on the area where primary power has failed. They remain on for a reasonable duration (suggest 10 minutes is sufficient for this test). [1]
Functionality demonstration of the fire pump set.	The pumps operate on primary and secondary power supplies. The pump(s) can pump water to the furthest connection point on the pipework where suitable pressure is available.

6.16 Questions to Answer Before Leaving Factory

A list is given below of questions that the Electrical Safety Assessors should ask themselves before leaving the premises, as a further check that the information recorded using the checklist has given them an adequate understanding of the Electrical Safety issues related to the factory buildings:

1. Have you seen all substations?
2. Have you seen all generators?
3. Have you checked room ventilation?
4. Have all electrical panels and transformers been surveyed with a thermographic camera? Was this done with electrical equipment under load?
5. Do all life safety services have a primary and secondary source? Have these been checked?
6. Is there a lightning protection system? Has it been checked?

---

1 Do not allow the test to continue beyond 10 minutes as batteries may be drained and may take some time to recharge and become functional again.

7 Overall Building Risk Classification Color Coding

7.1 Overview

The following sections provide guidance on an approach for assigning an overall building risk classification or color code as a result of each of the Structural, Fire and Electrical Preliminary Safety Assessments. This is a valuable additional outcome from the Safety Assessments, which summarizes the findings in a clear and understandable way. It will facilitate appropriate prioritization of follow-up activities and ensure that serious safety issues are clearly identified, early in the process. It is a qualitative method, appropriate to the rapid assessment nature of the Preliminary Safety Assessment program and is not a highly definitive quantitative method.

Building risk classification by color coding is a well-established approach for appraisal of existing buildings and we propose to adopt it here.

Guidance is provided on assigning the overall building risk classification color coding. However, the Engineer/Assessor may come across situations where one safety issue is so critical to life safety in itself, or combined with a number of other issues, the building merits a high-risk category even though the guidance does not indicate this. The Engineer/Assessor should use his/her judgement in these cases to adjust the risk category appropriately.

Before finalizing the risk classification of the building, the Engineer/Assessor should use his/her judgement to assess whether the scoring reflects the perceived life safety condition of the building. If the classification indicates a different level of life safety to that perceived by Engineer/Assessor from the observations on site, then the building should be given a color category that corresponds to the perceived condition.

This methodology entirely relies on three components:

- Using appropriately experienced engineers as defined in Section 3.1.1 who use engineering judgement to form a view on the building risk classification.
- Training of the team of Engineers/Assessors and providing guidance to enable them to make informed decisions
- Ongoing QA/QC and updating of the methodology based on feedback

7.2 Factories with Multiple Buildings

Where factories comprise more than one significant building, these should be individually categorized following the classification system included here. The overall factory categorization should be most critical individual building categorization. The Executive Summary should include details of the individual building categorization.

7.3 Structural Risk Classification

Codes for Overall Assessment (of an individual factory building or factory building within a factory complex)		Prioritised Action	
Black	**Unable to complete full assessment** and/or reasonable conclusions due to lack of access, lack of co-operation, inability to see structure particularly at base/ground floor levels etc.	Priority 1:	Not Applicable
		Priority 2:	Important (arrange for complete survey to be made)
		Priority 3:	Not Applicable
Red	**Immediate closure of factory building** or significant part of building recommended. Closure in accordance with protocol. Due to Critical stress levels in structural members, concern with progressive collapse and/or visible defects resulting in immediate danger to structure and workers. There is at least one Priority 1 issue found	Priority 1:	Critical: close factory immediately
		Priority 2:	Important
		Priority 3:	Longer term/Maintenance
Red/ Amber	If the QSEC deems that there are important IMMEDIATE actions required to maintain an Amber designation, the report may be designated as Amber with Red actions. The Red actions must be completed in two weeks or the overall factory designation will become Red. There is at least one Priority 1 issue found	Priority 1:	Critical e.g. localised closure of space; load reductions
		Priority 2:	Important
		Priority 3:	Longer term/Maintenance
Amber	**No reason to suspend operations in the facility** but action may be required locally. Significant stress levels in structural member, concerns with potential for progressive collapse or visible defects with no immediate danger to structure or workers. Production may continue subject to agreement to further assessments and testing and actions to address issues raised with prioritised actions in report. There is at least one Priority 1 issue found	Priority 1:	Critical e.g. localised closure of space
		Priority 2:	Important
		Priority 3:	Longer term/Maintenance
Yellow	**Limited concerns** but have questions on structural arrangements and details, limited visible defects with no immediate danger to structure or workers. Production may continue subject to agreement to address issues raised and prioritised action in report. Priority 2 issues are the highest level found.	Priority 1:	Not Applicable
		Priority 2:	Important
		Priority 3:	Longer term/Maintenance
Green	Generally, all clear subject to agreement to address prioritised comments. No critical visible defects or structures and no visible immediate risk to workers. Production can continue. Priority 3 issues are the highest level found.	Priority 1:	Not Applicable
		Priority 2:	Not Applicable
		Priority 3:	Longer term/Maintenance

Timing of Priority Actions		
	Priority 1:	**Immediate Action**
	Priority 2:	Within 6 weeks
	Priority 3:	Within 6 months and longer term actions (maintenance)

7.4 Fire Risk Classification

The Priorities given to each Observation and Action (FP-1 to FP-3) are used to determine the Risk Classification of each significant building in the factory. As guidance 'significant building' could be considered as all Production buildings, Storage buildings greater than 1,500m^2 total area, and any others considered significant by the Assessor. The Risk Classification is assigned a color based on the number of FP-1 priority items as shown in the table below. These are then used to determine the appropriate Fire Risk classification for the factory; the Risk Classification color assigned to the building with highest risk becomes the risk classification for the Factory complex.

Codes for Overall Assessment **(of an individual factory building or factory building within a factory complex)**		**Prioritised Action**	
Black	**Unable to complete full survey** and/or make reasonable conclusions due to lack of access, lack of co-operation, etc.	Priority 1:	Not Applicable
		Priority 2:	Important (arrange for complete survey to be made)
		Priority 3:	Not Applicable
Red	**Immediate closure of factory building** or significant part of building recommended. Closure in accordance with protocol.	Priority 1:	>15: Critical – close factory immediately
		Priority 2:	Any number
		Priority 3:	Any number
Red/ Amber	If the Assessor deems that there are important IMMEDIATE actions required to maintain an Amber designation, the report may be designated as Amber with Red actions. The IMMEDIATE actions identified by the Assessor in the Executive summary of the report must be completed in two weeks or the overall factory designation will become Red.	Priority 1:	7 < n =< 15 – Critical e.g. localised closure of space
		Priority 2:	Any number – Important
		Priority 3:	Any number – Longer term/Maintenance
Amber	**No reason to suspend operations in the facility** but action may be required locally. Production may continue subject to the IMMEDIATE actions identified by the Assessor in the Executive summary of the report being completed in two weeks.	Priority 1:	0 < n =< 7 – Critical e.g. localised closure of space
		Priority 2:	Any number – Important
		Priority 3:	Any number – Longer term/Maintenance
Yellow	**Limited concerns** but have questions on fire arrangements and details. Production may continue subject to agreement to address issues raised and prioritised action in report.	Priority 1:	0
		Priority 2:	Any number - Important
		Priority 3:	Any number – Longer term/Maintenance
Green	Generally, all clear subject to agreement to address prioritised comments. No critical visible defects and no visible immediate risks to workers. Production can continue.	Priority 1:	0
		Priority 2:	0
		Priority 3:	Any number – Longer term/Maintenance

Timing of Priority Actions		
	Priority 1:	Immediate Action
	Priority 2:	Within 6 weeks
	Priority 3:	Within 6 months and longer term actions (maintenance)

The purpose of this fire safety risk classification is to orientate the Assessor in assigning a risk classification of the building, but as stated earlier the Engineer/Assessor should use his/her judgement to assess whether the scoring reflects the perceived life safety condition of the building.

7.5 Electrical Risk Classification

Codes for Overall Assessment (of an individual factory building or factory building within a factory complex)		Prioritised Action	
Black	**Unable to complete full survey** and/or make reasonable conclusions due to lack of access, lack of co-operation, etc.	Priority 1:	Not Applicable
		Priority 2:	Important (arrange for complete survey to be made)
		Priority 3:	Not Applicable
		Priority 4:	Not Applicable
Red	**Immediate closure of factory building** or significant part of building recommended to close. Closure in accordance with protocol. Priority 1 items found across the in major sections of the building, therefore actions are required throughout the building.	Priority 1:	Critical: Close factory immediately
		Priority 2:	Important
		Priority 3:	Less important
		Priority 4:	Longer term/Maintenance
Red/ Amber	If the Assessor deems that there are important IMMEDIATE Priority 1 actions in limited or localised areas.	Priority 1:	Critical e.g. localised closure of space to protect workers
		Priority 2:	Important
		Priority 3:	Less important
		Priority 4:	Longer term/Maintenance
Amber	**No reason to suspend operations in the facility** but action may be required locally. Priority 2 items are the highest level found.	Priority 1:	Not Applicable
		Priority 2:	Important
		Priority 3:	Less important
		Priority 4:	Longer term/Maintenance
Yellow	**Limited concerns** but have questions on electrical arrangements and details. Priority 3 items are the highest level found.	Priority 1:	Not Applicable
		Priority 2:	Not Applicable
		Priority 3:	Important
		Priority 4:	Longer term/Maintenance
Green	Generally, all clear subject to agreement to address prioritised comments. No critical visible defects and no visible immediate risks to workers. Production can continue. Priority 4 items are the highest level found.	Priority 1:	Not Applicable
		Priority 2:	Not Applicable
		Priority 3:	Not Applicable
		Priority 4:	Longer term/Maintenance

Timing of Priority Actions		
	Priority 1:	Immediate Action
	Priority 2:	Within 2 weeks
	Priority 3:	Within 4 weeks
	Priority 4:	Within 2 months

8 Preliminary Safety Assessment Reports

8.1 Overview

Factory reports should be succinct, with an emphasis on graphical output with limited detailed text. The reports should follow the same format for all assessments and include specific text describing the assessment, requirements for follow on actions and outlining assessment limitations.

Prior to issue of the final report to LABS, a review shall be carried out by another suitable senior engineer and then approved by the Project Director. A proposed flowchart identifying the key steps in the quality and checking process is included in Appendix L.

8.2 Structural Safety Assessment Reports

A number of guidance documents are available for the preparation of the Structural Safety Assessment reports:

- Structural Safety Assessment Checklist (Appendix D)
- Structural Issues Categorization and Prioritization (Appendix G).
- Structural Safety Assessment Report - Template (Appendix J1) which is a blank template to be used in developing the report
- Structural Safety Assessment Report – Sample (Appendix K1) for reference and guidance on how the template should be used.

Reports will contain the following sections and a description for report writing based on a completed assessment is outlined below:

- Cover Sheet
- Contents page
- Executive Summary
- Description of the Factory Extents
- Description of the building structure
- Observations
- Priority Actions
- Summary of Priority Actions
- Detailed Engineering Assessment (if required)
- Limitations and Assumptions

8.2.1 Cover Sheet

The cover sheet should contain the name, address and coordinates of the Factory. Once the report is completed and prior to checking review the color classification should be indicated. The names of the assessment team, date of the assessment and a photograph of the building should also be included. On completion of the review, the revision number, date and names of checker and approver will be added by the checking engineer. Where more than one building is assessed and given a color classification, the most onerous of the color classifications is the one that should appear on the cover sheet for the factory.

8.2.2 Contents Page

The report contents will be standard for all reports, but a list giving the main report headings will be given with corresponding page numbers. Page numbers will have to be entered manually given that the FFC Actions PDF report has to be inserted under the 'Priority Actions' heading.

8.2.3 Executive Summary

The executive summary should include a description of the assessment activities, observations and priority actions. The following format should be adopted:

- On DAY xxth Month Year Assessor Name of Assessment Firm Name carried out a visual structural assessment of the Factory Name factory at the address and coordinates given on the cover page of this report.
- Describe Building Use.
- Describe what we did and did not inspect.
- Comment on status of drawings/reports provided – permit, architectural, engineer, as-built, other.
- Comment on validity of drawings. Are they close to the as built condition?
- If a factory contains a number of buildings provide a brief description of each.
- Label each building for ease of reference in the report. The overall structural color coding for the report will be based on the worst case building on the site.
- Comment on the factory color code: "The overall color code category of this factory is Color Code. This means that there are at least some actions which must be addressed within Time Period."

  Where multiple buildings occur in a factory the individual categories should be recorded here as follows:

  "The color code categories for the significant individual factory buildings assessed are outlined below:

  Building 1: Color Code

  Building 2: Color Code

  Building 3: Color Code
- List of key concerns noted: Highest priority concerns should be noted first. If there is a concern raised that brings a report to Category Amber or higher this should be highlighted in bold. This should be contained within the first two pages of the report. Then provide a schedule of additional concerns
- Comment on the level of housekeeping and maintenance demonstrated in the factory, based on the key concerns listed and other documentary evidence presented
- If a Detailed Engineering Assessment is required in a multi-building factory, be explicit about which building requires this. Also remember that a DEA must be for an entire building.
- Comment on need to suspend factory operations in part or all of factory if safety issues determined
- Comment on actions 'Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

- Comment on Limitations - ‘Our Limitations and Assumptions are also noted at the end of this report.’

8.2.4 Factory Extents

This section of the report should contain a graphical description of the building(s) and the extent of the assessed factory floors within the site. Google Maps images can be useful to provide a site plan for indicating the building extents. These images can be supplemented with site photographs, sketches and text to describe the following:

- Number of stories
- Approximate year of construction
- Phased development
- Movement and Construction Joints
- Floors occupied by the Factory in multi-use building
- Vertical or Horizontal extensions
- Status of Permit identification of unpermitted development
- Validity of drawings
- Any other features of note.

8.2.5 Structural System

This section of the report should contain a graphical description of the structure of the building(s). The structural system is likely to vary, especially in buildings where floors and extensions have been added. However, it should be possible to give a high level summary of each individual building with one page per building.

It is not necessary to provide very detailed descriptions of non-critical support

buildings which do not accommodate significant numbers of people.

Each system should be described to provide a summary of the following information:

- Structure Type – beam & slab/flat slab/other
- Stability System – moment frame/shear wall /bracing /other
- Number of stories
- Grid dimensions
- Typical column size at lower levels or critical areas
- Typical beam size
- Slab thickness
- Foundation type (if available)
- Position of joints
- Any other features of note

8.2.6 Observations

This section should contain a graphical representation of observations using a combination of photographs and sketches to describe the issues of concern. Each observation should be described separately, numbered sequentially from STR 1 to STR n. Where relevant and useful, a location for the observation should be provided by means of a marked up drawing, sketch or photograph.

The observations should be ordered in priority of highest concerns first (e.g., high working stress on columns at ground floor) followed by secondary issues of lesser concern.

8.2.7 Priority Actions

This section of the report is prepared through FFC, which is the database platform being used by LABS to collate all of the observations and actions in each factory. Separate training is being provided to assessors in the detail of how this is done.

For each observed item an action list should be prepared to identify the specific required follow up actions and prioritized as follows:

- Priority 1 (SP1) - Immediate Action, e.g., full or partial evacuation, cease construction, remove load etc. (red, amber action)
- Priority 2 (SP2) - Action to be completed within 6 weeks
- Priority 3 (SP3) – Action to be complete within 6 months.

The assessment team should consult with the color coding table and Appendix G2 when assigning priorities.

All actions are also to be categorized into issue and sub-issue type in accordance with the guidance provided in Appendix G1. Relevant clause numbers from the LABS Standard should also be included for reference to identify the relevant clause under which the action is being included.

The assessment teams will prepare the section entirely through FFC and use the PDF output report to insert into this section of the report.

If a Detailed Engineering Assessment (DEA) is required to establish a more in- depth check on the structure, a page describing the standard requirements for this work should be included at the end of this section. The standard text is included in the LABS Standard and it should not be altered. DEAs should include as actions in cases where the Structural Engineer has one or more observations which, on their own or in aggregate, raise serious concerns in relation to the structural safety of the building. A DEA should only be requested where this is the case.

8.2.8 Summary of Priority Actions

This is a one-page summary of the actions to be undertaken by the factory management, including the timelines. It is generated automatically from FFC as a table, which is to be inserted into the report.

8.2.9 Limitations and Assumptions

Our standard text on the assessment limitations and assumptions should be included at the end of the report. This text should not be modified.

In addition, the following disclaimer text from LABS should be included:

LABS disclaimer

*This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").*

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

8.2.10 FFC Uploads

In addition to uploading the Structural Safety Assessment Report to FFC, the following should also be uploaded:

- Column capacity checks
- Beam capacity checks

8.3 Fire Safety Assessment Report

A number of guidance documents are available for the preparation of the Fire Safety reports:

- Fire Safety Assessment Checklist (Appendix E)
- Fire Issues Categorization, Prioritization & Standard Actions document (Appendix H). An excel version of this document titled 'Fire categorization- actions.xlsx' is also available to assist with compiling the report.
- Fire Safety Assessment Report - Template (Appendix J2) which is a blank template that can be used in developing the report
- Fire Safety Assessment Report – Sample (Appendix K2) for reference and guidance on how the template should be used.

The factory building data noted by the Fire Safety Assessor following the checklist prompts, can be used together with the Fire Safety Report template and 'Fire categorisation-actions.xlsx' spreadsheet to complete the report.

Reports will contain the following sections and a description for report writing based on a completed Assessment is outlined below

- Cover Sheet
- Contents Page
- Executive Summary
- General Factory and Building Information
- Description of the Fire Safety measures
- Observations
- Priority Actions
- Summary of Priority Actions
- Limitations and Assumptions

Each of these sections is covered in more detail below by making reference to the prompts and tables provided in the Fire Safety Assessment Report – Template. Guidance as to what data is required in which tables, and some comment on the relevance of this data *is given in italics in the tables extracted from the template*.

8.3.1 Cover Sheet

The cover sheet should contain the name, address and coordinates of the Factory. Once the report is completed and prior to review the color classification should be indicated. Where more than one building is assessed and given a color classification, the most onerous of the color classifications is the one that should appear on the cover sheet for the factory.

The names of the Assessment team, date of the Assessment and a photograph of the building should also be included. On completion of the review, the revision number, date and names of checker and approver will be added by the checking engineer.

8.3.2 Contents Page

The report contents will be standard for all reports, but a list giving the main report headings will be given with corresponding page numbers. Page numbers will have to be entered manually given that the FFC Actions pdf report has to be inserted under the 'Priority Actions' heading.

8.3.3 Executive summary

The executive summary should include a description of the Assessment activities, observations and actions. The following format should be adopted:

- On DAY xxth MONTH YEAR Assessor Name of Assessment Firm Name carried out a visual electrical Assessment of the Factory Name factory at the address and coordinates given on the cover page of this report.
- Describe Building Use.
- Describe what we did and did not inspect.
- Comment on status of drawings/reports provided – permit, engineer, as built, other.
- Comment on validity of drawings – are they close to the as built condition?
- If a factory contains a number of buildings provide a brief description of each.
- Label each building for ease of reference in the report. The overall Fire Safety

- color coding for the report will be based on the worst case building on the site.
- Comment on the factory color code: "The overall color code category of this factory is Color Code. This means that there are at least some actions which must be addressed within Time Period."
- Where multiple buildings occur in a factory the individual categories should be recorded here as follows:
- "The color code categories for the significant individual factory buildings assessed are outlined below:
- Building 1: Color Code Building 2: Color Code Building 3: Color Code
- List of key concerns noted: Highest priority concerns should be noted first. If there is a concern raised that brings a report to status Red-Amber this should be highlighted in bold.
- Comment on the need to suspend factory operations in part or all of the factory if safety issues are determined.
- Comment on whether there are immediate actions required on Priority 1 issues which should be dealt with within 2 weeks, such as removing locks from Final Exit doors.
- Comment on the level of housekeeping and maintenance demonstrated in the factory, based on the key concerns listed and other documentary evidence presented.
- Comment on Limitations - 'Our Limitations and Assumptions are also noted at the end of this report.'

8.3.4 General Factory and Building Information

The information required for the General building description is common to all Structural, Fire Safety and Electrical Assessments, and may be obtained jointly before inspecting the buildings, at the initial factory management meeting.

8.3.4.1 General Factory information

A table is given indicating the minimum data to be noted for 'General factory Information', and is self-explanatory.

8.3.4.2 General Building Information

The General Building Information aims to capture all information about each building relevant to the Fire Safety Assessment of the factory. This information is captured in the following table:

Number of Buildings		*The number of buildings that will be assessed and given a Risk Category rating.* *Generally, this will include as a minimum all Production Buildings and some Storage Buildings.* *As guidance Storage buildings with over 50 occupants or greater than 1.500m^2 total (based on design density factor of 30m^2/person) shall be assessed and given a Risk Category.* *There will normally be other ancillary buildings (Generator, Transformer, Boiler, 1st Aid, Crèche, Pump rooms, small Stores, etc.) on the site, that will form part of the Fire Safety Assessment and which should be mentioned later. For these buildings, as well as Storage buildings less than 1.500m^2 in area, the assessors can use their discretion as to whether they should be given a Risk Categorization or not.*
Building Designation and Uses in Building/s	*Production xx*	*Give each building a label for future reference in the report and identify the use or uses of the building*
	Production yy	*ditto*
	Storage xx	*ditto*
	Other zz	*ditto*
Basement Floors	*State whether there is/are basement/s* *Indicate all buildings where basements are present using building labels identified above*	
Mezzanine floors	*State whether there is/are mezzanine floor/s* *Indicate all buildings where mezzanines are present, and at which floor levels*	
Stories above grade	*Production xx*	*Number of stories n; Ground +(n-1)*
	Production yy	*ditto*
	Storage xx	*ditto*
	Other zz	*ditto*
Height of Buildings (m)	*Production xx*	*Height (m) of top occupied floor above Fire Brigade access level*
	Production yy	*ditto*
	Storage xx	*ditto*

ºFloor Dimensions/ Areas	*Other zz Production xx*	*Ditto Width x length = area (m^2) for each*
		building
	Production yy	*ditto*
	Storage xx	*ditto*
	Other zz	*ditto*
Occupant Numbers	*Production xx*	*This needs to be broken down into occupancy by floor*
		For large areas floor occupancy may need to be broken down into occupancy per area/use
	Production yy	*ditto*
	Storage xx	*ditto*
	Other zz	*ditto*

Number of Work Shifts *State number of works shifts, and shift hours if appropriate*

Year of Construction *Year of construction for each building*

Type of Construction	*Production xx*	*Reinforced concrete, structural steel,*
		timber or describe combination, for
	Production yy	*each building* *ditto*
	Storage xx *Other zz*	*ditto* *ditto*

Additions/ Renovations *Note any additions/alterations to the building and the year in which they were made*

Floor Plans provided	*Production xx*	*Architectural drawings, Factory*
		Assessor's layouts, Planning layouts, or
		any other used as reference in the
	Production yy	*report.* *ditto*
	Storage xx *Other zz*	*ditto* *ditto*
Permits provided	*Note the permits that management could produce on the day of the Assessment.* *This should include items such as:* - *Planning Authority License to construct the factory buildings, with approval date* - *Fire Police report, with latest inspection date* - *Fire License, with validity date*	

Other Comments	*Any other characteristics not picked up in the table that may have relevance to the Fire Safety Assessment should be noted here.*

A graphical description of the buildings should also be presented here by making use of:

- Schematic layout of factory premises, in which the buildings being assessed could be indicated and labelled

  Typical floor plans were obtained prior to the inspection or at the management meeting. The different areas or uses that will be referred to in the report should be indicated and labelled on these.

- Sections in which the different uses on each floor should be identified and labelled.

8.3.5 Fire Safety measures

The description of the Fire Safety measures for buildings can be done by filling in the data noted during the Assessment in the tables corresponding to the checklist prompts (see Appendix H and 'Fire categorization-actions.xlsx' spreadsheet).

The report headings and sub-headings use the 'Issue Type' and 'Sub-Issue Type' headings from the checklist.

Use of Photos

The Fire Safety Report template provides some boxes under 'Fire Safety measures' in which Photos can be inserted to illustrate some of the descriptive text in the tables. The location or number of Figures used is left up to the discretion of the authors of the report - they can be inserted in any of the subsections above, but it is not essential here to insert any photos.

To save time in producing the report, the amount of photos could be minimized in this section. It is expected that when 'Observations' are discussed in a later section most of the observations noted will be accompanied by photos to illustrate the descriptions.

Tip on inserting photos: If using Word to produce reports, convert all photos to smaller size format or use the Windows Snipping Tool to insert them easily into boxes provided.

8.3.5.1 Occupancy Classification

The Occupancy Classification determines the fire safety measures that the LABS Standard requires, and should be identified for each significant building documented in the report, e.g.:

Production buildings - General Industrial Occupancy (Group G Industrial)

Warehouse buildings - Ordinary Hazard Storage (Group H Storage) Canteen buildings – Assembly

Dormitory buildings - Residential

8.3.5.2 Means of Escape

This section follows a sequence of provisions for horizontal escape, vertical escape and then final escape to outside and away from the building.

It is recommended that at least two diagrams are provided at the beginning of this section to make the description that follows easier:

- A diagram indicating Floor Exits from Typical Floor/s of Building/s. This diagram should also distinguish between room/area exits and Floor Exits, as requirements for each are different.

  A diagram indicating Final Exits from Ground Floor of Building/s. This diagram should also distinguish between room/area exits and Final Exits, as requirements for each are different.

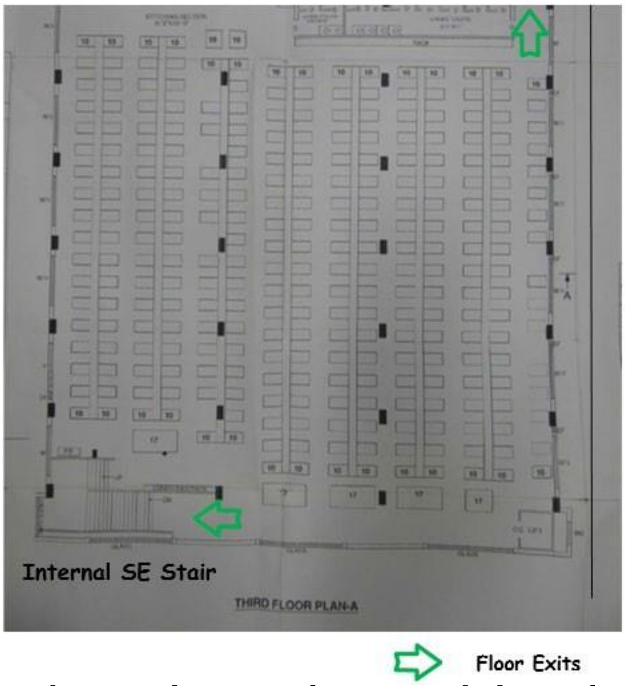


Figure 16 Schematic showing Floor Exits from Typical Floors of Building

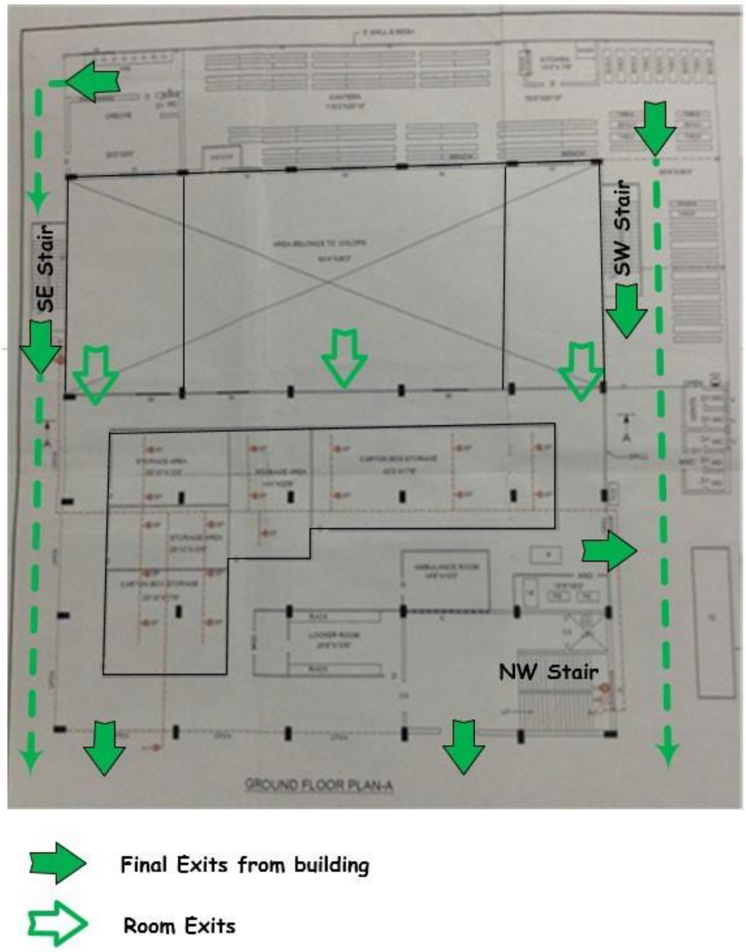


Figure 17 Schematic showing Final Exits from Ground Floor of Building/s and route away from building

For a single story building, this data can be shown on one drawing. These diagrams can be created quickly by using floor layouts collected during the Assessment and marking up relevant data.

These diagrams should also be used for labelling areas, stairs, exit numbers that can be referred to in the descriptions given in the data boxes.

The data tables from the Fire Safety Report template are reproduced below, with a short description of what information should be recorded here and for what purpose:

Floor Exits

This table aims to set out the data needed to assess whether the number and width of Exit Doors from any floor is adequate for the floor occupancies

Building/Floor/ Area	**Occupancy**	**Door width required**	**No. Exits provided**	**Total Door Width**	**Door Capacity provided**
Where there is more than one building each building should be identified separately. For multi-story buildings data for each floor of the building needs to be recorded	*Greater of occupants noted on Assessment (factory data or observed) and calculated using density factor x floor area*	*Occupancy x 5mm/per*	*No.*	*Sum of door widths*	*Total door width provided / 5mm/per*

Further points to note:

- When recording data for Ground Floor the contribution from occupants from any stairs discharging internally must be taken into account in assessing door capacities.

Following this the same exercise is carried out to assess whether the number and width of Exit Stairs from any floor is adequate for the floor occupancies and floor exits provided. Some points to note:

Building/ Floor/ Area	**Occupancy**	**Stair width required**	**No. Stairs**	**Total Stair Width**	**Stair Capacity provided**
As above	*As above*	*Occupancy x 7.6Mm /person*	*No.*	*Sum of stair widths*	*Total stair width provided / 7.6mm/per*

Once this data has been set out the report provides a table that looks at the travel distances to exits:

Alternative routes for escape provided from all areas	*Record either 'Yes' or indicate where there are areas where only one direction of travel is possible.*
Excessive travel distance to nearest floor exit	*Are there points where travel distances to the nearest exit exceed 61m (or 76m sprinklered)?* *Note also any travel paths that have components of travel greater than 15m (30m sprinklered) where only one direction of travel is possible (common path) before divergence to alternate routes*
Escape from Mezzanines	*One or more exits off mezzanines, and common path distance on mezzanine. Consider also the total distance from mezzanine to floor exits*

Escape Paths to Floor Exits

The aim of this section is to record the condition of the horizontal escape routes from all points on the floors to the floor exits.

It is not generally necessary to record this data on a floor-by-floor basis for the following sections, but if observations are noted that apply to only one particular area or building, the building/ floor/ area should be noted.

Escape paths of adequate widths from all areas	*Generally talking about aisles between workstations. Note any aisles on any part of the escape path of inadequate width (less than 915mm)*
Excessive dead ends to aisles or corridors	*Note whether there are any dead-end deviations of travel paths that exceed 15m*
Pathways clearly indicated on floor	*Condition of floor markings*
Escape paths clear of temporary obstacles	*Refers generally to uncontrolled storage, workstations invading aisles, or other items that could be addressed by better housekeeping*
Escape paths free of any permanent obstacles	*Permanent obstructions such as columns, machinery, heavy furniture that reduce the effective width aisles to less than allowable*
Doors on exit paths swing correctly in travel direction	*Doors between any point on the floor and the Floor Exit (Floor Exit doors covered later)*
Doors on exit paths are easily openable, no locking devices	*If there are locking devices, they must have lock override devices to allow opening from direction of travel.*

Exit Signage

This section deals with the signage provided to indicate paths to the Floor Exits from all points on the floor.

Clear floor signage indicating all escape paths	*Is floor signage provided, and condition of floor markings*
Evacuation pathways correctly sign posted	*Does the signage provide lead people correctly to the Floor Exits?* *Is there overhead signage provided at the end indicating changes of direction (normally at end of aisles between workstations)?*
Illuminated exit signs at all emergency exits	*Exit signs above all Floor Exit doors. Comment also on the size of these signs; are they appropriate to the size of the space?*
Signage consistent on all exit paths	*Is signage consistent on any one floor and throughout the building*

Floor Exit doors

This section deals with the doors to the Floor Exits, which are the doors leading to stairs, protected corridors or ramps providing exits from upper floors.

The aim of this section is to examine all Floor Exit doors at the upper levels. At Ground Floor level these doors may also be the Final Exit doors, which are dealt with later.

Floor exit door width, height adequate	*Comment on widths will be based on Door capacity data tabulated earlier; any other door dimension remarks to be noted here*
Floor exit doors swing correctly in travel direction	*Side swing doors or other types (sliding, shutters, etc.)*
Floor exit doors are easily openable, no locking devices	*Can the doors be locked, and if so, are they equipped with lock override device from inside?*

Exit Stairs

The report now assesses the 2nd component, the vertical part of the escape route, which generally comprises the stairwells:

Stair width adequate	*Comment on widths will be based on Stair capacity data tabulated earlier; any other stair dimension remarks to be noted here*
Tread/riser consistent and not too steep	*Note here whether there are any notable differences in steps in any one flight, and whether the stair tread/riser relationship makes the stair too steep (greater than 45°)*
Handrails provided both sides in all stairways	*Note whether provided or not*
All stairways lead directly to outside at discharge level	*Note whether there are stairs discharging internally or not. If they discharge into covered areas, that could be affected by fire/ smoke inside the building, they do not discharge to outside and this should be flagged up*

Number of stairs discharging inside building, unprotected distance from Final Exit	*The number of stairs that discharge into the accommodation at Ground level (permissible to have up to 50% discharging internally under certain conditions). If they do discharge inside, note use of area and distance to Final Exit.*
Stairs discharging inside lead into a protected corridor	*Note whether stairs discharging inside enter into a protected area before exiting outside*

Final Exits

The last component of the means of escape is the Final Exits to outside. This is treated separately to the Floor Exits because even though there are many common issues, the conditions and requirements differ.

Final Exit doors swing correctly in travel direction	*Side swing doors or other types (sliding doors, shutters, security gates, etc.)*
Final Exit doors easily openable from inside, override any security locking devices	*Can the doors be locked, and if so, are they equipped with lock override device from inside?* *Generally, at Ground level there will be a security requirement for lockable doors, so a push bar or similar arrangement will be required, which overrides any lock from inside.*
Final Exit doors open to outside	*Similar to that mentioned for stair discharge, do the exits lead to outside or into a covered area that could be affected by fire/ smoke inside the accommodation*
From Final Exit door, can people move safely away from the building	*Can people move directly away from the building subject to fire, or does it lead into a confined space such as an open corridor or alleyway that leads people in close proximity (less than 3m) to the façade for some distance before they can move away from the building.*
Protection of escape route outside required	*Where the escape path outside keeps people within 3m of the building facade, is it a solid fire rated façade barrier or are there unprotected façade openings along the route?*

8.3.5.3 Fire Safety Construction

The aim of this section is to identify construction requirements for fire rated protection of escape paths, compartmentation to limit the size of a fire and fire rated separation of high-risk areas from other usable space.

Protection of Vertical Openings

The most common types of openings that need to be assessed are the vertical openings between floors to accommodate stairs, lifts or services ducts.

Stairs connecting more than 2 floors need to be protected as a ‘place of relative safety’ in the vertical component of means of escape.

Enclosure of internal Stairs connecting more than 2 floors	***Indicate w***hich stairs this applies to and the extent of enclosure with fire rated construction.*
Self-closing doors to protected stairs	*The doorways into the stair enclosures need to be fire rated doors, opening in the direction of travel and with self-closing devices. Where there are no enclosures, there will be no doors; for existing enclosures the data on doors should be noted here.*
Unsealed penetrations in stair enclosures	*Where existing enclosures are present, this item notes the condition of the openings through the wall enclosure for ducts, electrical services or other penetrations. Are these openings properly sealed around the services with adequate fire stopping products?*
Protection of external stair from fire in interior	*External exit stairs also need protection from a fire inside the building. Note any openings in the façade wall with 3m of the path of the external stair all the way to ground.* *Doors to these stairs would also need to be fire rated and self-closing*
Protection of vertical service shafts passing through floors	*Shafts for vertical connection of services are common, and enclosed in fire rated walls.* *Access openings to these shaft ducts should also be fire rated.*
Protection of vertical service shafts passing through floors	*Shafts for vertical connection of services are common, and enclosed in fire rated walls.* *Access openings to these shaft ducts should also be fire rated.*
Fire rated separation of lifts shafts	*Lift shafts constitute other common vertical openings through floors, and need to be enclosed with fire rated construction*
Other vertical openings through compartment floors	*Other vertical openings should be noted (garment chutes, atrium, etc.) as well as the level of fire rated enclosure to prevent fire and smoke spread via these openings*
Protection of basement with FR lobby, walls and self- closing doors	*Basements need to be separated from the above ground floors with fire rated construction, and with lobbies to stair openings regardless of building height*

Separation of Occupancies

The main occupancy categories of the buildings are identified in 8.3.3.1 above. Where there are other occupancies, such as Offices or Dining areas, then where these do not meet the requirements for 'incidental occupancies' they should be identified here.

Storage areas are treated separately in the next section.

Use of space with area too great to be considered an 'incidental occupancy'	*Identify whether there are any areas of use on the production floor that, due to the use and area of that space, do not classify as 'incidental occupancies'. Such areas would need to be separated from the main occupancy with fire rated construction.*
Fire rated separating walls between different occupancies	*State whether other occupancy uses need to be separated from the main occupancy by fire rated construction*

Unsealed penetrations through separating walls	*Where fire rated enclosures are provided between occupancies, identify penetrations through these separating walls (doors, windows, ductwork, gaps between top of wall and ceiling, etc.) and state how these penetrations are protected.*

Storage Areas

Storage areas are much more prevalent in Garment, Apparel, Footwear, Bags and Accessories factories and subject to more variables to provide a more flexible approach to facilitate the production process and maximize the amount of unseparated storage allowed in existing buildings.

This section distinguishes between dedicated storage areas, which usually occupy significant floor areas, and temporary or 'in-process' storage that is more distributed over the production floor.

There are multiple factors that affect the amount of storage that can be accommodated in any one area, and the following table captures the information required to guide the Assessor as to whether remedial actions are required or not:

Storage Location	**Approx. area Storage (m^2)**	**Total Floor area (m^2)**	**FR enclosure**	**Sprinklered Floor**
Building			*Yes/No*	*Yes/No*
Floor - location			*Yes/No*	*Yes/No*

In-process or temporary storage can be left open to the production floor, subject to restrictions on the amount of accumulated storage in any one area. Where in

process storage has been identified as not meeting these requirements, but where in the opinion of the Assessor measures could be implemented to make it comply and avoid having to enclose it with fire rated construction, a description of these cases should be noted in the following table:

Location	**Description**
Building	
Floor - location	*e.g.,'In-process' storage far exceeding $23m^2$ in a non-sprinklered area along corridor adjacent to the Finishing area on the S side of 2^{ND} Floor. Estimated total area $60m^2$.*

Other High-Risk Areas

There are a number of uses that require fire rated separation from the production areas and escape paths under all circumstances.

If they are located inside the building, they must always be contained within a fire rated enclosure, if located outside the building fire rated separation is required where there is not at least 3m clear of any façade openings or clear of the required width of escape path.

The data for these areas is recorded in the following table:

Installation	Type	Location	Separated from Production Area	Separated from Exit Path
Generator	*Electric, Diesel, Gas*	*Describe location*	*Yes, how separated or No*	*Yes, how separated or No*
Boiler	*ditto*	*ditto*	*ditto*	*ditto*
Transformer	*ditto*	*ditto*	*ditto*	*ditto*
Compressor	*ditto*	*ditto*	*ditto*	*ditto*
Chemicals Storage	*ditto*	*ditto*	*ditto*	*ditto*
Other	*ditto*	*ditto*	*ditto*	*ditto*

Structure and Finishes

Protection of the structure is more relevant to steel structures than to concrete structures.

Structural Fire Protection	*For RC structures it is assumed that the concrete cover to the reinforcement provides sufficient fire protection to the structure.* *For steel structures a note should be made as to whether fire protection is observed or not, and what type if possible*
Wall Finishes	*Normally brickwork, plaster/ paint* *Record if any wall finish appears to be flammable and that may not meet the fire spread requirements of the LABS Standard for wall finishes*
Ceiling finishes	*Normally brickwork, plaster/ paint* *Record if any wall finish appears to be flammable and that may not meet the fire spread requirements of the LABS Standard for ceiling finishes*

8.3.5.4 Fire Safety Systems

In the Fire Safety Report, the type and coverage of the Detection and Alarm systems are recorded. More detail of the wiring and back-up supply will be covered by the Electrical Report.

Any variations across different buildings, floors or areas should be noted:

Fire Detection types	*Typical types to note here would be Point Detectors (battery operated), Smoke Detectors, Beam Detectors, Heat Detectors, etc.*
Fire Detector coverage	*Does coverage of detectors appear sufficient to meet LABS Standards spacing requirements?* *Note whether detection provided in enclosed spaces within the main floor area*
Fire Alarm types	*Typical types to note here would be Sounders, Sounder with Visual, Voice Alarm, etc.*
Fire Alarm coverage	*Does coverage by alarms provided appear sufficient to meet LABS Standards spacing requirements?* *Based on test carried out on the system, comment on audibility throughout the area tested.* *Are there enclosed areas, or areas with high background noise that would need additional alarms?*
Fire Detection and Alarm back-up power	*State what was learned during the Assessment, refer to Electrical report for more detail*

Emergency Lighting at Exits	*Record whether all Floor Exits and Final Exits were equipped with emergency lighting that illuminated the path in the vicinity of the exit*
Emergency Lighting of escape paths	*Comment on distribution of the emergency lights remote from the exits and state whether the distribution appeared to be sufficient to provide adequate lighting on all parts of the escape paths.* *A test of the emergency lighting will be carried out, but that will not provide meaningful information on lux levels*
Emergency Lighting back- up power	*State what was learned during the Assessment, refer to Electrical report for more detail*

8.3.5.5 Provisions for Fire Fighting

Water Supply		*Municipal network, Site storage or a combination.* ***Is the storage amount reduced by depending on a guaranteed municipal supply or is municipal supply only used for topping up site storage?***
Water Storage		*State what volumes of water for firefighting are stored on site, and location of storage* *Where there is ground level as well as roof level storage, volume available at Roof level must be given.* ***The fire hose reel system is considered as part of the life safety systems and therefore the Assessor needs to determine whether there is enough water (with associated pumping facilities) for this system***
Fire Pumps	**Type**	*Mention the type of pumps provided:* - *to get water into high level storage* - *booster or jockey pumps to maintain pressure in* ***hydrant, hose reel and sprinkler system (if installed)***
	Capacity	***- record capacity of pump; flow (lpm) and pressure (kPa)***
	Back-up	*State what was learned during the Assessment* *back up pumps at low and high level* ***refer to Electrical report for more detail on wiring, activation of pumps***
Hydrants		*Refers to external hydrants at ground level, and outlets for hydrant hoses inside the building, normally near exits or stairs, on landings or half-landings.* ***State locations and approx. diameters (normally ~75mm) Do they appear sufficient to give full floor coverage?***
Fire Hoses		*Fire Hose should be connected to water supply and under pressure. Try and note a pressure reading on the system* *State locations and approx. diameters* *Fire Hoses are considered a part of the life safety measures so they should be connected to a system with a stand-by pump supply.*

		State what was learned during the Assessment, refer to Electrical report for more detail on wiring, back-up to pumps
Handheld Fire Extinguishers (HHFE)		*State type of extinguishers observed and whether tags show recent maintenance Assessment dates.* *Comment on the observed distribution of the extinguishers and state whether the distribution appeared to be sufficient to comply with LABS Standard requirements for fire extinguisher coverage*
Automatic suppression system		*Note type and location of any automatic extinguishing systems* *Where provided, mention whether there is full floor coverage or only partial coverage. If partial coverage, is protected area separated from non-protected areas with fire rated separating enclosure?*
Access for Fire Fighting vehicles		*Mention perimeter access provided for fire tenders; access with sufficient clear width and height required for fire tender access* *Note where internal hydrant connection points are at Ground level, and access for the Fire Services to those points*

8.3.5.6 Management and Housekeeping

The aim of this section is to record how well the facility appears to be managed, and the rigor with which maintenance of fire safety systems is carried out.

Legal Documents	*It should be noted whether the factory has a Fire License, even though this may not reflect the observed condition of the buildings.* *In most jurisdictions the Fire Police report should indicate instructions for improvements to fire safety systems given by the local authority.*
Emergency Plan	*Each factory should have an Emergency Plan in which responsibilities for different actions in the event of an emergency are assigned.* *Note things such as the existence of this Emergency Plan and whether responsibilities have been assigned.* *Emergency layout panels posted at each floor exit could also be mentioned, and information from the Emergency Plan contained on these panels such as (phone numbers, responsible person for floor, etc.)*
Fire drills	*Note whether Fire Drills have been documented, which employees participated and the date of the last recorded fire drills*
Fire Safety Training	*Note what training has been provided to staff for 1st Aid firefighting, and whether people responsible for actions identified in the Emergency Plan receive training to carry out those actions.*

Maintenance records for fire safety systems	*Maintenance and testing records of the Fire Safety systems are to be noted here for the following systems as well as dates for last documented tests:* - *Alarm and Detection system* - *Emergency lighting system* - *Water pumps* - *Back-up power activation* *Cause and effect testing should also be noted e.g. test that activates detector to see that alarms and pumps are activated automatically*
Housekeeping	*Any other documentation that the factory may provide to demonstrate how all fire safety measures are implemented or maintained.* *Mention also the general state of housekeeping observed during the Assessment:* - *Are escape routes generally clear of obstacles?* - *Are escape stairs kept free of stored goods?* - *Is storage maintained in designated areas or untidily distributed around the production floor?*

8.3.6 Observations

This section should describe observations using a combination of text, photographs and sketches. Each observation should be described separately, numbered sequentially from FIRE-1 to FIRE-n. Where relevant and useful, a location for the observation should be provided by means of a marked up drawing, sketch or photograph.

Non-compliances that were noted during the Assessment will be noted under Observations in the formatted table, and the first line provides boxes for the Observation Reference No., Issue Type and Sub-Issue Type.

The next line provides space to describe the Observation and boxes are provided below to insert photos to assist with the description and location of the issue.

A sample Observations table is given below, with some tips on how to go about entering the data:

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-xx *Use sequential numbering*	*From column C in the 'Fire categorization actions' excel spreadsheet choose the relevant Issue Type*	*From column E in the 'Fire categorization actions' excel spreadsheet choose the relevant Sub-Issue Type*
Observation		**Building** *Give Building/s reference/s here (for buildings identified for Risk Categorization)*
In many cases, you should find relevant text in column F in the 'Fire categorization actions' excel spreadsheet under Sub-Issue Detail that provides a broad description of the Sub-Issue. *This can be inserted into the Observation Description box, and then elaborated on to describe the observation as it relates to this factory.*		

<table>
<tr><td colspan="2">If no appropriate text is found in the ‘Fire categorization actions’ excel spreadsheet, then the observation can simply be described based on what was observed.</td></tr>
<tr><td>Figure 20 Each figure to be given a descriptive title</td><td>Figure 21 Each figure to be given a descriptive title</td></tr>
</table>

8.3.7 Priority Actions

This section of the report is prepared through FFC, which the database platform being used by LABS to collate all of the observations and actions in each factory. Separate training is being provided to assessors in the detail of how this is done.

Guidance is given in the appendix, for the way in which these actions and prioritizations will be recorded.

In Appendix H tables are given in the ‘Fire Issues Categorization, Prioritization & Standard Actions’ document for each Issue Type and Sub-Issue Type for Fire Safety issues, and then possible typical actions that may be needed to address these issues are given. All actions are also to be categorized into issue and sub- issue type in accordance with the guidance provided in Appendix H.

An excel version of this document titled ‘Methodology Fire Checklist Actions and Scoring.xlsx’ is also available to assist with compiling the report, which provides standard text for many of the typical actions likely to be needed.

Alongside each action listed is a Priority that can be used as guidance for each action, for the building or space under consideration. The basis for the priorities given in the table are based on the following principles:

- Priority 1 (FP1) - Actions that are perceived to immediately affect the ability of people to evacuate the building safely in the event of fire, and attention should be given to addressing them from the outset. Immediate Action e.g., partial/full closure, localized closure of space, etc.
- Priority 2 (FP2) - Actions that are perceived to have a delayed or lesser effect on people evacuating the building safely in the event of fire. Actions to be completed within 6 weeks.
- Priority 3 (FP3) - issues that are perceived to have less of an impact on their own to evacuate the building safely in the event of fire. Actions to be completed within 6 months.

The Fire Safety Assessor must always be aware that some issues, in a typical case may be given a lesser priority rating, but under other circumstances may be more critical. It is left to the Assessor’s engineering judgement to modify any priority rating if it does not appear to reflect the impact that the deficiency may cause.

A list of actions must be developed for each building that will get a risk categorization (those buildings defined in the first table of the report), as the risk classification is calculated from the number and priority of actions assigned to each building. The assessment teams will prepare the section entirely through FFC and use the PDF output report to insert into this section of the report.

The actions given in the appendix, are not an exhaustive list of actions corresponding to all issues that may be identified by the Fire Safety Assessor, but rather a list of typical issues and remedial actions. This will serve to standardize the way in which actions are recorded as far as possible, which will assist in the recording and tracking of actions over a large number of factories.

The Fire Safety Assessor will be responsible for judging the adequacy of the

actions to address the non-compliances observed, and should add their own actions to this list of 'typical remediation actions' if and as necessary.

The final Risk Category for the Factory will be that of the building that gets the highest Risk Category e.g., a factory with two Production Buildings getting a 'Yellow' and 'Amber/Red' classification, and one Warehouse Building getting an 'Amber' classification, the Factory would be 'Amber/Red'.

8.3.8 Summary of Priority Actions

This is a one-page summary of the actions to be undertaken by the factory management, including the timelines. It is generated automatically from FFC as a table, which is to be inserted into the report.

8.3.9 Limitations and Assumptions

Our standard text on the Assessment limitations and assumptions should be included at the end of the report. This text should not be modified.

In addition, the following disclaimer text from LABS should be included:

LABS disclaimer

*This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").*

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

8.4 Electrical Safety Assessment Report

A number of guidance documents are available for the preparation of the Electrical Safety Assessment reports:

- Electrical Safety Assessment Checklist (Appendix F)
- Electrical Issues Categorization and Prioritization (Appendix I).
- Electrical Safety Assessment Report - Template (Appendix J3) which is a blank template to be used in developing the report
- Electrical Safety Assessment Report – Sample (Appendix K3) for reference and guidance on how the template should be used.

Reports will contain the following sections and a description for report writing based on a completed assessment is outlined below:

- Cover Sheet
- Contents Page
- Executive Summary
- Description of the Factory Extents
- Description of the building electrical systems
- Observations
- Priority Action List
- Summary of Priority Actions
- Limitations and Assumptions

8.4.1 Cover Sheet

The cover sheet should contain the name, address and coordinates of the Factory. Once the report is completed and prior to checking review the color classification should be indicated. The names of the assessment team, date of the assessment and a photograph of the building should also be included. On completion of the review, the revision number, date and names of checker and approver will be added by the checking engineer. Where more than one building is assessed and given a color classification, the most onerous of the color classifications is the one that should appear on the cover sheet for the factory.

8.4.2 Contents Page

The report contents will be standard for all reports, but a list giving the main report headings will be given with corresponding page numbers. Page numbers will have to be entered manually given that the FFC Actions pdf report has to be inserted under the 'Priority Actions' heading.

8.4.3 Executive Summary

The executive summary should include a description of the assessment activities, observations and actions. The following format should be adopted:

- On DAY xxth Month Year Assessor Name of Assessment Firm Name carried out a visual electrical assessment of the Factory Name factory at the address and coordinates given on the cover page of this report.
- Describe Building Use.

- Describe what was and was not inspected.
- Comment on status of drawings/reports provided – permit, engineer, as built, other.
- Comment on validity of drawings –are they close to the as built condition?
- If a factory contains a number of buildings provide a brief description of each.
- Label each building for ease of reference in the report. The overall structural
- color coding for the report will be based on the worst case building on the site.
- Comment on the factory color code: "The overall color code category of this factory is Color Code. This means that there are at least some actions which must be addressed within Time Period."
- Where multiple buildings occur in a factory the individual categories should be recorded here as follows:

"The color code categories for the significant individual factory buildings assessed are outlined below:

Building 1: Color Code

Building 2: Color Code

Building 3: Color Code

- List of key concerns noted: Highest priority concerns should be noted first. If there is a concern raised that brings a report to status amber this should be highlighted in bold. This should be contained within the first 2 pages of the report. Then provide a schedule of additional concerns
- Comment on the level of housekeeping and maintenance demonstrated in the factory, based on the key concerns listed and other documentary evidence presented
- Comment on actions 'Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted. '
- Comment on need to suspend factory operations in part or all of factory if safety issues determined
- Comment on Limitations - 'Our Limitations and Assumptions are also noted at the end of this report.'

8.4.4 Factory Extents

This section of the report should contain a graphical description of the building(s) and the extent of the assessed factory floors within the site. Google maps images can be useful to provide a site plan for indicating the building extents. These images can be supplemented with site photographs, sketches and text to describe the following:

- Number of stories
- Approximate year of construction
- Phased development
- Number of substation and general location
- Number of generators and general location
- Floors occupied by the Factory in multi-use building
- Validity of drawings

- Any other features of note.

8.4.5 Electrical Systems

This section of the report should contain a graphical description of the building(s) electrical systems. The following headings should be used in the report:

- Supplies to Life Safety System
- Earthing and Bonding
- Generators
- Substations
- Distribution

8.4.6 Observations

This section should contain a graphical representation of observations using a combination of photographs and sketches to describe the issues of concern. Each observation should be described separately, numbered sequentially from Elec-1 to Elec-n. A location for the observation should be provided by means of a marked up drawing, sketch or photograph. A summary of the actions required should also be provided (more detailed information will be provided in the priority actions section of the report).

8.4.7 Priority Actions

This section of the report is prepared through FFC, which the database platform being used by LABS to collate all of the observations and actions in each factory. Separate training is being provided to assessors in the detail of how this is done.

For each observed item an action list should be prepared to identify the specific required follow up actions and prioritized as follows:

- Priority 1 (EP1) - Immediate Action, e.g., full or partial shutdown of equipment,
- Priority 2 (EP2) - Action to be completed within 2 weeks
- Priority 3 (EP3) - Action to be complete within 4 weeks.
- Priority 4 (EP4) - Action to be complete within 2 months.

The assessment team should consult with the color coding table and Appendix I2 when assigning priorities.

All actions are also to be categorized into issue and sub-issue type in accordance with the guidance provided in Appendix I1. Relevant clause numbers from the LABS Standard should also be included for reference to identify the relevant clause under which the action is being included.

The assessment teams will prepare the section entirely through FFC and use the PDF output report to insert into this section of the report.

8.4.8 Summary of Priority Actions

This is a one-page summary of the actions to be undertaken by the factory management, including the timelines. It is generated automatically from FFC as a table, which is to be inserted into the report.

8.4.9 Limitations and Assumptions

Our standard text on the assessment limitations and assumptions should be included at the end of the report. This text should not be modified.

In addition, the following disclaimer text from LABS should be included:

LABS disclaimer

*This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").*

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

Appendix A

Pre-Assessment Preparation

A1 LABS Initiative Safety Assessment Questionnaire

Introduction

Dear Sir/Madam, we plan to visit your factory, in the near future, to study the structural, fire and electrical condition of the building(s) and assess all areas of the building(s).

The visit will be carried out by Structural, Fire and Electrical Engineers representing the LABS initiative.

We would appreciate if you could please answer the following questions in this pdf form below and return to us within 5 working days of the proposed visit.

If there are a number of buildings in the factory compound, please copy this form and fill out Sections 2 & 3 for EACH building. Please number or name each building.

Questions

Section 1: Factory Address, Ownership and Number of Buildings

Your Factory Name: ☐

Full Address of Factory: ☐

☐

☐

Factory Coordinates: (see guidance) ☐

Telephone No.: ☐

Email: ☐

Are you the Owner of Building or a Tenant? ☐

If a tenant, please indicate the type of tenancy in the building ☐ Single tenancy building ☐ Multiple tenancy building

Building Owner Name: ☐

Telephone No.: ☐

Email: ☐

Section 1: (Continued)

Number of Buildings in the Factory Compound? [ ]

(Where more than 1 building is in the Factory Compound, a Site Plan in PDF shall be returned with this Questionnaire, identifying all of the individual buildings recorded below.)

Building 1:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 2:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 3:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 4:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 5:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 6:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 7:

Name/Use of Building: [ ] Number of floors: [ ]

Plan Area of Typical Floor Plate (sq. meters) [ ]

Building 8:

Name/Use of Building: | | Number of floors: | |
Plan Area of Typical Floor Plate (sq. meters) | |

Building 9:

Name/Use of Building: | | Number of floors: | |
Plan Area of Typical Floor Plate (sq. meters) | |

If there are a number of buildings in the factory compound, please copy this form and fill out Sections 2 & 3 for EACH building. Please number or name each building.

Section 2: Factory Details

Building Number or Name:

No. of Basements:

No of Floors: (including ground floor and roof [if used])

Do you occupy all floors?

If not, who occupies the other floors and what do they do:

Are all floors accessible for survey:

If not, why:

For each floor, please describe the activities on that floor: (e.g. Level 1 - 3 Lines of Sewing, Cutting and Storage)

Section 3: Factory Documentation

What is the permitted use of the building?

Is planning permit in place?

Permit Number / Details:

Is construction permit in place?

Permit Number / Details:

Is occupation permit in place?

Permit Number / Details:

Number of Floors Permitted:

Are all floors designed for factory use?

If not, please explain:

Will planning permit and approval details be available by the survey date?

Will construction permit and approval details be available by the survey date?

Will occupation permit and approval details be available by the survey date?

Have there been any recent additions or refurbishments, extensions, addition of floors or are there any planned?

If yes, please explain:

Have you carried out any structural repair work after construction? (i.e., cracking repair, re-plastering work)

If yes, please explain, and highlight these areas during the survey:

Name of Original Structural Engineer:

Telephone No.:

E-mail:

Can Original Structural Engineer attend Site during our Site Visit?

Name of Original Electrical Engineer:

Telephone No.:

E-mail:

Can Original Electrical Engineer attend Site during our Site Visit?

Name of Building Architect:

Your Name:

Your Role:

Date:

Note: Please save this PDF Form using your Factory Name and Building Number / Name (where appropriate) as the file name and return by e-mail. Thank you for your cooperation.

A2 LABS Initiative Safety Assessment Checklist

Documentation Checklist

Please have the following documents available at the factory for the Assessment Team. Please also issue electronic copies As- Built drawings in PDF when returning the Pre-Assessment Questionnaire (5 working days in advance of proposed visit).

Architect As - Built Drawings	☐	2 no. copies at full scale or A3 (1 copy for the assessment team to take away)
Structural and Electrical As - Built Drawings	☐	2 no. copies at full scale or A3 (1 copy for the assessment team to take away)
Site Plans:	☐	12 no. copies at full scale or A3

Please ensure that the Building Engineer has visited the factory to ensure the As-Built Drawings represent the as constructed state of the building.

All Relevant Permits:	☐	1 no. copy of each permit
Material Test Certificates (Concrete Cube Tests, Reinforcing Steel Tests, Structural Steel material certificate, Weld Testing certificates etc...)	☐	1 no. copy at A4 or A3
Soil Investigation Report:	☐	1 no. copy at A4 for assessment team to take away
Declaration of Building Safety/Loading Certificate:	☐	Signed by Building Engineer
Previous Building Inspection Reports:	☐	1 no. copy at A4 per inspection
Fire safety Occupational Reports:	☐	1 no. copy at A4 per inspection

Structural Information
Loading Plans and Loading Information:

Please be prepared to share any information and answer questions on the following issues

- ☐ Structural / Sketches / Calculations indicating allowable loading on each floor (Load Plans).
- ☐ All areas of loading heavier than workshop, sewing, cutting and general operative activities e.g. material storage, pre-order delivery storage areas, temporary and permanent water tanks, generators, boilers etc.
- ☐ Please advise on how floor loading is controlled. By limiting height or load zones?
- ☐ Please advise on any fuel storage areas in the building to fire.

Fire Information

Please be prepared to share any information and answer questions on the following issues

- ☐ Fire Safety Annual Inspection Reports
- ☐ Fire Systems Maintenance Records
- ☐ Municipal water supply from mains
- ☐ Advise on water storage supply facilities for premises
- ☐ Advise on backup power supply for emergency systems
- ☐ Nearest Fire Station and expected response time for Fire Brigade
- ☐ Emergency Evacuation drills
- ☐ Please advise on any fuel storage areas in the building.

Electrical Information

Please be prepared to share any information and answer questions on the following issues

- ☐ Automatic Fire Alarm System inspection and maintenance records

Inspection and/or testing records for;

- ☐ Lightning Protection
- ☐ Switchgear
- ☐ Transformer
- ☐ Generator
- ☐ Earthing

Assistance Required from Factory:

- Provision of safe access to all areas of factory
- Provision of suitable A-frame ladder
- Attendance by competent person to provide access to electrical panels and equipment We draw the Factory's attention to the risk posed by electric shock and arc flash and the requirements of NFPA 70E.
- One day prior to the visit all flash guards in electrical panels shall be safely removed. This shall normally be done while the panel is isolated (switched off). No works shall be carried in or on panels while flash guards are removed. All flash guards to be removed to enable full thermographic survey to be carried out. After the visit all flash guards to be reinstalled.
- Possible lifting of ceiling tiles locally by factory staff
- Removal of small areas of render to concrete elements by factory staff (hammer and chisel will be required)
- Removal of small areas of paint to steelwork elements by factory staff (paint scraper and blow torch will be required)

Note: These documents should be available for all buildings in the Factory Compound.

A3 LABS Initiative Safety Assessment –Pictorial Guide

A GUIDE TO BUILDING SURVEY ACTIVITIES

Meet the factory owner

Review the questionnaire and engineer’s drawings

Make assessments from outside

With a camera and binoculars

Take photos of the building

Measure the building with:
A laser measure

A tape measure

Inspect the bottom of slabs

Lift ceiling tiles if needed

Check reinforcement

With a Ferro Scanner

With a Cover Meter

Check concrete

Test with the Rebound Hammer

Thermographic Scanning

Using an Infra-Red camera, scan electrical equipment, operating at normal conditions.

Identify connections operating at a higher than normal temperature.

Appendix B

Assessment Testing Equipment

B1 Ferroscan

Ferroscan

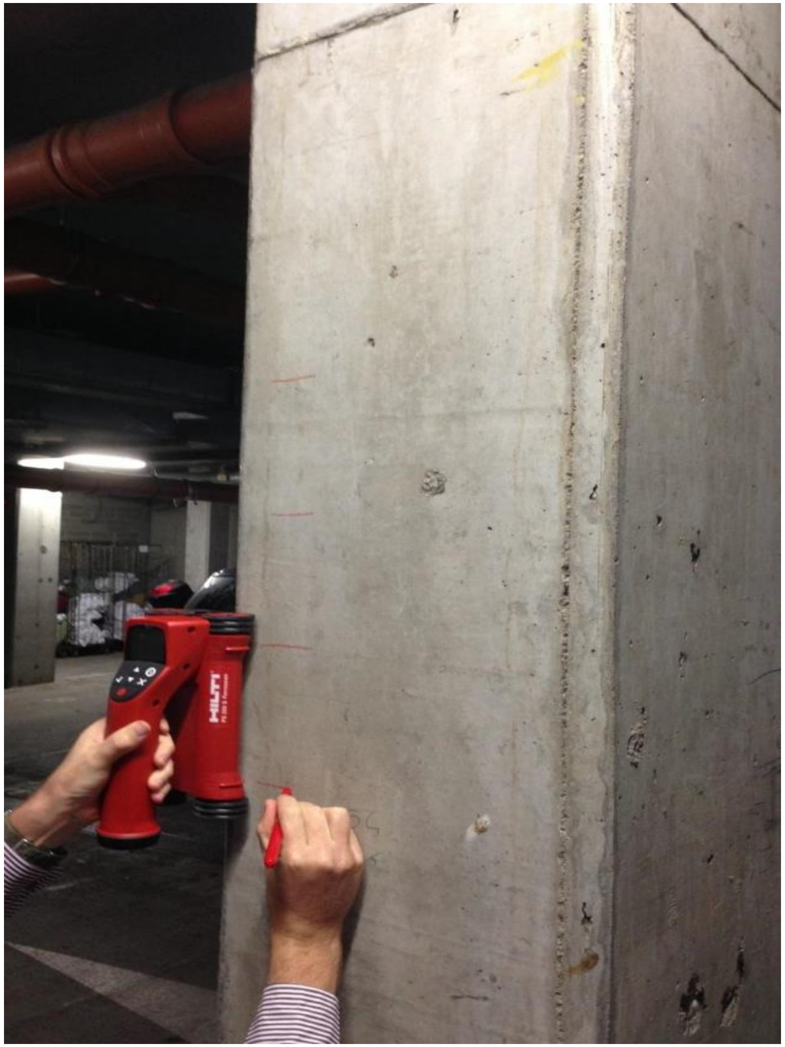
This equipment if used carefully can give an indication of what steel reinforcement is inside a concrete element.

We are using the latest technology, PS250 from Hilti which allows us to estimate on a single concrete face:

- number and location of bars
- bar diameter
- concrete cover

Note that the results are estimates and should be interpreted using your sound engineering judgement.

Outline guide on using this equipment follows…

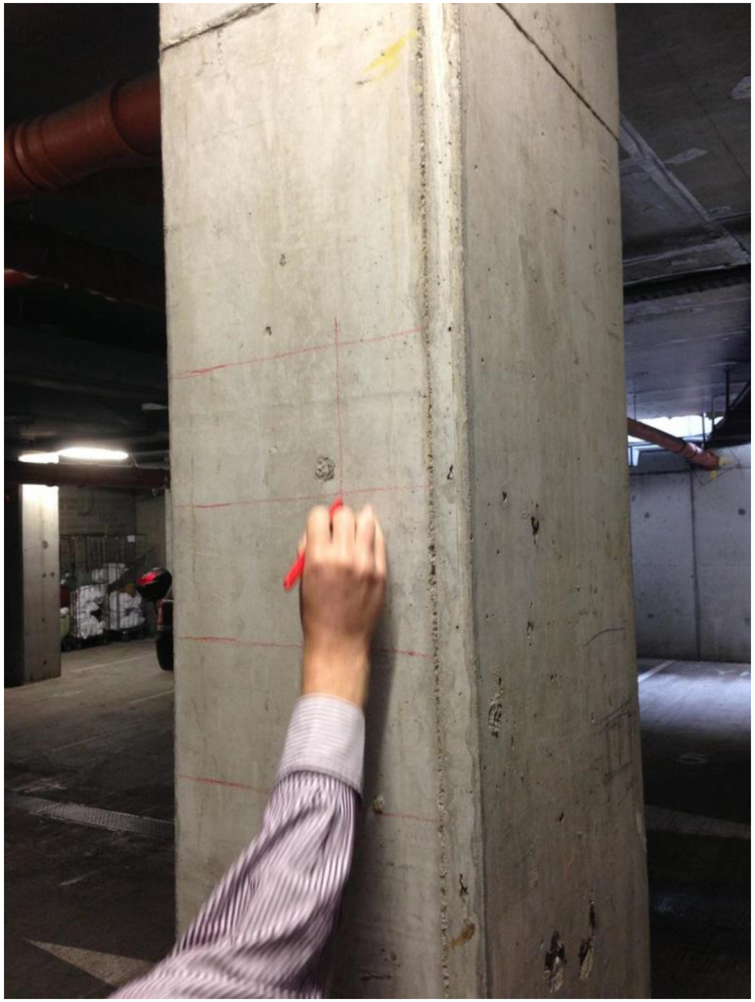


Step 1 Horizontal Guidelines

Create horizontal guidelines on surface of concrete using the lugs on the scanning device (150mm apart)

Tips:

- When scanning columns, scan as high as you can to avoid long starter bars/laps (which will distort bar diameter readings)
- Using "Image Scan" you will scan four rows horizontally



Step 2 Vertical Guidelines

Mark vertical guidelines on the surface of the concrete

Tips:

- For narrow column as shown here, a single vertical scan is sufficient to pick up the shear link steel
- The vertical main steel is picked up by the horizontal scan

Step 3 Image Scan”

I. Turn on the machine using the Button

II. Select the “Image Scan” option as shown in the photo by using the arrow buttons and the 

Tips:

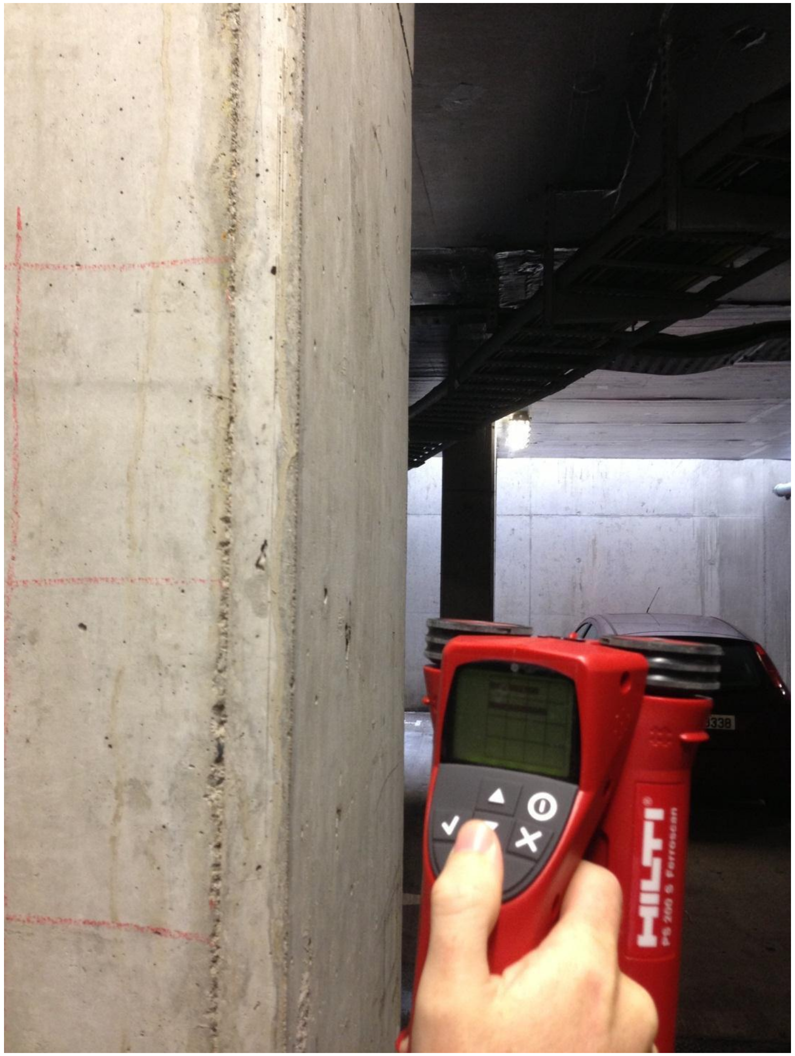
- “Image Scan” is recommended as it allows
4x4 scan grid (600 x 600mm area) and gives details for bar size and cover
- “Quick scan” is a single row and gives indication of steel with cover, but not diameter
- The third option is a collection of 9 images
scans to cover an area of 1.8 m x1.8m

I. Place the scanner such that

- the center is in line with the outside face of the column (there is a plastic lug at the center on the top face of the scanner which indicates where the scan starts)
- the plastic lug on the side of the scanner is lined up with the guideline (see photo below)

II .Press the button  to hear the “beep” which starts the scan. Roll the scanner carefully sideways travelling from left to right over the column (take ~5 seconds to scan 600mm)

Step 4 Horizontal Scan Row 1 START



Roll off the column. If you have scanned 600mm the scanner will stop automatically. If not, you should press the button to hear to "Beep" which stops the scan.

Tips:

- If you are not happy with your scan (i.e. you didn't keep the wheels straight to the guideline, you can cancel that row by pressing the button, and starting Step 4 again

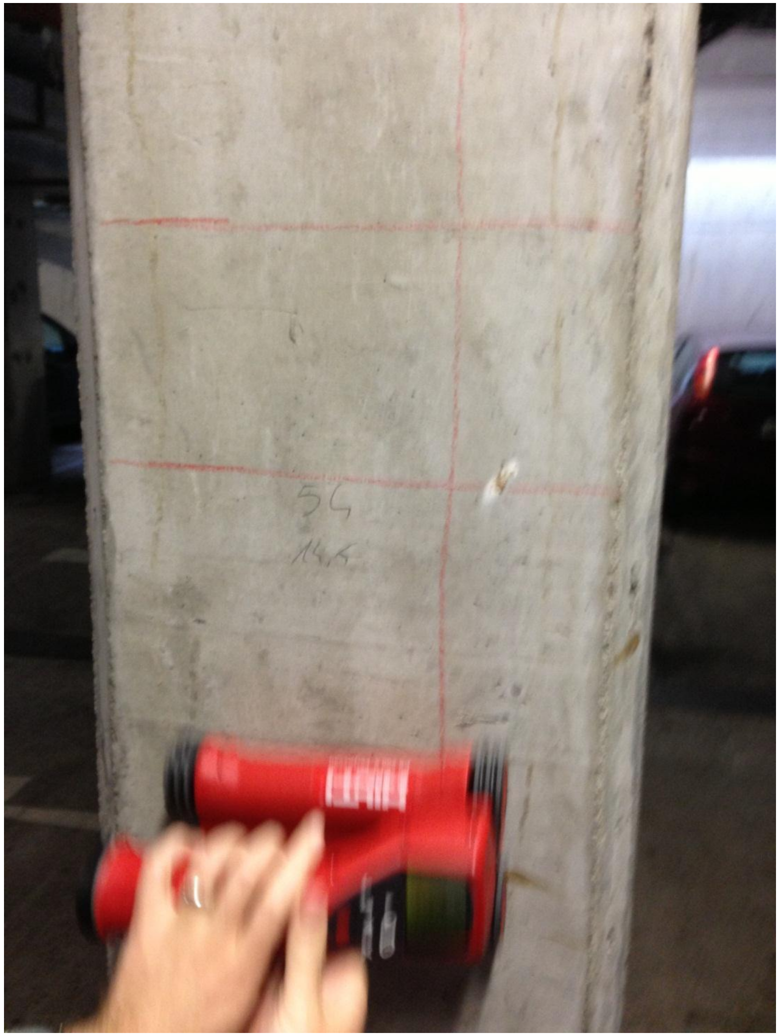
Step 5 Horizontal Scan Row 1 END

Step 6 Complete Horizontal Scans

Repeat for rows 2, 3, and 4, following the guidelines carefully

Tips:

- On completion of the first row, the scanner sets itself automatically for the next row scan, you need to press the button  to start the scan when you are ready to roll.



The scan strip is indicated  by a
Repeat the same process as for horizontal scans for each strip travelling from top to bottom

Tips:

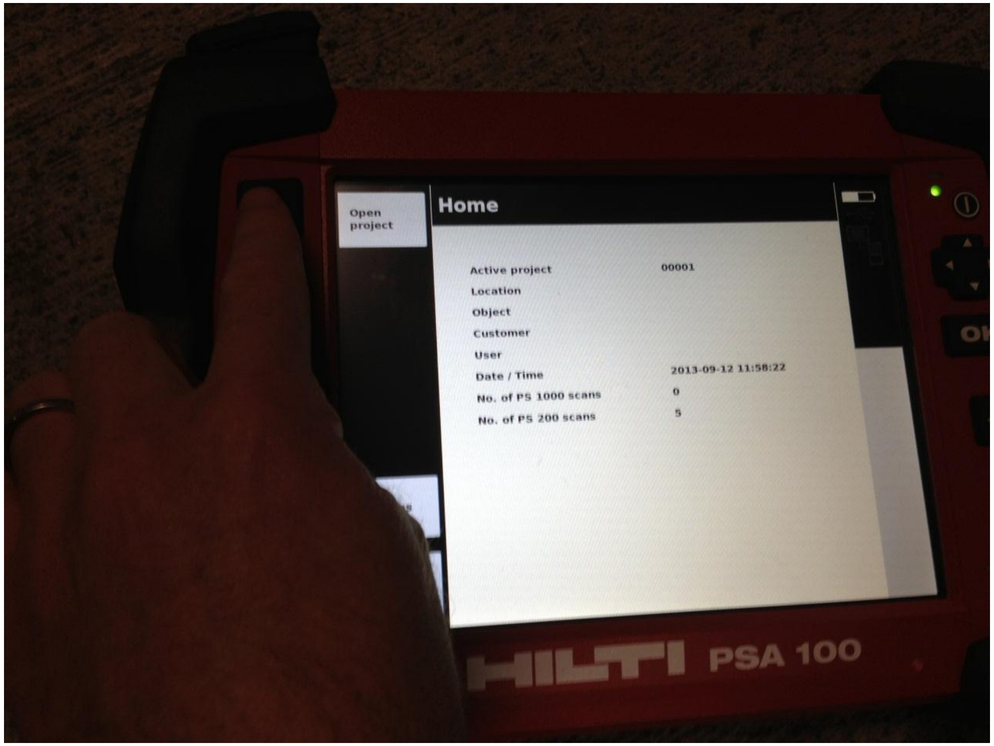
- If you only want to scan a single row the middle of the column, press the  button twice to skip a row

Step 7 Vertical Scans

Step 8 Complete Scan

On completion of all rows and strips, press the  button to complete image scan.

You will then be back at the home screen where you will see you scan has registered as one of nine (capacity of scanner)

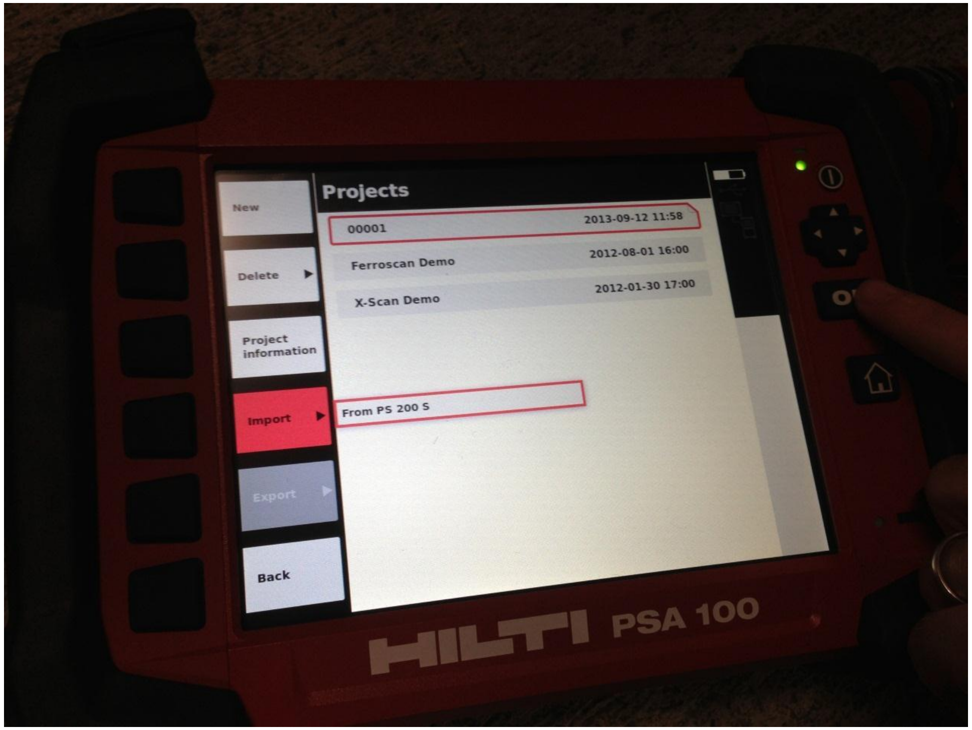


From the home screen, select "Open Project" and select or create your project

Tips:

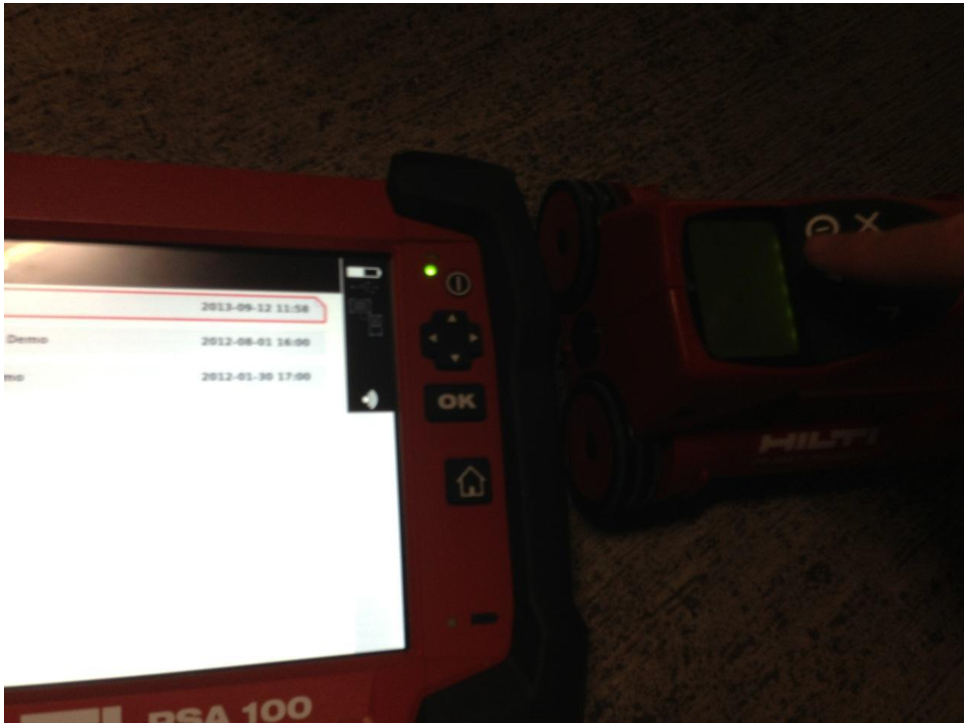
- Monitor is not touch screen – use controls on either side!

Step 9 Transfer Scan to Monitor



From the projects screen, select "Import" and then "OK"

Step 9 Transfer Scan to Monitor



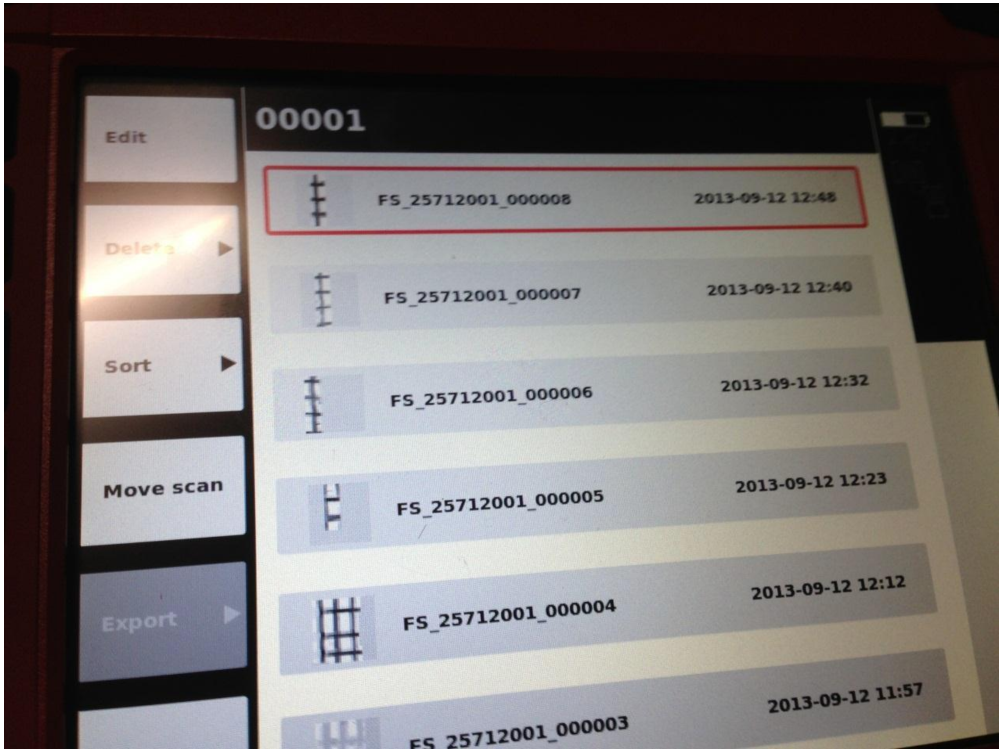
I. Line up the infrared ports of the scanning device and the monitor

II. On scanning device, press the  button to start the file transfer

Tips:

- It is easy to do this on the floor or table top to free your hands

Step 9 Transfer Scan to Monitor



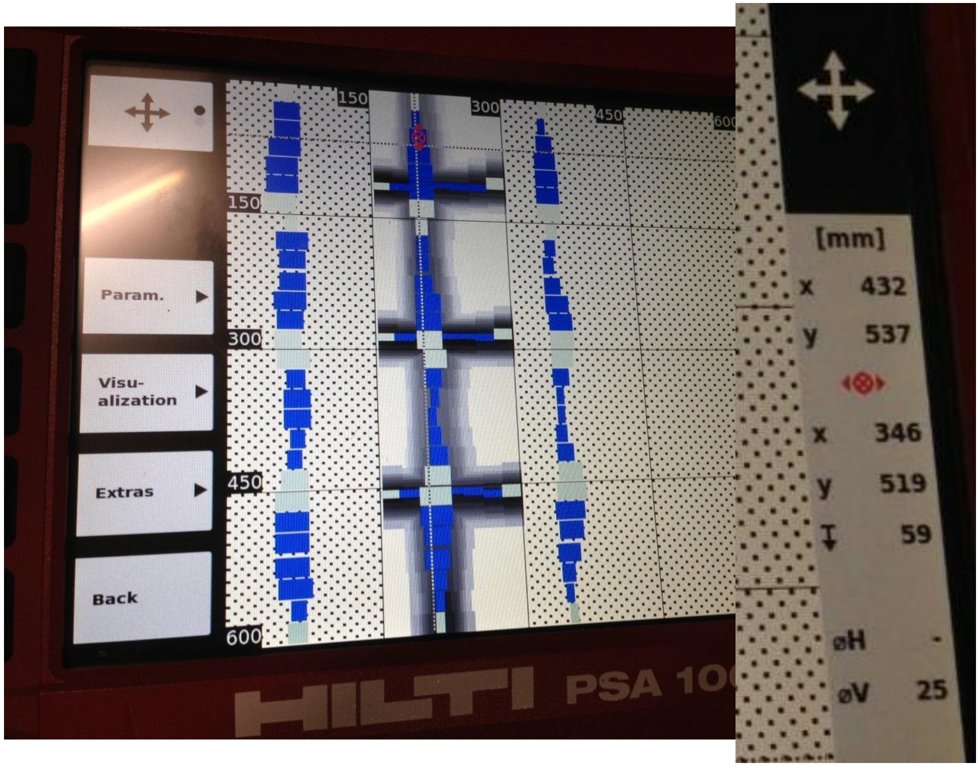
When the transfer is complete, it should appear in the scans list under your project automatically. You can see it organized by date and time.

Press "OK" to select the scanned image

Tips:

- The scanning device should also register a successful scan, see below

Step 9 Transfer Scan to Monitor



Blue shows steel.

I. Use the Arrow keypad to navigate around the image to select different bars to give coordinates and diameters.

II. Photograph any useful images using the IPAD to get them directly into the PDF site survey record

Tips:

- Spacing can be estimated from the grid, or measured from the coordinates
- Bar diameter is to the nearest standard bar size with some error allowance.

Estimation should be made based on average readings and considering any possible lap locations

Step 10 Interpret Image

B2 Schmidt Hammer

The Schmidt or Rebound Hammer measures the surface hardness of concrete. If correctly calibrated it can give an indication of in-situ compressive strength but it should be understood that the surface hardness can be influenced by a number of factors. The Schmidt Hammer is not to be used as an absolute measurement of compressive strength.

The Schmidt Hammer still has a useful role in aiding experienced structural engineers undertaking the assessments. The process of removing the render ensures that the engineer identifies the aggregate type and in preparing the surface for the Schmidt Hammer test the engineer gets to 'feel' the concrete. This process provides invaluable information to aid engineering judgement.

Step 1. Select column

I. Walk the entire factory first. Identifying columns that will be suitable for testing. Removal of render is a dusty process and this needs to be communicated to the factory owner.

II. Columns where the render is already damaged are likely to be accepted more readily by the owner.

III. If there is a column where there is evidence that a core has been previously taken, locate a Schmidt Hammer test here.

IV. Removing render during lunch breaks can be favorable as the process will attract lots of attention from workers.

V. Choose a typical column at the lowest possible level.

VI. Choose a typical column on upper floor.

VII. If time permits or if tests are very low or variable, select other columns.

VIII. Carbonation increases the hardness of concrete. Thus, external columns without render will likely return higher results than internal columns that have been rendered.

<u>Step 2. Remove render</u>

I. Mark out a square using the Ferro scan crayon approximately 150mm x 150mm.

II. Wear gloves and eye protection provided in the kit bag.

III. Using the geological hammer or hammer and chisel break off the surface render.

IV. Note that you will not be able to 'grind' the surface right to the edge of the 'breakout'.

You are aiming to have a prepared surface of at least 100mm x 100mm.

Step 3. Preparation of the exposed concrete surface

I. Wear gloves and the dust mask provided in the kit bag (use a new mask each day).

II. Using the abrasive stone, grind heavily textured or soft surfaces, or surfaces with loose mortar, until they are smooth and free

of loose material over an area of at least 100mm by 100mm. If lots of aggregates are visible, a larger area may need to be

prepared. Smooth-formed or troweled surfaces may be tested without grinding.

III. Using the brush provided in the kit bag remove surface dust.

IV. Remove any water present on the surface of the concrete.

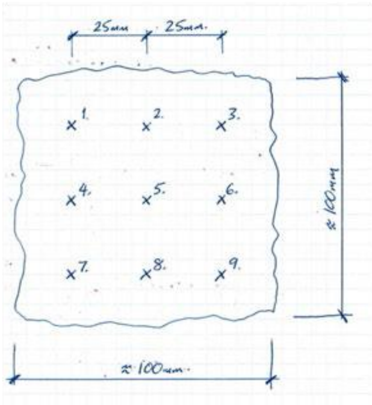
Step 4. Schmidt Hammer use

I. Take a minimum of nine valid readings to obtain a reliable estimate of the rebound number for a test location.

II. Ensure that no two impact points are closer than 25mm and none are within 25mm of

an edge (hence the prepared area must be at

least 100mm square).



III. Hold the hammer firmly in a position that allows the plunger to impact perpendicularly to the surface being tested

IV. Gradually increase the pressure on the plunger until the hammer impacts.

V. Hold in position and read out the result displayed on the sliding scale. Alternatively press the button on the side of the hammer to lock the reading so that the hammer can be lifted from the surface.

VI. Examine each impression made on the surface after impact and if the impact has crushed or broken through a near-to-surface

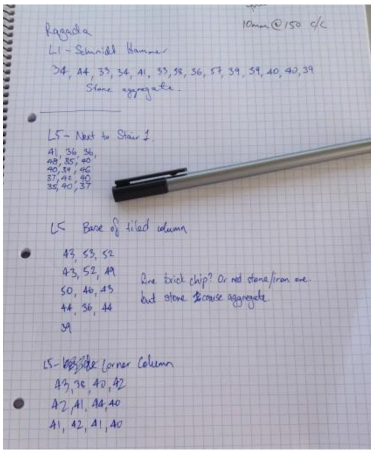
void, discount the result.

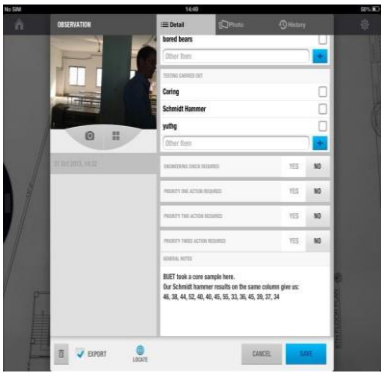
VII. Avoid placing the hammer directly on aggregate, as this will return a false result.

Step 5. Record results

I. Write down the results in notebook or directly into tablet app. Photograph results with iPad

II. After the assessment, add the results to the master database.





Appendix C

Garment, Apparel, Footwear, Bags and Accessories Factory Loading Guidance

C1 Loading Guidance

Concrete density

The densities of brick-aggregate and stone-aggregate concrete are listed below.

Concrete aggregate	Density (kN/m^3)
Stone aggregate	25.0

Live Loads

Most floor areas observed in a Garment, Apparel, Footwear, Bags and Accessories factory will consist of cutting and sewing operations. The basic occupational usage may appear relatively light (workstations comprising tables and sewing machines or irons). Typically, sewing and cutting floors have an occupancy load of 1-2kN/m^2. The LABS Standard requires that a minimum **live load of 2kN/m^2** be adopted for these areas for the purposes of visual assessments.

Please note that in these areas where observed live loading is in excess of this, the observed load should be used in any follow-up calculations.

Storage Loads

Pay attention to locations used for storage, which may or may not be visible at the time of the assessment. Typical storage comprises stacking of raw materials (fabric, cardboard boxes etc.). Multi-story factories may often be arranged such that the raw material is delivered and initially stored at the lowest factory level. The material will then work its way up the factory levels as it is cut and joined. Finished garments are then washed and finally boxed for shipping. As a result, the top most factory floors may house heavy washing and drying equipment (see below) and these floors may also be stacked full of boxed garments.

Some typical densities of stored materials are included here. Due to the range of possible densities, it is recommended that measurements be taken on site to determine typical densities of materials in the layouts encountered in factories.

Fabric	Density (kN/m^3)	Reference
Cardboard	2.5	
Unworked Fabric (e.g. cotton bales, denim bales, wool)	3.5	
Finished garments, packed	2.0	
Finished garments, loose piles	1.5	
Leather	8.0-9.0	
PVC sheets	16.1-17.1	Ref to product properties of PVC sheet (Density a=1.38 g/cm^3)
Polyester webbing roll	13.5	Ref to product properties of polyester (Density a=1.38 g/cm^3)

Machinery and Dynamic loads

Attention should also be given to plinths on which the equipment may be founded and the effects of vibration from the machinery.

- Dampers should be installed at the feet of the machinery to reduce dynamic load;
- Use static load instead of dynamic load on elevated floors in the FOS calculation column;
- The dynamic load needs to be considered for the flooring system capacity, and fatigue checked by a qualified engineer;
- If no information provided by the machinery manufacturer, suggest using a dynamic load factor of 1.20~1.5.

Some cases as mentioned in clause 16.07.8.2 of IBC-2009:

- Light machinery, shaft-or motor-driven: Dynamic Load factor of 1.2
- Hangers for floors or balconies: Dynamic Load factor of 1.33
- Reciprocating machinery or power-driven units: Dynamic Load factor of 1.5

Loading Examples

Examples of loading types that have been observed in factories already inspected are shown below.

6.3kN/m^2 (1.8m High) 1.8m high stack of rolled denim **Assume density of unworked fabric i.e. 3.5kN/m^2/m height** Stack height of 1.8m Equivalent area load of 6.3kN/m^2 Watch access to perimeter areas Assume denim roles are 55kg each in calculations	
2.7kN/m^2 (1.5m High) 1.5m high disordered bundles **Assume density of loose clothing i.e. 1.8kN/m^2/m height** Stack height of 1.5m Equivalent area load of 2.7kN/m^2	

Can be up to 4.0kN/m^2 (2.0m High) depending **on contents of boxes** Denim factory Boxes are 45cm x 37cm x 11cm **Assume density of packed clothing i.e. 2. 0kN/m²/m height** Stack height of 2.0m Equivalent area load of 4.0kN/m^2 Check box weights and dimensions and carry out calculations to determine storage load	
2.5kN/m^2(2.0m High) Stacked flat cardboard up to 2m high **Assume density of packed cardboard i.e. 1.25kN/m^2/m height** Thus, 2m high stack = 2.5kN/m^2 Alternative measurement: - Density = 125kg/m^3 This was determined by weighing a sample of cardboard 8cm x 14cm x 0.5cm thick (7g). Stacked 2m high the equivalent area load is 2.5kN/m^2.	
Heavy Machinery Measure weight on site	
10 kN/m^2/m height Measure height of plinths and calculate weight Record tank capacities and consider total load on slabs, beams or columns	

Appendix D

Structural Safety Assessment Checklist

D1 Structural Safety Assessment Checklist

No.	Prompt questions for Structural Engineers	Yes	No	Comment
S1	**Vertical Structural System (Gravity loads)**			
	Is the vertical support system apparent and logical?			
	What is the type of structural system used?			
	How many floors are in the structure?			
	What is the measured structural grid?			
	What are the measured floor to ceiling heights?			
	Do columns and walls extend directly from roof to ground floor/foundation level or are transfer structures provided?			
	Is a design check required to verify column capacity? Consider if floor areas with high loading are vertically stacked resulting in locally high column stresses.			
	Identify areas that are not accessible or are concealed by finishes.			
	Is the building in shared occupancy or under the control of the factory management only? Are any floors inaccessible?			
	Are the roof and floor structural systems apparent and logical?			
	Do the roof and floor structural systems comprise one or two way spanning slabs?			
	What is the typical floor thickness?			
	Do the roof and floor structural systems comprise flat slab construction? Ensure that depth of flat slab (excluding finishes) is measured. Is punching shear at column head a concern in heavily loaded areas? Is a design check required on punching shear?			
	Are 'Allowable Floor Loading Plans' available for all suspended floors and roof areas (if readily accessible)?			
	What is the observed live loading at each level?			
	Are there any water tanks at suspended or roof levels with locally high loads?			
	Are floor loads and any roof loads well managed and compliant with allowable floor design loads?			
	Are built up floors/screed and finishes present in any areas?			
	What is the floor finishes depth?			
	Are mezzanine floors of concrete construction, steel flooring or timber decking in a satisfactory condition?			

No.	Prompt questions for Structural Engineers	Yes	No	Comment
	Where are the movement joints located, if provided?			
	If building movement joints are provided, do floor slab cantilevers result in additional loads to columns adjacent to these joints?			
S2	**Lateral Structural System (Wind Loads)**			
	Is the lateral support system apparent and logical?			
	Does the lateral support system have redundancy?			
	For steel buildings; - Is bracing provided in the plane of the roof in each direction AND if bracing is not provided in any of the two directions, is the steel frame acting as a moment frame in that particular direction? - Is vertical bracing provided, to transfer loads to foundation level, consistent with the location of the roof bracing? - Are all bracing systems complete, fully bolted and appropriately tensioned?			
	For concrete buildings; - Is lateral stability provided by floor and roof slab diaphragm action with concrete shear walls within concrete stairs/elevator cores? - If concrete shear walls are not provided, check if the lateral stability system is then provided by moment frame action of the concrete frame. Is this moment frame action assisted by substantial roof and floor beam/column connections? - If floors are of flat slab construction and shear walls are not provided, is there any evidence of structural distress due to lateral			
	If building movement joints are present – check and record the lateral support system provided to each section of the building.			
	Do block/brick walls form part of the lateral stability system?			
	Identify areas that are not accessible or are concealed by finishes.			
S3	**Key Elements**			
	What are the column sizes (without plaster) at lowest levels and critical areas?			
	What are the typical down stand beam dimensions?			
	Identify if there are any key structural elements - i.e. elements whose collapse would result in a disproportionate extent of damage.			
	Estimation of reinforcement in critical concrete elements (Ferro scanner)			

No.	Prompt questions for Structural Engineers	Yes	No	Comment
	Estimated concrete strength – any observations following removal of plaster to columns and use of the Schmidt Hammer.			
	Are there any transfer slabs or beams where the point of application of column loads is transferred?			
	Are there any slender columns - double height in entrance areas or at material in/out where impact loads from vehicles may be a consideration?			
	Identify areas with floor slab cantilevers; consider if design check is required on cantilever or columns due to cantilever and perimeter wall loading. Is there significant imposed loading on cantilever areas?			
	Is Seismic bracing provided to all non-structural members to ensure that, in a seismic event, falling non-structural elements do not create a life safety hazard?			
S4	**Foundation Performance**			
	Is there any evidence of foundation settlement - such as cracking in ground floor slab adjacent to columns/walls?			
	Is there any evidence of differential movement of elements of structure such as columns and adjacent walls?			
S5	**Visible Distress in Structural Members**			
	Is there any evidence of cracking in structural elements? If so, what are the likely causes?			
	Is there any evidence of torsion, twisting or excessive deflection in structural elements? If so, what are the likely causes?			
S6	**Visible Distress in Non-Structural Members**			
	Are there any signs of distress in non-structural members which may indicate movement issues? E.g. façade cracking, internal wall cracking and weathering/structural deterioration. If so, what are the likely causes?			
S7	**Performance of Extensions/Additions**			
	Are all extensions (horizontal and vertical) included on the structural documents provided?			
	Are any of the structural additions non-engineered?			
	Is there evidence that any sections of the building have previously been demolished or that provisions are included for possible building extensions which are not included in the original design?			
S8	**Structural Documentation**			
	Are previous structural audit reports available from factory management? Check that any actions highlighted on these reports have been completed.			
	What is the status and date of documentation provided?			
	Is a Soils report available and has the recommended foundation type been shown on the drawing?			
	Are allowable Loading Plans available for floors and accessible roof areas?			

No.	Prompt questions for Structural Engineers	Yes	No	Comment
	Are the structural drawings provided generally in agreement with the in-situ structure as inspected? What areas do not match?			
S9	**Maintenance**			
	Are there any signs of a lack of maintenance which will eventually result in structural problems?			
	Any corrosion to structural steelwork?			
	Is there any ponding of water at roof or other levels which could give rise to deterioration of the structure?			

Appendix E

Fire Safety Assessment Checklist

E1 Fire Safety Assessment Checklist

No		Sub-Category	Observation	Building/ Space Description		
1		**Means of Egress**				
	1-1	Floor Exits	Insufficient number of floor exits			
			Total width of Exit doors insufficient			
			Alternative directions for escape not provided			
			Travel distance to alternative exit excessive			
			Inadequate means of escape from Mezzanine			
			Inadequate means of escape from basement			
	1.2	Escape Paths	Escape path width inadequate			
			Internal doors on escape paths do not side swing and/or with lockable devices			
			Escape paths not clear of temporary obstacles			
			Escape paths not free from permanent obstacles			
			Excessive dead ends to aisles or corridors			
			Insufficient height of doors, bulkheads on escape path			
	1.3	Exit Signage	Escape paths not clearly indicated on floor			
			Evacuation pathways not correctly sign posted			
			Illuminated exit signs at emergency exits are missing or not adequate			
			Inconsistent graphics and/or colors for Exit signs			
	1.4	Exit doors	Exit doors not side hung to swing correctly in direction of escape			
			Exit doors are not always easily openable, doors have locking devices			
			Other Exits			
	1.5	Exit stairs	Inadequate width of stairs and entry doors			
			Tread/riser relationship inconsistent on stairway			
			Stair too steep for emergency escape			
			Inadequate or no handrails to stairs			
			No protected route from stairs to outside			
	1.6	Final Exits	Total width of Ground Floor exits inadequate			

No		**Sub-Category**	**Observation**	**Building/ Space Description**		
			People not able to move safely away from the building directly on exiting to outside			
			Other exits			
2		**Fire Safety Construction**				
	2.1	Protection of openings	Lack of enclosure of Stairs connecting more than 2 floors			
			No FR self-closing doors to protected stairs			
			Unprotected penetrations in stair enclosures			
			Inadequate protection of External Stairs from fire in interior			
			Inadequate protection of vertical service shafts passing through floors			
			No FR separation of lifts shafts			
			Other vertical openings through compartment floors			
			Protection of basement with FR lobby, walls and self-closing doors			
	2.2	Separation of occupancies	Use of space with area too great to be considered an 'incidental occupancy'			
			Separation of different occupancies not provided or incomplete			
	2.3	Storage areas	Designated storage areas not separated with FR construction			
			Storage areas facing onto exit pathways			
			Excessive areas of non-sprinklered 'in-process' storage open to production areas			
			Excessive areas of sprinklered 'in-process' storage open to production areas			
			Excessive areas of 'in-process' storage open to production areas			
			Other storage (e.g. under or on stairs)			
	2.4	Other high risk areas	Generator enclosure inadequate			
			Boiler Room enclosure inadequate			
			Large Compressor without enclosure			
			Transformer enclosure inadequate			
			Chemical Store enclosure inadequate			
			Others			

No		Sub-Category	Observation	Building/ Space Description		
	2.5	Structure & Finishes	Fire Protection of the Structure			
			Non-compliant Wall Finishes			
			Non-compliant Ceiling finishes			
3		**Fire Safety Systems**				
	3.1	Fire Detection	Unsuitable Fire Detector type			
			Inadequate Fire Detector coverage			
			Incorrect Fire Detector positioning			
			Inadequate back-up power to Detectors			
	3.2	Fire Alarm	Unsuitable Fire Alarm type (audio, visual)			
			Inadequate Fire Alarm coverage			
			Incorrect or no automatic Fire Alarm activation			
			Inadequate back-up power to Fire Alarms			
	3.3	Emergency Lighting	Insufficient Emergency Lighting for escape pathways			
			Emergency lighting at Exits			
			No emergency Lighting provided			
			Inadequate back-up power to Emergency Lighting			
			Wiring configuration of emergency lighting system incorrect			
4		**Provisions for Firefighting**				
	4.1	Water supply	No municipal main water supply			
			Insufficient water storage on premises for firefighting systems			
			No or inadequate water pump-set			
			Water storage insufficient for fire hose reel given the pump system provided			
			Pump-set back-up and/or water storage insufficient			
			Manual activation of fire pumps			
	4.2	Firefighting Systems	Inadequate fire hydrant/ wet riser system			
			No or inadequate internal fire hose reel system			
			Insufficient portable fire extinguishers			

			Portable extinguishers not signposted			
			Portable extinguishers not checked and tagged			
			No automatic extinguishing system			
	4.3	Access	Inadequate access for Fire Fighting vehicles			
			Other issues			
5		**Maintenance and Housekeeping**				
	5.1	Legal Documents	Fire NOC; does the factory have one and what information is given in the Annex			
			Other Fire Authority documentation			
	5.2	Maintenance records	Inadequate maintenance records for Alarm system			
			Inadequate maintenance records for Emergency lighting			
			Inadequate maintenance records for Pumps & Fire hose			
			Inadequate extinguishing system maintenance records			
	5.3	Emergency Plan	Inadequately documented or no Emergency Plan			
			Responsible persons designated and assigned tasks documented			
			Emergency layouts posted at Exits on each floor			
	5.4	Fire Safety Training	No evidence of personnel training and emergency duties			
			Inadequate records of regular fire drills			
	5.5	House-keeping	Stored goods, obstacles on evacuation pathways			
			Stored goods, obstacles on stairways			
			Combustible goods stacked near heat/electrical sources			
			Other			

Appendix F

Electrical Safety Assessment Checklist

F1 Electrical Safety Assessment Checklist

No	Sub-Category	Observation	Building/ Space Description		
1	**Supplies to Life Safety Systems**				
		Voltage drop for emergency equipment given on SLD?			
		Check the primary and secondary power supplies to the fire alarm panel			
		Check the primary and secondary power supplies to the emergency lighting			
		Check battery ventilation			
		check that battery charging is functional			
		Check that there is a battery failure alarm i.e. if battery is disconnected from panel does panel display a fault			
2	**Earthing and Bonding**				
		Check bonding connection of metalwork (machines, structure, metallic piped services) to earth			
		Check that the neutral connection is not broken throughout the site.			
		Are there broken or disconnected Earthing systems?			
		Schematic of main earth bar and connections available?			
		Earth electrode impedance correct?			
		Are residual current devices used correctly			
		Check size of main equipotential bonding conductors			
		Are earth loop impedance measurements provided?			
		General condition of the LPS: Damaged or unfixed conductors and components found?			
		General condition of the LPS: Corrosion found?			
		Check structures that are not covered by the LPS.			
		Equipotential bonding for all systems where items are directly connected to the LPS			
		Lightning protection calculations provided?			

		Type and detail of lightning protection provided?			
3	**Generators**				
		Check that the type of generator is clearly stated in documents and on equipment			
		Check that the capacity of generator is the same as stated in the power balance			
		Electrical distribution, safety interlocking, Earthing and changeover facilities made?			
		Check that fuel storage requirements is adequate for the use			
		Check for Earthing connection from generator frame			
		Check fuel storage for leaks			
		If the generator fuel deliver relies on a fuel pump check the power to the pump is backed up			
		Check that the generator battery is monitored (it can be done manually or			
		Check for liquids leaking from generator, tank and pipework			
		Check for signs of ventilation is adequate			
		Check that fresh air inlets should be located as far from the sources of heat as practical and as low as possible.			
		Check that exhaust air should be at the highest point possible, preferably directly over the engine.			
		Check that ventilation air inlets and outlets should be positioned to prevent exhaust air from being drawn into the ventilation inlets (recirculation).			
4	**Substations**				
		Check that electrical rooms are not used for storing material or equipment			
		Is there adequate identification and labelling of substation?			
		Is there adequate display of warning and danger notices in substation?			
		Is the main incoming power supply adequate for the power requirements of the building?			
		Is Substation location proper?			
		Transformer room ventilation provided?			
		Transformer catch pit for oil provided and properly sized?			
		There are no signs of water ingress?			

		Type and detail of lightning protection provided?			
		The room is clean, tidy and not being used as storage space			
		Services (lighting, sockets) are working			
		Doors and windows are secure and, when required, locked			
		There are no signs of damage to the equipment or room			
		The room is not overgrown with vegetation, and access is acceptable			
		There are no signs of rodent activity			
		Ventilation (ventilation shall be designed to comply with the recommendations of the equipment manufacturer)			
		Warning Signage are in place			
		Emergency first aid signage and equipment			
		Soak pit for transformer with more than 2000 liters of oil.			
5	**Distribution**				
		Check that cables are supported correctly			
		Check that the cables have been laid in accordance with design?			
		Current carrying capacity of the cable is appropriate for the application?			
		Is there adequate identification and labelling of all distribution boards?			
		Is there adequate identification and labelling of all circuits in DBs?			
		Is there adequate display of warning and danger notices in distribution boards?			
		Is the protection of cable systems against other causes of damage and deterioration e.g. heat, water adequate?			
		Are any cables or conductors exposed due to damage, corrosion, missing covers etc.?			
		Are there adequate barriers or enclosures against direct contact? Are those barriers or enclosures compromised, e.g. due to damage?			
		Check for dust and lint in electrical panels			
		Check for dust and lint on cables			
		Are there damaged flexible conduits?			
		Check for flammable material in electrical panels			

		Type and detail of lightning protection provided?			
		Are the cables properly segregated in cable trays?			
		Load balance under normal conditions is provided?			
		Load balance under emergency conditions is provided?			
		Conductors shall be crimped or have cable sockets			
6	**Drawings**				
		Does the factory have electrical single line diagram (SLD)?			
		Does the factory have updated Earthing diagram?			
		Does the factory have updated fire alarm diagram?			
		Does the factory have updated electrical distribution layout?			
		Does the factory have updated small power layout?			
		Does the factory have updated lighting and emergency lighting layout?			
		Does the factory have updated fire alarm layout?			
		Does the factory have updated lightning protection layout?			
		Does the factory have updated Earthing layout?			
		Does the factory have updated power balance schedule?			
		Are diagrams of electrical network placed on wall in substation?			
		Are diagrams of each switchboards placed inside DBs?			
		Cross-sectional areas of cables given on SLD?			
		Protection requirements are given on SLD?			
		Does cable sizes shown given on SLD?			
		Prospective short-circuit currents shown on SLD?			
		Fault levels - short-circuit current rating of low voltage distribution boards and breakers shown on SLD?			
		Breaker types are shown on SLD?			
7	**Maintenance and Records**				

		Type and detail of lightning protection provided?			
		Maintenance records to be requested for Generator(s)			
		Maintenance records to be requested for transformers			
		Maintenance records to be requested for high voltage switchgear			
		Maintenance records to be requested for low voltage switchgear			
		Building(s) Power Balance / Load Estimate (at original construction or at last major project on site?)			
		Maintenance / Assessment records to be requested for Lightning protection system			
		Records for previous Thermographic survey reports			
		Maintenance records to be requested for Earthing System			
8	**Thermographic Scanning**				
		All cable connections			
		All circuit protective devices cable connections			
		Protective devices			
		Ancillary equipment within the panels			
9	**Lightning Protection**				
		Roof level air termination network. Generally provided by means of a metallic roof covering to the building, tape mesh faraday cage conductors and/or vertical air rods.			
		Are connections from the roof air termination network to dedicated down conductors?			
		Do the down conductors comprise structural steel columns or reinforcing steel within structural support columns and/or dedicated down tape conductors?			
		Bonding the dedicated down conductors to adjacent earth electrode housings where earth rods shall be driven through to the earth source. Each down conductor shall have a separate earth termination.			
		Check that test points are in place.			
		Is bonding of all extraneous metalwork such as structural steelwork, metal gutters, down-pipes etc. and any roof mounted mechanical			

		Type and detail of lightning protection provided?			
		plant, boiler flues, AHUs, cable trays, railings, louvers, vent pipes etc. in place?			
		Equipotential connection via test link to building main electrical earth bar.			
		Are lightning protection installation layouts available and up to date?			
		Check strike counter and number of strikes.			

Appendix G

Structural Issues Categorization and Prioritization

G1 Structural Issues Categorization

The table below provides the appropriate categories for assigning actions in FFC.

Issue Type	Sub Issue
S1: Vertical structural system	
	Vertical support system not apparent/logical
	Transfer structures
	High column stress
	Areas not accessible/concealed by finishes
	Areas/floors not accessible - shared building
	Roof and floor structural systems not logical/appropriate
	Punching shear
	'Allowable Loading Plans' not available
	Water tanks on suspended floors/roof
	Heavy point loads on suspended floors/roof
	Uncontrolled floor loading
	Heavy floor finishes/screeds
	Condition of mezzanine floors
	Additional column loads at movement joints
S2: Lateral structural system	
	Lateral structural system not apparent/logical

	No redundancy in lateral structural system
	Steel buildings: Bracing missing/incomplete
	Steel buildings: apparent insufficient capacity in moment frames
	Concrete buildings: apparent insufficient capacity in moment frames
	Concrete buildings: distress in flat slab system due to lateral movement
	Lateral structural systems not present in all areas of building
	Non-engineered masonry walls part of lateral stability system
	Areas is not accessible/concealed by finishes
S3: Key elements	
	Key structural elements
	Transfer structures
	Slender/double height columns
	Overloaded floor slab cantilevers
S4: Foundation Performance	
	Foundation settlement
	Differential movement

S5: Visible Distress in Structural Members	
	Cracking
	Torsion, twisting or excessive deflection
	Poor quality structural connections
	Concrete Spalling
	Poor quality structural materials
	Damage
S6: Visible Distress in Non-Structural Members	
	Cracking
	Torsion, twisting or excessive deflection
	Damage
S7: Performance of Extensions/Additions	
	Structural documents
	Non-engineered structural additions
	Provisions for possible building extensions
	New openings in Structural elements
S8: Structural Documentation	
	No documentation available
	Documentation status
	Soils report

	Allowable Loading Plans
	Structural drawings not in accordance with as- built structure
S9: Maintenance	
	Lack of maintenance
	Structural steelwork corrosion
	Ponding
	Water ingress/dampness

G2 Prioritization of Structural Safety Actions

As the Preliminary Structural Safety Assessment is largely based on judgement of the condition of the existing building and various evidence-based indicators of performance of the structure, it is not possible to provide a definitive prioritization for each issue on the Structural checklist.

This forms an important part of the training of the assessment firms. Examples of typical actions associated with the principal issues which are likely to be found and guidance on their prioritization can be provided at that time.

However, the following guidance is provided to assist suitably qualified engineers to determine the most appropriate priority level for a particular finding. This should be read in conjunction with the principles set out in Section 7.1.

SP3: 6 months actions

Issues which typically may be categorized in this way include:

- Column stresses at levels indicated in Section 4.6
- Local damage to structural elements which merits repair but does not significantly impact on overall structural performance in the short term
- Corrosion which has minimal impact on structural performance in the short term
- Individual structural elements or parts of structure which require design check but which have demonstrated performance over time. This would include extensions/ additions or modifications. Examples may include a slab or beam carrying water tanks or heavy equipment, an external steel staircase which has been added, a new steel roof structure
- Alterations or absence of local element of a designed lateral stability system where there is a credible alternative load path
- There are visible structural movements during strong wind.
- Structural elements which are at a low risk of impact from vehicles
- Differential settlement issues which do not appear to be ongoing
- Cracking in non-structural elements
- Dampness/ water ingress which is not related to severe structural degradation
- Non-engineered structures which require design checks – low risk/ low occupancy or have demonstrated performance over time
- Lack of as-built drawings or loading plans
- Drawings not in accordance with as-built situation

A building with only EP3 findings has an overall Green color code.

Green: Generally, all clear subject to agreement to address prioritized comments. No critical visible defects or structures and no visible immediate risk to workers. Production can continue.

SP2: 6 weeks actions

Issues which typically may be categorized in this way include:

- Column stresses at levels indicated in Section 4.6
- Flat slab structures where there is a concern about the punching shear capacity
- Local damage to structural elements which may impact overall structural performance in the short term
- Cracking in structural elements which is evidence of non-performance or over-stress in the structure
- Individual structural elements or parts of structure which require design check and which have associated signs of non-performance. Examples may include a slab or beam carrying water tanks or heavy equipment which has cracking, deflection or distortion which could be deemed to be associated with the application of those loads.
- Non-engineered structures which require design checks. These include higher risk or occupancy structures or those with specially identified deficiencies. These may include roof structures where the roof sheeting is at risk of falling off,
- Corrosion which impacts structural performance in the short term
- More significant alterations or absence of local elements of a designed lateral stability system where there is a credible alternative load path. This may be associated with evidence of overall lateral movements
- Structural elements which are at credible risk of impact from vehicles.
- This would include columns in delivery areas, where the damage to the column could lead to a local building failure
- Structural columns which are at risk from induced vibration from heavy machinery
- Differential settlement issues which appear to be ongoing
- Cracking in non-structural elements where the cracking is severe enough to affect the stability of the non-structural element
- Dampness/ water ingress which is related to severe structural degradation
- Lack of loading plans in a situation where there is a concern over extensive areas of high load or where there is a likelihood of significant loading changes in the short term

A building with SP2 findings at worst has an overall Yellow color code.

Yellow: Limited concerns but have questions on structural arrangements and details, limited visible defects with no immediate danger to structure or workers. Production may continue subject to agreement to address issues raised and prioritized action in report.

SP1: Immediate Actions

- Column stresses at levels indicated in Section 4.6
- Lack of a credible lateral stability system or lack of robustness of the lateral stability system
- Local damage to structural elements which may lead to local failure of the element
- Cracking in structural elements which is evidence of significant non- performance or over-stress in the structure. Vertical column cracking would always be an immediate action item, unless there are very good mitigating factors.
- Cracking to the top surface of a slab in the vicinity of a column in a flat slab structure would also be an immediate action item
- Individual structural elements or parts of structure which require design check and which have associated significant signs of non-performance.
- Such examples would also include potential brittle failure mechanisms
- Non-engineered structures which require immediate intervention to reduce the risk of collapse.
- Corrosion which makes the structural element ineffective i.e., corrosion has reduced cross sectional area of the structural element
- Significant settlement issues which appear to be ongoing and impact the overall stability of the building
- Cracking in non-structural elements where the cracking is severe enough that the element is likely to collapse
- Dampness/ water ingress which has rendered the structural element ineffective

A building with SP1 findings at worst may have the following color codes.

Amber: No reason to suspend operations in the facility but action may be required locally. Significant stress levels in structural member, concerns with potential for progressive collapse or visible defects with no immediate danger to structure or workers. Production may continue subject to agreement to further assessments and testing and actions to address issues raised with prioritized actions in report.

Red/Amber: If the QSEC deems that there are **important IMMEDIATE actions required to maintain an Amber designation**, the report may be designated as Amber with Red actions. The Red actions must be completed in two weeks or the overall factory designation will become Red. An example of this may be where column stresses are so critically high that immediate load reduction is necessary and feasible to remove the immediate risk to life safety.

Red: Immediate closure of factory building or significant part of building recommended. Closure in accordance with protocol. Due to Critical stress levels in structural members, concern with progressive collapse and/or visible defects resulting in immediate danger to structure and workers.

Appendix H

Fire Issues Categorization,
Prioritization and Typical Actions

H1 Prioritization of Fire Safety Actions

H1.1 Means of Egress

No.	Issue Type	No.	Sub-Issue Type	Sub-Issue Detail		Typical Recommended Actions	Priority
1	Means	1.1	Floor Exits	Insufficient number of floor exits	a.	Provide additional floor exit/s to comply with Cl. 6.6 of the LABS Standard	FP1
					b.	Reduce occupant load on the floors in question to ensure the minimum number of exits based on population numbers complies with Cl. 6.6 of the LABS Standard	FP1
				Total width of Exit doors insufficient	a.	Provide additional floor exit/s to comply with Cl. 6.5 of the LABS Standard	FP2
					b.	Reduce occupant load on the floors in question to ensure capacity of means of egress matches the occupancy number to comply with Cl. 6.5 of the LABS Standard	FP2
					c.	Increase width of existing exit/s to comply with Cl. 6.5 of the LABS Standard	FP2
				Alternative directions for escape not provided	a.	Provide additional floor exit/s to ensure alternative paths of travel where single direction escape distance is excessive to comply with Cl. 6.6 and 6.7 of the LABS Standard	FP1
				Travel distance to alternative exit excessive	a.	Provide additional floor exit/s to ensure that escape distances are not excessive to comply with Cl. 6.7 of the LABS Standard	FP2
				Inadequate means of escape from Mezzanine	a.	Provide additional stair from mezzanine to ensure that escape distances are not excessive, in accordance with Cl. 3.13 and 6.6 of the LABS Standard	FP2
				Inadequate means of escape from basement	a.	Provide additional exit from basement to comply with Cl.6.6.2 of the LABS Standard	FP1
		1.2	Escape Paths	Escape path width inadequate	a.	Increase width of escape paths to comply with the requirements of Cl.6.5 of the LABS Standard	FP3

				Internal doors on escape paths do not side swing and/or with lockable devices	a.	All doors in a means of egress shall be of the side-hinged swinging type and shall not be locked in the direction of egress under any conditions in accordance with Cl. 6.9 of the LABS Standard	FP1
				Escape paths not clear of temporary obstacles	a.	Ensure pathways on exit routes clear of all temporary storage and other obstacles in accordance with Cl.6.3 of the LABS Standard	FP1
				Escape paths not free from permanent obstacles	a.	Divert pathways around permanent obstacles or create new paths to emergency exits to comply with the requirements of Cl.6.5 of the LABS Standard	FP2
				Excessive dead ends to aisles or corridors	a.	Create new paths to exits to comply with Cl. 6.7 of the LABS Standard and avoid excessive dead-ends	FP2
				Insufficient height of doors, bulkheads on escape path	a.	Demolish lintel above opening and re-instate to ensure headroom complies with minimum height specified in Cl. 6.3 of the LABS Standard	FP2
		1.3	Exit Signage	Escape paths not clearly indicated on floor	a.	Mark up on floor or make clearer escape paths, or provide adequate overhead signage to clearly indicate paths to emergency exits in accordance with Cl. 6.8 and Cl. 6.12 of the LABS Standard	FP3
				Evacuation pathways not clearly or correctly sign posted	a.	Correct floor markings and/or overhead signage to clearly indicate paths to emergency exits in accordance with Cl. 6.12 of the LABS Standard	FP3
					b.	Provide signage at end of long aisles to indicate directional change in escape route to nearest floor exit in accordance with Cl.6.12 of the LABS Standard	FP3

No.	Issue Type	No.	Sub-Issue Type	Sub-Issue Detail		Typical Recommended Actions	Priority
		1.3	Exit Sign	Illuminated exit signs at emergency exits are	a.	Provide illuminated exit signs above each emergency exit door in accordance with	FP2
					b.	Provide illuminated exit signs above each emergency exit door of sufficient size to be easily identified from any location in the factory building in accordance with Cl.6.12 of the LABS	FP3
				Inconsistent graphics and/or colors for Exit signs	a.	Provide consistent graphics to all emergency exit signage in accordance with Cl. 6.12 of the LABS Standard	FP3
		1.4	Exit doors	Exit doors are not side hung to swing correctly in direction of escape	a.	Replace doors with side hung doors that open in the direction of escape in accordance with Cl. 6.1, 6.3 and 6.9 of the LABS Standard	FP1
					b.	Provide side hung door panel in sliding door leaf to ensure exit doors available that that swing in the direction of travel in the event of the sliding door being closed in accordance with Cl. 6.1, 6.3 and 6.9 of the LABS Standard.	FP1
				Exit doors are not always easily openable, and/or doors have locking devices	a.	Replace outside locks with locking mechanisms that allow easy opening from inside without the use of a key in accordance with Cl. 6.1 and 6.9 of the LABS Standard	FP1
					b.	Replace locks on inside of doors with locking mechanisms that allow easy opening from inside without the use of a key in accordance with Cl. 6.1 and 6.9 of the LABS Standard	FP1
				Other Exits	a.	Describe other exits that could be used as part of the escape route even though they pass through other areas on the way to outside	
		1.5	Exit stairs	Inadequate width of stairs and/or entry doors	a.	Provide additional stairs to comply with Cl. 6.5 and 6.10 of the LABS Standard	FP2
					b.	Reduce occupant load on the floors in question to ensure stair capacity matches the occupancy number to comply with Cl. 6.5 of the LABS Standard	FP1
					c.	Increase width of stairs to comply with Cl. 6.5 and 6.10 of the LABS Standard	FP2

				Tread/riser relationship inconsistent on stairway	a.	Where there is a large inconsistency in stair risers in any one flight that could make the stair unsafe for use in an emergency escape, remove signage indicating the stair as part of the emergency evacuation path. Use Cl. 6.10 of the LABS Standard as guidance on stair riser/tread relationship	FP2
				Stair too steep for emergency escape	a.	Where the stair is too steep for safe use in an emergency, remove signage indicating the stair as part of the emergency evacuation path. Use Cl. 6.10 of the LABS Standard as guidance on stair riser/tread relationship	FP3
				Inadequate or no handrails to stairs	a.	Provide handrails to stairs to comply with Cl. 6.10 of the LABS Standard	FP3
				No protected route from stair discharge to outside	a.	Provide protected route from the stair discharge to the exit to outside in accordance with Cl. 6.17 of the LABS Standard.	FP1
		1.6	Final Exits	Total width of Ground Floor exits inadequate	a.	Provide additional floor exit/s to comply with Cl. 6.5 of the LABS Standard	FP2
					b.	Reduce occupant load on the floors in question to ensure capacity of means of egress matches the occupancy number to comply with Cl. 6.5 of the LABS Standard	FP1
					c.	Increase width of existing exit/s o comply with Cl. 6.5 of the LABS Standard	FP2
				People not able to move safely away from the building directly on exiting to outside	a.	Remove obstacles preventing occupants from moving away from the building on the discharge to outside, in accordance with Cl. 6.17 of the LABS Standard	FP2
					b.	Provide a fire rated barriers to protect occupants from the effects of a fire in the building where they cannot move directly away from the building, in accordance with Cl. 6.17 of the LABS Standard	FP1
				Other exits	a.	Describe other Final Exits that could be used as part of the escape route	

H1.2 Fire Safety Construction

No.	Issue Type	No.	Sub-Issue Type	Sub-Issue Detail		Typical Recommended Actions	Priority
2	Fire Safety Construction	2.1	Protection of vertical openings	Lack of enclosure of Stairs connecting more than 2 floors	a.	Provide fire rated protective enclosures to the stairs to comply with Cl. 4.8, 4.10 and 6.14 of the LABS Standard	FP2
				No fire rated self-closing doors to protected stairs	a.	Provide self-closing devices to doors in accordance with Cl. 4.5 of the LABS Standard	FP1
				Unprotected penetrations in stair enclosures	a.	Openings in stair enclosures to be protected with protective opening assemblies that comply with Cl. 4.6, 4.7 and 6.14 of the LABS Standard	FP1
				Inadequate protection of External Stairs from fire in interior	a.	Exterior exit stairs to be protected from the building interior with fire rated construction in accordance with Cl.6.3 and Cl.6.10 of the LABS Standard	FP1
				Inadequate protection of vertical service shafts passing through floors	a.	Services shaft passing through compartment floors to have fire rate enclosure in accordance with Cl. 4.4 and 4.7 of the LABS Standard	FP2
				No adequate fire rated separation of lifts shafts	a.	Elevator (lift) shafts to be enclosed with fire rated construction in accordance with Cl. 4.8 and 5.11 of the LABS Standard	FP2
				Other vertical openings through compartment floors	a.	The atrium connecting floors is to be separated from the adjacent spaces using one of the methods provided in Cl. 4.12 of the LABS Standard	FP2
				Protection of basement with FR lobby, walls and self-closing doors	a.	The connection between Basement and Ground floor to be separated with fire rated construction including vestibule, in accordance with Cl. 4.4.5 and 6.14 of the LABS Standard	FP1
		2.2	Separation of occupancies	Use of space with area too great to be considered an 'incidental occupancy'	a.	Provide 1-hour fire rated partition wall with 45-minute self-closing fire rated doors between area and main use category in accordance with Cl.3.10 and 3.11 of the LABS Standard	FP2

				Separation of different occupancies not provided or incomplete	a.	Provide 1-hour fire rated partition wall with 45-minute self-closing fire rated doors between occupant areas in accordance with Cl.3.10 and 3.11 of the LABS Standard	FP2
					b.	Extend partition wall up to roof level with 1-hour fire rated construction to separate the different occupancies in the building in accordance with Cl.4.4 of the LABS Standard	FP2
					c.	Block up the openings in wall separating occupancies with fire rated construction, and/or install fire rated doors to openings in the compartment wall in accordance with Cl.4.4 and 4.10 of the LABS Standard	FP2
					d.	Seal the penetration openings in wall separating occupancies with fire stop systems in accordance with Cl.4.11 of the LABS Standard	FP2
		2.3	Storage areas	Designated storage areas not separated with fire rated construction	a.	Separate storage areas from adjacent areas by means of 1-hour fire rated construction in accordance with Cl. 3.10 and 3.11 of the LABS Standard	FP2
				Storage areas facing onto exit pathways	a.	Storage area to be separated from stair shaft or protected corridor with 1-hour fire rated construction and vestibule in accordance with Cl. 6.14 of the LABS Standard	FP1
				Excessive areas of non-sprinklered 'in-process' storage open to production areas	a.	Re-arrange temporary storage into ‘blocks’ no greater than 23m^2 area, 2,45m high and 3m separation between adjacent ‘blocks’ in accordance with Cl. 3.11.5.6 of the LABS Standard	FP2
				Excessive areas of sprinklered 'in- process' storage open to production areas	a.	Re-arrange temporary storage into ‘blocks’ no greater than 93m^2 area, 3.66m high and 7.62m separation between adjacent ‘blocks’ in accordance with Cl. 3.11.5.6 of the LABS Standard	FP2
				Excessive areas of 'in-process' storage open to production areas	a.	Reduce the amount of temporary storage in ‘blocks’ to ensure that the accumulated area of temporary storage not to exceed 25% of total floor area in accordance with Cl. 3.11.2 of the LABS Standard	FP2

No.	Issu	No. Type	Sub-Issue	Sub-Issue Detail		Typical Recommended Actions	Priority
		2.3	Storage areas	Excessive areas of 'in-process' storage open to production areas	b.	Separate storage areas from adjacent areas by means of 1-hour fire rated construction in accordance with Cl. 3.11 of the LABS Standard	FP2
				Other storage (e.g. under or on stairs)	a.	Storage to be removed from stair enclosure or separated with 1-hour fire rated construction in accordance with Cl. 3.11.5.4 of the LABS Standard	FP2
		2.4	Other high risk areas	Generator enclosure inadequate	a.	Generator sets to be separated from all other occupancy areas by a minimum 2-hour construction in accordance with Cl. 3.11.5.3 of the LABS Standard	FP2
				Boiler Room enclosure inadequate	a.	Boiler room to be separated from all other occupancy areas by a 1-hour fire rated construction with an automatic suppression system, or 2-hour construction in accordance with Cl. 3.11.5.2 of the LABS Standard	FP2
				Large Compressor without enclosure	a.	Compressor to be separated from all other occupancy areas by a minimum 1-hour fire rated construction in accordance with Cl. 3.11.5.4 of the LABS Standard	FP2
				Transformer enclosure inadequate	a.	Transformers to be separated from all other occupancy areas by a minimum 1-hour fire rated construction in accordance with Cl. 3.11.5.4 of the LABS Standard	FP2
				Chemical Store enclosure inadequate	a.	Chemical store to be separated from all other occupancy areas by a minimum 1-hour fire rated construction in accordance with Cl. 3.11.6.3 of the LABS Standard	FP2
				Others	a.	Other hazardous areas to be separated from all other occupancy areas by fire rated construction in accordance with Cl. 3.11.5.4 of the LABS Standard	FP3
		2.5	Structure & Finishes	Fire Protection of the structure	a.	Provide steel structure with fire protection for a period defined in Cl. 3.12, 3.13 and 4.3 of the LABS Standard according to type of construction	FP3
				Non-compliant Wall Finishes	a.	Partition finishes to be removed and replaced with material meeting the fire spread characteristic requirements of Cl. 6.3.2 of the LABS Standard	FP3
				Non-compliant Ceiling finishes	a.	False ceilings to be removed and replaced with finish meeting the fire spread characteristic requirements of Cl. 6.3.2 of the LABS Standard	FP2

H1.3 Fire Safety Systems

No.	Issue Type	No.	Sub-Issue Type	Sub-Issue Detail		Typical Recommended Actions	Priority
3	Fire Safety systems	3.1	Fire Detection	Unsuitable Fire Detector type	a.	Replace fire/ smoke detectors with detectors suited to the type of environment of the space in accordance with Cl.5.9 of the LABS Standard	FP2
				Inadequate Fire Detector coverage	a.	Provide detectors to all enclosed areas to ensure compliance with Cl.5.9 of the LABS Standard	FP2
				Incorrect Fire Detector positioning	a.	Location of fire/ smoke detectors are not in accordance with specification of distance from ceiling/ spacing between detectors/ avoidance of obstructions. Upgrade detector system to comply with requirements of Cl.5.9 of the LABS Standard	FP2
				Inadequate back-up power to Detectors	a.	Back-up power for the Fire Detection system to be provided in accordance with Cl.5.13 of the LABS Standard	FP1
		3.2	Fire Alarm	Unsuitable Fire Alarm type (audio, visual)	a.	Provide a Fire Alarm system to comply with Cl.4.12, 5.2.4 and 5.9 of the LABS Standard	FP1
				Inadequate Fire Alarm coverage	a.	Provide a Fire Alarm system to comply with Cl.5.9 of the LABS Standard	FP1
					b.	Test decibel levels of alarm sounders in all areas. Add sounders for all areas where the alarm decibel level is not sufficient in accordance with Cl.5.9 of the LABS Standard.	FP2
				Incorrect or no automatic Fire Alarm activation	a.	Provide a Fire Alarm activation mechanism to comply with Cl. 5.9 of the LABS Standard	FP1
				Inadequate back-up power to Fire Alarms		Back-up power for the Fire Alarm system to be provided in accordance with Cl.5.13 of the LABS Standard	FP1
		3.3	Emergency Lighting	Insufficient Emergency Lighting for escape pathways	a.	Provide emergency lighting in compliance with Cl.6.8 of the LABS Standard on all escape paths	FP2
				No Emergency Lighting provided	a.	Provide emergency lighting in compliance with Cl.6.8 of the LABS Standard on all escape paths	FP1

				Inadequate back-up power to Emergency Lighting	a.	Backup power for Exit Signs and Emergency Lighting to escape paths must be provided in accordance with Cl.6.8.3 of the LABS Standard	FP1
				Wiring configuration of emergency lighting system incorrect	a.	Re-configure wiring of the emergency lighting system to ensure that the lighting activates when power is lost in the affected zone in accordance with Cl.6.8 of the LABS Standard	FP1

H1.4 Provisions for Firefighting

No.	Issue Type	No.	Sub-Issue Type	Sub-Issue Detail		Typical Recommended Actions	Priority
4	Provisions for Fire Fighting	4.1	Water supply	No municipal main water supply	a.	Provide on-site water storage and fire pumps in accordance with Cl.5.7.2 of the LABS Standard	FP2
				Insufficient water storage on premises for firefighting systems	a.	Check water demand for all firefighting systems and provide adequate water storage on site in accordance with Cl.5.7 of the LABS Standard.	FP2
				No or inadequate water pump-set	a.	Provide adequate fire water pumps with capacity required by Cl.5.7 of the LABS Standard	FP1
					b.	Provide new pumps that meet the pressure and flow capacity requirements of LABS Standard Cl.5.3, 5.5 & 5.6	FP2
					c.	Check pressure and flow capacities of fire pumps to ensure they can meet the requirements given in LABS Standard Cl.5.3, 5.5 & 5.6	FP2
				Water storage insufficient for fire hose reel given the pump system provided	a.	Provide water storage sufficient to serve hose reel system and sprinklers if any to meet flow and duration requirements Cl.5.7 of the LABS Standard	FP2
				Pump-set back-up not provided or insufficient	a.	Provide pump-set back-up for hose reel system and sprinklers if any to meet flow and duration requirements of LABS Standard Cl.5.6	FP2
				Manual activation of fire pumps	a.	Ensure clear procedure for manual activation of fire pumps, with assigned responsible persons identified in an Emergency Plan, in accordance with Cl.5.13 of the LABS Standard	FP2
					b.	Link fire pumps to an automatic backup power supply that is activated on activation of the Fire Alarm in accordance with Cl.5.13 of the LABS Standard	FP3
		4.2	Firefighting	Inadequate fire	a.	Provide a fire hydrant system with sufficient	FP2

			systems	hydrant/ wet riser system		outlets to ensure full coverage of all parts of the building in accordance with Cl.5.5 and 5.6 of the LABS Standard	
					b.	Provide additional connection points to the fire water system to ensure full coverage of all parts of the building in accordance with Cl. 5.6.3 of the LABS Standard	FP3
				No or inadequate internal fire hose reel system	a.	Provide internal fire hose reel system in accordance with Cl. 5.6 of the LABS Standard or justify omission on the basis of alternative firefighting provisions	FP1
					b.	Replace existing deteriorated hoses with hoses that are fit for purpose in accordance with Cl.5.5 & 5.6 of the LABS Standard	FP3
				Insufficient portable fire extinguishers	a.	Provide sufficient fire extinguishers of the correct type and distribution, as required by Cl.5.8 of the LABS	FP2
				Portable extinguishers not signposted	a.	Provide signposting for portable fire extinguisher locations so that they are clearly by occupants from their workstations in accordance with Cl.5.8 of the LABS Standard	FP3
				Portable extinguishers not checked and tagged	a.	Carry out regular maintenance of all fire extinguishers and ensure that inspections are recorded adequately in accordance with Cl.5.8 of the LABS Standard	FP3
				No automatic extinguishing system	a.	An automatic sprinkler system to be installed in accordance with Cl.5.3 of the LABS Standard	FP3
		4.3	Access	Inadequate access for Fire Fighting vehicles	a.	Access for fire fighting vehicles to be provided in accordance with Cl.5.12 of the LABS Standard	FP3
				Other issues			

H1.5 Maintenance and Housekeeping

No.	Issue Type	No.	Sub-Issue Type	Sub-Issue Detail		Typical Recommended Actions	Priority
5	Maintenance and Housekeeping	5.1	Legal Documents	Fire Police inspection report; does the factory have one and what information is given in the Annex	a.	Obtain Fire Police Inspection report or similar document from Local Fire Authority for presentation at the factory in accordance with Cl. 3.3 of the LABS Standard	FP2
				Other Fire Authority documentation	a.	Obtain regulatory licenses, permits or similar for presentation at the factory in accordance with Cl. 3.3 of the LABS Standard	FP3
		5.2	Maintenance records	Inadequate maintenance records for Alarm system	a.	Carry out maintenance of the Fire Alarm system in accordance with CL.12.8 and 12.10 of the LABS Standard and ensure that records are kept of all maintenance activities for future inspection	FP2
				Inadequate maintenance records for Emergency lighting	a.	Carry out maintenance of the Emergency Lighting system in accordance with 12.11 & 12.12 of the LABS Standard and ensure that records are kept of all maintenance activities for future inspection	FP2
				Inadequate maintenance records for Pumps & Fire hose	a.	Testing and maintenance to be carried out on the Fire Hose system in accordance with Cl.5.6 of the LABS Standard	FP3
				Inadequate extinguishing system maintenance records	a.	Testing and maintenance to be carried out on the Sprinkler system in accordance with Cl.5.3 of the LABS Standard	FP3
		5.3	Emergency Plan	Inadequately documented or no Emergency Plan	a.	Emergency Plan to be produced/updated and documented for inspection in accordance with Cl. 12.1 and 12.3 of the LABS Standard	FP3
				Responsible persons designated and assigned tasks documented	a.	Emergency Plan to be produced/updated and documented for inspection in accordance with Cl. 12.1 and 12.3 of the LABS Standard	FP3
				Emergency layouts posted at Exits on each floor	a.	Emergency Plan to be produced/updated and documented for inspection in accordance with Cl. 12.1 and 12.3 of the LABS Standard	FP3
		5.4	Fire Safety Training	No evidence of personnel training and emergency duties	a.	Personnel training and emergency duties to be set out in the Emergency Plan in accordance with Cl. 12.1 to 12.3 of the LABS Standard	FP3
				Inadequate records of regular fire drills	a.	Fire drills to be carried out and recorded in accordance with Cl.12.2 of	FP3

						the LABS Standard, with frequency as dictated by the Fire Police permit	
		5.5	House-keeping	Stored goods, obstacles on evacuation pathways	a.	In-process storage, storage awaiting shipment loading and other miscellaneous items to be properly managed in accordance with Cl. 12.6 and 12.7 of the LABS Standard	FP1
				Stored goods, obstacles on stairways	a.	In-process storage and other miscellaneous items to be properly managed in accordance with Cl. 12.6 and 12.7 of the LABS Standard	FP1
				Combustible goods stacked near heat/electrical sources	a.	All combustible goods to be properly managed in accordance with Cl. 12.6 and 12.7 of the LABS Standard	FP2
				Other			

H2 Prioritization of Fire Safety Actions

Color Category	**Green**	**Yellow**	**Amber**	**Amber/Red**	**Red**
Priority 1 Observations	0	0	0 < n =< 7	7 < n =< 15	>15
Priority 2 Observations	0	Any number	Any number	Any number	Any number
Priority 3 Observations	Any number	Any number	Any number	Any number	Any number
Notes on Factory color coding for Fire Safety					
The scoring system given above to determine the factory color coding should be used only as a guide for prioritizing the urgency of addressing the fire safety aspects of the factory.					
The Fire Inspector may come across situations where one item on the checklist is so deficient that the particular issue in itself, or that issue combined with a few other issues, merits a high-risk category even though the scoring system above does not produce a high score. The Inspector should use his/her judgement in these cases to adjust the risk category.					
Before finalizing the color category of the building the Fire Inspector should use his/her judgment to assess whether the scoring reflects the perceived fire safety condition of the building. If the scoring indicates a different level of safety to that perceived by the Fire Inspector from the observations on site, then the building should be given a color category that corresponds to the perceived condition					

Appendix I

Electrical Issues Categorization and Prioritization

I1 Categorization of Electrical Issues

Issue Type	Sub Issue
E1: Supplies to Life Safety Systems	
	Life safety system
	Fire detection and alarm
	Emergency Lighting
	Fire Water Pump
	Equipment Condition
	Other
E2: Earthing and Bonding	
	Insufficient bonding of equipment
	Break in neutral connection
	Broken/disconnected earthing conductor
	Residual current device
	Main equipotential bonding conductors
	General condition of the LPS: damaged/unfixed conductors and components found
	General condition of the LPS: corrosion found
	No LPS installed
	Details of lightning protection unknown

	Other
E3: Generators	
	Generator type not stated in documents/on equipment
	Generator capacity
	Interlocking and changeover
	Fuel storage
	Generator earthing
	Fuel leaks
	Fuel pump not on life safety supply
	Fuel Monitoring
	Generator Battery
	Ventilation
	Housekeeping
	Equipment condition
	Other
E4: Substations	
	Housekeeping
	Warning/danger signage
	Main incoming power supply
	Substation location

	Oil bonding
	Water ingress
	Substation services
	Substation access
	Ventilation
	Equipment condition
	Other
E5: Distribution	
	Cable support / Installation
	Cable current carrying capacity
	Cable / Circuit identification
	Lint / dust present
	Damaged cables / conduits
	Combustible/flammable materials
	Load balancing
	Housekeeping
E6: Drawings	
	None or outdated Single Line Diagram
	None or outdated earthing diagram
	None or outdated electrical layout drawing

	None or outdated power balance schedule
	Switchboard diagrams not available
E7: Maintenance and Records	
	Maintenance Schedule
	Maintenance Record
E8: Thermographic Scanning	
	No survey / Incomplete due to access issues
	Cable connection / termination
	Circuit breaker
	Other device

I2 Prioritization of Electrical Safety Actions

As the Electrical Safety Assessment is largely based on judgement of the condition of the existing building and various evidence-based indicators of performance of the various electrical and life safety systems, it is not possible to provide a definitive prioritization for each issue on the Electrical checklist.

This forms an important part of the training of the assessment firms. Examples of typical actions associated with the principal issues which are likely to be found and guidance on their prioritization can be provided at that time.

However, the following guidance is provided to assist suitably qualified engineers to determine the most appropriate priority level for a particular finding. This should be read in conjunction with the principles set out in Section 7.1.

EP1: Immediate Actions

EP1 actions shall be reserved and applied where the electrical assessor has determined that a severe risk to life safety or fire exists.

Some observations / actions that would generally be considered to result in an EP1 may be:

- High temperatures observed during thermographic survey in electrical equipment/connection/cables/panels/switchboards
- Exposed live conductors within reach of people or close to flammable material
- Overheating issues in wiring/panels/switchboard
- Overloading issues identified in circuits
- High resistance observed in earth pit (equipment and lightning protection)
- No circuits are drawn for loads without incorporating of an overcurrent protection device (circuit breaker)
- Electrical rooms/panels are not clean and free dirt, lint, water, oil and debris
- Significant levels of lint/dust where high temperatures were recorded in electrical panel in the same facility
- Flammable materials observed in electrical panels or combustible goods stored in electrical room.

A building with SP1 findings at worst may have the following color codes.

Red/Amber: If the QEEC deems that there are **important IMMEDIATE actions required to maintain an Amber designation**, the report may be designated as Amber with Red actions. The Red actions must be completed in two weeks or the overall factory designation will become Red. The most critical actions need to be limited in their number. An example of this may be where high temperatures were observed in a limited number of panels.

Full production may be affected.

Red: Immediate **closure of factory building** or significant part of building recommended. Closure in accordance with protocol. This is where **IMMEDIATE actions** are numerous and / or found across entire systems. Full production may be affected.

EP2: 2 Weeks Actions

EP2 can be applied to actions where the risk of fire and risk to life is lower than EP1.
EP2 can be used where human intervention or another event is required for the risk to be harmful. Some observation / actions that would generally be considered to result in an EP2 may be:

- Unsecured substation or electrical room

The risk only presents itself where an unauthorized or untrained person enters the space:

- Poor or taped joints on cables
- Faults on fire alarm panel
- Faults on primary or secondary power supplies to life safety services
- Significant levels of lint/dust where high temperatures were recorded in other
- panels in the same facility.

This coupled with mediate to high temperature on the same equipment presents a risk of fire.
Amber: No reason to suspend operations in the facility but action may be required locally. Production may continue subject to agreement to further assessments and testing and actions to address issues raised with prioritized actions in report. Issues need to be addressed in the next 2 weeks. Production can continue.

EP3: 4 Weeks Actions

EP3 can be applied to actions where the risk to life safety and fire is low. These may include actions that required multiple (safety) systems to fail at the same time. Examples that could be given an EP3:

- Bonding of extraneous metalwork.

This requires unbounded metalwork to become live and for someone to come into direct contact to affect a person.

- Maintenance overdue on a fire alarm system.
- The Control Panel electrical connections was not updated in the single line diagrams
- No Earthing Schematic Diagram available for review
- Electrical distribution board with improper connection (lack of cable glands and lugs)
- Improper IP (Ingress of Protection) rating of electrical distribution board.

A building with only EP3 findings has an overall yellow color code.

Yellow: Generally, all clear subject to agreement to address prioritized comments. Could include requirements for maintenance to be carried out on LIFE SAFETY SYSTEMS. No critical visible system or component defects no visible immediate risk to workers. Production can continue.

EP4: 2 Months Actions

These are items that if not addressed within the time may deteriorate and develop into a more significant risk.

EP4 can also be applied where maintenance is required to be carried out on an ongoing basis. For example:

- Labelling of electrical equipment is missing or incorrect
- No maintenance has been carried out or documented for electrical equipment
- Lower levels of lint/dust within panel that shows no signs of overheating.
- The fire pump location on terrace does not have any proper path for human access.
- Exposed main electrical panel room to external weather condition.

A building with only EP4 findings has an overall Green color code.

Green: Generally, all clear subject to agreement to address prioritized comments. Could include requirements for maintenance to be carried out on systems. No critical visible system or component defects no visible immediate risk to workers. Production can continue.

Appendix J

Safety Assessment Report Formats - Templates

J1 Structural Template

Revision: Issue XXX

Date: DD Month YYYY

Category (Color)

Factory Name

Factory Address
(Factory
Coordinates)
DD Month YYYY *(Date of assessment)*

Structural Safety Assessment Report

Observations & Actions

Assessment Firm: Name
Authors: Author Name
Reviewed by: Reviewer Name
Approved by: Approver Name

Image of Factory

LABS
Life And Building Safety

Contents

1 Executive Summary

On Day xxth Month Year, Name Surname of Assessment Firm carried out a visual structural assessment of the Factory Name factory at the address and coordinates given on the cover page of this report. The assessment was non- intrusive and was carried out in accordance with the LABS Standard for Country Name and associated Methodology for Preliminary Safety Assessment for Country Name.

Factory Name occupy the entire building (or all buildings on the site) and provided access to all areas.

We met with factory management representative Name Surname (Job Title) and Name Surname (Job Title) (any other management personnel). As the assessment was being carried out as part of an overall Structural, Fire and Electrical pilot assessment exercise, other representatives from Assessment Firm were also present, along with observers from Company and Company. [Delete if not applicable]

Description of factory: Number of buildings Use of buildings

Year of construction

Is whole factory owned by one company? Number of workers

E.g. The factory generally comprises of two main production buildings (Building 5-10 and Building 11 as per site plan) and a number of smaller ancillary facilities. Building 5-10 is used for sewing, cutting, dining and storage while Building 11 is a sewing / cutting building. The buildings were constructed in 2008 and the factory complex is entirely owned and occupied by XXX. There are approximately 500 workers in the factory complex.

Overview of structural system in place in factory buildings (steel / concrete, portal frame / moment frame etc.).

E.g., The production buildings are both single story steel framed structures. Building 11 is a single span portal frame, while Building 5-10 is a two span portal frame.

Drawings:

What drawings were presented? E.g., Structural design drawings, soils report, as- built drawings, permit application, construction completion permit

E.g.**,** We were presented with Permit application and approval documents for the factory complex, based on the design documents prepared prior to commencement of construction. No construction completion license/ permit was provided.

Structural design drawings were provided for both main buildings, which were broadly in agreement with the structure as observed during the assessment.

No soils report was available. Pad foundations are shown on the structural drawings.

Name of buildings (if applicable) were the primary focus of the structural assessment. List any other buildings assessed and level of assessment e.g., a brief walk-through assessment of the ancillary buildings was carried out to identify any critical life safety issues from a structural perspective. None were identified. ***[change as appropriate]***

The overall color code category of this factory is Color Code. This means that there are at least some actions which must be addressed within Time Period. The color code categories for the significant individual buildings assessed (if applicable) are as follows:

- Building Name: Category Nn
- Building Name: Category Nn
- Building Name: Category Nn

A high level and non-exhaustive list of key concerns are:

- Issue 1
- Issue 2
- Issue 3
- Issue 4

Based on the state of the structural safety systems and the condition of the factory floors observed, the level of maintenance appears to be acceptable, provided that regular maintenance activities are implemented or continued, and that detailed records are kept of these activities in the future. ***[change as appropriate]***

We have carried out a seismic assessment in accordance with the LABS methodology, with no significant findings arising. Further seismic assessment is not required as part of LABS Initiative. As this was not a code compliance check in accordance with the Cambodia Building Code, the factory management may wish to consider this separately. ***[change as appropriate]***

We see no reason to suspend operations in the facility due to these concerns (subject to the required actions noted at the end of this report.) ***[change as appropriate based on required actions]***

Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

Our Limitations and Assumptions are also noted at the end of this report.

2 Building Extents

Figure 1 Site Plan (if available) or suitable satellite image

Figure 2 Building Cross Section and Occupancy

Figure 3 N/S/E/W Elevation

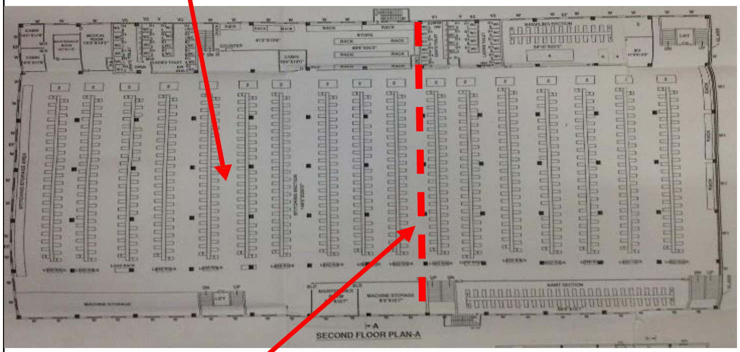
Figure 4 N/S/E/W Elevation

Figure 4 N/S/E/W Elevation

3 Structural System

Concrete Structure Example

Extent of basement level



Movement Joint (MJ) – double structure provided

RC flat slab system with drop panels and perimeter beam; steel structure at terrace

Stability System: Moment frame

Typ. Grid size: 7.5m x 7.5m

Slab Thickness: 250mm average with 3.4 x 3.4 x 0.18m drop panels at columns

Typ. RC Column: 530mm x 530mm
Beam size:
Typical perimeter beam: 530w x 650d
Typical beam at MJ: 530w x 800d

Typical floor to floor height: 3.8-

Figure 5 Building – Structural System (Typical Floor)

Figure N Typical flat slab with drop panels

Figure N Typical floor structure at link between Part A and B

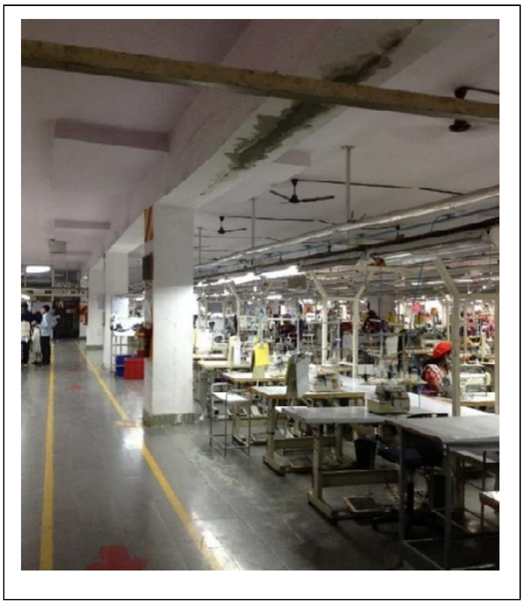


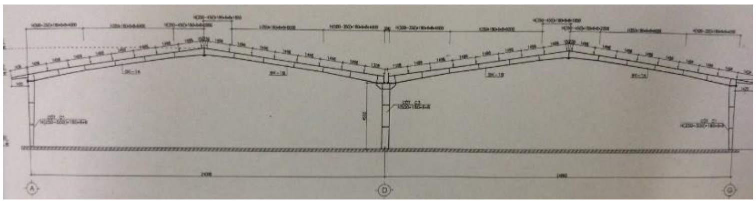
Figure N Double structure and down stand beam at MJ

Figure N Double column at MJ

Figure N Water tank on columns at Roof level – GL E/7-8. Approx. storage – 24,000 liters Similar tank at GL E/2-3

Figure N 10,000 liters tank at GL 0- 11/D-E

Steel Structure Example



Two span portal frame; 24m spans

Overall building length: 108m

Stability System: Moment frame transversely and braced bays in roof and elevation longitudinally

Grid size: Portal frame at 7.2m centers

Steel Column size:

250-500 deep x 180 wide plated column (plate thickness 6-10mm)

Rafter size:

350-500 deep x 180 wide beam (plate thickness 6- 10mm)

Figure N Building 1 – Structural System

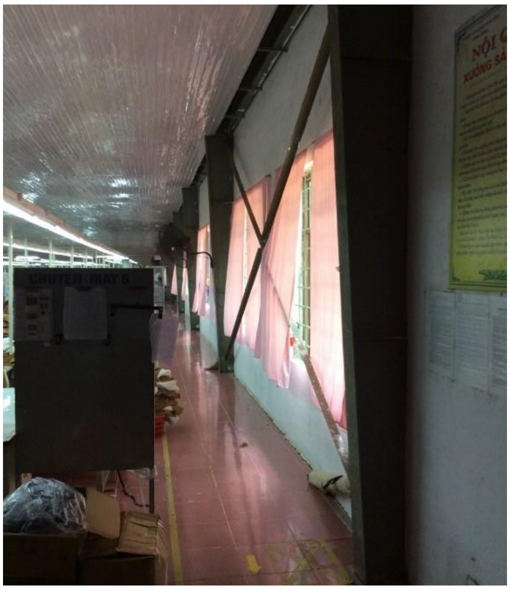


Figure N Typical braced bay – suspended ceilings throughout so portal frames not visible. External masonry wall built tight to outside of column flange

Figure N Typical eaves detail – eaves beam visible

4 Observations

Ref No.	**STR 1**
Observations: Description of Structural Observation 1	
Photo	

Figure N Further description if required

Example

Ref No.	STRUC-1
Observations: Bowing of unrestrained masonry wall on northern gable of Building 5-10. Apparent deflection to concrete canopy on this wall.	

Figure N Bowing of masonry wall which is not restrained by steel columns in gable – c.30-40mm deflection at mid height of wall

Figure N View of northern gable wall with apparent repairs / new render. Concrete canopy appears to have deflected

Ref No.	**STRUC - n+1**
Observations: Description of Structural Observation 2	
Photo	***Photo***

Figure N Further description if required

Figure N Further description if required

Ref No.	**STRUC - n+2**
Observations: Description of Structural Observation 3	
Photo	***Photo***

Figure N Further description if required

Figure N Further description if required

Ref No.	**STRUC – n+3**
Observations: Description of Structural Observation 4	
Photo	***Photo***

Figure N: Further description if required

Ref No.	**STRUC – n+4**
Observations: Description of Structural Observation 5	
Photo	***Photo***

Figure N: Further description if required

5 Priority Actions

Each action has been prioritized as follows:

Priority 1 (SP1) - Immediate Action, e.g., full or partial evacuation, cease construction, remove load etc. (red, amber action)

Priority 2 (SP2) - Action to be completed within 6 weeks Priority 3 (SP3) – Action to be complete within 6 months.

Each recommended action includes the relevant clause reference to the LABS Standard for Cambodia.

Findings and Remediation Issues from FFC to be inserted here

6 Summary of Priority Actions

CAP Priority	Response	Issue Type	Company Plan Of Action
SP2	STRUC-1	S7: Performance of Extensions/Additions	Factory to appoint Structural Engineer to review Stability of stairs, including connection to the existing building and propose remedial measures if required. Refer to clause xxx of the LABS Standard.
SP2	STRUC-2	S7: Performance of Extensions/Additions	Factory to appoint Structural Engineer to Produce Safe load plan for existing terrace to be used for storage giving consideration to floor capacity and column capacity, factory to actively manage floor loading, Refer to Clause xxx of the LABS Standard.
SP2	STRUC-2	S7: Performance of Extensions/Additions	Factory to appoint Structural Engineer to review capacity of existing roof terrace to act as a storage area. Refer to Clause xxx of the LABS Standard.
SP3	STRUC-1	S7: Performance of Extensions/Additions	Implement remedial measures. Refer to Clause xxx of the LABS Standard.
SP3	STRUC-3	S1: Performance of Extensions/Additions	Factory to appoint Structural Engineer to produce safe load plans for all suspended floors, giving consideration to floor capacity and column capacity. Factory to actively manage floor loading. Refer to Clause xxx of the LABS Standard.
SP3	STRUC-4	S6: Performance of Extensions/Additions	Factory to appoint Structural Engineer to Review extent and nature of cracking and monoid as necessary. Remedial measures to be implemented including prevention of water ingress. Refer to Clause xxx of the LABS Standard.
SP3	STRUC-5	S3: Performance of Extensions/Additions	Factory to appoint Structural Engineer to assess column design for vehicle impact in accordance with Clause xxx of the LABS Standard Suitable column protection barriers to be designed and constructed..

SP3	STRUC-6	S8: Performance of Extensions/Additions	Factory to appoint Structural Engineer to prepare as-built structural drawings for the factory. Refer to Clause xxx of the LABS Standard.

CAP Priority	**Response**	
	SP1	Immediately
	SP2	Within 6 weeks
	SP3	Within 6 months

Example of content indicated here, CAP Priority should be in order from highest to lowest

7 Limitations and Assumptions

This report is for the private and confidential use of LABS Initiative for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of Assessment Firm. The assessment has been carried out to identify and address critical life safety issues within the factory, in accordance with the LABS Initiative Localized Standard for Garment, Apparel, Footwear, Bags and accessories Factories in Cambodia.

This report can be used in discussion with the Supplier or Factory Owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual assessment of the building.

This Report is not intended to be treated as a generalized assessment and does not cover the deterioration of structural members through dampness, fungal or insect attack, nor does it deal with problems and defects of a non-structural nature. Other non-structural aspects of the building such as fire safety have not been assessed in this survey.

Except as otherwise noted, drains and other services were not viewed or tested during our assessment and are therefore similarly excluded from this Report. We have not assessed any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External assessment of the façade walls has generally been carried out from ground level only by visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the structure and, in particular, foundations. Strengths of materials and components are untested and we recommend that the Factory Owner's Building Engineer carries out in situ testing over and above those suggested to satisfy themselves with the material strengths and component details, where necessary.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed. This report does not interfere with the Factory Owner's Building Engineers responsibility for the structural performance of this building, The Building Engineer remains fully responsible for the structural adequacy of the building.

The findings and recommendations in this report are not intended to imply, guarantee, ensure or warrant compliance with any National Codes or Government Regulations, nor do they alleviate any responsibility of the Factory Owner in this regard. The site inspection and this Report are carried out as a parallel exercise to design approval and inspections carried out by the Authorities as part of the established state enforcement process.

The observations in this report are based on the Engineering Judgement of the Lead Assessor / Engineer at the time of the survey. We assume in making these observations that no covering up of faults defects, filling or plastering over cracking or significant repair work has been carried out by the Building Owner. Any future alteration or additional work by the Building Owner will void this report.

LABS disclaimer

This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

J2 Fire Template

Revision: Issue XXX

Date: DD Month YYYY

Category (Color)

Factory Name

Factory Address

(Factory Coordinates)

DD Month YYYY *(Date of assessment)*

Fire Safety Assessment Report

Observations & Actions

Assessment Firm: Name Authors:
Authors Name Reviewed by: Reviewer
Name Approved by: Approver Name

Image of Factory

Contents

1 Executive Summary

On DAY xxth of MONTH YEAR, NAME SURNAME of ASSESSMENT

FIRM Name carried out a visual Fire Safety Assessment of the FACTORY NAME factory at the address and coordinates given on the cover page of this report. The inspection was non-intrusive and was carried out in accordance with the LABS Standard for COUNTRY NAME and associated Methodology for Preliminary Safety Assessments for COUNTRY NAME. Limited testing of the fire safety systems was carried out.

FACTORY NAME occupy the entire building (OR ALL BUILDINGS ON THE SITE) and allowed us access to all areas.

We met with factory management representative NAME SURNAME (JOB TITLE) and NAME SURNAME (JOB TITLE) (ANY OTHER MANAGEMENT

PERSONNEL). As the assessment was being carried out as part of an overall Structural, Fire and Electrical pilot assessment exercise, other representatives from ASSESSMENT FIRM were also present, along with observers from ASSESSMENT FIRM and ASSESSMENT FIRM. [Delete if not applicable]

The factory generally comprises DESCRIPTION. It was constructed during the period YEARS and FACTORY NAME have been occupying/renting the premises since YEAR. There are approximately NUMBER workers in the factory complex.

The assessment was carried out principally to identify issues affecting the life safety of occupants in the Production buildings. The separate ancillary buildings were also inspected with a view to identifying any life safety impact on the occupants of the Production building for a fire anywhere on the premises.

The overall color code category of this factory is COLOUR CODE. This mean there are at least some actions which must be addressed within TIME PERIOD. The color code categories for the significant individual buildings are as follows:

- Building Name: Category Nn
- Building Name: Category Nn
- Building Name: Category Nn

A high level and non-exhaustive list of key concerns are:

- Xxxxxxxxxxxxxxx
- Xxxxxxxxxxxxxxx
- Xxxxxxxxxxxxxxx
- Xxxxxxxxxxxxxxx

A summary of actions with associated priorities and timeframes are given at the end of this report.

Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

Based on the state of the fire safety systems observed, the condition of the factory floors and circulation routes observed and the documentary evidence of maintenance records presented, the level of housekeeping in the factory appears to be VERY GOOD/ACCEPTABLE/BELOW STANDARD.

The purpose of the inspection was to identify significant fire safety issues and to provide actions for remediation based on applicable standards specified by LABS.

Our Limitations and Assumptions are also noted at the end of this report.

2 General Information

2.1 General Factory Information

Factory Name	Name
Factory Address	Address
GPS Co-ordinates	GPS Co-ordinates
Factory Contact Person	Name
Assessment Participants	Name
	Name
	Name
	Name
Visiting Cards	Image of business card
Other Tenants	

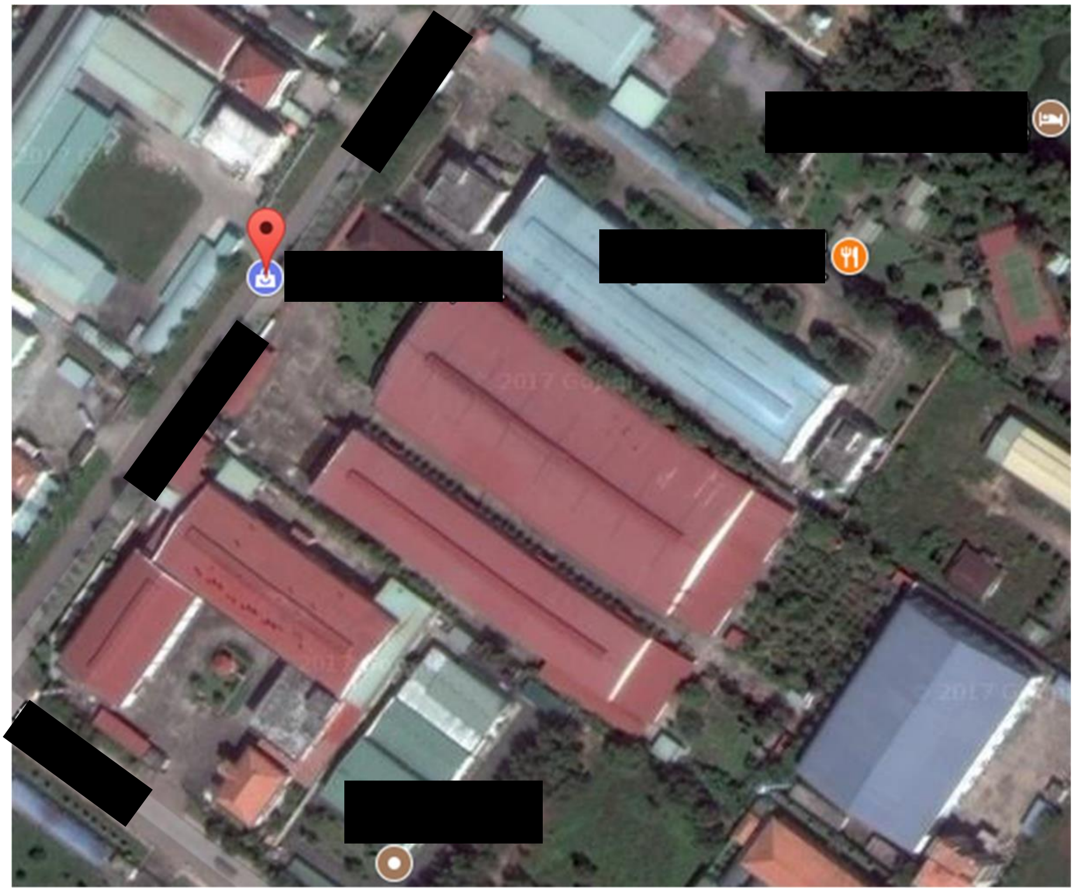


Figure 1 Satellite view of factory buildings (e.g. Above)

2.2 General Building Information

3 Number of Buildings 4		
Building Designation and Uses in Building/		
Basement Floors Mezzanine floors		
Basement Floors Mezzanine floors		
Stories above grade of buildings		
Height of buildings (m)		
Floor Dimensions/ Areas of buildings		
Occupant Numbers		
Number of Work Shifts		
Year of Construction		
Type of Construction		

Additions/ Renovations		
Floor Plans provided		
Permits provided Other Comments		
Permits provided Other Comments		

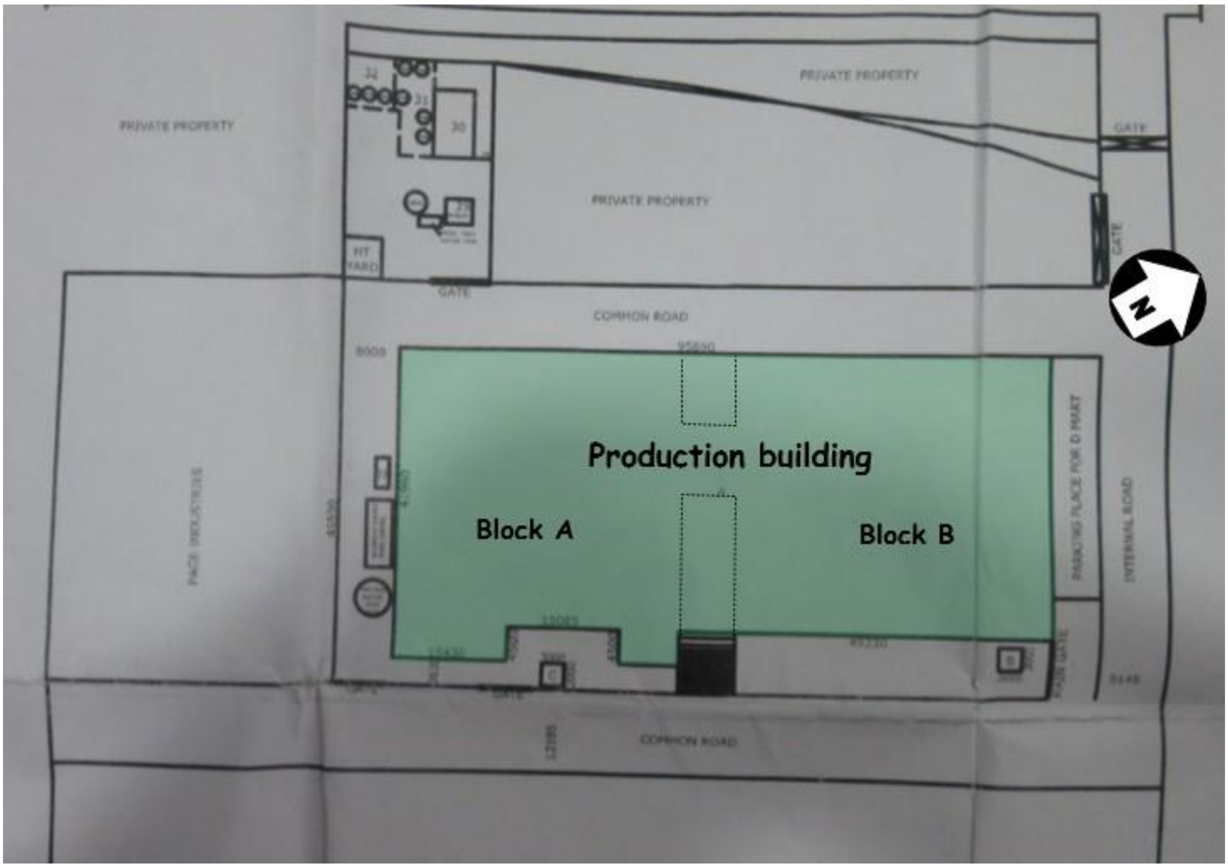


Figure 2 Schematic layout of Factory premises

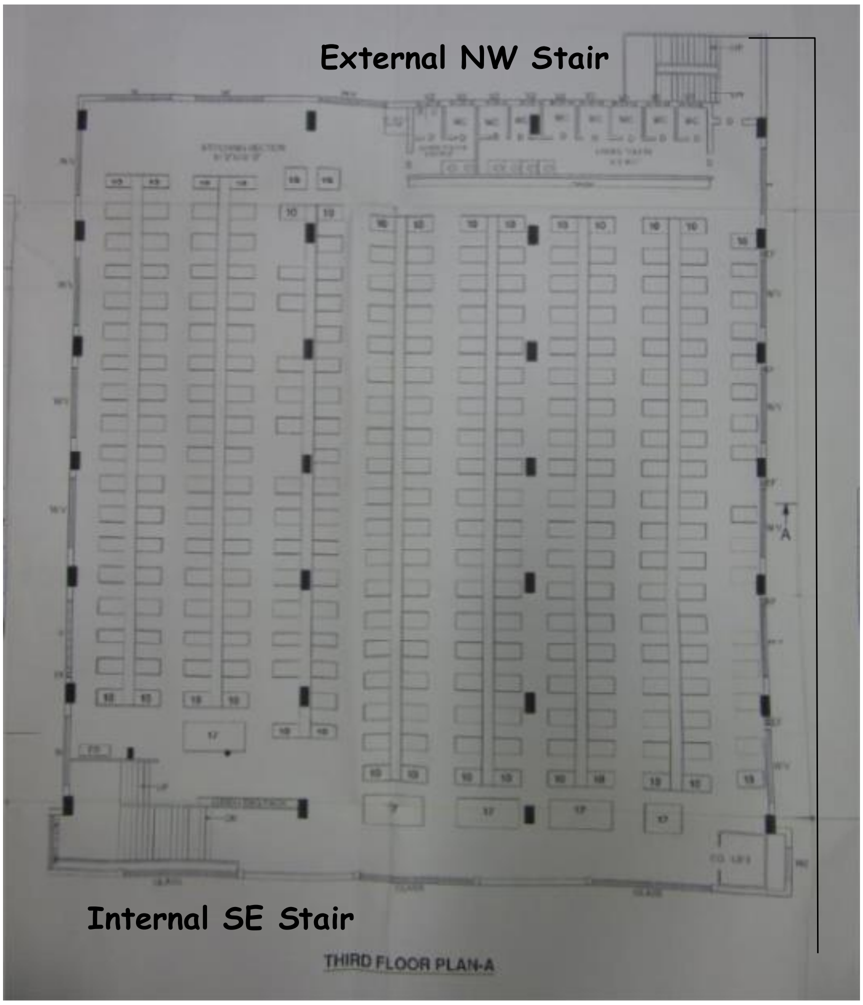


Figure 3 Floor plans (e.g. Third Floor Plan)

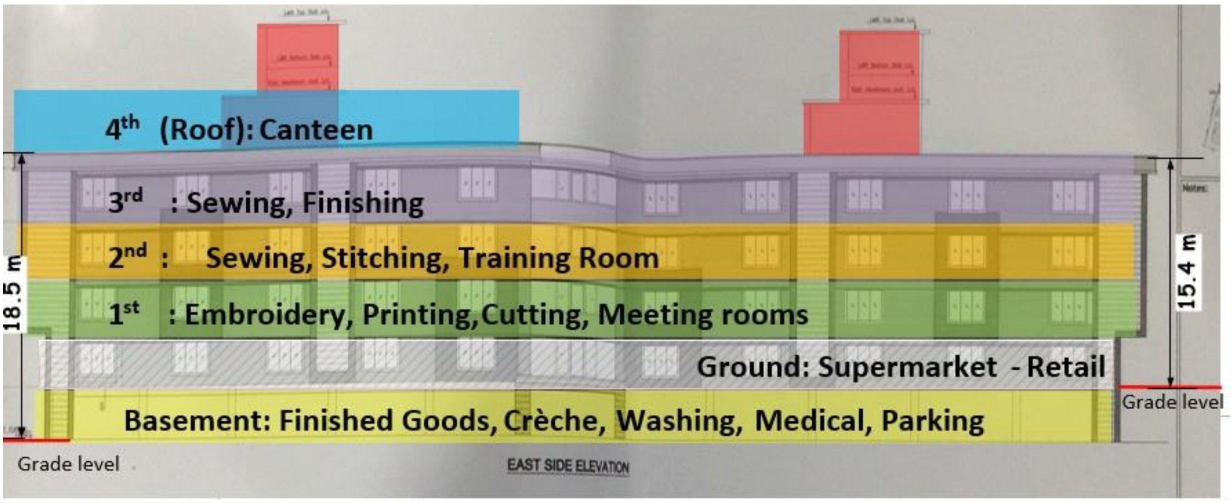


Figure 4 Perspectives/ Elevations/Sections

3 Fire SafetyMeasures

3.1 Occupancy Classification

The Building is classified as:

- General Industrial Occupancy (Group G Industrial Building)

3.2 Means of Escape

BRIEF DESCRIPTION

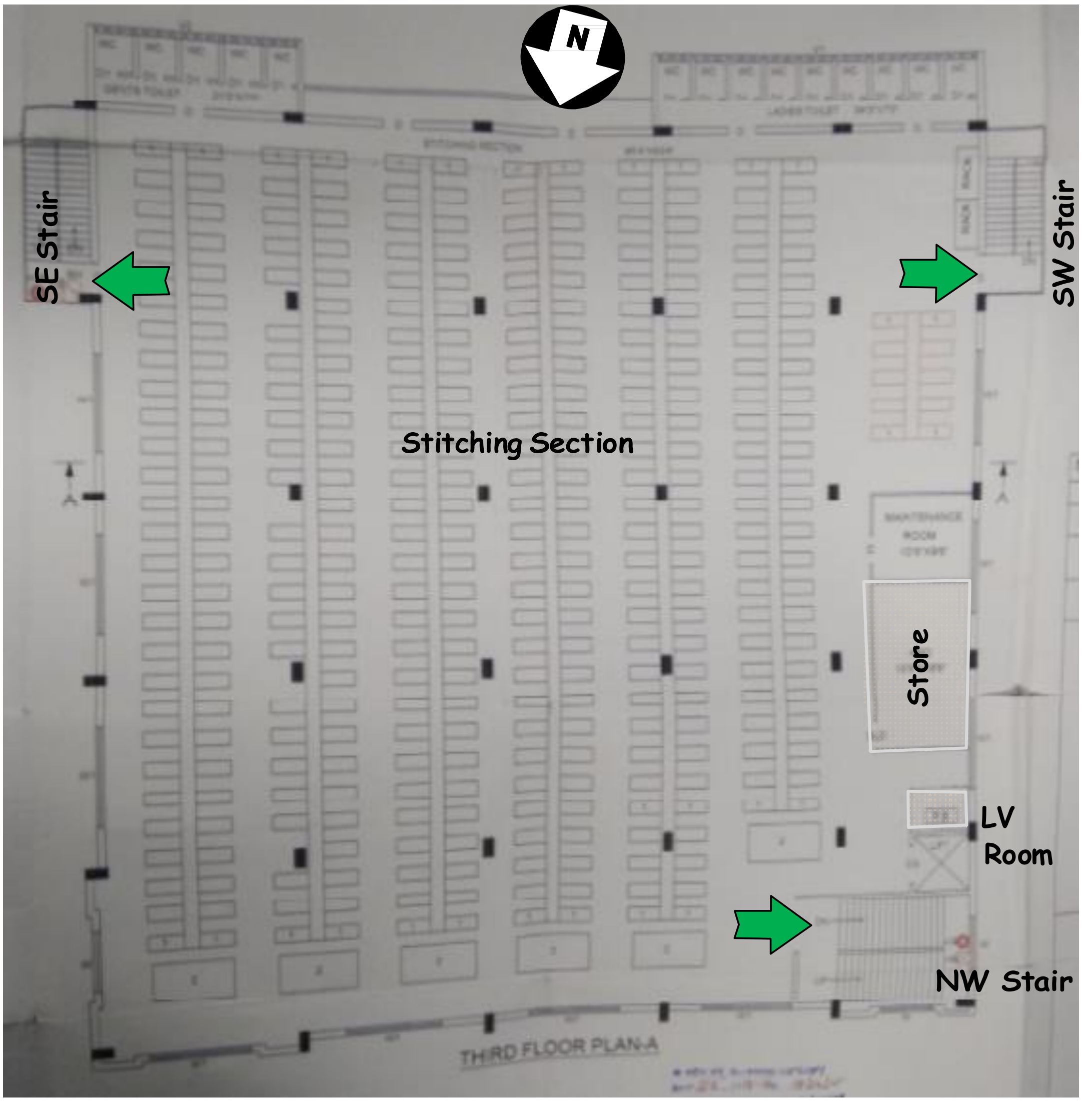


Figure 5 Schematic layout indicating Floor Exits from Typical Floor/s of Building

COMMENTS.

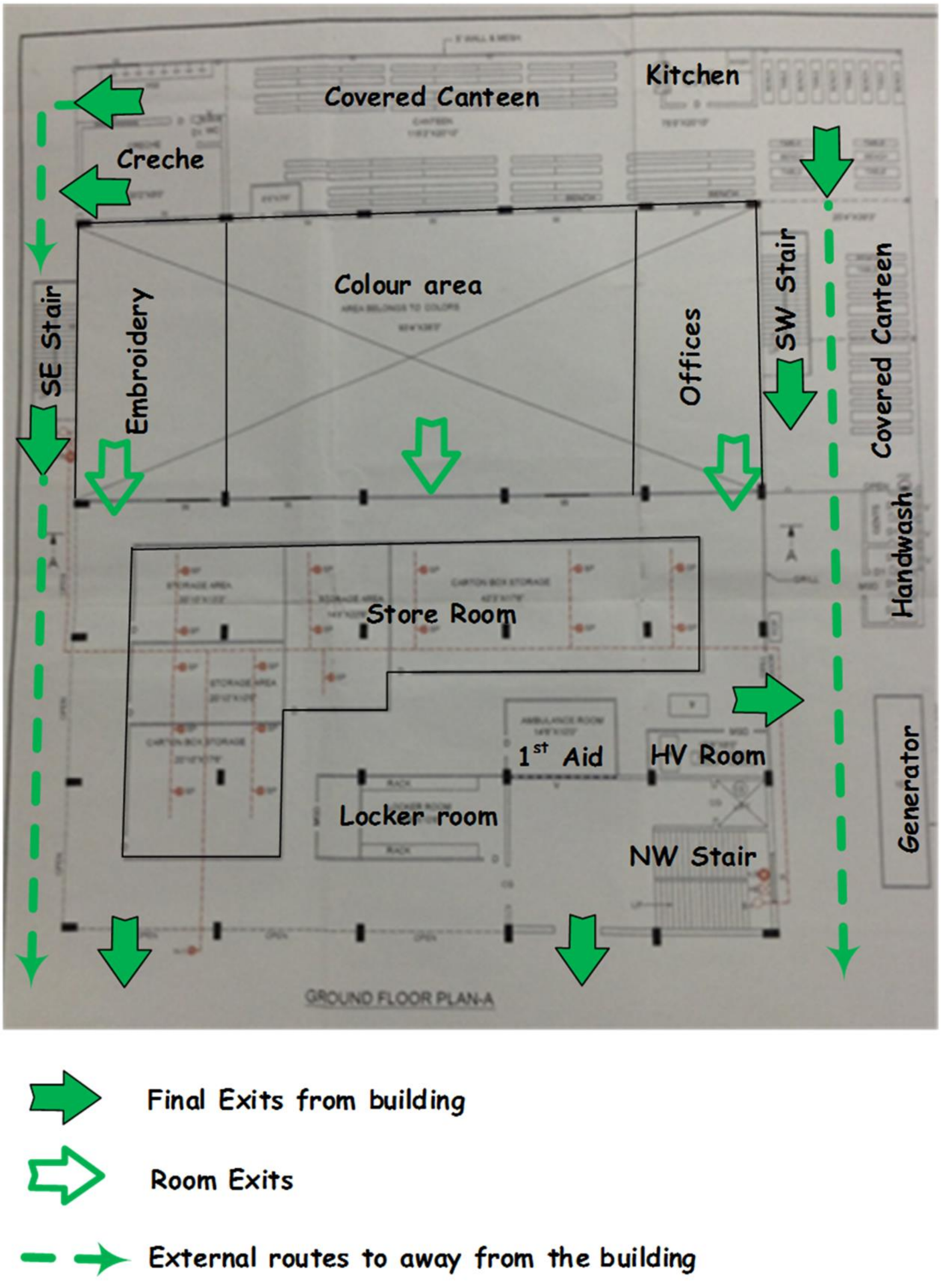


Figure 6 Schematic indicating Final Exits from Ground Floor of Building/s

3.1.1 Floor Exits

Exit capacities for doors of floor exits compared to occupancy numbers maximum numbers per shift (taking into account two shifts simultaneously in building) are as follows:

Building/Floor or Area	Occupancy	Door width required	No. Exits provided	Total Door Width	Door Capacity provided

From the table above it can be seen that exit capacity ………… Stair exit

capacities from the upper floors are as follows

Building/Floor/ Area	Occupancy	Stair width required	No. Stairs	Total Stair Width	Stair Capacity provided

Alternative routes for escape provided from all areas	
Excessive travel distance to nearest floor exit	
Escape from Mezzanines	

3.2.2 Escape Paths to Floor Exits

Escape paths of adequate widths from all areas	
Excessive dead ends to aisles or corridors Pathways clearly	
indicated on floor Escape paths clear of temporary obstacles	
Escape paths free of any permanent obstacles	
Doors on exit paths swing correctly in travel direction Doors on exit paths	
easily openable, no locking devices	

3.2.3 Exit Signage

Evacuation pathways correctly sign posted	
Clear Floor signage indicating all escape paths Illuminated exit	
signs at all emergency exits Signage consistent on all exit paths	

3.2.4 Floor Exit Doors

Floor exit door width, height adequate	
Floor exit doors swing correctly in travel direction Floor exit doors easily	
openable, no locking devices	

3.2.5 Exit Stairs

Stairs width adequate	
Tread/riser consistent and not too steep	
Handrails provided both sides in all stairways	
All stairways lead directly to outside at discharge level	
Number of stairs discharging inside building, unprotected distance from Final Exit	
Number of stairs discharging inside building, unprotected distance from	

3.2.6 Final Exits

Final Exit doors swing correctly in travel direction	
Final Exit doors easily openable from inside, override any security locking devices	
Final Exit doors open to outside	
From Final Exit door, can people move safely away from the building	
Protection of escape route outside required	

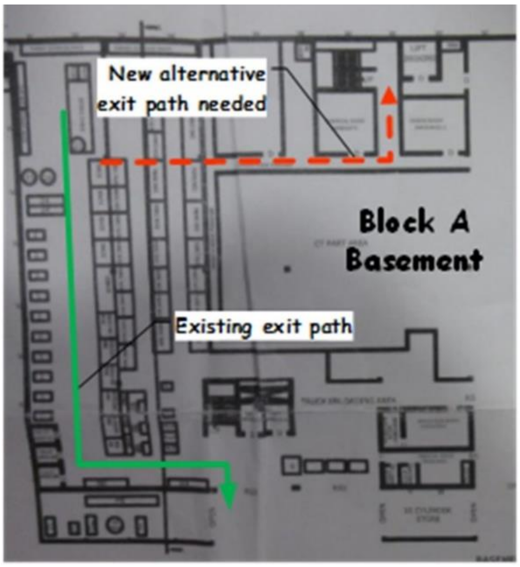


Figure 7 Schematic showing excessive single direction travel distance (e.g. Above)

Figure 8 Temporary storage of carton along the Exits (e.g. Above)

3.3 Fire Safety – Construction

3.3.1 Protection of Vertical Openings

SHORT DESCRIPTION (Vertical component of means of escape)

Enclosure of Stairs connecting more than 2 floors	
Self-closing FR doors to protected stairs	
Unsealed penetrations in stair enclosures	
Protection of external stair from fire in interior	
Protection of vertical service shafts passing through floors	
Fire rated separation of lifts shafts	
Other vertical openings through compartment floors	

3.3.2 Separation of Occupancies

Fire rated separating walls between different occupancies (other than Storage)	
Unsealed penetrations through separating walls	
Separation of basement with FR lobby, walls and self- closing doors	

3.3.3 Storage Areas

SHORT DESCRIPTION (dedicated storage areas).

Dedicated storage areas and sprinkler/ fire rated enclosure provisions are as follows:

Storage Location	**Approx. area Storage (m^2)**	**Total Floor area (m^2)**	**FR enclosure**	**Sprinkle red Floor**

Temporary ‘in-process’ Storage observed that is open to the production area and that needs attention is as follows:

Location	Description

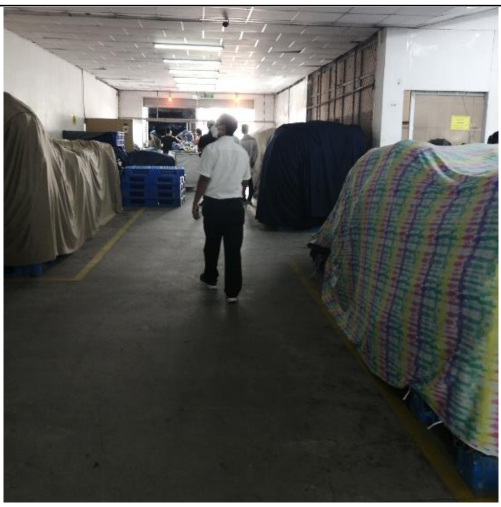


Figure 9 Excessive 'in-process' storage stacked on Sewing floor

Figure 10 Miscellaneous storage and UPS battery back-up under stairway

3.3.4 Other High Risk areas

Installation	Type	Location	Separated from Production Area	Separated from Exit Path
Generator				
Boiler				
Transformer				
Compressor				
Chemicals Storage				

Figure 11 Dedicated storage area separated by open wire enclosure (e.g. above)

Figure 12 Diesel cooled Transformer Adjacent Crèche and large window onto Stair

3.3.5 Structure and Finishes

Structural Fire Protection 5		
Wall Finishes		
Ceiling finishes		

3.4 Fire Safety Systems

Fire Detection types	
Fire Detector coverage	
Fire Alarm types	
Fire Alarm coverage	
Activation of Fire Alarm	
Fire Detection and Alarm back-up power	
Emergency Lighting at Exits	
Emergency Lighting of escape paths	
Emergency Lighting back- up power	

3.5 Provisions for Fire Fighting

Water Supply		
Water Storage		
Fire Pumps	Type	
	Capacity	
	Back-up	
External Hydrants		
Internal Hydrants		
Hose reels		
Handheld Fire Extinguishers (HHFE)		
Automatic suppression system		
Access for Fire Fighting vehicles		

Figure 13 Fire Hydrant and hose reel at half landing, located at height

Figure 14 Centrifugal suction fire water pump adjacent to reservoir

3.6 Management and Housekeeping

Legal Documents	
Maintenance records for fire safety systems	
Emergency Plan	
Fire Safety Training	
Fire drills	
Housekeeping	

4 Observations

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-Issue Type</th></tr>
<tr><td>FIRE-1</td><td></td><td></td></tr>
<tr><td colspan="2">Observation</td><td>Building</td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2">
Figure xx Boiler room with no enclosing wall facing onto external stair (e.g.: external stairs)</td><td>
Figure xx Unprotected window openings adjacent to external stair (e.g.: external stairs)</td></tr>
</table>

Ref No.	Issue Type	Sub-Issue Type
FIRE-n+1		
Observation		**Building**
 **Figure xx** Each figure to have brief descriptive title (e.g. Uncontrolled storage on escape path)		 **Figure xx** Storage of waste textiles under stairway (e.g. Uncontrolled storage on escape path)
Figure xx Each figure to have brief descriptive title		**Figure xx** Each figure to have brief descriptive title

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-Issue Type</th></tr>
<tr><td>FIRE-n+2</td><td></td><td></td></tr>
<tr><td colspan="2">Observation</td><td>Building</td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2">

Figure xx Narrow external corridor with windows unprotected from inside (e.g. Exit routes outside to place of safety)</td><td>Figure xx Each figure to have brief descriptive title</td></tr>
</table>

5 Priority Actions

For each observed item identified above an action list has been prepared to identify the specific required follow up actions and prioritized on the basis of the following:

- Fire Priority 1 (FP1) – Actions that are perceived to immediately affect the ability of people to evacuate the building safely in the event of fire, and attention should be given to addressing them from the outset. Immediate Action e.g., partial/full evacuation, localized closure of space, etc.
- Fire Priority 2 (FP2) – Actions that are perceived to have a delayed or lesser effect on people evacuating the building safely in the event of fire. Actions to be completed within 6 weeks.
- Fire Priority 3 (FP3) – Issues that are perceived to have less of an impact on their own to evacuate the building safely in the event of a fire. Actions

  to be completed within 6 months.

Findings and Remediation Issues from FFC to be inserted here.

6 Summary of PriorityActions

Table from FFC

CAP Priority	Response	Issue Type	Company Plan Of Action
FP1	FIRE-2	F1: Means of Escape	Proper housekeeping needed in Ground floor storage room. Ensure pathways on exit routes clear of all temporary storage and other obstacles Change the Kitchen Door to open inwards or direct the people towards SE Stair Exit
FP1	FIRE-3	F1: Means of Escape	Replace doors with side hung doors that open in the direction of escape in accordance with Cl. 6.1, 6.3 and 6.9 of the LABS Standard. Replace outside locks with locking mechanisms that allow easy opening from inside without the use of a key in accordance with Cl. 6.1, 6.3 and 6.9 of the LABS Standard
FP1	FIRE-1	F1: Means of Escape	Extend one of the two external stairs(SE stair or SW Stair) up to 4th Floor level, and create an alternate escape path to the landing of this stair at 4th Floor level.
FP1	FIRE-16	F3: Fire Safety Systems	Provide a Fire Alarm activation linked to smoke detectors to comply with Cl. 5.9 of the LABS Standard
FP2	FIRE-12	F2: Fire Safety Construction	Minimum 1-hour fire rated construction required to protect 1st Aid room and Escape path neat Exit 3 on the W side from fire or explosion of the HV panel and Compression in accordance with the LABS Standard
FP2	FIRE-8	F2: Fire Safety Construction	The elevator shaft to be enclosed with fire rated construction in accordance with Cl. 4.8 and 5.11 of the LABS Standard
FP2	FIRE-9	F2: Fire Safety Construction	Services opening passing through compartment floors to be suitably enclosed or protected with fire rated material in accordance with Cl. 4.4 and 4.7 of the LABS Standard
FP2	FIRE-10	F2: Fire Safety Construction	Separate storage areas from adjacent areas with 1-hour fire rated construction in accordance with Cl. 3.10 1nd 3.11 of the LABS Standard

FP2	Fire-17	F3: Fire Safety Systems	Provide emergency lighting in compliance with Cl.6.8 of the LABS Standard on all escape paths, including escape stairs
FP2	FIRE-19	F4: Provisions for Fire Fighting	Check current distribution of fire extinguishers and provide additional if necessary to comply with Cl.5.8 of the LABS Standard.
FP2	FIRE-18	F4: Provisions for Fire Fighting	Provide fire water pumps (duty and standby) with backup power supply in accordance with Cl. 5.7 of the LABS Standard
FP3	FIRE-11	F2: Fire Safety Construction	Re-arrange temporary storage into 'blocks' no greater than 23m2 and 3m separation between adjacent 'blocks' in acc. with Cl.3.11.5.6.
CAP Priority	FP1	Immediate action	
	FP2	Within 6 weeks	
	FP3	Within 6 months	

(Example of Content indicated above, CAP Priority should be in order from highest to lowest)

7 Assumptions and Limitations

This report is for the private and confidential use of LABS for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of ASSESSMENT FIRM NAME.

The assessment has been carried out to identify and address critical life safety issues within the factory, in accordance with the LABS Initiative Localized Standard for Garment, Apparel, Footwear, Bags and accessories Factories in Cambodia.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual inspection of the building.

This Report is not intended to be treated as a generalized inspection and does not cover the deterioration of fire safety construction measures or fire safety systems through lack of maintenance. Other aspects of the building that do not affect the safety of the occupants of the Production buildings have not been assessed in this survey.

Except as otherwise noted, other services were not viewed or tested during our inspection and are therefore similarly excluded from this Report. We have not inspected any parts of the building which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the building. Performance testing of fire safety systems do not form part of these inspections and we recommend that the factory owners Building Engineer carries out standard testing and maintenance of these systems to satisfy themselves of their proper functioning.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed.

This report does not interfere with the factory owners Building Engineers responsibility for the fire safety performance of this building, The Building Engineer remains fully responsible for the fire safety adequacy of the building.

The information in this Fire Safety Inspection Report was obtained during a one- day site visit to the factory, where we carried out interviews with local factory management and reviewed design and permit documentation presented at that meeting. It has not been possible to provide independent verification for all the information and data collected, and, therefore Archetype group cannot accept general responsibility for omissions or errors arising from inaccuracies in this report from the information obtained.

The findings and recommendations in this report are not intended to imply, guarantee, ensure or warrant compliance with any National Codes or Government

Regulations. The site inspection and this Report are carried out as a parallel exercise to design approval and inspections carried out by the Authorities as part of the established state enforcement process.

Additionally, the results do not imply in any way that compliance with the findings or recommendations as stated in this report will eliminate all hazards, risks or exposures or that hazards, risks or exposures not referred to in this report do not exist.

Implementation of the recommendations stated in this report does not relieve the factory owner from any obligation to comply with specific project requirements, industry standards, or the provisions of any local government regulations.

LABS disclaimer

This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as,

but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

J3 Electrical Template

Revision: Issue XXX

Date: DD Month YYYY

Category (Color)

Factory Name

Factory Address

(Factory Coordinates)

DD Month YYYY *(Date of assessment)*

Electrical Safety Assessment Report

Observations & Actions

Assessment Firm: Name Authors:
Authors Name Reviewed by: Reviewer
Name Approved by: Approver Name

Image of Factory

LABS
Life And Building Safety

Contents

1 Executive Summary

On Wednesday 14th March 2018 Assessor Name of Assessment Firm Name carried out a visual Electrical Safety Assessment of the XXX factory at the address and coordinates given below under 'General Factory Information'. The assessment was non-intrusive and was carried out in accordance with the LABS Standard for Cambodia and associated Preliminary Assessment Methodology. Limited testing of the electrical systems was carried out.

XXX occupy the entire building except the portion of ground floor (XXX occupy portion of ground floor) and we were provided with access to all areas of XXX.

We met with factory management representative XXX (Electrical – Maintenance In-charge) and a number of other XXX employees accompanied us during the assessment. As the assessment was being carried out as part of an overall Structural, Fire and Electrical pilot assessment exercise, other representatives from Assessment Firm Name were also present, along with observers from XXX.

The XXX factory comprises one building that has a main Production and Storage areas, the other facilities like Offices, Electrical room and Pump room are located within building. The site wide area has Generator, Canteen, and Kitchen.

The building was constructed circa XXX,. There are approximately 900 workers in the factory complex.

The overall color code category of this factory is XXX. This means that there are at least some actions which must be addressed within Time Period. The color code categories for significant individual buildings is as follows: *(where relevant)*

- Main Building: Category Nn

A high level and non-exhaustive list of key concerns are:

- Lack of access control or lock and key system for the major electrical rooms
- Excessive dust and lint evident with electrical distribution boards
- The Main electrical panel room exposed to weather conditions.

A summary of actions with associated priorities and timeframes are given at the end of this report.

Based on the state of the electrical safety systems and the condition of the factory floors observed, the level of maintenance appears to be acceptable, provided that regular maintenance activities are implemented or continued, and that detailed records are kept of these activities in the future. *(change as appropriate)*

Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

Our assumptions and limitations are also noted at the end of this report.

2 General Information

2.1 General Factory Information

Factory Name	XXX
Factory Address	XXX
GPS Co-ordinates	XXX
Contact Person	XXX
Inspection Participants	Assessor Name 1 (Assessment Firm Name)
	Assessor Name 2 (Assessment Firm Name)
	Assessor Name 3 (Assessment Firm Name)
	Assessor Name 4 (Assessment Firm Name)
Visiting Cards	Image of business card
Other Tenants	**XXX, XXX**

Image of factory site or appropriate satellite image

Figure 1 Google Maps Image of Site

2.2 General Building Information

Number of Buildings	
Building Designation and Use	Example - • Cutting& finishing building – 1 level • Sewing building – 1 level
Basement Floors	
Stories above grade	
Floor Dimensions/ Areas	Example – Cutting& finishing building: 72m x 23m = approx. 1650m^2 Sewing building: 75m x 23m = approx. 1700m^2
Year of Construction	Example – Cutting & finishing building – 2002 Sewing building – 2002
Additions/Renovations	
Floor Plans Provided	List floor plans provided

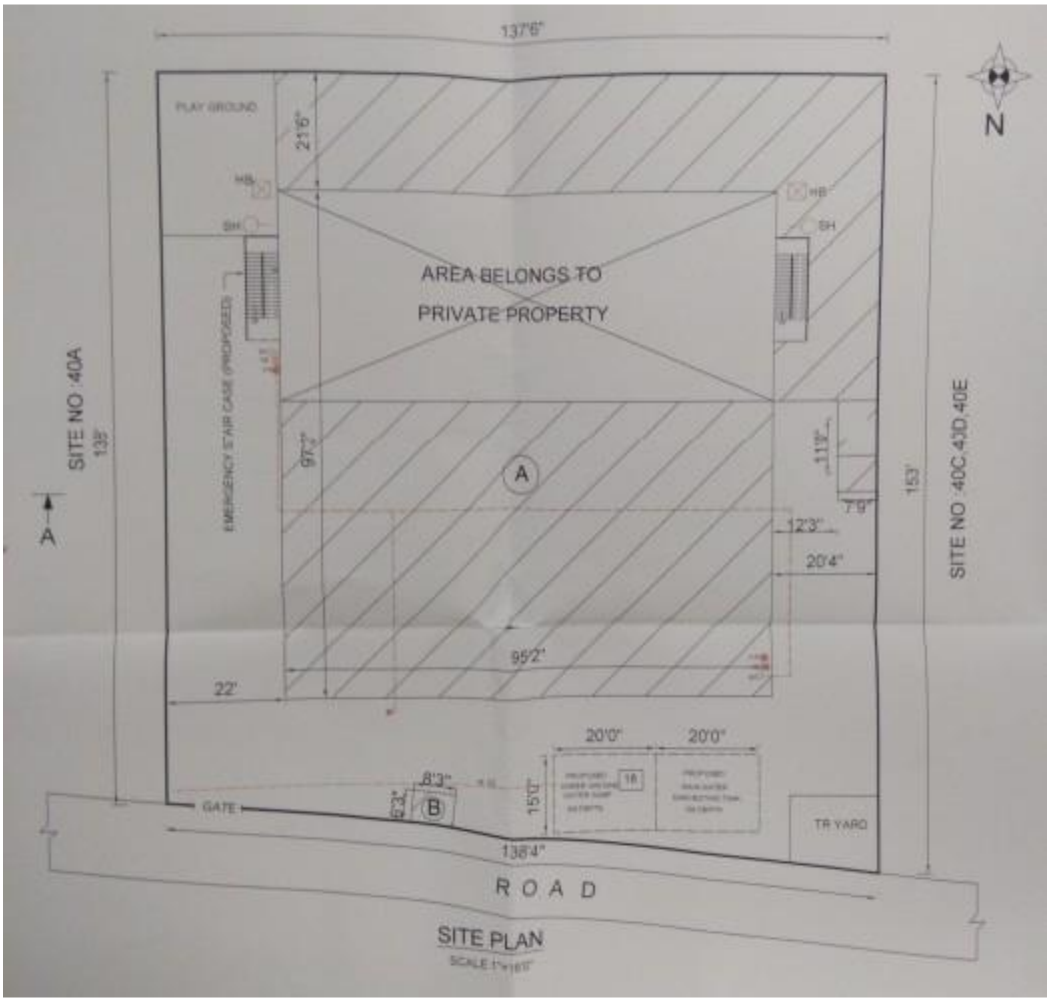


Figure N Site Layout showing location of 11kV HT pole mounted transformer (TX)

3 Electrical Systems

The following sections indicate examples of how the electrical systems should be recorded in the report.

3.1 Supplies to Life Safety Systems

Three life safety systems and power supplies to same were observed during the assessment as follows;

System	Primary Power	Secondary Power
Emergency Lighting	Utility Power Supply	Centralized UPS with 90 minutes backup time
Fire Detection and Alarm System	Utility Power Supply	Centralized UPS with 90 minutes backup time Local Batteries
Factory Fire Hoses (one fire pump on terrace)	Utility Power Supply	Generator backup

The operation of the hose reel pump system had manual switchover on the electric pump and also start the Diesel pump (where primary power fails).

3.2 Emergency Lighting

Emergency lighting throughout consisted of twin spot fittings mounted above doorways and final exits.

Figure N Emergency Lighting

3.3 Fire Detection and Alarm System

Fire Detection	Smoke detectors were provided on ground floor storage areas. Smoke detection in the Panel Checking, Cutting and Major Electrical rooms missing. Detectors missing in the electrical panel room. Each higher floor has one smoke detector. All other areas manual activation by Manual Call Points (MCP) Fire Alarm Panel backed by UPS location below staircase.
Fire Alarm	Alarm sounders located over on all floors Activated manually by MCPs at exit doors in all other areas. Fire Alarm Panel backed by UPS location below staircase.

Testing / witnessing the operation of the fire alarm system carried out and found operational.

3.4 Earthing and Bonding

Connection of metalwork (machines, electrical panels, transformer, DG set) was clearly evident. The electrical single line diagram does not show any details of the earthing arrangement nor the size of earth cables. These could not be checked.

3.5 Lightning Protection

A lightning protection system is provided, however, there was no record of regular maintenance provided.

3.6 Power

Power enters the site via 11kV overhead BESCOM supply which is connected to a tapping pole and 250kVA oil type transformer located outside boundary wall. The step-down voltage of 433V is connected to Main LT Panel located on ground floor.

One standby diesel generator of 200kVA is located on ground floor adjacent to the main LT panel room, the diesel is stored near to DG cabinet. The starting of DG is manual. 200kVA oil cooled voltage stabilizer is connected at the output side of transformer.

Figure N 250kVA Transformer and 200kVA DG set.

3.7 Distribution

There is a main LT panel located in the power compound which distributes power to the internal Panel boards.

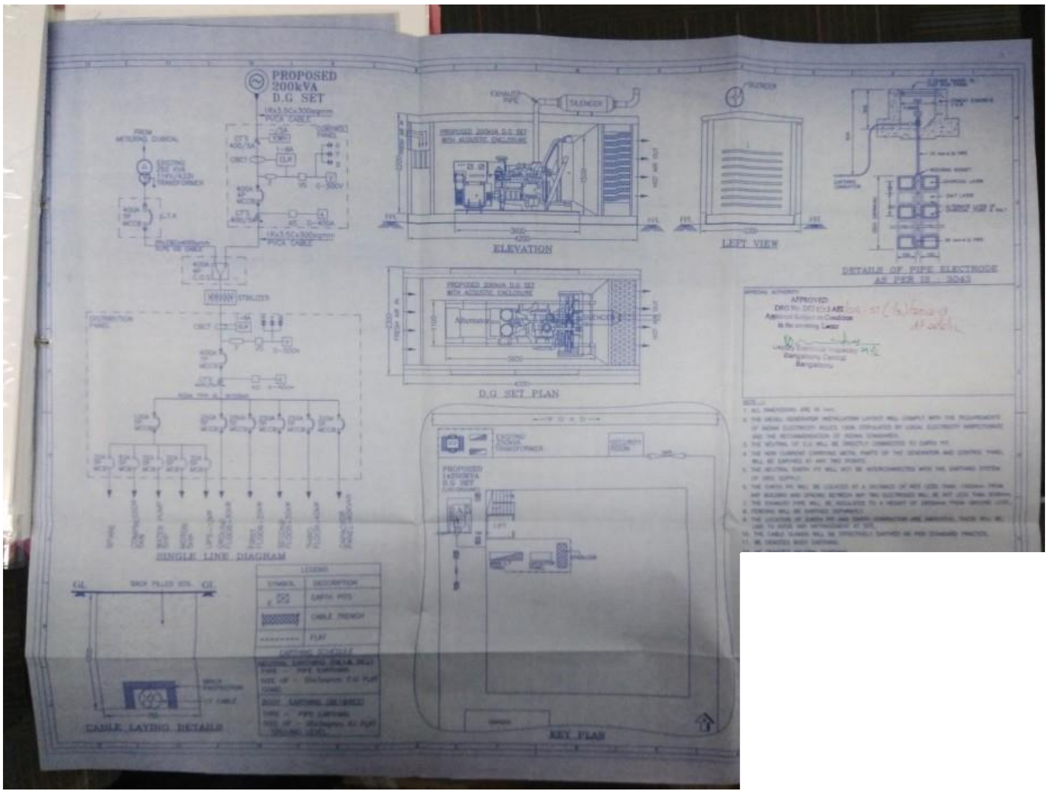


Figure N Single Line Diagrams (SLD)

1.1 Maintenance and Records

No maintenance recorders for the transformers, Main panels and DG set were available for review during the assessment.

4 Observations

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-header</th></tr>
<tr><td>ELEC-1</td><td></td><td></td></tr>
<tr><td colspan="3">Observations:</td></tr>
<tr><td colspan="3">Figure xxx Image Description</td></tr>
</table>

Examples

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-header</th></tr>
<tr><td>ELEC-n</td><td>E5 : Distribution</td><td>Combustible/flammable materials present</td></tr>
<tr><td colspan="3">Observations: Combustible material storage next to the main LT panel room metal fence.</td></tr>
<tr><td colspan="3">
Figure N Storage of combustible material near main LY panel metal fencing.</td></tr>
</table>

Ref No.	**Issue Type**	**Sub-Header**
ELEC – n+1	E5 : Distribution	Inadequate protection against direct contact

Observations: Exposed main electrical panel room to external weather condition.

Figure N Exposed main Electrical panels

Ref No.	Issue Type	Sub-Header
ELEC-n+2	E5 : Distribution	Incorrect cable installation

Observations: Cables are terminated without fixing of cable armor into the gland, there is no other insulation available on outer sheet.

Figure N Improper termination of cables.

5 Priority Actions

Each recommendation has been categorized using the following logic;

Priority	Logic	Timeline
1	The non-conformance poses an immediate danger to life or immediate risk of causing a fire. Examples; exposed live conductor(s), insufficient or no protection via circuit breaker.	Immediately
2	Similar to item 1 above, however requires two or more non- conformances / recommendation to contribute to the start of a fire or electrocution. Example; inflammable materials surrounding electrical installation.	2 weeks
3	The item(s) pose a lower risk to life and causing a fire.	4 weeks
4	The recommendation will help to ensure that equipment remains fit for purpose, and reduces the risk to life safety.	2 months

Each recommended action includes the relevant clause reference to the LABS Standard for Cambodia.

Findings and Remediation Issues from FFC to be inserted here.

6 Summary of Priority Actions

CAP Priority	Response	Issue Type	Company Plan Of Action
EP3	Elec-4	E1: Supplies to Life Safety Systems	The fire pump panel to be placed inside room and shall have automatic starting arrangement in the event of fire. Refer to Clause 10.22 of the LABS Standard.
EP3	Elec-6	E2: Earthing and Bonding	Dual earthing connection to be provided based on fault level on the respective panel. Refer to Clause 10.34 of the LABS Standard.
EP3	Elec-1	E5: Distribution	The storage near Main LT panel need to be removed. The main LT panel to be placed inside the dedicated room. Refer to Clause 10.6.5 of LABS Standard.
EP3	Elec-8	E5: Distribution	A proper cable termination by gland and lugs to be carried out. Refer to Clause 10.15.3 of the LABS Standard.
EP3	Elec-9	E5: Distribution	A proper cable containment shall be provided. Refer to Clause 10.16 of the LABS Standard.
EP3	Elec-5	E5: Distribution	The life safety UPS should be provided a proper room and lighting. Refer to Clause 10.26 of the LABS Standard.
EP3	Elec-10	E5: Distribution	An appropriate ingress protection consider shall be taken to avoid direct contact. Refer to Clause 10.18.3 of the LABS Standard.
EP4	Elec-7	E4: Substations	A proper human and material access to be provided for Transformer. Refer to Clause 10.8.5 of the LABS Standard.
EP4	Elec-2	E5: Distribution	The room to be constructed for Main LT panel that should prevent entry of rain water. Refer to Clause 10.10, 10.10.9 of the LABS Standard.
EP4	Elec-3	E5: Distribution	The cable need to terminated by using proper lugs and the armour should be terminated inside gland. Refer to Clause 10.15.3 of the LABS Standard.

CAP Priority		
	EP1	Immediately
	EP2	Within 2 weeks
	EP3	Within 2 months
	EP4	Within 2 months

Example of content indicated here. CAP Priority should be in order from highest to lowest

7 Assumptions and Limitations

This report is for the private and confidential use of LABS for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of Assessment Firm Name.

The assessment has been carried out to identify and address critical life safety issues within the factory, in accordance with the LABS Initiative Localized Standard for Garment, Apparel, Footwear, Bags and accessories Factories in Cambodia.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual assessment of the building.

This Report is not intended to be treated as a generalized assessment and does not cover the deterioration of electrical safety construction measures or electrical safety systems through lack of maintenance. Other aspects of the building that do not affect the safety of the occupants of the Production buildings have not been assessed in this survey.

Except as otherwise noted, other services were not viewed or tested during our assessment and are therefore similarly excluded from this Report. We have not assessed any parts of the building which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External assessment of the façade walls has generally been carried out from ground level only by visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the building. Performance testing of electrical safety systems do not form part of these assessments and we recommend that the factory owners' Building Engineer carries out standard testing and maintenance of these systems to satisfy themselves of their proper functioning.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious electrical defects as identified in this Report, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed.

This report does not interfere with the factory owners' Building Engineers responsibility for the electrical safety performance of this building, The Building Engineer remains fully responsible for the electrical safety of the building.

The information in this Electrical Safety Assessment Report was obtained during a one-day site visit to the factory, where we carried out interviews with local factory management and reviewed design and permit documentation presented at that meeting. It has not been possible to provide independent verification for all the information and data collected, and, therefore Assessment Firm Name cannot accept general responsibility for omissions or errors arising from inaccuracies in this report from the information obtained.

The observations and recommendations in this report are not intended to imply, guarantee, ensure or warrant compliance with any National Codes or Government Regulations. The site assessment and this Report are carried out as a parallel exercise to design approval and inspections carried out by the Authorities as part of the established state enforcement process.

Additionally, the results do not imply in any way that compliance with the observations or recommendations as stated in this report will eliminate all hazards, risks or exposures or that hazards, risks or exposures not referred to in this report do not exist.

Implementation of the recommendations stated in this report does not relieve the factory owner from any obligation to comply with specific project requirements, industry standards, or the provisions of any local government regulations.

LABS disclaimer

This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the “**Methodology**”) and the LABS harmonized reference standard and protocol (“**LABS Standard**”).

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

J4 Color Code Template

Use the following templates for defining the appropriate color code on report front page.

Category Black

Category Red

Category Red/Amber

Category Amber

Category Yellow

Category Green

Appendix K

Safety Assessment Report Formats - Sample Reports

K1 Structural Sample Report

Revision: Issue 2
Date: 11 March 2022

Amber

NYAN KIDS (CAMBODIA) LTD - 2

Banla Sa-it Village, Sangkat Khmuonh, Khan Sen Sok, Phnom Penh, Cambodia

(11.602821790941281, 104.87109037711541)

19 January 2022

Structural Safety Assessment Report

Observations & Actions

Assessment Firm: Archetype Cambodia

Authors: Chantha Ny

Reviewed by: Pichmuny Youk

Approved by: Pichmuny Youk

Contents

1 Executive Summary

On Friday 21th January 2022, Chantha Ny, a structural engineer from Archetype Cambodia, carried out a visual structural assessment of Nyankids-2 Cambodia Co., LTD at the address, and coordinates are given on the cover page of this report. The assessment was non-intrusive and was carried out in accordance with the LABS Standard for Cambodia and associated Preliminary Assessment Methodology for Cambodia.

Nyankids-2 Cambodia LTD occupied the entire building and provided access to all areas. We met with factory management representatives Pheng Kang (HR Manager), Sara (Production Manager), Sok Vanny (HR Assistant), and Kok Chok Soon (Senior Mechanical Maintenance). As the assessment was being carried out as part of an overall Structural, Fire, and Electrical pilot assessment exercise, other representatives from Archetype were also present, along with observers from LABS.

The factory generally comprises three main buildings. The three main buildings are used for sewing, cutting, printing, and storage. The two buildings (building A&B) were constructed in 2011 and building was built in 2019. Nyankids-2 Cambodia Co., LTD rents and occupies the entire factory. There are approximately 1500 workers in the factory complex.

A Brief description of the structural system in place in factory building:

- Building A: Single Story, RC column with steel truss roof
- Building B: Single Story, RC column with steel truss roof
- Building C: Single Story, RC column with steel truss roof
- Hostel Building: Single Story, RC column with steel truss roof

Drawings:

The construction permits were not presented for review during the Assessment. A Fully package of design/ As-built drawings was not provided for review. Soils report was not available for review during the Assessment.

The overall color code category of this factory is Category Amber. This means that there are at least some actions that must be addressed within time period.

A high level and non-exhaustive list of key concerns are:

- Many cracks were found on the brick wall of building A, B, C and Dormitory
- Smartboard wall at HR/Nurse office was cracked and bended
- Generator room, scrap fabric storage, and workshop were constructed with unskilled workers
- No structural drawings available.

Based on the state of the structural safety systems and the condition of the factory floors observed, the housekeeping and level of maintenance could be improved.

Regular maintenance activities should be implemented and detailed records should be kept of these activities in the future.

We see no reason to suspend operations in the facility due to these concerns (subject to the required actions noted at the end of this report.)
Further actions with associated priorities and timeframes are given at the end of this report. Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

Our Limitations and Assumptions are also noted at the end of this report.

2 Building Extents

Figure 1: Satellite Image of the Factory

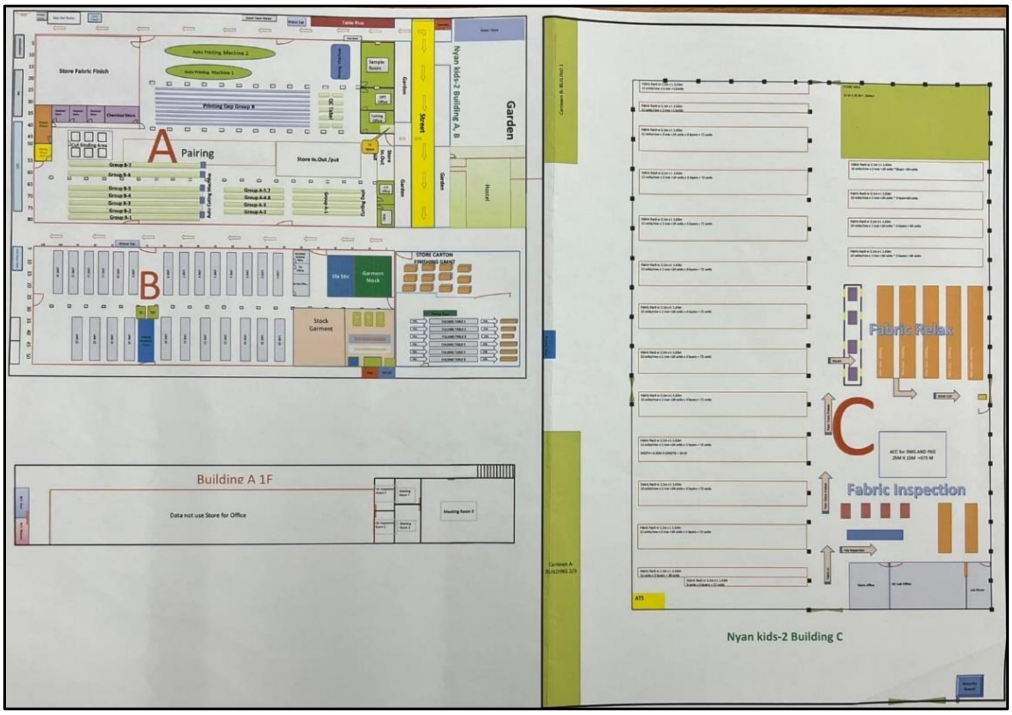


Figure 2: Building Cross Section and Occupancy

Figure 3: Building A – Front View

Figure 4: Building B

Figure 5: West Side View

Figure 6: Building C

Figure 7: Building C – East Side View

Figure 8: Building C – West Side View

Figure 9: Security Guardhouse – Side View

Figure 10: Water Tanks – Side View

Figure 11: Hostel

Figure 12: Dining Area

Figure 13: Generator Room

Figure 14: Diesel Tank

Figure 15: Compressor Room

Figure 16: Workshop

Figure 17: Mezzanine

Figure 18: Scraped Fabric Storage

Figure 19: Gas Storage

Figure 20: Boiler Area

Figure 21: HR Office and Nurse Room

3 Structural System

#1 – Main Factory and Warehouse Building

Figure 22: Roof truss system of building A

Figure 23: Truss system supported by concrete columns

Figure 24: Cantilever floor of building A

Single story building with size of Size: 80x105m

Members size

- Building frames:
  - Column: 200x300mm
  - Beam: 200x300mm
  - Column spacing: 4.80m
  - Size: 80x105m
- Mezzanine frames:
  - Column under mezzanine: 200x300mm
  - Beam: 300x300mm
  - Column spacing: 5m
  - Mezzanine height: 2.82m
  - Cantilever slab: 1.73m

Building completed 2011

Stability System: Roof truss structure fixed to reinforcement concrete column. There was no wind bracing on roof.

Foundation: No Information

#2 – Building B

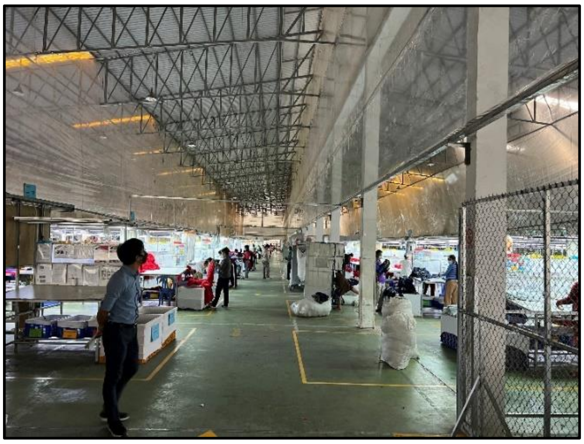


Figure 25: Structural sysem of building B

Figure 26: Roof truss system of building B

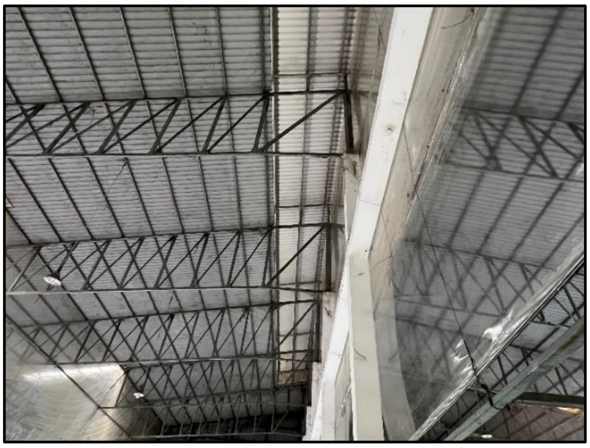


Figure 27: Zoom-in roof truss system of building B

Single story building with size of 50x105m

Members size

- Building frames:
  - Column: 200x300mm
  - Beam: 300x300mm
  - Column spacing: 4.90m

Building completed on 2011

Stability System: Roof truss structure fixed to reinforcement concrete column. There was no wind bracing on roof.

Foundation: No Information

#3 – Building C

Figure 28: Inside view of the structural system

Single story building with size of 90x50m

Members size

- Building frames:
  - Column: 300x300mm
  - Beam: 300x300mm
  - Column spacing: 4.70m
  - Height: 11.24m

Building completed on 2019

Stability System: Roof truss structure fixed to reinforcement concrete column. There was no wind bracing on roof.

Foundation: No Information

Figure 29: Truss system of the building

Figure 30: Zoom-in view of the truss system supported by the columns

Figure 31: Hallway view of Hostel Building

Members size

- Building frames:
  - Column: 200x200mm
  - Beam: 200x300mm
  - Ceiling height: 3.77m & 3.27
  - Height: 6m

Stability System Steel structure fixed to reinforcement concrete column. There was no wind bracing on roof.

Foundation: No Information

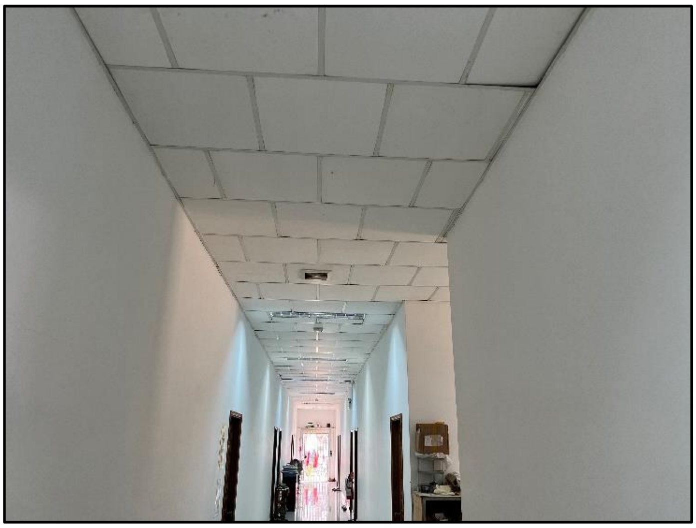


Figure 32: Ceiling view for Hostel Building

Figure 11 Additional steel structure on 4th floor

4 Observations

Ref No.	Issue Type	Sub-Issue Type
STR1	S2 –Lateral Structural System	Steel buildings: Bracing missing/incomplete

Observations: No bracing were observed in Building A, B and C.

Figure 33: The vertical support system not apparent

Figure 34: The vertical support system not apparent

Ref No.	Issue Type	Sub-Issue Type
STR1	S9 – Maintenance	Lack of maintenance

Observations: The vertical support system was not apparent, the old chimney was hung without support

Figure 33: The vertical support system not apparent

Figure 34: The vertical support system not apparent

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-Issue Type</th></tr>
<tr><td>STR2</td><td>S6 – Visible Distress in Non-Structural Members</td><td>Cracking</td></tr>
<tr><td colspan="3">Observations: Smartboard wall at HR/Nurse Office was cracked and bended</td></tr>
<tr><td colspan="2">
Figure 35: Smartboard wall was cracked and bended</td><td>
Figure 36: Smartboard wall was cracked and bended</td></tr>
</table>

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-Issue Type</th></tr>
<tr><td>STR3</td><td>S9 – Maintenance</td><td>Structural steelwork corrosion</td></tr>
<tr><td colspan="3">Observations: Steel support corrosion at building B</td></tr>
<tr><td colspan="2">
Figure 37: Steel support corrosion</td><td>
Figure 38: Steel support corrosion</td></tr>
</table>

Ref No.	Issue Type	Sub-Issue Type
STR4	Visible distress in nonstructural members	Cracking

Observations: Wall cracking at building A, B, C, and Hostel building

 Figure 39: Wall cracking at building A	 Figure 40: Steel trusses connected with masonry wall
 Figure 41: Wall cracking at building B	 Figure 42: Wall cracking at building C
 Figure 43: Wall cracking at building C	 Figure 44: Wall cracking at building C


Figure 45: Wall cracking at Hostel building

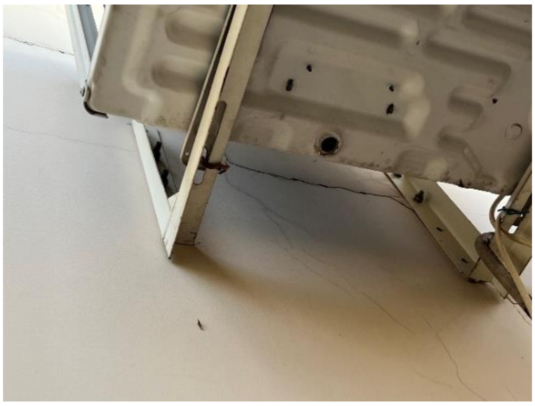


Figure 46: Wall cracking at Hostel building

Ref No.	Issue Type	Sub-Issue Type
STR5	Maintenance	Lack of maintenance

Observations: Ceiling has been damaged by water leakage at building A and mezzanine floor building A


Figure 47: Ceiling has been damaged at building A


Figure 48: Ceiling has been damaged at mezzanine floor

Ref No.	Issue Type	Sub-Issue Type
STR6	Vertical structural system	Water tanks on suspended floors/roof
Observations: Non-engineered and corroded steel structure supporting the water tank		
 Figure 49: Non-engineered steel structure		 Figure 50: Visible corrosion on steel structure

Ref No.	Issue Type	Sub-Issue Type
STR7	Maintenance	Lack of maintenance
Observations: Column damaged by drilling and observable broken floor tiles at building B		
 Figure 51: Column damaged by drilling		 Figure 52: Broken floor tiles were observed

Ref No.	Issue Type	Sub Issue Type
STR8	Structural Documentation	Unaligned structural drawing and as-built structure

Observations: Dining Table Area, Generator room, Compressor Room, Scrap fabric storage, Workshop were built with unskilled worker

Figure 53: Dining Table Area

Figure 54: Generator room

Figure 55: Compressor Room

Figure 56: Workshop

Figure 57: Scrap Fabric Storage

5 Priority Actions

Each action has been prioritized as follows:

Priority 1 (SP1) - Immediate Action, e.g. full or partial evacuation, cease construction, remove load, etc (red, amber action)

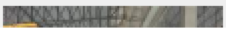
Priority 2 (SP2) - Action to be completed within 6 weeks

Priority 3 (SP3) – Action to be complete within 6 months.

Each recommended action includes the relevant clause reference to the LABS Standard for Cambodia.

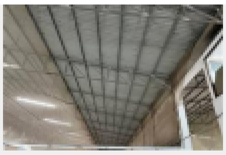
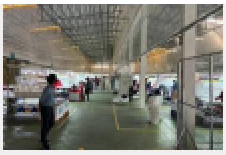
FINDINGS AND REMEDIATION ISSUES

S1: Vertical structural system - Water tanks on suspended floors/roof	
Issue type	S1: Vertical structural system
Sub Issue Type	Water tanks on suspended floors/roof
Reference Number	STR6
Details Of Issue Found	
CAP Priority	SP2
Recommended Action Deadline Date	23 Mar 2022
Responsible Person	
Recommended Action	
Comments	
Photo(s)	

S2 –Lateral Structural System - Steel buildings: Bracing missing/incomplete	
Issue type	S2 –Lateral Structural System
Sub Issue Type	Steel buildings: Bracing missing/incomplete
Reference Number	STR1
Details Of Issue Found	No bracing was observed in Building A, B and C
CAP Priority	SP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to check the tighten of bracing systems in the factory then propose the properly remedial measures if needed. Refer to Clause 8.18 of the LABS Standard
Comments	
Photo(s)	  

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

	 STR1 No Bracing in Building A.jpg  STR1 No Bracing in Building B.jpg  STR1 No Bracing in Building C.jpg

S5 –Visible Distress in Structural Members - Cracking

Issue type	S5 –Visible Distress in Structural Members
Sub Issue Type	Cracking
Reference Number	STR4
Details Of Issue Found	
CAP Priority	SP2
Recommended Action Deadline Date	23 Mar 2022
Responsible Person	
Recommended Action	
Comments	
Photo(s)	

Issue type	S6: Visible Distress in Non-Structural Members
Sub Issue Type	Cracking
Reference Number	STR2
Details Of Issue Found	Smartboard at HR/Nurse Office was cracked and bended
CAP Priority	SP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to review extent and nature of cracks, dampness and monitor as necessary. Remedial measures to be implemented. Refer to clause 8.26 of the LABS Standard
Comments	
Photo(s)	

	 STR2 Smart board at HR and Nurse Office is crack and bend.jpg  STR2 Smartboard at HR andNurse Office is crack and bend (2).jpg
Issue type	S6: Visible Distress in Non-Structural Members
Sub Issue Type	Cracking
Reference Number	STR3
Details Of Issue Found	Many cracking were found on the Wall of building A, B, C, and Hostel Building
CAP Priority	SP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to review extent and nature of cracks, dampness and monitor as necessary. Remedial measures to be implemented, including prevention of water ingress. Refer to clause 8.26 of the LABS Standard
Comments	
Photo(s)	 Cracks on wall at Building A  Cracks on wall at Building B  Cracks on wall at Building C  Cracks on wall at Hostel Building

S7: Performance of Extensions/Additions - Non-engineered structural additions

Issue type	S7: Performance of Extensions/Additions
Sub Issue Type	Non-engineered structural additions
Reference Number	STR4
Details Of Issue Found	Dining Table Area, Generator room, Compressor Room, Scrap fabric storage, Workshop were built with unskilled worker

copyright 2014 Fair Factories Clearinghouse

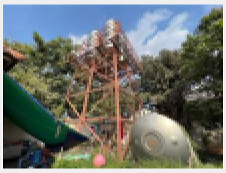
CAP Priority	SP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Factory to find out the documents or appoint a Structural Engineer to survey and make drawing. Refer to clause 8.20 of LABS Standard.
Comments	
Photo(s)	 STR4 Dining Table Area.JPG  STR4 Generator Room.JPG  STR4 Compressor Room.JPG  STR4 Scrap Fabric Storage.JPG  STR4 Workshop.JPG

S7: Performance of Extensions/Additions - Structural documents

Issue type	S7: Performance of Extensions/Additions
Sub Issue Type	Structural documents
Reference Number	STR5
Details Of Issue Found	Steel structure no calculation at water tank
CAP Priority	SP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to check steel structure of water tanks then propose the properly remedial measures if needed. Refer to clause 8.13 of the LABS Standard.
Comments	

copyright 2014 Fair Factories Clearinghouse

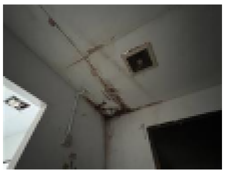
Factory Name : NYAN KIDS (CAMBODIA) LTD-2

Photo(s)	 STR5 No calculation on steel structure at water tank .jpg  STR5 Steel structure no calculation at water tank.jpg
S8: Structural Documentation - No documentation available	
Issue type	S8: Structural Documentation
Sub Issue Type	No documentation available
Reference Number	STR6
Details Of Issue Found	A full as-built document was not provided for review during the assessment. There was no as-built document for all building
CAP Priority	SP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Factory to find out the documents or appoint a Structural Engineer to survey and make existing drawing. Refer to clause 8.20 of LABS Standard.
Comments	
Photo(s)	
S9: Maintenance - Lack of maintenance	
Issue type	S9: Maintenance
Sub Issue Type	Lack of maintenance
Reference Number	STR7
Details Of Issue Found	The vertical support system not apparent, the old chimney was hung without support
CAP Priority	SP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	

copyright 2014 Fair Factories Clearinghouse

Recommended Action	Factory to appoint Structural Engineer to study the damages and propsoe the proper remedial measures according to clause 8.5 of the LABS Standard. The remedial solution needs to submit to LABS and IF for approval. The retrofitting of deficient structural
Comments	
Photo(s)	 STR7 Old chimney was hung without support_1.jpg  STR7 Old chimney was hung without support_2.jpg
Issue type	S9: Maintenance
Sub Issue Type	Lack of maintenance
Reference Number	STR8
Details Of Issue Found	Column damage by drilling and some broken floor tiles at building B
CAP Priority	SP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to survey damage column and floor tiles in the factory propose the proper remedial measures accoding to clause 8.5 of the LABS Standard. The maintenance work needs to be carried out frequently. Refer to clause 8.26 o
Comments	
Photo(s)	 STR8 Column damage by drilling at building B.JPG  STR8 Some broken floor tiles at building B.JPG
S9: Maintenance - Ponding	
Issue type	S9: Maintenance

copyright 2014 Fair Factories Clearinghouse

Sub Issue Type	Ponding
Reference Number	STR9
Details Of Issue Found	Ceiling has damage by water leakage at building A and mezzanine floor building A
CAP Priority	SP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to survey all ceiling have damaged in the factory propose the proper remedial measures according to clause 8.5 of the LABS Standard. The maintenance work needs to be carried out frequently. Refer to clause 8.26 of th
Comments	
Photo(s)	 STR9 Ceiling has damage by water leakage at building A mezzanine floor.JPG  STR9 Ceiling has damage by water leakage at building A.JPG

S9: Maintenance - Structural steelwork corrosion

Issue type	S9: Maintenance
Sub Issue Type	Structural steelwork corrosion
Reference Number	STR10
Details Of Issue Found	Steel support corrosion at building B; Corrosion on steel structure supported Water tank
CAP Priority	SP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Factory to appoint Structural Engineer to survey all the corrosion in the factory and propose the proper remedial measures according to clause 8.5 of LABS Standard. The maintenance work needs to be carried out frequently. Refer to clause 8.26 of the LABS
Comments	
Photo(s)	

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2


STR10 Steel support corrosion at building B.JPG


STR10 Steel support corrosion at building B(2).JPG


STR10 Corrosion on steel structure at water tank.jpg

copyright 2014 Fair Factories Clearinghouse

6 Summary of Priority Actions

CAP Priority	Response	Issue Type	Company Plan Of Action
SP1	STR 1	S9 – Maintenance	Factory to appoint Structural Engineer to study the damages and propose the proper remedial measures according to clause 8.5 of the LABS Standard. The remedial solution needs to submit to LABS and IF for approval. The retrofitting of deficient structural elements needs to be carried out according to clause 8.25 of the LABS Standard.
SP1	STR 2	S6 – Visible Distress in Non-Structural Members	Factory to appoint Structural Engineer to review extent and nature of cracks, dampness, and monitor as necessary. Remedial measures to be implemented. Refer to clause 8.26 of the LABS Standard.
SP3	STR 3	S9 – Maintenance	Factory to appoint Structural Engineer to survey all the corrosion in the factory and propose the proper remedial measures according to clause 8.5 of LABS Standard. The maintenance work needs to be carried out frequently. Refer to clause 8.26 of the LABS Standard.

SP3	STR 4	S5 – Visible Distress in Structural Members	Factory to appoint Structural Engineer to review extent and nature of cracks, dampness, and monitor as necessary. Remedial measures to be implemented, including prevention of water ingress. Refer to clause 8.6 of the LABS Standard
SP3	STR 5	S9 – Maintenance	Factory to appoint Structural Engineer to survey all ceiling have damaged in the factory propose the proper remedial measures according to clause 8.5 of the LABS Standard. The maintenance work needs to be carried out frequently. Refer to clause 8.6 of the LABS Standard.
SP3	STR 6	S1 – Vertical structural system	Factory to appoint Structural Engineer to check steel structure of water tanks then propose the proper remedial measures if needed. Refer to clause 8.13 of the LABS Standard.
SP3	STR 7	S9 – Maintenance	Factory to appoint Structural Engineer to survey damage column and floor tiles in the factory propose the proper remedial measures according to clause 8.5 of the LABS Standard. The maintenance work needs to be carried out frequently. Refer to clause 8.26 of the LABS Standard.

SP3	STR 8	S8 – Structural Documentation	Factory to find out the documents or appoint a Structural Engineer to survey and make drawings. Refer to clause 8.20 of LABS Standard.
SP3	STR 9	S8 – Structural Documentation	Factory to find out the documents or appoint a Structural Engineer to survey and make drawings. Refer to clause 8.20 of LABS Standard.
CAP Priority	SP1	Immediate action	
	SP2	Within 6 weeks	
	SP3	Within 6 months	

Each recommended action includes the relevant clause reference to the LABS Standard for Cambodia.

7 Limitations and Assumptions

This report is for the private and confidential use of LABS Initiative for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of the Assessment Firm. The assessment has been carried out to identify and address critical life safety issues within the factory, in accordance with the LABS Initiative Localized Standard for Garment, Apparel, Footwear, Bags, and Accessories Factories in Cambodia.

This report can be used in discussion with the Supplier or Factory Owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual assessment of the building.

This Report is not intended to be treated as a generalized assessment and does not cover the deterioration of structural members through dampness, fungal or insect attack, nor does it deal with problems and defects of a non-structural nature. Other non-structural aspects of the building such as fire safety have not been assessed in this survey.

Except as otherwise noted, drains and other services were not viewed or tested during our assessment and are therefore similarly excluded from this Report. We have not assessed any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External assessment of the façade walls has generally been carried out from ground level only by the visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the structure and, in particular, foundations. Strengths of materials and components are untested and we recommend that the Factory Owner's Building Engineer carries out in situ testing over and above those suggested to satisfy themselves with the material strengths and component details, where necessary.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed. This report does not interfere with the Factory Owner's Building Engineers responsibility for the structural performance of this building, The Building Engineer remains fully responsible for the structural adequacy of the building.

The findings and recommendations in this report are not intended to imply, guarantee, ensure or warrant compliance with any National Codes or Government Regulations, nor do they alleviate any responsibility of the Factory Owner in this regard. The site inspection and this Report are carried out as a parallel exercise to design approval and inspections carried out by the Authorities as part of the established state enforcement process. The observations in this report are based on the Engineering Judgement of the Lead Assessor / Engineer at the time of the survey. We assume in making these observations that no covering up of faults defects, filling or plastering over cracking or significant repair work has been carried out by the Building Owner. Any future alteration or additional work by the Building Owner will void this report.

LABS disclaimer

This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical, and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe a duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies, and/or any third party involved caused by or in connection with structural, electrical, and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

K2 Fire Sample Report

Revision: Issue II
Date: 11 March 2022

Category Amber

NYAN KIDS (CAMBODIA) LTD-2

Banla Sa-It Village, Sangkat Khmuonh,
Khan Sen Sok, Phnom Penh, Cambodia
(11.602821790941281, 104.87109037711541)
21st January 2022

Fire Safety Assessment Report

Observations & Actions

Assessment Firm: Archetype Cambodia
Authors: Vuthea Chim
Reviewed by: Dilip Abye
Approved by: Dilip Abye

Contents

1 Executive Summary

On Friday 21st of January 2021, Dilip Abye and Vuthea Chim of Archetype Cambodia carried out a visual Fire Safety Assessment of the Nyan Kids (Cambodia) Ltd-2 factory at the address and coordinates given on the cover page of this report. In 2012 the factory name is Smart Pea Garment Ltd and 2020 it is changed name to be Nyan Kids (Cambodia) Ltd02. The inspection was non-intrusive and was carried out in accordance with the LABS Standard for Cambodia and associated Methodology for Preliminary Safety Assessments for Cambodia. Limited testing of the fire safety systems was carried out.

Nyan Kids (Cambodia) Ltd-2 occupies the entire building and allowed us access to all areas.

We met with factory management representative Pheng Kang (H.R Manager), Mr. Sara (Production Manager), Ms. Sok Vanny (HR Assistant), Mr. Kok Chok Soon (Senior Mechanical Maintenance). As the assessment was being carried out as part of an overall Structural, Fire and Electrical pilot assessment exercise, other representatives from Archetype Cambodia were also present, along with observers from LABS.

The NYAN KIDS (CAMBODIA) LTD-2 factory comprises of: Building A, used as for production building that has offices block with mezzanine, Cutting Department, Pairing Department, Printing Department, Store in/out, Store Fabric Finish, MDB Electrical Room. Building B, used as for production building that has Sawing Lines, Offices, Elastic Area, Garment Stocks, Quality Control Area, Store Carton Finish Garment Area, Folding Table Lines and DB Electrical Room. Building C, used as Warehouse Building that has offices, warehouse spaces, MDB Electrical Room, Fabric Inspection Space, Fabric Relax Space. Hostel Building, used as dormitory building. The site wide area has Security Post, Parking lot, Motorbike parking area 01 & 02, Generator 01 & LVMSB Room, Fuel Storage Tank Area, Generator 02 Room, Boiler Room, Air Compressor, Fire Fighting Pump station and Canteen.

The factory generally comprises three main buildings. The two buildings (Building A and B) were constructed in 1999 and building C was constructed in 2018. There are approximately 1500 workers in the factory complex.

The assessment was carried out principally to identify issues affecting the life safety of occupants in the Production buildings. The separate ancillary buildings were also inspected with a view to identifying any life safety impact on the occupants of the Production building for a fire anywhere on the premises.

The overall colour code category of this factory is Amber. This mean there are at least few actions which must be addressed within time period.

A high level and non-exhaustive list of key concerns are:

- The obstruction on the escape path
- Lock device on exit door
- Illuminated exit signs not adequate and Inadequate back up power to emergency lighting pathway
- Travel distance to exit door is excessive
- Coverage area for detector are not enough and smoke detector type is only localized types (No cable connected with Main Control Fire Alarm Panel)
- Over capacity gas storage behind building B
- No fire hydrant

A summary of actions with associated priorities and timeframes are given at the end of this report.

Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

Based on the state of the fire safety systems observed, the condition of the factory floors and circulation routes observed and the documentary evidence of maintenance records presented, the level of housekeeping in the factory appears to be ACCEPTABLE, however some effort needs to be done.

The purpose of the inspection was to identify significant fire safety issues and to provide actions for remediation based on applicable standards specified by LABS.

Our Limitations and Assumptions are also noted at the end of this report.

2 General Information

2.1 General Factory Information

Factory Name	**Nyan Kids (Cambodia) Ltd-2**
Factory Address	Banla Sa It Village, Sangkat Khmounh, Khan Sen Sok, Phnom Penh, Cambodia
GPS Co-ordinates	11.602821790941281, 104.87109037711541
Factory Contact Person	**Pheng Kang H.R Manager**
Assessment Participants	**Mr. Sara- Production Manager**
	Ms. Sok Vanny- HR Assistance
	Mr. Kok Chok Soon- Senior Mechanical Maintenance
Visiting Cards	
Other Tenants	**N/A**

Figure 3 Satellite view of factory buildings

2.2 General Building Information

Number of Building	**Main Production Building A, B, Building C for Storage+ other facilities (MEP equipment)**	
Building Designation and Uses in Building/s	**Building A**	**9200m^2**
	Mezzanine Office	**370 m^2**
	Building B	**4500 m^2**
	Building C	**6550m^2**
	Dormitory GF	**400 m^2**
Basement Floors	**N/A**	
Mezzanine floors	**Mezzanine floor at Building A**	
Stores above grade of buildings	**N/A**	
Height of buildings (m)	**1-story and mezzanine floors,**	
Floor Dimensions/ Areas of all buildings	**Area_20650 sq.m**	
Occupant Numbers	**Ground Floor**	**1144**

	Mezzanine floor	**50**
Number of Work Shifts	**Administration shift: 7:00 - 16:00**	
Year of Construction	**The factory site was built:** **- In 1999 for building A and B** **- In 2018 for building C**	
Type of Construction	**The buildings were built in reinforcement concrete with roof steel.**	
Additions/ Renovations	**N/A**	
Floor Plans provided	**Yes**	
Permits provided	**Fire Inspection certificate (NOC in March,13 2021) was provided by factory.**	
Other Comments	**N/A**	

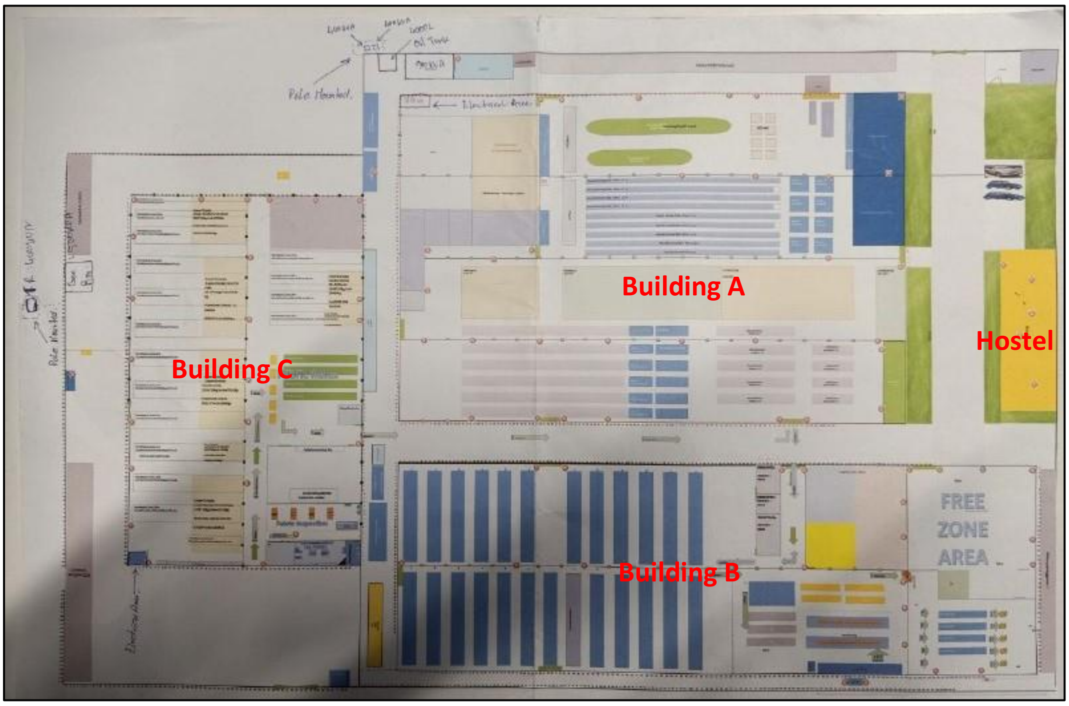


Figure 2: Master Plan of Factory

Figure 3: Building A – Front view

Figure 4: Building B – Front view

Figure 5: Front view of Building C

Figure 6: Hostel Building overview

3 Fire Safety Measures

3.1 Occupancy Classification

The Building is classified as:

- General Industrial Occupancy as per LABS standard CL 3.10
- Residential Occupancy for the dormitory

3.2 Means of Escape

The main production building have more than one exit. Alternative routes of evacuation were provided for most of the areas. All final exit had exit sign and emergency exit light but there was inadequate emergency light in some areas in the middle of the building. During assessment there were some temporary obstruction was found in building B.

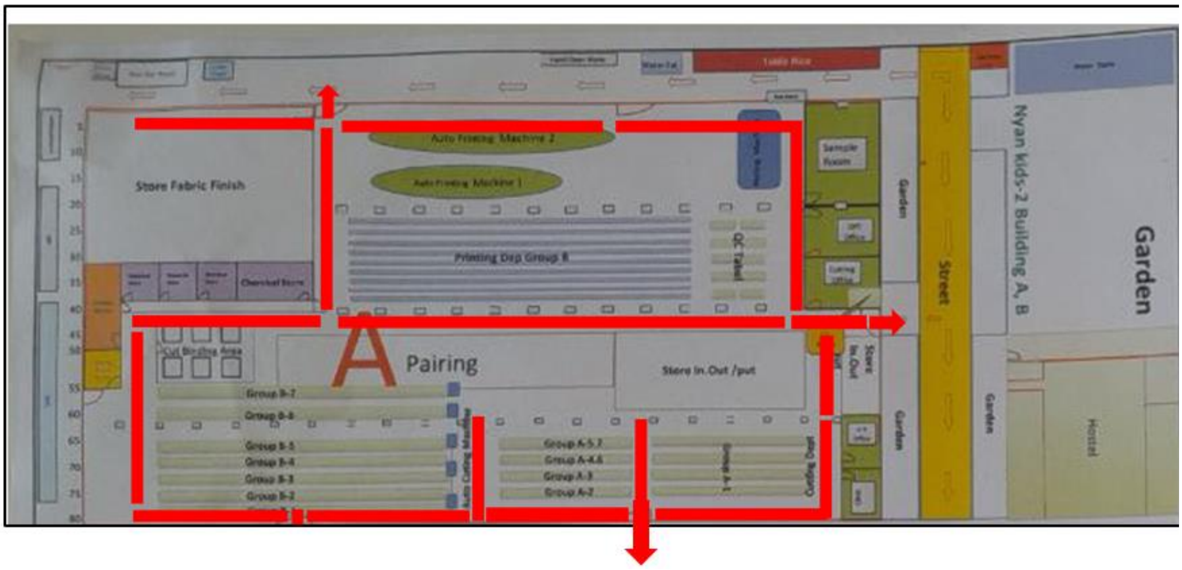


Figure 7: Escape Path and Final Exit for Building A

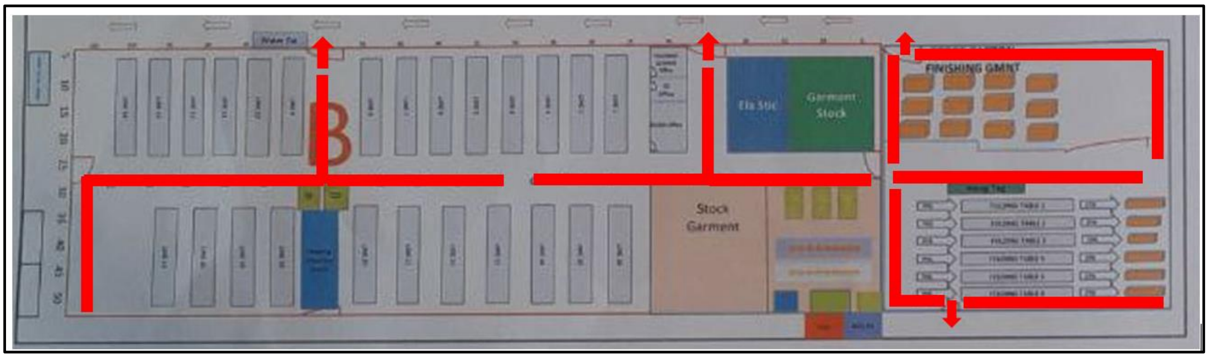


Figure 8: Escape Path and Final Exit for Building B

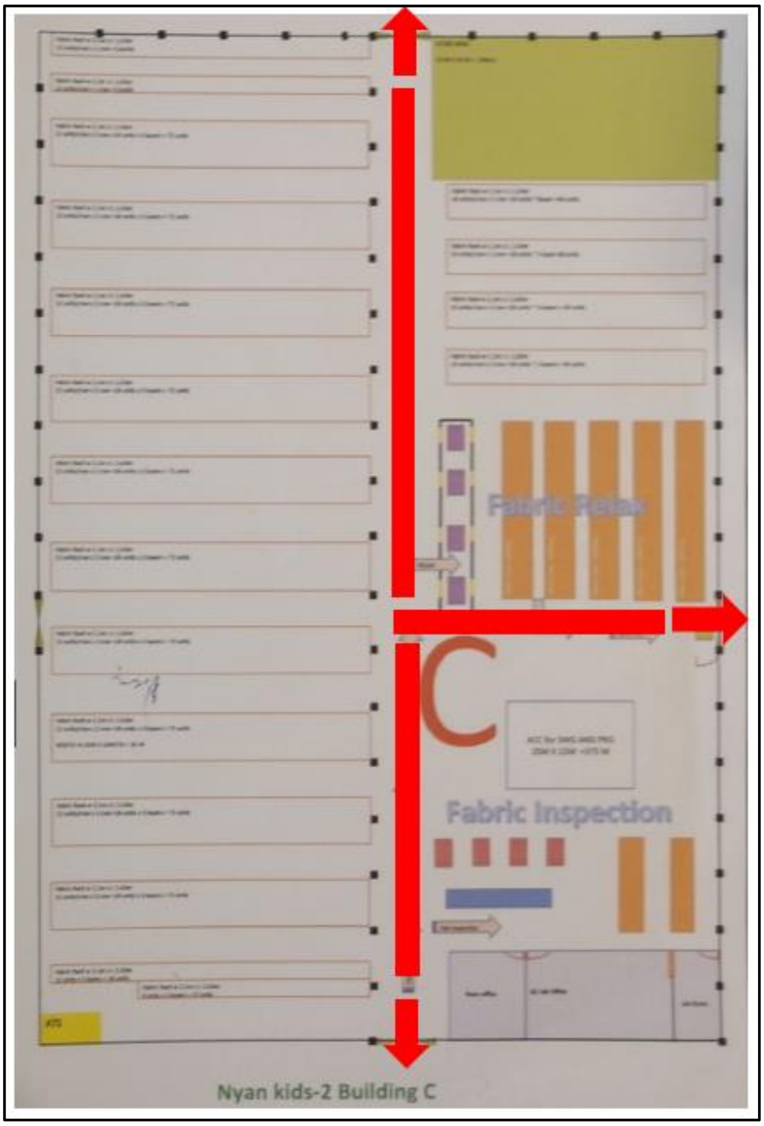
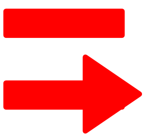


Figure 9: Escape Path and Final Exit for Building C



Escape path

Final Exit

3.2.1 Floor Exits

Exit capacities for doors of floor exits compared to occupancy numbers maximum numbers per shift are as follows:

Building/Floor or Area	Occupancy	Door width required	No. Exits provided	Total Door Width	Door Capacity provided
Main Production Building A	210	210*0.005= 1.05m (0.8m min)	3	1*2.3+1*0.9+ 1*1.35=4.55 m	4.55/0.005 = 910
Building A mezzanine for office	50	50*0.005= 0.25m (0.8m min)	1	1.2*1=1.2m	1.2/0.005= 240
Main Production Building B	709	709*0.005= 3.54m (0.8m min)	2	2*2=4m	4/0.005= 800
Storage Area in Building B	156	156*0.005= 0.78m (0.8m min)	2	1.4*1+2*1=3. 4m	3.4/0.005= 680
Storage in Building C	69	69*0.005= 0.345m (0.8m min)	3	4*3=12m	12/0.005= 2400
Dormitory	10	0.8 min	2	1.2*2=2.4m	2.4/0.005= 480

From the table above it can be seen that exit capacity is sufficient

Stair exit capacities from the upper floors are as follows:

Building/Floor/ Area	Occup	Stair width required	No. Stairs	Total Stair	Stair Capacity provided
Building A mezzanine for office	50	0.915m min	1	1.4*1=1.4m	1.4/0.0076 = 184

From the table above it can be seen that the stair capacity is sufficient.

This situation is acceptable if there is clear marking directing to the exit staircase.

Alternative routes for escape provided from all areas	Yes .For all areas, alternative routes are provided
Excessive travel distance to nearest floor exit	No .Concern in building B (refer to observations) travel distance (non-sprinkle red area) > 61m
Escape from Mezzanines	Yes. Escape from Mezzanine floor are fine

3.2.2 Escape Paths to Floor Exits

Escape paths is adequate widths from all areas	Yes. All main escape path are not less than 915mm
Excessive dead ends to aisles or corridors	Yes. Alternative ways are planned for all areas
Pathways clearly indicated on floor	Yes. Floor arrows are marked on evacuation routes
Escape paths clear of temporary obstacles	No. Temporary obstacles were observed for example in building B (refer to observations).
Escape paths free of any permanent obstacles	Yes. Permanent obstacles are not observed on escape path
Doors on exit paths swing correctly in travel direction	No. Some location with sliding doors (refer to observations)
Doors on exit paths easily openable, no locking devices	No. Some exit path with locking devices

3.2.3 Exit Signage

Evacuation pathways correctly sign posted	Yes. Evacuation pathways correctly sign posted
Clear Floor signage indicating all escape paths	Yes. Clear Floor signage indicating all escape paths

Illuminated exit signs at all emergency exits	No. We observed some location where exit sign was not/not enough illuminated. (refer to observations)
Signage consistent on all exit paths	No. We observed missing some exit signage on exit path. (refer to observations)

3.2.4 Floor Exit Doors

Floor exit door width, height adequate	Yes. Floor exit door width, height adequate
Floor exit doors swing correctly in travel direction	No. Sliding door were observed as floor exit doors. (refer to observations)
Floor exit doors easily openable, no locking devices	No. lock device was observed on floor exit doors

3.2.5 Exit Stairs

Stairs width adequate	Yes. Stairs width adequate
Tread/riser consistent and not too steep	Yes. Tread/riser consistent and not too steep
Handrails provided both sides in all stairways	Yes
All stairways lead directly to outside at discharge level	Not all stairs leads directly outside.
Number of stairs discharging inside building, unprotected distance from Final Exit	01 No's of stairs were discharging inside the building from mezzanine to floors
Stairs discharging inside lead into a protected corridor	Leads to escape pathway close to final exit

3.2.6 Final Exits

Final Exit doors swing correctly in travel direction	No. Some location with sliding doors (refer to observations)
Final Exit doors easily openable from inside, override any security locking devices	No. Lock devices were observed in some location.(refer to observations)

Final Exit doors open to outside	No. Some final exit door open to inside
From Final Exit door, can people move safely away from the building	No. No clear signage outside, no assembly point clearly located
Protection of escape route outside required	Yes.

3.3 Fire Safety – Construction

3.3.1 Protection of Vertical Openings

SHORT DESCRIPTION (Vertical component of means of escape)

Enclosure of Stairs connecting more than 2 floors	N/A The building have only one story with mezzanine floor
Self-closing FR doors to protected stairs	N/A
Unsealed penetrations in stair enclosures	N/A
Protection of external stair from fire in interior	N/A
Protection of vertical service shafts passing through floors	N/A
Fire rated separation of lifts shafts	N/A
Other vertical openings through compartment floors	N/A

3.3.2 Separation of Occupancies

Fire rated separating walls between different occupancies (other than Storage)	N/A
Unsealed penetrations through separating walls	N/A
Separation of basement with FR lobby, walls and self-closing doors	N/A

3.3.3 Storage Areas

Dedicated storage areas and sprinkler/ fire rated enclosure provisions are as follows:

Storage Location	Approx. area Storage (m^2)	Total Floor area (m^2)	FR enclosure	Sprinkle red Floor
Storage in Building A	896	9200	No	No
Storage 01 Building B	500	6550	No	No
Storage 02 Building B	625	6550	No	No
Storage Building C	4500	4500	Yes	No

3.3.4 Other High-Risk areas

Installation	Type	Location	Separated from Production Area	Separated from Exit Path
Generator	Diesel generator	Ground floor	Yes	Yes
Boiler	Non-electrical boiler	Ground floor	Yes	Yes
Transformer	Sub-station	Ground floor	Yes	Yes
Compressor	Air compressor	Ground floor	Yes	Yes
Chemicals Storage	Diesel/oil	Ground floor	Yes	Yes
Gas Storage	Gas	Ground floor	Yes	Yes

3.3.5 Structure and Finishes

Structural Fire Protection	**Buildings are mainly in reinforce concrete with steel roof**
Wall Finishes	**Cement plastering**
Ceiling finishes	**When applicable, Non-combustible is used**

3.4 Fire Safety Systems

Fire Detection types	**Smoke detector type: stand alone with built in battery type (Smoke detector not connected to Main Fire Alarm Control Panel)**
	Smoke detector were available for Building A, B, C
Fire Detector coverage	**Number of smoke detector:** 1. **Building A:10nos** 2. **Building B: 13nos** 3. **Building C: 26nos**
	Inadequate coverage area for smoke detector
Fire Alarm types	**Alarm bell MCP and Strobe light were provided to cover all area in the building**
Fire Alarm coverage	**Manual call points were located at all the final exits.**
Activation of Fire Alarm	**Fire Alarm work manually .**
Fire Detection and Alarm back-up power	**Fire alarm control panel was not available**
Emergency Lighting at Exits	**Emergency Lighting for Exit were provided all final exit path**
Emergency Lighting of escape paths	**Emergency lightings were missing on some paths way (Inadequate Emergency light in the middle of main production building). They provide all emergency light for final exit**
Emergency Lighting back-up power	The power backup is only built in battery backup type. Random emergency lights were tested for more than 10 minutes and we found that inadequate battery back-up observed for some emergency lighting.

3.5 Provisions for Fire Fighting

Water Supply		**Main supplied for the firefighting system from Phnom Penh water supply authority.**
Water Storage		**Water storage tanks observed of 40 m3 was available for water supply.**
Fire Pumps	**Type**	**2 Electrical pumps was provide 11KW**
	Capacity	**N/A**
	Back-up	**There was one duty one stand by fire pump**
External Hydrants		**External hydrants were unavailable around the main buildings in factory.**
Internal Hydrants		**N/A**
Hose reels		**15 indoor hoses were available for building A, B,C**
Handheld Fire Extinguishers (HHFE)		**80 Nos. of fire extinguishers were available in the factory.**
Access for Fire Fighting vehicles		**It is ok for building C fire truck can access three side but for building A, B cannot access all side as requirement in LABS Standard 5.12.2.5.3**

Figure 10: Inadequate back up power to emergency lighting

Figure11: Fire Extinguisher was not checked regularly at Dormitory

3.6 Management and Housekeeping

Legal Documents	Fire Inspection Certificate was evidenced as a Legal Document.
Maintenance records for fire safety systems	Maintenance records for Fire Safety systems were provided for review during the assessment.
Emergency Plan	Some final exit not provide emergency layout (Building A and B)
Fire Safety Training	Fire Safety training was done in the factory two time per year by the internal department Number of people join training: 72people
Fire drills	Fire drills were maintained on 11 September 2021
Housekeeping	Acceptable

4 Observations

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-01	Means of Escape	Exit door
Observation		**Location:** Behind Production Building B
Exit door was not free from temporary obstruction		

Figure 12: Exit door was not free from temporary obstructed

Figure 13: Exit door was not free from temporary obstructed

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-02	Means of Escape	Exit Door
Observation		**Location:** In building A
Exit door were not side hung to swing correctly		
 **Figure 14:** Door were not side hung		 **Figure 15:** Door were not side hung

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-03	F1: Mean of Escape	Exit doors
Observation		**Location:** All building
Exit Door have locking devices in all building		
 **Figure 16:** Exit door with lock device		 **Figure 17:** Exit door with lock device
Ref No.	Issue Type	Sub-Issue Type

FIRE-04	Means of Escape	Floor Exit
Observation		**Location:** Building B
Travel distance to alternative exit was excessive in Building B		

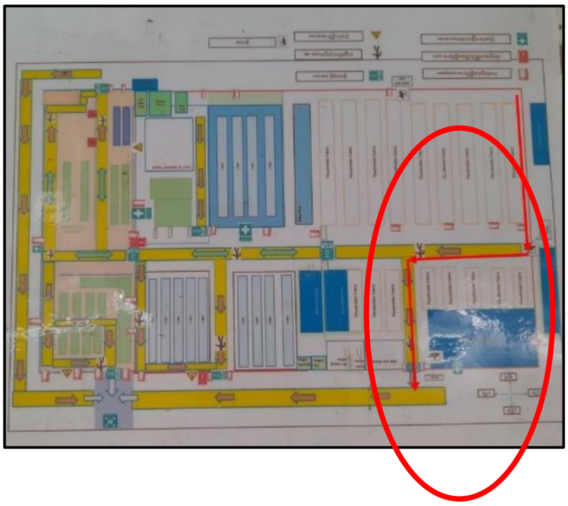


Figure 18: Travel distance building B is 83m

Ref No.	Issue Type	Sub-Issue Type
FIRE-05	Fire Safety Construction	Protection of opening
Observation		**Location:** Building B
Separation of different occupancies was incomplete		

Figure 19: Separation of different occupancies was incomplete

Figure 20: Separation of different occupancies was incomplete

Ref No.	Issue Type	Sub-Issue Type
FIRE-06	F3: Fire Safety System	Emergency Lighting
Observation		**Location:** Building A
Inadequate back up power for emergency light		

Figure 21: Inadequate back up power for emergency light

Ref No.	Issue Type	Sub-Issue Type
FIRE-07	F3: Fire Safety System	Fire Alarm
Observation		**Location:** Guard House
No Main Fire Alarm control panel for factory		


Figure 22: No Main Fire Alarm control panel for factory

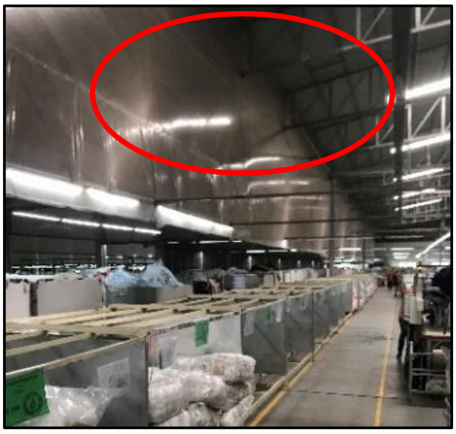
Ref No.	Issue Type	Sub-Issue Type
FIRE-08	F1: Mean of Escape	Exit Signage
Observation		**Location:** All building
Inadequate mergency light and exit sign for escape path		

Figure 23: Inadequate emergency light and exit sign

Figure 24: Inadequate emergency light and exit sign

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-09	F3: Fire Safety System	Fire Detection
Observation		**Location:** Gas storage close to Building A
No gas detector for gas storage close to building A		

Figure 25: No gas detector for gas storage close to building A

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-Issue Type</th></tr>
<tr><td>FIRE-10</td><td>Fire Safety System</td><td>Fire Detection</td></tr>
<tr><td colspan="2">Observation</td><td>Location: Building all building</td></tr>
<tr><td colspan="3">Inadequate Fire Detector Coverage</td></tr>
<tr><td colspan="2">
Figure 26: Inadequate Fire Detector-A</td><td>
Figure 27: Inadequate Fire Detector-A</td></tr>
</table>

Ref No.	Issue Type	Sub-Issue Type
FIRE-11	Provision for fire fighting	Access
Observation		**Location:** Storage all area
No sprinkler system for storage area		

Figure 28: No sprinkler system

Figure 29: No sprinkler system

Ref No.	Issue Type	Sub-Issue Type
FIRE-13	F4: Provision for Fire Fighting System	Fire Fighting System
Observation		**Location:** Dormitory
Fire Extinguishers in dormitory were expired		

Figure 32: Fire Extinguishers was not check

Figure 33: Fire Extinguishers was not check

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-14	Provision for Fire Fighting	Water Supply
Observation		**Location:** External
Fire Hydrant were not available for factory		
 **Figure 34 :** No Fire Hydrant		 **Figure 35:** No Fire Hydrant

Ref No.	**Issue Type**	**Sub-Issue Type**
FIRE-15	Maintenance and House Keeping	Emergency Plan
Observation		**Location:** Building A and building B
Inadequate Emergency layout		
 **Figure 36:** Inadequate Emergency layout A		 **Figure 37:** Inadequate Emergency layout B

Ref No.	Issue Type	Sub-Issue Type
FIRE-16	Maintenance and House Keeping	House Keeping
Observation		**Location:** Building B
Over capacity gas storage behind building B		

Figure 38: Over gas capacity storage behind building B

5 Priority Actions

For each observed item identified above an action list has been prepared to identify the specific required follow up actions and prioritized on the basis of the following:

- Fire Priority 1 (FP1) – Actions that are perceived to immediately affect the ability of people to evacuate the building safely in the event of fire, and attention should be given to addressing them from the outset. Immediate Action e.g., partial/full evacuation, localized closure of space, etc.
- Fire Priority 2 (FP2) – Actions that are perceived to have a delayed or lesser effect on people evacuating the building safely in the event of fire. Actions to be completed within 6 weeks.
- Fire Priority 3 (FP3) – Issues that are perceived to have less of an impact on their own to evacuate the building safely in the event of a fire. Actions to be completed within 6 months.

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

FINDINGS AND REMEDIATION ISSUES

F1: Means of Escape - Escape Paths

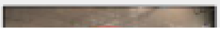
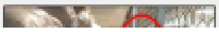
Issue type	F1: Means of Escape
Sub Issue Type	Escape Paths
Reference Number	FIRE-1
Details Of Issue Found	Escape paths not free from temporary obstacles B
CAP Priority	FP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	
Recommended Action	Ensure pathways on exit routes clear of all temporary storage and other obstacles in accordance with Cl.6.3 of the LABS Standard
Comments	
Photo(s)	 F1.2.3.1_Exit door not free from temporary obstrucles building B.JPG  F1.2.3.2_Exit door not free from temporary obstrucles building B.JPG
Issue type	F1: Means of Escape
Sub Issue Type	Exit doors
Reference Number	FIRE-3
Details Of Issue Found	Exit Door have locking devices in Building A
CAP Priority	FP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

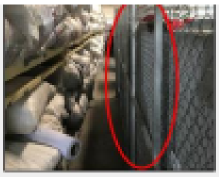
Recommended Action	Replace outside locks with locking mechanisms that allow easy opening from inside without the use of a key in accordance with Cl. 6.1 and 6.9 of the LABS Standard
Comments	
Photo(s)	 F1.4.2.1_Exit door with lock device.JPG  F1.4.2.2_Exit door with lock device.JPG
F1: Means of Escape - Exit doors	
Issue type	F1: Means of Escape
Sub Issue Type	Exit doors
Reference Number	FIRE-2
Details Of Issue Found	Exit doors are not side hung to swing correctly in Building A
CAP Priority	FP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	
Recommended Action	Replace doors with side hung doors that open in the direction of escape in accordance with Cl. 6.1, 6.3 and 6.9 of the LABS Standard
Comments	
Photo(s)	 F1.4.2.1_Door were not side hung.JPG  F1.4.2.2_Door were not side hung.JPG
F1: Means of Escape - Floor Exits	
Issue type	F1: Means of Escape
Sub Issue Type	Floor Exits

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

Reference Number	FIRE-4
Details Of Issue Found	Floor Exit Travel distance to alternative exit excessive in Building B
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Provide additional floor exit/s to ensure that escape distances are not excessive to comply with Cl. 6.7 of the LABS Standard
Comments	
Photo(s)	 F1.1.4_Travel distance is excessive building B.JPG
F2: Fire Safety Construction - Protection of openings	
Issue type	F2: Fire Safety Construction
Sub Issue Type	Protection of openings
Reference Number	FIRE-5
Details Of Issue Found	Separation of different occupancies was incomplete
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Provide 1-hour fire rated partition wall with 45-minute self-closing fire rated doors between occupant areas in accordance with Cl.3.10 and 3.11 of the LABS Standard
Comments	
Photo(s)	 

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

	 F2.2.2.1_Storage was incomplete separation.JPG  F2.2.2.2_Storage was incomplete separation.JPG
F3: Fire Safety Systems - Emergency Lighting	
Issue type	F3: Fire Safety Systems
Sub Issue Type	Emergency Lighting
Reference Number	FIRE-6
Details Of Issue Found	Inadequate back-up power to Emergency Lighting FP1
CAP Priority	FP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	
Recommended Action	Backup power for Exit Signs and Emergency Lighting to escape paths must be provided in accordance with Cl.6.8.3 of the LABS Standard
Comments	
Photo(s)	 F3.3.3_Indequate back up power to emergency light building B.JPG
F3: Fire Safety Systems - Fire Alarm	
Issue type	F3: Fire Safety Systems
Sub Issue Type	Fire Alarm
Reference Number	FIRE-7

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

Details Of Issue Found	No fire alarm control panel
CAP Priority	FP1
Recommended Action Deadline Date	14 Mar 2022
Responsible Person	
Recommended Action	Provide a Fire Alarm system to comply with Cl.4.12, 5.2.4 and 5.9 of the LABS Standard
Comments	
Photo(s)	 F3.3.2_No fire alarm control panel.JPG
Issue Type	F3: Fire Safety Systems
Sub Issue Type	Fire Alarm
Reference Number	FIRE-8
Details Of Issue Found	No gas detector for gas storage close to building A
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Provide detectors to all enclosed areas to ensure compliance with Cl.5.9 of the LABS Standard
Comments	
Photo(s)	 F3.3.1.1 No gas detector.JPG

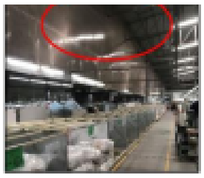
copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

F3: Fire Safety Systems - Fire Detection	
Issue type	F3: Fire Safety Systems
Sub Issue Type	Fire Detection
Reference Number	FIRE-9
Details Of Issue Found	Insufficient Emergency Lighting for escape pathways
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Provide emergency lighting in compliance with Cl.6.8 of the LABS Standard on all escape paths
Comments	
Photo(s)	 3.3.1.1_Inadequate emergency light and exit sign.JPG  3.3.1.2_Inadequate emergency light and exit sign.JPG
Issue type	F3: Fire Safety Systems
Sub Issue Type	Fire Detection
Reference Number	FIRE-10
Details Of Issue Found	Inadequate Fire Detector coverage
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Provide a Fire Alarm system to comply with cl.5.9 of the LABS Standard
Comments	
Photo(s)	

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

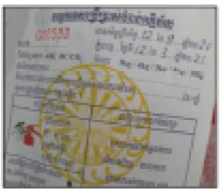
	 F3.1.2.1_Inadequate smoke detector.JPG  F3.1.2.2_Inadequate smoke detector.JPG

F4: Provisions for Fire Fighting - Access

Issue type	F4: Provisions for Fire Fighting
Sub Issue Type	Access
Reference Number	FIRE-11
Details Of Issue Found	No automatic sprinkler system for warehouse and storage area
CAP Priority	FP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Sprinkler system shall be comply Cl.5.3.2.2 of LABS Standard
Comments	
Photo(s)	 F4.3.2.1_No sprinkler system.JPG  F4.3.2.2_No sprinkler system.JPG
Issue type	F4: Provisions for Fire Fighting
Sub Issue Type	Access
Reference Number	FIRE-12
Details Of Issue Found	Fire truck cannot access all side
CAP Priority	FP3
Recommended Action Deadline Date	07 Sep 2022

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

Responsible Person	
Recommended Action	Access for fire fighting vehicles to be provided in accordance with Cl.5.12 of the LABS Standard
Comments	
Photo(s)	 F4.4.3.1_Fire truck cannot access.JPG  F4.4.3.2_Fire truck cannot access.JPG
F4: Provisions for Fire Fighting - Fire fighting systems	
Issue type	F4: Provisions for Fire Fighting
Sub Issue Type	Fire fighting systems
Reference Number	FIRE-13
Details Of Issue Found	Portable extinguishers were not check Domitory
CAP Priority	FP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Carry out regular maintenance of all fire extinguishers and ensure that inspections are recorded adequately in accordance with Cl.5.8 of the LABS Standard
Comments	
Photo(s)	 F4.2.8.1_Fire exitinguisher was not check.JPG  F4.2.8.2_Fire exitinguisher was not check.JPG
F4: Provisions for Fire Fighting - Water supply	

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

Issue type	F4: Provisions for Fire Fighting
Sub Issue Type	Water supply
Reference Number	FIRE-14
Details Of Issue Found	No Fire Hydraint
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	Provide a fire hydrant system with sufficient outlets to ensure full coverage of all parts of the building in accorance with Cl.5.6 and 5.7 of LABS Standard
Comments	
Photo(s)	 F4.2.1.1_No fire hydrant.JPG  F4.2.1.2_No fire hydrant.JPG

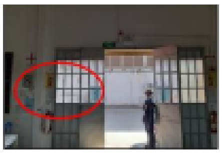
F5: Maintenance and Housekeeping - Emergency Plan

Issue type	F5: Maintenance and Housekeeping
Sub Issue Type	Emergency Plan
Reference Number	FIRE-15
Details Of Issue Found	Inadequate Emergency Plan
CAP Priority	FP3
Recommended Action Deadline Date	07 Sep 2022
Responsible Person	
Recommended Action	Emergency Plan to be produced/updated and documented for inspection in accordance with Cl. 12.1 and 12.3 of the LABS Standard
Comments	
Photo(s)	 

copyright 2014 Fair Factories Clearinghouse

Factory Name : NYAN KIDS (CAMBODIA) LTD-2

F5.3.1.1_Inadequate emegency layout A.JPG



F5.3.1.2_Inadequate emegency layout B.JPG

F5: Maintenance and Housekeeping - House-keeping	
Issue type	F5: Maintenance and Housekeeping
Sub Issue Type	House-keeping
Reference Number	FIRE-16
Details Of Issue Found	Over capacity gas storage in building B
CAP Priority	FP2
Recommended Action Deadline Date	22 Apr 2022
Responsible Person	
Recommended Action	The maximum allowed quantities (MAQs) of LPG allowed in each control area shall not exceed 400Kg in accordance with Cl. 3.11.6.4 of the LABS Standard
Comments	
Photo(s)	 F5.2.4.1_Over capacity gas storage behind building B.JPG

copyright 2014 Fair Factories Clearinghouse

6 Summary of Priority Actions

CAP Priority	Response	Issue Type	Company Plan Of Action
FP1	FIRE-01	F1: Means of Escape	Ensure pathways on exit routes clear of all temporary storage and other obstacles in accordance with Cl.6.3 of the LABS Standard
FP1	FIRE-02	F1: Means of Escape	Replace doors with side hung doors that open in the direction of escape in accordance with Cl. 6.1, 6.3 and 6.9 of the LABS Standard
FP1	FIRE-03	F1: Means of Escape	Replace outside locks with locking mechanisms that allow easy opening from inside without the use of a key in accordance with Cl. 6.1 and 6.9 of the LABS Standard
FP1	FIRE-6	F3: Fire Safety System	Backup power for Exit Signs and Emergency Lighting to escape paths must be provided in accordance with Cl.6.8.3 of the LABS Standard
FP1	FIRE-7	F3: Fire Safety Systems	Provide a Fire Alarm system to comply with Cl.4.12, 5.2.4 and 5.9 of the LABS Standard
FP2	FIRE-04	F1: Mean of Escape	Provide additional floor exit/s to ensure that escape distances are not excessive to comply with Cl. 6.7 of the LABS Standard
FP2	FIRE-5	F5: Fire Safety Construction	Provide 1-hour fire rated partition wall with 45-minute self-closing fire rated doors between occupant areas in accordance with Cl.3.10 and 3.11 of the LABS Standard

FP2	FIRE-08	F3: Fire Safety System	Provide detectors to all enclosed areas to ensure compliance with Cl.5.9 of the LABS Standard
FP2	FIRE-09	F4: Fire Safety System	Provide emergency lighting in compliance with Cl.6.8 of the LABS Standard on all escape paths
FP2	FIRE-10	F4: Fire Safety System	Provide a Fire Alarm system to comply with Cl.5.9 of the LABS Standard
FP2	FIRE-14	F5: Provision for fire fighting	Provide a fire hydrant system with sufficient outlets to ensure full coverage of all parts of the building in accordance with Cl.5.6 and 5.7 of the LABS Standard
FP2	FIRE_16	F5: Maintenance and house keeping	The maximum allowed quantities (MAQs) of LPG allowed in each control area shall not exceed 400Kg in accordance with Cl. 3.11.6.4 of the LABS Standard
FP3	FIRE-11	F4: Provision for fire fighting	Sprinkler system shall be comply Cl.5.3.2.2 of LABS Standard
FP3	FIRE-12	F4: Provision for fire fighting	Access for fire fighting vehicles to be provided in accordance with Cl.5.12 of the LABS Standard
FP3	FIRE-13	F4: Provision for fire fighting	Carry out regular maintenance of all fire extinguishers and ensure that inspections are recorded adequately in accordance with Cl.5.8 of the LABS Standard
FP3	FIRE-15	F5: Maintenance and house keeping	Emergency Plan to be produced/updated and documented for inspection in accordance with Cl. 12.1 and 12.3 of the LABS Standard
CAP Priority	FP1	Immediate action	

	FP2	Within 6 weeks	
	FP3	Within 6 months	

7 Assumptions and Limitations

This report is for the private and confidential use of LABS for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of ARCHETYPE.

The assessment has been carried out to identify and address critical life safety issues within the factory, in accordance with the LABS Initiative Localized Standard for Garment, Apparel, Footwear, Bags, and accessories Factories in Cambodia.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual inspection of the building.

This Report is not intended to be treated as a generalised inspection and does not cover the deterioration of fire safety construction measures or fire safety systems through lack of maintenance. Other aspects of the building that do not affect the safety of the occupants of the Production buildings have not been assessed in this survey.

Except as otherwise noted, other services were not viewed or tested during our inspection and are therefore similarly excluded from this Report. We have not inspected any parts of the building which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the building. Performance testing of fire safety systems do not form part of these inspections and we recommend that the factory owners Building Engineer carries out standard testing and maintenance of these systems to satisfy themselves of their proper functioning.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious structural defects as identified in this presentation, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed.

This report does not interfere with the factory owners Building Engineers responsibility for the fire safety performance of this building, The Building Engineer remains fully responsible for the fire safety adequacy of the building.

The information in this Fire Safety Inspection Report was obtained during a one-day site visit to the factory, where we carried out interviews with local factory management and reviewed design and permit documentation presented at that meeting. It has not been possible to provide independent verification for all the information and data collected, and, therefore Archetype cannot accept general responsibility for omissions or errors arising from inaccuracies in this report from the information obtained.

The findings and recommendations in this report are not intended to imply, guarantee, ensure or warrant compliance with any National Codes or Government Regulations. The site inspection and this Report are carried out as a parallel exercise to design approval and inspections carried out by the Authorities as part of the established state enforcement process.

Additionally, the results do not imply in any way that compliance with the findings or recommendations as stated in this report will eliminate all hazards, risks or exposures or that hazards, risks or exposures not referred to in this report do not exist.

Implementation of the recommendations stated in this report does not relieve the factory owner from any obligation to comply with specific project requirements, industry standards, or the provisions of any local government regulations

LABS disclaimer

This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "Methodology") and the LABS harmonized reference standard and protocol ("LABS Standard").

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of

LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

K3 Electrical Sample Repo

Revision: Issue 1
Date: 11 February 2022

Red / Amber

NYAN KIDS (CAMBODIA) LTD - 2

Banla Sa it Village, Sangkat Khmounh, Khan Sen Sok, Phnom Penh, Cambodia

(11.602821790941281, 104.87109037711541)

21st January 2022

Electrical Safety Assessment Report

Observations & Actions

Assessment Firm: Archetype Cambodia
Authors: Kimhour Mann
Reviewed by: Jaime Quilala
Approved by: Jaime Quilala

Contents

1 Executive Summary

On Friday 21st January 2022, Assessor Mr. Kimhour Mann from Archetype Cambodia carried out a visual Electrical Safety Assessment of the NYAN KIDS (CAMBODIA) LTD-2 factory at the address and coordinates given below under ‘General Factory Information’. The assessment was non-intrusive and was carried out in accordance with the LABS Standard for Cambodia and associated Preliminary Assessment Methodology. Limited testing of the electrical systems was carried out.

NYAN KIDS (CAMBODIA) LTD-2 occupies the entire building and provided access to all areas.

We met with factory management representative Mr. Pheng Kang (HR Manager), Sara (Production Manager), Sok Vanny (HR Assistant), and Kok Chok Soon (Senior Mechanical Maintenance) and a number of other employees accompanied us during the assessment. As the assessment was being carried out as part of an overall Structural, Fire and Electrical pilot assessment exercise, other representatives from Archetype were also present, along with observers from LABS.

The NYAN KIDS (CAMBODIA) LTD-2 factory comprises of: Building A, used as for production building that has offices block with mezzanine, Cutting Department, Pairing Department, Printing Department, Store in/out, Store Fabric Finish, MDB Electrical Room. Building B, used as for production building that has Sawing Lines, Offices, Elastic Area, Garment Stocks, Quality Control Area, Store Carton Finish Garment Area, Folding Table Lines and DB Electrical Room. Building C, used as Warehouse Building that has offices, warehouse spaces, MDB Electrical Room, Fabric Inspection Space, Fabric Relax Space. Hostel Building, used as dormitory building. The site wide area has Security Post, Parking lot, Motorbike parking area 01 & 02, Generator 01 & LVMSB Room, Fuel Storage Tank Area, Generator 02 Room, Boiler Room, Air Compressor, Fire Fighting Pump station and Canteen.

The factory generally comprises three main buildings. The two buildings (Building A and B) were constructed in 1999 and building C was constructed in 2018. There are approximately 1500 workers in the factory complex.

The overall colour code category of this factory is RED/AMBER. This means that there are at least some actions which must be addressed within Time Period.

A high level and non-exhaustive list of key concerns are:

- Thermographic Scanning:
    - High Temperature/Overheating 81.1°C found inside the Electrical Panel "MDB-001B" in Building A.
    - High Temperature/Overheating 78.5°C found inside the Electrical Auto machine printing panel "DB-002B" in Building A.
    - High Temperature/Overheating 71.8°C and 73.1°C found inside the Electrical Panel "DB-0013B" of Building B.

- High Temperature/Overheating 97.0°C found inside the Electrical panel "DB-003B" in Compressor Room.
- High Temperature/Overheating 66.2°C found inside the Electrical Panel "DB-005B" in Building A.

- Distribution:
    - Inadequate insulation rubber floor mat for Electrical panels; improper cable installation; lint & dust inside panels.
    - There are many under size of cable cross-sectional areas compare to the current rating marked on the protective devices.
    - There are Combustible/flammable materials (wood) installed in SDB-001B in Building A and SDB-0016B in Building B.
    - Unprotected Outgoing cables/circuits (Circuits drawn without protective device) from Generator 01 panel to both of MTS panel 01&02.

- Supplies to Life Safety:
    - Inadequate Normal/Emergency Light for Technical Room (LVMSB/MTS, Generator Room, MDB Room…)
    - Some Emergency Lights already broken and some just lighted on less than 10minutes with localized battery backup.
    - No Fire Alarm Control Panel for the whole factory.

- Earthing and Bonding: No Protective Earth (PE) bares and cables in some Electrical Panels. And also there were under size (cross-sectional area) of PE cables in some Electrical Panels.
- Generator: There are some oil leak inside generator room 01, the generator room 01&02 also used as storage area, there are also insufficient access in Generator Room 01…
- Substation: LVMSB/MTS Panel cover damaged in Generator Room 01, inadequate numbers of normal/emergency lighting, insufficient access in Main Distribution Board Room, there are also inadequate rubber floor mats for MSB/MTS, MDB and also for DB in some locations inside each Building A, B and C.…
- Drawing: No Electrical drawings (No Single Lines Diagrams, No Earthing Schematic Diagrams, No Layouts plans…) available on factory.
- Maintenance Record: No maintenance record available (Substation, Generator, Fire Alarm…)

A summary of actions with associated priorities and timeframes are given at the end of this report.

Based on the state of the electrical safety systems and the condition of the factory floors observed, the level of maintenance appears to be acceptable. No maintenance record was available for review for Substations (Belong to EDC), Generators and Panels. The generators and panels were checked and maintained by factory internal technical team. No Earth resistance was measured periodically and no records were available for review. New Lightning protection system was constructed in 05/Jan/2021. So it has sufficient report and specification for review.

Please note that these actions should be completed as soon as practically possible and certainly within the timeframe noted.

Our assumptions and limitations are also noted at the end of this report.

2 General Information

2.1 General Factory Information

Factory Name	NYAN KIDS (CAMBODIA) LTD-2
Factory Address	Banla Sa it Village, Sangkat Khmounh, Khan Sen Sok, Phnom Penh, Cambodia
GPS Co-ordinates	**9 11.602821790941281, 104.87109037711541**
Contact Person	Pheng Kang (H.R Manager)
Inspection Participants	Mr. Kok Chok Soon (Senior Mechanical Maintenance) Mr. Kimhour Mann (Archetype)
Visiting Cards	
Other Tenants	**N/A**

Figure 1: Satellite view of Factory Buildings

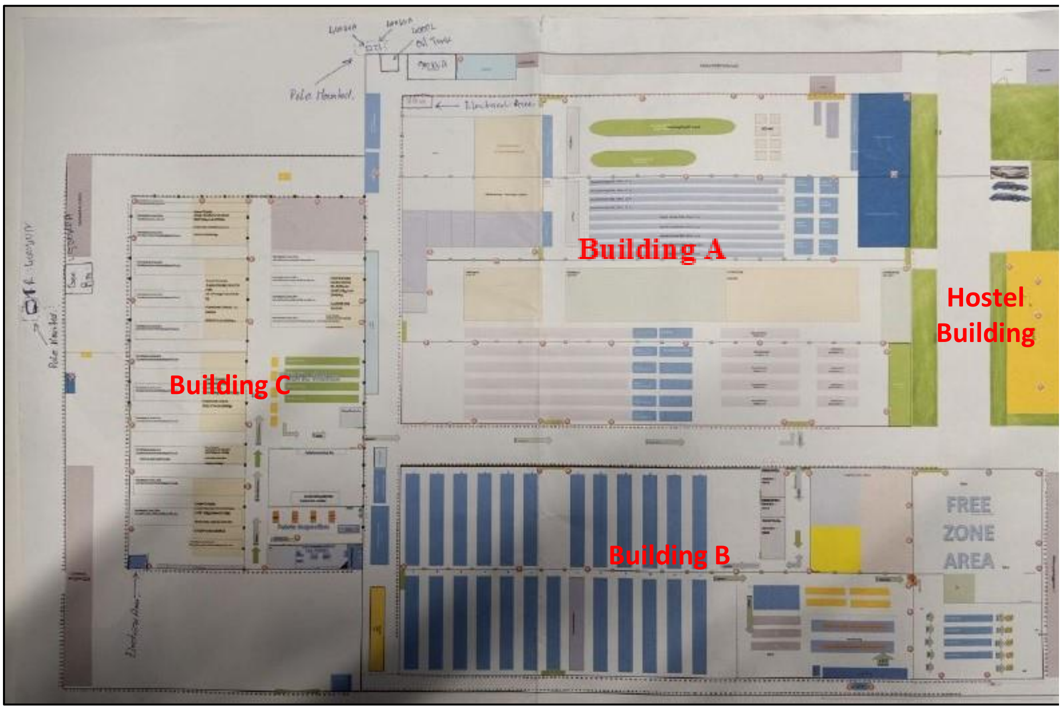


Figure 2: Factory General Site Plan

Figure 3: Front view of Building A

Figure 4: Front view of Building B

Figure 5: Front view of Building C

Figure 6: Hostel Building overview

2.2 General Building Information

Main Buildings	4
Building Designation and Use	• Building A ground floor was used for production building. • Building A mezzanine was used for offices. • Building B ground floor was used for production building. • Building C was used for warehouse building. • Hostel Building was used for dormitory building.
Basement Floors	N/A
Mezzanine Floors	• Mezzanine floor at building A
Storeys above grade	N/A
Floor Dimensions/ Areas	• Building A=9200m^2 • Building A Mezzanine=370m^2 • Building B=5250m^2 • Building C=4500m^2 • Hostel Building=400m^2
Year of Construction	• Building A and B were constructed in 1999 • Building C was constructed in 2018
Additions/Renovations	NO
Floor Plans Provided	NO

3 Electrical Systems

3.1 Supplies to Life Safety Systems

Three life safety systems and their power supplies were observed during the assessment as follows:

System	Primary Power	Secondary Power
Emergency Lighting	Utility Power Supply	Battery backup
Fire Detection and Alarm System	Utility Power Supply	Battery backup
Factory Fire Hoses (Two Main Electrical Fire pumps at Fire Pump Station)	Utility Power Supply	Generator 01 backup

The fire pump station included 2 mains electrical pumps 11kW/each and no main diesel pump. Pumps can be started during testing.

Figure 7: Fire Pump Station and Fire Hose testing

3.2 Emergency Lighting

Emergency lighting throughout consisted of twin spot fittings mounted above doorways and final exits.

Figure 8: Emergency & Exit Lighting Testing Time at Building A

Random emergency and exit lights were tested at main production building; *some* were not working and some just lighted on less than 10 minutes with battery power.

3.3 Fire Detection and Alarm System

Fire Detection	Smoke detectors were not provided in Hostel Building. Smoke detectors were provided only in Building A (10nos), Building B (13nos) and Building C (26nos). Detectors missing in the generator room 01 & 02. Localized detector has backup power from built in or integrated battery.

	All other areas manual activation by Manual Call Points (MCP) All signals were not linked and connected to the central system because factory did not has Fire Alarm Control Panel (FACP).
Fire Alarm	Alarm sounders located over on all floors Activated manually by MCPs at exit doors in all other areas. Factory did not has Fire Alarm Control Panel (FACP).

Witnessing the operation of the fire alarm system carry out for some local detectors and MCPs at Production Building B.

Figure 9: Fire Detection & Alarm (MCPs) tested at Building B.

Figure 10: Fire Detection & Alarm (MCPs) tested at Building C.

3.4 Earthing and Bonding

Connection of metalwork (machines, electrical panels, transformer, DG set) was clearly evident. The Protective Earth (PE) was installed in Main Distribution Panel and then distributed to Sub-Panels. And some distribution board use localized Earthing System that installed next to each DB. There was no Earthing/Lightning schematic diagram available on the current factory. Inadequate size of earth conductors was observed during the factory inspection. Some motors and panels did not have Protective Earth (PE) connection. No Earth testing records for review.

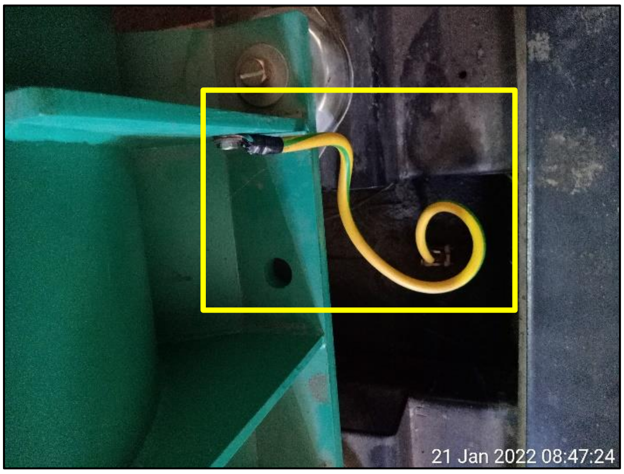


Figure 11: Incorrect size PE Earthing cable for generator at generator room.

Figure 12: Incorrect size PE Earthing cable for generator panel at generator room.

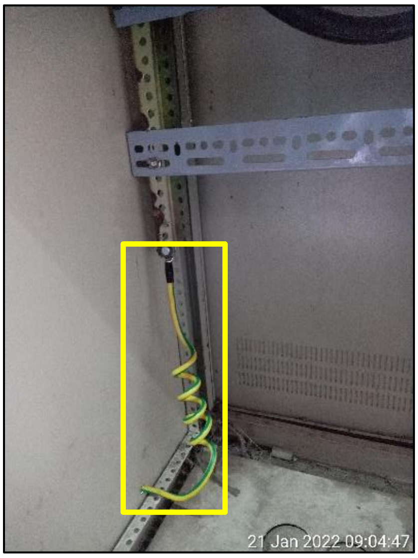


Figure 13: Incorrect PE Earthing cable installation for Electrical panel at building A

Figure 14: Missing PE Earthing bar installation for Electrical panel at building A

3.5 Lightning Protection

A new Early Streaming Emission (ESE) lightning protection system is provided on the roof top of Main Production Building, however, there was no Lightning protection layout and record of testing and report provided for review.

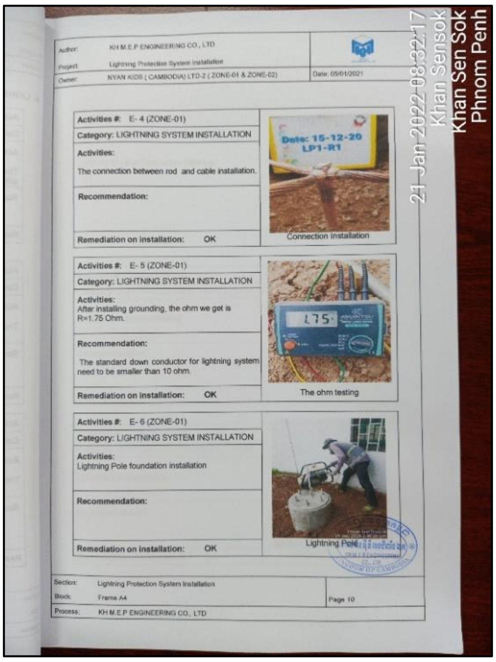


Figure 15: Lightning Protection System Air Terminal Zone 01 installed on Steel Pole near Building A with earthing resistance testing report.

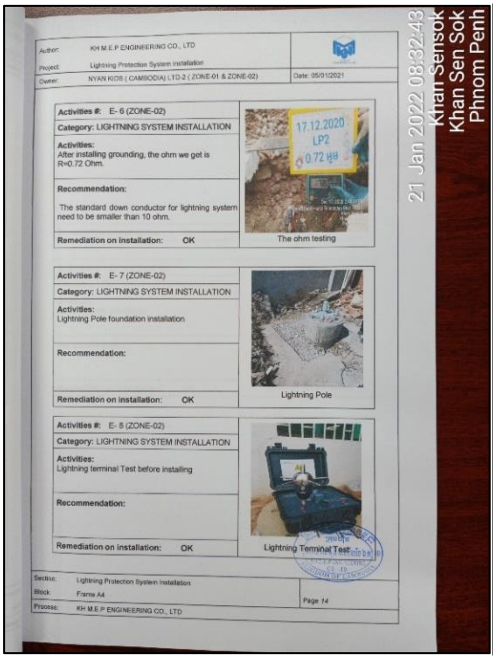


Figure 16: Lightning Protection System Air Terminal Zone 02 installed on Steel Pole near Building C with earthing resistance testing report.

3.6 Power

One power entered the site via 22kV overhead supply which is connected to 2nos of 400kVA pole mounted oil type transformers located next to Generator and MTS room 01 near Building A and another 22kV overhead supply which is connected to 1nos of 400kVA pole mounted oil type transformer along the road behind the Building C. All of these pole mounted oil type transformers were installed outside the factory boundary (Belong to EDC) that could not be access. The low voltage cables from each oil type transformers to LVMSB/MTS/ATS room are installed overhead.

Figure 17: Pole mounted oil type transformers at outside of Factory Boundary (Belong to EDC) with overhead LV cables to LVMSB/MTS panel in Generator Room 01 near Building A.

Figure 18: Incoming Overhead LV cables from another 400kVA Pole mounted oil type transformer to LVMDB/ATS panel in Electrical Room inside Building C.

There are 2 separated Diesel backup generators are used for the whole factory site.

- ➢ 1nos of 900kVA with 1 set of 1000L fuel daily tank located at inside Generator Room 01 at Ground floor near Building A. The over ground Bulk Fuel storage located next to the generator room 01. In case of no primary power available, the generator 01 can be start in Auto Mode with Manual Transfer Switch (MTS) panels. This 900kVA supplies to 2 separated MTS panels that located inside Generator Room 01 and then supply to MDB-001B and MDB-002B accordingly in Electrical Room inside Building A. The LV cables from these MTS panels are installed overhead.

Figure 19: 900kVA Generator Room 01 without ventilation fan near Building A.

Figure 20:

- A: 1 side of MTS panel 01 connected from 1nos of 400kVA pole mounted oil type transformer and another side connected from 900kVA Diesel Generator 01.

- B: 1 side of MTS panel 02 connected from another 1nos of 400kVA pole mounted oil type transformer and another side connected from 900kVA Diesel Generator 01.

➢ 1nos of 500kVA with 1 set of 1500L fuel daily tank located at inside Generator Room 02 at Ground floor behind Building C. The Daily Fuel Tank for Generator 02 will be filled up by Manual by Factory Technician. In case primary power supply fails, the generator 02 can be start in Auto Mode with Auto Transfer Switch(ATS) panel in Electrical MDB-003B room inside Building C.

Figure 21: 500kVA Generator Room 02 without fan ventilation system at behind Building C.

3.7 Distribution

The LV power from LVMSB/MTS panels in Generator room 01 & 02 were transferred to the Main Distribution Boards located in the main building A and C and then distributed power to the functional Distribution Boards and Sub-Distribution Boards inside each buildings and also to other buildings.

Figure 22: Main Distribution Boards (MDBs) insides building A.

Figure 23: Distribution Boards (DBs) insides building A.

Figure 24: Sub Distribution Boards (SDBs) inside building A.

Figure 25: Distribution Boards (DBs) inside building B.

Figure 26: Sub-Distribution Boards (SDBs) inside Building B.

Figure 27: Main Distribution Boards (MDBs) inside Building C.

Figure 28: Distribution Board (DB) inside Hostel Building.

3.8 Maintenance and Records

No maintenance recorders/Maintenance Schedule for the transformers, Main Distribution Boards, Generators… were available for review during the assessment.

4 Observations

Ref No.	Issue Type	Sub-Header
ELEC-1	E1 : Supplies to Life Safety System	Power supply to emergency lighting

Observations: Random Emergency & Exit Lights were tested at Production Building A & B, some fitting were not working and some just lighted on less than 10minutes with Localized Battery Backup.

Figure 29: Power Back Up Fail for Emergency & Exit Light in Production during testing.

Ref No.	Issue Type	Sub-header
ELEC-2	E1 : Supplies to Life Safety System	Power supply to fire alarm panel

Observations: There were no Fire Alarm Control Panel installed for the whole factory site that could not alert to the security guard person in case of fire occurred during night time or if anyone not stay inside the factory building.

Ref No.	Issue Type	Sub-Header
ELEC-3	E2 : Earthing & Bonding	Break in neutral connection

Observations: There were no Neutral Bar for:
- SDB-0015B in Building B
- SDB-0019B in Boiler Room

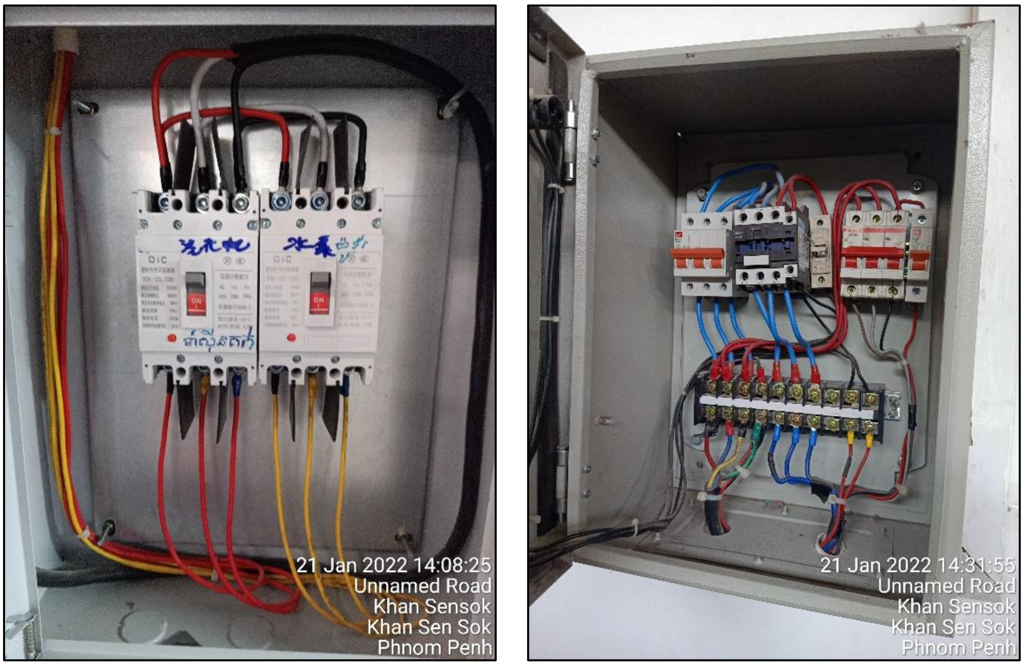


Figure 30: No Neutral bar installed inside SDB-0015B and SDB-0019B.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-4	E2 : Earthing & Bonding	Insufficient bonding of equipment

Observations: There were many missing of Earthing bonding cables connected to:

- Cable Routing (Ladder, Tray, Trunking…) in all areas
- Fuel Daily Tanks in Generator Room 01 & 02
- Above Ground Fuel Storage Tank
- Electrical Panel door frames (LVMSB/MTS 01&02 panels, Switching Panel…in Generator Room 01)
- Electrical Panel door frames (SDB-0019B in Boiler Room)
- Electrical Panel door frames (DB-0010B in Building B)
- Boiler and Pump Boiler Enclosures
- Washing Machines in Building B

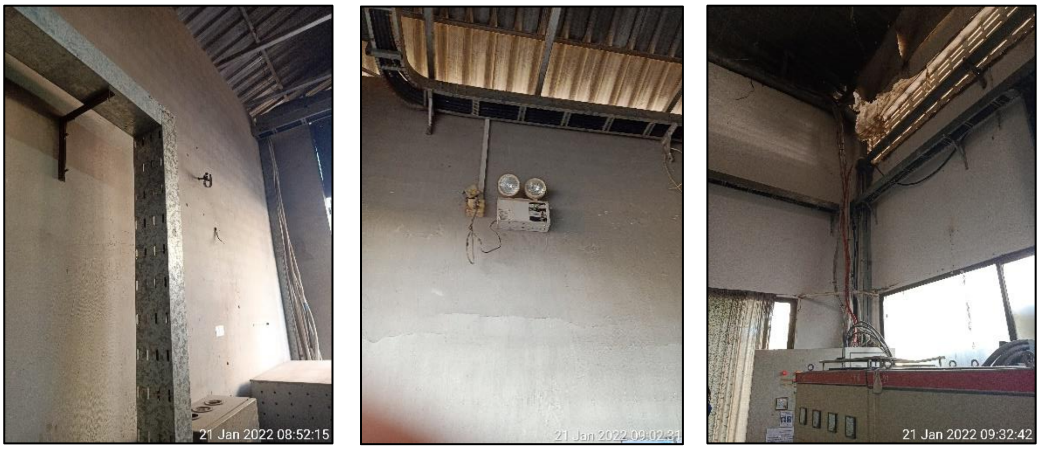


Figure 31: No Earthing bonding cable connected to cable routing (Tray, Ladder, Trunking…)

Figure 32: No Earthing bonding cable connected Fuel Daily Tanks and Bulk fuel storage tank.

Figure 33: No Earthing bonding cable connected Electrical Panel Door Frames in Generator Room 01.

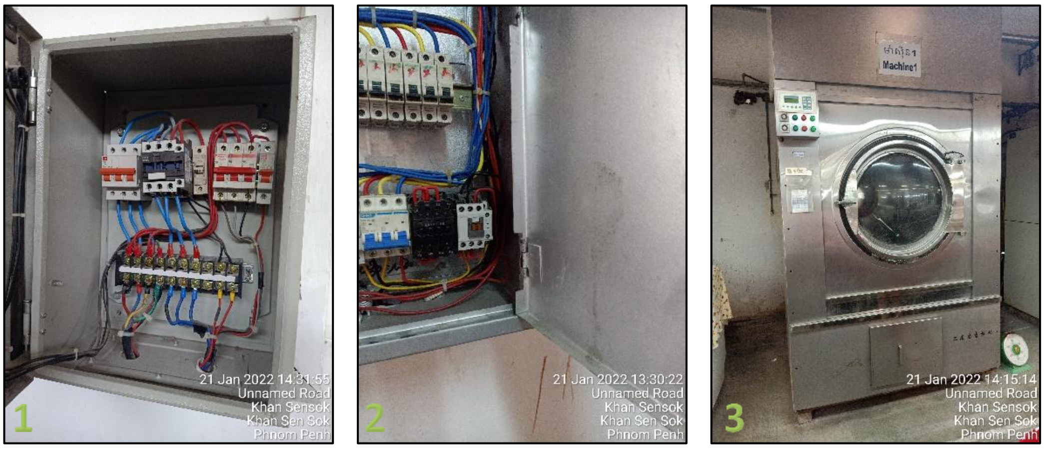


Figure 34: No Earthing bonding cable connected to:

1. Electrical Panel door frames (SDB-0019B in Boiler Room)
2. Electrical Panel door frames (DB-0010B in Building B)
3. Washing Machines in Building B

Figure 35: No Earthing bonding cable connected to boiler and pump boiler enclosure.

<table>
<tr><th>Ref No.</th><th>Issue Type</th><th>Sub-Header</th></tr>
<tr><td>ELEC-5</td><td>E2 : Earthing & Bonding</td><td>Insufficient bonding of equipment</td></tr>
<tr><td colspan="3">Observations: There were missing PE Earthing Bar/Cable for:
- SDB-0017B in Building B
- SDB-0019B in Boiler Room</td></tr>
</table>

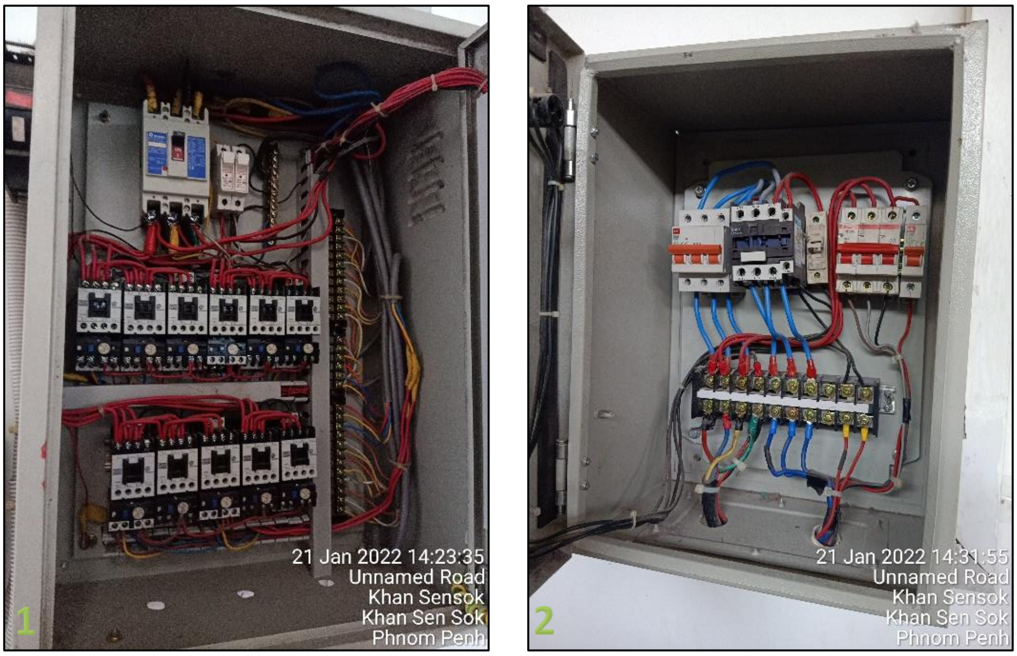


Figure 36: No PE Earthing Bar/Cable installed in:

1. SDB-0017B in Building B
2. SDB-0019B in Boiler Room

Ref No.	**Issue Type**	**Sub-Header**
ELEC-6	E3 : Generators	Inadequate generator ventilation
Observations: The Generator Room 01 & 02 used as a storage with combustible materials.		

Figure 37: Combustible materials store inside generator room 01.

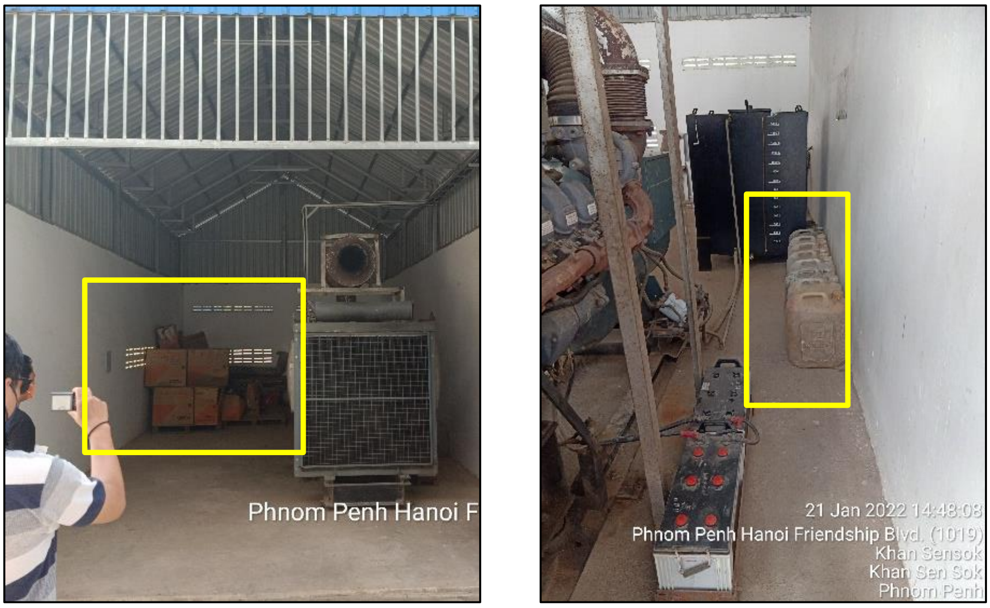


Figure 38: Combustible materials store inside generator room 02.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-7	E3 : Generators	Inadequate generator ventilation

Observations: Insufficient access found in Generator room 01 between MTS-02 panel and Generator 01 near Building A.

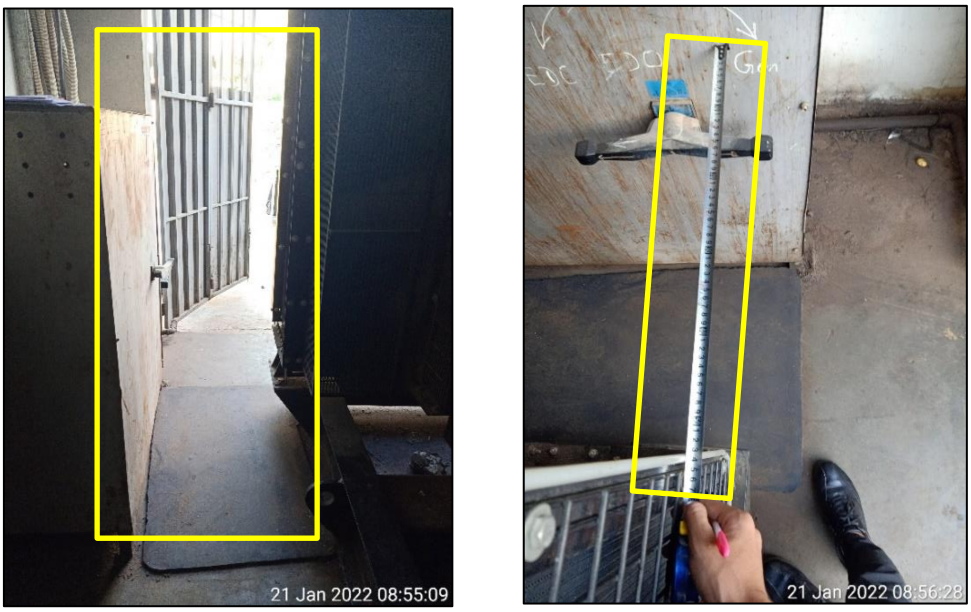
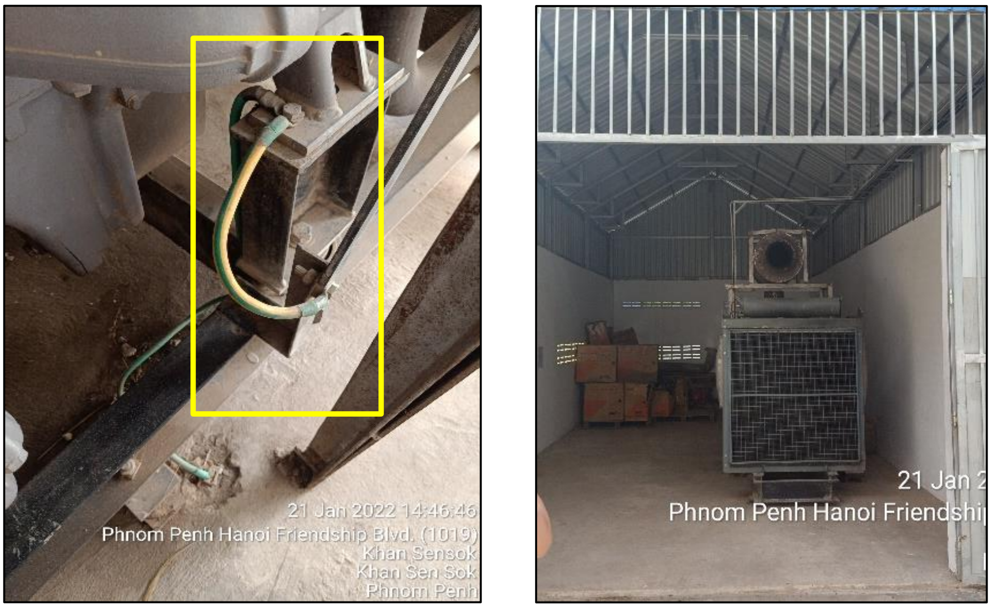


Figure 39: Insufficient access between MTS-02 panel and Generator 01.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-8	E3 : Generators	Insufficient generator earthing
Observations: There were insufficient generator 01 & 02 earthing with two separate points.		
 Figure 40: Insufficient generator 01 earthing with two separate points.		
 Figure 41: Insufficient generator 02 earthing with two separate points.		

Ref No.	**Issue Type**	**Sub-Header**
ELEC-9	E3 : Generators	Leakage from generator/tank/pipework
Observations: There was fuel leakage from 1000L Daily Tank in Generator Room 01 near Building A.		

Figure 42: Fuel Leak from Daily Tank.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-10	E4 : Substations	Accessibility issues
Observations: There is insufficient access found in DBs locations in Building A.		

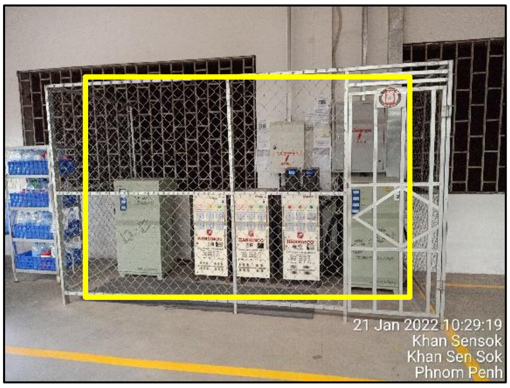


Figure 43: Insufficient Access to wall mounted DBs that blocked by floor standing Voltage Stabilizers.

Ref No.	Issue Type	Sub-Header
ELEC-11	E4 : Substations	LV panel damaged
Observations: LVMSB/MTS panels cover damaged and replaced with unsafe flash guard when need to open to the LVMSB/MTS 01 & 02 cover in Generator Room 01 near Building A.		

Figure 44: Panels cover damaged and replaced with unsafe flash guard when need to open to the LVMSB/MTS 01 & 02 cover.

Ref No.	Issue Type	Sub-Header
ELEC-12	E4 : Substations	Substation unsecured
Observations: There were Inadequate/No number of Normal and Emergency Lighting inside: 1. The two of Generator Rooms (Generator 01 & 02) 2. MDB/DB room/location inside Building A, B and C		

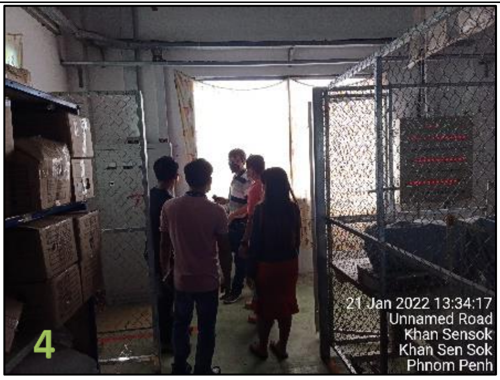


Figure 45: Inadequate/No number of Normal and Emergency Lighting inside:

1.Generator Room 01 near Building A
2.Generator Room 02 behind building C
3.MDBs Electrical Room inside Building A
4.DBs Electrical Room inside Building B
5.MDBs Electrical Room inside Building C

Ref No.	**Issue Type**	**Sub-Header**
ELEC-13	E4 : Substations	Substation unsecured
Observations: There were inadequate rubber floor mats for: 1. MSB/MTS in Generator Room 01 2. MDB and also for DB in some locations inside each Building A, B and C.		

Figure 46: Inadequate rubber floor mats for MTS-01 panel, MDBS & DBs panel.

Ref No.	Issue Type	Sub-Header
ELEC-14	E5 : Distribution	Combustible/flammable materials present

Observations: There were Combustible/flammable materials (wood) installed in SDB-001B in Building A and SDB-0016B in Building B.

Figure 47: Combustible/flammable materials (wood) installed in SDB-001B.

Figure 48: Combustible/flammable materials (wood) installed in SDB-0016B.

Ref No.	Issue Type	Sub-Header
ELEC-15	E5 : Distribution	Inadequate cable segregation

Observations: Inadequate cable segregation found for LV cables inside MDB-001B in Building A

Figure 49: Inadequate cable segregation for LV cables inside MDB-001B

Ref No.	Issue Type	Sub-Header
ELEC-16	E5 : Distribution	Inadequate cable support

Observations: The issues were founded as below:

1. Inadequate cable support for LV incoming cables from EDC to Generator room
2. Inadequate cable support for LV cables from Generator room to MDB room inside
   Building A
3. Inadequate cable support for LV cables in DB-002B location in Building A and the current transformer was installed outside of DB.
4. Inadequate cable support for LV cables in Fire System Control Panel location in FF Pump station.

Figure 50: Inadequate cable support for:

1.LV incoming cables from EDC to Generator room

2.LV cables from Generator room to MDB room inside Building A

3.LV cables in DB-002B location in Building A and the current transformer was installed outside of DB.

4.LV cables in Fire System Control Panel location in FF Pump station.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-17	E5 : Distribution	Inadequate cable support
Observations: Almost Internal components of distribution boards were not properly concealed. There were a many openings at top and bottom of DB		

enclosure, incoming and outgoing cable from DB without cable glands, missing knockout covers, missing phase separators…

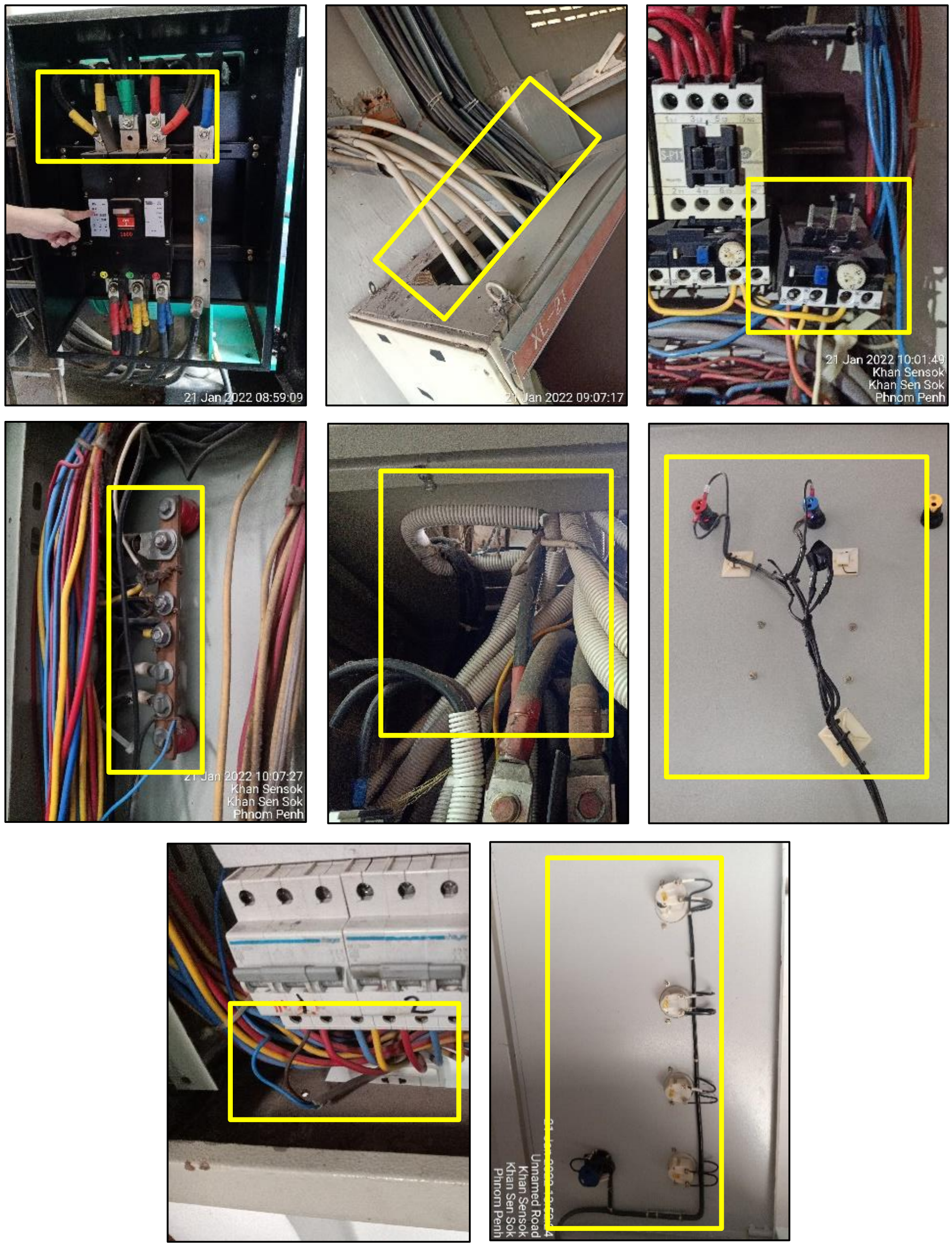


Figure 51: Inadequate cable support and panels component broken.

Ref No.	Issue Type	Sub-Header
ELEC-18	E5 : Distribution	Incorrect cable installation
Observations: In Building A, there were some issues founded as below:		

1. 10sqmm cable connected from 80A circuit breaker (under size of phase cable) in MDB-001B.
2. 6sqmm cable connected from 100A circuit breaker (under size of phase cable) in MDB-002B.
3. 2.5sqmm cable connected from 32A circuit breaker (under size of phase cable) in DB-004B (Hand Print).
4. 4sqmm cable connected from 50A circuit breaker (under size of phase cable) in DB-002B (Print Machine No.2).
5. 4sqmm cable connected from 50A circuit breaker (under size of phase cable) in DB-001B (Print Machine No.1).

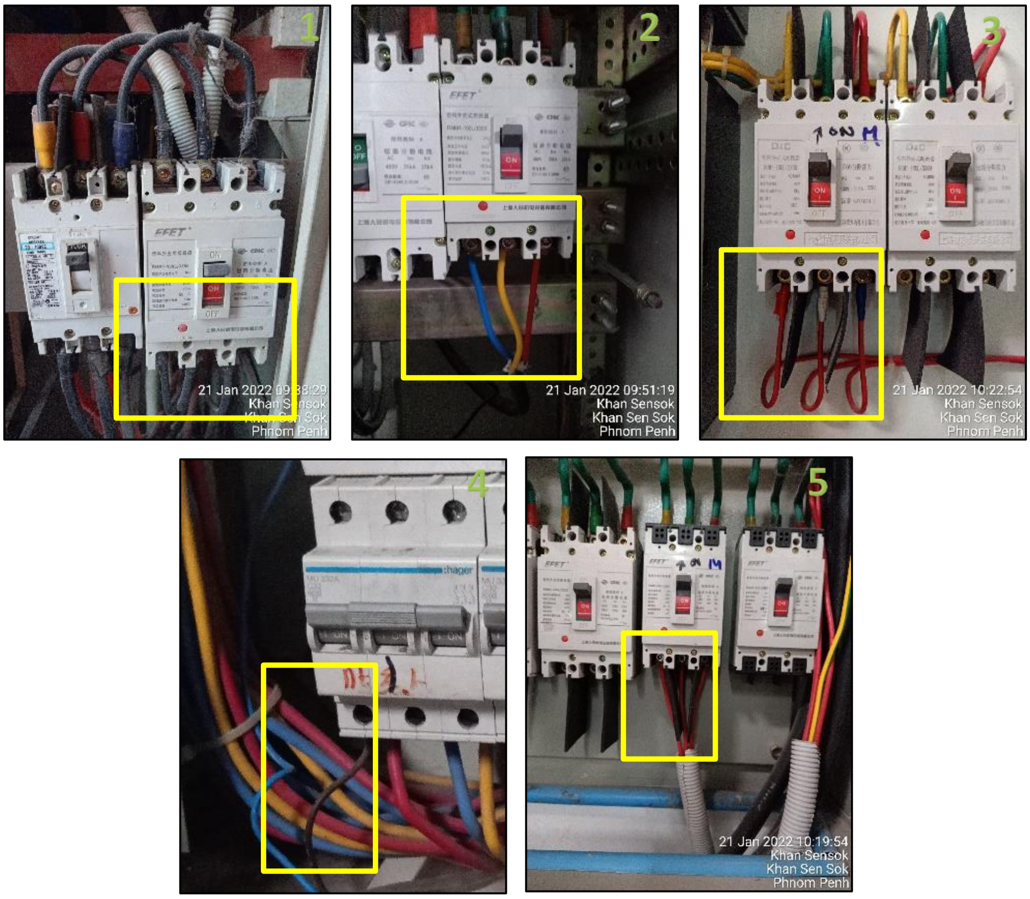


Figure 52: Under size of cable cross-sectional area compare to circuit breakers:

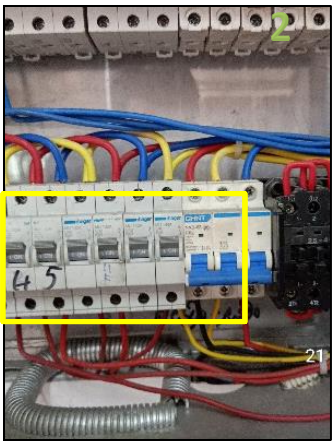
1. 10sqmm cable connected from 80A circuit breaker in MDB-001B.
2. 6sqmm cable connected from 100A circuit breaker in MDB-002B.
3. 4sqmm cable connected from 50A circuit breaker in DB-001B (Print Machine No.1).
4. 2.5sqmm cable connected from 32A circuit breaker in DB-004B (Hand Print).
5. 4sqmm cable connected from 50A circuit breaker in DB-002B (Print Machine No.2).

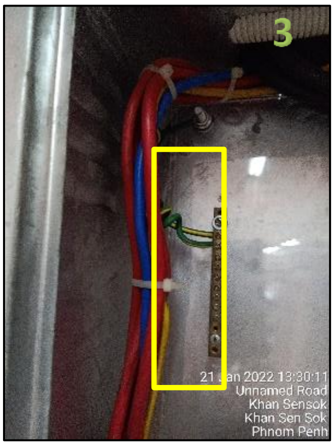
Ref No.	Issue Type	Sub-Header

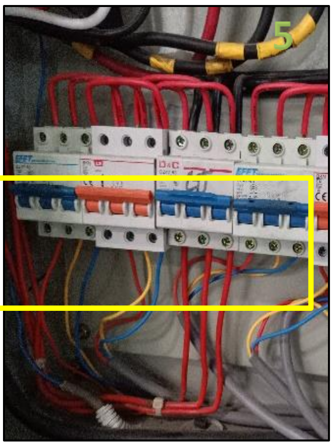
ELEC-19	E5 : Distribution	Incorrect cable installation

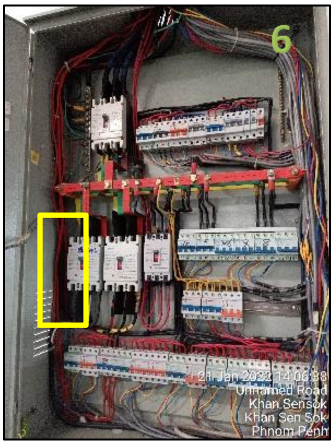
Observations: In Building B, there were some issues founded as below:

1. 50sqmm cable connected to 250A circuit breaker (under size of phase cable) in DB-0010B.
2. 2.5sqmm cable connected to 63A, and also 40A circuit breakers (under size of phase cable) in DB-0010B.
3. Under size of PE cable for DB-0010B.
4. 185sqmm cable connected to 630A circuit breaker (under size of phase cable) in DB-0013B.
5. 1.5sqmm cable connected from 32A circuit breaker (under size of phase cable) in DB-0012B.
6. 10sqmm cable connected from 100A circuit breaker (under size of phase cable) in DB-0012B.
7. Incoming 10sqmm cable connected to 100A circuit breaker (under size of phase cable) in DB-0015B.
8. Outgoing 6sqmm cable connected from 100A circuit breaker (under size of phase cable) in DB-0015B.
9. Outgoing 4sqmm cable connected from 80A circuit breaker (under size of phase cable) in DB-0015B.









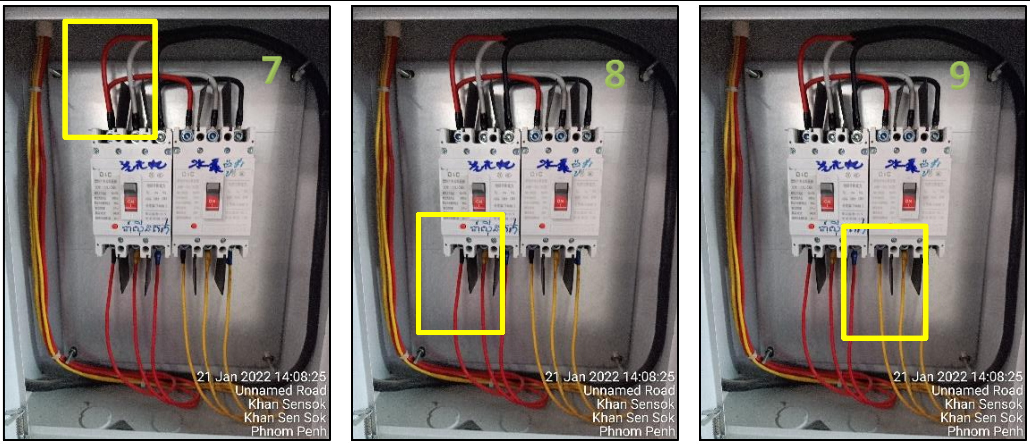


Figure 53: Under size of cable cross-sectional area compare to circuit breakers:

1. 50sqmm cable connected to 250A circuit breaker in DB-0010B.
2. 2.5sqmm cable connected to 63A, and also 40A circuit breakers in DB-0010B.
3. Under size of PE cable for DB-0010B.
4. 185sqmm cable connected to 630A circuit breaker in DB-0013B.
5. 1.5sqmm cable connected from 32A circuit breaker in DB-0012B.
6. 10sqmm cable connected from 100A circuit breaker in DB-0012B.
7. Incoming 10sqmm cable connected to 100A circuit breaker in DB-0015B.
8. Outgoing 6sqmm cable connected from 100A circuit breaker in DB-0015B.
9. Outgoing 4sqmm cable connected from 80A circuit breaker in DB-0015B.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-20	E5 : Distribution	Incorrect cable installation

Observations: In Building C, there were some issues founded as below:

1. Small cable 185 sqmm Cu/XLPE/PVC connected from big breaker 800A at 500kVA Generator 02 panel in Generator room 02 at behind building C.
2. Small cable 240 sqmm Cu/XLPE/PVC connected from 1250A ATS and then connected to big breaker 800A at MDB-003B inside building C.

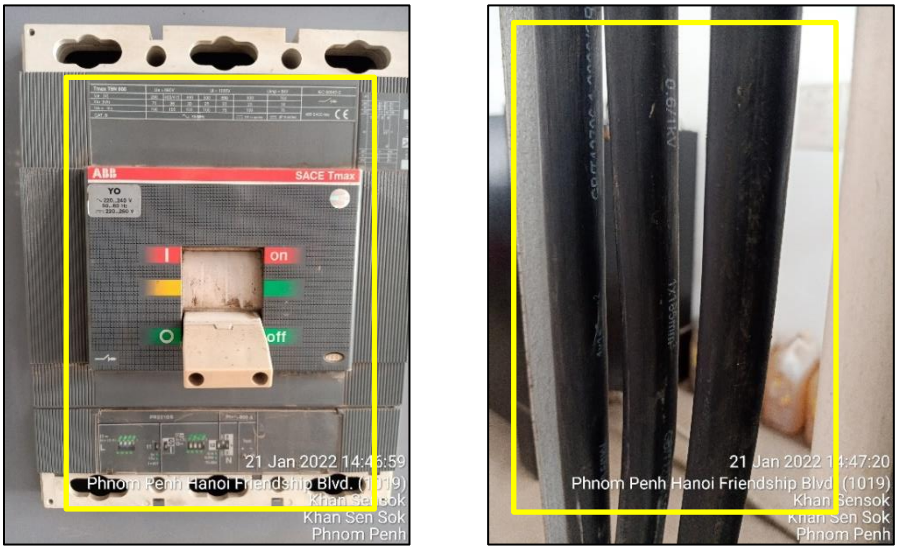


Figure 54: Under size of phases cable cross-sectional area compare to circuit breaker from Generator 02 panel to ATS panel inside Building C.

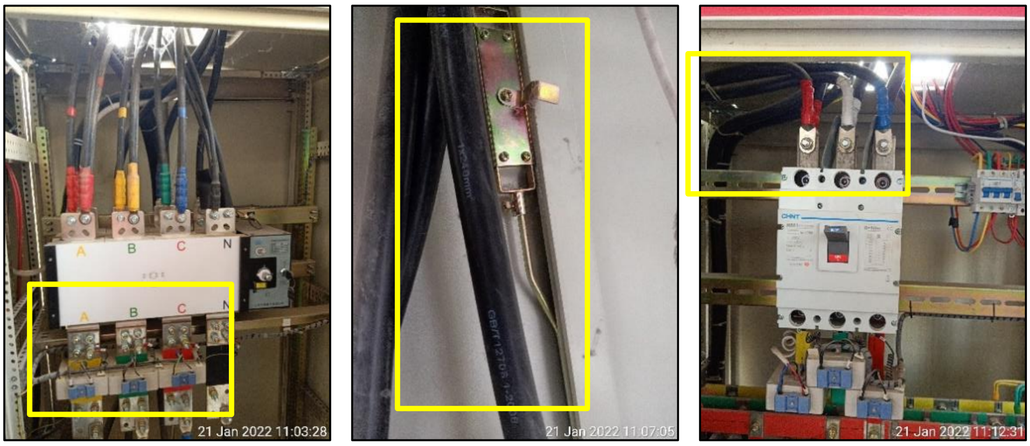


Figure 55: Under size of phases cable cross-sectional area 240sqmm from ATS panel to 800A circuit breaker in MDB-003B panel inside Building C.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-21	E5 : Distribution	Incorrect cable installation
Observations: There were undersize of PE cable founded inside DB-009B in Hostel Building.		

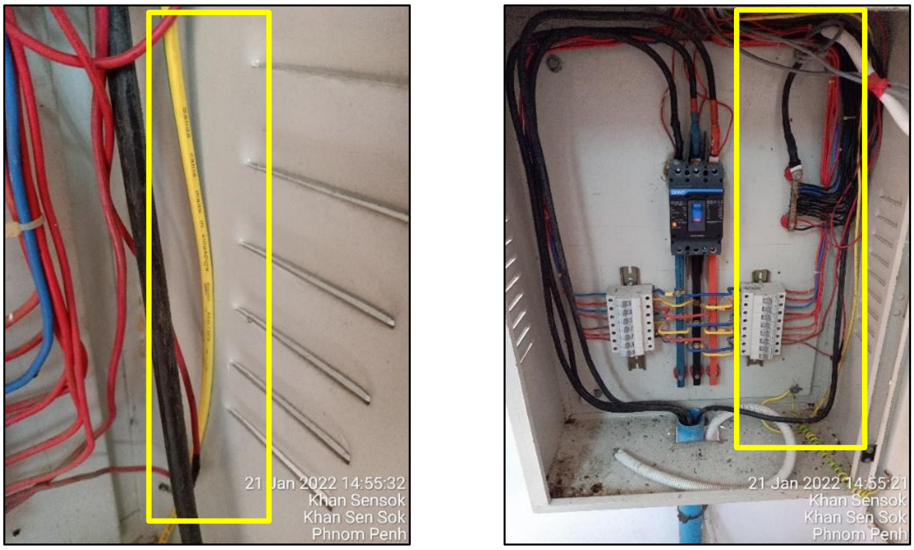


Figure 56: Undersize of PE cable founded inside DB-009B.

Ref No.	**Issue Type**	**Sub-Header**
ELEC-22	E5 : Distribution	Incorrect cable installation

Observations: Normal insulation power cables connected from Main Distribution Board inside Building A to Fire System control panel in FF pump station and Unprotected Outgoing cables/circuits (Circuits drawn without protective device) from Generator 01 panel to both of MTS panel 01 & 02.

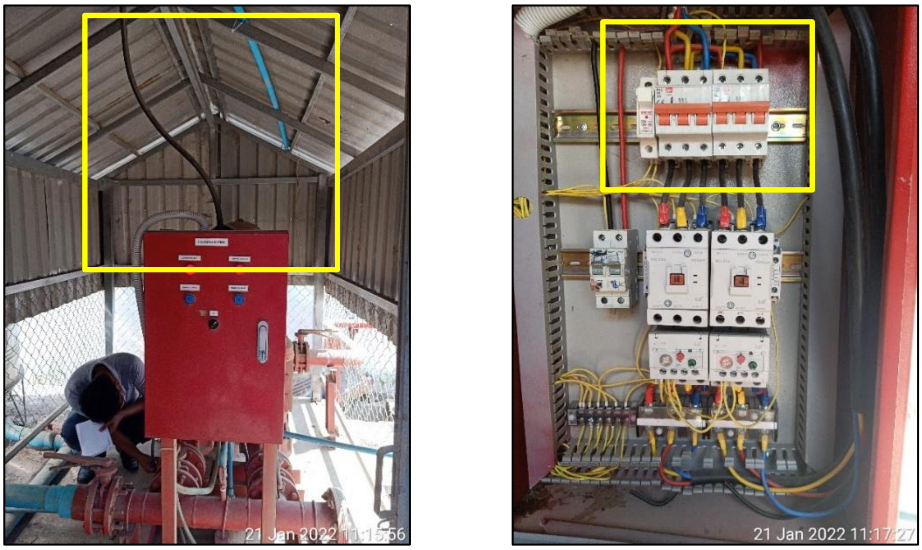


Figure 57: Normal insulation power cables from MDB in Building A to FF pump control panel.

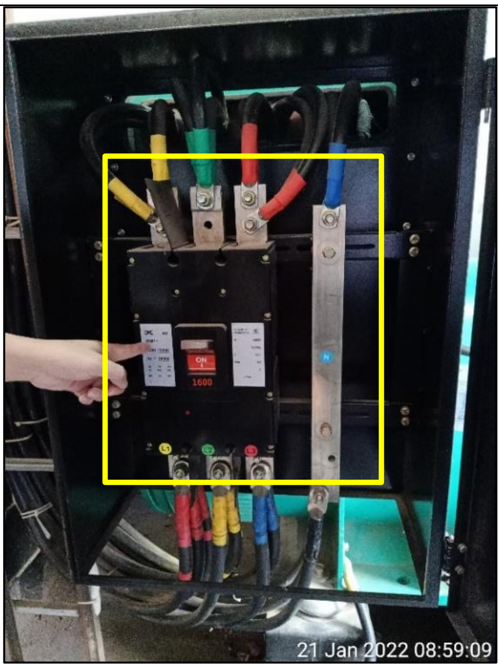


Figure 58: Unprotected Outgoing cables/circuits to MTS panel 01

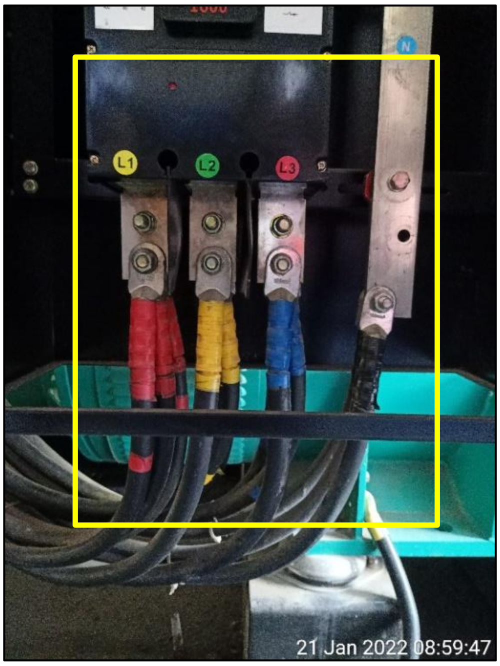


Figure 59: Unprotected Outgoing cables/circuits to MTS panel 02.

]

Ref No.	Issue Type	Sub-Header
ELEC-23	E5 : Distribution	Lint and dust present within/on distribution boards

Observations: There were lint and dust found in:

1. MDB-001B in Building A
2. DB-004B in Building A

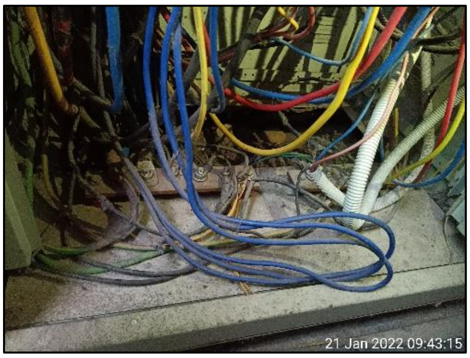


Figure 60: Lint and Dust in MDB-001B.

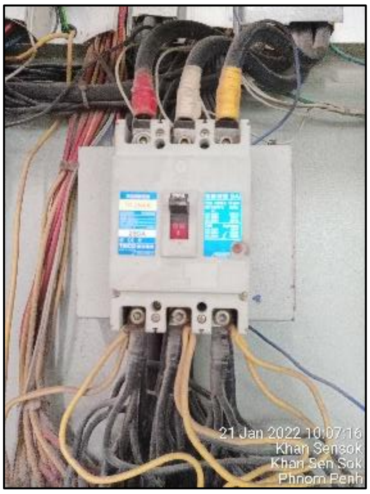


Figure 61: Lint and Dust in DB-004B

Ref No.	Issue Type	Sub-Header
ELEC-24	E6 : Drawings	Electrical network diagrams not available

Observations:

- No Earthing Diagram for review
- No Fire Alarm Diagram for review
- No Single line diagrams for review

Ref No.	Issue Type	Sub-Header
ELEC-25	E7 : Maintenance and Records	No maintenance records available
Observations: No Maintenance Records available for Substation (Transformer, MV Switchgear, LV Switchgear), Generators, Electrical Panels, Lightning Protection System, Thermographic Survey Report and also Earthing system.		

Ref No.	Issue Type	Sub-Header
ELEC-26	E7 : Maintenance and Records	No maintenance records available
Observations: Factory did not have record for earth impedance testing and report.		

Ref No.	Issue Type	Sub-Header
ELEC-27	E8 : Thermographic Scanning	All cable connections
Observations: 1. High Temperature/Overheating 81.1°C found inside the Electrical Panel "MDB-001B" in Building A. 2. High Temperature/Overheating 78.5°C found inside the Electrical Auto machine printing panel "DB-002B" in Building A.		

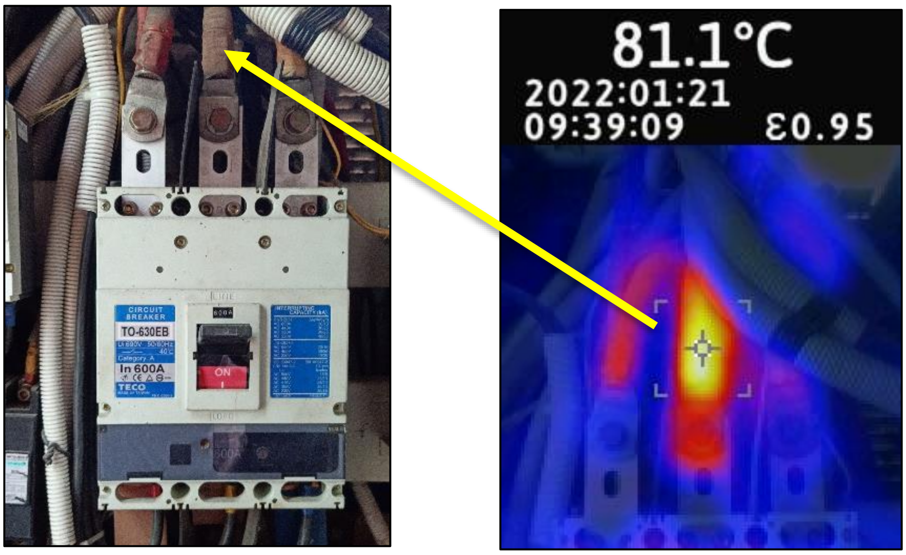


Figure 62: Inside the Electrical Panel "MDB-001B" in Building A and thermal scanning image

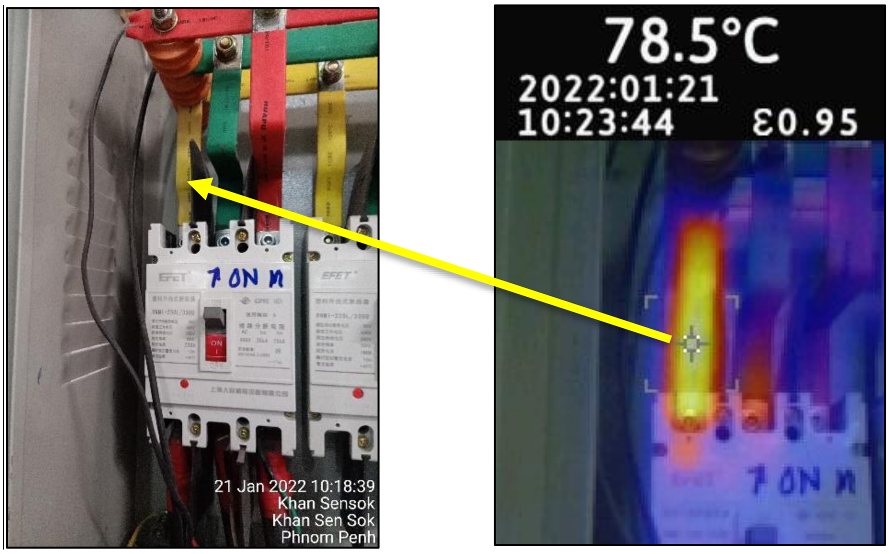


Figure 63: Inside the Electrical Panel "DB-002B" in Building A and thermal scanning image

Ref No.	Issue Type	Sub-Header
ELEC-28	E8 : Thermographic Scanning	All cable connections

Observations:

1. High Temperature/Overheating 71.8°C and 73.1°C found inside the Electrical Panel "DB-0013B" of Building B.

2. High Temperature/Overheating 97.0°C found inside the Electrical panel "DB-003B" in Compressor Room.

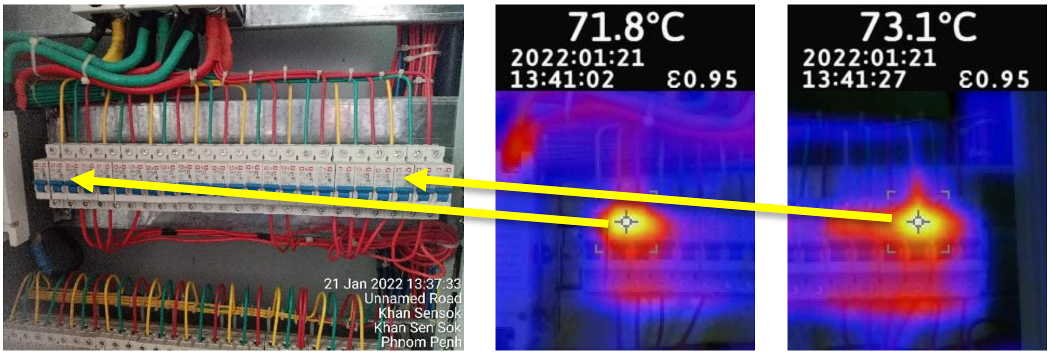


Figure 64: Inside the Electrical Panel "DB-0013B" in Building B and thermal scanning image

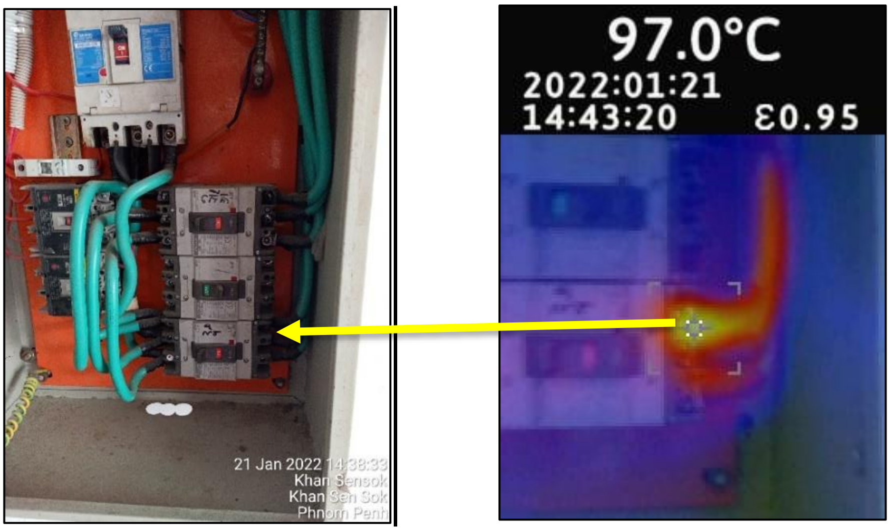


Figure 65: Inside the Electrical Panel "DB-003B" in Compressor Room and thermal scanning image

Ref No.	Issue Type	Sub-Header
ELEC-29	E8 : Thermographic Scanning	All cable connections

Observations: High Temperature/Overheating 66.2°C found inside the Electrical Panel "DB-005B" in Building A.

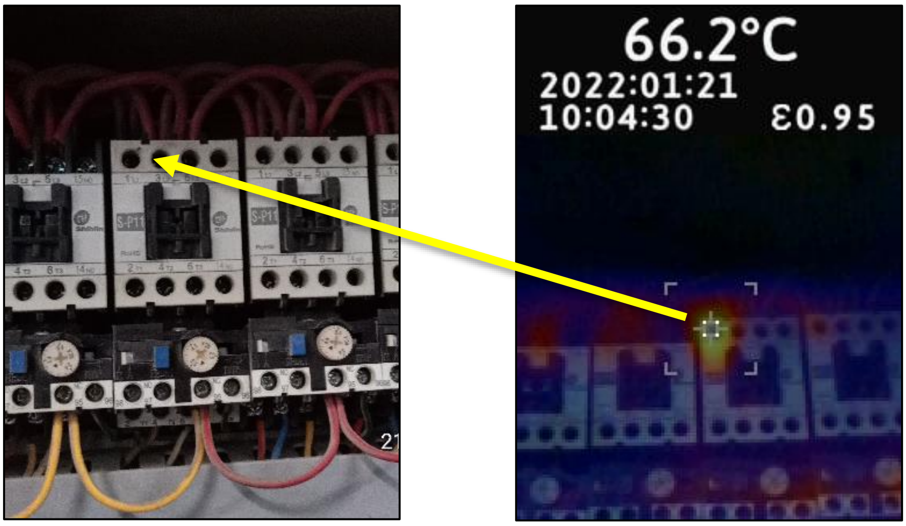


Figure 66: Inside the Electrical Panel "DB-005B" in Building A and thermal scanning image

5 Priority Actions

Each recommendation has been categorised using the following logic;

Priority	Logic	Timeline
1	The non-conformance poses an immediate danger to life or immediate risk of causing a fire .Examples; exposed live conductor(s), insufficient or no protection via circuit breaker.	Immediately
2	Similar to item 1 above, however requires two or more non-conformances /recommendation to contribute to the start of a fire or electrocution . Example; inflammable materials surrounding electrical installation .	2 weeks
3	The item(s) pose a lower risk to life and causing a fire .	4 weeks
4	The recommendation will help to ensure that equipment remains fit for purpose, and reduces the risk to life safety .	2 months

Each recommended action includes the relevant clause reference to the LABS Standard for Cambodia.

FINDINGS AND REMEDIATION ISSUES

E1: Supplies to Life Safety Systems - Power supply to emergency lighting

Issue type	E1: Supplies to Life Safety Systems
Sub Issue Type	Power supply to emergency lighting
Reference Number	ELEC-1
Details Of Issue Found	Random Emergency & Exit Lights were tested at Production Building A & B, some fitting were not working and some stayed on for less than 10minutes on battery back up power supply
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.26.1.2 and Sub-clause (1), factory should appoint the competent Electrical Engineer/technical to check and repair or replace with new one.
Comments	
Photo(s)	 E1 Power Backup for Emergency Light Fail.jpg

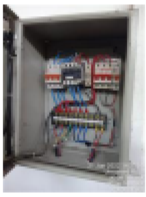
E1: Supplies to Life Safety Systems - Power supply to fire alarm panel

Issue type	E1: Supplies to Life Safety Systems
Sub Issue Type	Power supply to fire alarm panel
Reference Number	ELEC-2
Details Of Issue Found	No Fire Alarm Control Panel
CAP Priority	EP3
Recommended Action Deadline Date	18 Feb 2022

copyright 2014 Fair Factories Clearinghouse

Responsible Person	
Recommended Action	According to LABS Standard Clause 10.26.1.2 and Sub-clause (1), Clause 10.26.1.3, Clause 10.26.1.4, Clause 10.26.2.3, factory should install Addressable/Conventional Centralized Fire Alarm Control Panel in Security/Fire Control Room with sufficient power supply backup source.
Comments	
Photo(s)	

E2: Earthing and Bonding - Break in neutral connection

Issue type	E2: Earthing and Bonding
Sub Issue Type	Break in neutral connection
Reference Number	ELEC-3
Details Of Issue Found	There were no Neutral Bar for: - SDB-0015B in Building B - SDB-0019B in Boiler Room
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.32, factory should appoint the competent Electrical Engineer/technical to check and provide Neutral Bar as required.
Comments	
Photo(s)	 E2 No Neutral Bar for SDB-0015B.jpg  E2 No Neutral Bar for SDB-0019B.jpg

E2: Earthing and Bonding - Insufficient bonding of equipment

Issue type	E2: Earthing and Bonding
Sub Issue Type	Insufficient bonding of equipment
Reference Number	ELEC-4
Details Of Issue Found	There were many missing Earthing Bonding cable connected to: - Cable Routing (Ladder, Tray, Trunking,...) in all areas. - Fuel Daily Tanks in Generator Room 01 & 02 - Above

	Ground Fuel Storage Tank - Electrical Panels Door Frame (MSBs, Switching Panel,... in Generator Room) - Electrical Panels Door Frame (SDB-0019B, in Boiler Room) - Electrical Panels Door Frame (DB-0010B, in Building B) - Boiler and Pump Boiler Enclosures - Washing Machines in Building B
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.34.1 and Clause 10.35.2, factory should appoint the competent Electrical Engineer/technical to check and provide the Earth cables as required.
Comments	
Photo(s)	 E2 no earth bonding for routing-01.jpg  E2 no earth bonding for routing-02.jpg  E2 no earth bonding for routing-03.jpg  E2 no earth bonding for Daily Tank.jpg  E2 no earth bonding for Daily Tank-02.jpg  E2 no earth bonding for Above Ground Bulk fuel Tank.jpg  E2 no earth bonding for MSB 1 door frame.jpg  E2 no earth bonding for MSB 2 door frame.jpg  E2 no earth bonding for Switching Panel door frame.jpg  E2 no earth bonding for SDB-0019B frame.jpg  E2 no earth bonding for DB-0010B door frame.jpg  E2 no earth bonding for Boiler and Boiler Pump frame.jpg

copyright 2014 Fair Factories Clearinghouse

	 E2 no earth bonding for Washing Machine Enclosure.jpg
Issue type	E2: Earthing and Bonding
Sub Issue Type	Insufficient bonding of equipment
Reference Number	ELEC-5
Details Of Issue Found	There were missing of PE Earthing Bar/Cable for: - SDB-0017B in Building B - SDB-0019B in Boiler Room
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.34.1 and Clause 10.35.2, factory should appoint the competent Electrical Engineer/technical to check and provide the Earth cables as required.
Comments	
Photo(s)	 E2 No PE Earthing Cable&Bar for SDB-0017B.jpg  E2 No PE Earthing Cable&Bar for SDB-0019B.jpg
E3: Generators - Inadequate generator ventilation	
Issue type	E3: Generators
Sub Issue Type	Inadequate generator ventilation
Reference Number	ELEC-6

copyright 2014 Fair Factories Clearinghouse

Details Of Issue Found	The Generator Room 01 & 02 used as storage with combustible materials.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.9.4, factory should appoint competent Electrical Engineer to check and clean it.
Comments	
Photo(s)	 E3 Generator Room used as storage-01.jpg  E3 Generator Room used as storage-02.jpg  E3 Generator Room used as storage-03.jpg  E3 Generator Room used as storage-04.jpg

Issue type	E3: Generators
Sub Issue Type	Inadequate generator ventilation
Reference Number	ELEC-7
Details Of Issue Found	There had insufficient access founded in Generator room 01 between MTS-02 panel and Generator 01 near Building A.
CAP Priority	EP3
Recommended Action Deadline Date	18 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.9.4, factory should appoint competent Electrical Engineer to check and provide the minimum clearance 1m for bewteen MSB panel to Generator.
Comments	
Photo(s)	

	 E3 insufficient access between MSB&Generator-01.jpg  E3 insufficient access between MSB&Generator-02.jpg

E3: Generators - Insufficient generator earthing	
Issue type	E3: Generators
Sub Issue Type	Insufficient generator earthing
Reference Number	ELEC-8
Details Of Issue Found	There were insufficient generator 01 & 02 earthing with two separate points.
CAP Priority	EP3
Recommended Action Deadline Date	18 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.9, Clause 10.26.3 and Clause 10.34, factory should appoint competent Electrical Engineer to check and provide with two separate earthing point.
Comments	
Photo(s)	 E3 Generator 1 insufficient earthing-01.jpg  E3 Generator 1 insufficient earthing-02.jpg  E3 Generator 2 insufficient earthing-01.jpg  E3 Generator 2 insufficient earthing-02.jpg

E3: Generators - Leaks in Fuel Storage	
Issue type	E3: Generators
Sub Issue Type	Leaks in Fuel Storage
Reference Number	ELEC-9

copyright 2014 Fair Factories Clearinghouse

Details Of Issue Found	There was fuel leakage from 1000L Daily Tank in Generator Room 01 near Building A.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.9, factory should appoint competent Electrical Engineer to check and repaire it.
Comments	
Photo(s)	 E3 Fuel leak from Daily Tank-01.jpg  E3 Fuel leak from Daily Tank-02.jpg
E4: Substations - Accessibility issues	
Issue type	E4: Substations
Sub Issue Type	Accessibility issues
Reference Number	ELEC-10
Details Of Issue Found	There is insufficient access founded in DBs locations in Building A.
CAP Priority	EP3
Recommended Action Deadline Date	18 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.7.2 and Clause 10.9.4, factory should appoint competent Electrical Engineer to check and provide the sufficient access for maintenance and operation.
Comments	
Photo(s)	

copyright 2014 Fair Factories Clearinghouse

	 E4 insufficient Access-01 to wall mounted DBs.jpg  E4 insufficient Access-02 to wall mounted DBs.jpg

E4: Substations - LV panel damaged	
Issue type	E4: Substations
Sub Issue Type	LV panel damaged
Reference Number	ELEC-11
Details Of Issue Found	LVMSB/MTS panels cover damaged and replaced with unsafe flash guard when need to open to the LVMSB/MTS 01 & 02 cover in Generator Room 01 near Building A.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.12.1 and Clause 10.12.3, factory should appoint competent Electrical Engineer to check and repaire it.
Comments	
Photo(s)	 E4 Panel flash guard damaged and replace with unsafe when need to open-01.jpg  E4 Panel flash guard damaged and replace with unsafe when need to open-02.jpg  E4 Panel flash guard damaged and replace with unsafe when need to open-03.jpg

E4: Substations - Substation unsecured	
Issue type	E4: Substations
Sub Issue Type	Substation unsecured
Reference Number	ELEC-12

copyright 2014 Fair Factories Clearinghouse

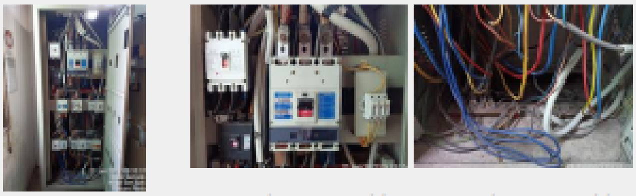
Details Of Issue Found	There were Inadequate/No number of Normal and Emergency Lighting Inside: - The two of Generator Rooms - MDB/DB room/location inside Building A, B and C
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.7.6 and Sub-clause (7), factory should appoint competent Electrical Engineer to check the required number of lighting fixtures needed&installed as follow requirement.
Comments	
Photo(s)	 E4 inadequate of number of emergency lighting for Generator 01 room.jpg  E4 inadequate of number of emergency lighting for Generator 02 room.jpg  E4 no normal and emergency lighting from MDB location in Building A.jpg  E4 no normal and emergency lighting from MDB location in Building B.jpg  E4 no normal and emergency lighting from MDB location in Building C.jpg
Issue type	E4: Substations
Sub Issue Type	Substation unsecured
Reference Number	ELEC-13
Details Of Issue Found	There were inadequate rubber floor mats for: - MSB/MTS in Generator Room 01 - MDB and also for DB in some locations inside each Building A, B and C.
CAP Priority	EP3
Recommended Action Deadline Date	18 Feb 2022

Responsible Person	
Recommended Action	According to LABS Standard Clause 10.7.6 and Sub-Clause (2), factory should appoint competent Electrical Engineer to check and provide as requirement.
Comments	
Photo(s)	 E4 no robber floor mat for MSB&MTS 01 in Generator room 01.jpg  E4 no robber floor mat for MDB-002B in Building A.jpg  E4 no robber floor mat for MDB-003B in Building C.jpg

E5: Distribution - Combustible/flammable materials present

Issue type	E5: Distribution
Sub Issue Type	Combustible/flammable materials present
Reference Number	ELEC-14
Details Of Issue Found	There were Combustible/flammable materials (wood) installed in SDB-001B in Building A and SDB-0016B in Building B.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	The Enclosure of Electrical Panel must be provided in accordance with Clause 10.12.1.3 and Clause 10.19.1 of the LABS standard.
Comments	
Photo(s)	 E5 combustible material (Wood) installed in SDB-  E5 combustible material (Wood) installed in SDB-

copyright 2014 Fair Factories Clearinghouse

	001B.jpg 0016B.jpg
E5: Distribution - Inadequate cable segregation	
Issue type	E5: Distribution
Sub Issue Type	Inadequate cable segregation
Reference Number	ELEC-15
Details Of Issue Found	Inadequate cable segregation for LV cables inside MDB-001B in Building A
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.20.2.1 ,Clause 10.20.2 and Clause 10.20.3, factory should appoint competent Electrical Engineer to check and repair it.
Comments	
Photo(s)	 E5 inadequate cable segregation inside MDB-001B-01.jpg; E5 inadequate cable segregation inside MDB-001B-02.jpg; E5 inadequate cable segregation inside MDB-001B-03.jpg
E5: Distribution - Inadequate cable support	
Issue type	E5: Distribution
Sub Issue Type	Inadequate cable support
Reference Number	ELEC-16
Details Of Issue Found	- Inadequate cable support for LV incoming cables from EDC to Generator room - Inadequate cable support for LV cables from Generator room to MDB room in Building A - Inadequate cable support for LV cables in DB-002B location in Building A and the current transformer was installed outside of DB. - Inadequate cable support for LV cables in Fire System Control Panel location in FF Pump station.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022

Responsible Person	
Recommended Action	According to LABS Standard Clause 10.16.2 ,Clause 10.16.3, Clause 10.16.4 and Clause 10.23, factory should appoint competent Electrical Engineer to check and provide as required.
Comments	
Photo(s)	 E5 inadequate cable support for LV incoming cables.jpg  E5 inadequate cable support for LV cables in MDB room.jpg  E5 inadequate cable support for LV cables in DB-002B location.jpg  E5 inadequate cable support for LV cables in Fire System Control Panel.jpg
Issue type	E5: Distribution
Sub Issue Type	Inadequate cable support
Reference Number	ELEC-17
Details Of Issue Found	Almost Internal components of distribution boards are not properly concealed. There are a many openings at top and bottom of DB enclosure, incoming and outgoing cable from DB without cable glands, missing knockout covers, missing phase separators.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.16.2 ,Clause 10.16.3, Clause 10.16.4 and Clause 10.20 and Clause 10.23, factory should appoint competent Electrical Engineer to check and provide as required.
Comments	
Photo(s)	 E5 missing phase separator-01.jpg  E5 opening on top of distribution boards-  E5 opening on top of distribution boards-02.jpg  E5 opening at bottom of distribution boards-01.jpg

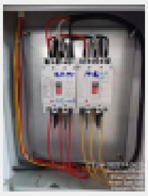
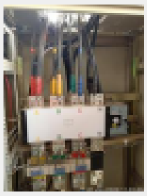
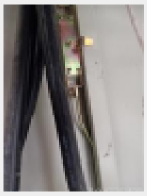
copyright 2014 Fair Factories Clearinghouse

	01.jpg
E5: Distribution - Incorrect cable installation	
Issue type	E5: Distribution
Sub Issue Type	Incorrect cable installation
Reference Number	ELEC-18
Details Of Issue Found	In Building A, there were some issues founded as below: 1. 10sqmm cable connected from 80A circuit breaker (under size of phase cable) in MDB-001B. 2. 6sqmm cable connected from 100A circuit breaker (under size of phase cable) in MDB-002B. 3. 2.5sqmm cable connected from 32A circuit breaker (under size of phase cable) in DB-004B (Hand Print). 4. 4sqmm cable connected from 50A circuit breaker (under size of phase cable) in DB-002B (Print Machine No.2). 5. 4sqmm cable connected from 50A circuit breaker (under size of phase cable) in DB-001B (Print Machine No.1).
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable), factory should appoint competent Electrical Engineer to check and solve this issue.
Comments	
Photo(s)	 E5 10sqmm connected from 80A circuit breaker in MDB-001B.jpg  E5 6sqmm connected from 100A circuit breaker in MDB-002B.jpg  E5 2.5sqmm connected from 32A circuit breaker in DB-004B.jpg  E5 4sqmm connected from 50A circuit breaker in DB-002B.jpg  E5 4sqmm connected from 50A circuit breaker in DB-

copyright 2014 Fair Factories Clearinghouse

	001B.jpg
Issue type	E5: Distribution
Sub Issue Type	Incorrect cable installation
Reference Number	ELEC-19
Details Of Issue Found	In Building B, there were some issues founded as below: - 50sqmm cable connected to 250A circuit breaker (under size of phase cable) in DB-0010B. - 2.5sqmm cable connected to 63A, and also 40A circuit breakers (under size of phase cable) in DB-0010B. - Under size of PE cable for DB-0010B. - 185sqmm cable connected to 630A circuit breaker (under size of phase cable) in DB-0013B. - 1.5sqmm cable connected from 32A circuit breaker (under size of phase cable) in DB-0012B. - 10sqmm cable connected from 100A circuit breaker (under size of phase cable) in DB-0012B. - Incoming 10sqmm cable connected to 100A circuit breaker (under size of phase cable) in DB-0015B. - Outgoing 6sqmm cable connected from 100A circuit breaker (under size of phase cable) in DB-0015B. - Outgoing 4sqmm cable connected from 80A circuit breaker (under size of phase cable) in DB-0015B.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable) and Clause 10.35.2, factory should appoint competent Electrical Engineer to check and solve this issue.
Comments	
Photo(s)	 E5 50sqmm connnected to 250A circuit breaker in DB-0010B.jpg  E5 2.5sqmm connnected to 63A and also 40A circuit breakers in DB-0010B.jpg  E5 under size of PE cable for DB-0010B.jpg  E5 185sqmm connnected to 630A circuit breaker in DB-0013B.jpg  E5 1.5sqmm connected from 32A circuit breaker in DB-  E5 10sqmm connected from 100A  E5 incoming 10sqmm connected to 100A  E5 outgoing 6sqmm connected from 100A

copyright 2014 Fair Factories Clearinghouse

	0012B.jpg circuit breaker in DB-0012B.jpg circuit breaker in DB-0015B.jpg circuit breaker in DB-0015B.jpg  E5 outgoing 4sqmm connected from 80A circuit breaker in DB-0015B.jpg
Issue type	E5: Distribution
Sub Issue Type	Incorrect cable installation
Reference Number	ELEC-20
Details Of Issue Found	In Building C, there were some issues founded as below: - Small cable 185 sqmm Cu/XLPE/PVC connected from big breaker 800A at 500kVA Generator 02 panel in Generator room 02 at behind building C. - Small cable 240 sqmm Cu/XLPE/PVC connected from 1250A ATS and then connected to big breaker 800A at MDB-003B inside building C.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable), factory should appoint competent Electrical Engineer to check and solve this issue.
Comments	
Photo(s)	 E5 185 sqmm connnected from 800A MCCB-01.jpg  E5 185 sqmm connnected from 800A MCCB-02.jpg  E5 240 sqmm connnected from 1250A ATS.jpg  E5 240 sqmm connnected to 800A MCCB-01.jpg

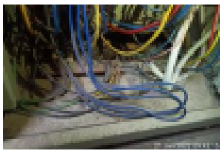
copyright 2014 Fair Factories Clearinghouse

	 E5 240 sqmm connnected to 800A MCCB-02.jpg
Issue type	E5: Distribution
Sub Issue Type	Incorrect cable installation
Reference Number	ELEC-21
Details Of Issue Found	There were undersize of PE cable founded inside DB-009B in Hostel Building
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable) and Clause 10.35.2, factory should appoint competent Electrical Engineer to check and solve this issue.
Comments	
Photo(s)	 E5 under size of PE cable for DB-009B.jpg
Issue type	E5: Distribution
Sub Issue Type	Incorrect cable installation
Reference Number	ELEC-22
Details Of Issue Found	- Normal insulation power cable connected from Main Distribution Board inside Building A to Fire System control panel in FF pump station. - Unprotective Outgoing cables/circuits (Circuits drawn without protective device) from Generator 01 panel to both of MTS panel

	01 & 02.
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	- According to LABS Standard Clause 10.26.2.3, factory should appoint competent Electrical Engineer to check and change it. - According to LABS Standard Clause 10.5.2 and Clause 10.5.4, factory should appoint competent Electrical Engineer to check and provide it.
Comments	
Photo(s)	 E5 normal insulation power cable supply to Fire System Control Panel-01.jpg  E5 normal insulation power cable supply to Fire System Control Panel-02.jpg  E5 Unprotective outgoing circuits from Generator 01-1.jpg  E5 Unprotective outgoing circuits from Generator 01-2.jpg

E5: Distribution - Lint and dust present within/on distribution boards	
Issue type	E5: Distribution
Sub Issue Type	Lint and dust present within/on distribution boards
Reference Number	ELEC-23
Details Of Issue Found	There were lint and dust found in: - MDB-001B in Building A - DB-004B in Building A
CAP Priority	EP2
Recommended Action Deadline Date	04 Feb 2022
Responsible Person	
Recommended Action	Factory to appoint competent Electrical Engineer to check and clean it. Refer to Clause 10.12 of the LABS Standard.
Comments	
Photo(s)	  

copyright 2014 Fair Factories Clearinghouse

	 E5 dust inside MDB-001B-01.jpg  E5 dust inside MDB-001B-02.jpg  E5 dust inside DB-004B.jpg

E6: Drawings - Electrical network diagrams not available

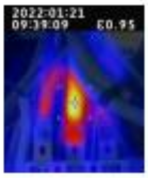
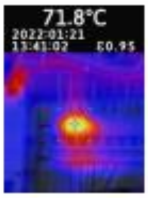
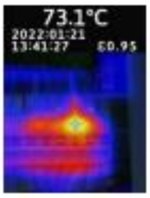
Issue type	E6: Drawings
Sub Issue Type	Electrical network diagrams not available
Reference Number	ELEC-24
Details Of Issue Found	- No Earthing Diagram for review - No Fire Alarm Diagram for review - No Single line diagrams for review
CAP Priority	EP4
Recommended Action Deadline Date	22 Mar 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.22.1, factory should appoint competent Electrical Engineer to update it.
Comments	
Photo(s)	

E7: Maintenance and Records - Information not provided on single line diagram

Issue type	E7: Maintenance and Records
Sub Issue Type	Information not provided on single line diagram
Reference Number	ELEC-25
Details Of Issue Found	No Maintenant Records available (Substation, Generator, Fire Alarm,...)
CAP Priority	EP4
Recommended Action Deadline Date	22 Mar 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 12.12, factory should appoint competent Electrical Engineer to update it

Comments	
Photo(s)	
E7: Maintenance and Records - No maintenance records available	
Issue type	E7: Maintenance and Records
Sub Issue Type	No maintenance records available
Reference Number	ELEC-26
Details Of Issue Found	Factory did not have record for earth impedance
CAP Priority	EP3
Recommended Action Deadline Date	18 Feb 2022
Responsible Person	
Recommended Action	According to LABS Standard Clause 10.39.1 and Clause 10.39.2, factory should appoint competent Electrical Engineer to check the grounding location, and do testing for earth impedance
Comments	
Photo(s)	
E8: Thermographic Scanning - All cable connections	
Issue type	E8: Thermographic Scanning
Sub Issue Type	All cable connections
Reference Number	ELEC-27
Details Of Issue Found	- High Temperature/Overheating 81.1°C found inside the Electrical Panel "MDB-001B" in Building A. - High Temperature/Overheating 78.5°C found inside the Electrical Auto machine printing panel "DB-002B" in Building A.
CAP Priority	EP1
Recommended Action Deadline Date	24 Jan 2022
Responsible Person	
Recommended Action	The allowable of overheating/temperature of electrical equipment/components shall be to Clause 10.40.2.2 and Sub-Clause (1) & (2) of the LABS Standard.
Comments	
Photo(s)	 

copyright 2014 Fair Factories Clearinghouse

	 E8 High Temperature in MDB-001B bldA-1.jpg  E8 High Temperature in MDB-001B bldA-2.jpg  E8 High Temperature in DB-002B bldA-1.jpg  E8 High Temperature in DB-002B bldA-2.jpg
Issue type	E8: Thermographic Scanning
Sub Issue Type	All cable connections
Reference Number	ELEC-28
Details Of Issue Found	- High Temperature/Overheating 71.8ºC and 73.1ºC found inside the Electrical Panel "DB-0013B" of Building B. - High Temperature/Overheating 97.0ºC found inside the Electrical panel "DB-003B" in Compressor Room.
CAP Priority	EP1
Recommended Action Deadline Date	24 Jan 2022
Responsible Person	
Recommended Action	The allowable of overheating/temperature of electrical equipment/components shall be to Clause 10.40.2.2 and Sub-Clause (1) & (2) of the LABS Standard.
Comments	
Photo(s)	 E8 High Temperature in DB-0013B bldB-1.1.jpg  E8 High Temperature in DB-0013B bldB-1.2.jpg  E8 High Temperature in DB-0013B bldB-2.jpg  E8 High Temperature in DB-003B Compressor rm-1.jpg  E8 High Temperature

copyright 2014 Fair Factories Clearinghouse

	in DB-003B Compressor rm-2.jpg
Issue type	E8: Thermographic Scanning
Sub Issue Type	All cable connections
Reference Number	ELEC-29
Details Of Issue Found	High Temperature/Overheating 66.2°C found inside the Electrical Panel "DB-005B" in Building A.
CAP Priority	EP2
Recommended Action Deadline Date	24 Feb 2022
Responsible Person	
Recommended Action	The allowable of overheating/temperature of electrical equipment/components shall be to Clause 10.40.2.2 and Sub-Clause (1) & (2) of the LABS Standard.
Comments	
Photo(s)	 E8 High Temperature in DB-005B bldA-1.jpg  E8 High Temperature in DB-005B bldA-2.jpg

6 Summary of Priority Actions

CAP Priority	Response	Issue Type	Company Plan Of Action
EP1	ELEC-27	E8: Thermographic Scanning	The allowable of overheating/temperature of electrical equipment/components shall be to Clause 10.40.2.2 and Sub-Clause (1) & (2) of the LABS Standard.
EP1	ELEC-28	E8: Thermographic Scanning	The allowable of overheating/temperature of electrical equipment/components shall be to Clause 10.40.2.2 and Sub-Clause (1) & (2) of the LABS Standard.
EP2	ELEC-1	E1: Supplies to Life Safety Systems	According to LABS Standard Clause 10.26.1.2 and Sub-clause (1), factory should appoint the competent Electrical Engineer/technical to check and repair or replace with new one.
EP2	ELEC-2	E1: Supplies to Life Safety Systems	According to LABS Standard Clause 10.26.1.2 and Sub-clause (1), Clause 10.26.1.3, Clause 10.26.1.4, Clause 10.26.2.3, factory should install Addressable/Conventional Centralized Fire Alarm Control Panel in Security/Fire Control Room with sufficient power supply backup source.
EP2	ELEC-3	E2: Earthing and Bonding	According to LABS Standard Clause 10.32, factory should appoint the competent Electrical Engineer/technical to check and provide Neutral Bar as required.
EP2	ELEC-4	E2: Earthing and Bonding	According to LABS Standard Clause 10.34.1 and Clause 10.35.2, factory should appoint the competent Electrical Engineer/technical to check

			and provide the Earth cables as required.
EP2	ELEC-5	E2: Earthing and Bonding	According to LABS Standard Clause 10.34.1 and Clause 10.35.2, factory should appoint the competent Electrical Engineer/technical to check and provide the Earth cables as required.
EP2	ELEC-6	E3: Generators	According to LABS Standard Clause 10.9.4, factory should appoint competent Electrical Engineer to check and clean it.
EP2	ELEC-9	E3: Generators	According to LABS Standard Clause 10.9, factory should appoint competent Electrical Engineer to check and repair it.
EP2	ELEC-11	E4 : Substations	According to LABS Standard Clause 10.12.1 and Clause 10.12.3, factory should appoint competent Electrical Engineer to check and repair it.
EP2	ELEC-12	E4 : Substations	According to LABS Standard Clause 10.7.6 and Sub-clause (7), factory should appoint competent Electrical Engineer to check the required number of lighting fixtures needed and installed as follow requirement.
EP2	ELEC-14	E5: Distribution	The Enclosure of Electrical Panel must be provided in accordance with Clause 10.12.1.3 and Clause 10.19.1 of the LABS standard.
EP2	ELEC-15	E5: Distribution	According to LABS Standard Clause 10.20.2.1 ,Clause 10.20.2 and Clause 10.20.3, factory should appoint competent Electrical Engineer to check and repair it.
EP2	ELEC-16	E5: Distribution	According to LABS Standard Clause 10.16.2 ,Clause 10.16.3, Clause 10.16.4 and Clause 10.23, factory should appoint competent Electrical

			Engineer to check and provide as required.
EP2	ELEC-17	E5: Distribution	According to LABS Standard Clause 10.16.2 ,Clause 10.16.3, Clause 10.16.4 and Clause 10.20 and Clause 10.23, factory should appoint competent Electrical Engineer to check and provide as required.
EP2	ELEC-18	E5: Distribution	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable), factory should appoint competent Electrical Engineer to check and solve this issue.
EP2	ELEC-19	E5: Distribution	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable) and Clause 10.35.2, factory should appoint competent Electrical Engineer to check and solve this issue.
EP2	ELEC-20	E5: Distribution	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable), factory should appoint competent Electrical Engineer to check and solve this issue.
EP2	ELEC-21	E5: Distribution	According to LABS Standard Clause 10.29 (Protection against Overload Current for selection the correct size of cable) and Clause 10.35.2, factory should appoint competent Electrical Engineer to check and solve this issue.
EP2	ELEC-22	E5: Distribution	According to LABS Standard Clause 10.26.2.3, factory should appoint competent Electrical Engineer to check and change it.
EP2	ELEC-23	E5: Distribution	Factory to appoint competent Electrical Engineer to check and clean it. Refer to Clause 10.12 of the LABS Standard.

EP2	ELEC-29	E8: Thermographic Scanning	The allowable of overheating/temperature of electrical equipment/components shall be to Clause 10.40.2.2 and Sub-Clause (1) & (2) of the LABS Standard.
EP3	ELEC-7	E3: Generators	According to LABS Standard Clause 10.9.4, factory should appoint competent Electrical Engineer to check and provide the minimum clearance 1m for between MSB panel to Generator.
EP3	ELEC-8	E3: Generators	According to LABS Standard Clause 10.9, Clause 10.26.3 and Clause 10.34, factory should appoint competent Electrical Engineer to check and provide with two separate earthing point.
EP3	ELEC-10	E4 : Substations	According to LABS Standard Clause 10.7.2 and Clause 10.9.4, factory should appoint competent Electrical Engineer to check and provide the sufficient access for maintenance and operation.
EP3	ELEC-13	E4 : Substations	According to LABS Standard Clause 10.7.6 and Sub-Clause (2), factory should appoint competent Electrical Engineer to check and provide as requirement.
EP3	ELEC-26	E7: Maintenance and Records	According to LABS Standard Clause 10.39.1 and Clause 10.39.2, factory should appoint competent Electrical Engineer to check the grounding location, and do testing for earth impedance
EP4	ELEC-24	E6: Drawings	According to LABS Standard Clause 10.22.1, factory should appoint competent Electrical Engineer to update it.

EP4	ELEC-25	E6: Drawings	According to LABS Standard Clause 12.12, factory should appoint competent Electrical Engineer to update it

7 Assumptions and Limitations

This report is for the private and confidential use of LABS for whom it was prepared together with their professional advisors as appropriate. It should not be reproduced in whole or in part or relied upon by third parties for any use without the express written permission of ARCHETYPE.

This report can be used in discussion with the supplier or factory owner as a means to rectify or address any observations made. The report is not comprehensive and is limited to what could be observed during a visual assessment of the building.

This Report is not intended to be treated as a generalised assessment and does not cover the deterioration of electrical safety construction measures or electrical safety systems through lack of maintenance. Other aspects of the building that do not affect the safety of the occupants of the Production buildings have not been assessed in this survey.

Except as otherwise noted, other services were not viewed or tested during our assessment and are therefore similarly excluded from this Report. We have not assessed any parts of the building which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

External assessment of the façade walls has generally been carried out from ground level only by visual sighting. No opening up works were carried out (except as noted) and we rely on the Architects and Engineers drawings provided to us for our views on concealed parts of the building. Performance testing of electrical safety systems do not form part of these assessments and we recommend that the factory owners' Building Engineer carries out standard testing and maintenance of these systems to satisfy themselves of their proper functioning.

Recommendations, where given, are for the purpose of providing indicative advice only, are not exhaustive, relate solely to identifying key and obvious electrical defects as identified in this Report, and do not take the form of or constitute a specification for works. We take no responsibility for the works as constructed.

This report does not interfere with the factory owners' Building Engineers responsibility for the electrical safety performance of this building, The Building Engineer remains fully responsible for the electrical safety of the building.

The information in this Electrical Safety Assessment Report was obtained during a one-day site visit to the factory, where we carried out interviews with local factory management and reviewed design and permit documentation presented at that meeting. It has not been possible to provide independent verification for all the information and data collected, and, therefore Archetype cannot accept general responsibility for omissions or errors arising from inaccuracies in this report from the information obtained.

The observations and recommendations in this report are not intended to imply, guarantee, ensure or warrant compliance with any National Codes or Government Regulations. The site assessment and this Report are carried out as a parallel exercise to design approval and inspections carried out by the Authorities as part of the established state enforcement process.

Additionally, the results do not imply in any way that compliance with the observations or recommendations as stated in this report will eliminate all hazards, risks or exposures or that hazards, risks or exposures not referred to in this report do not exist.

Implementation of the recommendations stated in this report does not relieve the factory owner from any obligation to comply with specific project requirements, industry standards, or the provisions of any local government regulations

LABS disclaimer

This report is the result of an assessment conducted applying the Methodology for Preliminary Safety Assessment for Cambodia (the "**Methodology**") and the LABS harmonized reference standard and protocol ("**LABS Standard**").

The LABS Standard and the Methodology describe the requirements for addressing life safety in factories with respect to structural, electrical and fire safety, but LABS Foundation is not responsible for, nor can it guarantee that factories have fully ensured structural, electrical and fire life safety. LABS Foundation is not responsible for assuring that the factories and/or inspection companies conducting assessments conform to the requirements of the LABS Standard and/or the Methodology.

The inspection company conducting assessments must interpret and adapt the LABS Standard and Methodology as necessary to each specific factory and the local context where an assessment takes place. The inspection company is solely responsible for the assessment and the outcomes of such assessment, such as, but not limited to, this report. In connection with this report or any part thereof, LABS Foundation does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated and LABS Foundation shall not be liable to any party who uses, relies or acts on this report. LABS Foundation is not responsible and cannot be held liable for any losses and/or any damages suffered by factories, inspection companies and/or any third party involved caused by or in connection with structural, electrical and fire life safety in factories, the LABS Standard, the Methodology, assessments, reports, outcomes of assessments and/or consequences of assessments, unless the factory, inspection company or any third party proves the willful misconduct or gross negligence of LABS Foundation.

By reading the report the reader of the report shall be deemed to have accepted the terms mentioned hereinabove.

Appendix L

Quality Control Flowchart

L1 Quality Control Flowchart

Quality Control by Assessment Firms (AF)