



GUIDELINES FOR THE REQUIREMENTS AND IMPLEMENTATION OF THE LEBANESE STANDARDS

Lift Example

Abstract

The implementation of the building safety requirements in Lebanon is mandated by the decree 7964 published in 2012. The decree introduced the role of technical auditor. The role of the technical auditor is to contribute to the implementation of the safety standards.

SAFETY IS EVERYBODY'S RESPONSIBILITY

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I. Introduction

The standards related to safety states requirements in the form of text books. They are the result of accidents. In fact, further to accidents and/or incidents investigating will be initiated to determine the causes and address the needed steps to prevent or avoid reoccurrence. That's why it is common to state that they are written in red (blood). Therefore, all the standards related to safety are mandated by decrees. In this case, the decree includes at least the following two points:

- Statement that the specific standard/code is mandatory; and,
- The implementation method; and/or
- the entity that is responsible for the implementation

In Lebanon, the mandating of several safety standards related to buildings and premises has been initiated during the year 2005 by decree 14293 and amended in 2012 by decree 7964.

Before publication, the role of any engineer in the construction field was either consultancy or execution. The decree mandated, as part of the implementation, the intervention of the technical auditor. The technical auditor role is to contribute during the construction to ensure the safety. It is to be noted that safety is everybody's responsibility: all the engineers.

What contribution does the technical auditor bring to the safety... it is the verification of conformity...

To perform any conformity assessment mission, the applicable reference should be defined. In fact, conformity means compliance with a documented reference. For the technical auditor, the references are the safety standards and they could include another documented reference(s) requested by the employer.

II. Technical Audit

A. Role players

The main role players in the building construction are:

- Directly involved:
 - Designers
 - Contractors
 - Technical auditors
- Indirectly involved:
 - Manufacturers
 - Accredited Laboratories
- Authorities:
 - Concerned Ministries and municipalities
 - OEA (Beirut and Tripoli)
 - Libnor

The standards are issued and prepared by Libnor. The conformity assessment is performed by the technical auditors. This paper is about the expected deliverables of the technical auditors with the example of lifts.

B. Deliverables:

The technical auditor contributes to the safety by delivering information about the compliance status during the advancement of construction work. The deliverables are reports issued at every stage of the construction phases. The objective of every engineer (designer, contractor and auditor) is to lead the project to a happy ending “safety”. Thus, the building license is issued by the authorities to completed building complying to the applicable codes and standards based on the final report issued by the technical auditor.

The reports address all the verified elements with clear conclusion statement; which is one of three:

- **Favorable opinion:** it means that the verified point complies with the applicable reference
- **Non-favorable opinion:** it means that the verified point does not comply with the applicable reference
- **Suspended opinion:** It means that there is no sufficient information to enable the auditor to decide whether the verified point complies or not with the applicable reference. So, the opinion will be on hold until getting the sufficient information.
The final report cannot include a suspended opinion.

In case the opinion is either non-favorable or suspended, the report should address the following three items in a format determined in the methodology of the technical auditor firm:

- The reference of the clause and the applicable code
- Finding description
- Requirements of the code.

During the redaction of the report, the technical auditor keeps in mind that the main purpose of the report is the corrections and repairs. Noting that the report is never a way to pinpoint the works of the other engineers. For that purpose, the followings should be observed:

- The finding shall clearly define the issue to allow the designer or the contractor to understand the need and perform the corrections/repairs. For example, if a drawing contains a missed

emergency light in one of the corridors, the report should state the drawing reference and the corridor rather than simply indicating that there is a missed emergency light in one corridor.

- The requirements of the code do not mean to copy the clause word by word. Sometimes rephrasing the contents of the clause will be necessary to be understandable by all the concerned parties. To make it clear, a good example follows.

Clause 5.4 of the famous lift standard EN81-1 have as a title: Construction of the walls of lift wells and landing doors facing a car entrance. This title will become very confusing to the lift installer. It could lead them to consider it as part of the well construction and not included in the scope of the lift installation. This point is much more known in the lift industry as “landing door toe guard”.

After reporting, meetings would be a part of the deliverables. The purpose of the meeting is to clarify any ambiguity, discuss solutions and (in case of need) explore the possible solutions. During the meeting, all possibilities addressed by the standard could be explored with the auditor. The auditor could give an opinion on the proposed solutions rather than detailed solution. This is not due to bad attitude, but a requirement of the code of ethics; in fact, any solution proposed shall be reviewed by the auditor; in case it is his opinion, then how can he give an impartial opinion?

C. Missions

The mandatory missions for any building are: L, PS and S all of them are related to the safety of the building.

L: Solidity; PS: Seismic protection and S: Safety (Fire, Elevators, electrical and mechanical)

Additional missions could be requested by the employer (Building owner) such as F: Functional, etc...

D. Intervention

The mission of the technical auditors includes the verification of documents or physical intervention on sites.

The interventions are done in phases:

- Phase 1: Design
Document review
- Phase 2: Execution Documents
Document review
- Phase 3: Execution:
Document Review and site intervention

The early intervention of the technical auditor will make the work easier, smoother and with the minimum of repairs and corrections.

To make the points stated above clear, the interventions on lifts stipulated in the following paragraphs could be a good example

III. Example of lifts

Starting from 2017, OEA Beirut has mandated the verification, examination and testing of every lift installed in a new building before putting it into service. The mission shall be performed by accredited technical auditors. The final report is a pre-requisite for the issuance of a building license.

The following paragraph contains a summary on the expected technical auditor intervention.

A. Applicable codes

LIBNOR has issued, up till end of the year 2017, 20 Lebanese standards related to conveying systems. They are listed in Annex A: List of standards related to lifts

For the implementation of the Lebanese standards:

1. Every lift shall comply to one of the following standards (as applicable) to ensure the safety of the lift.
 - a. For new passenger lifts in new building:
NL EN 81-1, NL EN 81-2, NL EN 81-20 or NL EN 81-22
 - b. For new passenger lifts in existing building:
NL EN 81-21
 - c. For goods only lifts:
NL EN 81-3 or NL EN 81-31
 - d. For special lifts for handicapped:
NL EN 81-40 or NL EN 81-41
2. Additional standards would be applicable if required by other codes such as:
 - a. For passenger lifts with handicapped requirements: NL EN 81-70
 - b. For fire rated landing doors: NL EN 81-58
 - c. For special remote alarm system: NL EN 81-28

B. Phase 1: Design review

During the building design, the following points should be verified by the technical auditor. It is worthy to mention that earlier the non-compliances are detected, easier the corrections will be and the repairs on site will be prevented.

Followings are some points that are normally verified by the technical auditor at the design stage:

1. Fire code requirements

These are indicative points required by the fire code and not stated in any lift standard. Thus, they should be communicated to the lift supplier at a very early stage (before quotation):

1. Lift characteristics: i.e.
 - a. NFPA 5000, in special cases, requires the provision of lifts that can accommodate stretchers and have a capacity of 1600kg
 - b. In specific case, there will be need for special intercommunication system
2. Fire rating of the landing doors. The terminology used should be according to NL EN 81-58 i.e. E 120, EI 90 or EW 30 etc...

3. Behavior of lifts in case of fire: what should the lift do? Should it be connected to the fire alarm system or any other system? The requirement for wiring between the fire alarm system and the lift control panel is to be taken into consideration in the electrical lot
4. Special requirements for emergency exit trap on car roof (ERP)
5. Etc...

It is to be noted that in case there is no fire code implemented in the building, it is useless to request any of the above.

2. Dimension requirements

The lift characteristics should be defined by the concerned parties; Annex B: Lift Specifications Checklist could be used as a checklist for the minimum information that should be submitted to the lift supplier at the tendering stage.

The main lift characteristics are: Rated speed, Rated load / number of persons, height of the car, type and dimension of the doors.

Based on the main characteristics, the technical auditor verifies that the well dimensions indicated on the Architectural drawings (width, depth, headroom height, pit depth) and the machine room dimensions stated on the drawings can accommodate the required lift. For this purpose, one of the following two methods could be adapted:

1. Check compliance with the requirements of the standard NL ISO 4190-1. This standard contains the universal lift characteristics and the related well and machine room dimensions. It includes information for residential lifts general purpose lifts, intensive use lifts and Health care lifts. It indicates, as well, the acceptable car and well dimensions for handicapped requirements
2. A technical dossier should be submitted from a lift company that includes all the information stipulated in the phase 2 paragraph.

3. Others

In case the mission “F” is included in the scope of the Technical auditor, he should verify the calculation notes related to the traffic analysis.

C. Phase 2: Review of the technical dossier

Upon conclusion of the contract with a lift supplier, the lift supplier submits a technical dossier that includes:

1. Information about the installation
2. Layout drawings
3. Calculation notes
4. Technical data sheets
5. Schematic diagram of the safety circuit
6. Type examination certificates

Details about the needed information are detailed in the present document in Annex C: Technical dossier requirements.

The technical auditor will

- Verify the compliance of the submitted drawings with the requirements of the standards.
- Verify the calculation notes.

- In case of availability of a CE type examination certificate for the entire lift, there is no need for such verification since it has been done by the notified body. Nevertheless, the certificate will be considered as another applicable reference.
- Verification of adequacy of the components based on the submitted certificates and characteristics.

Some points are related to the intervention and/or approval of other engineers. Those being:

1. Architects:
the provided dimension and finishing should be approved by the architect; special care shall be taken for closing around the fire rated landing doors.
2. Structural engineers:
if the indicated reaction loads on the pit, on the machine room floor, on the hook(s) and the forces on the rails are within an acceptable level depending on the design.
3. Electrical Engineers:
the required power and point of connection in the machinery space is indicated on the drawings and the electrical engineer should take it into consideration. Also, in some cases, there will be need for the provision of wiring between the lift control panel and the control room.
4. Mechanical Engineers:
the acceptable temperature range and the machine heat emission are stated and should be checked by the mechanical engineer to take the needed action.

D. Phase 3: Final examination and testing

Before putting the lift into service, it shall be subject to examination, tests and verification.

After completion and before the acceptance tests of the installation works, the lift vendor shall provide final documents. Those documents are listed in Annex D: Final Documents

The site verification includes:

- Visual inspection
- Measurement
- Tests and checks
- Verification of availability of information

The purpose is to verify that:

- All the requirements of the applicable codes are met
- All the element stated in the technical dossier has been properly installed
- All the requirements of the Type examination certificates are met.

The main points that will be subject to verification, examination and/or tests are stipulated in Annex E: Examination, Verification and testing.

Annex A: List of standards related to lifts

Reference	Title
NL EN 81-1	Safety rules for the construction and installation of lifts – Part 1: Electric lifts
NL EN 81-2	Safety rules for the construction and installation of lifts – Part 2: Hydraulic lifts
NL EN 81-3	Safety rules for the construction and installation of lifts – Part 3: Electric and Hydraulic service lifts
NL EN 81-20	Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger lifts
NL EN 81-21	Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods - Part 21: New Passenger and goods passenger lifts in existing buildings
NL EN 81-22	Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods - Part 22: Electric lifts with inclined path
NL EN 81-28	Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods - Part 28: Remote alarm on passenger and goods passenger lifts
NL EN 81-31	Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods - Part 31: Accessible goods only lifts
NL EN 81-40	Safety rules for the construction and installation of lifts – Special Lifts for the transport of persons and goods - Part 40: stairlifts and inclined lifting platforms intended for persons with impaired mobility
NL EN 81-41	Safety rules for the construction and installation of lifts – Special Lifts for the transport of persons and goods - Part 41: Vertical lifting platforms intended for use by persons with impaired mobility
NL EN 81-50	Safety rules for the construction and installation of lifts – Examination and tests - Part 50: Design rules, calculations, examinations and tests of lift components
NL EN 81-58	Safety rules for the construction and installation of lifts – Examination and tests - Part 58: Landing doors fire resistance test

Reference	Title
NL EN 81-70	Safety rules for the construction and installation of lifts – Particular applications for passenger and goods passenger lifts - Part 70: Accessibility to lifts for persons including persons with disability
NL EN 81-80	Safety rules for the construction and installation of lifts – Existing lifts Part 80: Rules for the improvement of safety of existing passenger and goods passenger lifts
NL EN 81-82	Safety rules for the construction and installation of lifts – Existing lifts Part 80: Rules for the improvement of the accessibility of existing lifts for persons including persons with disability
NL EN 115-1	Safety of Escalators and moving walks - Part 1: Construction and Installation
NL EN 1808	Safety requirements for suspended access equipment – Design calculations, stability criteria, construction Examinations and tests
NL EN 14010	Safety of machinery — Equipment for power driven parking of motor vehicles — Safety and EMC requirements for design, manufacturing, erection and commissioning stages
NL EN 12159	Builders hoists for persons and materials with vertically guided cage
NL ISO 4190-1	Lift Installation – Part 1: Class I, II, III and VI lifts

Annex B: Lift Specifications Checklist

The following characteristics should be provided to the lift vendor to submit his offer:

Lifts:	References (i.e. A, B, ...)
Applicable Codes	NL EN 81-1 NL EN 81-70
Drive:	i.e. VVVF
Operation:	i.e Collective
Rated Speed:	in m/s (standard: 0.63, 1, 1.6, 2, 2.5,)
Well Dimension:	Width and depth
Well Headroom:	Distance from top FFL to the well ceiling
Pit Depth:	Distance from bottom FFL to the pit floor
Travel:	Distance from lowest FFL to Highest FFL
Stops:	Number of stops
Machinery Space/Room:	MRL (Machine room Less) or Machine above
Car Dimensions:	Clear Width, Depth and Height of the car
Load/Passenger:	xxxkg/N persons
Car Finishes:	
Car and Landing Doors:	type and dimensions
Car Door finishes:	
Landing Doors:	Required Fire rating (According to EN 81-58) if applicable
Additional Features:	Car fan Full door height Safety curtain for the car door All requirements of EN81-1 such as emergency light, intercoms on car top, pit, in car, in machine room and in a permanently attended place Fireman switch (key operated) Fire return connected with the fire alarm system with possibility of alternate floors Emergency Landing Device (to be priced as an optional feature) card access reader facility

Annex C: Technical dossier requirements

The lift vendor should submit to the Employer for approval, within couple of weeks of signing the contract, the technical dossier giving details requested in this document and/or any other employer's needed information. The technical dossier shall comply with Annex C of the applicable lift code (NL EN81-1). The technical dossier shall include the following information:

General

- Names and addresses of the installer, the owner and/or the user
- Address of the installation premises
- Type of equipment – rated load – rated speed – number of passengers
- Travel of the lift, number of landings served
- Mass of the car and counterweight or balancing weight
- Means of access to machinery space and pulley spaces

Plan and Drawings

These plans should contain the necessary particulars to check conformity to the applicable codes and standards, and particularly the following:

- Clearances at the top of the well and the pit
- Any accessible spaces which exist below the well
- Access to the pit
- Guards between lifts if there are more than one lift in the same well
- Provision for holes for fixings
- All bases, plinths, channels, holes, grouting-in of fixings
- Position and principal dimensions of machinery spaces with the layout of the machine and principal devices. Dimensions of the traction sheave or the drum. Ventilation holes. Reaction loads on the building and at the bottom of the pit.
- Access to the machinery spaces
- Position and principal dimensions of the pulley spaces, if any. Position and dimensions of pulleys.
- Position of other devices in the pulley space
- Access to the pulley spaces
- Arrangement and principal dimensions of the landing doors and the distance between landing door sills shall be indicated
- Suitable locations of luminaries for machine room and lift well lighting
- Details of structural steelwork for lift machinery in lift machine room
- Hoisting facilities and access required for delivery of equipment to machine room etc... showing the loading and size of the largest single piece of equipment
- Arrangement and dimensions of inspection doors, inspection traps, and emergency doors
- Dimensions of the car and its entrances
- Distances from the sill and from the car door to the inner surface of the well wall
- Horizontal distance between the closed landing and car doors
- The heat emission of the lift machines

Technical Details

- Principal characteristics of the suspension – safety factor – ropes (number, diameter, composition, breaking load)
- Calculation for the evaluation of the traction
- Calculation of safety factor
- Principal characteristics of the overspeed governor rope: diameter, composition, breaking load, safety factor

- Dimensions and proof calculation of the guide rails, condition and dimensions of the rubbing surfaces (drawn, milled, ground)
- Characteristics of the machine and static load out of balance calculation
- Characteristics of the inverter
- Characteristics of the control panel board

Electric Schematic Diagrams

Outline electric schematic diagrams of:

- The power circuits
- The circuits connected with electric safety devices

These schematic diagrams should be clear and use CENELEC symbols

Verification of conformity

A copy of each relevant type examination certificate shall be provided:

- Locking devices
- Landing doors (i.e. fire test certificate if applicable)
- Safety gear
- Overspeed governors
- Ascending car overspeed protection means
- Buffers
- Safety circuits containing electronic components (if applicable)
- Protection against unintended car movement

Annex D: Final Documents

Register

The basic characteristics of the lift shall be recorded in a register, or file, drawn up at the latest at the time the installation is put into service. This register or file shall comprise:

- A technical section giving:
 - The date the lift was put into service;
 - The basic characteristics of the lift;
 - The characteristics of the ropes and/or chains;
 - The characteristics of those parts for which verification of conformity is required:
 - locking device
 - landing doors (fire test certificate)
 - overspeed governor
 - ascending car overspeed protection means
 - Buffers
 - Safety circuits containing electronic components
 - Ascending over-speed protection means
 - UCM (Unintended Car Movement)
 - The plans of installation in the building;
 - Electric schematic diagrams (using CENELEC symbols); the circuit diagrams may be limited to the circuits for the overall understanding of the safety considerations. The abbreviations used with the symbols shall be explained by means of a nomenclature;
- A section intended to keep duplicate dated copies of examination and inspection reports, with observations.

Operating Manuals

The installer information shall be provided in the form of manuals having the following sections:

- Normal use
- Maintenance
- Examinations and Tests

Annex E: Examination, Verification and testing

During Examination

- Well
- Machine Room
- landing doors
- Car and Counterweight
- suspension elements
- Compensation elements
- protection against free fall elements
- Protection against ascending overspeeding
- Protection against unintended car movement
- Guide Rails
- Buffers
- Final limit switches
- Lift machines
- Electrical Installation
- protection against electric faults
- Controls and priorities

Testing

- Locking devices
- Electric safety devices
- Suspension elements and their attachments
- Braking System
- Measurement of current and speed
- Electric wiring
- Final limit switches
- Checking the traction
- Overspeed governor
- Car Safety Gear
- Counterweight safety gear (if applicable)
- Buffers
- Alarm device
- Ascending car overspeed protection means
- Functional tests of the mechanical device preventing movement of the car (in case of MRL)
- Devices for emergency and tests operations
- stopping and levelling accuracy
- Unintended car movement protection means