

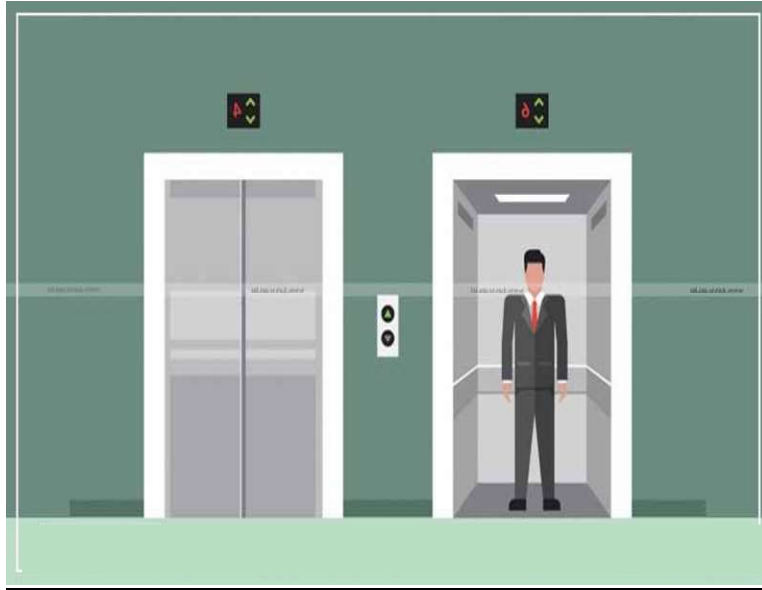


भारतीय मानक ब्यूरो  
BUREAU OF INDIAN STANDARDS

Doc. No.: PRTD/AR/PF:03	Issue No. : 2	Issue Date: 30 Sept. 2020	<b>Report of Action Research</b>
----------------------------	---------------	------------------------------	----------------------------------

1.	<b>Action Research Project No.</b> (as assigned by PRTD)	AR/0029
2.	<b>Title of the Action Research Project</b>	Horizon scanning for quality control: need of strengthening regulations in lifts, escalators and moving walks industry and revision of standards in the area
3.	<b>Name &amp; Designation of Officer</b>	Meghna Mudgal, Scientist-C
4.	<b>Employee No.</b>	67717
5.	<b>Deptt./BO/RO &amp; Place of Posting</b>	ETD, BIS HQ
6.	<b>Date of Approval of the Project</b>	29 May 2020
7.	<b>Objective of the Project</b>	<ol style="list-style-type: none"><li>1. To study the technological advancements in the sector of Lifts, Escalators and Moving walks industry at the international level</li><li>2. To analyze the specifications keeping in view the need of Indian Industry</li><li>3. Horizon scanning for need of strengthening existing state regulations for quality control in the sector</li><li>4. To propose a strategy to undertake the revision of existing Indian Standards in the sector</li></ol>
8.	<b>Report of Action Research Activities</b>	Please see report enclosed.
9.	<b>Conclusion &amp; Recommendations</b>	Please see report enclosed.
10.	<b>Any other relevant information</b>	The project will help in proposing evidence based strategy to undertake revision of existing Indian Standards on Lifts, Escalators and Moving Walks in line with latest technological advancements. Also, exploring the need of strengthening existing state wise quality control implementation for Lifts, Escalators and Moving Walks industry by the state electrical/lift inspectorates.

**Meghna Mudgal**  
**Scientist C, ETD**



**HORIZON SCANNING FOR QUALITY CONTROL-  
STRENGTHENING REGULATIONS IN LIFTS INDUSTRY AND REVISION OF  
STANDARDS IN THE AREA**



**ACTION RESEARCH PROJECT BY**  
**MEGHNA MUDGAL**  
**SCIENTIST C**  
**ELECTROTECHNICAL DEPARTMENT**  
**BUREAU OF INDIAN STANDARDS**

## INDEX

<b>SI No.</b>	<b>Chapters</b>	<b>Page No.</b>
1.	Project Objectives	3
2.	Methodology	4
3.	Introduction to Indian Standards on Lifts and their Implementation	5
4.	Survey and Data Collection for Installation and Testing	6-9
5.	Comparative Study and Analysis of Data	10-19
6.	Recommendations & Conclusion	20-29

**CHAPTER 1**

**PROJECT OBJECTIVES**

- To study the technological advancements in the sector of Lifts, Escalators and Moving walks industry at the international level
- To analyze the specifications keeping in view the need of Indian Industry
- Horizon scanning for strengthening existing state regulations for quality control in the sector
- To undertake the revision of existing Indian Standards in the sector

**CHAPTER 2**  
**METHODOLOGY**

- Literature Survey of International Standards for best practices
  
- Collection and Study of the data of lifts, escalator and moving walks being inspected by state electrical/lift inspectorates in India and data of reported accidents in the installations for existing buildings and new buildings. Understanding the provisions of enforcement in different lift/electrical inspectorates
  
- Collection of data w.r.t check points and measures undertaken during the installation and testing process – Through VC and series of talks
  
- Analysis of data of accidents/failures and their occurrences and to identify the most critical causes of accidents and propose corrective actions in consultation with experts from the industry

### **CHAPTER 3**

#### **INTRODUCTION TO INDIAN STANDARDS ON LIFTS AND THEIR IMPLEMENTATION**

**Abstract:** *The Indian Standards on lifts have been in existence since long. The current series of Lift Standards, namely IS 14665 Part 1 to Part 5 was published in the years 1999 to 2001 replacing the then current standards IS 4666, IS 1860, IS 3534, and other component standards. The Indian Standards on Special lifts e.g. lifts for Persons with Disabilities, Home lifts, and Machine-Room-less lifts, etc. were added subsequently.*

**Introduction:** The vertical transport industry in India has been largely regulated by the Bombay Lift Act-1938 and Bombay Lift Rules-1958 revised from time to time. As of now, there are 10 states and 1 union territory which have enacted their own Lift Act and framed Rules thereunder. In addition, the Bureau of Indian Standards (BIS) has published several Indian Standards on Lifts and Escalators since long ago.

**Implementation:** Typically, the Indian Standards are voluntary in nature. However, some states e.g. Kerala, Tami Nadu, Karnataka, Jharkhand, and Haryana have incorporated clauses in their respective Lift Act and Lift Rules making compliance to the relevant latest Indian Standards on the Lifts and Escalators compulsory. Lifts and Escalators get regulated through the National Building Code of India as well.

The list of Indian Standards currently available on Lifts is given in the **Annex 1**. These standards have been developed over a long period of time.

## CHAPTER 4

### SURVEY AND DATA COLLECTION FOR INSTALLATION AND TESTING

#### **4.1 INTIAL SURVEY**

Survey was initiated with evaluating the current position of Quality Control of Lifts in various states of the country. Out of the 28 states, 11 states have Lift Act/Rules & regulations in place. *The idea was to understand the provisions of enforcement in different lift/electrical inspectorates.*

The existing lift regulations were studied and the present status is given below:

#### States where Lift rules are the **SAME AS INDIAN STANDARDS:**

- Karnataka state Lift & Esc. Rules 2015
- Tamil Nadu Lift rules
- Haryana Lift Rules (Same as IS) + Extra (15 min UPS)
- Kerala Lift and Escalator Rules
- Jharkhand Lift & Escalator Rules 2018

#### States where Lift rules make reference to Indian Standards and have requirements over and above them:

- The Bombay Lift Rules, 1958 (Act revised in 2018 covering all)
- West Bengal Lift Rules, 1958 (Act revised in 2019 covering all)
- Gujarat Lifts and Escalator Rules 2001 (Under Rev. for 2021)
- Delhi Lift Rules (Same as Bombay Lift Rules)
- Himachal Pradesh Lift Rules, 2008
- Assam Lifts and Escalator Rules 2010 (Similar to Gujarat Lifts and Escalator Rules)

*The various check points have been compared with the existing IS and the international best practices and the proposed verification check list is given in Chapter 5.*

## 4.2 DATA REGARDING ACCIDENTS/CAUSE OF ACCIDENTS AND CHECK POINTS

### - FROM ELECTRICAL/LIFT INSPECTORATES

Through telephonic and email communication, information and data from various states was sought and collected w.r.t:

- i. Data of reported accidents in the installations; analysis done reg. cause of accidents, if any
- ii. Check points and measures undertaken during the installation and testing process

States like Maharashtra, Assam, West Bengal, Gujarat, Delhi shared detailed information regarding accidents occurring and their causes based on analysis carried out by them. The same is enclosed as **Annex 2**.

Collection of data w.r.t check points and measures undertaken during the installation and testing process through VC and series of talks helped in understanding the general process of lift quality control in various states of the country.

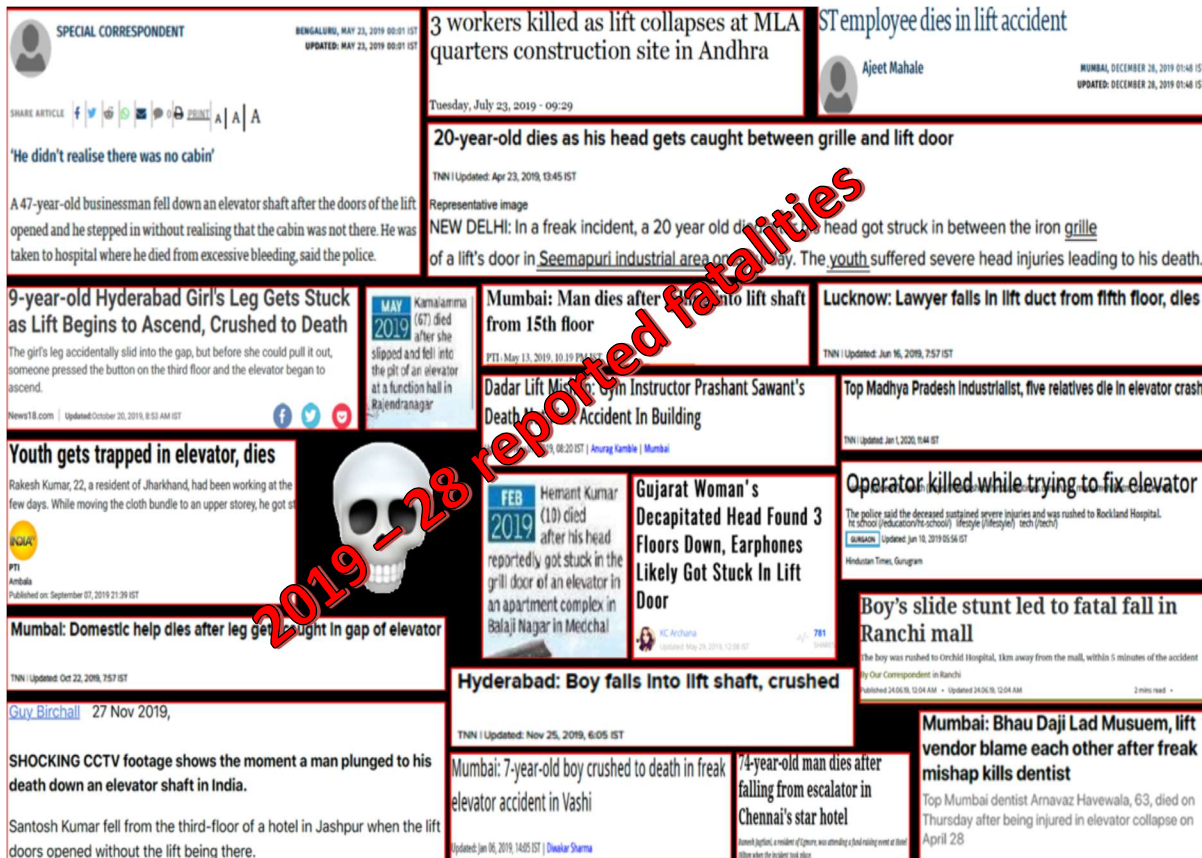
### - FROM INTERNET RESOURCES

Papers/Journals/News articles available on internet have also been examined for information on:

- reported accidents and
  - technological advancements,
- which provided guidance on how the work of quality control and redressal in this area is being carried out in various states of the country.

Some startling figures appear on examination:





In 2020, prior to shutdown, India had witnessed at least 8 fatalities.

During shutdown, at least 8 fatalities were reported. In 2021 as well, accidents related to lifts have been reported due to various reasons.

The reasons have been examined and the same is reflected in Chapter 5.

### 4.3 LITERATURE SURVEY FROM INTERNATIONAL STANDARDS

ISO TC 178 'Lifts, Escalators and Moving Walks' is the technical committee at the international Organization for Standardization with the following scope of work:

*Standardization of all aspects, including safety, of lifts, service lifts, escalators, passenger conveyors and similar apparatus.*

*Excluded: continuous mechanical handling equipment and lifts in mines.*

India is a P member in this ISO committee. BIS Sectional Committee ETD 25 is in liaison with ISO TC 178 'Lifts, Escalators and Moving Walks'

ISO standards ISO 8100-1 : 2019 'Lifts for the transport of persons and goods — Part 1: Safety rules for the construction and installation of passenger and goods passenger lifts' and ISO 8100-2 ' Lifts for the transport of persons and goods — Part 2: Design rules, calculations, examinations and tests of lift components' were studied and compared with the existing Indian Standards for evaluating possible modifications in the existing IS..

Chapter 5 gives the detailed analysis of the comparative study carried out based on above.

#### **4.4 INTERACTION CARRIED OUT WITH INDUSTRY EXPERTS AND CONTRACTING CONSULTANTS**

Interaction with Industry Experts and Contracting Consultants was carried out which further helped in:

- Identification of lift components and relevant test methods for type testing of components
- Inspection manual/Verification check points may be devised based on best practices for safe installation and operation of lifts.

#### **4.5 WEBINARS CONDUCTED**

2 National Webinars were conducted on 'Revision of Indian Standards on Lifts' to obtain valuable feedback from the users and industry on various technical subjects related to the area.

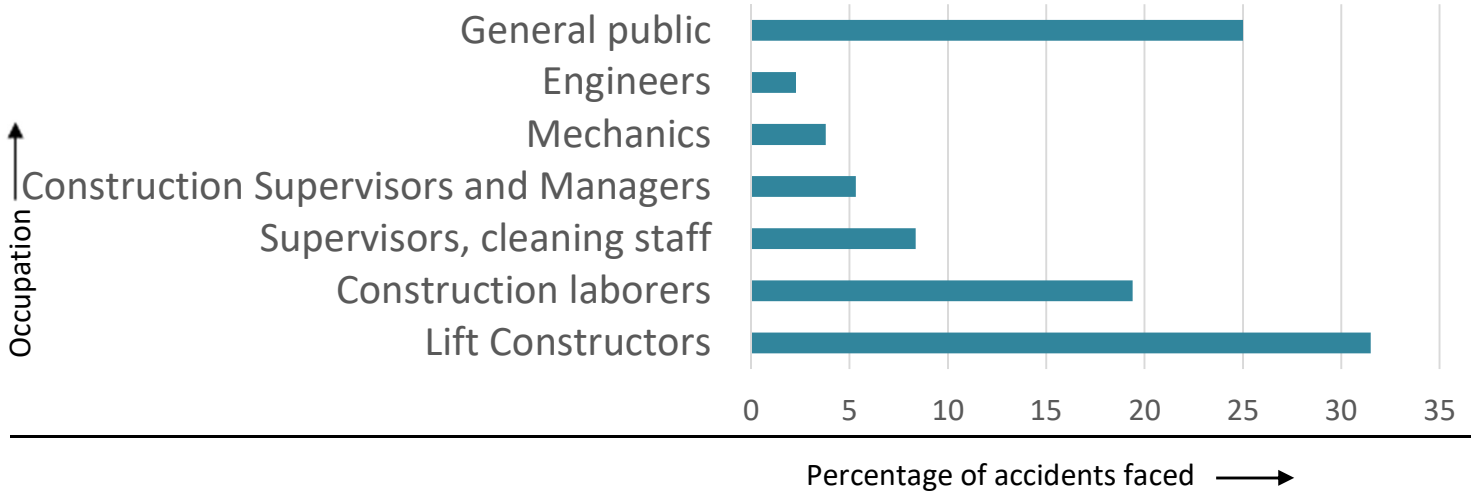
Inputs obtained and comments received were collated and analyzed to propose updations in existing Indian Standards.

**CHAPTER 5**

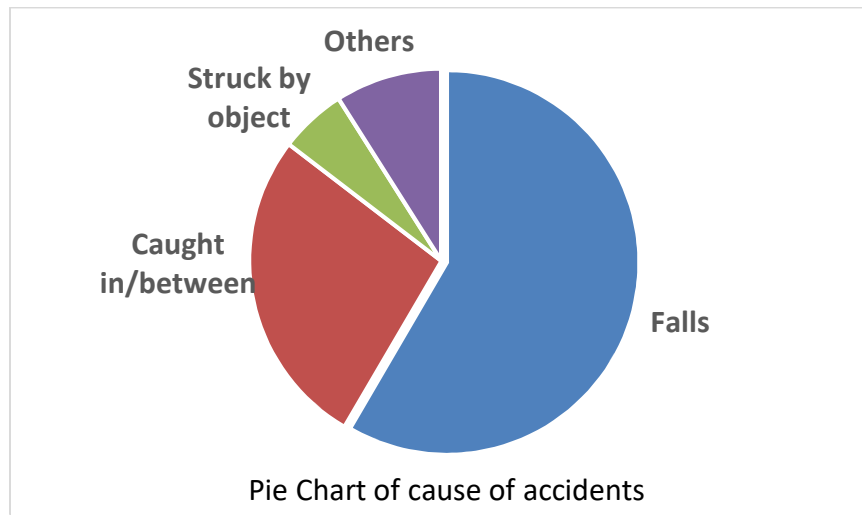
**COMPARITIVE STUDY AND ANALYSIS OF DATA**

**5.1 ACCIDENTS DATA ANALYSIS**

**- OCCUPATION BASED ANALYSIS**

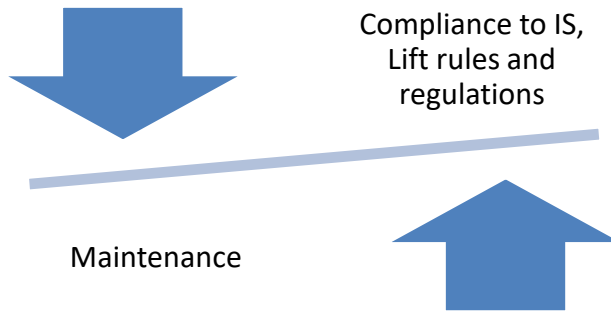


**- CAUSE OF ACCIDENTS**



Detailed analysis shows that in in states where there are no lift act, rules and regulations in place, many accidents occur due to Non-Compliance to IS apart from the above shown reasons.

Further, Maintenance plays a crucial rule as the reports submitted by Electrical Inspectorates (see Annex 2) reflect lack of maintenance being one of the key reasons of lift accidents.



## 5.2 COMPARISON OF ISO STANDARDS VIS-À-VIS EXISTING INDIAN STANDARDS

The study of the ISO 8100-1 and ISO 8100-2 was carried out comparing their provisions viz-a-viz existing IS provisions. There are several new features over and above the existing provisions in Indian Standards that may be proposed in the revision documents which will enhance the safety of the lift passengers, service engineers etc.

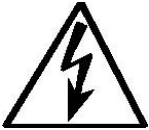
Due consultation with technical industry experts and consultants and based on study of best international practices for improved safety of lifts, the following has emerged:

### COMPARATIVE STUDY FOR PROVISIONS PROVIDED IN ISO 8100-1 VIZ-A-VIZ EXISTING INDIAN STANDARDS

#### a) Safety improvements related to Passengers:

International provisions		Existing Indian Standard's provisions
<p><b>UCM:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Unintended Car Movement with landing door not locked &amp; car door not in closed position</li> <li><input type="checkbox"/> Excluded: failure of suspension ropes, traction sheave, traction.</li> <li><input type="checkbox"/> Not required for lifts without levelling, re-levelling &amp; preliminary operations with</li> </ul>		<p>These are new requirements not covered in existing Indian standards.</p>

doors open.		
<ul style="list-style-type: none"> <li>• <b>Ascending car over speed protection</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Over speed of the ascending car detected &amp; car made to stop or reduce speed to buffer design speed</li> <li><input type="checkbox"/> Over-speed detection can be by speed governor or another device</li> <li><input type="checkbox"/> Stopping element can act on car/c'wt/ropes/traction sheave etc.</li> </ul> </li> <li>• <b>Car door/Landing door- Strength:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> 300 N over 5 sq. cm – Permanent deformation &lt; 1 mm; elastic deformation &lt;= 15 mm</li> <li><input type="checkbox"/> 1000 N over 100 sq. cm – No permanent deformation</li> </ul> </li> <li>• <b>Car door/Landing door-Pendulum shock test:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Soft pendulum for door panel without glass panel (impact force equivalent to a person colliding at running speed)</li> <li><input type="checkbox"/> Soft pendulum &amp; hard pendulum tests for glass panels</li> </ul> </li> </ul>	<p>These are new requirements not covered in existing Indian standards. (Except requirement of: 345 N: without causing permanent deformation)</p>	
<p><b>Landing/Car door lock:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Lock shall resist 1000 N force at the level of lock &amp; 3000 N on the locking pin (hinged door)</li> <li><input type="checkbox"/> 300 N in the opening direction of the door shall not diminish effectiveness of locking</li> <li><input type="checkbox"/> Minimum engagement of locking elements shall be 7 mm.</li> <li><input type="checkbox"/> Emergency unlocking triangle is defined</li> </ul>	<p>These are new requirements not covered in existing Indian standards.</p>	
<p><b>Fire classification for lift car materials:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Flooring, walls, ceiling materials shall not be easy to ignite.</li> <li><input type="checkbox"/> Good flaming droplet properties</li> <li><input type="checkbox"/> Flame retardant</li> </ul>	<p>These are new requirements not covered in existing Indian standards.</p>	
<p><b>Car light:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 20 Lux for 1 hour: Emergency Light</li> <li><input type="checkbox"/> 100 Lux (minimum) in Normal Operation</li> </ul>	<p><b>Car light:</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Car shall be fitted with emergency light</li> <li><input type="checkbox"/> Car shall be fitted with a light</li> <li><input type="checkbox"/> Light shall be ON when lift is in use (exception of auto-door lifts in no call condition)</li> </ul>	

<p><b>Stopping &amp; releveling accuracy</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Stopping accuracy to be <math>\pm 10</math> mm</li> <li><input type="checkbox"/> Releveling accuracy to be <math>\pm 20</math> mm</li> </ul>	<p><b>Stopping &amp; releveling accuracy</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Stopping accuracy to be within <math>\pm 12</math> mm to <math>\pm 75</math> mm depending on drive, speed.</li> <li><input type="checkbox"/> Re-leveling accuracy not specified</li> </ul>
<p><b>Non-contact protection devices</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Monitored non-contact protection devices for all automatic-operation-doors mandatory</li> <li><input type="checkbox"/> If unable to detect persons, must reduce the door impact force or remove lift from service. (4J)</li> </ul>	<p><b>Non-contact protection devices</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Non-contact protection devices for all automatic operation doors is recommended</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Protection against electric shocks:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Protection against electrical shock shall comply with IEC 60364-4-41 and IS 8623.</li> <li><input type="checkbox"/> Additional protection by means of 30 mA RCD <ul style="list-style-type: none"> <li><input type="checkbox"/> Socket outlets</li> <li><input type="checkbox"/> Control circuits for landing controls and indicators and the safety chain having higher voltage than 50 V AC, and</li> <li><input type="checkbox"/> Circuits on the lift car having higher voltage than 50 V AC</li> </ul> </li> <li><input type="checkbox"/> Labelling for electrical hazards.</li> <li><input type="checkbox"/> Protection of motors against overheating shall be provided for each motor</li> </ul> </li> </ul> <div style="text-align: center;">  </div>	<p>These are new requirements not covered in existing Indian standards IS 14665</p>
<ul style="list-style-type: none"> <li>• <b>Landing &amp; Car door bypass device:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Required for maintenance purposes in the control panel or in the emergency and test panel</li> <li><input type="checkbox"/> Only car or landing door contacts can be bypassed at one time</li> <li><input type="checkbox"/> Separate monitoring signal for car door shall prove that car door is closed before movement</li> <li><input type="checkbox"/> Faulty door contact monitoring <ul style="list-style-type: none"> <li><input type="checkbox"/> Correct operation of Car door and Landing door electric safety devices and car door monitoring signal used for bypass function shall be monitored</li> <li><input type="checkbox"/> Short circuits and jumpers shall be detected and normal operation prevented</li> </ul> </li> </ul> </li> </ul>	<p>These are new requirements not covered in existing Indian standards IS 14665</p>

- **Automatic Rescue device (ARD):**

- ❑ ARD now required to function in case power failure of primary power supply (single phase, 2 phase, reverse phase (where required) faults
- ❑ Audio visual warning in the car
- ❑ Low battery monitoring required with audio warning in the car
- ❑ Stopping accuracy of +/- 40mm and door should be openable on emergency landings as well
- ❑ ARD batteries shall be such that minimum three consecutive rescue operations can be performed without recharging for the maximum travel distance between two consecutive served stops (can be 11m max)

These are new requirements not covered in existing Indian standards IS 14665

- **PESSRAL Components:**

- ❑ There are a number of incidents which indeed require an immediate stop of the car:
  - ❑ Over speed at a level which triggers the mechanical safety
  - ❑ Contact with upper or lower final limit switch
  - ❑ Opening of door if the car is passing that particular landing
  - ❑ Activation of emergency stop push buttons e.g. in the pit or the car roof

Existing standard requires that the car cannot start or must stop immediately, if the electric safety chain is interrupted. More than 40 paragraphs require such an immediate stop. Examples of electric safety devices are:

- Upper and lower emergency stopping switch
- Door contacts for closure and locking of car and shaft doors
- Over speed governor switch
- Emergency stop push button in the pit
- Emergency stop push button in the machine room
- Emergency stop push button on the car roof
- Switch monitoring position of moveable stops
- Switch monitoring closure of access doors to the shaft
- Switch monitoring governor rope
- Switch monitoring action of safety device on the car

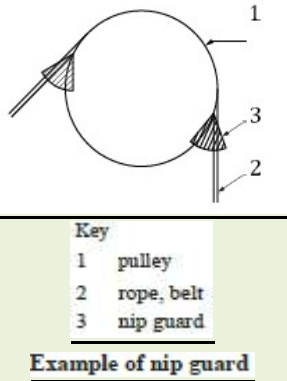




	<ul style="list-style-type: none"> <li>- Switch monitoring full extension of hydraulic buffer</li> <li>- Device monitoring equal tension of lift wires</li> <li>- Device monitoring balancing ropes</li> </ul>
<ul style="list-style-type: none"> <li>• <b>PESSRAL Components:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Programmable electronic systems in safety related applications (PESSRAL)</li> <li><input type="checkbox"/> PESSRAL shall comply with the design rules for relevant safety integrity levels (SIL) as listed in adopted ISO 8100-2:2019, 5.16.</li> <li><input type="checkbox"/> To avoid unsafe modification, measures to prevent unauthorized access to the program code and safety related data of PESSRAL shall be provided, e.g. using EPROM, access code, etc.</li> <li><input type="checkbox"/> If a PESSRAL and a non-safety-related system share the same hardware, the requirements for PESSRAL shall be met.</li> <li><input type="checkbox"/> Check of retardation in case of reduced stroke buffers is now SIL 3 due to greater reduction</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- These are new requirements not covered in existing Indian standards.</li> <li>- IS 17106 -1/2 based on ISO 22201-1/2 can be used.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Hydraulic Lifts:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Whole new set of requirements have been written for Hydraulic lifts which were not mentioned in IS 14671</li> <li><input type="checkbox"/> Emergency Electrical Operation <ul style="list-style-type: none"> <li><input type="checkbox"/> Now required also for hydraulic lift</li> <li><input type="checkbox"/> Maximum speed 0.3m/s</li> <li><input type="checkbox"/> Inspection operation priority over Emergency Electrical Operation more clearly defined</li> </ul> </li> <li><input type="checkbox"/> PESSRAL can be used and shall comply with the design rules for relevant safety integrity levels (SIL) as listed in adopted ISO 8100-2:2019, 5.16.</li> </ul> </li> </ul>	<p>These are many new requirements not covered in existing Indian standards IS 14671 for Hydraulic Lifts.</p>



**b) Safety improvements related to Service Engineers:**

International Provisions		Existing Indian Standards' provisions
<ul style="list-style-type: none"> <li>• <b>Shaft lighting, Car roof lighting:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> 50 lux: 1 meter above the car roof vertically and 1 meter above the pit floor</li> <li><input type="checkbox"/> 20 lux: elsewhere excluding any shadows</li> <li><input type="checkbox"/> 5 lux for 1 hr: emergency lighting on the car roof</li> </ul> </li> <li>• <b>Anti-slip working surface for car roof.</b></li> <li>• <b>Protection for sheaves &amp; pulleys</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Provision of nip guards to prevent introduction of objects between ropes &amp; pulleys.</li> <li><input type="checkbox"/> Provision of guards to protect the rotating parts</li> <li><input type="checkbox"/> Guards to prevent ropes from leaving grooves of pulleys.</li> </ul> </li> </ul>	 <p style="text-align: center;">Key 1 pulley 2 rope, belt 3 nip guard</p> <p style="text-align: center;"><u>Example of nip guard</u></p>	<p>These are new requirements not covered in existing Indian standards (or very minimal requirements).</p>
<ul style="list-style-type: none"> <li>• <b>Access to pit, machine room and control station location</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Pit access door is mandatory</li> <li><input type="checkbox"/> For pits up to 2.5 metre depth, access by ladder is permissible.</li> <li><input type="checkbox"/> If access to pit is from landing door, the door lock shall be reachable from the pit ladder else permanently installed device to enable unlocking is required.</li> <li><input type="checkbox"/> to facilitate inspection or maintenance, a control station with a stop button is mandatory in the pit</li> <li><input type="checkbox"/> an audio signaling device must be located in the pit near the refuge spaces for use in case of entrapment.</li> <li><input type="checkbox"/> A reset function to bring lift in normal operation must be located outside of the lift shaft.</li> </ul> </li> </ul>		<p>These are new requirements not covered in existing Indian standards.</p>
<ul style="list-style-type: none"> <li>• <b>Accessible spaces below lift pit:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Counterweight safety gear is required.</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>• <b>Accessible spaces below lift pit:</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Counterweight</li> </ul> </li> </ul>

- **Car roof balustrades**

- ❑ Distance between balustrade handrail and the shaft wall  $\leq 500$  mm; balustrade height  $\geq 700$  mm
- ❑ Distance between balustrade handrail and the shaft wall  $> 500$  mm; balustrade height  $\geq 1100$  mm
- ❑ toe board to protect against objects falling from the car roof

safety gear is required

OR

- ❑ The solid pier under the buffers extending to solid ground

- **Car roof balustrades**

These are new requirements not covered in existing Indian standards

**Car roof and pit refuge spaces (minimum volume requirements)**

- ❑ Upright position: 0.4 x 0.5 m (horizontal dimensions), 2 m (height)
- ❑ Crouching position: 0.5 x 0.7 m (horizontal dimensions), 1 m (height)
- ❑ Laying position: 0.7 x 1.0 m (horizontal dimensions) 0.5 m (height) for pit only
- ❑ Respective pictogram sign in the pit/car roof readable from the entrance is required.



**Sample Pictogram Upright posture**

**Car roof and pit refuge spaces (minimum requirements)**

- ❑ PIT: 600 mm clearance over 800 mm x 500 mm area.
- ❑ TOP CLEARANCE: 600 mm clearance over car sling

- **Stopping devices in the pit**

- ❑ One stop switch for pit depth  $\leq 1600$  mm
- ❑ Two stop switches for pit depth  $> 1600$  mm
- ❑ One stop switch near pit access door (if applicable)

- **Switch for well lighting**

- ❑ Shall be available in the pit near the access door.
- Release of brake from outside of lift well
  - ❑ It shall be possible to release brake from outside well even under failure of mains supply

- **Stopping devices in the pit**

- ❑ One stop switch is mandatory
- ❑ If two stop switches are required they must be wired in series.

- **Switch for well lighting**

- ❑ Not specified

- **Release of brake from outside of lift well**

- ❑ Not specified

### c) Changes affecting building design

International Provisions	Existing Indian Standards' provisions
<ul style="list-style-type: none"><li><input type="checkbox"/> All glass used in the lift shaft must be laminated.</li><li><input type="checkbox"/> Shaft walls to withstand 1000N</li><li><input type="checkbox"/> Shaft ventilation is the responsibility of the building designer.</li></ul> <p><i>(Lift manufacturer to give information on heat emissions of lift components, permissible maximum temperature in the lift shaft to the builder for facilitating the most energy-efficient solution.)</i></p> <ul style="list-style-type: none"><li><input type="checkbox"/> Fire extinguisher can be located in the shaft</li><li><input type="checkbox"/> Activation of sprinklers is permissible if</li><li><input type="checkbox"/> Lift is stationery at landing</li><li><input type="checkbox"/> Main switches are OFF</li></ul>	<ul style="list-style-type: none"><li><input type="checkbox"/> Glass panels placed at points normally accessible to persons shall be made of laminated glass.</li><li><input type="checkbox"/> Shaft walls to withstand 300N</li><li><input type="checkbox"/> Lift shaft shall have minimum 0.2 sq. m ventilation area under the machine room slab.</li></ul>

### COMPARATIVE STUDY FOR PROVISIONS PROVIDED IN ISO 8100-2 VIZ-A-VIZ EXISTING INDIAN STANDARDS

The adaptation of *ISO 8100-2* will bring-in following two new and important aspects to the lifts / lift components.

**1. Type-Testing mandatory:** The lift safety components will have to be type tested :

Following safety components will need type testing to be done:

- i) Landing and car door locking devices
- ii) Safety gear
- iii) Over speed governor
- iv) Buffers
- v) PESSRAL
- vi) Ascending car overspeed protection means
- vii) Unintended car movement protection means
- viii) Rupture valve/one-way restrictor

**2. Design Calculations:** Important calculations, e.g. machine traction calculations, guide rail calculations, suspension rope safety factor, etc. are elaborated.

Following calculations will be available for use:

- i) Guide rail
- ii) Evaluation of traction
- iii) Evaluation of safety factor on suspension ropes
- iv) Ram, cylinder, rigid pipes, and fittings
- v) Calculations against over pressure
- vi) Calculations of jacks against buckling

In addition, the landing doors have to be subjected to pendulum shock test: hard and soft pendulum/soft pendulum depending on the construction of the doors with/without glass.

## **CHAPTER 6**

### **RECOMMENDATIONS & CONCLUSION**

Based on the study and analysis, the following is recommended in order to ensure safer lift installations in the country

<b>STEP 1</b>	<b>Revision of standards</b>	<b>of</b>	<i>To incorporate safety requirements in existing Indian Standards (namely IS 14665 series (except Part 5), IS 14671, IS 15785) to address:</i> <ul style="list-style-type: none"><li>• <i>Unintended car movement</i></li><li>• <i>Revision of requirements for Car door, landing door, landing/car door locking device, &amp; car wall strength</i></li><li>• <i>Fire classification of lift car materials</i></li><li>• <i>Car emergency lighting</i></li></ul>
<b>STEP 2</b>	<b>Check points and measures to be undertaken during the installation and testing process</b>		<ul style="list-style-type: none"><li>• <i>Component testing for Ropes, CSB, Door Impact test etc.</i></li><li>• <i>Type testing for Overspeed Governor, Safety gear, Landing and Car Locking door devices etc.</i></li><li>• <i>Detailed testing validation checklist to be incorporated in the standards</i></li></ul>
<b>STEP 3</b>	<b>Awareness Creation for Compliance to Standards &amp; Strengthening Regulations</b>	<b>for to &amp;</b>	<ul style="list-style-type: none"><li>• <i>Webinars</i></li><li>• <i>Dissemination of information to State Governments</i></li><li>• <i>Regulation of lift components may be considered.</i></li></ul>

The above steps have been further elaborated below.

#### **REVISION OF THE CORE INDIAN STANDARDS ON LIFTS**

The main aim of revising the existing Indian standards on lifts is to bring them at par with the international standards. The adaptation of ISO 8100-1 and ISO 8100-2 standards is proposed which will result in several advantages such as enhanced safety for the lift passengers and lift service technicians; and possibility of using latest state-of-the-art technology “*Programmable Electronic Systems in Safety Related Application for Lifts*”.

*The listed standards in the Annex 1 except IS 14665 Part 5: Inspection Manual, and IS 15259 - Installation and Maintenance of Home Lifts - Code Of Practice may be revised based on ISO 8100-1: Lifts for the transport of persons and goods — Part 1: Passenger and goods passenger*

lifts; and ISO 8100-2: Lifts for the transport of persons and goods — Part 2: Design rules, calculations, examinations and tests of lift components.

The Indian standard on hydraulic lifts: IS 14671: Code of Practice for Installation and Maintenance of Hydraulic Lifts was published in the year 1999. Since ISO 8100-1 and ISO 8100-2 cover requirements of Hydraulic Lifts, the Indian standard IS 14671 is also proposed to be superseded bringing-in a lot of improvements in the safe operation of the hydraulic lifts as well.

Further IS 15785 on Machine room less elevator may also be superseded as all requirements may be covered as part of the safety standard on lifts proposed above.

### **Changes proposed in the revision documents vis-à-vis the ISO 8100-1 and ISO 8100-2**

Based on inputs received from Indian stakeholders, for ensuring enhanced safety, some changes are also proposed in the ISO documents while adapting them in India **to suit the Indian conditions**; the major ones are listed hereunder:

1. The provision of partitions in case of the lift well containing multiple lifts may be made more stringent aligning it with the existing Indian Standards. The partitions are required for full height of the well irrespective of the distance between moving parts of the lifts; thus ensuring enhanced safety.
2. Safety requirements may be added in the revision document when the machinery is placed inside the well and is to be maintained from a platform positioned in the path of the counterweight or balancing weight. This may be given in addition to that as specified in the *ISO 8100-1* with respect to the platform being in the travel path of the car.
3. Reference to the hinged car doors may be deleted as such doors are not in use in India.
4. Minimum width of the entrance may be specified as 700 mm in the revision document aligning it with *IS 14665*.
5. In case of vertically sliding doors, a safety condition may be added that provision shall be made such that in case of the failure of one suspension means of the panel, the panel shall not fall.
6. Requirements may be enhanced in case additional building doors are to be installed in front of the landing door. Requirements of minimum space between the two sets of the doors, means of communication, and proper ventilation have to be specified in the revision document.
7. The existing condition as per the *IS 14665* that power operated doors shall not be provided with the vision panel may be maintained in the revision document.

8. Requirement for permitting locking only one door panel in case of indirectly mechanically linked panels may be made more stringent by adding the condition that the single locking shall prevent the opening of the other panels notwithstanding breakage of the panel linking member, thus aligning it to the existing Indian Standard *IS 14665*.
9. The standard weight of a person may be retained as 68 kg as per the existing Indian Standard *IS 14665*, as against 75 kg as per the *ISO 8100-1*. The relationships of the maximum permissible car area v/s the rated capacity in kg as well as the minimum required car area v/s the carrying capacity in terms of number of passengers are also maintained as per the existing *IS 14665*.
10. The *ISO 8100-1* permits bigger car area in case of goods passenger lifts hydraulically driven, however the same is not permissible in case of goods passenger lifts with traction drive. Differentiation between the permissible car areas in case of goods lifts on the basis of the drive type may be avoided as per practice followed in India. The revision document must allow bigger car area in case of goods lifts as per the existing *IS 14665*.
11. The *ISO 8100-1* does not treat motor vehicle lifts separately. The revision document may specify the minimum load rating for such lifts as 1.42 KN/sq. m.
12. The emergency light level in the car must be increased from 5 lux as per the *ISO 8100-1*.
13. Specifications for non – metallic filler weights for counterweight may be added aligning it with the *IS 14665*.
14. The *ISO 8100-1* does not recognize alternative elastomeric coated suspension means such as the Coated Steel Belts (CSB). The revision document may permit the CSBs as a suspension means aligning with the existing Indian standard *IS 14665* & *IS 15785*.
15. The *ISO 8100-1* permits 2 rope suspensions. The minimum number of ropes in the case of car suspension is related to the diameter of the rope. Thus, the minimum number of ropes as defined in the existing Indian standard *IS 14665* may be reused while revising the standard i.e. 4 for 8 mm diameter rope and 3 for 10 mm and bigger diameter ropes.
16. Provision of Automatic Rescue Device must be included.
17. In addition to the Final Terminal Switches; Normal Slow Down devices, Normal Terminal Switches as per the existing *IS 14665* must also be specified.
18. Fire protection requirements of the lifts in case of buildings taller than 15 m must be included (aligned with existing IS).

Thus, it may be observed that the revision documents propose to enhance the safety levels beyond that as per the *ISO 8100-1* and *ISO 8100-2* without compromising it anywhere.

**WAY FORWARD FOR STRENGTHENING REGULATIONS IN LIFTS INDUSTRY**

- At present, **only 11 states of 28 states have Lift Acts/rules/regulations.** **Other states** must also formulate and implement similar Acts in their respective states to ensure safe lift installations.
- In order to regulate the lift industry within the country under various States lift acts, the following tests, examinations must be performed and checklist must be verified on site before commissioning Lifts into service:

**a) Examinations and tests before putting into service**

- Braking system
- Electric installation
- Checking of the traction
- Car safety gear
- Counterweight or balancing weight safety gear
- Pawl device
- Buffers
- Rupture valve
- Restrictor/one-way restrictor
- Pressure test
- Ascending car overspeed protection means
- Stopping of the car at landings and levelling accuracy
- Protection against unintended car movement

**b) Components Performance Test**

- Ropes or CSB
- Glass-panels
- Door impact test
  - Pendulum shock test
- Door fire test;

c) For regulation of the lift components, **Type Testing** for the **following components** must be carried out:

Component	Test	Standard reference
Over speed Governor	Type Test	ISO 8100-2 Cl 5.4



Buffer	Type Test	ISO 8100-2 Cl 5.5
Landing and car door locking devices	Type Test	ISO 8100-2 Cl 5.2
Safety Gear	Type Test	ISO 8100-2 Cl 5.3
PESSRAL Component	Type Test	ISO 8100-2 Cl 5.6
Ascending Car Overspeed protection device	Type Test	ISO 8100-2 Cl 5.7
Unintended Car Movement Protection Means	Type Test	ISO 8100-2 Cl 5.8
Rupture valve/One-way restrictor	Type Test	ISO 8100-2 Cl 5.9
Ropes	Component Test	ISO 8100-2 Cl 5.12
CSB	Component Test	ISO 8100-1 Annex H
Glass Panels	Component Test	ISO 8100-2 Cl 5.14.2, 5.14.2.2
Door Impact Test	Component Test	ISO 8100-2 Cl 5.14
Door Fire Test	Component Test	IS 17518 (Part 2)

#### d) Testing Validation

Refer ISO 8100 -1 (Table 8)

Sub-clause	Safety requirements	Visual inspection <sup>a</sup>	Performance check/ test <sup>b</sup>	Measurement <sup>c</sup>	Drawing/calculation <sup>d</sup>	User information <sup>e</sup>
<a href="#">5.1.1</a>	Non-significant hazards	✓				✓
<a href="#">5.1.2</a>	Notices and Labels	✓				✓
<a href="#">5.2</a>	<b>Well, machinery spaces and pulley rooms</b>					
<a href="#">5.2.1</a>	General provisions	✓	✓	✓	✓	✓
<a href="#">5.2.2</a>	Access to well and to machinery spaces and pulley rooms	✓		✓		✓
<a href="#">5.2.3</a>	Access and emergency doors — Access trap doors — Inspection doors	✓		✓		✓
<a href="#">5.2.4</a>	Notices	✓				✓

<a href="#">5.2.5</a>	Well	✓	✓	✓	✓	✓
<a href="#">5.2.6</a>	Machinery spaces and pulley rooms	✓	✓	✓	✓	✓
<b><a href="#">5.3</a></b>	<b>Landing doors and car doors</b>					
<a href="#">5.3.1</a>	General provisions	✓		✓	✓	
<a href="#">5.3.2</a>	Height and width of entrances			✓	✓	
<a href="#">5.3.3</a>	Sills, guides, door suspension	✓			✓	
<a href="#">5.3.4</a>	Horizontal door clearances	✓	✓	✓	✓	✓
<a href="#">5.3.5</a>	Strength of landings and car doors	✓	✓	✓	✓	✓
<a href="#">5.3.6</a>	Protection in relation to door operation	✓	✓	✓	✓	✓
<a href="#">5.3.7</a>	Local landing lighting and “car here” signal lights	✓	✓	✓		✓
<a href="#">5.3.8</a>	Locking and closed landing door check	✓	✓			✓
<a href="#">5.3.9</a>	Locking and emergency unlocking of landing and car doors	✓	✓			✓
<a href="#">5.3.10</a>	Requirements common to devices for proving the locked condition and the closed condition of the landing door		✓			
<a href="#">5.3.11</a>	Sliding landing doors with multiple, mechanically linked panels	✓	✓		✓	
<a href="#">5.3.12</a>	Closing of automatically operated landing doors	✓	✓		✓	✓
<a href="#">5.3.13</a>	Electric safety device for proving the car doors closed	✓	✓			✓
<a href="#">5.3.14</a>	Sliding or folding car doors with multiple, mechanically linked panels	ü	ü		ü	
<a href="#">5.3.15</a>	Opening the car door	ü	ü		ü	
<b><a href="#">5.4</a></b>	<b>Car, counterweight and balancing weight</b>					
<a href="#">5.4.1</a>	Height of car			✓	✓	✓
<a href="#">5.4.2</a>	Available car area, rated load, number of passengers		✓	✓	✓	✓
<a href="#">5.4.3</a>	Walls, floor and roof of the car	✓			✓	

<a href="#">5.4.4</a>	Car door, floor, wall, ceiling and decorative materials	✓			✓	
<a href="#">5.4.5</a>	Apron	✓		✓	✓	
<a href="#">5.4.7</a>	Car roof	✓		✓	✓	
<a href="#">5.4.8</a>	Equipment on top of the car	✓	✓			
<a href="#">5.4.9</a>	Ventilation	✓			✓	
<a href="#">5.4.10</a>	Lighting	✓		✓	✓	✓
<a href="#">5.4.11</a>	Counterweight/balancing weight	✓			✓	
<b>5.5</b>	<b>Suspension means, compensation means and related protection means</b>					
<a href="#">5.5.1</a>	Suspension means	✓		✓	✓	✓
<a href="#">5.5.2</a>	Sheave, pulley, drum and rope diameter ratios, rope terminations	✓		✓	✓	
<a href="#">5.5.3</a>	Rope traction		✓		✓	
<a href="#">5.5.4</a>	Winding up of ropes for positive drive lifts		✓		✓	
<a href="#">5.5.5</a>	Distribution of load between the ropes	✓	✓		✓	
<a href="#">5.5.6</a>	Compensation means		✓		✓	
<a href="#">5.5.7</a>	Protection for sheaves, pulleys	✓			✓	
<a href="#">5.5.8</a>	Traction sheave and pulleys in the well	✓		✓	✓	
<b>5.6</b>	<b>Precautions against free fall, excessive speed, unintended car movement and creeping of the car</b>					
<a href="#">5.6.1</a>	General provisions	✓			✓	✓
<a href="#">5.6.2</a>	Safety gear and its tripping means	✓	✓		✓	✓
<a href="#">5.6.3</a>	Rupture valve	✓	✓		✓	✓
<a href="#">5.6.4</a>	Restrictors	✓	✓	✓	✓	
<a href="#">5.6.5</a>	Pawl device	✓	✓		✓	
<a href="#">5.6.6</a>	Ascending car over-speed protection means	✓	✓	✓	✓	✓
<a href="#">5.6.7</a>	Protection against unintended car movement	✓	✓	✓	✓	✓
<b>5.7</b>	<b>Guide rails</b>					
<a href="#">5.7.1</a>	Guiding of the car, counterweight or balancing weight	✓			✓	✓
<a href="#">5.7.2</a>	Permissible stresses and deflections	✓			✓	
<a href="#">5.7.3</a>	Combination of loads and forces				✓	

<a href="#">5.7.4</a>	Impact factors				✓	
<a href="#">5.8</a>	<b>Buffers</b>					
<a href="#">5.8.1</a>	Car and counterweight buffers	✓	✓	✓	✓	✓
<a href="#">5.8.2</a>	Stroke of car and counterweight buffers	✓	✓		✓	✓
<a href="#">5.9</a>	<b>Lift machinery and associated equipment</b>					
<a href="#">5.9.1</a>	General provision	✓			✓	
<a href="#">5.9.2</a>	Lift machine for traction lifts and positive drive lifts	✓	✓	✓	✓	✓
<a href="#">5.9.3</a>	Lift machine for hydraulic lifts	✓	✓	✓	✓	✓
<a href="#">5.10</a>	<b>Electric installations and appliances</b>					
<a href="#">5.10.1</a>	General provisions	✓	✓	✓	✓	✓
<a href="#">5.10.2</a>	Incoming supply conductor terminations				✓	
<a href="#">5.10.3</a>	Contactors, contactor relays, components of safety circuits	✓	✓		✓	
<a href="#">5.10.4</a>	Protection of electrical equipment	✓	✓		✓	✓
<a href="#">5.10.5</a>	Main switches	✓	✓		✓	✓
<a href="#">5.10.6</a>	Electric wiring	✓			✓	
<a href="#">5.10.7</a>	Lighting and socket outlets	✓	✓		✓	✓
<a href="#">5.10.8</a>	Control of the supply for lighting and socket outlets	✓	✓		✓	✓
<a href="#">5.10.9</a>	Protective earthing		✓		✓	
<a href="#">5.10.10</a>	Electrical identification	✓			✓	✓
<a href="#">5.11</a>	<b>Protection against electric faults; failure analysis; electric safety devices</b>					
<a href="#">5.11.1</a>	Protection against electric faults; failure analysis	✓	✓		✓	✓
<a href="#">5.11.2</a>	Electric safety devices	✓	✓		✓	✓
<a href="#">5.12</a>	<b>Controls — Final limit switches — Priorities</b>					
<a href="#">5.12.1</a>	Control of lift operations	✓	✓	✓	✓	✓
<a href="#">5.12.2</a>	Final limit switches	✓	✓		✓	
<a href="#">5.12.3</a>	Emergency alarm device and intercom system	✓	✓	✓	✓	✓
<a href="#">5.12.4</a>	Priorities and signals	✓	✓	✓	✓	✓

<sup>a</sup> Visual inspection is used to verify the features necessary for the requirement, by visual examination of the components

supplied.

- b A performance check/test verifies that the features provided perform their function in such a way that the requirement is met.
- c Measurement verifies, by the use of instruments, that requirements are met to the specified limits.
- d Drawings/calculations verify that the design characteristics of the components provided meet the requirements.

Verify that the relevant point is dealt with in the instructions handbook or by marking.

### **ADDITIONAL RECOMMENDATIONS FOR BUILDING OWNERS/RWA DURING MAINTENANCE**

- Ensure compliance to NBC
- Use Adequate Lockout/Tagout Procedures
- Treat Elevator Shafts as Confined Spaces
- Ensure Adequate Maintenance and Inspections
- Qualified Personnel for maintenance/repair – ITI trained lift and escalator mechanic or lift manufacturer trained personnel

### **Conclusion**

The above discussed improvements will go a long way in enhancing the safety of persons using lifts and maintaining lifts. The maintenance of the lifts is also very important and keeping lifts in safe working conditions is only possible through a well-planned and executed maintenance programme. However, only a safe-designed and properly installed lift can operate in safe conditions with good maintenance.

**Annex 1**

**Existing Indian Standards on Lifts**

## IS 14665: ELECTRIC TRACTION LIFTS

- PART 1 GUIDELINES FOR OUTLINE DIMENSIONS OF PASSENGER, GOODS, SERVICE AND HOSPITAL LIFTS
- PART 2 CODE OF PRACTICE FOR INSTALLATION, OPERATION AND MAINTENANCE
  - Section 1 Passenger and Goods Lifts
  - Section 2 Service Lifts
- PART 3 SAFETY RULES
  - Section 1 Passenger and Goods Lifts
  - Section 2 Service Lifts
- PART 4 COMPONENTS
  - Section 1 Lift Buffers
  - Section 2 Lift Guide Rails and Guide Shoes
  - Section 3 Lift Car frame, Car, Counterweight and Suspension
  - Section 4 Lift Safety Gears and Governors
  - Section 5 Lift Retiring Cam
  - Section 6 Lift Doors and Locking Devices and Contacts
  - Section 7 Lift Machines and Brakes
  - Section 8 Lift Wire Ropes
  - Section 9 Controller and Operating Devices for Lifts
- PART 5 INSPECTION MANUAL

IS 15785 - INSTALLATION AND MAINTENANCE OF LIFT WITHOUT CONVENTIONAL MACHINE-ROOMS: CODE OF PRACTICE

IS 14671 - CODE OF PRACTICE FOR INSTALLATION AND MAINTENANCE OF HYDRAULIC LIFT

IS 15259 - INSTALLATION AND MAINTENANCE OF HOME LIFTS - CODE OF PRACTICE

[Annex 2](#)

**Accident data report submitted by State Electrical Inspectorates**



Details Of Accidents To Be Provided For Year 2018-19 And 2019-2020 (Unit No.3)							
Year	Sr.No.	Location	Date Of Accident	Fatal / Non-Fatal	Make And AMC	Description Of Building And Elevation	Cause Of Accident
2018-2019	1	Kesari CHSL Kandivali (W)	7/15/2018	Non-Fatal	Make-SUNRISE Ele. AMC-SUNRISE Ele.	06 PASS (G+7)	Lack Of Maintenance
	2	Prestij Industrial Estate Co.Hsg.Premises Soc. Malad (W)	10/15/2018	Non-Fatal	Make-Eros Ele. AMC-Kapadiya Ele.	3.5T (G+2+T)	Lack Of Maintenance
2019-2020	3	Bhumi Arcade Building No.1 CHSL Ashok Nagar,Kandivali (E)	9/25/2019	Non-Fatal	Make-Shindler AMC- Shindler	15 PASS (G+19)	Lack Of Maintenance

Details Of Accidents To Be Provided For Year 2018-19 And 2019-2020 (Unit No.6)							
Year	Sr.No.	Location	Date Of Accident	Fatal / Non-Fatal	Make And AMC	Description Of Building And Elevation	Cause Of Accident
2018-2019	1	Venktesh Jyoti Building, Balaji Complex, 150 Feet Rd, Bhayandar(W)	14.07.2018	Fatal	Make-Schindler AMC-Schindler	12 PASS (G+19)	Negligence Of Safty Measures
	2	Wing D,Dias Residency, Sativali Vasai (E)	05.01.2019	Fatal	Make-Omax AMC-Omax	06 PASS (G+4)	Lack Of Maintenance And Negligence Of Safty Measures
2019-2020	3	Wing A, Dimond CHSL, Kashmirira, MiraRoad (E)	30.06.2019	Non-Fatal	Make-Not Defined AMC- Himalaya	06 PASS (G+7)	Lack Of Maintenance And Negligence Of Safty Measures

**FOR YEAR 2018-19 AND 2019-20 (UNIT NO 5)**

YEAR	SR.NO	LOCATION	DATE OF ACCIDENT	FATAL/NONFATAL	COMPANY	DESCRIPTION OF BLDG. AND ELEVATION	CAUSE OF ACCIDENT
2018-19	1	AARADHYA SIGNATURE, SION ROAD, SION, 400022	16.09.2017	FATAL	CITY	3T (G+5)	INADEQUATE/LACK OF MAINTENANCE AND NEGLECT SAFETY MEASURES
	2	CRYSTAL TOWER, BA RD, PAREL EAST	22.08.2018	FATAL	KONE	8 PASS (G+17)	LIFT USED IN FIRE ACCIDENTS
2019-20	3	DR BHAU DAJI LAD MEUSEAM, BYCULLA	28.04.2019	FATAL	EXPERT EQ.	3 PASS (G+2)	OTHER REASON
	4	CENTRAL GARDEN CONDOMINIUM, CHUNABHATTI, MUMBAI, 400022	13.05.2019	FATAL	SCHINDLER	13 PASS (G+16)	INADEQUATE/LACK OF MAINTENANCE AND NEGLECT SAFETY MEASURES
	5	VIJYA BUILDING NOFRA	21.10.2019	FATAL	SHREE ELEVATOR	8 PASS (G+12)	VIOLATION/NEGLECT SAFETY MEASURES
	6	ST,GEORGE HOSPITAL FORT	27.05.2020	FATAL	VIVEK ELEVATOR	6 PASS (G+2)	INADEQUATE/LACK OF MAINTENANCE AND NEGLECT SAFETY MEASURES

**Details of Lift Accidents of Fatal and Non-fatal for Year 2018-19 and 2019-20**

**Unit No. 9**

Sr No	Place	Accident Date	Fatal /Non Fatal Accideent	Lift Contractor	Building Description	Reason of Accident
1	Akshay Prime, near to Sinhgad College, ambegaon (bu), pune	06.09.2018	Fatal	Petra Elevators and Electricals, Pune	G+5 (6 stops)	On dt. 06.09.2018, morning 8 am at Akshay Prime, near to Sinhgad College, ambegaon (bu), pune, 3 phase power supply to lift Fluctuating. Shree Ravi Haribhau Ranpise and Shree Dyanoba Dinakar Khirit were traveling in same lift, at that time power supply get cut off and lift car got stuck in between 3rd and 4th floor. After that both asked someone from 4th floor to open the lift door using safety iron rod. Shree Dyanoba Dinkar Khirit step down to 3rd floor using chair. But Shree Ravi Haribhau Ranapise refuses to step down through chair and he jumped from lift car to 3rd floor. while doing this, he loses his balance and fall down into lift pit. He got seriously injured and in this way, fatal accident happened.
2	la Crista apartment, C wing, plot no. 9, s no. 62/1, sopanbag, Ghorpadi, Pune	08.09.2018	Fatal	Kone Elevator, Pune	B+P+11 (13 stops)	On dt. 08.09. 2018, stretcher lift at la Crista apartment, C wing, plot no. 9, sopanbag Ghorpadi, Pune, was out of order and lift car was halt at 6th floor. At 6th floor both lift landing door and lift car door were open condition. Nearly 8-9 am, lift car travel from 6th floor to 11th floor, with 6th floor lift landing door remains opened. Shree Paras kalakhati, security guard of that apartment went to see lift landing door at 6th floor, he falls into lift pit and in this way, fatal accident happend.
3	Jora complex, ghorapade peth, Pune	20.10.2018	Fatal	Nil (No AMC)	G+8 (9 stops)	Accidental girl, Nashara, when she was going inside lift by opening lift car door, lift landing door closed due to door closer sensors were not working. Same time lift get upper floor call, but Nashara was not completely inside car. Distance between lift car door and car jamb was more than standard rule, therefore car gate safety completed and lift moves upward to atted upper floor call. Nashara get stucked between lift car platform and landing door top seal and in this way, fatal accident happened.

4	Gress garden, B wing, Nanapeth, Pune	25.02.2018	Non-Fatal	Siscon Elevators Pvt Ltd, Pune	G+8 ( 9 stops)	From Ground floor , Smt. Lata Suhas Salave and other get inside lift car to go upper floor. They press call buttons of 2nd , 6th and 8th floor. Lift traveled smoothly upto 2nd floor. the lifts was supposed to be hault at 2nd floor. But lifts machine break were not operated at lift car travelled to upper floor .As lift was not hault at 2nd floor, error mode was activated in control drive In such situation, drive send lift car to starting floor ( ground floor) to reset lift functions. Again machine break not operated and lift car goes below ground floor level. Ground floor limit switch operates and it cut off the power supply. Lift car suddenly stopped nearly 1 feet below landing level. Because of that sudden jerk, Smt lata Suhas Salave and other get casual injuries and in this way , non fatal accident happened
5	Shree Srushti, A wing, yeolewadi , Pune	13.08.2018	Non-Fatal	Nil (No AMC)	G+11 ( 12 stops)	Car door came out of door seal as no car door gibs provided. When lift was going from 5th floor to downward direction, the portion of car door(without gibs) get stucked into 4th floor landing door frame. Lift speed got disturbed. But power supply was continuous to lift machine , it remains working and therefore main rope get collected at lift car top. By seeing that collected rope, residents misinterpreted as rope is broken.and they called fire brigade. Fire brigade workers opened the 5th floor door and tied lift car to staircase railing using their own rope. And they rescue to two stuck persons from lift car. After rescuing, they released the rope which tied to railing. That empty lift car suddenly went down and collided.
6	Sector R 5, building no. 20, amnora park town, Pune	11.10 2019	Non-Fatal	Thyssenkrupp Elevators (company) Pvt Ltd, Pune	B+G+10 ( 12 stops)	Shree Kishor Bhandare was travelling through lift from 3rd floor to downward. That time lift car door stucked into 1st floor landing door frame and lift stopped. According to Ms. Shruti Bhandare's statement, when lift stucked at 1st floor , security guard pushes lift car door using safety iron rod to rescue them. But lift goes down and collided loudly in pit. while lift going downward , lose main rope found. At that time , overspeed governor not worked and hydraulic buffer not worked after lift car collided in pit. So that Shree Kishor Bhandare got injuries and in this way non-fatal accident happened.



GOVERNMENT OF ASSAM  
INSPECTORATE OF ELECTRICITY  
OFFICE OF THE CHIEF ELECTRICAL INSPECTOR -CUM- ADVISER, ASSAM  
1st FLOOR, WEST END BLOCK : HOUSEFED COMPLEX : DISPUR : GUWAHATI-06.  
ASSAM.

\*\*\*

NO. CEIA/LeEsAR-01/2017/29,

Dated Guwahati, the 14<sup>th</sup> December 2020.

From: Sri A.C. Khataniar,  
Chief Electrical Inspector-cum-Adviser,  
Govt. of Assam.

To Meghna Mudgal,  
Scientist C,  
Member Secretary (ETD 25),  
Electrotechnical Department,  
Bureau of Indian Standards

Subject : Regarding Lift accidents data for standards related purpose-BIS -

Reference: Your email received on 25.11.2020.

Madam,

With reference to the subject cited above, I have the honour to furnish herewith the particulars regarding Lift accidents data for standards related purpose-BIS related to this Inspectorate of Electricity as sought in SI No(i) to SI (iii) vide your email mentioned above.

- (i) One accident was reported to this office related to Lift which occurred on 28.04.2017 at Lift of Samannay Abas Housing Society Apartment (a building older than 10yrs), Japorigog Road, Guwahati-05. Accordingly, an enquiry was conducted from this end in this matter and the Report of Accident prepared thereupon based on the findings/observations is enclosed herewith as Annexure-I. No other accident related to Lift in new building has so far been reported to this office from any corner.
- (ii) Check points and measures undertaken during the inspection and testing process of Lift is enclosed herewith as Annexure-II.
- (iii) Soft copies of Assam Lifts and Escalators Act, 2006 and Assam Lifts and Escalators Rules, 2010 made under the Act are enclosed herewith as Annexure-III & Annexure-IV.

This is for favour of your kind information and needful please.

With regards.

Yours faithfully,

  
(A.C. Khataniar)

Chief Electrical Inspector-cum-Adviser,  
Govt. of Assam.

## Report

The Lift installation in the Samannay Abas Housing Society apartment, Japorigog Road, Guwahati – 781005 under Dispur Police Station under Kamrup Metro District of Assam was inspected by this Inspectorate on 01<sup>st</sup> June, 2017 along with the following officers and persons concerned, in the matter of reported accident that occurred on 28<sup>th</sup> April, 2017 in the passenger lift situated therein:

- (1) Sri P. P. Kathkotia, ACS  
Addl. District Magistrate, Kamrup Metro District
- (2) Sri S. R. Singh, Branch Manager  
ECE Lift Industries.
- (3) Sri Santosh Kumar, ---  
ECE Lift Industries.
- (4) Sri Utpal Kumar Baruah, Sri Debanjan Sengupta & Sri Biren Khataniar, representative of  
the Samannay Abas Housing Society

Sri P. P. Kathkotia, Addl. District Magistrate enquired the matter and taken the written statement from the eye witnesses.

During inspection it was found that the Lift was at sealed condition, as sealed by the Dispur police authority. Therefore, the lift could not be checked and the program was postponed and decided to make joint inspection along with the Police personnel on another date.

Subsequently, as arranged by the Addl. District Magistrate, on 21<sup>st</sup> June 2017 this Inspectorate along with Second Officer Sri Amitabh Sensuwa of Dispur Police Station, the representative of ECE Lift Company Sri S. R. Singh & Santosh Kumar along with the representative of the Samannay Abas Housing Society, carried out inspection of the lift. The Police Officer arranged to remove the seals of the lift landing doors of all the floors.

During physical inspection, it was found that the lift car door and all the lift landing doors at all the floors are collapsible type MS door exhibiting magnetic property. It was found that there is an emergency manual door opening lever situated on top left corner of the lift enclosure at landing side door of every floor and that is easily accessible by persons having height capable to reach the same.

The so unsealed lift landing doors of above mentioned all the floors were tried to be opened one after another, starting from the ground floor and it was found that the door of ground floor could be opened with or without electric power supply and also with or without the lift car in position at ground floor. But, none of the lift landing doors of the rest floors, namely 1<sup>st</sup> floor, 2<sup>nd</sup> floor, 3<sup>rd</sup> floor and 4<sup>th</sup> floor could be opened with or without presence of electric power when the lift car is not positioned in respective floor.



It was also found after above mentioned opening of seals and opening of ground floor lift landing door that the lift car in issue was at resting position in a place in between 1<sup>st</sup> floor and 2<sup>nd</sup> floor and the door opening alarm was working with supplied power.


Further to the above, since the ground floor lift landing door opens with or without electric power and with or without the lift car in position, it was physically tested and found that the lift car immediately stops if the ground floor lift landing door is opened when the lift car was in motion upward or downward in between any floors.

**Findings:**

From the above it is opined that the lift in issue is not in safe condition which is existing there in violation of mandatory provision of Rule 5, 33(1) (a), 33(2) & 33 (8) of the Assam Lifts and Escalators Rules, 2010 made under the Assam Lifts and Escalators Act, 2006.

Had the lift been maintained in safe condition with proper maintenance and in compliance with mandatory safety provisions, the accident would not have occurred.

  
Senior Electrical Inspector  
Govt. of Assam

  
25/6/17  
Deputy Chief Electrical Inspector  
Inspectorate of Electricity  
Govt. of Assam



GOVERNMENT OF WEST BENGAL  
DIRECTORATE OF ELECTRICITY  
11, NETAJI SUBHAS ROAD, KOLKATA – 700 001.

\*\*\*\*\*

Memo No. SS/ 716, Dated, Kolkata, the 02/12/ 2020.

From :: The Jt. Chief Electrical Inspector, West Bengal.

To :: **Meghna Mudgal,**  
**Scientist C,**  
**Member Secretary (ETD 25),**  
**Electrotechnical Department,**  
**Bureau of Indian Standards.**

Sub : Regarding Lift accidents data for standards related  
purpose – Bureau of Indian Standards (BIS).

Dear Madam,

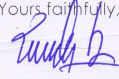
The undersigned would like to state that.

- 1) As per our office record the accidents in the installations for existing buildings (older than 10 years) and new buildings as on dated 01.11.2020 is nil.
- 2) All measures under Lifts & Escalators rules has been considered during installation of Lift.
- 3) Copy of Rules & Regulation on Lifts is attached herewith.

Thanking you and assuring you of our best services all the time.

Encl.: Copy of Lift Rules, 1958.

Yours faithfully,



( S. SARKAR )

Jt. CHIEF ELECTRICAL INSPECTOR  
WEST BENGAL

## **Bibliography**

### **Indian Standards and Technical Papers**

1. Paper published in IEEMA Journal – Revision of the Indian Standards on Passenger and Goods Lifts; Meghna Mudgal, Sc C, BIS, Pravin Tipnis, Abhijit Dandekar
2. National Building Code of India, 2016
3. ISO 8100-1 : 2019 Lifts for the transport of persons and goods — Part 1: Safety rules for the construction and installation of passenger and goods passenger lifts
4. ISO 8100-2 : 2019 Lifts for the transport of persons and goods — Part 2: Design rules, calculations, examinations and tests of lift components
5. IS 14665 Electric Traction lifts
6. IS 15785 Installation and Maintenance of Lift Without Conventional Machine-Rooms: Code of Practice
7. IS 14671 Code of Practice for Installation and Maintenance of Hydraulic Lift

### **National/International Papers, Journals and Training Curriculum**

1. Systems Engineering of Elevators; J. P. Andrew
2. Deaths and Injuries Involving Elevators and Escalators; Michael McCann
3. ITI Curriculum – Craftsmen Training Scheme (NSQF Level 5) – Lift and Escalator Mechanic (Engineering Trade) – Developed by Ministry of Skill Development and Entrepreneurship (Directorate General of Training – Central Staff Training and Research Institute)

### **State Lift Act/Rules/Regulations**

1. The Gujarat and Lifts and Escalators Rules, 2001
2. Lift and Escalators Act 2006, Assam
3. Lift and Escalators Rule 2010 , Assam
4. Inspection and Testing Manual for Lift, Assam
5. Inspection and Testing Manual for Lift, Maharashtra
6. The Bombay Lift Rules, 1958 (Act revised in 2018 covering all)
7. WB LIFT RULES 1958
8. Gujarat Lifts and Escalator Rules 2001 (Under Rev. for 2021)
9. Delhi Lift Rules (Same as Bombay Lift Rules)
10. Himachal Pradesh Lift Rules, 2008
11. Assam Lifts and Escalator Rules 2010 (Similar to Gujarat Lifts and Escalator Rules)
12. Karnataka state Lift & Esc. Rules 2015
13. Tamil Nadu Lift rules
14. Haryana Lift Rules (Same as IS) + Extra (15 min UPS)
15. Kerala Lift and Escalator Rules
16. Jharkhand Lift & Escalator Rules 2018

**Internet resources:**

1. <https://www.elevatoraccident.net/category/location/india/>
2. <https://timesofindia.indiatimes.com/city/mumbai/boy-falls-to-death-in-lift-shaft-in-mumbais-dharavi/articleshow/79470272.cms>
3. <https://timesofindia.indiatimes.com/city/noida/lift-collapses-in-car-service-centre-4-injured/articleshow/83415035.cms>
4. <https://www.tribuneindia.com/news/amritsar/hotel-security-guard-dies-in-freak-mishap-in-ranjit-avenue-165084>
5. <https://timesofindia.indiatimes.com/city/rajkot/two-electrocuted-in-residential-buildings-lift/articleshow/75541432.cms>
6. <https://www.indiatoday.in/india/story/dead-lift-installed-madhya-pradesh-businessman-farm-house-fell-1632979-2020-01-01>
7. <https://mumbaimirror.indiatimes.com/mumbai/other/kohinoor-electronics-director-crushed-under-worli-buildings-lift/articleshow/77967529.cms>
8. <https://connectgujarat.com/serviceman-killed-after-lift-fell-on-him-in-vadodara/>
9. [https://mumbaimirror.indiatimes.com/mumbai/other/mumbai-rains-two-security-guards-killed-in-elevator-accident-at-agripada/articleshow/78274304.cms?utm\\_campaign=andapp&utm\\_medium=referral&utm\\_source=native\\_share\\_tray](https://mumbaimirror.indiatimes.com/mumbai/other/mumbai-rains-two-security-guards-killed-in-elevator-accident-at-agripada/articleshow/78274304.cms?utm_campaign=andapp&utm_medium=referral&utm_source=native_share_tray)
10. <https://www.indiatoday.in/india/story/dead-lift-installed-madhya-pradesh-businessman-farm-house-fell-1632979-2020-01-01>

-----



# भारतीय मानक ब्यूरो BUREAU OF INDIAN STANDARDS

Doc. No. : PRTD/AR/PF:04	Issue No. : 1	Issue Date 28 Apr 2020	DECLARATION OF ORIGINAL WORK
-----------------------------	------------------	---------------------------	------------------------------

## DECLARATION OF ORIGINAL WORK

I, MEGHNA MUDGAL, SCIENTIST C (indicate official's Name & Designation),

Employee No 67717 hereby declare that the Action Research Project titled

"Horizon Scanning for Quality Control - Strengthening Regulations in Lifts Industry and

Revision of Standards in the area

is the original research work done by me. I have not copied from any other Action Research Project or any other work of similar nature and topic done by any person/institution/body either published or yet to be published. Data and information from other sources, used if any, have been with prior permission, wherever required and is duly acknowledged appropriately in the project report submitted by me.

This declaration is made on the 27 day of AUGUST 2021.

*Meghna*  
27/08/2021

Sign. of Officer  
with Date

Note: Joint Declaration should be submitted for Projects undertaken jointly