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**भारतीय मानक मसौदा**

यात्रियों के परिवहन के लिये रोपवे के सभी प्रकार के संचालन और अनुरक्षण — रीति संहिता

(आईएस 17234 का पहला पुनरीक्षण )

**DRAFT Indian Standard****Operation and Maintenance of All Types of Ropeways Intended  
for Transportation of Passengers — Code of Practice**

*(First Revision of IS 17234 )*

ICS 93.110

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Continuous Bulk Conveying, Elevating, Hoisting  
Aerial Ropeways and Related Equipment Sectional  
Committee, MED 06

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Last date for receipt of comments  
is **15 January 2024**

**FOREWORD**

*(Formal clause will be added later)*

An aerial ropeway is a special form of transportation system where passengers/materials are carried on a tensioned wire rope supported above the ground. In ropeways handling passengers, safety, reliability, and conformance to high-quality and good industry practices are paramount for securing the safety of the users. Aerial ropeways are particularly useful in regions where the facility in surmounting natural barriers gives them a great advantage over railways or roads, both of which may need the heavy civil engineering work to secure easy gradient. They are inexpensive to maintain; pollution free; environment friendly; does not affect aesthetics; their power demand is modest; and, they are not seriously affected by adverse climatic conditions.

Nothing in this standard is intended to contravene any provisions of the statutory regulations wherever they are in force.

This standard was first published in 1974.

This revision has been taken up to keep pace with the latest technological developments and practices followed in ropeway industry. This revision incorporates the following major changes:

- a) Schedule for non destructive tests of critical parts is added under **8.3**;
- b) New clause **10** and **Annex E** added for manual rescue;
- c) Editorial corrections have been made.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

**DRAFT Indian Standard**

**OPERATION AND MAINTENANCE OF ALL TYPES OF ROPEWAYS INTENDED  
FOR TRANSPORTATION OF PASSENGERS — CODE OF PRACTICE**

( *First Revision of IS 17234* )

**1 SCOPE**

This Standard covers the Standard Operating Procedure (SOP), safety requirements and maintenance of all types of ropeways intended for transportation of passengers.

**2 TERMINOLOGY**

For the purpose of this standard, the following definitions shall apply.

**2.1 Ropeway**—The system of overhead ropes on which carriers are used for the purpose of carriage of passengers, animals or goods and includes trestles, ropes, carrier, stations, offices, machinery and other works used for the purpose of or in connection with such aerial ropeway.

**2.2 Inspecting Authority** — Any competent authority recognized by the statutory regulations to inspect the aerial ropeways installation and determine its acceptability or otherwise, on the basis of this standard and compliance to prevailing statutory rules and regulations. If required, Competent Authority may hire external agencies like engineering institutions/independent experts for carrying out said inspection.

**2.3 Equipment/Component** — Assembly or Sub-assembly of unit, parts, devices including safety devices, Drive and Tension system that have been incorporated in the Ropeway installation.

**2.4 Operation** — Running of the system for the purpose of transportation of passengers or tests.

**2.5 Operator** — Agency deployed for operation and maintenance of the Ropeway.

**2.6 Servicing** — Actions intended to maintain specified condition of the system and its parts/equipment.

**2.7 Standard Operating Procedure** — Procedure established by the operator or any competent authority to be followed by operating personnel to ensure safe and trouble free operation of the installation.

**2.8 Inspection**—Action intended for assessing the actual condition of the installation or its parts/components as also conformance with the specified performance.

**3 REFUSAL OF RIDES**

### **3.1 Rides may be refused to**

Persons who behave in a way that could endanger his own safety or safety of other passengers or the equipment.

## **4 STANDARD OPERATING PROCEDURE (SOP)**

### **4.1 Safety**

In addition to General safety rules as described in relevant Indian Standards, the following safety measures shall be taken:

- a) Deployment of trained operating personnel;
- b) Availability of simple and clear operating instruction (Manual);
- c) Ensure wearing of proper personal protective (PPE)– Helmet, Safety shoes, gloves, identification badge etc;
- d) Ensure availability of medical facility (First Aid, oxygen cylinder at altitude above 12 000 feet), signage, safety instructions, information or means of communication at various points of use;
- e) Prevent entry and movement of passengers to the areas not designated for public use; and
- f) Ensure availability of safety measures as defined in the Ropeway Standards.

### **4.2 Operating Conditions**

**4.2.1** Passenger transportation service shall take place only when the Ropeway In-charge or the person designated by him is present at the installation.

**4.2.2** Before starting daily operation, a check must be made on the condition of the ropeway as per preset daily checklist including a test run encompassing the following and a record for the same must be kept:

- a) The required minimum clearances from stationary structures are obeyed;
- b) The position of the hauling rope and the rotation of the sheaves/rollers on the trestles are normal and there are no unusual noises/vibrations;
- c) Opening and Closing of the Grips are effective; and
- d) All safety units are active and/or in operating conditions.

**4.2.3** The Ropeway operation for passenger service shall be started only with the agreement of the Upper and Lower station operators and receipt of “All clear” message.

**4.2.4** Whenever a cross-wind makes the cabins sway intolerably, the system operation should be temporarily stopped. Similar action should be taken upon the arrival of a storm, or whenever there is fear for the safety of the installation.

**4.2.5** No operation shall be carried out in complete darkness. If it is required, the stations and the trestles must be adequately illuminated.

**4.2.6** If the system operation is interrupted by safety devices or technical problems, the cause must be eliminated and a check must then be carried out to ensure that functioning is normal.

**4.2.7** If a fault cannot be eliminated within a time acceptable to passengers who find themselves on the route and if it is not possible to set the Ropeway installation in motion, passenger rescue must be proceeded with.

**4.2.8** Rescue operation should be carried out by trained personnel only and with utmost safety.

**4.2.9** Goods may be transported in separate goods cabin only if:

- a) the weight does not exceed 10 percent of the equivalent passenger load;
- b) the space taken by the load is compatible with the clearances;
- c) the load is adequately secured against undue movement; and
- d) the passengers are not unduly inconvenienced by the stops needed for loading and unloading.

**4.2.10** Before leaving a station, the personnel must close the entrances and exits, as well as attach appropriate “NO ENTRY” sign.

### **4.3 Passenger Information**

Information Board containing directives/regulations, Dos and don'ts, tariff plan, opening and closing time etc shall be provided in a clear and simple, mono or bilingual text, clearly readable and displayed in a conspicuous location that passengers can notice before entering into the Plant building. Entry and exit as also forbidden areas shall be marked prominently by appropriate notice/signage.

### **4.4 Duty and Responsibility of Operating Personnel**

#### **4.4.1 Ropeway In-Charge**

During operation, the in-charge or his designated person shall be present at the installation and shall be responsible for:

- a) Total administration of the installation – both technical and commercial;
- b) Operational safety including that of operators and service personnel;
- c) Deployment of operating personnel at respective area and for assigned duty;
- d) Ensure implementation of set instructions and procedure for operation and maintenance including any supplementary instruction;
- e) Training of operating personnel on continual basis;
- f) Plan requirement of spares and ensure their availability as per plan;
- g) Oversee that operational records are properly maintained;

- h) Decide on what measures to take in the case of a breakdown or prolonged stoppage of the installation;
- j) Ensure fixing of proper signage, instruction boards, display etc for the passengers and their maintenance;
- k) Ensure that the installation as a whole and the equipment in particular do not become a source of any kind of pollution beyond the limit permissible by local regulations;
- m) Decide and prominently display a time table on availability of service – Opening and closing time and closing days;
- n) Ensure enforcement of prevailing statutory laws, rules and regulations including labour laws;
- p) Maintaining close liaison with competent authority in the event of any accident, law and order problem, labour unrest, natural calamity etc;
- q) Maintenance, Updation and Safe custody of following documents (as applicable):
  - 1) Installation permit/agreement;
  - 2) land lease/acquisition document;
  - 3) Clearance document from all statutory authority;
  - 4) Acceptance/Fitness certificate;
  - 5) All test and calibration reports;
  - 6) Operation log and event log including accident, if any;
  - 7) Parts drawing/documents;
  - 8) Operation and maintenance Manual and instructions;
  - 9) Maintenance schedule and records;
  - 10) Staff record including competence assessment and improvement;
  - 11) Contact details of nearby Doctors, Ambulance service, Hospitals;
  - 12) Medical care unit, Police, Fire station, Local Administration; and
  - 13) Any other related and important documents.

#### **4.4.2 Operating Personnel**

Operating personal shall carry out the tasks entrusted to them by the ropeway in-charge and shall follow his instructions as under:

- a) Safe operation;
- b) Carrying out the operating checks specified in **5.2.3** and **5.2.4**;
- c) Maintain and update operational log book;
- d) Regulate the admission and transportation of the passengers and loads in accordance with **3** and **4**;
- e) Help passengers, whenever needed, board and alight from cabins quickly and safely; and
- f) Inform the ropeway in-charge as soon as possible if any abnormalities (smoke, sound, vibration etc) is noticed and await instructions. However, in an emergency, they shall take appropriate measures or stop the system.

#### **4.5 Normal Operation**

After the checks stipulated in **4.2.2** are satisfactorily done, passenger transportation shall be started and continued as per scheduled hours of operation provided the operators are stationed at their assigned position and in a state of performing their respective duty as defined in **5.4.1** and **5.4.2**, weather and visibility conditions are good and wind velocity within design limit. During operation, the operating personnel shall keep a continuous careful watch on the correct functioning of the equipment. At the end of operation for the day, they will ensure that there is no passenger on line or at stations and entry is closed.

#### **4.6 Abnormal Operation**

The following may be considered as abnormal conditions:

- a) Heavy rain or snow fall;
- b) High wind or storm that are impending;
- c) Poor visibility;
- d) Failure of Power supply;
- e) Excessive wear in wearable parts that crossed acceptable limit; and
- f) Malfunction of some safety and monitoring devices.

Ropeway operation may be continued in the above condition provided they do not pose any risk to passengers or installation. Otherwise services shall be stopped and passengers on line evacuated. Operation with alternate monitoring devices or manual monitoring permitted.

#### **4.7 Unscheduled Stoppage**

If the Ropeway is stopped unscheduled through manual or automatic energy station or if there is a disruption of service, the reasons shall be investigated by the operators and remedied wherever required. If it is felt that such remedial measures shall take a long time, passengers shall be informed and requested to keep calm. For suspected prolonged stoppage, passengers on line shall be evacuated and operation suspended.

#### **4.8 Checks During Operation**

Ropeway in-charge or any competent operator shall conduct, time to time during operation, a careful inspection of the entire installation whether the Operating condition stipulated in **5.2** or other stipulations contained in this code are met and maintained or any abnormalities occurring. If any violation is noticed, the operation shall be suspended and the fault remedied before resumption of operation.

#### **4.9 Accident**

If an accident happens resulting in injury to passengers, they shall be provided medical attention as fast as possible, either on site or at the nearest care center.

#### **4.10 Fire Prevention**

Each Station shall have minimum measures (dry powder type fire extinguishers, sand basket etc) as per statutory rules prevailing in that area for combating any incidence of fire. The operators shall be trained to use them. The units shall be replaced immediately upon use or expiry of useable date.

## **5 MAINTENANCE**

### **5.1 General**

The following minimum requirements shall generally apply in conformity with the Standards listed in Annex A. A Preventive Maintenance Schedule (PMS) shall be drawn up and kept up to date. It shall take into account the required periodic inspections and maintenance operations set out in **5.2** and **5.3**. A suggestive PMS is provided in Annex B.

- a) A clear and transparent Format for maintaining records including breakdown maintenance shall be prepared and made available to the maintenance personnel for keeping records. Suggestive formats are given in Annex C and Annex D respectively.
- b) The periodic inspections and maintenance operations shall be accordance with the PMS and format which contain the reference values and permissible tolerances, as well as the frequency of replacement for the components.
- c) The specifications and defect acceptance criteria for visual inspections and non-destructive testing shall be indicated in the PMS.
- d) The report on each maintenance operation shall be confirmed by the signature of the person carrying out the work.
- e) Maintenance work carried out on safety components in accordance with schedule mentioned in the maintenance plan shall be inspected by a second person authorized by the ropeway in-charge and the inspection confirmed by that person's signature.
- f) Necessary tools in good working condition shall be available at the installation. Also the weights required for loading the carriers when carrying out braking tests shall be kept ready in a conspicuous place.
- g) The required spare parts, in a good useable condition, shall be properly stored so as to avoid damage/deformation/deterioration in a prominent and designated place in the vicinity of the installation and shall be readily available. For requirement of capital spares like motor, gear box, ropes, control drive, drive and return sheaves, main drive shaft, saddles, brake units etc, Operation & Maintenance (O&M) manual shall be referred.
- h) Lifting equipment, ropes etc, shall be kept in good condition and their permissible load shall be indicated.
- j) The equipment necessary for line maintenance and the protection of workers shall be provided.
- k) The special operations to be carried out on the ropes at regular intervals (for example, the renewal of sockets and the displacement of track ropes or grips), are to be carried out in accordance with applicable standards.

### **5.2 Inspection**

#### **5.2.1 General**



- a) Inspection shall encompass physical measurement, examination and assessment of the actual condition of the installation;
- b) Inspections shall be carried out periodically at daily, weekly, monthly, yearly intervals as per maintenance plan set in **5.1**;
- c) The results of the inspections shall be recorded in writing in a set format as suggested in Annex C and Annex D;
- d) If deviations from the specified condition are found, necessary corrective measures shall be taken immediately and repeat inspection shall be carried out. The installation as a whole and its parts/equipment shall be continuously monitored to ensure safe operation and long life;
- e) Immediately after occurrence of any accident, heavy storm or rain, snowfall and earthquake, the installation shall be inspected thoroughly; and
- f) All measuring/inspection instruments shall be kept calibrated all the time and certificates shall be maintained.

### **5.2.2 Daily Inspections**

Daily inspection of the items shall be carried out as per set plan and findings as also action taken shall be recorded in a format. A suggestive format is given in Annex C.

### **5.2.3 Weekly Inspection**

Weekly inspection of the items shall be carried out as per set plan and findings as also action taken shall be recorded in a format. A suggestive format is given in Annex D.

### **5.2.4 The monthly inspections shall include the following:**

- a) Performance of Coupling/Un coupling devices and conformance of relative position of track rail, rope, hold down, side track etc to the design values;
- b) Performance of the drive unit – main and auxiliary including operation of over speed preventer/monitor;
- c) The external condition, position and fastening of the rollers, sheaves and Tension devices;
- d) Smooth movement of cabins and tow-hangers at entry, exit, inside the station and in the parking;
- e) Performance of the brakes and condition of brake linings/pads. Measurement of stopping distances with empty cabin or tow-hangers and compare with preset value;
- f) The manual operation of onboard brakes, with the installation stationary and the consequential operation of the corresponding switches;
- g) The external condition of the carriers, door fastenings and locks, opening and closing devices, safety bars and tow-hangers;
- h) The electrical safety devices; and
- j) Condition of the trestle mounts, line sheaves, track rope saddles, rope catcher and guard, cabin guides, limit switches

### **5.2.5 Inspection in the Case of Intermittent Operation**

If operation is intermittent, periodic inspections need not be carried out during the period of stoppage, in accordance with the following principles:

- a) If operation is interrupted for a period of more than seven days, resumption of operation shall be preceded by a weekly inspection in accordance with **5.2.3**;
- b) If operation is interrupted for a period of more than 1 month, resumption of operation shall be preceded by a monthly inspection in accordance with **5.2.4**; and
- c) If operation is interrupted for a period of more than 6 months, resumption of operation shall be preceded by an annual inspection in accordance with **5.2.7**.

## **5.2.6 Annual Inspections**

### **5.2.6.1 General condition of the installation by visual examination**

- a) Damage/deterioration of any structures due to the effects of accident and/or abnormal operation, frost, falling stones, snow creep, foundation settlement or similar actions;
- b) Inspection of foundations for any crack, damage, tilting including the state of anchor bolts;
- c) Inspection of ground anchors.

### **5.2.6.2 Ropes**

- a) Electromagnetic test of the ropes in accordance with MRT standard (*under print*); and
- b) Visual check of the rope end fixings; and visual check of the signaling cables, their supports, connections and fastenings.

## **6 CARRIERS AND TOW-HANGERS**

**6.1** Visual check of each carrier or tow-hanger, including suspension, carriage and hanger. At least 20 percent of the grips shall be subjected to visual check in the dismantled condition and recorded with an identification no. so as interval between consecutive checks of each grip does not exceed 1 year. The checks and operating tests of the grips shall be in accordance with the supplier's instructions.

**6.2** All grips are to be tested once a year for resistance to slipping at the minimum required slipping force, except for grips for ski-tows.

## **7 MISCELLANEOUS**

The following visual checks shall be carried out periodically:

- a) fire protection equipment;
- b) first-aid equipment; and
- c) special tools.

## **8 NON-DESTRUCTIVE TEST**

Grips, drive, return/tension shafts, anchor pin and line pedestal shall be submitted to non-destructive tests according to a programme suggested below:

**8.1** All grips annually; and

**8.2** 100 percent of all other item mentioned above at least once a year.

**8.3** For reference, a schedule for non destructive testing for different parts of ropeways is given in table 1.

**Table 1 Proposed Non Destructive Testing Schedule to Enhance Safety**

SI No.	Item list	Visual testing			Ultra Sonic Testing		Magnetic Particle Testing / Dye Penetration Testing	
		Unit	Third Party		Third Party		Third party	
		Daily	Half Yearly	Annually	Half Yearly	Yearly	Half Yearly	Annually
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Cabin Hanger	√	√	√			√	√
ii)	Carriage / Grip / parts	√	√	√	√	√	√	√
iii)	Cabin top bracket	√	√	√			√	√
iv)	Drive sheave shaft			√		√		√
v)	Return sheave shaft			√		√		√
vi)	Tower Pedestal			√		√		√
vii)	Pair/ Quad/ Mount beam spindles			√				√
viii)	Line sheave spindles			√				√
ix)	Tension sheave pin		√	√		√		√
x)	Thimble pin (Tension Rope end)		√	√		√		√
xi)	Haulage Rope	Annual NDT after 2 years of installation						

NOTE—Notwithstanding the tests of the different components as stated above, the drive/return sheave shall be replaced after a certain hours of operation. The hours of operation can be worked out as  $(10 \text{ hours} \times 350 \text{ days} \times 10 \text{ years}) = 35\,000$  working hours.

## 9 REPAIR

**9.1** Any repair work shall be recorded in writing and filed. The person carrying out the work shall certify that he has carried it out in accordance with the applicable requirements and shall immediately inform the ropeway incharge.

**9.2** Before undertaking the repair of any damage, its origin shall be determined and the initial cause shall, whenever possible, be eliminated beforehand; when this cannot be done, appropriate compensatory measures shall be evaluated.

## **10 Manual Rescue Requirements**

For the list of equipment's and other requirements for manual rescue Annex E shall be referred.

The rescue time may be defined by the inspection authority for each ropeway at the time of inspection by carrying out the mock drills. The rescue time shall not be more than 4 to 6 hours.

**Annex A**  
(Clause 5.1)  
**List of Indian Standard**

<i>IS No.</i>	<i>Title</i>
IS 5228 : 2017	Continuous movement monocable ropeways with fixed grips — Code of practice
IS 5229 : 2017	Continuous movement monocable ropeways with automatic grip — Code of practice
IS 7649 : 1975	Glossary of terms used in connection with aerial ropeways and cableways
IS 5230 : 2017	To and Fro (Jig back) movement Bi-cable ropeways — Code of practice
IS 16620 : 2017	Jig back movement monocable ropeways with fixed grips — Code of practice
IS 16623 : 2017	Pulsated movement monocable ropeways with fixed grip — Code of practice

**Annex B**  
(Clause 5.1)  
**Preventive Maintenance Plan and Schedule (PMS)**  
(Suggestive)

<b>PRIVENTIVE MAINTENANCE SCHEDULE — DAILY</b>		
<i>Sl No</i>	<i>Item</i>	<i>Work to be Done</i>
(1)	(2)	(3)
1)	Cabin, hanger and grip	Visual check against any damage, breakage, missing or loosen bolts/nuts, lock pin, cleanliness.
2)	Abnormal sound or vibration	Search to find cause.
3)	Operation of brakes	Visual check against any abnormalities or heating of thrust or, power pack components.
4)	Drive, return sheave bearings, motor bearings	Feel by hand. If felt over-heated, check with thermoster.
5)	Diesel engine	Visual check for oil level, radiator water level, battery water level and terminal condition.
6)	Diesel generator	Visual check for oil level, radiator water level, battery water level and terminal condition. output power voltage
7)	Safety switches at stations and line	Check tightness of bolts as also desired performance.

<b>PRIVENTIVE MAINTENANCE SCHEDULE — WEEKLY</b>		
<i>Sl No.</i>	<i>Item</i>	<i>Work to be Done</i>
i)	Drive sheave liner	Check wear and tear at both stations.
ii)	Return sheave liner	
iii)	Service brake liner	
iv)	Emergency brake liner	
v)	Coupling bolts, bush, chain link	Check condition/tightness in static condition.
vi)	Main motor fixing bolts	
vii)	Rescue motor fixing bolts	
viii)	Cardon shaft fittings	
ix)	Drive/return sheave all joint bolts	
x)	Gear ring and drive sheave connecting bolts	
xi)	Main gear box fixing bolts	

xii)	Rescue engine fixing bolts	
xiii)	Drive bed foundation/fixing bolts	
xiv)	Tensioning hydraulic pack assembly	
xv)	Station all limit switch fixing bolts	
xvi)	Rope in position on drive and return sheave	Adjust if required.
xvii)	Locking/unlocking module	Check relation between rope, rail, side roller track etc and adjust to the limit as specified in manual.
xviii)	Operation of grip testing device	Check tightness of bolts.
xix)	Greasing at tension trolley track	Apply grease, if dry.
xx)	Tyre pressure for Cabin Hauler	Check with the limit specified in the Manual and refill, if necessary.
xxi)	Station structural/monorail fixing bolts	Check condition/tightness in static condition.
xxii)	Guide for cabin movement at station	Check for proper functioning.
xxiii)	Tower foundation and joint bolts	Check condition/tightness in static condition.
xxiv)	Ladder and structural bolts	
xxv)	Line sheave alignment with respect to rope	Adjust, if required.
xxvi)	Lighting arrester fixing	Check condition at line.
xxvii)	Anemometer fittings	
xxviii)	PA system	
xxix)	Condition of earth pits/pouring of water	Visually/Water pouring.
xxx)	Firefighting system	Check condition.
xxxi)	CCTV auto backup working	
xxxii)	All PA speaker at station and line	
xxxiii)	Main Rope including splice zone	Feel by hand throughout the length wearing safety gloves against any wire breakages, kink etc.
xxxiv)	Line signal cable and catenary rope	Check condition and sag.

**PRIVENTIVE MAINTENANCE SCHEDULE – MONTHLY**

<i>Sl No.</i>	<i>Item</i>	<i>Work to be Done</i>
i)	H. Rope lubrication of splice knots	Lubrication

ii)	Check main motor electric connections	Tightness by spanner
iii)	Check earth resistance at main motor	Megger >15 Ohm
iv)	Emergency brake - gap between pad and bull wheel/Disc	Set as per manufacturer's recommendation
v)	Emergency brake, brake linear thickness	Replace as per manufacturer's recommendation
vi)	Service brake - gap between linear and disc	Set as per manufacturer's recommendation
vii)	Service brake linear thickness	Replace as per manufacturer's recommendation
viii)	Emergency braking testing	Braking test with empty cabins, check recorded deceleration curve.
ix)	Service braking testing	
x)	Emergency engine drive test run	Whole cableway
xi)	Emergency electric drive test run	Whole cableway
xii)	Line sheave and its pedestal / bracket	Greasing
xiii)	Line sheave assembly connecting bolts of side plates	Tighten, if required preferably using torque wrench
xiv)	Line sheave linear of rope groove	Check wear whether exceeded permissible limit as specified in the manual. Replace, if required
xv)	Check joint bolts of tower to tower head	Tightness by spanner
xvi)	Drive/PLC panel all internal connections	Check continuity as per circuit
xvii)	Components condition in drive/PLC panel	Visual
xviii)	Cleanliness of drive panel	Visual
xix)	Earth resistance at drive panel	Megger, >5 Ohm
xx)	Components Em. Motor drive panel	Visual/condition
xxi)	Insulation/Earth resistance of tall electrical components — between phases and phase to earth	Check using megger

<b>PERIODICAL MAINTENANCE SCHEDULE - HALF YEARLY</b>		
<i>Sl No.</i>	<i>Item</i>	<i>Work to be Done</i>
i)	Hauling rope clean	Manually
ii)	Main gear box oil	Oil consistency (WDA)
iii)	Main motor cooling fan electrical connection	Proper tightness
iv)	Emergency Engine drive & gear box oil level	Check visually
v)	Emergency Motor drive gearbox oil level	Check visually
vi)	Tension carriage check bolted connection	Tightness by spanner
vii)	Tension carriage wheel bearing	Greasing of bearing eye
viii)	Check Rope clamp force	Use hydraulic tools
ix)	Cabin doors rubber profiles	Visually
x)	Hanger arms check bolted connection	Tightness by spanner
xi)	Check joint bolts of tower head to platform	Tightness by spanner
xii)	Measurement of tuck points in, Splice zone	Manual by tape



NOTE — The above list is suggestive. However, Engineer in charge may modify the same as per the requirement of exact type of ropeway System being maintained.

### Annex C

## Format for Daily Maintenance Record

(Clause 5.1, 5.2.1 & 5.2.2)

DAILY CHECK REPORT					Passenger ropeway										Sr. No.:
Date: _____ Day _____															
Activity & Location	Instrument/Tools	Item/Equipment & Observation			Attended By	Activity & Location	Instrument/Tools	Item/Equipment & Observation						Attended By	
Check all Cabin, Hanger & Grip assembly	Visually / by working	Cabin Door Lock Working				Check tensioning system at Drive Station	Trolley position (Inch) / Pressure Bar/ Visually	From back stopper	No load		Full load				
		Cabin cleaning & all parts fitting						From front stopper	No load		Full load				
		Cabin & H-bracket fitting						Pressure gauge	No load		Full load				
		H-bracket & fitting						Tension Cylinder & Hydraulic pack motor working							
		Cabin Grip assembly condition						<b>ELECTRICAL CHECK</b>							
<b>Temperature in running condition</b>					Main supply (V)	Visual / Existing Meter / Indications	<b>R-Y</b>		<b>Y-B</b>		<b>B-R</b>				
Ambient temp	Non-Contact Thermometer (In °C)	L/Stn		U/Sn			Main motor current	<b>Starting</b>		<b>No load</b>		<b>Full load</b>			
Main Motor		Drive End		Body		Panel healthiness	<b>SSB-1</b>		<b>SSB-2</b>		<b>SSB-3</b>				
Cardan shaft		Motor side		GB side		Ropeway speed	Run speed(m/s)		Crawling Speed(m/s)						
Main gear box		Input		Output		<b>MOTORS</b>			<b>Main</b>	<b>Blower</b>	<b>Rescue</b>	<b>Oil cooler</b>	<b>Hyd. Tn.</b>	<b>Brake</b>	
		Body		Oil		All fixing bolt	Visual / Paint mark								
MGB cooler motor		Body		Pump		Earth connection									
Drive Sheave bearing		Top		Bottom		Cleanliness									
Rtn. Sheave bearing		Top		Bottom		Fixing & Connection		Bull wheel Encoder		Rope Encoder					
Hydraulic Tn. Motor		Body				<b>CABIN RUNNING IN LINE</b>									
Safety brake motor		Body				<b>W1</b>	<b>W2</b>	<b>W3</b>	<b>W4</b>	<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>		
Service brake motor	Body				<b>Y1</b>	<b>Y2</b>	<b>Y3</b>	<b>Y4</b>	<b>G1</b>	<b>G2</b>	<b>G3</b>	<b>G4</b>			
<b>MAIN GEAR BOX</b>					Rescue equipment	Visual / In position	U/Stn		Line		L/Stn				
Check in running Condition	By hearing	Noise/Vibration			QRT		Upper station		Lower Station						
	Visually	Temp. sensor fittings & working			Cumulative Ropeway running Hrs.	<b>For the day</b>					<b>SHEAVE LINER REPLACED IF ANY</b>				
	Visually	Oil Leakage				<b>For the week</b>					<b>Sheave No.</b>				
	Visually	Fdn./Fixing Bolts Paint mark				<b>For the month</b>									
<b>LINE</b>						<b>From 1<sup>st</sup> April</b>									
Wind speed (Kn/Hr.)	Maximum	Tower-6		Tower-7	<b>Remarks:</b>										
Line Sheave liner	Visually	Noise & liner condition													
LPS & Signal cable	Visually	Fixing at tower													
Cable station guide	Visually	L/Stn		U/Stn											
<b>DETAIL OF ROPEWAY RUNNING HOURS</b>													<b>TOTAL</b>	Mark [√] for OK,[X] for defective, readings, initials wherever applicable in <input style="width: 20px; height: 20px; border: 1px solid black;" type="text"/>	

Power supply			PREPARED BY	PI SIGN	UNIT HEAD SIGN
AC Rescue drive					
Diesel engine drive			DATE	TIME	

**Annex D**  
**Format for Monthly Maintenance Record**  
*(Clause 5.1, 5.2.1 & 5.2.3)*

WEEKLY CHECK REPORT		PASSENGER ROPEWAY					Sl. No.....	
Year ..... to .....								
From ..... to .....								
ACTIVITY & LOCATION	INSTRUMENTS/ TOOLS	ITEM	ATTENDED BY	ACTIVITY & LOCATION	INSTRUMENTS / TOOLS	ITEM	ATTENDED BY	
Check wear & tear at Both Station	Visual	<input type="checkbox"/> Drive sheave liner	<input type="text"/>	Check tightness at stations and Line	Spanner / Visual Paint mark	For two tower <input type="checkbox"/> <input type="checkbox"/>	<input type="text"/>	
		<input type="checkbox"/> Return sheave liner	<input type="text"/>			<input type="checkbox"/> Sheave axel, rocker & suspension bolts		<input type="text"/>
		<input type="checkbox"/> Service Brake liner	<input type="text"/>			<input type="checkbox"/> Tower foundation & joint bolts		<input type="text"/>
		<input type="checkbox"/> Emergency Brake liner	<input type="text"/>			<input type="checkbox"/> Ladder and Structural bolts		<input type="text"/>
		<input type="checkbox"/> Chain and Link of chain coupling	<input type="text"/>			<input type="checkbox"/> Break fork mounting bolts		<input type="text"/>
Check condition/ tightness in static condition at Drive station	Spanner / Visual Paint mark	<input type="checkbox"/> Main Motor fittings	<input type="text"/>	Tightness in static condition at Return Stn	Spanner / Visual Paint mark	<input type="checkbox"/> Turn Sheave all joint bolts	<input type="text"/>	
		<input type="checkbox"/> Rescue Motor fittings and triple chain	<input type="text"/>	Check condition	Visual / by operating	<input type="checkbox"/> Station structural bolts	<input type="text"/>	
		<input type="checkbox"/> Cardan shaft fittings	<input type="text"/>			<input type="checkbox"/> Fighting system	<input type="text"/>	
		<input type="checkbox"/> Drive Sheave all joint bells	<input type="text"/>			<input type="checkbox"/> CCTV auto backup working	<input type="text"/>	
		<input type="checkbox"/> Gearing and drive fixing bolts	<input type="text"/>	Check in line/both stations	Visual	<input type="checkbox"/> All PA speaker at station and line	<input type="text"/>	
		<input type="checkbox"/> Main gear box fixing bolts	<input type="text"/>			<input type="checkbox"/> Roker and Line sheave alignment w.r.t. Rope	<input type="text"/>	
		<input type="checkbox"/> Rescue engine fixing bolts & triple chain	<input type="text"/>			<input type="checkbox"/> Rope in position on Drive & Return sheave	<input type="text"/>	
		<input type="checkbox"/> Drive bed foundation / fixing bolts	<input type="text"/>			<input type="checkbox"/> Check tightness of cabin grip bolts	<input type="text"/>	
		<input type="checkbox"/> Brake hydraulic pack assembly fittings	<input type="text"/>			<input type="checkbox"/> Greasing at tension trolley track	<input type="text"/>	
						<input type="checkbox"/> Station all limit switch fixing bolts	<input type="text"/>	

		<input type="checkbox"/> Service brake Assembly Emergency brake assembly <input type="checkbox"/> Tensioning hydraulic pack assembly <input type="checkbox"/> Station structural / monorail fixing bolts	<input type="text"/> <input type="text"/> <input type="text"/>	Check Breakage/ Deformation	Visual	<input type="checkbox"/> Splice Zone of Haulage rope at 0.3mtr./sec. <input type="checkbox"/> Line signal cable & calenary rope	<input type="text"/> <input type="text"/>		
Check condition at line	Visual/ Tightness	<input type="checkbox"/> Lightning arrester Fixing <input type="checkbox"/> Tower communication junction box (Inside) <input type="checkbox"/> Anemometer fittings at Tr.6 & Tr.7 <input type="checkbox"/> Sound horn fittings at Tr.5, Tr.6 & Tr.7	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Check dimension in static condition	Vemier	<b>TUCK POINTS DIMENSION (In mm)</b>			<input type="text"/> <input type="text"/>
				1)		2)	3)		
				4)		5)	6)		
Check at Both stations	Manual	<input type="checkbox"/> Addition of earth pits / pouring of water	<input type="text"/>			Many Point dimension (In mm)		<input type="text"/>	
	Spanner / Visual Paint mark	<input type="checkbox"/> Stop & guide for cabin movement at Slaton <input type="checkbox"/> Cabin lock-unlocking guide fixing bolts	<input type="text"/> <input type="text"/>			Normal dimension (In mm)		<input type="text"/>	

**ANNEX E***(Clause 10)***MANUAL RESCUE OPERATION****H-1 MANUAL RESCUE SYSTEM**

In case, the operation of ropeway is not possible using main drive or emergency drive (Rescue engine emergency drive and AC rescue emergency drive) due to any reason, Ropeway in-charge will decide and pass necessary instructions for the manual rescue of the passengers.

**H-2 RESCUE TEAMS**

- a) Depending of terrain and ropeway span, rescue plan should be developed at the time of first commercial start of a ropeway to minimize the rescue time;
- b) Multiple teams keeping in view the ropeway requirement should be constituted;
- c) Regular training should be conducted for existing and new employees;
- d) Teams/team members should be assigned responsibilities based on their skills and trainings; and
- e) Rescue plan should be updated regularly based on new advancements.

**H-3 RESCUE EQUIPMENT**

- a) Sufficient rescue equipment should be available in ropeway for conducting rescue in time and safely;
- b) Rescue equipment should be inspected regularly to ascertain healthiness of the equipment;
- c) Depending on terrain and vertical distance, three options (as under) should be finalized for rescuer to enter in the cabin;
  - 1) Rescue Carriage.
  - 2) Aluminum Ladder (for lesser vertical distances).
  - 3) Rope Ladder (for lesser vertical distances).

**H-4 Other rescue equipment required:**

- |   |        |
|---|--------|
| a) Rescue carriage  | 1 No.  |
| b) Rescuer chair  | 1 No.  |
| c) Rescue chair/harness (for rescuer) as per convenience of customers.(for passenger) | 1 No.  |
| d) Grip descender   | 1 No.  |
| e) One sheave pulley (closed hook 0.5T)   | 1 No.  |
| f) D-Shackle  | 1 No.  |
| g) Safety belt  | 3 Nos. |

h)	8 mm diameter nylon rope	1 Roll (50 m)
j)	16 mm diameter nylon rope/Kernmantle rope	2 Rolls (length as per terrain)
k)	Helmet	3 Nos.
m)	Stretcher	1 No.
n)	Rope ladder	1 No.
p)	Emergency light	1 No.

NOTES

<sup>1</sup> The above equipment have been listed for one rescue team.

<sup>2</sup> Number of equipment should be decided based on number of teams.

### **H-5 RESCUE ROOM/STORAGE**

- a) Sufficient rescue rooms/storages should be provided at lower terminal, upper terminal and at various locations along ropeway line for easy accessibility; and
- b) All rescue equipment should be made available at these locations.

### **H-6 CONDITION MONITORING**

Regular condition monitoring of all equipment should be carried out by skilled manpower to ascertain health of the equipment's.

### **H-7 Manpower Required**

- a) Sufficient trained teams/persons should be deployed to perform the rescue operation;
- b) The person, who may be engaged to rescue the passengers by chair type rescue system, must be familiar and well trained on the system; and
- c) The name, requirement, procedure and location of every item, which is in use in this system, should be known to every member of the rescue team.

### **H-8 MOCK DRILLS**

- a) Monthly manual mock drill should be conducted in different spans; and
- b) Annual mass manual rescue should be conducted to assess the preparedness of system and team.

### **H-9 OTHER REQUIREMENT**

- a) Emergency contact numbers should be displayed inside cabin;
- b) Ropeway line should always be kept clean for conducting manual rescue;
- c) After de-boarding rescued passengers should be taken to a safe location;
- d) Rescued passengers should be given first aid, if required; and

- e) Local administration should be informed after declaring the manual rescue.

NOTE— withstanding all the above points, any directives from the National Disaster Management Authority (NDMA) that may be relevant to ropeways are to be implemented as and when such directives are issued.

(MED 06)