

Maintenance Manual for Elevator Hoisting Rope

1. Introduction

This manual describes the maintenance of main ropes of elevators.

Elevators need to be inspected and maintained periodically by competent maintenance persons.

If elevators are used without proper maintenance, they may not be able to deliver the performance that we expect. The components specified in this manual are particularly critical for safety of users and maintenance persons. Therefore, please plan for proper maintenance in accordance with this manual.

For maintenance of Mitsubishi Electric elevators, we recommend that you sign a maintenance contract with our official distributor. To contact our official distributor, please visit our website below.

<http://www.mitsubishielectric.com/elevator/network/index.html>

This manual specifies important points which require special attention in basic maintenance. The owner of the installation and operation manager shall request the maintenance organization to be sure to include those points in maintenance.

This manual is applicable only to the region (Region and Locale) and the product (Elevator) selected when you downloaded this manual from our website.

Do not use this manual for other regions and products.

2. Maintenance of main ropes of elevators

The main ropes of elevators are critical components, as they deteriorate over time. Since deterioration speed differs depending on the frequency and environment of use of elevator, it is necessary to carry out maintenance to keep them in good condition at all times.

The owner of the installation and operation manager shall have the competent maintenance persons maintain the elevators.

3. General precaution

This manual summarizes important maintenance information for competent maintenance persons who carry out basic elevator maintenance. The competent maintenance persons shall understand and observe the instructions thoroughly.

3.1 Safety symbols

Safety symbols below represent the degree of hazard that would arise should the provided instructions be neglected. The definitions of the symbols are as follows.

(1) Definitions of danger, warning and caution symbols

Symbol	Description
 Danger	Indicates an imminently hazardous situation which, if it is not observed, will result in death or serious injury.
 Warning	Indicates a potentially hazardous situation which, if it is not observed, could result in death or serious injury.
 Caution	Indicates a potentially hazardous situation which, if it is not observed, may result in injury or damage to the elevator equipment.

(2) Definitions of precaution symbols

Symbol	Description
	Indicates a mandatory action.
	Indicates a prohibited action.
	Warns of electricity. (This symbol reminds workers to take care to avoid coming into contact with electricity.)

3.2. Precautions after inspection and maintenance

(1) Fault

If any fault has been found during inspection and/or maintenance, take appropriate measures immediately.

- 1) Take the elevator out of service until the fault is repaired. Report the state to the operation manager.
- 2) Record the detail of fault, replacement and repair in the Work Log, and maintain it permanently.
- 3) If any abnormality has been found during inspection and replacement, or repair or adjustment by Mitsubishi Electric Corporation is required, please contact our official distributor.

 Caution	<ul style="list-style-type: none"> Make sure to close the doors of the elevator taken out of service. Use the Mitsubishi Electric's genuine parts for replacement. If there is any problem with the product, contact our official distributor.
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(2) Restoration

- 1) Restore screws loosened, covers removed, etc. for inspection or maintenance to the original state.
- 2) If no abnormality has been found during inspection and/or maintenance, confirm the safety and restore the elevator to the automatic (normal) operation.

 Caution	<ul style="list-style-type: none"> Before resuming automatic (normal) operation, check that there is no problem with elevator operation by first running the car manually, then stopping the car at every floor in automatic (normal) operation, and running the car from the top to the bottom floor in automatic (normal) operation at the end.
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3.3. Latest maintenance information

For supply of parts, contact our official distributor.

Please note however that parts supply may not be possible when the product is too old or is used in poor condition. In that case, we recommend modernization of the product.

 Caution	 This manual may be subject to change without notice. Before starting maintenance, visit the URL below to check the latest manual. http://www.mitsubishielectric.com/elevator/maintenance/index.html
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4. Maintenance instructions

The frequency of the following maintenance must be determined in accordance with the operation conditions, such as the frequency of use and environment of installation, and the maintenance must be carried out regularly.

 Warning	 The items below must be checked regularly, at least once a year.
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(1) Check items

- 1) There shall be no abnormality such as breakage, wear and rust in the entire ropes.
- 2) There shall be no change in the installation condition or any other abnormality such as deterioration of double nut and split pin at rope end.
- 3) All hoisting ropes shall have almost equal tension.
- 4) The runby (space between the bottom of the counterweight and the buffer) is within the range specified in the nameplate.

(2) Standard of rope wear and replacement

Check that the ropes are in good condition in accordance with the replacement criteria below.

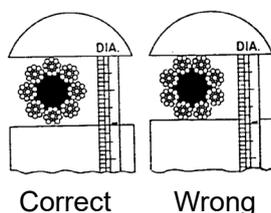
 Warning	 The rope must be replaced in any of the following cases a) to g).
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Replacement criteria

- a) The rope diameter is 94% or less of the nominal diameter.

Measure the rope diameter, referring to the figures below.

*Check the diameter of ropes in use with the nameplate.



b) The number of broken wires per rope pitch is equal to or greater than the values shown in the table below.

Type of broken wire	Description	Number of broken wires	
		8 strands	6 strands
Distributed breaks	The broken wires are evenly distributed among the strands.	30	24
Concentrated breaks	The broken wires are concentrated in one or two strands.	10*1	8*1

*1: Check the area where broken wires are concentrated.

- c) Four or more adjacent wires per pitch in a strand side are broken.
- d) There is one or more valley breaks on a wire.
- e) A large amount of rust is visible.
- f) A large amount of wear debris is visible.
- g) A certain area is deteriorated or damaged.

(3) Maintenance method

1) Cleaning and lubrication

- a) Wipe off dirt and dust adhering to the hoisting ropes with a cloth moistened with designated oil.
- b) Check that the hoisting ropes are moistened with oil properly (not to be too wet) by wiping the rope surface with a cloth. If the oil does not adhere to the cloth, apply designated oil.

List of applicable oil

Rope	Designation	Product name (manufacturer)
General rope	Mitsubishi elevator oil No. 6	Wirol R-M (Tokyo Rope Manufacturing)
High-traction rope	Mitsubishi elevator oil No. 16	High Traction Oil MD-2L (Tokyo Rope Manufacturing)

 Warning	<p> Do not use unspecified oil to prevent any fault such as landing error by traction shortage.</p> <p> Normally, lubrication is not required; however, it may be necessary for elevators installed in special environment. (For example, temperature and/or humidity in the hoistway gets very high, and the elevator is exposed to a lot of dust.)</p>
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2) Check of wear on hoisting ropes

- a) Check that there is no abnormality, such as scratch, wire breakage, wear and rust, on the hoisting ropes. Note that the more a rope passes sheaves, the faster wear progresses; check carefully especially when there are a number of sheaves.
- b) If a valley (between strands) of hoisting rope is in rust, the inside of the rope may be damaged. Check the progress of the rust and change in the rope diameter periodically, and determine the date of replacement accordingly.
- c) Check the ropes in accordance with the replacement criteria in (2), and replace the ropes, if necessary.
- d) If the elevator has only two service floors or stops at certain floors more often than others, the rope is apt to wear rapidly. Check the progress of wear periodically, and determine the date of replacement in accordance with the start frequency of the elevator.
- e) If temperature in the hoistway gets high by direct sunlight, humidity is high or a rope gets wet by heavy rain, the rope is apt to wear rapidly. Check the progress of wear periodically, and determine the date of replacement accordingly.

3) Check of hoisting rope ends

- a) Check that there is no damage, such as crack and deformation, on the fasteners and brackets.

If babbitt metal is used on the rope ends, check that there is no damage, such as crack and deformation, on the babbitted portions. Also, check that there is no rope-oil leakage from the babbitted portion. If there is any abnormality, stop using the elevator immediately, replace the parts and restore the elevator.

- b) Make sure that tension applied on all ropes is equal by checking the spring elasticity.

If different tension is applied on each rope, adjust the tension with the screw rod at the rope end.

4) Check of distance between counterweight and buffer

Check that the distance between the counterweight and the buffer, while the car is parking at the top floor, meets the condition indicated on the plate at the bottom of the counterweight.

 Caution	 Soon after rope replacement, the new rope elongates faster (initial elongation) than the old rope. Therefore, increase the inspection frequency accordingly after rope replacement.
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If the runby is out of the specified range, adjust it with the spacers installed under the counterweight.

*If the runby cannot be adjusted by the spacers, the hoisting ropes need to be cut or replaced.

*Keep the removed spacers. They are required to restore the hoisting ropes in original condition after the ropes have been cut or replaced.

*If fine adjustment is required, use the screw rod at the rope end.

5) Cut or replacement of hoisting ropes

If the hoisting ropes need to be cut or replaced as a result of the above check, observe the following instructions.

- a) Before removing the hoisting ropes, hold the car and counterweight firmly with heavy-duty clamps, chain blocks, etc., and make thorough preparation including check of the strength of the holding structures and the passage for bringing in and out new and old ropes.
- b) Be careful not to kink or twist the ropes when drawing or cutting the ropes.
- c) If using babbitt metal to fasten the rope ends, remove the fiber core from the rope and bend the strands, and make sure that the babbitt metal is heated at an appropriate temperature before pouring babbitt metal into the socket.

 Warning	 Replace all hoisting ropes at a time.  Make sure to replace the hoisting ropes with appropriate ones by checking applicable ropes specified in the nameplate, etc.
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 Caution	 If an elevator is equipped with a load weighing device at rope end, the data in the control panel must be reset after the hoisting rope is cut for adjustment or replaced. Contact our official distributor to reset the data in the control panel.
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