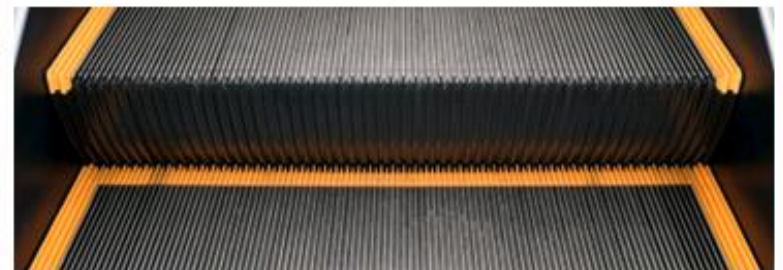


Instructor/Participant Guide



209: Escalator-Specific: Electrical Systems

Module 5: Escalator Drive Motors



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None

PREVIEW ONLY



Icons Used in This Guide

Throughout the Instructor's Guide, the following icons indicate the type of content presented.



Refer To



PowerPoint



Multimedia



**Web based
Training**



Write



Ask



Individual Activity



**Small Group
Activity**



**Classroom
Activity**



Duration

Agenda

Topic No.	Topic Title	Duration
1	Introduction	5 minutes
2	Safety Precautions	20 minutes
3	Escalator Drive Motors	20 minutes
4	Servicing Drive Motors	20 minutes
5	Motor Overload Protection	15 minutes
6	Motor Removal & Replacement	15 minutes
7	Summary	5 minutes
Total Time:		1.5 hours



Overview

Purpose

The purpose of this module is to:

- Provide the participant with a basic knowledge of the operation, testing, and applicable maintenance procedures related to transit escalator drive motors.

Objectives

At the end of this chapter, the learner will be able to:

- Identify the types of motors associated with each type of escalator system
- Describe the types of overload protection and their method of operation
- List and describe the different types of motor faults, which may occur
- Test and verify load current specifications on a drive motor
- Identify and trace the wiring configuration for a drive motor
- Trace the electrical system pathways of a drive system using a schematic diagram

Materials

Make sure you have the following:

- Laptop (one for leader)
- Participant Guides
- PowerPoint slide deck
- LCD projector

- A17.1 Safety Code for Elevators and Escalators
- A17.2 Guide for Inspection of Elevators, Escalators and Moving Sidewalks
- A17.3 Safety Code for Existing Elevators and Escalators
- Heavy Duty Transportation System Elevator Design Guidelines (APTA RT-RP-FS 008-03)
- Heavy Duty Transportation System Escalator Design Guidelines (APTA RT-RP-FS 007-02)
- Field Employees' Safety Handbook
- Transit Agency Handbook

Preparation

PREPARE flip charts with the following title:

- Class Expectations



Instructor's Notes

Escalator Drive Motors

Escalator Drive Motors



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Slide 1

GAIN audience attention by introducing yourself.



WELCOME the participants to the Escalator Drive Motors Module.



ASK the participants to describe the types of drive motors.

DIRECT participants to the objectives on slide 2.



REVIEW the objectives on slide 2.

Escalator Drive Motors

Outline

- Identify the types of motors associated with each type of escalator system.
- Describe the types of overload protection and their method of operation.
- List and describe the different types of motor faults that may occur.
- Test and verify load current specifications on a drive motor.
- Identify and trace the wiring configuration for a drive motor.
- Trace the electrical system pathways of a drive system using a schematic diagram.

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Slide 2

Introduction

Welcome to the Escalator Specific: Escalator Drive Motors Module.

List the types of drive motors.



Instructor's Notes

Escalator Drive Motors

Commencement of Work

- Before starting to work on a unit, a **Job Hazard Analysis** should be performed by the person(s) assigned to work on the escalator.
- Once a floor cover has been removed or hinged and before entering the pit, the maintenance operating panel should be connected.
- Always turn off and lock the main disconnect switch in the machine room when carrying out maintenance work inside the step band.

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Escalator Drive Motors

Completion of Work

- Remove all tools, maintenance signage, accessories, and safety devices from the site in a safe manner to ensure no danger arises.
- Notify the appropriate agency personnel of the completion per transit agency policy.
- Complete all required maintenance documentation in accordance with applicable transit agency procedures.

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Slide 4

Slide 5



REVIEW slides 4 and 5 and discuss the procedures for commencement and completion of work.

APPLICATION FEEDBACK: Now that we have discussed a little about general safety procedures, have the participants answer the following questions.



ASK participants to describe a job hazard analysis.

Commencement/Completion of Work

What is a job hazard analysis?

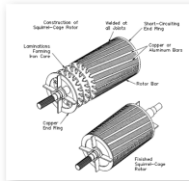


Instructor's Notes

Escalator Drive Motors

Induction Motors

- Robust and have no brushes.
- Speed can be controlled with a variable frequency drive.



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Slide 8



REVIEW slide 8 and discuss the details of an induction motor.

CONTENT: Direct participants to describe in their own words the purpose of escalator drive motors.

APPLICATION FEEDBACK: Now that we have discussed a little about escalator drive motors, have the participants answer the following questions.



ASK: How are induction motors controlled?

Induction Motors

How are induction motors controlled?



Instructor's Notes

Escalator Drive Motors

Motor Cleaning and Lubrication

- Follow the recommended lubrication schedule for each particular motor.
- Check published PMI schedules for the equipment.
- Do not lubricate more often than recommended and do not over lubricate.
- Thoroughly clean the motor housing of oil, dirt, and dust.
- Never use compressed air to blow dirt from the motor housing or the end bearings of the motor.
- Remember when working around electric motors to listen and observe.

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Slide 9



REVIEW slide 9 and discuss proper motor cleaning and lubrication procedures.



ASK participants to describe proper motor cleaning procedures.

Motor Cleaning and Lubrication

Describe the proper motor cleaning procedures.



Instructor's Notes

Escalator Drive Motors

Testing and Inspecting Motors

Routine measurements:

- Perform insulation breakdown tests on all wires to the motor.
- Record frame and bearing temperatures.
- Record current readings on each phase of the motor when operating under normal load.
- Record voltage readings on each phase when operating under normal load.
- Record the nameplate information on the motor (serial number, model number, horsepower, location and usage).

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Slide 10

Escalator Drive Motors

Testing and Inspecting Motors

- Frame temperature of a motor is also an important record to maintain.
- It is best to take the measurement after the motor has been doing its normal job for some time.
- Ideally, the best temperature points to record are the end bell housings.
- Current, voltage, and resistance readings are also useful and can be used to pinpoint electrical problems within the motor.

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Slide 12



REVIEW slides 10 thru 12 and discuss how to test and inspect motors.



ASK: What does a megohmmeter measure?

Testing and Inspecting Motors

What does a megohmmeter measure?



Instructor's Notes

Escalator Drive Motors

Troubleshooting the Control Circuit

- Starts out just like troubleshooting the system as a whole.
- First step: Lock out the system and check the control circuit fuses.
 - Measure coil resistance
 - Voltage testing
- Second step: Check for voltage variation.
- Third step: Check for a wiring problem.
- The key is to always know the circuits well and always proceed logically.

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Slide 16



REVIEW slide 16 and discuss how to properly troubleshoot the control circuit.

CONTENT: Direct participants to describe in their own words the purpose of the servicing drive motors.

APPLICATION FEEDBACK: Now that we have discussed a little about servicing drive motors, have the participants answer the following questions.



ASK the participants to describe how to check for voltage variation.

Troubleshooting the Control Circuit

Describe how you can check for voltage variation.



Instructor's Notes

Escalator Drive Motors

Motor Replacement

- **Rated speed** of a replacement motor must be the same as that of the old motor in all cases.
- **Service factor** rating should match or exceed the rating of the motor being replaced.
- **Duty rating** of a motor is whether the motor is meant for continuous operation, or for intermittent operation.
- **Full load amperes** is the load current the motor will draw from each power line when producing its rated output power.
- **Locked rotor amperage** is current that motor will draw under full load startup and stall.

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Slide 18



REVIEW slides 13 and 14 to discuss motor replacement.

CONTENT: Direct participants to describe in their own words the process of replacing a motor.

APPLICATION FEEDBACK: Now that we have discussed a little about motor replacement, have the participants answer the following questions.



ASK the participants to describe the listed terms.

Escalator Drive Motors

Motor Replacement

- When removing or installing a motor, be sure the power circuit is locked out.
- Proper grounding is very important for safety.
- Go through the proper alignment procedure to prevent vibration and excessive loads on the motor bearings.
- Motors must be bolted down to something solid.
 - Both bearing and insulation failure are quicker in motors which vibrate or shake.
 - Be sure to torque the mounting assembly to the required specifications.
- Record the line current and voltage to the motor both during startup and after it is running under normal load.

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Slide 19

Motor Replacement

Describe the terms below.

Rated Speed:

Service Factor:

Duty Rating:

Full load Amperes:

Locked Rotor Amperage:



Instructor's Notes

Summary

Escalator Drive Motors

Summary

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Slide 20



REVIEW slide 20 and summarize the module.

EVALUATION AND CLOSURE: Recap the main points of the module before moving on to the next topic within this course.



ASK the participants if they have any outstanding questions on what was presented.