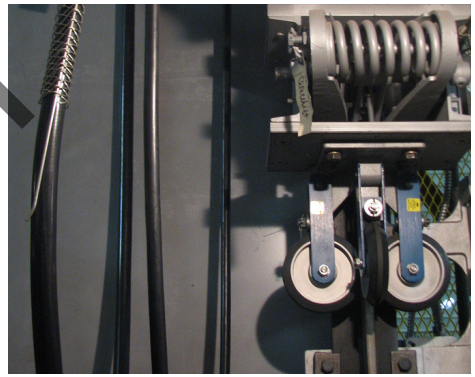
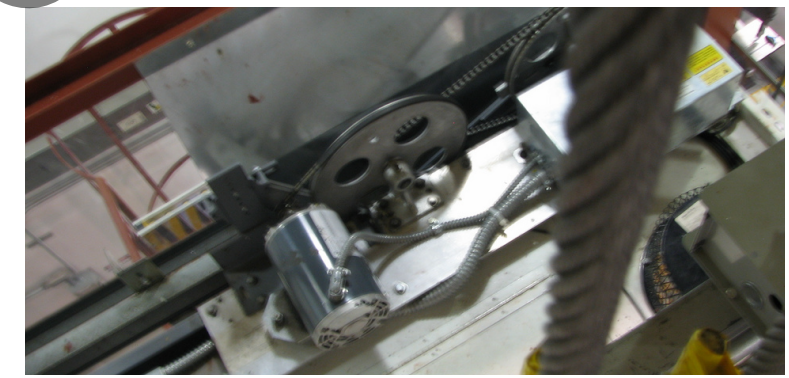
Instructor Guide





217: Elevator: Traction Elevator
Module 2: Principles of Operation

TRANSIT ELEVATOR/ESCALATOR CONSORTIUM

Table of Contents

Icons Used In This Guide

REVIEW slides

INDIVIDUAL ACTIVITY

ASK

WRITE

CLASSROOM ACTIVITY

Multimedia

SMALL GROUP ACTIVITY

REFER participants to

Agenda

Topic #	Topic Title	Duration
1	Overview	30 minutes
2	Principles of Operation	30 minutes
3	Field Trip	90 minutes
4	Safety Circuit	30 Minutes
5	Stopping and Holding	30 Minutes
6	Machine Drives	30 Minutes
7	Field Trip	90 Minutes
	Summary	30 Minutes
	Total Time:	360 Minutes

Overview

Purpose The purpose of this module is to:

- Provide the participant with a general knowledge and understanding of the principles of Electric Traction and MRL Elevator Operations. The key concepts discussed will aid the trainee in their future applications of elevator concepts and terminology.

Objectives

At the end of this lesson, the transit elevator/escalator trainee will be able to:

- Describe the basic principles of operation
- Identify and describe the safety circuit
- Describe the method of stopping and holding an electric elevator
- Identify and describe the types of machine drives
- Describe both geared and gearless electric elevators

Materials

Mandatory Make sure you have the following

- PowerPoint Presentation
- Course book
- Quizzes
- Pencils
- Paper
- Elevators 101, 2nd Edition

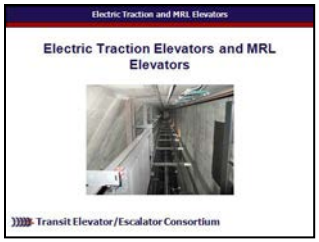
Optional You may also want the following for optional activities:

- Chalk board with chalk, large paper with marker, etc.
- Internet connection
- Lab, simulator or out of service elevator

Elevator – Electric Traction Principles of Operation

Instructor's Guide

Module Length: 360 min Time remaining: 360 min This section: 30 min (7 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW introduction slides **Multimedia** **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Welcome to the module for the principles of operation for electric traction and mrl elevators. All passenger elevators are designed to accomplish one objective: moving people in a multi-storey structure to their selected floor destination. The different types of elevators are distinguished by how they are driven. For example, one means of raising and lowering an elevator car is through the use of fluid power and, in our time, hydraulic oil is used to produce the fluid power necessary to drive this category of elevators. ***DO NOT Advance***	✓PPT slides 1, 2 

Elevator – Electric Traction Principles of Operation

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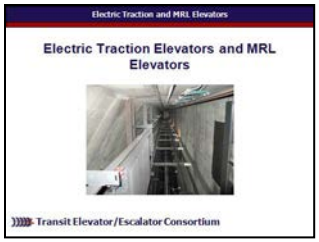
Module Length: 360 min Time remaining: 360 min This section: 30 min (7 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW introduction slides **Multimedia** **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** This module discusses another means of raising and lowering an elevator car by a method whereby electrical energy is converted to mechanical energy which, through the use of a wire rope traction system, then raises or lowers the elevator car. The module will also introduce the participant to the safety circuit, stopping and holding the elevator car as well as the types of mechanical drives associated with electric traction elevators. ***Advance.*** ***[Click on illustration for short video explaining the basic and early principles of traction elevators.]*** ***Advance.***	✓PPT slides 1, 2   ✓Internet connection

Elevator – Electric Traction Principles of Operation

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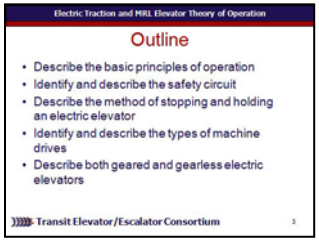
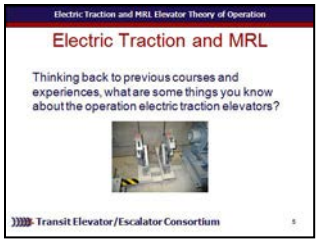
Module Length: 360 min Time remaining: 360 min This section: 30 min (7 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW module objectives **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Today we will look at the principles of operation for hydraulic elevators. In doing so, we will… - Describe the basic principles of operation - Identify and describe the safety circuit - Describe the method of stopping and holding an electric elevator - Identify and describe the types of machine drives - Describe both geared and gearless electric elevators ***Advance.***	✓PPT slide 3 

Module Length: 360 min Time remaining: 345min This section: 30 min (7 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
ASK participants what they remember about electric traction elevators **SMALL GROUP ACTIVITY** **WRITE** **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Thinking back to previous courses and experiences, what are some things you know about the operation electric traction elevators? ***[Allow participants to think for a minute and perhaps discuss with a partner ideas as well as write down any ideas. Discuss participant responses and if possible list them on a chalk board or similar.]*** ***Advance.***	✓PPT slide 5  **Optional:** Chalk board/chalk or white paper/marker

Module Length: 360 min Time remaining: 330 min This section: 30 min (11 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** The first objective we want to look at will be the actual principle of operation for an electric traction elevator system. ***Advance.***	✓PPT slide 8 

Elevator – Electric Traction Principles of Operation

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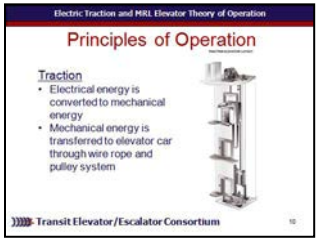
Module Length: 360 min Time remaining: 330 min This section: 30 min (11 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Behind the scenes where elevator personnel do most of their work, is the means being used to drive the elevator. While this course focuses on electric traction elevators, it is important to recall that hydraulic fluid power – where mechanical energy creates fluid energy acting – acts on a piston to drive the hydraulic elevator. For traction elevators, electrical energy is converted to mechanical energy which is then transferred to the elevator car through a wire rope and pulley system. ***Advance.***	✓PPT slide 10 

Elevator – Electric Traction Principles of Operation

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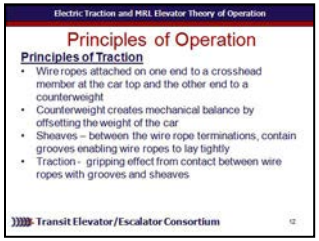
Module Length: 360 min Time remaining: 330 min This section: 30 min (11 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** The traction system on an electric elevator consists of ***Advance.*** a series of wire ropes attached on one end to the crosshead member located on the car top and on the other end to a weight assembly known as the counterweight. ***Advance.*** The counterweight creates a mechanical balance in the traction system by offsetting the weight of the elevator car. ***Advance.*** In between the wire rope terminations are a series of pulleys known as sheaves. The sheaves have grooves which enable the wire ropes to lay tightly. ***Advance.***	✓PPT slide 12 

Elevator – Electric Traction Principles of Operation

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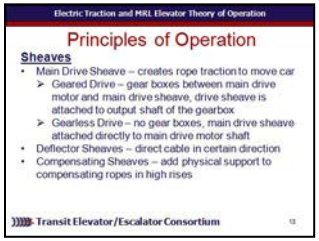
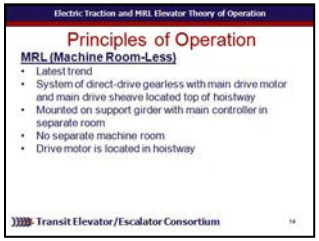
Module Length: 360 min Time remaining: 330 min This section: 30 min (11 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** All electric traction elevators contain a ***Advance.*** main drive sheave which is responsible for creating the rope traction that moves the elevator. What the main drive sheave is attached to accounts for the differences between geared and gearless drives. ***Advance.*** Older installations used gear boxes situated between the main drive motor and main drive sheave. The drive sheave is attached to the output shaft of the gearbox. ***Advance.*** On newer gearless installations there is no need for gear boxes and the main drive sheave is attached directly to the main drive motor shaft. ***Do Not Advance.***	✓PPT slide 13 

Elevator – Electric Traction Principles of Operation

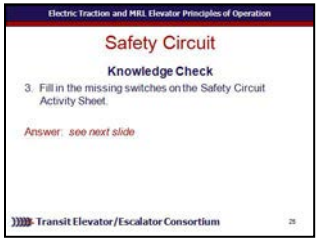
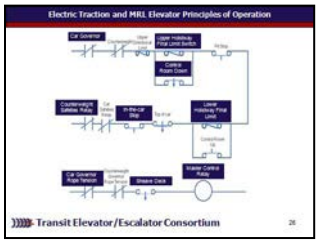
Instructor's Guide

Module Length: 360 min Time remaining: 330 min This section: 30 min (11 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** The MRL, or Machine Room-Less, ***Advance.*** is the latest trend in passenger electric traction elevators. ***Advance.*** This elevator system is a direct-drive gearless setup where the main drive motor and main drive sheave are located at the top of the hoist way ***Advance.*** mounted on a support girder with the main controller is located in a separate room. ***Advance.*** Like its name implies, the MRL does not have a separate machine room. ***Advance.*** The drive motor is located in the hoistway and the controller is located in a separate room. In elevator systems with machine rooms, the drive motor and controller are located in a separate room located above the hoist way separated by a floor. ***Advance.***	✓PPT slide 15 

DO	SAY	Materials Needed
CLASSROOM ACTIVITY **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Okay, now it's time to see how this works in the real world. Please get your stuff together for a trip to the lab. ***[At instructor's discretion, take time to visit the field and look for traction elevator examples of operation and related information.]*** ***Advance.***	✓ PPT slide 19 

Module Length: 360 min Time remaining: 210 min This section: 30 min (10 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
ASK **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Fill in the missing switches on the Safety Circuit Activity Sheet. ***Advance.*** ***[Advance through the slide. Ask participants for the missing parts of the safety circuit as blue boxes appear. Advance for correct answers.]***	✓PPT slides 26, 27  

Elevator – Electric Traction Principles of Operation

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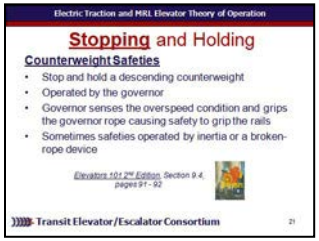
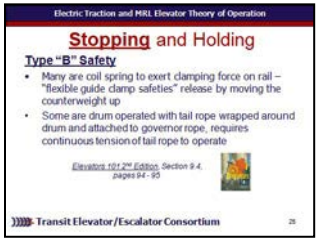
Module Length: 360 min Time remaining: 180 min This section: 30 min (15 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **REFER** participants to Elevators 101 2nd Edition, Section 9.4 pages 91 - 92. **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Counterweight safeties are designed to ***Advance.*** stop and hold a descending counterweight. ***Advance.*** The are o perated by the governor which ***Advance.*** senses the overspeed condition and grips the governor rope causing safety to grip the rails. ***Advance.*** Sometimes safeties operated by inertia or a broken-rope device. ***[Have participants turn to pages 91 – 92 in Elevators 101. Review those pages together.]*** ***Advance.***	✓PPT slide 34  ✓ Elevators 101 2nd Edition

Module Length: 360 min Time remaining: 180 min This section: 30 min (15 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **REFER** participants to Elevators 101 2nd Edition, Section 9.4 pages 94 - 95. **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** ***Advance.*** Many of these Type "B" safeties use a coil spring to exert clamping force on rail and are often called a "flexible guide clamp safeties" because they are released by moving the counterweight up ***Advance.*** Some Type "B" safeties are drum operated with a tail rope wrapped around drum and attached to governor rope. This type requires continuous tension of tail rope to operate. ***[Have participants turn to pages 94 – 95 in Elevators 101. Review those pages together.]*** ***Advance.***	✓PPT slide 38  Electric Traction and MRL Elevator Theory of Operation Stopping and Holding Type "B" Safety • Many are coil spring to exert clamping force on rail – "flexible guide clamp safeties" release by moving the counterweight up • Some are drum operated with tail rope wrapped around drum and attached to governor rope, requires continuous tension of tail rope to operate Elevators 101 2nd Edition, Section 9.4, pages 94 - 95 Transit Elevator/Escalator Consortium ✓ Elevators 101 2nd Edition

Elevator – Electric Traction Principles of Operation

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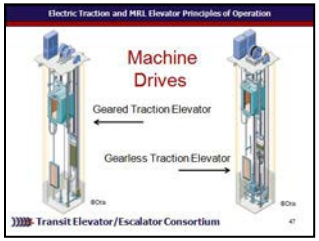
Module Length: 360 min Time remaining: 150 min This section: 30 min (6 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide	**In your own words:** Here are the two systems side by side. ***Advance.*** This is a Geared Traction Elevator. ***Advance.*** And on this side, we have a gearless traction elevator. ***[Discuss differences.]*** ***Advance.***	✓PPT slide 48 

Instructor's Notes

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Module Length: 360 min Time remaining: 30 min This section: 30 min (3 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slides **ASK** **Instructor's Notes**	**In your own words:** ***Read slide.*** ***[For each objective, briefly review what was learned in this module or ask students to share what they have learned for each learning objective and briefly discuss as a class.]*** ***Advance.*** Lets take a look at some of the key words we have defined as moved through this module. ***[Read slide. Discuss definitions as a group.]*** ***Advance.*** ***[Read slide. Discuss definitions as a group.]*** ***Advance.***	✓ PPT slides 52, 53