Instructor Guide

214: Elevator: Electrical Systems
Module 5: Safety Circuits

TRANSIT ELEVATOR/ESCALATOR CONSORTIUM
# Table of Contents

Overview ......................................................................................................................... 4  
Safety Circuit String ........................................................................................................ 7  
Safety Device Locations .................................................................................................. 14  
Safety Circuits & Fault Conditions ............................................................................... 29  
Summary ....................................................................................................................... 56
## Agenda

<table>
<thead>
<tr>
<th>Topic #</th>
<th>Topic Title</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overview</td>
<td>30 Minutes</td>
</tr>
<tr>
<td>2</td>
<td>Safety Circuit String</td>
<td>60 Minutes</td>
</tr>
<tr>
<td>3</td>
<td>Safety Device Locations</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>4</td>
<td>Safety Circuits &amp; Fault Conditions</td>
<td>60 Minutes</td>
</tr>
<tr>
<td>5</td>
<td>Field Trip</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>6</td>
<td>Summary</td>
<td>30 Minutes</td>
</tr>
</tbody>
</table>

**Total Time:** 360 Minutes
Elevator – Safety Circuits
Instructor’s Guide

Overview

Purpose
The purpose of this module is to:

- Provide the participant with an explanation and discussion regarding the functions of elevator electrical safety circuit devices.

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

- Explain the electrical function of specific devices of a safety circuit string.
- Discuss circuit fault conditions as they relate to the safety circuit.
- Identify the locations of safety circuit components.

Materials

Mandatory
Make sure you have the following:

- PowerPoint Presentation
- Coursebook
- Quizzes
- Pencils
- Elevator World Educational Package and Reference Library Volume 1: Lessons II & III
- Elevator Maintenance
- Elevators 101
- ASME A17.1-2007: Table2.26.4.3.2
- Safety Device Location Activity sheets

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
**Instructor’s Notes**

---

**DO**

- REVIEW introduction slides

**SAY**

In your own words:

Welcome to the course on Elevator Electrical Systems: Safety Circuits.

Advance

The safety circuit is a critical part of the elevator system. By ensuring the function of the safety string, we will prevent situations like the one you see here.

Advance

**Materials Needed**

- ✓ PPT slides 1, 2
### Elevator – Safety Circuits

**Instructor’s Guide**

<table>
<thead>
<tr>
<th>DO</th>
<th>SAY</th>
<th>Materials Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>REVIEW module objectives</td>
<td>In your own words:</td>
<td>✓ PPT slide 3</td>
</tr>
</tbody>
</table>

**Instructor’s Notes**

- Today we will
  - Today, we will take some time to look at the safety circuit and in doing so will”
  - Explain the electrical function of specific devices of a safety circuit string
  - Identify the locations of safety circuit components
  - Discuss circuit fault conditions as they relate to the safety circuit

**Advance**
Elevator – Safety Circuits

Instructor’s Guide

In your own words:

Thinking back to previous elevator courses, or elevator technical experiences in general, what do we might we already know about elevator safety components and circuits?

[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

Materials Needed

✓ PPT slide 4

Optional:
Chalkboard/chalk or Paper/marker
<table>
<thead>
<tr>
<th><strong>DO</strong></th>
<th><strong>SAY</strong></th>
<th><strong>Materials Needed</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>REVIEW slides</td>
<td><strong>In your own words:</strong>&lt;br&gt;Lets begin by:&lt;br&gt;- Explain the electrical function of specific devices of a safety circuit string&lt;br&gt;- Discuss circuit fault conditions as they relate to the safety circuit&lt;br&gt;<strong>Advance</strong></td>
<td>✓ PPT slides 5, 6</td>
</tr>
</tbody>
</table>

**Instructor’s Notes**

---

---

---

---
## Elevator – Safety Circuits
### Instructor’s Guide

**Module Length:** 360 min  
**Time remaining:** 330 min  
**This section:** 60 min (7 slides)  
**Section start time:**  
**Section End Time:**

<table>
<thead>
<tr>
<th>DO</th>
<th>SAY</th>
<th>Materials Needed</th>
</tr>
</thead>
</table>
| REVIEW slides | **In your own words:**  
Let's begin by reviewing some previous lessons on electrical principles and the safety string.  
[Refer: Participants should review the Lesson II p. IV-7 – IV-9 in Elevator Control and Operation Volume 1. Participants should read and review these pages followed by an instructor-led group discussion regarding the questions at the end of the lesson. Answers for the questions are located on p. IV-10.]  
Advance | ✓ PPT slide 6 |
| REFER participants to Elevator Control and Operation, Vol 1  
Pages IV-7 – IV-9 | | ✓ Elevator World Educational Package and Reference Library |

**Instructor’s Notes**

---

---

---

---

---

---

---

---
Elevator – Safety Circuits

In your own words:

Let's continue by reviewing lesson III on electrical principles and the safety string.

[Refer: Participants should review the Lesson II p. IV-11 – IV-13 in Elevator Control and Operation Volume 1. Participants should read and review these pages followed by an instructor-led group discussion regarding the questions at the end of the lesson. Answers for the questions are located on p. IV-16.]

Advance

Materials Needed

- PPT slide 7
- Elevator World Educational Package and Reference Library
### Materials Needed

- PPT slide 8

---

<table>
<thead>
<tr>
<th>DO</th>
<th>SAY</th>
<th>Instructor’s Notes</th>
</tr>
</thead>
</table>
| REVIEW slide | **In your own words:** A safety string in an elevator system prevents car movement when any safety concern has been violated.  
The safety string is made up of components within items such as the motor field to prevent energizing within the safety relay circuit.  
Furthermore, contacts in strategic locations will prevent power from being applied to the brake or motor should the safety relay not become energized.  
*Advance* | |
In your own words:

Let's take a look at the safety string in elevator Maintenance. Turn to page 94.

**[Refer: Participants should turn to p. 94 in Elevator Maintenance. Participants should read this page followed by group discussion regarding the diagrams of the safety sting.]**

Advace

### Materials Needed

- PPT slides 9
- Elevator Maintenance
### Elevator – Safety Circuits

#### Instructor’s Notes

**In your own words:**

Let’s look at safety devices found on the car and illustrated on this drawing with a dotted box at the top of the car. Here we have an ascending car overspeed protection device, a car top emergency exit electrical device, a gate electronic contacts or Car door gate switch, an inspection switch, and a top of car stop switch.

Again, these are all located on the car.

**Advance**

Let’s look at safety devices found under the car and illustrated on this drawing with a dotted box at the bottom of the car. Here we just a load switch on a hydraulic system under the car.

**Advance**

### Materials Needed

- PPT slides 24, 25

---

### Instructor’s Guide

**DO**

- REVIEW slides

**SAY**

- In your own words:

  Let’s look at safety devices found on the car and illustrated on this drawing with a dotted box at the top of the car. Here we have an ascending car overspeed protection device, a car top emergency exit electrical device, a gate electronic contacts or Car door gate switch, an inspection switch, and a top of car stop switch.

  Again, these are all located on the car.

  **Advance**

  Let’s look at safety devices found under the car and illustrated on this drawing with a dotted box at the bottom of the car. Here we just a load switch on a hydraulic system under the car.

  **Advance**
### Instructor’s Notes

- Review slides

### DO

**In your own words:**

Let’s look at safety devices found inside the car and illustrated on this drawing with a dotted box around the car. Here we have a car access panel looking device, a car door interlock, a car leveling device, an emergency stop switch, a firefighter’s stop switch, an in-car equipment access panel device, an in-car stop switch, and an inspection switch.

Again, these are all located inside the car. 

**Advance**

Let’s look at safety devices found in the pit area and illustrated on this drawing with a dotted box around the pit. Here we have a stop switch and a pit access door electric contact.

Again, these are all located in the pit area. 

**Advance**

### Materials Needed

- PPT slides 26, 27
In your own words:
Lets see what we have learned so far:
Another name for a hoistway door unlocking device is _____________________
   a. Hoistway switch
   b. Door Switch
   c. Access switch
   d. Limit Switch

Call on participants for answer
Advance once given the correct answer
Answer: a.
## Classroom Activity

**DO**

<table>
<thead>
<tr>
<th>CLASSROOM ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>In your own words: [Read slide. For each objective, briefly review what was learned in this module or ask participants to share what they have learned for each learning objective and briefly discuss as a class.]</td>
</tr>
</tbody>
</table>

**SAY**

**Instructor’s Notes**

- 
- 
- 

**Advance**

**Materials Needed**

- ✓ PPT slides 45
## Elevator – Safety Circuits
### Instructor’s Guide

**Module Length:** 360 min  
**Time remaining:** 30 min  
**This section:** 30 min (2 slides)  
**Section start time:** ________  
**Section End Time:** ________

<table>
<thead>
<tr>
<th>DO</th>
<th>SAY</th>
<th>Materials Needed</th>
</tr>
</thead>
</table>
| CLASSROOM ACTIVITY | **In your own words:**
| INDIVIDUAL ACTIVITY | *Administer quizzes.* |

**Instructor’s Notes**

- 
- 
- 
- 
- 

- ✓ PPT slides 46
- ✓ Quizzes
- ✓ Pencils