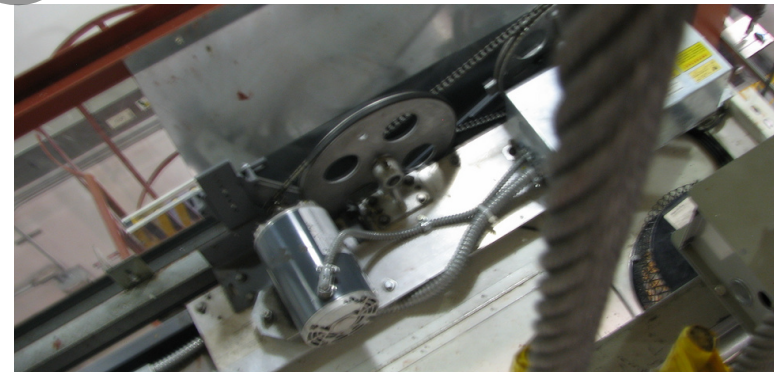
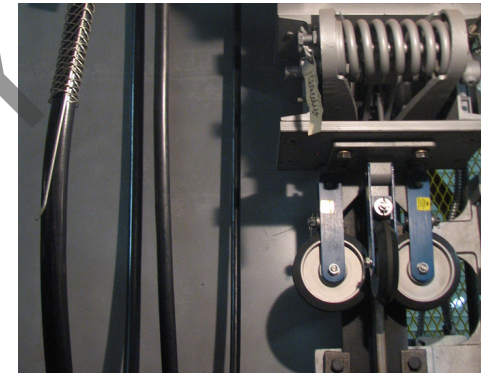
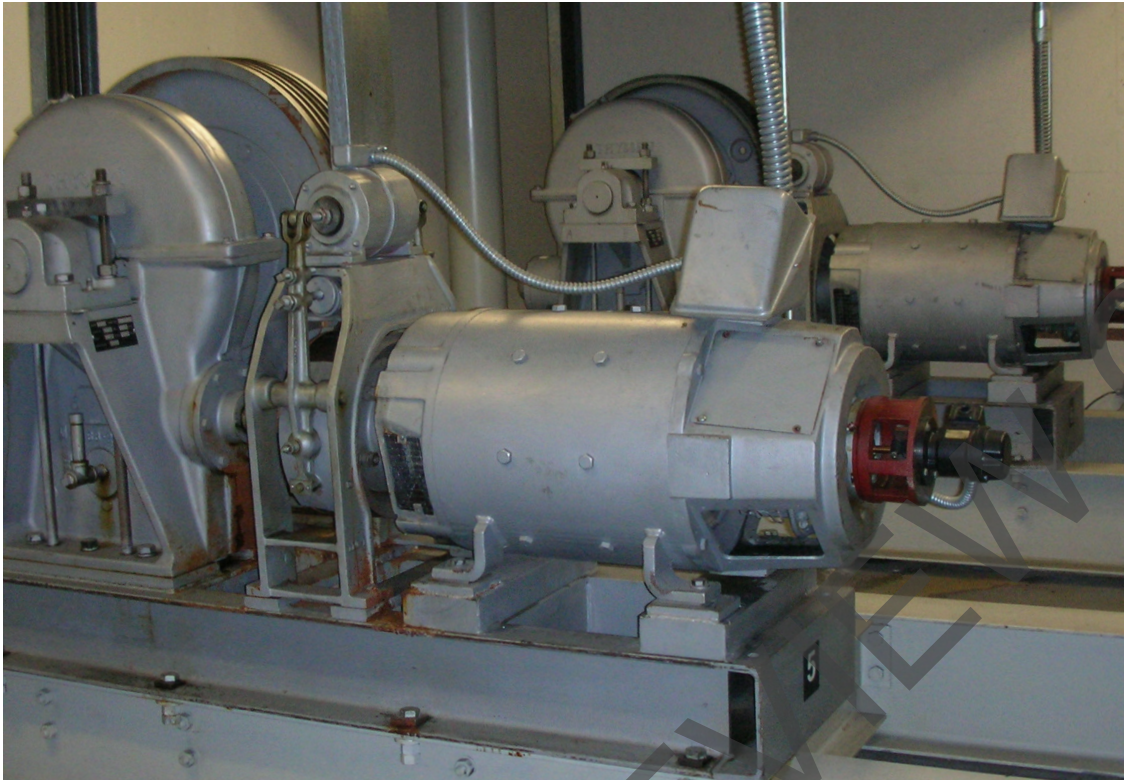


# Instructor Guide



## 215: Elevator: Mechanical Drive Systems Module 2: Mechanical Geared Drive Systems

# Elevator – Mechanical Geared Drive Systems

*Instructor's Guide*



## **Table of Contents**

Overview.....	4
Geared Drive System Operation.....	11
Geared Drive System Components.....	26
Controlling Geared Drive Systems.....	36
Summary.....	45

PREVIEW ONLY

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



### Icons Used In This Guide



**REVIEW** slides



**ASK**



**CLASSROOM ACTIVITY**



**SMALL GROUP ACTIVITY**



**INDIVIDUAL ACTIVITY**



**WRITE**



**Multimedia**



**REFER** participants to

### Agenda

Topic #	Topic Title	Duration
1	Overview	30 minutes
2	Geared Drive Systems Operation	40 minutes
3	Field Trip	60 minutes
4	Geared Drive Components	40 minutes
5	Field Trip	60 minutes
6	Controlling Geared Drive Systems	40 minutes
7	Field Trip	60 minutes
8	Summary	30 minutes
	<b>Total Time:</b>	360 minutes

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



### Overview

**Purpose** The purpose of this module is to:

Provide an overview of elevator geared drive systems and how they operate as part of traction elevator driving machines.

### **Objectives**

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

- Explain how a geared drive system operates
- Identify major components of the geared drive systems
- List methods of controlling geared drive systems

### **Materials**

**Mandatory** Make sure you have the following

- PowerPoint Presentation
- Coursebook
- Quizzes
- Pencils
- Authority Specific Related Procedures
- Elevator Industry Field Employees' Safety Handbook

### **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

PREVIEW ONLY

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min ( slides)

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO



**REVIEW** module objectives

### Instructor's Notes

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### SAY

#### In your own words:

Today we will

**Advance** Explain how a geared drive system operates

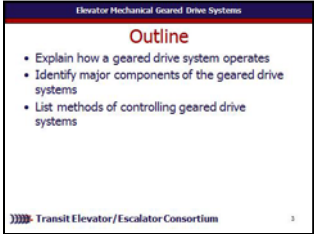
**Advance** Identify major components of the geared drive systems

**Advance** and List methods of controlling geared drive systems

**Advance**

### Materials Needed

✓ PPT slide 3



# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min ( slides)

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO

### SAY

### Materials Needed



**REVIEW** slide

**In your own words:**

Looking back our photo from earlier, we know that to control the mechanical movement of elevator cars, gears power steel hoist ropes over a traction drive sheave which is attached to an output shaft of a gear driven by the input of a high speed motor.

**Advance**

✓ PPT slide 6



### Instructor's Notes

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# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min ( slides)

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO



**REVIEW** slides

### Instructor's Notes

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### SAY

**In your own words:**

Many times technicians use the term “worm gear” to refer to the worm, the worm gear, or the worm drive as a unit. The worm shaft, as seen here, must be supported in two directions – radial and axial – and bearings provide this support.

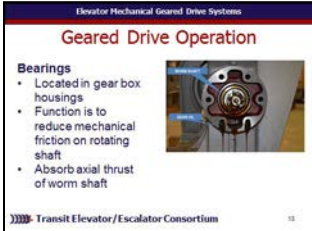
**Advance**

Bearings are located in housings in the gear box and their function is to reduce mechanical friction on the rotating shaft. The bearings also absorb the axial thrust of the worm shaft.

**Advance**

### Materials Needed

✓ PPT slides 12, 13



# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min ( slides)

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO



**REVIEW** slide

### Instructor's Notes

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### SAY

**In your own words:**

In the geared traction system the output rotation of the motor is transmitted to the drive sheave through the worm shaft and a reduction gear. It is called a reduction gear because it reduces the speed from the motor so that there is more control of elevator motion. By decreasing the rotation speed, the output torque increases adding the ability to lift larger objects for a given pulley diameter.

**Advance**

### Materials Needed

✓ PPT slide 15





# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



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

DO	SAY	Materials Needed
<div> </div> <p><b>REVIEW</b> slide</p> <div> </div> <p><b>REFER</b> participants to <u>Elevators 101 2<sup>nd</sup> Edition</u>, Section 5.3 pages 41</p> <p><b>Instructor's Notes</b></p> <hr/> <hr/> <hr/> <hr/> <hr/>	<p><b>In your own words:</b></p> <p>Reduction ratio is discussed in <u>Elevators 101 2<sup>nd</sup> Edition</u>, Section 5.3, page 41  <b><i>[Refer participants to <u>Elevators 101 2<sup>nd</sup> Edition</u> Section 5.3 page 41 to review reduction ratio.]</i></b></p> <p><b>Advance</b></p>	<p>✓ PPT slide 20</p> <div> </div> <p>✓ <u>Elevators 101 2<sup>nd</sup> Edition</u></p>

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min      Time remaining: min      This section: min ( slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div> </div> <div> <p>ASK</p> </div> <div> <h3>Instructor's Notes</h3> </div> <hr/> <hr/> <hr/> <hr/> <hr/>	<p><b>In your own words:</b>                  Describe how a gear system works.  <i>Call on participants for answer</i>  <i>Advance once given the correct answer</i>                  Answer: A gear is a part of a machine that attaches to the output shaft and meshes with the worm shaft. With every rotation of the worm shaft, the gear tooth is advanced one tooth. Properly adjusted the load being driven is born over many gear teeth.  <b>Advance.</b></p>	<p>✓PPT slide 24</p> <div> </div>

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min      Time remaining: min      This section: min      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div> </div> <p>ASK</p> <div> </div> <p>CLASSROOM ACTIVITY</p> <p><b>Instructor's Notes</b></p> <hr/> <hr/> <hr/> <hr/> <hr/>	<p><b>In your own words:</b></p> <p><i>[At instructor's discretion, take time to visit the field and/or lab to look for examples of gears and how they work.]</i> <b>Advance</b></p>	<p>✓PPT slide 26</p> <div> </div>

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min      Time remaining: min      This section: min ( slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

### DO



**REVIEW** slides

### Instructor's Notes

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### SAY

**In your own words:**

The gear case houses the gears, gear shaft, gear reducer, and other related gear components.

**Advance**

To control the mechanical movement of elevator cars, the motor provides the power so the gears can rotate hoist ropes over a traction drive sheave which is attached to an output shaft. Most of these components are shown here which is an uninstalled driving machine manufactured by Hollister-Whitney.

**Advance**

### Materials Needed

✓ PPT slides 31, 32



# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min ( slides)

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO

### SAY

### Materials Needed



**ASK**

**In your own words:**

The function of a \_\_\_\_\_ is to measure the rotation speed of the shaft.

- a. Worm gear
- b. Tachometer
- c. Brake
- d. Brake solenoid

**Call on participants for answer**

**Advance once given the correct answer**

**Answer: b.**

**Advance.**

### Instructor's Notes

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✓ PPT slide 38



# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO

### SAY

### Materials Needed



**ASK**



**CLASSROOM  
ACTIVITY**

**In your own words:**

*[At instructor's discretion, take time to visit the field and/or lab to look for examples of geared components.]  
Advance*

✓PPT slide 40



### Instructor's Notes

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# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



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

DO	SAY	Materials Needed
<div></div> <p><b>REVIEW</b> slide</p> <div></div> <p><b>REFER</b> participants to <u>AC Motor Controls for Elevators</u></p> <p><b>Instructor's Notes</b></p> <hr/> <hr/> <hr/> <hr/> <hr/>	<p><b>In your own words:</b></p> <p>Included in this module and used with permission, is a 1999 technical publication by Motion Control Engineering, Inc., <i>AC Motor Controls for Elevators</i>. This is an excellent resource for elevator technicians and it discusses pertinent issues regarding proper application and installation of AC motors and drives.</p> <p><b>[Refer participants to <u>AC Motor Controls for Elevators</u> by Motion Control Engineering to review proper application and installation of AC motors and drives.]</b></p> <p><b>Advance</b></p>	<p>✓ PPT slide 46</p> <div> </div> <p>✓ <u>AC Motor Controls for Elevators</u> by Motion Control Engineering</p>

# Elevator – Mechanical Geared Drive Systems

## Instructor's Guide



Module Length: min

Time remaining: min

This section: min ( slides)

Section start time: \_\_\_\_\_

Section End Time: \_\_\_\_\_

### DO

### SAY

### Materials Needed



**ASK**

**In your own words:**

SCR technology was used to develop \_\_\_\_\_ AC power to an AC driving machine and is found in most new elevator systems. (select all that apply)

- a. Variable voltage variable frequency
- b. Variable voltage frequency
- c. VVVF
- d. VVF

**Call on participants for answer**

**Advance once given the correct answer**

**Answer: a., c.**

**Advance.**

✓PPT slide 50



### Instructor's Notes

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