

RAIL VEHICLE LEVEL 200 SUBJECT OVERVIEW

Module: 201 – Couplers

Note: All 200 level courses should be delivered only after completion of 100 level training

About the Author

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Overview/Purpose

This training document provides students with an overview of the devices used to mechanically and electrically connect rail vehicles. In order for two or more rail vehicles or cars to be connected together in a train couplers are provided to make the physical connection and provide electrical signal connection. Couplers allow for travel on vertical and horizontal curves and allow for rotational movements.

The automatic coupler enables automatic coupling of railway vehicles. Coupling of two units is achieved without manual assistance by driving one unit up to a second unit. Automatic coupling is even possible, if the two units horizontally and vertically are not in alignment. The coupler permits coupled trains to negotiate vertical and horizontal curves and allows rotational movements. The rubber cushion draw gear contains a combined draw and buff gear consisting of a rubber cushion draw gear and a buffer. Each coupler assembly is provided with electric heads to achieve electric coupling. Uncoupling is done automatically by remote control from the driver's cab or manually from trackside. After uncoupling and separation of the cars, the coupler is again ready to couple.

Coupler System Characteristics

American Society of Mechanical Engineers, Standards Committee on Rail Transit Vehicles RT-2 8/20/03

“The design of the coupler system, including drawbars, draft gear and attachments to the car body, shall respond to normal and overload conditions in a predictable manner. The coupler system shall be capable of absorbing the compression and tension forces encountered in normal vehicle operation in a train, including coupling and uncoupling, without damage.”

“The coupler system shall also contain a shearback design consisting of an energy-absorbing release mechanism to respond to compressive overload conditions. In a collision, the draft gear elements shall first fully compress, followed by activation of the release mechanism which shall allow the coupler system to absorb additional energy and retract a sufficient distance to permit the car body anticlimbers to engage. If the collision forces are sufficiently high such that compression continues following the full retraction of the coupler system, the coupler system shall then be disconnected from the anchorage in a safe manner so as to not impede the CEM response of the car body overload conditions”. (CEM Crash Energy Management)

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Suggested Tools/Training Aids:

- Recommended Practice for Coupler System Periodic Inspection and Maintenance
APTA RT-RP-VIM-006-02

Topics Covered:

Topics listed below are covered in this introduction of rail vehicle couplers. A full copy of the National Training Standards from which these topics were taken is attached.

1.0 Introduction to Couplers

2.0 Coupler – Mechanical:

A device, which as part of a coupler assembly makes the physical connection between rail transit vehicles. It consists of a face plate with alignment pins holes to mate to a like device on another transit vehicle. It is also referred to as the mechanical coupler head.

3.0 Coupler – Pneumatic:

A self-sealing valve assembly mounted to a coupler assembly that allows for air pressure equalization between coupled rail vehicles.

4.0 Coupler – Electrical:

An electrical device mounted to a mechanical coupler assembly that makes the electrical circuit connections between rail transit vehicles through a series of mating contacts.

Definitions, Abbreviations and Acronyms

For the purposes of this lesson, the following glossary of terms, definitions, acronyms, and abbreviations shall apply. They are not all inclusive, and the reader is encouraged to explore the text, footnotes and bibliography sources for further information.

Definitions

With a diversity of manufacturers and rail transit agencies, it is necessary to establish a common vocabulary to describe components that are identical or similar in nature and function. For the purposes of clarity the following terms and definitions will be used in this document: (APTA)

Anchorage- Bearing Shell- At the rear of the mechanical coupler the Anchorage is bolted to the vehicle undercar frame, the attachment device.

Buffer: A spring assembly, gas-hydraulic self re-setting energy absorption device, crushes cartridge assemblies, or series of elastomeric elements within some coupler assemblies, which can absorb a high impact coupling or severe buff loads.

Buff Force: Compressive coupler forces that occur during a slack bunched condition

Centering device: A device that prevents or limits a free or uncoupled coupler assembly from moving in its normal lateral range.

Coupler control box/panel: A device from which commands/signals are generated to initiate a coupling or uncoupling sequence of events and the isolation/connection of electric train line circuits.

Coupler – electrical: A mechanical device mounted to a mechanical coupler assembly that makes the electrical circuit connections between rail transit vehicles through a series of mating contacts.

Coupler – mechanical: A device, which as part of a coupler assembly makes the physical connection between rail transit vehicles. It consists of a face plate with alignment pins and matching holes to mate to a like device on another rail transit vehicle. It is also known as the mechanical coupler head. The mechanical coupler includes subassemblies, (1) an anchor casting through which the mechanical coupler is physically connected to the frame of the car, (2) a draft gear which serves to absorb energy of coupling and the slack action, (3) a mechanical support which is attached to the anchor pin and which the coupler can swing laterally and move vertically, (4) a coupler center detent to position the mechanical coupler at the car centerline.

Coupler – pneumatic: A self-sealing valve assembly mounted to a coupler assembly that allows for air pressure equalization between coupled rail vehicles.

Coupler switch box: A termination point for electrical circuits to the electric coupler heads. Also known as a Jumper/Drum Switch.

Coupler system/assembly: A mechanical device optionally consisting of a mechanical coupler, electrical coupler, pneumatic coupler, drafts gear, yoke, and energy absorber.

Deformation tube: A two-section tube as part of a coupler assembly, which upon unusual severe impact collapses one into the other for dissipation of energy and momentum. It acts as an energy absorption device. It is not repairable and must be replaced when activated.