Chapter 6

Couplers and Draft Gear
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6.0  Couplers and Draft Gear

6.1  Overview

Each car shall be equipped on both ends with an energy absorbing coupler with associated draft gear, coupler carrier, uncoupling mechanism and centering device. The couplers shall be designed to be physically compatible with, couple to, and operate with standard Type H Tightlock couplers and components conforming to MCSCM drawings and APTA standards. The coupler head and knuckle shall conform to the Type H Tightlock pattern as per corresponding MCSCM drawings and specifications. The coupler and draft gear assembly shall be compliant with the requirements of APTA Recommended Practice RP-M-003-98. Push back couplers with energy absorption shall be used as a component of an integrated crash energy management system.

6.2  General Requirements

Couplers, draft gear and associated components shall conform to the strength requirements specified in all applicable APTA and AAR standards and recommended practices. Coupler carriers shall be capable of withstanding the vertical forces identified in 49CFR Section 238.207. All components shall be designed to operate properly under the operational and environmental conditions defined in PRIIA Specification 305-912. It shall be possible to remove or install a coupler and draft gear assembly without requiring lifting of the carbody or removal of the truck.

6.3  Performance Requirements

Couplers and associated apparatus shall be designed to meet buff and draft strength requirements as specified by AAR. The strength of the knuckle and head shall be equal to or greater than the strength of an MCSCM/APTA Type H tightlock knuckle and head. Under normal operating conditions, couplers and associated apparatus, including coupler carrier, shall be capable of withstanding for any horizontal position of the coupler, a vertical load of 100,000 lbs (45,400 kg) applied in either direction to the coupler as near to the pulling face as practical without deformation to coupler carrier, supporting car body structure and intervening connections.

Each car shall be capable of operating satisfactorily while coupled to any other car or locomotive used in passenger service under the operational and environmental conditions defined in PRIIA Specification 305-912. Coupler swing shall be such that a car shall be able to negotiate a 250 ft radius (76 m radius) (23 degree) curve while coupled to other cars and/or locomotives as specified without damage to trucks, draft gear, carbody, diaphragms, air hoses or car-to-car connections.

The centering mechanism shall maintain the coupler on the vehicle center line when in the uncoupled condition.

Car-to-car and coupler-to-carbody air connections shall be designed in conformance with APTA Recommended Practice RP-M-001-97. See Chapter 7 for details regarding car-to-car air connections.
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6.4 Coupler, Yoke and Radial Connector

Couplers shall use Type H –MCSCM/APTA standard Tightlock heads & knuckles. Material for couplers and yokes must be AAR Standard M-201 grade C or E high tensile steel. Couplers shall comply with the requirements of APTA Recommended Practice RP-M-003-98.

6.5 Draft Gear

Draft gear elements shall consist of twin-cushion WM-6-DP draft gear packs with standard 24.625 in. (625.475 mm) pockets.

6.6 Coupler Carrier

The coupler carrier shall be designed to adequately and consistently support the coupler through its full range of vertical and horizontal movement, and shall maintain the coupler at a nominal 34.5 in. (876.3 mm) Above Top of Rail (ATOR) height (as measured at the center of the coupler) when uncoupled. The coupler carrier shall be designed to accommodate the complete push-back motion of the coupler without interference with the energy absorption function. During coupler pushback, contact between the coupler head and the coupler carrier will not result in unintentional activation of the coupler uncoupling mechanism and therefore cause car separation.

A means shall be provided to allow removal and replacement of wear plates, carrier springs and carrier stops. The top surface of the coupler carrier shall be equipped with a replaceable nylon (or other low friction material) wear plate - the coupler shall not rest on a metal surface.

The coupler carrier shall provide for adjustment of coupler height of 1.0 in. (25.4 mm) in either vertical direction from the nominal 34.5 in. (876.3 mm) ATOR coupler height standard. The coupler carrier shall comply with the vertical force requirements specified in 49CFR Sections 238.205 and 238.207.

6.7 Uncoupling Mechanism

All uncoupling levers and hardware shall meet the safety requirements of 49CFR Part 238. An uncoupling mechanism shall be installed at each end of each car, in conformance with section 5.10 of APTA Standard SS-M-016-06. Minimum clearance of 2 in. (51 mm) shall be maintained between uncoupling mechanism and all other components on the end of the car (including jumper cables, receptacles and carbody structural elements such as collision posts) when car is either coupled or uncoupled. The uncoupling levers shall seat firmly when locked in place and will not rattle or vibrate.

The uncoupling mechanism shall be designed to accommodate the complete push-back motion of the coupler without unintentional activation of the coupler lock mechanism and therefore cause car separation.

6.8 Mounting Arrangement

The proposed mounting arrangement of the coupler assemblies (cab and non-cab ends) will be submitted for customer approval during design review.
6.9 Crash Energy Management

Both ends of all cars shall be equipped with push-back, energy absorbing coupler assemblies. A higher capacity coupler shall be provided on the cab-end of the cab car.

The push-back energy absorbing coupler assemblies shall meet the requirements shown in Table 6-1, Push-Back, Energy Absorbing Coupler Requirements.

Table 6-1: Push-Back, Energy Absorbing Coupler Requirements

<table>
<thead>
<tr>
<th>Application</th>
<th>Minimum Initiation Load, Pounds</th>
<th>Minimum Energy Absorption, Ft-lbs</th>
<th>Minimum Push-Back Stroke, Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>All, except cab-end of Cab Car</td>
<td>600,000 lbs (272,400 kg)</td>
<td>200,000 ft-lbs (271,164 Nm) @ 4 in. (102 mm)</td>
<td>9 in. (229 mm)</td>
</tr>
<tr>
<td>Cab-end of Cab Car</td>
<td>600,000 lbs (272,400 kg)</td>
<td>700,000 ft-lbs (949,073 Nm) @ 14 in. (356 mm)</td>
<td>20 in. (508 mm)</td>
</tr>
</tbody>
</table>

The slope of the force during push back shall be greater than or equal to zero.

The coupling system must be capable of transferring a 150,000 lbs (68,100 kg) draft load at any time during the push back sequence to ensure that cars remain coupled during and after an impact.

Indicators shall be provided that shall be visible from outside the car to indicate full or partial activation of the energy absorption unit and the need for its replacement. The activation of the energy absorption unit shall be readily apparent when performing periodic inspections.

* End of Chapter 6 *
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