



Cushioning Units & Energy Management

Travis Barbour

Canadian Pacific Kansas City

Member of AAR Equipment Engineering Committee



End of Car Energy Management Task Force

COMPONENT HISTORY

- Existing Specifications for Draft Gears (Year Adopted)
 - M-901E (1959), M-901G (1964), M-901K (1988)
 - AAR Approved Draft Gears are listed in Rule 21
- Existing Specifications for Cushioning Devices (Year Adopted)
 - M-921B Cushioning Devices, End-of-Car (1989)
 - M-921D Cushioning Devices, End-of-Car - Motor Vehicle (1993)
 - M-921E Cushioning Devices, Active Draft End - Motor Vehicle (2000)
 - M-921F Cushioning Devices, Active Draft End of Car (2004)
 - AAR Approved Cushion Units are listed in Rule 59



Component & Operations History

- Current Specifications for Draft Gears and Cushioning Devices
 - Evolved over decades, incrementally improved
 - Have produced reliable components
 - Behavior is predictable and RRs have built marshalling and operating rules around the characteristics
- Though we have decades of experience with current systems...
 - Cars have gone from **177,000 GRL to 286,000 GRL**
 - Train length has gone from perhaps **60 car trains to 200 or more**
 - LORFs and damaged goods continues to need attention
 - **Industry has interest in alternative end of car methods**

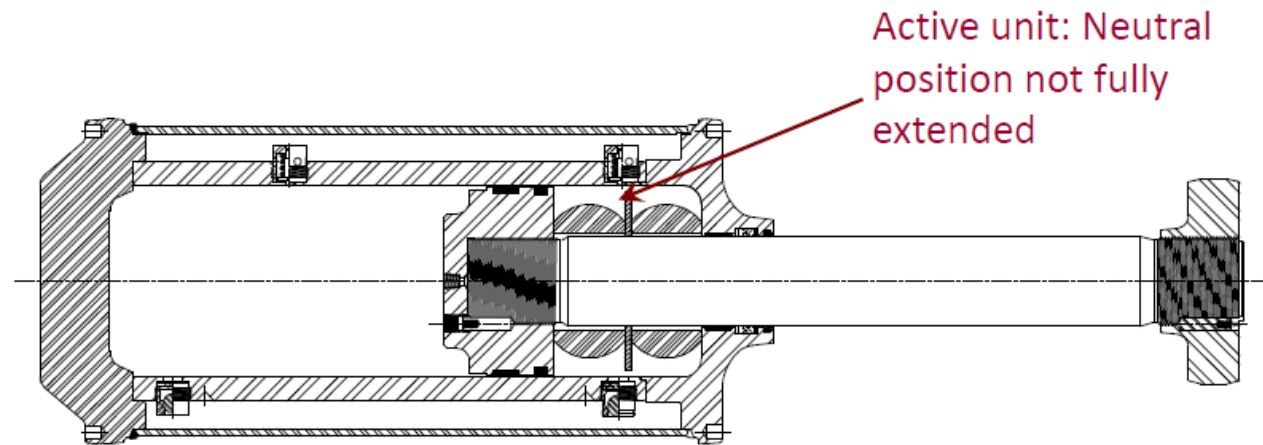
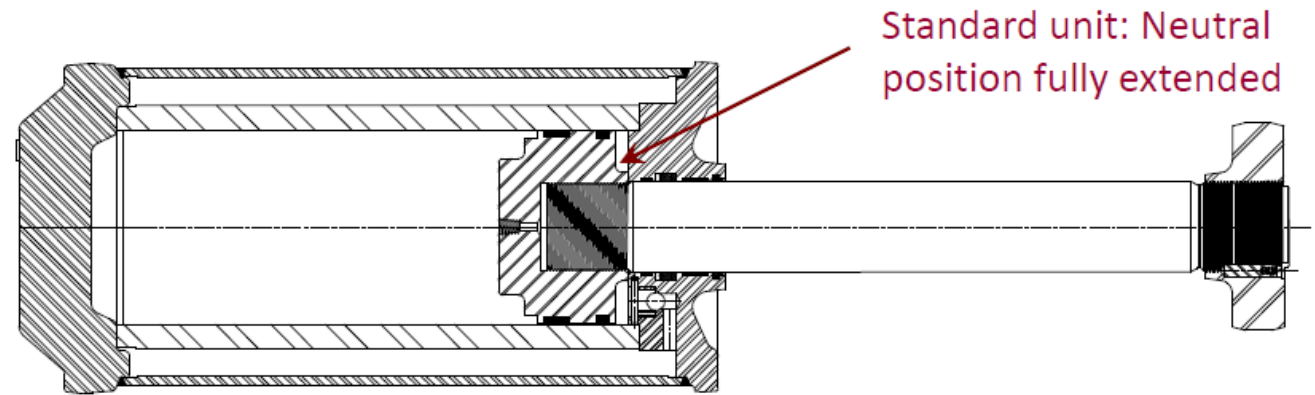


Recent Applications, Requests for Approval

- EEC has had requests for approval of end-of-car systems that offer different performance
 - 10-inch Active Draft Cushion Units
 - Dual draft gear pockets (4)
 - Two gears engaged in buff, one in draft
 - Longer Travel Draft Gears (2)
 - Up to seven inches of travel in the gear
 - Non-hydraulic elastomeric draft system (1)
 - Asymmetric travel, longer in buff than in draft

Amsted Rail Active Draft Cushion Units

- M-921E Adopted in 2000 (Active Draft for Autoracks)
 - Not many were initially introduced in autorack service
 - Renewed Interest recently

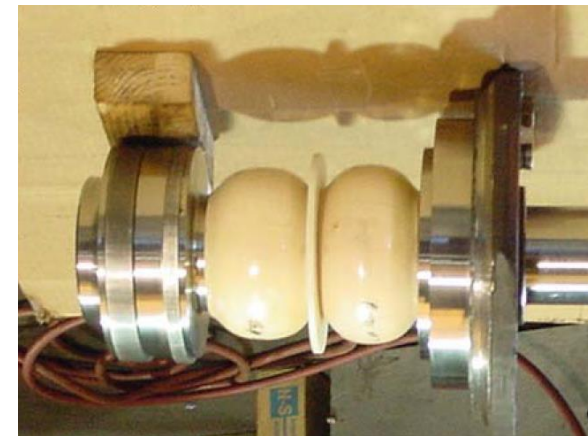


Amsted Rail Active Draft Cushion Units

- Standard Cushion Unit

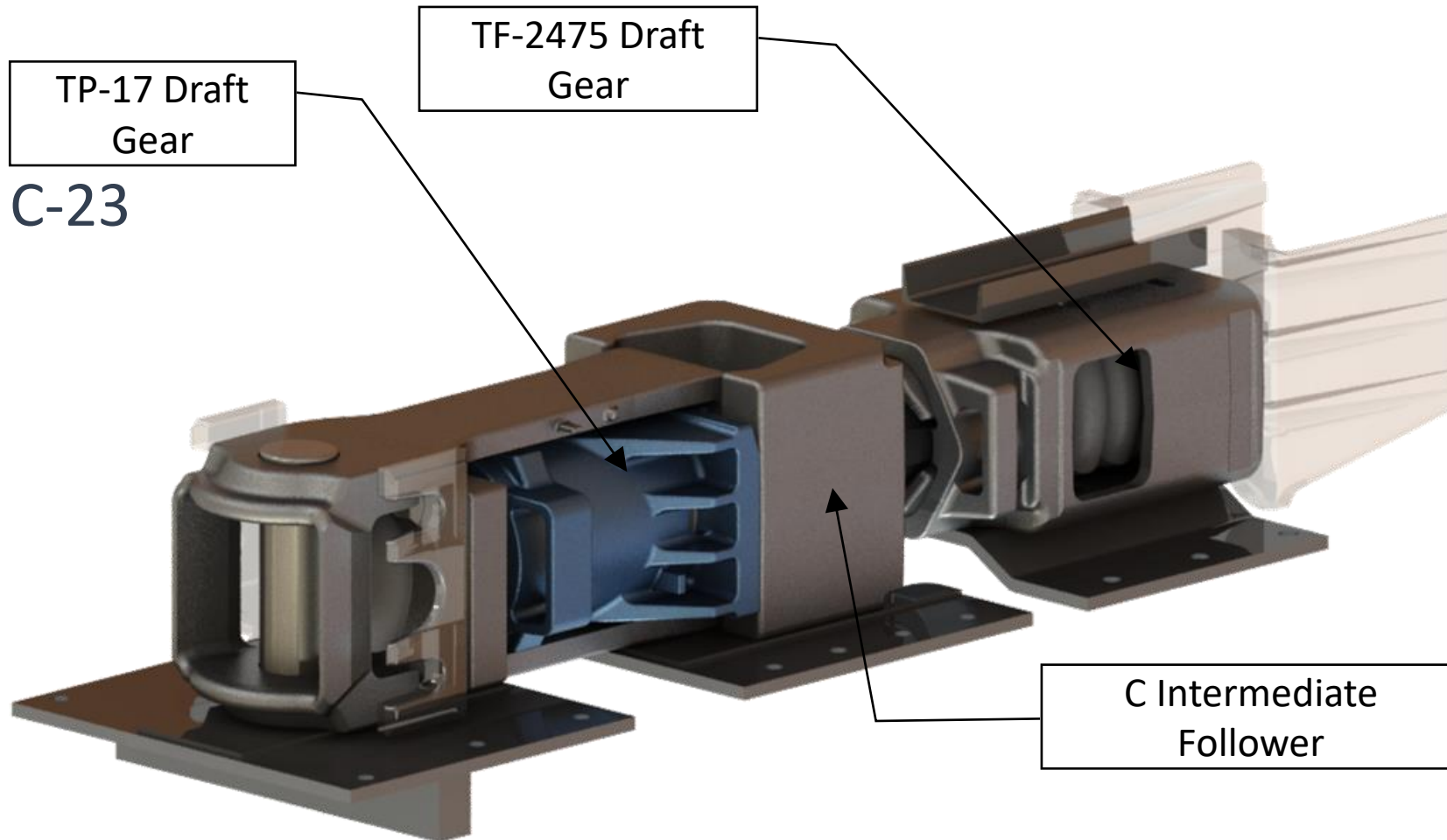


- Active Draft Components

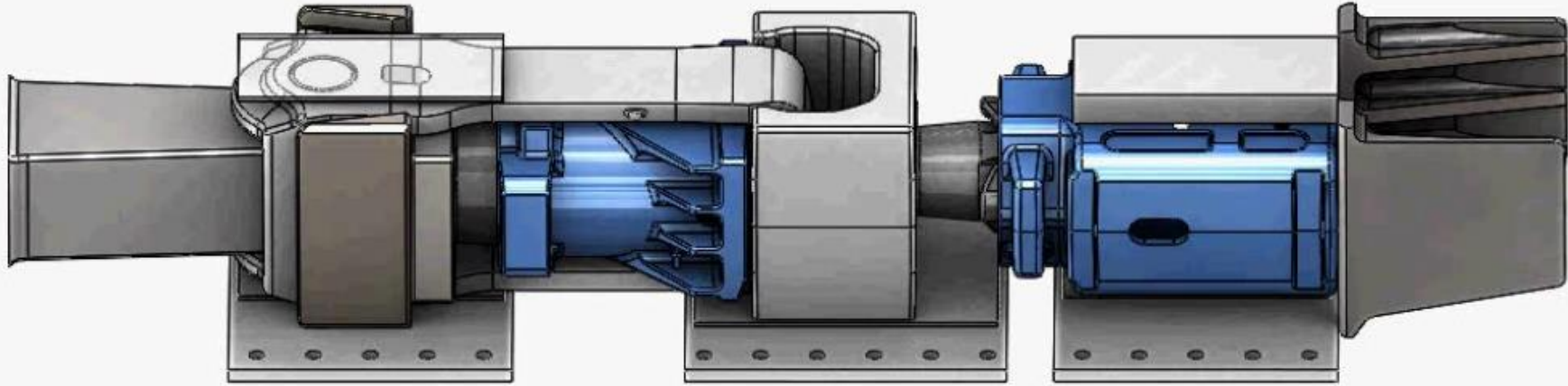


Miner Friction Cushioning System™ (FCS)

- FCS C-23

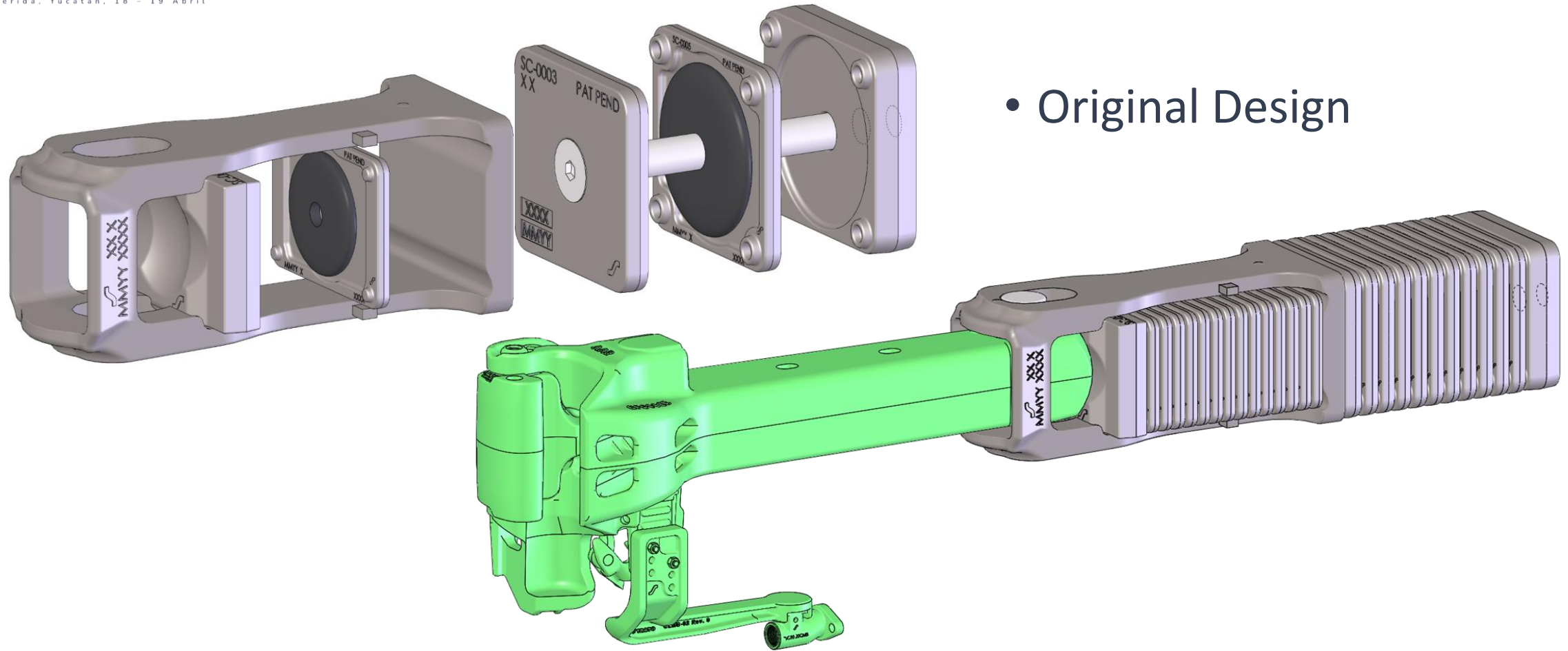


Miner Friction Cushioning System™ (FCS)



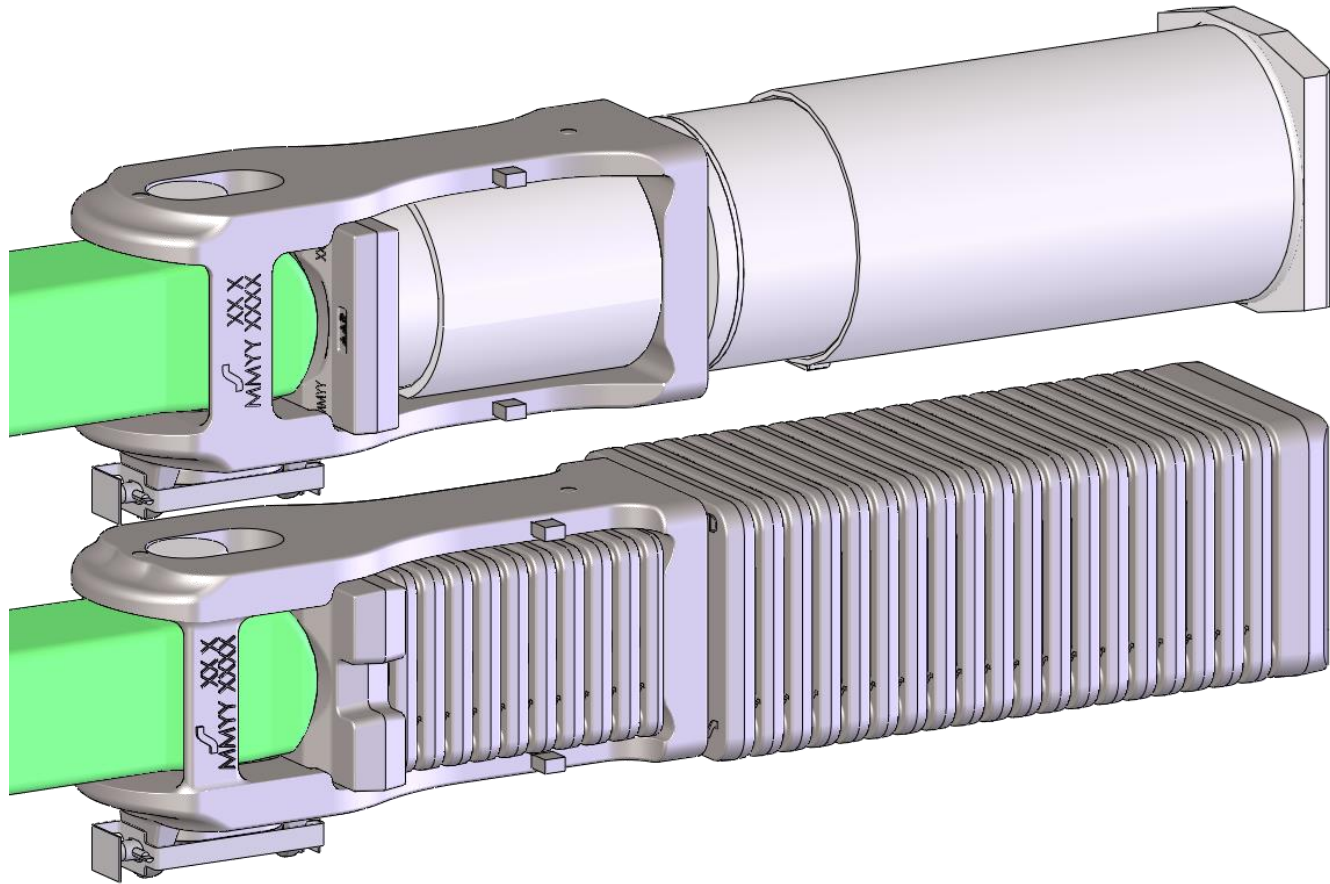
Buff (Compression) -->

Strato Selective Cushioning Unit (SCU)



- Original Design

Strato Selective Cushioning Unit (SCU)



- Proposed Design

- Original Design

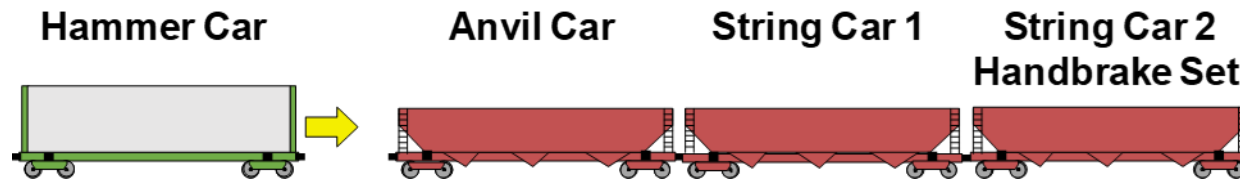


Recent Application Requests

- Guidance is needed for:
 - What cars and service (what commodities)?
 - Cause for attention and repairs (Field Manual)
 - Approval (new specifications)
 - Umler registrations
- Damage Prevention Committees are seeking guidance
 - Damage Prevention and Freight Claim Committee
 - Open Top Loading Rules Committee
 - Specially Equipped Freight Car Committee

End of Car Energy Management Task Force

- How can we evaluate systems for the two main operating scenarios?
- Yard impact testing currently done by AAR Damage Prevention Group



- Testing for over the road performance is not done, it is cost prohibitive
- Answer for over the road evaluations may be in modeling using AAR Train Operations and Energy Simulator (TOES) or other similar models
 - Predicts forces, speed, acceleration, etc. for each car/draft system in a train.
 - Includes inputs for locomotives & operation, braking, track geometry, and freight car characteristics



End of Car Energy Management Task Force

- Task Force is planning to make a new standard that might include the following approaches:
 - Testing of the End-of-Car devices to characterize performance – in yard Impact or lab testing
 - Modeling of over-the-road Performance
 - Provide information for use by railroads and Damage Prevention Committees
 - Yard Impact Performance
 - Over-the-road Performance

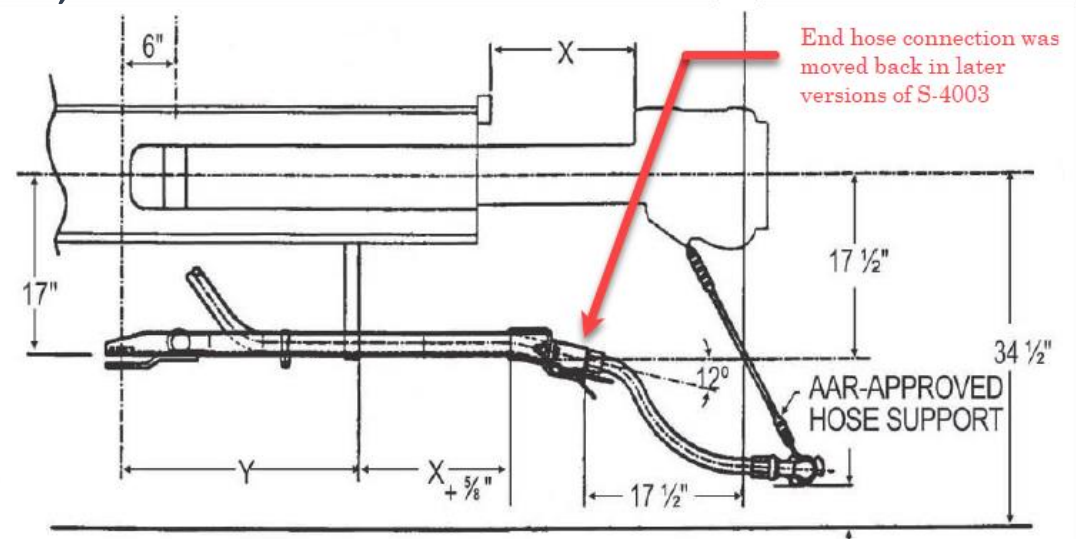


Equipment Engineering Committee

LORF Reduction Initiatives

Rule 6 – End Hose Arrangement Performance and Angle Cock Placement

- Older version of AAR Standard S-4003
 - Suspected to be overrepresented in Line of Road Failures
 - End hose connection was pushed too far forward, was revised in 2005
 - EEC is working to justify retrofits
 - Line of Road Failure database is being reviewed
 - Number of cars with arrangement being estimated
- EEC may look at other older designs for retrofit





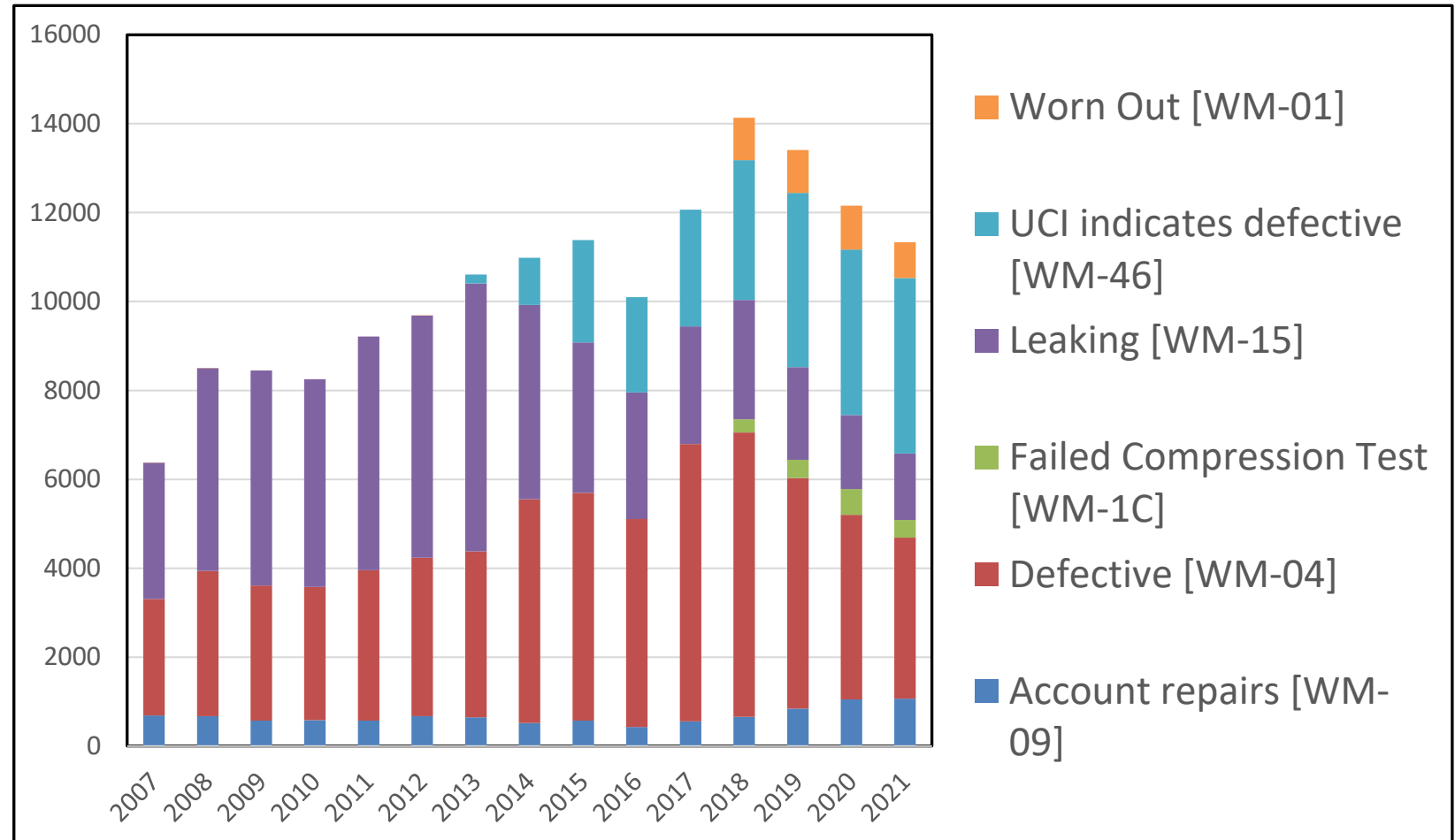
Rule 59 – Cushioned Underframe Devices

- In 2016, There were no wear related rules in Rule 59
 - Now has several pages of guidance
 - Wear on yoke and pocket wear plates
 - Coupler horn to striker contact
 - Vertical gap in pocket on E-type arrangements
 - Gage was developed for measuring wear on yokes/endcaps
 - Wear on keys and pins
 - Free slack limit



LORF Reduction – Rule 59 Billing History

- New Rules added
 - 2013 - UCI Indicates Defective
 - 2018 - Failed Compression Test
 - 2018 – Worn Out





Thank You