American Railway Engineering and Maintenance of Way Association
Letter Ballot 38 20-01

1. Committee and Subcommittee:
   AREMA C&S Committee 38

2. Letter Ballot Number: 38 20-01

3. Assignment:
   MP's revised at Spring ‘20 meeting.

4. Ballot Item:
   Ballot 38 20-01: This ballot contains the MP approved at the Spring ‘20 meeting:
   • 04.02.12 Recommended Design Criteria for Electro-Hydraulic Car Retarder

5. Rationale:
   Revised Manual Parts
A. **Purpose**

This Manual Part recommends design criteria for an electro-hydraulically operated car retarder for controlling the speed of cars in classification yards.

B. **Other Requirements**

The following recommendations should be considered:

1. Maximum velocity head removal, maximum gross weight per axle and maximum wheel diameter of the cars to be handled or other means of specifying retarder capacity.

2. Retarder operating voltage (dc or ac and frequency).

3. Foundation drawings.

4. Brake shoe type and material.

5. Controller voltage/current/power rating.

6. Rail size and section.

7. Tie size and dapping/framing requirements.

8. Tie selection and treatment specification.


10. Retarder configuration (number of active vs. inert sections).

11. Additional rail to be provided for tie-in of approaches.

C. **Design**

1. Retarder

   a. Retarder should be designed so as to properly handle cars of up to a maximum weight of 160 tons, wheel diameters ranging from 28 inch. to 39 inch. and nominal velocity head removal rating of 0.390 feet per effective beam length 5.5 feet when retarding a 160-ton,
four-axle cars with 38 inch. wheels with simultaneous application of retardation to both wheels on an axle.

b. Retarder should be so designed that it may be applied to either or both rails and shall be so constructed that it will withstand twice the maximum stress without damage to any of the parts.

c. Retarder should be so designed that shoe pressure can be applied in at least five steps.

d. Shoe pressures on car wheels should be equalized as nearly as possible to reduce the lifting effect of the retarder and increase its efficiency.

e. Means of adjustment should be provided to compensate for shoe wear with provisions for easy shoe replacement.

f. Lubrication:

(1) Moving parts should work freely, without lost motion and provision should be made for proper and convenient lubrication.

(2) If self-lubricating bushings are used, they should either be of non-metallic composite material or metallic material having a means of lubrication.

(3) Retarder supplier to outline lubrication requirements in a lubrication schedule stating acceptable lubrication products and recommended periodicity.

g. Clearances:

(1) Height of brake shoes above the top of rail with the retarder in the open position shall not exceed 2-3/4 inch.

(2) The distance between the brake shoes with the retarder in the open position shall be sufficient to clear car and locomotive wheels, but shall be not less than 6 inches.

h. Cross-bars, bearing brackets, rail chairs, shoe beams, flange guides, etc., should be hardened by flame or induction heat-treating, and/or hard surface weld and grind techniques to a specified range of
hardness. All components should be inspected and serialized in accordance with AAR M1003 specifications or equivalent.

i. Any/all factory-remanufactured retarder components shall meet or exceed all OEM specifications including dimensions, hardness, and materials. Components shall not be undersized in finished products.

j. Any/all factory-remanufactured retarder components shall be stress relieved per OEM specifications.

2. Operating Mechanism:

a. The operating mechanism should be enclosed in a substantial, metallic, ventilated, weather-resistant case. The cover should be removable and equipped with suitable fastenings for application of purchaser's padlock and, when open, should provide access to all parts.

b. The mechanism should be so designed as to permit its being firmly secured in fixed relation to the track.

c. The mechanism case should be provided with suitable cable entrance, conveniently located for access to binding posts.

d. Motor:

(1) The motor should be capable of delivering, without damage, the torque necessary for the most severe operating conditions.

(2) The motor should be suitably secured to the mechanism housing and should be easily removed from case and pump.

(3) The motor case should be provided with suitable wire entrance, conveniently located for access to binding posts, and arranged to protect wires from mechanical damage.

e. Pump:

The pump shall be properly secured to the mechanism housing and should be easily removable.

f. Hydraulic System:
(1) All lines and components must be capable of withstanding twice the system operating pressure.

(2) System should have manually controlled cut-off/release valves.

(3) All components should be industry standard devices.
   (a) The drive motor, fluid pump, oil strainer, fluid filter, reservoir, control valves, relief valves, pressure switches and fluid level gauges should be enclosed in a substantial metallic, ventilated weather resistant case.
   (b) The cover of the case should be removable and equipped with suitable fastenings for application of a padlock.
   (c) The hydraulic ram should be corrosion resistant and of such size and capacity to provide the retardation required.
   (d) The limit control switches, or other position feedback device, should be corrosion resistant and of sufficient strength and current capacity to satisfactorily operate in connection with the circuits used.
   (e) The hydraulic system should be constructed for easy and safe removal from the case.

f. Pump/Motor Coupling:
   (1) The coupling between the motor and hydraulic pump shall be of sufficient capacity at the rated motor horse power.
   (2) Provisions shall be made for alignment of the motor shaft and the pump shaft for smooth operation.

3. Controller
   a. The controller should be enclosed in a substantial metallic, ventilated, weatherproof case with doors or cover provided with a durable tight gasket and suitable fastenings for application of a padlock.
b. The controller case should be provided with suitable cable entrance, conveniently located for access to binding posts.

c. The control and protective equipment for each operating mechanism should be mounted on a fire resistant panel located in the case in such a manner as to permit access to all parts.

d. Switches for opening the power supply to the controller should be mounted on a fire resistant panel with the required power buses and binding posts.

e. Contact members, if used, should be made of corrosion-resistant metal of sufficient mechanical strength and current-carrying capacity to satisfactorily operate in connection with the circuits used.

f. Movement of the contact members should be such that they will provide a wiping contact.

g. A solid-state controller may be used instead of an electro-mechanical controller.

h. A display should be provided on the front of the controller panel to indicate the operating status of the system.

i. The panel should contain provisions for emergency shutdown and reset of the control system.

D. **Wiring**

1. Internal wiring should be neatly arranged and so located that it will not be subject to damage from normal operation and maintenance.

2. Wire for internal wiring should be stranded, insulated of suitable current rating, and of such physical strength and quality required to provide reliable service. Suitable terminations should be provided for all wiring.

E. **Binding Posts**

See Manual Part 1.4.1 Identical Items “Boilerplate” for All Manual Parts, Section C.

F. **Coil Insulation**

See Manual Part 1.4.1, Sections D.1 through D.7.
G. **Painting**

See Manual Part 1.4.1, Section F.

H. **Environmental Requirements**

1. See Manual Part 11.5.1 Recommended Environmental Requirements for Electrical and Electronic Railroad Signal System Equipment, Sections D.7 and E, with the following exception to Section E, Class A, environment: Electrical apparatus assembled shall withstand for one minute an insulation test of 1,500 volts rms between all parts of electric circuits and other metallic parts insulated there from.


4. Separate windings, which are insulated from each other, shall withstand for one minute an insulation test of 1,500 volts rms between their terminals.

5. A potential of twice the normal operating requirements at a suitable frequency shall be impressed across the windings without any excessive current flow indicating a short circuit.

I. **Identification**

Mechanism and controller should be plainly marked for identification purposes.

J. **Grounding of Equipment Enclosure**