American Railway Engineering and Maintenance of Way Association
Letter Ballot

1. Committee and Subcommittee: 11

2. Letter Ballot Number: 11-19-06

3. Assignment:

4. Ballot Item: Revision of 3.5.9 Signal Considerations

5. Rationale:
The purpose of this section is intended to be a brief introduction to considerations related to the signal system and its impacts on passenger operations. For more detailed guidance on signal systems, please reference the AREMA Communications and Signals Manual.

The efficient operation of a passenger rail system requires a centrally controlled signal system to govern the movement of trains. Wayside and/or in-cab signal systems provide authority for the movement of trains without the time-consuming process of manually receiving the authority to occupy a block of track from a train dispatcher. Signal systems create additional capacity to run more trains and generally allow for higher speeds in accordance with regulatory authority requirements.

If the proposed passenger rail improvement or operation is over an existing corridor, any improvements to that corridor will typically comply with the owning railroad’s signaling standards. For a new corridor where the passenger operator will be the owning railroad, the signaling system may be specifically developed in accordance with the needs of the operator.

Railroads employ two general types of signal systems. These include “speed” aspect systems, and “route” aspect systems. The two systems have advantages and disadvantages related to passenger track design and operation.

- A speed signaling system governs train speed through control points by displaying specific speed aspects. The advantage of this system is that the correct speed for a train can be displayed for a complex interlocking with multiple routes and turnout sizes. A possible disadvantage typically lies in the limitation on number of possible aspects for diverging speeds. For instance, there is typically a speed aspect for 45 mph, but not 60 mph. For routes featuring speed signaling, selecting a turnout with a diverging speed of 60 mph would yield little value as the signal system could only display 45 mph, unless the maximum authorized speed of the track is 60 mph.

- A route signaling system provides the same block occupancy authority as a speed signaling system, but an aspect for a specific speed for a route through a control point is not displayed by a signal. These systems display if a route is diverging (going through the curved side of a turnout) or non-diverging and the speed is governed by timetable or written instructions. The advantage of this system is a variety of speeds can be implemented for turnouts and routings. A possible disadvantage is that train speeds for complex interlockings with multiple routings may be defaulted to the lowest diverging speed as the signal system cannot easily distinguish which specific diverging route a train is to take.

- With the implementation of Positive Train Control (PTC), the correct turnout speed can be enforced using either signaling system. A wayside interface unit (WIU) at the interlocking or control point provides the routing information to the train. The onboard database provides the correct speed enforcement information for the route.

The design of track and other elements for a passenger rail system must consider the signal system needs. The correct location of control points, including turnout sizes, must be coordinated with the signal design to ensure that the intended operation of the facility can be achieved. Additionally, the physical location of signals should be considered when designing track and roadway features.

Freight and passenger systems have different signaling needs with regards to signal block spacing. Typically, freight systems favor long blocks between signals for train spacing and braking of long, heavy freight trains. Passenger systems not also serving freight trains can have much shorter blocks due to better ability to brake quickly and shorter train length. Having shorter blocks allows greater capacity to handle more trains efficiently.

At intercity and commuter passenger stations, a special consideration should be given to providing wayside “leaving” signals. These signals are placed a short distance away from the platform for the direction of
departure and allow for the departure to be made at authorized speed. If these signals are not present, operating rules typically require trains to depart expecting to stop at the next signal, which directly affects the expediting of trains along the route. Leaving signals may not apply when a cab signal system is employed.

In the U.S., all main lines hosting intercity and commuter passenger rail are required to be equipped with Positive Train Control (PTC). PTC systems provide collision avoidance and civil speed restriction enforcement. On freight railroads the system is typically deployed as an overlay to a wayside signal system. In more robust application of a PTC system, elimination of wayside signaling components are possible and train spacing can be controlled by the system, yielding even greater railroad capacity.

Additional detail on the tiered requirements for PTC systems can be found in Chapter 17-2.6.5.