NMRA

NMRA Technical Note	
CURVATURE AND ROLLING STOCK	
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1 Introduction

This Recommended Practice (RP-11) was published to coordinate the expectations of modelers with the capabilities of model manufacturers concerning the minimum radius that could be negotiated by various "classes" of equipment. In order to build a model railroad layout in the space available, curve radii must be reduced by much more than the scale factor of the scale selected, such as 1 to 87.1 for HO scale. However, such reduction in radius can be achieved only by compromising some of the aspects of the prototype which limit track curvature. The values shown below reflect a judgment of the trade-off between practical space requirements and the need to accommodate greater truck rotation and coupler swing by adjusting or eliminating underbody detail.

Modelers pick up RP-11 to answer two basic questions:

- Equipment purchase: can a specific locomotive or car run on the minimum radius of my home or club layout?
- Layout design: what radius should I design to accommodate a type of locomotives or cars I intend to run, even if I have not yet purchased them?

The tightest railroad curves built by the prototype were on streetcar lines, then somewhat broader on interurban and narrow-gauge lines. Short four-wheel cars were the most forgiving of tight curves and rigid frame locomotives, primarily steam, were the least.

2 Technical Note

In the 1992 edition of RP-11 changes were made which were driven by a need to offer specific recommendations for the most common sizes of HO sectional track, and to make the steps between classes narrower. New classes G and I correspond to 18" and 22" radius in HO scale. New classes K, M, and O divide the differences between adjacent classes, while new class Q is essentially specific to Union Pacific 4-12-2 locomotives. In making these additions, it was felt desirable to standardize the ratio of maximum rigid wheelbase to curve radius at roughly 10 ½ to 1. N scale radii were determined to the nearest 1/8 inch, while those for larger scales were determined to the nearest half inch. To accommodate modelers outside the United States, minimum radius values are provided in millimeters as well as in inches.

The maximum driving wheel sizes for each equipment class were also tabulated, as this information may be better known than the wheelbase. These values are in inches as such units were in general use in the US and Canada during the steam era.

As steam locomotives grew larger and more powerful, additional driving axles were added to distribute the weight. Some were built as "articulated" locomotives, with the driving wheels divided into two or three groups to enable them to negotiate tighter curves than the same number of axles in a rigid frame. In setting model standards, consideration must be given to overall length as well as the rigid wheelbase to determine an appropriate classification. A note in the pre-1992 edition specified that the minimum radius be increased two classes for such locomotives, compared to a non-articulated locomotive with the same rigid wheelbase. Thus, if a Pacific with 69" drivers might be able to negotiate former class L curves, a Challenger with similar drivers would be restricted to class N. In HO scale, the minimum radii are 20" and 26.5" respectively. In the 1992 and onwards

revisions the Pacific would fall in class H and to apply a similar radius to the Challenger, it would need to be increased four classes to class L. However, some articulated models allow both sets of drivers to rotate with respect to the boiler, and they may be able to negotiate sharper curves. For this reason Note 2 may be somewhat conservative. In the case of duplex locomotives with two groups of drivers and two sets of cylinders, but a rigid frame, the total wheelbase determines the classification.

On the other hand, Notes 7 and 8, allowing one class reduction for "blind" (flangeless) drivers or span bolster cars, are essentially unchanged. A greater reduction may be technically feasible, but appearance will be compromised to a degree that cannot be recommended. The application of these notes has been restricted to 15-foot wheelbase locomotives and 50-foot cars or greater, without diaphragms.

Truck mounted couplers on freight cars have been broken out as a separate column. Although not representing prototype practice, they find some use in entry level equipment where they permit slight reductions in radius. The maximum length of freight cars with body mounted couplers has been set at 36' for class E.

A number of recent passenger car models incorporate full width diaphragms. The edges of these diaphragms must compress on the inside of the curve to enable the car to negotiate the curve, and to the extent they spread apart on the outer edge the appearance will be unrealistic. Some recent models represented articulated trains, most of which also had full width diaphragms. It is recommended that either of these types be run on class N or greater track, similar to the steam engines which pulled such trains.

Reduction in turnout frog number for blind flanges or truck mounted couplers has been eliminated. However, a number 4.5 frog is now recognized, which may be applicable on industrial track. It is noted that there are relatively few turnout frogs commercially available. New recommendations for frogs used on equilateral (wye) and curved turnouts have been added. The former note concerning use of turnouts on three rail track has been modified to apply to center third rail for power supply, primarily found on tinplate layouts. Where outside third rail is used gaps can be avoided by placing third rail sections adjacent to both outside (non-frog) running rails. The legacy practice of using outside third rail pickup even for locomotives based on steam or diesel prototypes is now too rare to be considered in this kind of Recommended Practice.

The system of letter keys to identify equipment has been retained, but the Former Classification Keys values introduced by the 1992 revision were removed in the 2026 revision.

Civil engineers measure curves in degrees of curvature in 100 feet, measured in a straight line between two points on the center line of the track (a "chord"). If both the radius and the chord are measured in scale feet, model curves can be measured in the same way down to a minimum radius of 50 feet. At this value the curve diameter is 100 feet, and no chord can be shorter than this value. Classification Key B represents this value and Key A, would be about 72% of this value.

In section 2.2 Track Dimensions, the value for the Curve Degrees of Classification Key A has been set to "(undefined)" as the chord for a 36' radius curve would be below the 100 feet chord length. Prior to the 2026 revision of RP-11 this value was left blank.

3 Document History

Date	Description
April 2017	First Revision by Alex Schneider
February 2026	Second Revision by Yaron Bandell

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