PNW Free-mo N

Standards and Recommendations

Original Issue February 2018

OVERVIEW

The PNW Free-mo N group is a model railroading organization based in Western Washington and Northwest Oregon. We operate N scale trains and equipment on modular layouts. The PNW Free-mo N Group meets periodically to bring our modules together and run trains.

Free-mo is a modular scale railroading standard designed for individual modelers that specifies bench work, track work, scenery, and digital control intended to raise-the-bar for N scale modular railroading. The standard promotes, and even forces, prototypical appearance and operations by using a single main line traversing the center of the module resulting in prototypical point-to-point or loop-to-loop configurations and operation.

This document contains standards that must be followed to ensure modular compatibility and *recommendations*, in italics, that are intended to give guidance to the module builder when options are left up to the module builder. These standards are subject to revision as the need arises due to changes in technology and from lessons learned.

DEFINITIONS

Module

Any component or group of sections of bench work that are meant to be operated as a single unit in a fixed configuration. A module can have any number of sections.

Sections

A component of a module, complete with frame work, legs, track, scenery, etc. Except where otherwise noted, standards for module end plates do not apply to section interfaces, as these are considered to be internal to the module.

Endplate

The endplate is the standardized end surface of a module, usually two per module, that join to another module.

OBJECTIVES

The Free-mo standard has the following objectives in mind:

- To promote hi-fidelity prototypical scale model railroading.
- To ensure reliable track and electrical operation.
- To encourage visual continuity between modules.
- To encourage a loose association among individuals, free from membership dues, officers and titles.
- To keep the standard specifications to a minimum without compromising the previous objectives.

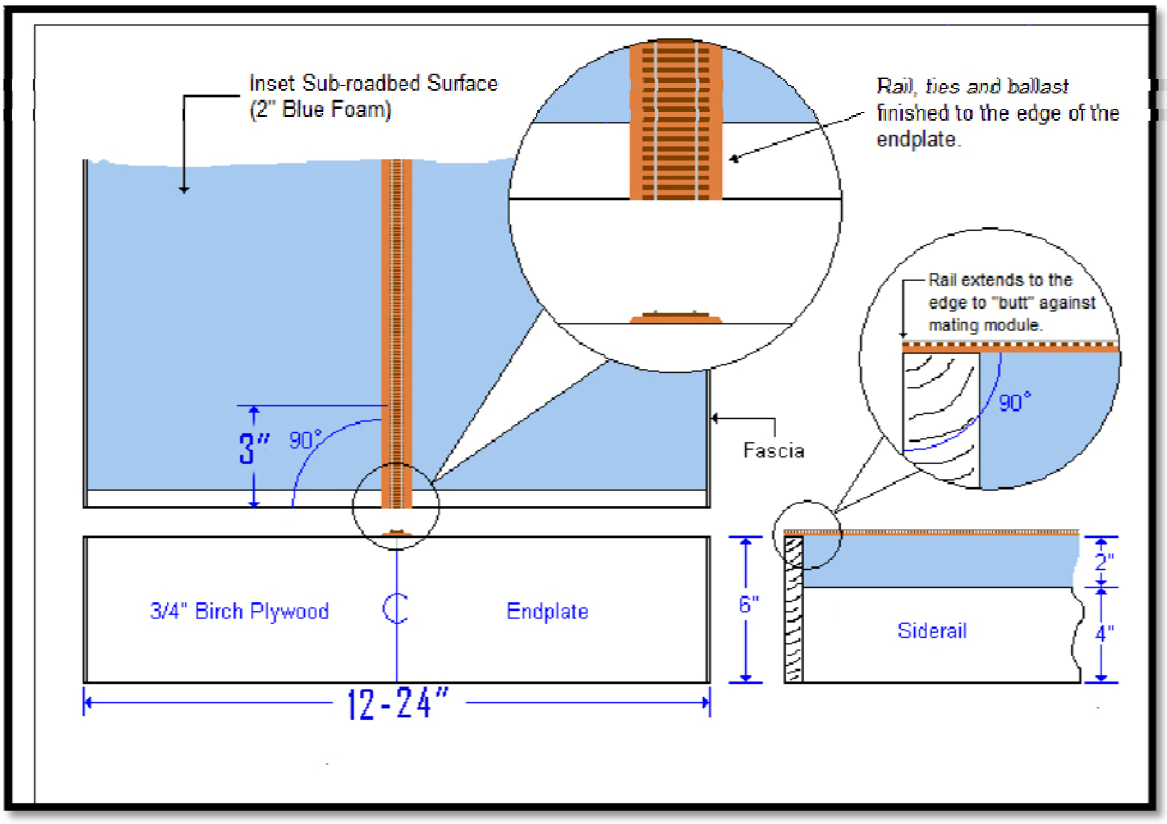
MODULE CONSTRUCTION

Framework

The module frame should be constructed of dimensionally stable materials to ensure proper alignment with other modules under all possible environmental conditions. Common sense construction techniques should apply. Materials and joints should be flat, square and true.

Endplates

Standard end plates are to be 6 inches high by 18 inches wide and made of 3/4 inch birch plywood or an equivalent material that resists warping. Alternate width end plates from 12 inches to 24 inches wide are allowed. Modules are joined together using clamps or bolts and nuts. To allow room for fingers tightening the endplate fasteners, keep the lower surface of endplate clear of obstructions. Refer to the diagram below.



Legs & Bracing

Each module shall have legs that support the module free-standing. Module height adjustment can be accomplished by the use of adjustable feet. Each leg must be vertically adjustable plus and minus 1 inch to compensate for uneven floors. Feet with floor surface protection shall be used when needed. Nominal and minimum height of rail head from the floor shall be 50 inches. On modules with grades the maximum height of the rail head shall be 62 inches above the floor and the elevation of the high end shall be some multiple of 3/4 inch above the low end.

Surface

Module surface treatment is left to the discretion of the builder. The sub roadbed surface shall be sturdy enough to prevent sagging over the length of the module. *Many modules are created with a base made from 2 inch thick extruded polystyrene foam panels (pink or blue in color) supported by a frame made of plywood or dimensional lumber. Using foam can help reduce the weight of the module. Plywood and/or plywood/homosote combinations can be used for the sub roadbed instead of foam if the modeler desires.*

Fascia

Each side of the module shall have a finished fascia that fully covers the side. The top edge of the fascia shall be contoured to match the scenic topography of the module. The fascia shall extend down to the same depth as the endplate, that is 6 inches below the module top surface. Modules that have scenery that extends below the bottom edge of the endplate, such as a canyon scene, should have the fascia covered in a manner similar to a standard depth module. The fascia shall be painted a flat or satin black color.

Skirting

The sides of the modules facing the public shall have a black skirt attached for public shows. The bottom edge of the skirt shall be 1-2 inches above the floor to prevent dragging on the floor. The skirt will be a black cloth.

Track & Ballast

Main line track shall be code 55 nickel-silver track. Main line minimum radius shall be 22 inches with at least 6 inches of straight track between reverse curves. For special purpose modules, such as a balloon track, an 18 inch radius may be used. Industrial areas off of the main line may use a radius less than 18 inches.

Main line roadbed must be 1/8 inch cork or equivalent. Track shall be weathered and ballasted. *A gray ballast material such as Arizona Rock & Mineral #130-1 Northern Pacific medium gray granite is recommended. Other colors of ballast are allowed when appropriate for a specific scene, such as an industrial area.*

Mainline track shall be centered on the endplate width and perpendicular to the end plate, straight, and level for at least 3 inches from the outside edge of the endplate. Main line track ballast shall be continued to the module end for good appearance.

Note that endplates are not required to be perpendicular to the rest of the module, and if an angled track exit is desired the end plate should be constructed at an angle to the length of the module to facilitate the track being perpendicular to the endplate.

Main line maximum grade shall be 2.0 percent (1/4 inch per foot).

Mainline track shall be placed no closer than 6 inches from the track centerline to the edge of a module. Yard or industrial spur tracks shall be placed no closer than 4 inches from the track centerline to the edge of a module.

Mainline track and ties shall be laid to the end of the module using the European method of inter-module track alignment and secured using a strong glue or a some strong mechanical method. *Soldering the rails to Gap Masters or PC board ties is recommended for attaching track at the endplate.* Main line track ends shall be squared and filed back slightly from the endplate face to aid in track end damage prevention.

Main line turnouts shall be at least #5, with #7 preferred. High speed turnouts shall be at least #7 and dual track cross-over switches shall be at least #10 turnouts. Turnout frog, points and point rails shall be powered in a manner that does not rely solely on the contact between the points and the stock rails.

Turnout control can be electrical with fascia mounted controls, mechanical with fascia mounted push/pull rods, or manual using ground throws. *Some method of positive locking of the switch points is recommended.*

Multiple Mainline Tracks

Parallel mainline tracks shall be placed 1 1/8 inches (1.125”) apart – centerline to centerline. The centerline between the two parallel tracks must be placed on the module endplate centerline. Parallel tracks on a curve shall be placed in accordance with NMRA standards for equipment clearance. A spacing of at least 1 11/32 inches (1.344”) on a 22 inch radius curve is recommended.

Clearances

Clearances for all tracks, tunnels, and platforms shall be based on NMRA standard for N-scale.

WIRING AND ELECTRICAL

DCC Documentation

Refer to the PNW Free-mo N Group DCC manual for specific information about DCC equipment, deployment, and module and LocoNet wiring practices.

Track Bus

Track Bus wire shall be stranded 12 gauge spanning the length of the module between the endplates and should be uncut. Feeder wires should be connected to the track bus using suitcase connectors. A short length of 18 gauge wire should be used connected to the track bus and used as the connection point for the track feeder wires. The track bus wires shall terminate near the top center of the endplate with a pair of Powerpole connectors and extend approximately 12 inches below the bottom edge of the endplate. The

track bus wire pair shall be twisted approximately 3 turns per foot to reduce EMF/RF interference. Electrical accessories within modules shall not use the DCC track bus power since that will reduce the power available to run locomotives.

A pair of RED Powerpole connectors shall be used for the Track Bus to distinguish them from those used for the Accessory bus and to emphasize that this is not ordinary wiring. The Powerpole connectors for the track bus shall be stacked vertically (hood up, tongue down). The top Powerpole shall connect to the left rail, as you face the endplate, and the bottom Powerpole shall connect to the right rail.

A short length of 22 or 24 AWG feeder wire shall be used to connect the rails to the track bus. Each individual rail section should be connected by a feeder wire.

Accessory Power Bus

A pair of 12 guage stranded wires for accessory power shall extend full module length and extend 12" below the module with a pair of Anderson Powerpole connectors on each end. The accessory bus wires should run the entire length of the module and be uncut. Suitcase connectors should be used to tap in for accessory power connections. These wires shall be colored different than the track bus wire. A pair of BLACK Powerpole connectors shall be used to distinguish them from those used for the track bus. The Powerpole connectors for this accessory bus shall be stacked horizontally (tongue-to-tongue and hood-to-hood).

It is intended that this accessory bus be used to power turnout motors that control track switches but it may also be used to power other accessories on modules such as structure lighting, signals, animation, and the like.

Electrical accessories within modules shall not use the DCC track bus power since that will reduce the power available to run locomotives.

If the Accessory bus is powered by AC, it may be used directly or may be rectified and regulated to DC as well. One solution is to use a bridge rectifier and voltage regulator. Refer to the DCC manual for more information. This option is at the discretion of the module owner.

DCC Throttle Bus (Loco Net)

DCC has been chosen as the standard for locomotive control. Each module shall be equipped with a Universal DCC Throttle Bus (Loco Net).

The Universal DCC Throttle Bus will work with NCE, Digitrax, Lenz and certain other DCC systems utilizing a 4 or 6-wire bus architecture. The control bus uses a simple 6-wire data cable with 6P6C RJ11 connectors and 6-conductor flat telco/network cable. Refer to the DCC Universal Bus Construction and Components section of the DCC Manual.

Each module shall, at the minimum, be equipped with a single pass-through cable equal to the length of the module plus 12” on each end and one F-F coupler to allow for interconnection to the adjacent module.

Modules longer than 4 feet shall have a Universal Throttle Panel (UTP) mounted on each side of the module for hand-held DCC throttle connection. The UTP terminals for the track status LED shall be wired to DCC track bus. All modules regardless of length with sidings or spur tracks intended for the setout/pickup of cars at sidings shall have UTPs on both sides.

SCENERY

Main line track shall be ballasted with a fine gray material. *Ballast material made from real rock such as that available from Arizona Rock and Mineral should be used, refer to the Track & Ballast section above.* Modules shall contain some form of scenery hiding the bench work. The module top surface shall be painted a base color of medium brown. *A fudge truffle color (101-115, 111-1Y8, 113-1Y27.5, 116-25.5) available from Home Depot and Lowes is recommended.*

Landscaping along the module ends must be designed to flow smoothly into adjacent modules - avoid features such as roads, lakes, and so forth from running against the module ends. *Use of a generic grassy terrain is suggested.*

EQUIPMENT

Each locomotive shall be equipped with an NMRA compliant decoder. All decoders shall be programmed to an address other than the default 03. Long address shall be used when possible. Analog stretching is disabled in the command station, therefore all decoders shall have CV29 configured with Analog Mode Conversion set to 'OFF'. Locomotive and stationary decoder address practices are covered in the DCC Manual.

Rolling stock wheels, trucks and weight shall meet or exceed NMRA Standards and Recommended Practices. *Metal wheel sets are recommended.*

All rolling equipment shall be marked on its underside with the owner's colors as listed in the database at the PNW Freemo-N Group Site.

REVISION HISTORY

February 2018 – Original Issue