

Bremerton Northern Model Railroad  
Kitsap Western Division  
HO Gauge Sectional Layout (2009)  
STANDARDS

References:

- 1) Introduction to Module Standards & Recommended Practices –NMRA Bulletin March 1990-
- 2) NMRA Standard MS-1.0, Module Standards-Standard Gauges
- 3) NMRA Recommended Practice MRP-1.3, Electrical Recommend Practices, All Scales, Modules
- 4) NMRA Standard S-7, Clearances
- 5) NMRA Standard S-8, Track Centers

Background:

Bremerton Northern Model Railroad, Kitsap Western Division, (BNMR-KWD) has had a quasi-modular layout for over 25 years. The layout did not follow NMRA standards as for electrical or track spacing. However, the layout served the club well, providing hours of entertainment for the members and the general public. Because of the quasi-modular design, various layout configurations could be assembled based on the available space. BNMR-KWD has displayed their layout with operation at county fairs, model railroad conventions, model railroad shows, senior retirement centers and assisted care facilities.

Because of wear and tear on the current layout, planning for a new layout was begun in 2005. Because of our operating preferences, it was decided to follow NMRA Module standards where possible, but not be restricted to those standards. We would follow the track spacing and location standards for the two mainline tracks where our design did not deviate from them significantly. The branch line track would not follow the module standards. The layout is considered to be a sectional layout, though different configurations are possible by leaving out pairs of sections. Because of the non-conforming branch line, the addition of inserted modules is not planned.

References (1), (2) and (3) were considered but not followed because of the desire to increase the width of the sections to 28". That width of section was selected as the maximum with based on trailer loading width. The electrical systems are reconfigured to provide greater capacity and reliability. For example, for the 120 VAC circuit, the sections use two duplex receptacles interconnected with AWG 12/3 Romex on each section and a flexible AWG 12/3 cord between modules instead of power strips. Another deviation is the use of 7-pin RV connectors to connect the track busses in lieu of the suggested TRW-Cinch connectors.

The direction convention used is North is looking outside the layout from inside. The north frame rail is always the outside of the layout. The yard tracks run north and south.

Section table construction:

- 1) Except for the Engine Terminal, the maximum dimensions of the straight sections are 28" wide and between 48 and 96 inches long in 24" increments. The maximum width for the engine terminal is 39". The outside corner sections have six sides, fit in a 5'x5' square, and are to be a maximum 41" wide across the two parallel sides and with interface surfaces of 28". The inside

(reverse) corner is constructed of two individual rectangular subsections, each 28" wide and one 36" long and the other 64" long.

- 2) The frames of the section table are to be constructed with birch plywood cut to 4 inch wide planks lengthwise from the sheet.
- 3) All joints are glued.
- 4) Plywood, between 1/8 and 3/8 inch thick are glued in a dado groove 1" from the top of each frame rail. The plywood may be cut out for lightning purposes provided adequate foam support and attachment surface remains.
- 5) The outside (north and south) frame rails are full module length and are glued to the end frame (interface) rails.
- 6) Cross bracing with 3/4" x 1 1/2", minimum, material is to be provided approximately every 2 feet on the straight modules. Providing additional bracing is optional.
- 7) The outside curve modules are to have 3/4" x 1 1/2", minimum, material bracing below the plywood panel with the main brace going the longest distance, corner to corner. Additional bracing runs from the other four corners to the main brace.
- 8) All wood is sealed with "Benite", primer and paint prior to attaching foam or electrical components. Only "Benite", no primer or paint, is to be used at the interface surfaces to prevent sticking between the sections.
- 9) Where seal is disturbed for installation of items such as switches and RV connectors, wood is resealed to prevent moisture absorption.
- 10) Unicellular foam, 1" thick is glued on top of the plywood inside the frame rails.
- 11) A second 1" foam base is provided for the final roadbed base. This foam may either be an additional sheet of foam or it may lie only under the track, in strips approximately 2" wide for single track. This second layer is added for scenery purposes only, allowing approximately 16 scale feet for gullies.
- 12) Under the track roadbed at the sectional interfaces, a 1" x 3/4" x 2" wood reinforcement is glued to protect that area. The foam is cut to provide space for the reinforcement.
- 13) Interface alignment and clamping is facilitated by accurately placed sleeved holes in each end and bolt assemblies. Because of design changes, two systems are used. In both cases, a template is used to drill the two holes for the sleeves. The sleeves are glued in the holes.
  - a. For the Engine Terminal and yard modules, the bolting system consists of 1/2" x 2 hex head bolts, washers and wing nuts. The alignment holes are 5/8" D and approximately 5-13/16" and 22-1/4" from the west face and 2-5/16" below the top of the frame rail. A metal sleeve is 1/2" ID x 3/4" long. On the inside of the interface rail frame and at each hole, a 1/2" D washer is attached using "JB Weld".
  - b. For the main layout modules, the bolting system consists of 3/8" x 2-1/2" thumb screws, washers and T-nuts. The alignment holes are 1/2" D and approximately 4" and 24" from the north rail and 2 1/4" from the top of the end rail. On the inside of the west end frame and at each hole, a 3/8" D washer is attached using 3M double sided foam tape. The T-nut is attached at the east end.

#### Sectional Supports:

- 1) Sectional supports consist of “saw horses” at each of the interfaces of two modules. Supporting the interface are two height adjustable channels approximately 1 ¾ inch between the sides of the channels.
- 2) Horses are approximately 24” wide and provide height adjustment of approximately 2”.
- 3) At the midpoint of adjustment, the mainline rail head is 38” above the floor. At that point, the branch line rail head height varies between approximately 40” and 45”.

#### Track standards:

- 1) References (2), (4), and (5) as they apply with exceptions as noted.
- 2) Mainline and yard tracks are Code 100 “nickel-silver” rail. Branch line tracks are Code 83 “nickel-silver” rail.
- 3) All rail joiners shall be “nickel-silver”. Insulating gaps shall be cut in the rail except between turnouts, where plastic rail joiners shall be used. When insulating gaps are cut in the rail, they shall be filled with “JB-Weld” and filed to conform to the rail head.
- 4) Gap locations shall be marked on the roadbed, adjacent to the gap.
- 5) Turnouts are commercially available. For mainline turnouts where high speed traffic may take the diverging route, the minimum size is #8. All other applications, except the wye, the minimum is #6. Modification of commercial turnouts is kept to a minimum.
- 6) Minimum radius for mainline is 40” and for yard entrance is 31”. The minimum branch line radius is 30” except for the reverse corner and the engine service track where it is 23” and 25”, respectively.
- 7) Track is fastened to cork roadbed with adhesive caulk. Where additional fastening is needed, the ties are drilled and steel straight pins are driven through the ties, roadbed and into the foam.
- 8) Minimum parallel track centerline spacing is 2” for tangent (straight) track and 2 ½” for curved track. Curved track spacing is obtained by starting with a simple 44” radius curve (no cubic curve spiral) on the outside track and using a cubic curve (approximate) to ease into the inside 2 ½” parallel track.
- 9) Tangent track length between the end of the bridge track at each sectional interface and the first deviation is nominally a minimum of 2 ½”. Exceptions to this are to be approved by the layout committee or Layout Construction Boss. In no instance is there to be less than 0.3” tangent track between the bridge track and a turnout or the beginning of a curve.
- 10) Bridge tracks between interfaces are, with few exceptions, to be constructed from commercial 9” straight sectional track using “quarter” rail joiners per the “Barrett” design. At each end, the molded spikes are to be cut away approximately 1” from the end of rail to provide spring without exceeding the elastic limit of the rail. The rail joiners are to be placed on the module track rails so that the open portion of the joiner is to the inside of the track rails. Exceptions to this design are used on the inside corner and the wye.
- 11) Bridge tracks on the inside corner and wye are, by necessity, built in place on 3/16” plywood base in lieu of cork roadbed. The ties and plywood are drilled to accept shortened straight pins for maintaining curvature. Rails and tie strips are cut appropriately after rail has been fastened

in place and taken a set. Following removal of the 3/16" plywood with track, the bridge track is prepared similar to the straight bridge tracks, above.

- 12) There are no designed grades for the mainline and yard tracks. Branch line track has grades of approximately 3% to raise the track above the mainlines and yard entrance tracks except for the yard to branch line interchange which is approximately 4% and 2 feet long.

#### Electrical standards, 120 VAC (non-yard sections):

- 1) Each section shall have at least two standard duplex outlets in plastic boxes placed on the south frame such that the cord from the east box can be plugged into the west box for traveling. As a result, for example, the two duplex outlets on an 8' section will be close to but less than 2' from each end.
- 2) The cord out of the east box shall be AWG12/3 approximately 5 feet long with a heavy duty plug at one end.
- 3) The duplex receptacles shall be connected with AWG 12/3 Romex wire. The Romex run is to be placed away from the south section frame to allow for installation of switches on that frame.
- 4) A light is to be hard wired to the west receptacle to indicate power is available in the module.
- 5) Power entry to the layout is to be protected by a ground fault interrupter (GFI) at each layout setup.

#### Electrical standards, 120 VAC (yard sections):

- 1) Each section shall have at least two standard duplex outlets in plastic boxes placed on the west frame such that the cord from the north box can be plugged into the south box for traveling.
- 2) The cord out of the north box shall be AWG12/3 approximately 5 feet long with a heavy duty plug at one end.
- 3) The duplex receptacles shall be connected with AWG 12/3 Romex wire.
- 4) A light is to be hard wired to the south receptacle to indicate power is available in the module.

#### Electrical Standards, Track Power:

- 1) Common rail system is not to be used.
- 2) Each line is to be capable of operating using either DC or DCC power source. Selection of the power source is made by switching from one to another, independently at the point of power supply connection.
- 3) Major divisions of operation are North Mainline, South Mainline, Branch Line, Yard and Engine Terminal.
- 4) Main busses for track power are to be color coded per schematic and AWG 14 stranded wire. Pairs of color codes wire are to be twisted together to facilitate wiring and troubleshooting circuits.
- 5) Through buss wires are to be approximately three (3) feet longer than the section they service. The east end of the buss is to have a "car end" 7-pin RV connector and a mating "trailer end" connector on the west end. The "car end" connectors are modified by removing the door and trimming to allow insertion into a 2" diameter hole that has a 3/16 round over on the outside of the frame rail and sealed. The "car end" connector is installed inside of the layout's south

section edge approximately six (6) inches from the east end of the module. Should additional connections be required, a similar reversed installation is made on the west end.

- 6) Track leads are to be red (north and west rail) and yellow (south and east rail) AWG 20 stranded soldered to the outside of the track rails approximately 8" (mainline tracks) to 15 " (branch line tracks) long and soldered to AWG 18, or better, color coded and twisted pair feeder wires which are in turn soldered to the appropriate buss wire.
- 7) Track power control switches are located on the south rail, near the middle of the track controlled. Switches are mounted on 1/8" 5-ply board and mounted through a 1 5/8"D hole and a ¼" thick piece on Masonite, or equal. The Masonite is used to prevent the switch lever from sticking out beyond the frame rail. Prior to installing the switch, the hole is to be rounded with a 3/16 R round over and sealed.
- 8) Yard track power control switches are mounted on 3/16 thick plywood panels mounted to the yard and engine terminal surface.

#### Scenery:

- 1) Scenery is to be light weight construction and durable.
- 2) Scenery is to depict Western and Eastern Washington, blending from one to the other around the full size layout.
- 3) The top of backdrop boards (sky boards) are to be 14" high above the section frame rail on all sections except the yard and engine terminal.
- 4) The top of plastic "glass" sections are to be 10" high above the section frame rail on all sections except the yard and walk through (Geezer Gulch) sections. The engine terminal section with turntable shall have "glass" on two sides and they may be between 4 to 8" high above the frame rail.
- 5) Except for on the engine terminal, any trees, structures, or other scenery, that extend above the line between the tops of the backdrop and "glass" shall be easily removable to prevent damage while stowing module and traveling. The location of any such scenery shall be plainly marked for reinstallation. It is recommended that all such scenery extend at least 1" above the line so that they may easily be chosen for removal. If at all possible, removed scenery pieces shall be stored on the section. All removable pieces shall be labeled with the name of the section as a minimum.