An Introduction to Free-mo, Part 2: Building a Platform for Track and Scenery

By Alan Ashton and Frank Wilhelm with contributions by Jerry Barsness and Mike Tietz

Disclaimer. This article and those that precede or follow are not intended to be a substitute for reading the official Free-mo standards for HO scale that can be found at http://www.free-mo.org/standard. This and other articles published herein do not represent any attempt to cover all of the standards. Our primary purpose is to provide a starting point for new Free-mo modelers and to share the experiences of current modelers as they went through the process of building their first modules. The author(s) also wish to acknowledge that some clubs and Free-mo groups have added ñlocalò standards that go beyond the ñofficialò ones. We have made no effort to review or include such ñsuper-standardsò but want to recognize that they are often valuable and worthy of your consideration. That said, let us beginé

As you consider building a Free-mo module, one of the first things that you will dream about is the size and shape of your platform. You should build strong and light, and no larger than what you can move yourself. Consider the following before setting out to buy materials or begin construction:

- What is your budget?
- How will you transport your layout modules?
- Where will you store your modules?
- How will your module fit with other modules?
- Do you want to emphasize scenery or operations?

Free-mo modules can take many shapes and sizes but to connect with other modules you must comply with some simple and basic standards.

Endplates

The *endplates* define the point at which modules are joined. For both functionality and appearance, the width of each module at the endplates must follow the standards. A single-track main line must have a 24-inch width (S2.2) and a double track main line module must have a 26-inch width (S2.3). These measurements *include the fascia* so take that into account when you are cutting the endplates for your module. If you mount your *side rails* on the outside of the endplate, those will also need to be included in the width calculations.

Both double and single track endplates are to measure 6-inches tall (S2.2 and S2.3). The measurement is taken from the bottom of the end plate to the top of the *platform deck* but not the track at the end plate. Here again, if you are installing a base for your scenery in the form of plywood where the plywood is *on top* of the end plate, the height measurement must include the thickness of the plywood. There is an additional discussion of top-side materials below.

Endplates should be high quality 3/4-inch birch plywood or ñequivalentò (S2.1) A recommended practice is to avoid the use of dimensional lumber because of warping and cupping with age and environmental changes (RP2.1.1). If possible, try to avoid the use of dimensional lumber *nearly everywhere* as you build your modules.

Are there exceptions to the width requirements? Yes. Where needed for specialized trackwork or scenery, ñmini-moò (or mini-modules) may be incorporated in a setup. These modules may be *narrower* than those described above but are considered to be a sub-set of the Free-mo standards (S1.5.3). Other standards do apply.

There should be a ñclearance zoneò on the inside of each endplate to allow modules to be clamped together. C-clamps are commonly used but that is not a requirement. The clearance zone is centered on each endplate and extends upward two inches. The zone width is not specified but an allowance of six inches (or more) should be adequate.

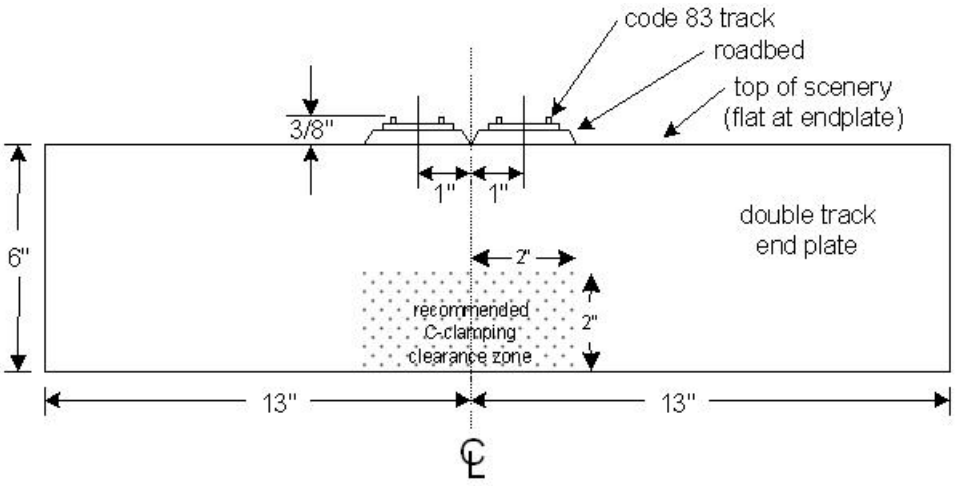

Figure 1. Diagram of two track Free-mo endplate borrowed from the Official Standard.

The clearance zone will take some abuse as modules are repeatedly attached so adding a piece of Masonite® or other replaceable material to define the zone might be a good idea.

Side Rails and Fascia

In its most basic and elemental form, a Free-mo module can take the shape of a simple box. Side rails can be cut from plywood and may be mounted inside or outside of the endplate. At this point you should begin to consider the overall weight of your module. The material that you choose for side rails must strike a balance between strength and effort required to move your module from place to place. If you choose to use, say, 3/4-inch plywood for the side rails, you could save a significant amount of weight by cutting away part of the material (think of the interior of an aircraft wing) without sacrificing too much strength. The same could

> Jerry says: When building rectangular modules, measure from opposite corner to corner. If the dimensions are equal, then the corners are square. Also check to make sure the corner reinforcing blocks are square; 2ò x 2ò stock purchased at home centers is not always square. And plywood is expensive! Carefully lay out your plan to ensure that you are making as few cuts as possible.

be said for cross bracing, an essential element to consider for modules exceeding four feet in length.

The most common material for fascia is probably tempered hardboard (Masonite®). The thickness of the fascia is not specified but, as mentioned above, you must take the thickness into account when cutting your endplates. Weight is also a consideration. If you have side rails that are honeycombed then the fascia adds a bit of strength.

The official standards do not provide much guidance regarding fascia and, in fact, do not explicitly require it. When used, module fascia color must complement scenery and not draw attention from the scene (S6.2).

Finally, remember that all Free-mo modules must be operable and viewable from both sides (S2.11) and you need to plan for a Digitrax UP5 (LocoNet Universal Interconnect Panel) or equivalent on both sides of each module (S4.12). We will more fully discuss that requirement in a later article.

Reinforcements

Do not underestimate the stresses placed on your module. Torque will be applied as you move your modules into and out of vehicles or trailers, and as modules are connected at setups. The legs can also increase twisting forces as modules are moved about. The longer the module, the more you should consider cross-member supports and diagonal bracing to prevent racking.

A good practice is to add corner bracing as you construct your module. Corner bracing can be as simple as adding 2-inch by 2-inch blocks. Just make sure that the corners stay square as you add the blocks. Of course, if you have angled ends as described below, the blocking material must have the appropriate angle.

On a four-foot module, the addition of simple perpendicular bracing for the side rails can add stability. For longer modules, consider diagonal bracing similar to that shown in Figure 2.

Figure 2. Diagonal bracing and solid top surface at the endplate add considerable strength to longer modules. (Frank Wilhelm photo)

There is a recommended but generally undocumented practice that you should definitely consider. Many clubs and groups construct their modules with a solid piece of plywood extending 6-inches from the top of the endplate. The standards state that the sub-roadbed must be 1/2-inch plywood, or equivalent (S2.4). The standards also state that through route track must be perpendicular (S3.5), straight and level for six inches from the endplates (S3.6). If you are constructing a module that has solid plywood topside then you should easily meet these requirements. If you are using other materials such as spline or extruded foam insulation (to save weight) then solid plywood for six inches from the endplate will help keep corners aligned and prevent a swayback module once the

track and scenery is installed. It also ensures a dead flat surface at the module end to prevent óski jumpsô track that is not perfectly level at the end of a module ï and causes large vertical displacement in engines and rolling stock resulting in unintentional uncoupling or derailments.

Leg Pockets

Each module should have at least four legs and be capable of standing on its own (S2.8). Exceptions may be made for mini-modules but those options are not discussed here. Beyond the need to be free-standing, the standards do not specify how legs are to be constructed or be attached to the module. Two methods are common: leg pockets and fold-down leg assemblies.

Figure 3. Leg pocket with key-hole lock. Also, note corner brace. (Alan Ashton photo)

Leg details will be discussed in a later article but if removable legs are your choice then installing the pockets during construction of the platform is a very good idea. If you opt for folding legs you should design a solid area on the bottom side of the platform to which you can attach the leg brackets. For ease of construction, cost, transportation and adjustability, leg pockets and removable legs may be your best option.

The leg pockets must withstand considerable stress during construction and when modules are being connected at events. A simple but very strong leg pocket can be constructed using 3/4-inch plywood cut from the same stock that you used for the endplates. For strength, use wood glue in addition to nails or screws to make each pocket. Secure them to the frame (side rails) using similar materials.

Top-side

Now we come to what happens on the scenery base. The simplest method to cover the top may be to cut a piece of 1/2-inch plywood or equivalent to conform to the shape of your module. This may be easy and add strength but will add considerable weight to the module. You can reduce the weight by ñcookie cuttingò and removing some material where there are no track or scenery elements that require a firm plywood base.

Alternative construction methods include spline (using wood strips or Masonite®) or extruded foam insulation. Spline has the advantage of making easements easier and also saves weight. Foam insulation provides an easy surface on which to model track and scenery and saves weight. Some groups have reported issues with foam shrinkage resulting in retirement of modules from active use because track standards could no longer be met. Recommendations are to only use foam for the scenery base, and use wood or spline for the rail sub-roadbed.

The standards do not specify which material(s) you should use, but do comment on the need to reinforce foam insulation to prevent sagging and flexing (S2.4).

Curves

One of the really interesting elements that Free-mo allows is very large radius curves. The standards say that ñcurves on the through route of a mainline module shall be appropriate for mainline operation of contemporary long carsò, but S3.12 also states that the minimum permitted curve radius on a through route of a mainline module is 42 inches which includes through track sidings and other tracks where through traffic will run. Large radius curves are seldom possible on home layouts and even on many mid- to large-sized layouts. Even a gentle bend adds interest and realism at a Free-mo event.

While 42 inches is the minimum radius on mainlines, the recommended practice (RP3.12.1) states that 48 inch and larger curves are preferred.

The introduction of large radius curves does place some restrictions upon module design and construction. For example, it is probably not practical to have a curved mainline on a single four foot module and still have the track aligned at both endplates. But through the coordination of two or more *adjacent modules* it can easily be accomplished. The most common method for introducing curves is to angle your endplates.

Angled endplates

The Free-Mo (free module) concept allows you to build any size and shape of module as long as the endplates meet the standards. This means the shackles of square dominos are off, and you can have angled endplates which allows the introduction of sweeping curves, not only in track but in the flow of the modules as well. This is strongly encouraged by participants to have setups and mainline flow more prototypically and avoid long dead-straight runs of mainline (Figure 4). As you dream and design, there are a couple of things to keep in mind with regard to the standards:

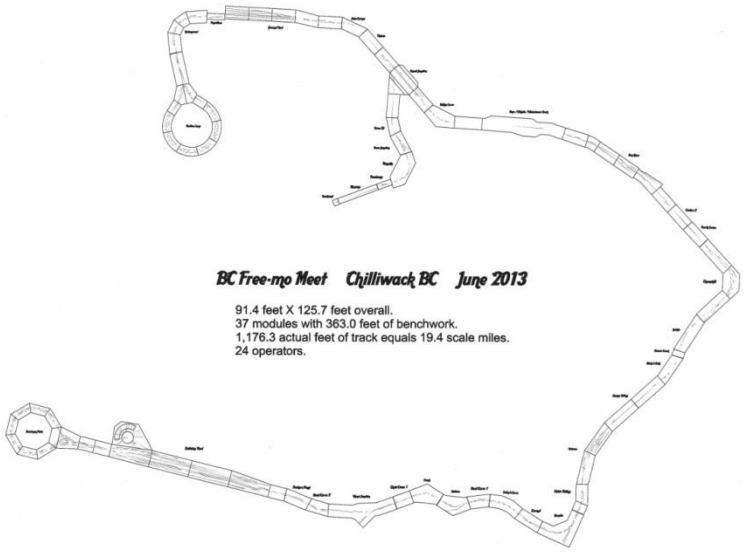

Figure 4. A Free-Mo setup diagram showing random flow of modules because of modules with angled endplates. (Chilliwack, BC)

- The steeper the angle, the narrower the module (see Figure 5)
- S3.2 ñThe centerline of the all tracks shall be 4 inches or more from the sides of the module at all timesò
- S3.5 ñTrack on the through route must be perpendicular to the endplate for 6 inches from each end of the moduleò
- S3.6 ñTrack on the through route must be straight and level for 6 inches from each end of the moduleò

- S3.12 ñThe minimum permitted curve radius on a through route of a Mainline Module is 42 inches. This includes through track sidings and other tracks where through traffic will run.ò
- Flat face joints are strong and neat. Match angles on all pieces you join. (see Figure 6.)

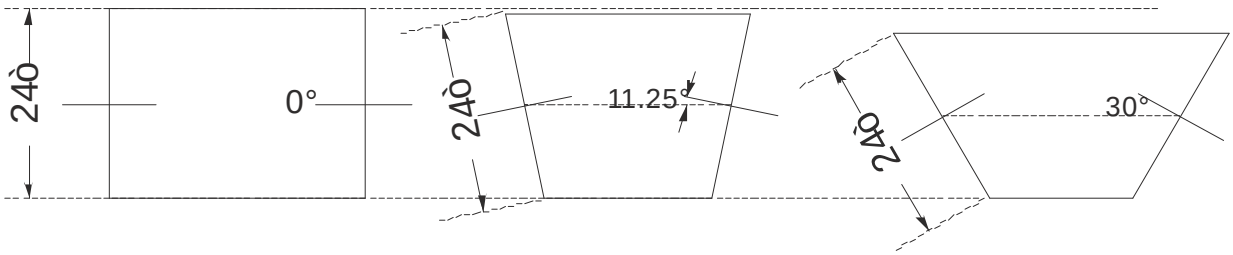

Figure 5. Top view of module with increasingly higher endplate angles; note how module width decreases as endplate angle increases. The cross represents the 6" of perpendicular track per S3.5. (Frank Wilhelm drawing)

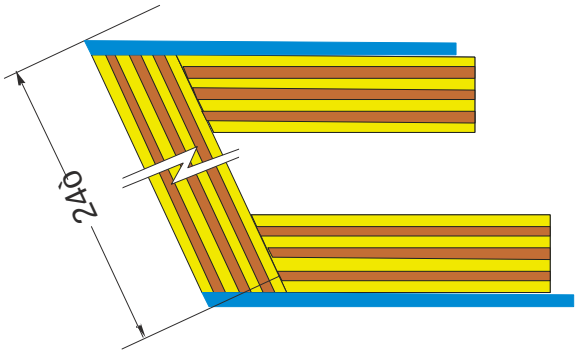

Figure 6. Top view of module frame; endplate width (corner to corner) must be either 24" for single track modules, or 26" for double track modules. Blue is fascia material added to plywood side frame and needs to be included in overall width. (Frank Wilhelm)

Elevations

The maximum track elevation, measured from the floor to the rail head, is 62 inches (S2.7). Just as with curves, any elevation in the track will impact module dimensions. Since the maximum grade on a mainline module is 2.0 percent or approximately 1/4 inch per foot of track (S3.14), having a grade on a single four foot module wouldnôt make much prototypical sense.

If grades are desired, and they do add interest to a layout, it will probably be accomplished only through the coordination of adjacent modules.

Depressions

Nearly everyone likes to see a train on a bridge or trestle. If you want elevation changes on your module so that trains can pass over a river or ravine you can add a ñdepressed centerò to your module design. This requires only structural changes to the module since in most cases you wonôt be changing track elevations or introducing a curve at the same time (although both are possible).

There are no specific guidelines in either the standards or recommended practices. However, introducing a depressed center module at a Free-mo event will require some cosmetic and visual adjustments. Because most clubs and groups publish requirements for fascia colors and the addition of skirts, some considerations should be undertaken to ensure that the module fits in to the ebb and flow of the scenery. It should be easy enough to add some Velcro® strips to accommodate the ñdipò in the layout.

Figure 7. A sample depressed center module currently under construction. (Jerry Barsness photo)

Figure 8. Another depressed center module with track and some scenery. (Frank Wilhelm photo)