Education Program

Basic skills Series

Module Four

Layout Framing

The following pages introduce the essential elements of framing your model railway

- Practical considerations
- Tools required
- Framing
- Decking
- Legs

Practical considerations

Once you get past setting up your trains on a table you need a purpose build layout frame with decking to lay your track on.

While our models are scaled down replicas of the real thing we are full size. We need to be able to see and reach the track and scenery on our model railways to build, maintain and operate them. These considerations need to taken into account when we plan our model railways regardless of the scale or gauge of your models.

A model railway frame and decking needs to be sturdy. A good test of a model railway is to be able to drive a 25 mm nail into the decking without the frame bouncing around.

Deck height

The height of your track above the floor depends on the purpose of your layout.

Providing younger modellers access to the layout would require a deck height of around 750 mm.

A reasonable deck height for a club layout would be around 1,000 mm.

An individuals home layout can be set up for optimum viewing of your trains. The maximum practical deck height is just less than underneath your armpit. This deck height allows you to comfortably work on your track work . The layout decking shown in the photo is 1,250 mm high and is comfortable for an adult to work on.

Access ways

To be able to maintain and operate our model railways we need access to the layout. A single person access way for maintenance can be as narrow as 450 mm. A single person operational access way needs around 600 mm wide. An access way to allow two operators to pass each other needs to be at least 900 mm wide. An operating area for two operators to work needs to be around 1,200 mm wide.

The ideal access arrangement for a model railway is to provide walk in access to the whole layout. Sometimes your layout design won't allow walk in access to all areas requiring access. Crawl ways to pop up hatches can be used for areas only occasional access. A duck under access to the layout operational access ways is practical, provided it has handrails for the less agile.

Reach

The comfortable reach across your layout depends on the beck height. You can reach around 750 mm from an access way for deck heights up to 1,000 mm. For deck heights above 1,000 mm a reasonable reach from an access way is 600 mm.

Tools and equipment

You probably have most of the tools required to build your layout. The following tools are typically required to build basic layout framing, decking and legs

Tape measure

For measuring twice and cutting once

Square

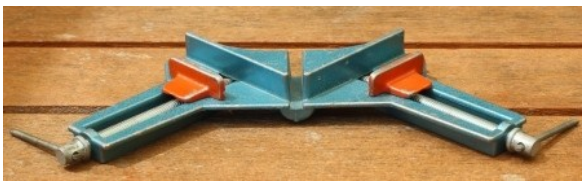
Marking out cuts in timber sections

Clamps

Hold timber sections together during assembly

Corner clamp

Hold perimeter frame members square during assembly



Jig saw

Cutting timber framing sections to length and cutting decking to shape

Power or cordless drill

Mostly used in layout construction for driving self drilling screws.

Saw horse or work bench

Hold timber sections safely during cutting operations.

Spirit level

Useful for levelling your layout during installation

Framing

The framing of your model railway is required to support your track and scenery. The two common methods of building layout framing are perimeter frames and "L" girder frames. Regardless of the framing style adopted both framing methods use the same basic components.

The timber sections and recommended spans listed below allow for casual leaning on the layout, not standing on the layout.

Member sizes and spans

Layout support members

Design analysis and long practical experience show the following readily available plantation pine timber sections can be used to construct layout frame sections up to 1,200 mm wide by 2,400 mm long.

- 42 mm by 19 mm,
- 68 mm by 19 mm
- 92 mm by 19 mm

The following shows the usable span for typical timber section sizes.

Rectangular sections can span twenty times their depth i.e.

- 42 mm by 19 mm can span 840 mm
- 68 mm by 19 mm can span 1360 mm
- 92 mm by 19 mm can span 1840 mm

"L" girders can span twenty five times their depth i.e.

- 61 mm by 42 mm "L" girder can span 1525 mm
- 87 mm by 42 mm "L" girder can span 2175 mm
- 111 mm by 42 mm "L" girder can span 2775 mm

Cross members

Cross members span depend on the cross member spacing. 42 mm by 19 mm cross members spaced at 300 mm can span up to 1,200 mm. 42 mm by 19 mm cross members spaced at 450 mm can span up to 1,000 mm. 68 mm by 19 mm cross members at 450 mm spacing can span up to 1,200 mm.

Fasteners

Long experience shows screwing together layout framing makes good sense. The layout frame can readily be modified by simply unscrewing the parts and reassembling them as required.

These timber sections can be reliably connected by 35 mm by 8 gauge countersunk self drilling wood screws. These screws can be driven with an ordinary power drill. Screws located across the grain close to the end of a member need a pilot hole to prevent the timber splitting.

Perimeter framing

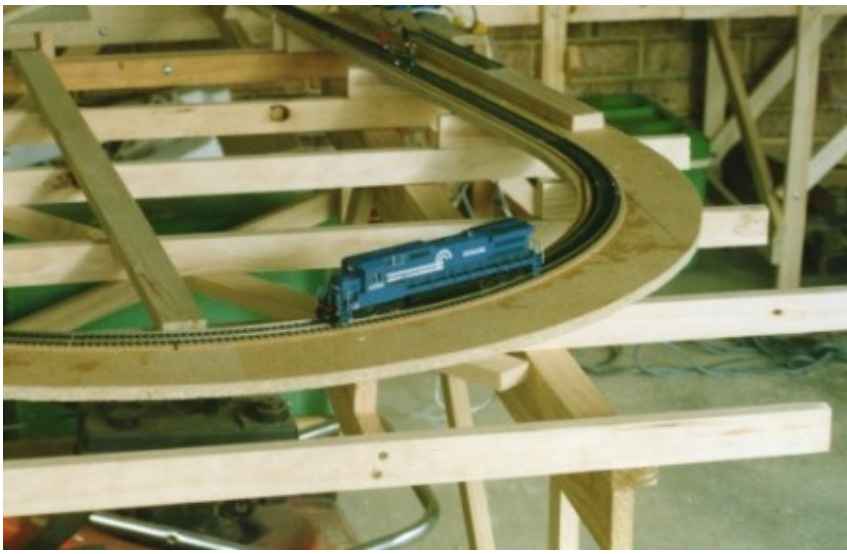
In a perimeter framed layout section the support members are the perimeter of the layout section.

Perimeter framing requires the timbers to be butted together at the joints. This requires reasonable carpentry skills to produce a square level layout section. Perimeter framing is well suited to exhibition layouts and flat areas of layouts such as stations and marshalling yards.

The attached photo shows a perimeter framed layout module under construction. The pictured 1,200 mm by 600 mm module sections from the span tables require 68 mm by 19 mm for the perimeter frame members and 42 mm by 19 mm cross members at 300 mm spacing. The deeper module end timbers shown in the photo allow the module to be clamped to adjoining modules.

A 1,200 mm by 1,800 mm stand alone layout would require 92 mm by 19 mm frame members with 42 mm by 19 mm cross members at 300 mm spacing.

"L" Girder framing



"L" Girder framing was developed in the 1960's for model railway layout framing. The frame support members are the wooden L sections beneath the cross members. "L" girder layout framing allows scenic flexibility especially below track level scenery . "L" girder layout frames require minimal carpentry skills to produce an adequate layout frame. The "L" girders are built up from readily available timber sections. .

The attached photo taken in 1996 shows an "L" girder framed layout under construction. The layout is still in operation and fully serviceable. The "L" girders in the layout frame pictured were made up of a 68 mm by 19 mm vertical section capped by a 42 mm by 19 mm section. The "L" girders are screwed together by 30 mm by 8 gauge countersunk wood screws at 200 mm centres.

A 1,200 mm by 1,800 mm "L" girder layout frame would require 87 mm by 42 mm "L" girders (built up of 68 mm by 19 mm and 42 mm by 19 mm) with 42 mm by 19 mm cross members at 300 mm spacing. The "L" girders are usually set back from the ends of the cross members. The set back is usually a sixth of the length of the cross member.

The lower recent photo shows the end of an "L" girder on the layout framing shown under construction above.

Decking

Materials

The decking on your layout supports the track. The decking needs to secure the track to the decking. Traditional layout decking materials are plywood and chip board. These materials can be used as delivered in most areas of Australia. In very damp environments either material needs to be painted paying particular attention to end grain to prevent deterioration.

Plywood

Plywood is the traditional layout decking material. 12 mm thick plywood requires cross members at 450 mm spacing. This cross member spacing requires 68 mm by 19 mm cross members for 1,200 mm spans.

The grain of the outer plies of the plywood affect the bending properties. Plywood bent across the grain of the outer plies will not bend evenly.

Chipboard

Chip board is cheaper and heavier than plywood but not as strong. Chip board bends evenly in any direction.

12 mm chip board requires cross members at 300 mm spacing. This cross member spacing requires 42 mm by 19 mm cross members for 1,200 mm spans.

Chip board layout decks have lasted without deterioration for over ten years on layouts located in car ports. However, chipboard is not recommended in high rainfall or poorly ventilated areas due to its tendency to swell in wet and/or damp conditions.

Foam Sheeting

Dense foam sheeting (about 35mm thick) is now being used by modellers who require very light weight layouts for portability. This material is also used for building up scenic terrain. Support framework for foam sheeting is similar to that for plywood. The big advantage of this material besides being light weight is it is impervious to moisture and very easy to work with.

The module in the photo has foam sheet decking.

Arrangement

Solid decking

Solid decking is ideal for yards and for your first layout. The decking over the whole area allows you to experiment with track arrangements as the attached photo shows.

Ribbon decking

Ribbon decking only places decking where the track runs. To use this decking approach you need a fully developed layout design. Ribbon decking can be mounted above the framing. Level track ribbon road decking can be mounted on blocks glued to the top of the cross members or risers screwed to the cross members. The photo shows ribbon decking on an "L" girder framed layout under construction. The decking is screwed to timber blocks glued to the framing cross members.

Layout Frame Support Legs

Your layout needs to be supported. This can be suitable furniture or purpose built legs. Allowing for the largest section of your layout framing to be up to 1,200 mm wide by 2,400 mm long simplifies the design of the legs.

The lightest , simplest way to build a leg system for a model railway is the fully braced system. A fully braced leg system will support your layout and withstand lateral loads such as visitors leaning on the layout or accidental bumps from passers by.

the layout deck. The longitudinal bracing should slope at around 45 degrees as shown in the attached sketches.

If your layout consists of multiple frame sections only one frame section in each line of frame sections needs to have fully braced legs at each end. The other sections in the line can be supported at one end by the adjoining frame section. The modular layout shown in the attached photo has four fully braced legs on one section. The other section has a

The fully braced leg system built out of 42 mm by 19 mm pine shown in the attached photo can support layouts with decking up to 1,200 mm high.

Each pair of legs is braced to prevent side sway .For 1,200 mm tall legs the cross bracing between the legs needs to be extend down around 900 mm from the layout decking.

The longitudinal bracing should slope at around 45 degrees.

Floors are seldom level. Drilling the bottom end of your layout legs and fitting a 6 mm hexagon head coach screw to each leg or Tee nuts, allows you to level your layout as you install it. If your layout room is carpeted a 100 mm square of plywood as shown in the photo will prevent the coach screw damaging the carpet and allow for later height adjustment.

References

- NMRA Video Library – DVD 2030 Design and Construction (Siskiyou Line – Joe Fugate)
- NMRA web site Clinics – Bench Work (Lawrence Nagy and Rob Peterson)
- NMRA Video Library – Peter Sutton's Hon3 Layout showing completed and in construction sections.