MODULE CONSTRUCTION STANDARDS 2020

EMRIG
EASTERN MODEL RAILWAY INTEREST GROUP

1 INTRODUCTION.

Over the years the standards have been revised and updated as the members have gained experience and the availability and quality of materials and models have expanded. In 2008 we introduced Digital Command Control on one track and analogue DC on the other and single track branch lines have been added. Now we only run DCC on our main layout, and DC analogue can be run on a separate “Branch Line Shunting“ layout. The quality of the rolling stock has improved with many fine scale wheel profiles, smaller tension lock and buck-eye couplings as well as models of many different prototypes from several countries. We thus run OO and HO models, so clearances and tolerances must be adhered to if we want reliable running for all.

In updating the standards all the above are taken into account, the basis being the standards as drawn up in 2009 and earlier versions. These revised standards will be applicable to all new modules built after the ratification of these standards, but there is no intention to force owners of existing modules to implement modifications, although they will not be discouraged from doing so. However those that cause problems in alignment or poor running may be excluded from the layout, especially exhibition layouts.

The revised standards are divided into three categories, these being mandatory, preferred and optional. Whilst modules offered to exhibition standards must conform to the mandatory requirements, it will be encouraged that the preferred and optional standards are also adopted. These categories are indicated by (M), (P) and (O) after each item.

2 TABLE OF CONTENTS

3 MODULE STANDARDS - GENERAL

3.1 Module width. (front to back)

All individual straight and corner modules and self-contained sets of straight and corner modules shall preferably be 600 mm wide but may be a minimum of 300 mm and a maximum of 800mm wide.(P). With a width of 600 mm there are many possibilities to add some scenery, buildings, and even a track deviation from a straight line on longer modules.

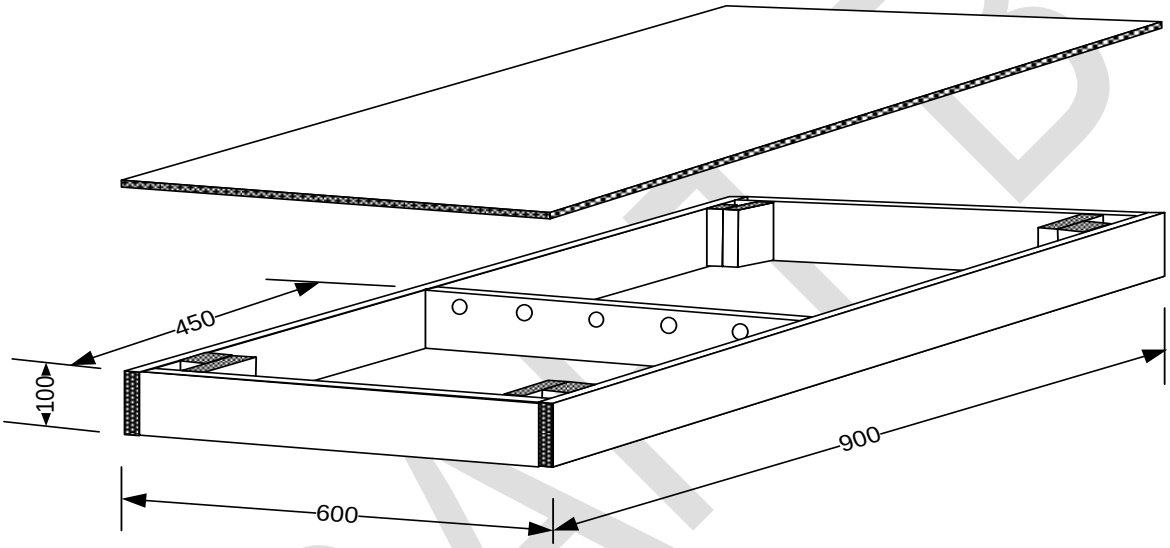
The width must be in multiples of 100mm and may exceed this width limit only where they are not primarily intended for exhibition purposes or where special circumstances require a greater width, i.e. in mainline stations where many facilities are installed.(O)

3.2 Module depth. (top to bottom)

All individual straight and corner modules and self-contained sets of straight and corner modules shall have a module depth of 100mm plus the 12mm top(P), except where special arrangements for scenes, such as river scenes require the depth to be modified. (O).

3.3 Preferred module design and construction

The drawing below indicates a good strong and easy to build module. A 900 module is easy to transport and manhandle whereas an 1800 long is a bit big to fit into a normal car. It is thus suggested that an 1800 module is made up of two 900mm bolted together to form one solid module that can be split for transport. It will then be possible to include a curve on the track, it will not have to be at 150 mm from front at the join and no drop-ins are needed. As a matched pair there are endless possibilities. Why not go to 3 modules as a matched set?



Drawing 1 Exploded view of preferred module construction

MATERIALS for 900 module
Long sides, 2 off, meranti 900 x 100 x 22 mm
End pieces, 2 off, meranti 556 x 100 x 22mm
Centre cross piece, 1 off meranti 556 x 100 x 22mm, with 5 off 20 mm holes near base board (top) edge These are for supporting wires running from end to end
Top base, 1 off, 12 mm high quality chip board must be primed, or Plywood 900 x 600 mm
Corner wells to support legs of 25 x 25 steel tubing, opening to be 26 mm to allow for paint and tolerances.

All joints to be sealed with white cold wood glue and CSK wood screws 4 mm dia by 45 mm long
Top surface to be fixed using cold wood glue and CSK wood screws 4 mm dia by 30 mm

MATERIAL FOR 1800 MODULE
Long sides, 2 off, meranti 900 x 100 x 22 mm
End pieces, 2 off, meranti 556 x 100 x 22mm
Centre cross piece, 3 off meranti 556 x 100 x 22mm, with 5 off 20 mm holes near base board (top) edge, These are for supporting wires running from end to end
Top base, 1 off, 12 mm high quality chip board must be primed or Plywood 1800 x 600 mm
Corner wells to support legs of 25 x 25 steel tubing, opening to be 26 mm to allow for paint and tolerances.

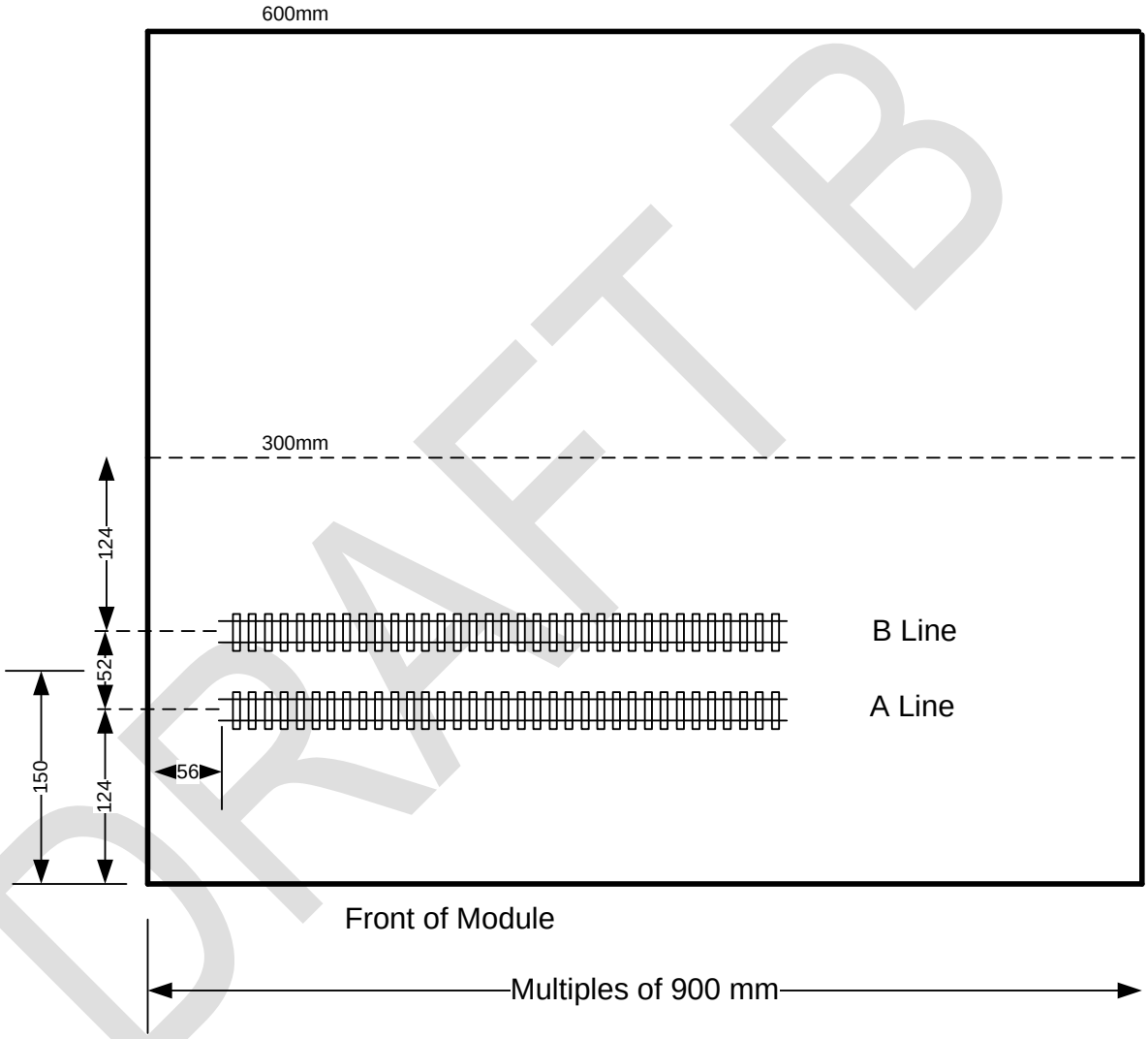
The use of meranti, chipboard, supawood, MDF or plywood is not mandatory but all have proved to be satisfactory materials if treated properly. The choice is yours, our preference is plywood for the top, but the final product must form a good foundation for a model railway.

3.4 Leg positions.

All individual straight and corner modules and self-contained sets of straight and corner modules must be provided with leg positions on all corners that will enable each module or set of modules to be free standing (M). Not all leg positions will necessarily be used when a number of modules are set up for running purposes.

3.5 Track Geometry.

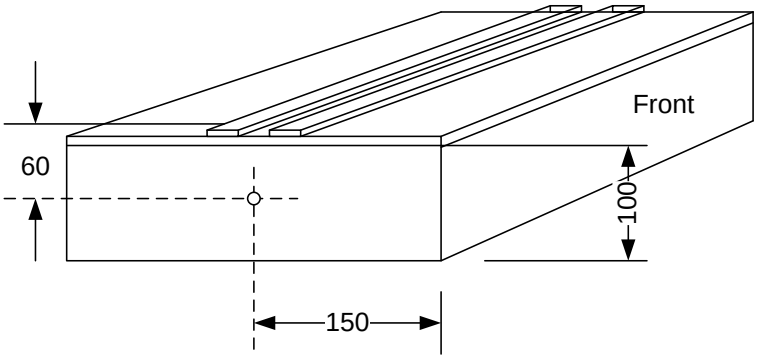
Each end of all individual straight and corner modules and self-contained sets of straight and corner modules must conform to the track layout and geometry detailed in drawing 2 (for straight modules) and Figures 5 and 6 (for corner modules).(M).



Drawing 2 Track alignment at ends of straight modules

3.6 Coupling of adjacent modules

Adjacent modules are bolted together using one or more 10 or 8 mm machine screw with washers and wing nut. A 12 mm hole shall be drilled in the end plate of the module 150 mm from front edge, i.e. on centre line of the double track and 60 mm below top of rail; head, see drawing 3 opposite.



Drawing 3, location of bolt hole for joining to adjacent module

There will always be a “manufacturing” tolerance so the use of a 10 mm or 8mm bolt in a 12mm hole allows ± 1 - 3mm error in manufacture.

For modules of greater width a second bolt is required spaced as indicated in table below.

Module width, mm	Front hole distance from front	Second hole from front
300**	150	Not applicable
400**	150	300
500**	150	450
600	150	450
700**	150	600
800	150	650

** denotes non preferred sizes

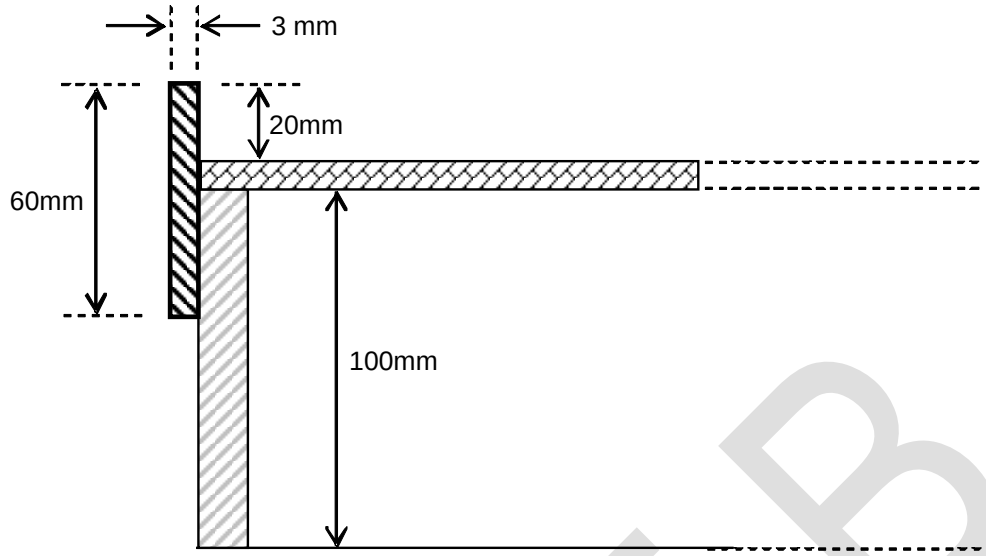
3.7 Joining of track

The track on each module is cut short by 56 mm from end of module, or group of modules, see drawing 2 above. The connection between the two tracks is achieved by use of a “dropper” made of standard code 100 track of length 110 mm long. All things being perfect this will leave a 1 mm expansion joint between rail ends. When joining up the two it is essential that the two modules are aligned in height as well as axially so that there is no “speed hump” or “chicane”. These cause derailments and uncoupling. Use your eyes to check that the track on the two adjacent modules is in line. This must be confirmed once the dropper is in place. If it looks right it usually is right.

The drop ins are supplied by the club but donations are welcome as there is usually not enough. Those within self contained sets of modules are to be provided by the module owner.

3.8 Protection Strip

Either or both the front and back edges of modules may have a protection strip to aid in the prevention of accidental derailments causing rolling stock to fall off the edge of a module. (P). If this edging strip is fitted, then it should conform to the dimensions in drawing 4. (P). From experience, this protection strip should be made from plywood or Masonite: Hardboard and chipboard are not recommended.



15
Drawing 4 Module Protection Strips dimensions

3.9 Painting.

Both the front and back edges of modules and protection strips where fitted, are to be painted with the Matt Black. It is preferred that matt PVA be used, which enables quick touching up at exhibitions and other venues. (P). The club will have a tin of this paint which will be available to the module owner to paint his module.

The ends of individual modules and each end of a set of modules shall be painted as above (P).

3.10 Velcro Strip for Skirting

All modules must be fitted with a strip of VELCRO onto which the skirting is fitted. The VELCRO will be supplied by EMRIG and must be fitted from end to end on the front, just below the protection strip. Fixing recommended by contact glue and heavy duty staples.

4 MODULE STANDARDS - STRAIGHTS

4.1 Module length

All straight modules and self-contained sets of straight modules must be 900mm long or multiples of 900mm. (M). 1800 mm long modules are preferred (P).

4.2 Group modules

A set or group of modules that form a self contained set of straight modules shall have an overall length of a multiple of 900 mm (M). Main line stations and similar that contain sidings or passing tracks are typical examples. The two main line stations are good examples of groups of modules, one is made up of 2 off 2700 mm long modules, the other is 4 off 1600 mm and one 800 mm long, totalling 7,200 mm plus a 900 mm extension module giving an overall group length of 8,100mm. With the engine shed facility module of 900 long, now 9,000 total length.

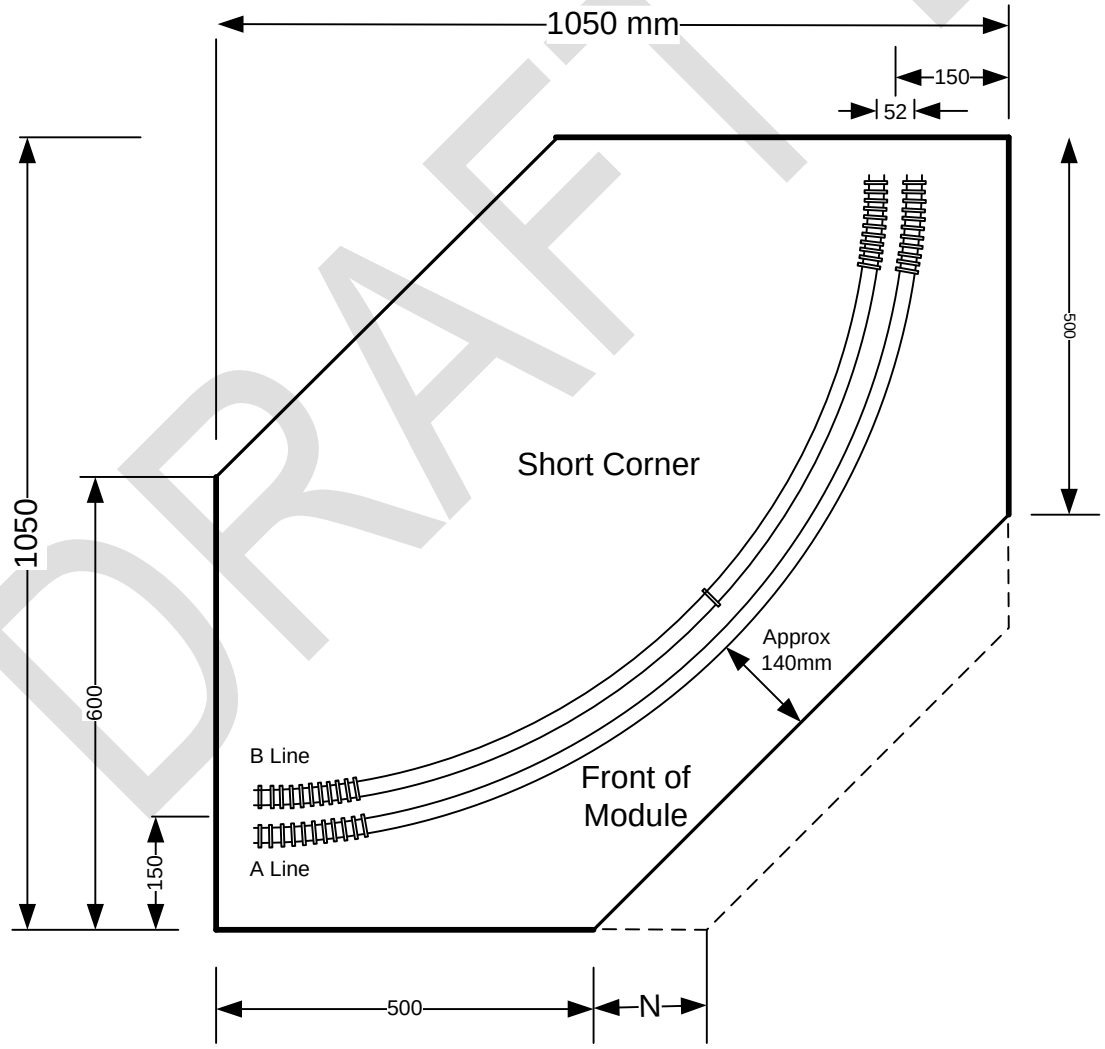
4.3 Module Standards - Corners

All corner modules and self-contained sets of corner modules must conform to the dimensions detailed in drawings 7 (M). There are 4 basic corner designs, long radius and short radius and standard and reverse corners. Standard corners are those that form the corners of a basic loop design layout where as the reverse corners are those that turn out from the loop

4.4 Standard Short Radius Corners

The dimensions for Short Corners are such that two such corners in “S” formation or “U-turn” through 180 degrees will cause an offset in the track of 1800mm, being two 900 module standard lengths.

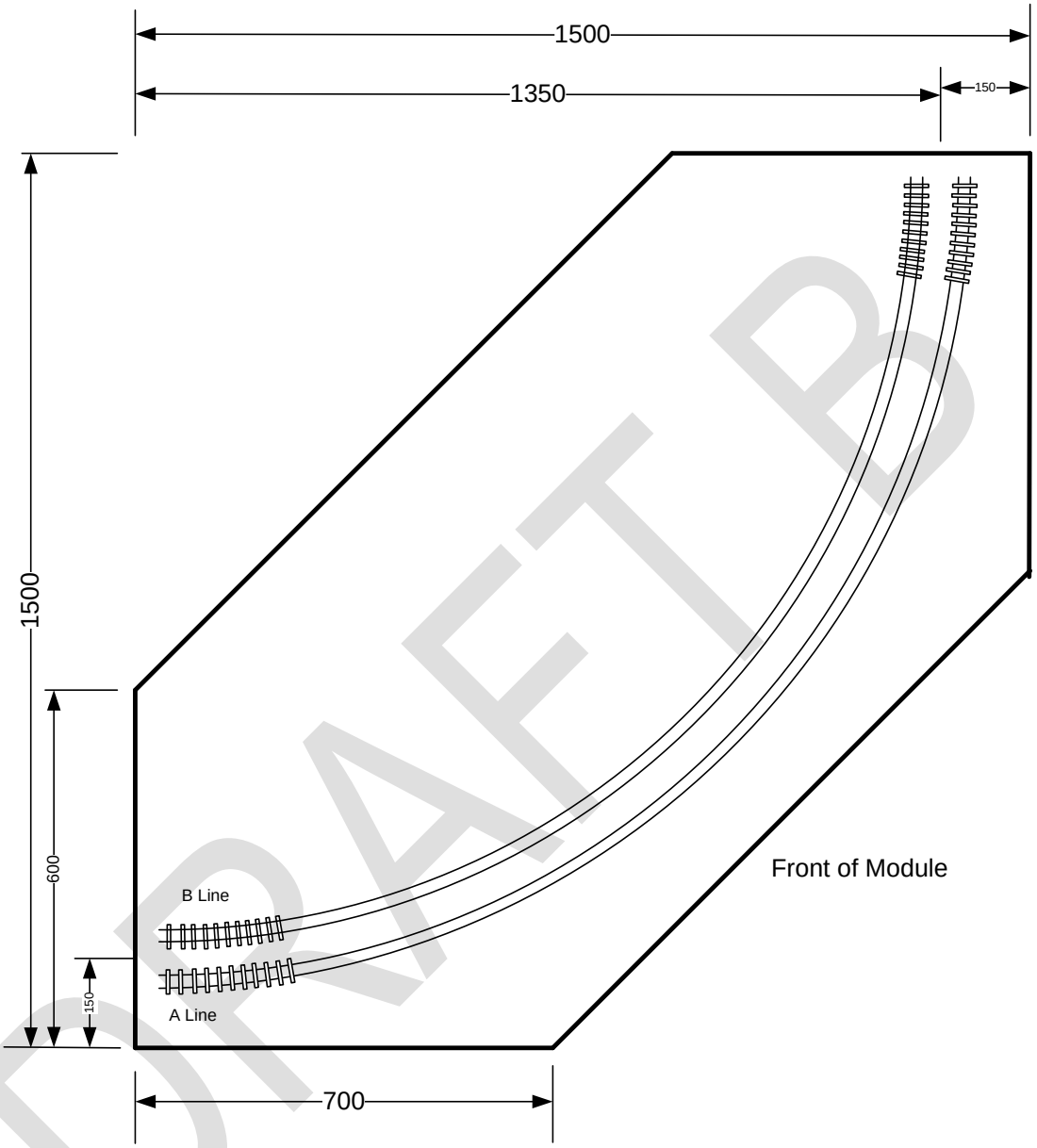
The preferred module width being 600 mm applies to the corner modules as well as shown below. The module will then fit better to all other modules and will provide ample space for scenery. Railway tracks usually go round corners to avoid natural obstacles such as hills, mountains, rivers, lakes and some property. So use your imagination and build your own piece of real estate.



Drawing 5, Standard Short Corner dimensions.

4.5 Standard Large Radius Corners

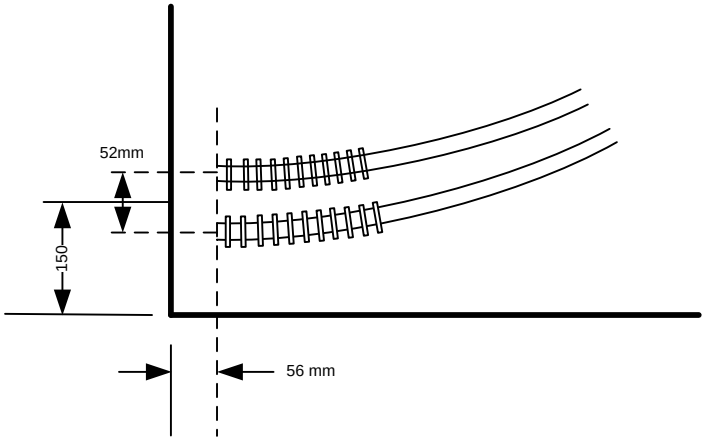
The dimensions for Long Corners are such that two such corners in “S” formation or “U-turn” will cause an offset in the track of 2700mm, being three 900 mm module standard lengths.



Drawing 6 Large Radius Corner Dimensions

4.6 Track geometry on Corner Modules.

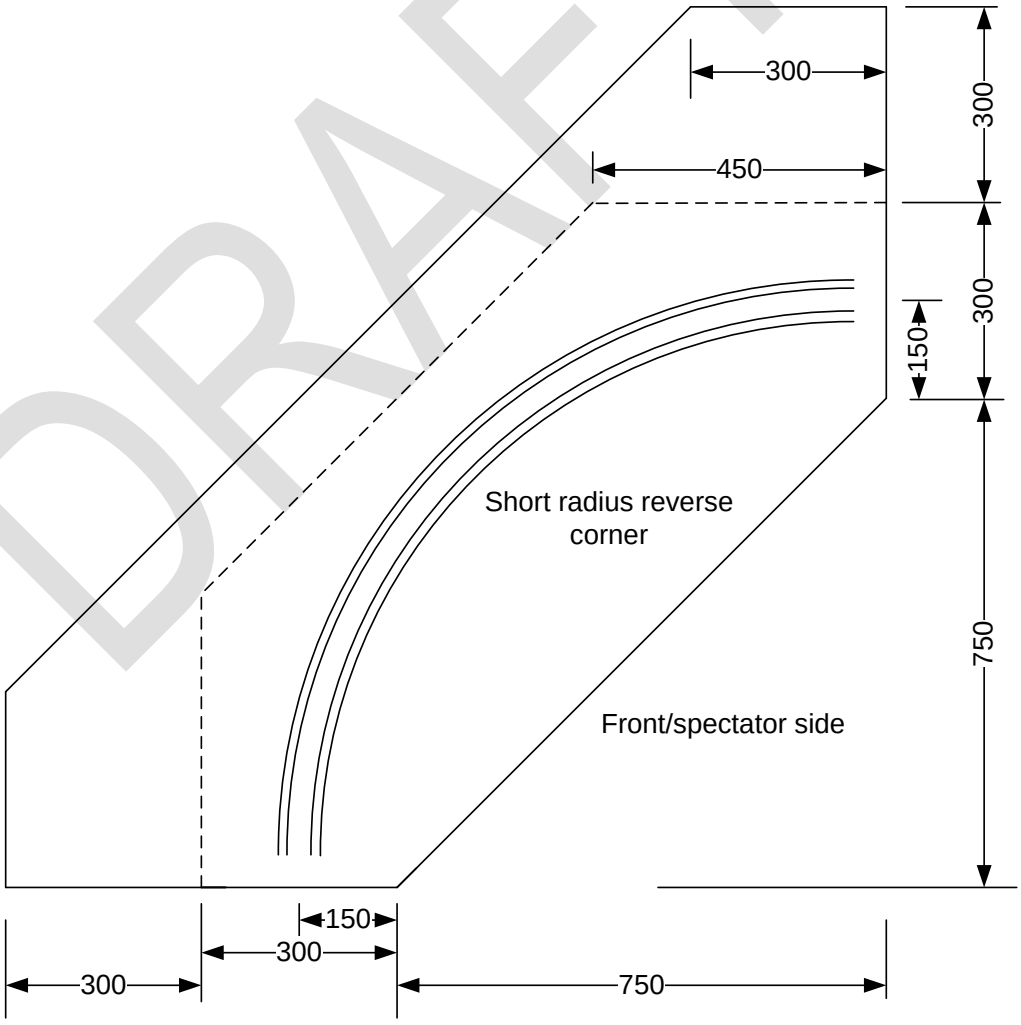
As with the straight modules the track must be aligned so that it connects with any other module. The double track spacing is 52 mm and the centre of the 2 tracks is 150mm from the front edge, see drawing 6 above. The radius of the centre of the 2 tracks is 900 mm for the short corner and 1350 for the long corner. To be exact the inner track radius is 900 less 26mm = 874mm and that of the outer track is 900+26 = 926mm for the short corner and the inner track radius will be 1350-26 = 1324mm and the outer line 1350+26 = 1376 mm for the long corner.



Drawing 7, track geometry on corner modules.

4.7 Reverse Short Radius Corner Module.

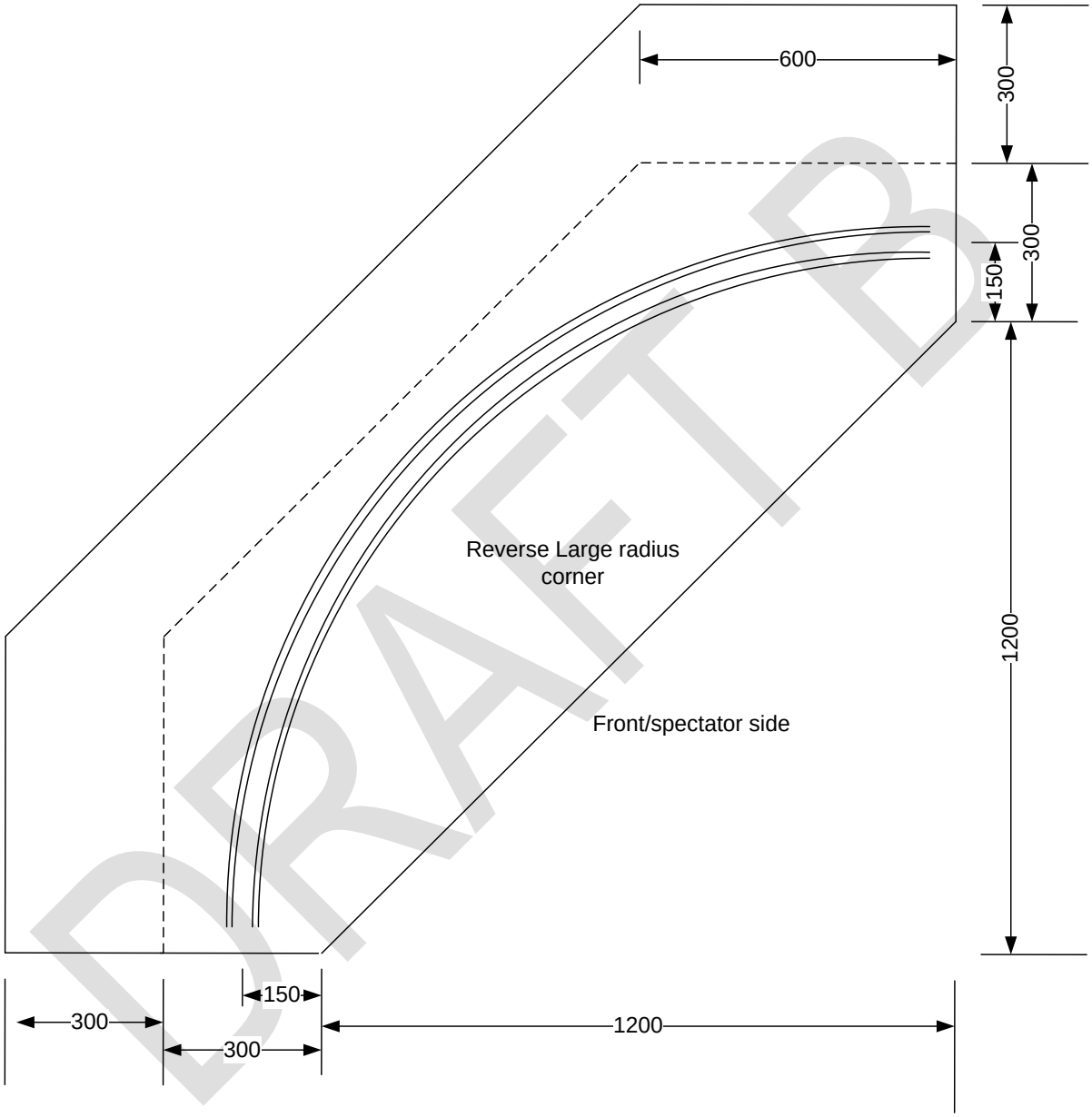
As stated above the reverse corners are those that turnout from the basic main loop and so form a “chicane’. The dimensions are basically the same as the standard corner but the front is now on the inside of the curve. See drawing 7 above. To match up with adjoining 600 mm wide modules the end plates need to be 600 wide as well. This then provides more space for scenery on the outside of the curve. The down side is that the module is getting a little large, almost the same size as the standard long radius corner.



Drawing 8, Short radius reverse corner module dimensions

4.8 Reverse Large Radius Corner Dimensions.

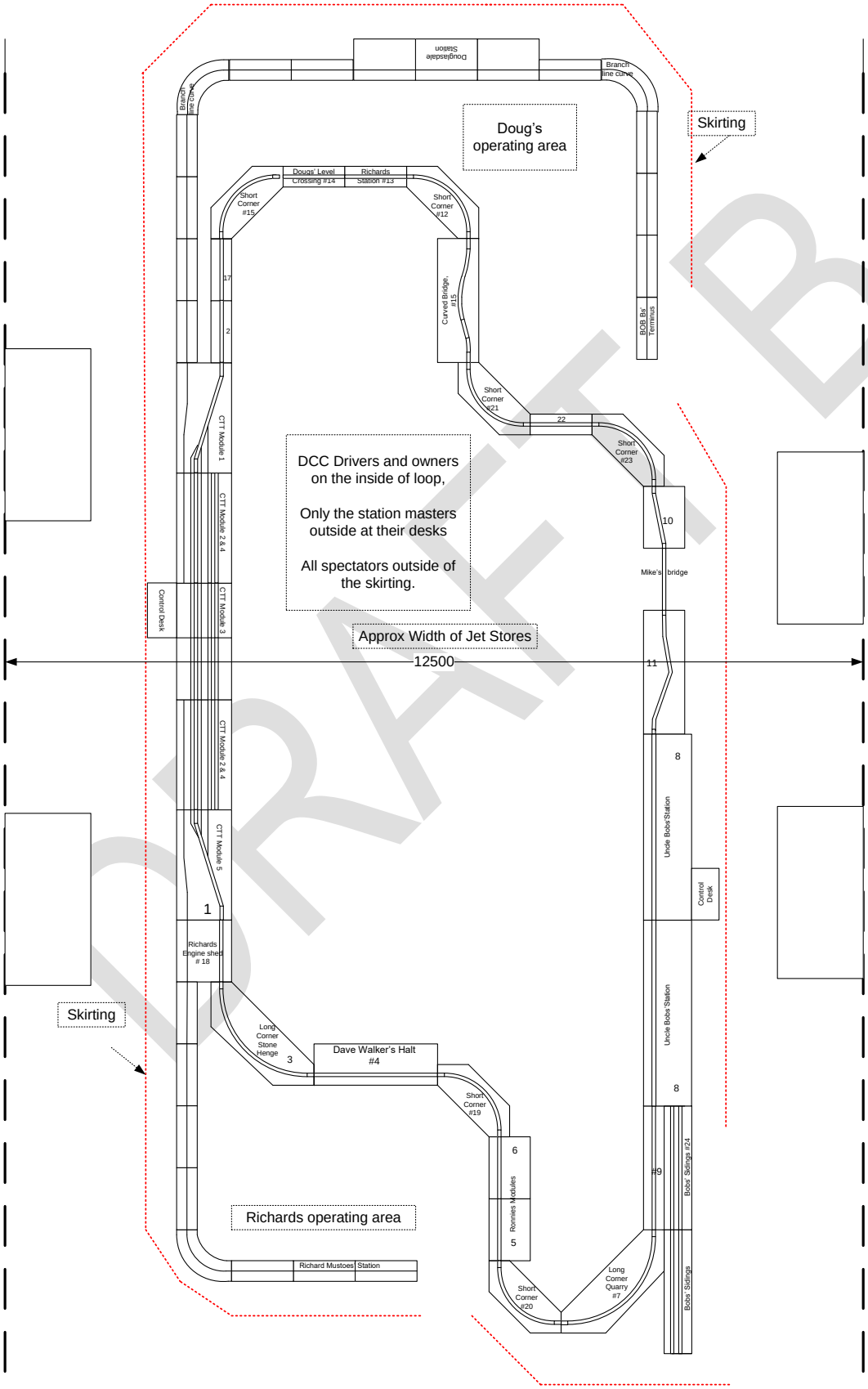
The drawing No 9 below indicates the dimensions of these modules. To match up with other 600 mm wide modules the size is now 1800 by 1800 mm, a large piece of furniture which is hardly practical. However it could be split in half to make 45º modules. Two of these could then make a very nice "S" curve.



Drawing 9, Reverse large radius corner module

5 TYPICAL LAYOUT CONFIGURATION.

This is the track/module plan of the layout as initially set up at Northmead Mall. Note the use of the reverse curves and the need for 600 wide modules.



6 MODULE LEGS

6.1 General.

Legs are normally made from square steel tube 1.6mm thick 25mm x 25mm (P) with a foot that is smooth such that it will not cause damage to the floor (M). The head of an adjusting bolt is normally acceptable for this purpose. Other leg designs are acceptable but must ensure that the top of rail is 1100 mm on uneven flooring.

6.2 Leg length.

Module legs length shall be such that the height from floor level to top-of-rail is 1100mm (M). Legs shall be adjustable in length by at least ±10mm to allow for uneven floors experienced at some venues (M).

6.3 Leg foot

The foot of a leg shall be of smooth finish, such that it will not cause damage to the floor (M). The head of an adjusting bolt is normally acceptable for this purpose.

A better solution is to use a plastic foot unit designed specifically for this purpose. It comprises a black plastic moulding that can be pushed into the end of the steel leg and a round foot on a 40 mm long 10mm bolt that screws into the moulding, There are other versions available with larger head and bolt that is more expensive, your choice. See photo of cheaper version attached.

The steel tube and plastic leg inserts and feet are stocked by Steelmate, Benoni and Boksburg

7 TRACK STANDARDS - A & B MAIN LINES

7.1 Track Standards.

All main tracks, points and crossings shall be of code 100 nickel silver track on wooden sleepers. Brass, steel and other materials are not to be used. (M)

Rail of lower “fine scale” codes are not permitted due to the general type of rolling stock used by members. Coarser standards may not be used for the same reason.(M)

7.2 Points, (also known as switches and turnouts)

On the main lines these must be no shorter than Peco medium radius or American No.6. Longer points may be used, but shorter points shall not be used. (M)

All points shall be of the live frog type, such as Peco “Electrofrog”, to avoid the stalling problems associated with short wheelbase locomotives, and to aid full use of DCC facilities. (M)

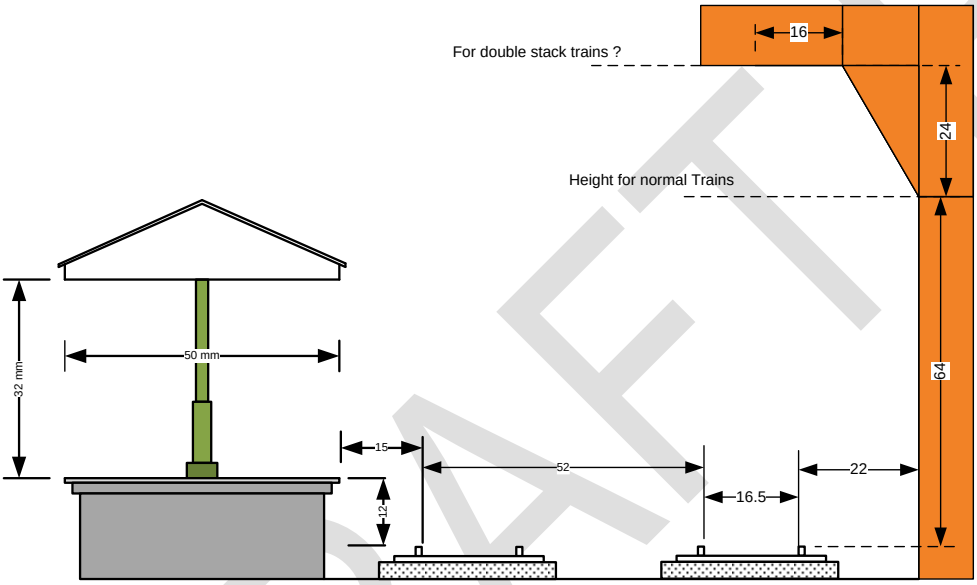
Double slips, three throw points, curve-off-curve points crossings are discouraged from use in the main lines as they are often the cause of derailment of older rolling stock with large

wheel flanges. Diamond crossings may be used, provided that they are of the live frog type. (P)

7.3 Gradients on the main lines shall be avoided (M).

8 CLEARANCES

The trains that run on the layout must not foul with any platforms, tunnels, bridges or other structures nor collide with other trains on the adjacent tracks. The clearance dimensions given herein are for the double track main lines where models of all nations will run and will be suitable for both OO and HO standard models. Consequently the clearances are the greater of those as published by the NMRA for HO American and continental model railways and those published by the British Railway Modellers Standards Bureau. (BRMSB) which apply to OO British models.



Drawing 10, clearances applicable to main line double track structures

The branch lines are very British and it is not expected that Continental or American trains will use them so the clearances for 00 British rail trains are given under Branch Line topics below.

8.1 Platforms

Clearance from edge of platform to inside of rail is 15mm.
From top of rail to platform surface is 12 mm
Platform canopies must not overhang the platform nor be lower than 32mm from platform surface. Electric loco pantographs when fully raised may foul overhead structures.

8.2 Bridges and Tunnels

The minimum height of the tunnel roof or underside of bridge must be greater than 64 mm for standard trains which is our norm. Double stack American trains need another 24 mm as shown in Drawing 10 above.

8.3 Cuttings and Embankments

These should be at an angle of 45 degree from the horizontal and start 22 mm from edge of outer rail. Cliff and embankment faces must comply as for bridges. Embankments same applies but your discretion is needed on embankment slope, as it depends on the material

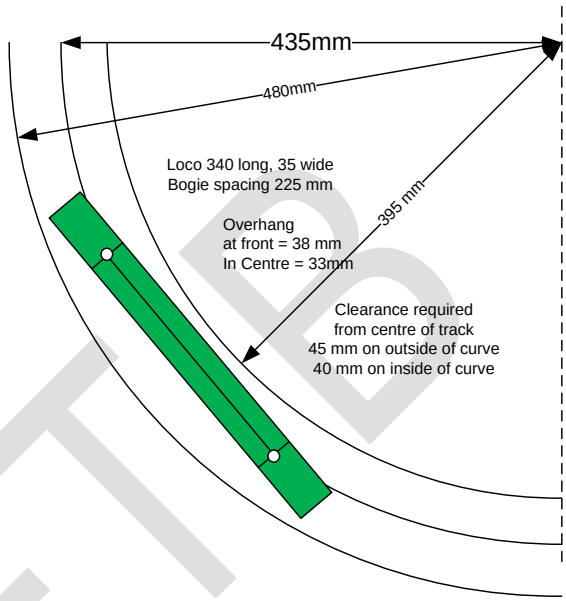
used and its angle of repose. As a side note, the normal slope is 1.5 units horizontal to 1 unit vertical. Cliff faces and hard rock cuttings may have almost vertical sides.

8.4 Extra clearance on corners.

Due to overhang at ends of long coaches and locomotives extra clearance will be necessary for bridges, cuttings and platforms depending on radius of corner and length of loco.

This is a drawing of possible worst case on no 2 curve, 438 mm radius with loco of 330 mm long and bogey centres at 225 mm. (Pendolino driving Car)

The overhang at the front is 38 mm from track centre and overhang in centre of car is 33 mm, so with an extra 3mm for tolerances and actual clearance the closest any building or bridge support should be is 45 mm on outside of curve and 40 mm on inside of course, that means the cutting needs to be 86 mm wide!
So use larger curves or only go round corners in flat terrain, (but mind the fences)

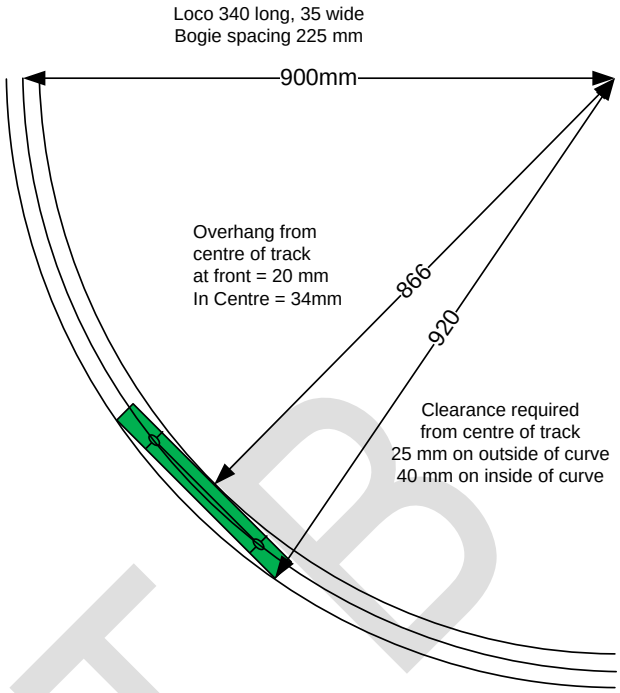


Drawing 11, illustration of need for suitable clearances to avoid collision of passing vehicles

For double tracks lines a similar situation but now on 900 mm radius curve as is on EMRIG short corners.

Now the front overhang is only 20 mm, half that of the previous example, and likewise the inner overhang is reduced to 34 mm from centre of track. Now the single track cutting need only be 60 mm wide again adding 3 mm for tolerances and actual clearance.

Note that with this large overhang there is no chance of collisions between trains on adjacent tracks if their spacing is greater than 50 mm, hence our standard of 52 mm. The track centres for PECO Setrack No 2 and No 3 curves is 47mm.



Drawing 12, illustrating clearances required on EMRIG mainline double track

9 INTER-MODULE ELECTRICAL CONNECTIONS

9.1 Power Bus.

Power is fed to the tracks from the DCC power controller via a power protection module via a power bus that runs through each module to the next via plugs and sockets. This bus consists of four wires, 2 per track. so that each track is isolated electrically and can be fed from a power management system. In other words we have 2 single line tracks running next to each other. If there is a problem on one the other can still operate independently. See separate document “Power Distribution and Control for Model Railways”.

The track is NOT the main conduit for the power. The track is connected to this bus by small short wires at each end of the module. This method avoids volt drop due to poor connections though rail joiners/fishplates and points.

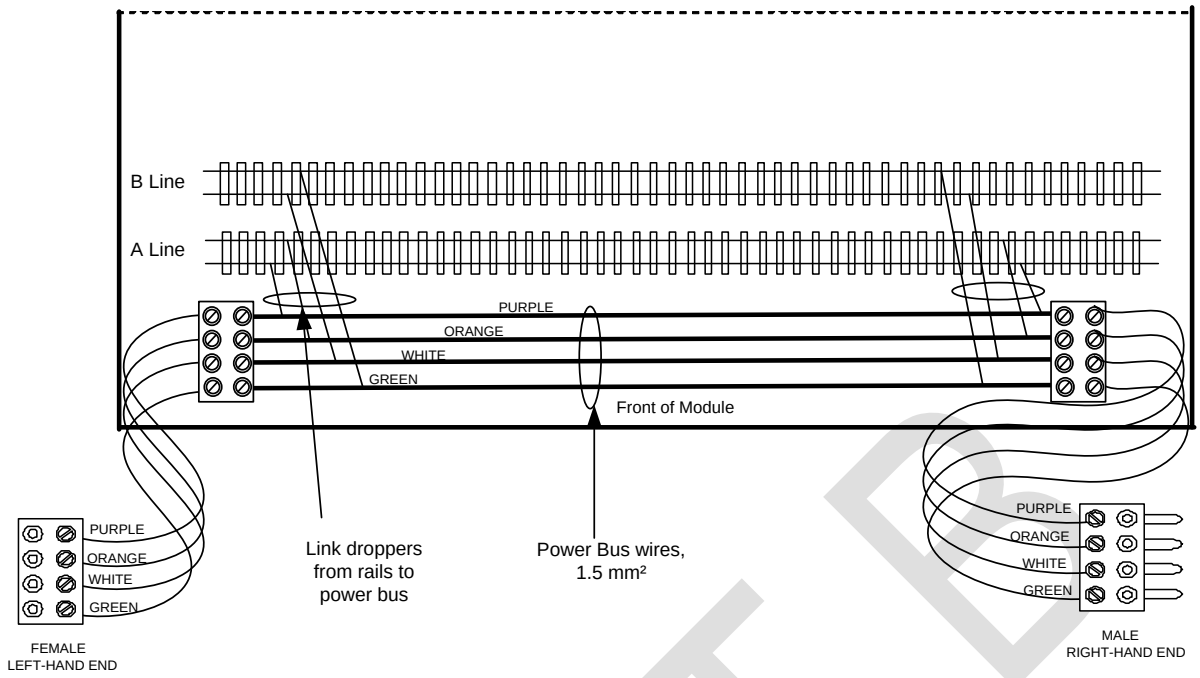
9.2 Bus Wiring.

The basic wiring between the ends of adjacent modules or sets of modules shall consist of four wires, plug-coupled, according to the following rules. The wire size shall be of 1.5 mm² or larger solid or multi stranded panel wire.

9.3 The colour code.

The colours of the four wires shall be as follows (M): The A line is the outer track which is closest to the spectators.

- A-Line Outer Violet/Purple
- A-Line Inner Orange
- B-Line Outer White
- B-Line Inner Green



Drawing 13, -wiring diagram of modules, viewed from above

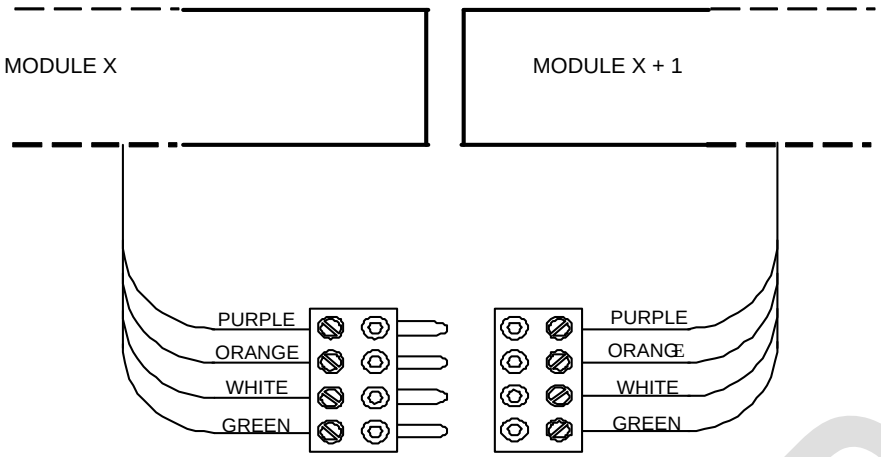
It is best to use single strand copper wire to connect from the power bus to the rails as it makes a neater soldered connection to the rail. Wire size best is 22 – 26 Standard Wire Gauge (SWG) or telephone wire.

The wiring between individual modules of a self-contained set of modules may be according to individual preferences (O) but the main power bus must still be installed from one end to the other in 1.5 mm wire. The feeds to the tracks on the modules can then be drawn from this bus via isolating switches for instance.

The colour of the bus wires are important and the flying leads from the module to the connectors must comply. These free/loose connectors and their connecting flying leads will be supplied by EMRIG.

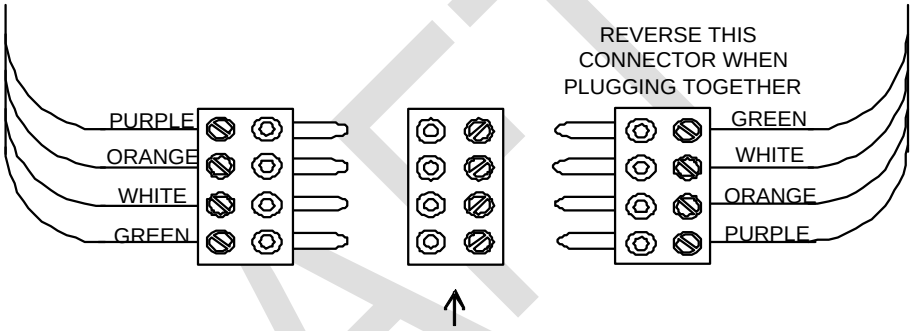
9.4 The plug-couplers.

These shall be free issued by the chairman who will ensure that they are from the same supplier and standard (M). The male connector is to be at the right hand end of the module when viewed from front or outside (spectator side) of the layout (M). The plug-couplers shall be wired from one to the other forming the power bus to which the rails are connected by short lengths of single strand copper wire according to Figure 14 below (M).

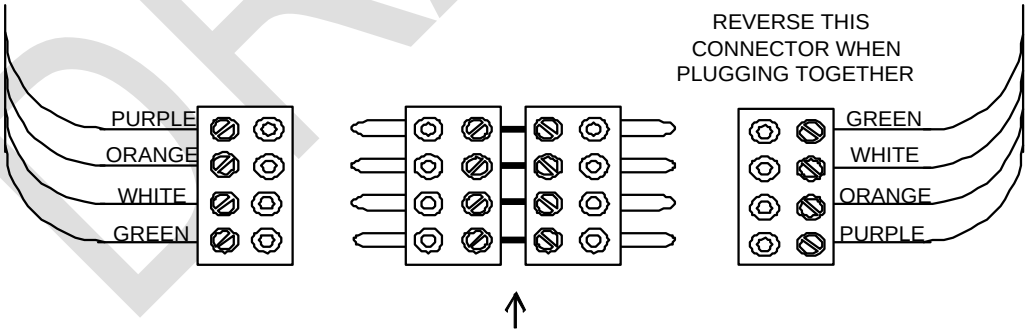


Drawing 14 Standard inter-module connection

Where it is required to install a module or a set of modules in reverse, i.e. with the front facing inwards, then adaptor units as detailed in drawing 15 or 16 shall be used (M).



Drawing15 MALE To MALE ADAPTOR USING NORMAL FEMALE BLOCK



Drawing 16 FEMALE to FEMALE ADAPTOR USING TWO MALE BLOCKS WIRED TOGETHER PIN To PIN

Note that when using a connector adapter block as above the plugs must be reversed so that A line now connected to B line on the other module.

10 TRAIN CONTROL SYSTEMS, ANALOGUE DC AND DCC

In 2007 Digital Command Control (DCC) was introduced to the club. As DCC has many features and advantages over the analogue system many members are now proud owners of DCC locos so the club has moved forward and has acquired its own Digitrax system. The main double track layout is now operated on DCC only.

The club owns the DCC power units and the Loconet UP5 panels connected round the layout. The club also owns a "programming" throttle and a smaller UT4 "buddy" single train controller.

The club now has a "Raspberry Pi" JMRI interface that allows operators to drive their train using an Android cellphone. The software, "Engine Driver" is available from the Google Play store. The system requires an access password that is available at the club. This is for members only and must be protected. Remember that with the JMRI system" stealing" another drivers train is as simple as calling up the decoder number.

Once again, the rule is simple. If you do not know what you are doing, then ask.

There are another 2 smaller layouts on which analogue DC locos can be operated, the branch line Shunting layout and the smaller "children's home" layout.

11 BRANCH LINE STANDARDS

Branch lines are single line offshoots from the double track main line so in general they must follow the same standards of construction. However there are some fundamental differences, the obvious one being that they are single track. At present there are facilities for 2 branch lines, both emanating from the new mainline "DCC" based station which has 2 bay platforms and access to both main running lines. Control of trains will be by DCC from the main layout system supply.

Single track branch lines can be set up separately from the main layout such as the 'Shunting" layout. This was originally developed in 2012 and was not intended to join onto the main HO double track layout, so the modules are of a different and more appropriate design. Both designs are covered herein.

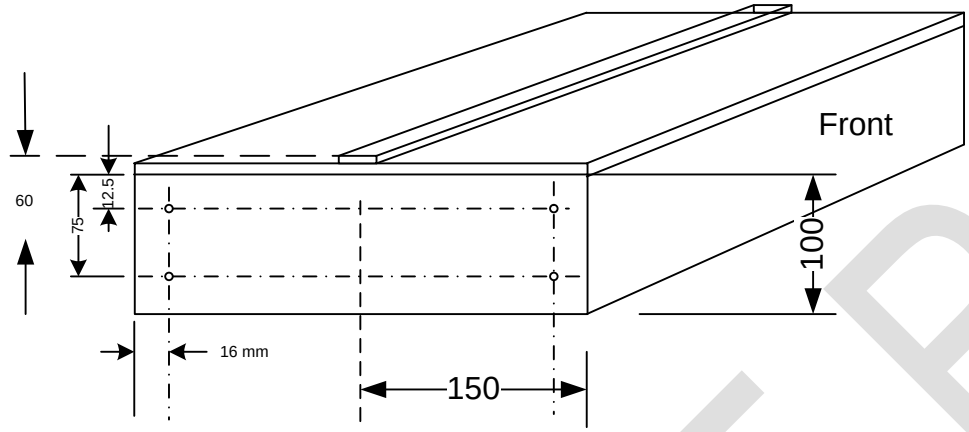
11.1 Branch Line Modules, original design.

11.2 Original Module Design

This original design is that with the central spine. The base and end sections are made of 16 mm thick MDF and 3 mm Masonite for the sides. The legs are attached in the corners by the 2 off 6 mm bolts as shown in the photograph below. The disadvantage with this design is that the fitting of points and under track point motors will be difficult if not impossible, but there is no need for remotely operated points as all will be close enough to operate manually but carefully. Also, the single centre mounted fixing bolt is not possible.

- Module design is similar to that for the main double track line but the single track is 150 mm from the front edge. (M)
- Construction to be centre spine with 3mm sides style, see drawings 17 below
- Module length is a multiple of 900 mm and width 300 mm minimum (M) but 600 mm preferred to allow from some depth to the scenery so that some features such as curves, cuttings, bridges and tunnels can be incorporated.

- Legs and their positioning should be such that a set of modules is self supporting, it is not necessary to have 4 legs per module.
- The legs are bolted to the modules, not placed in corner pockets
- Coupling of one module to another the 4 off 6 mm bolts to attach legs and the 2 modules together. With centre spine design it is not possible to have a single centre positioned bolt to join modules onto standard preferred modules so G clamps to be used.



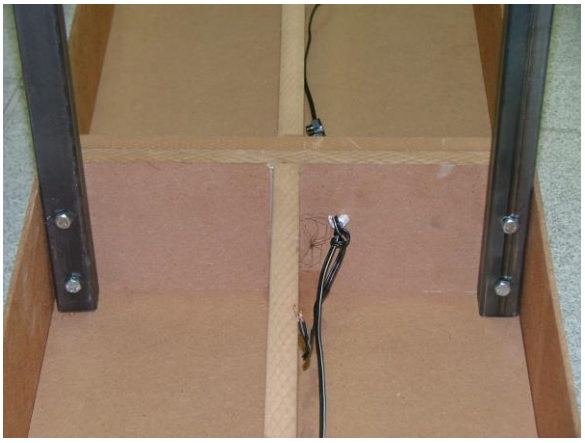
Drawing 17 Original Branch Line Module end plate drillings

- Electrical connections follow same pattern as for main line modules but only 2 wire connections required, same style plug and socket wired as indicated in drawing below.
- Train control on separate branch lines can be either by its own independent analogue or DCC controller. Only Digitrax hardware can be used.

11.3 Leg details, original design

The legs used on the branch lines are of the same construction as for the main line but they are fixed to the modules by bolts. These bolts are used to fasten two adjacent modules together and the leg, one on each corner. It is only necessary to have 2 legs per module.

The bolts are 6 mm diameter with 10mm across head flats and are 60 mm long. The legs have 2 off 8mm holes at 25 and 75 mm from top of leg in centre of the tube, i.e. 12.5 mm from each edge.



This method in not preferred as it is difficult to assemble and does not match the standard module design. Note that fixing holes to be positioned 16 mm from edge of end plate to allow for the 3 mm Masonite side panels.

11.4 Coupling of adjacent modules, original design

Adjacent modules are joined together using 6 mm bolts as shown in the photograph above

11.5 Preferred module design

The preferred design is the same as that for the mainline modules described on section 3.3 and 3.6 above. Module width can be either 300 or 600mm wide but the main track must be 150mm from the front same for the coupling bolt hole

11.6 Coupling of adjacent modules, preferred design

Use the same method as for main line modules, a single 10 mm bolt in a 12 mm hole 60 mm below top of rail and directly below the centre of the track.

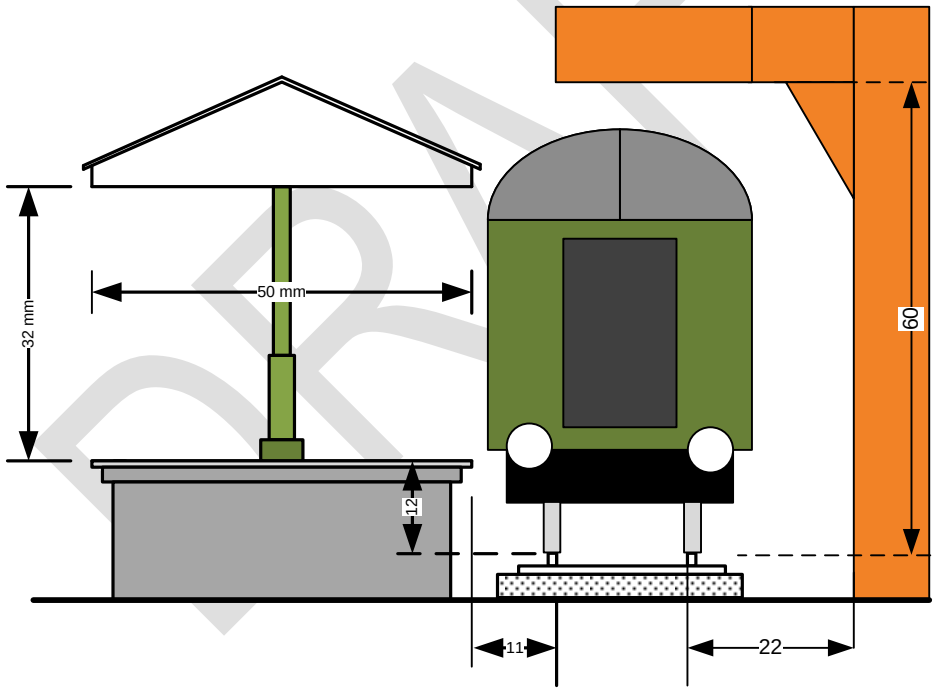
11.7 Joining of track.

As with the main line the track on each module is cut short by 56 mm from end of module, see Drawing 2 above. The connection between the two is by use of a “dropper” made of standard code 100 track of length 110 mm long. All things being perfect this will leave an expansion joint gap of 1 mm between both rail ends.

12 BRANCH LINE CLEARANCES

All dimensions given below are taken from the British Railway Modellers Standards Bureau for standard gauge British prototypes in “00” 4 mm to the foot scale. American and Continental models of HO Scale 3.5mm to the foot will also fit these clearances but may not be capable of the tight curves.

12.1 Platforms, bridges and Tunnels



Drawing 18, illustrating clearances between line side structures and 00 models of British prototype trains.

This drawing indicates the main dimensions to ensure adequate clearance between the train and the platform for British railway models in 4 mm to the foot 00 scale, as published by the British Railway Modellers Standards Bureau. (BRMSB).

13 PREFERRED SUPPLIERS

Below is a list of suppliers for the many items of equipment, hardware and rolling stock that is used in building and operating the layout.

13.1 Model Railway Suppliers

Note, some of these contact details may have changed thanks to TELKOM and others.

- **Hobbies and Models**, No 54 York Street, South Kensington, Contact Ingrid, Thelma or Richard on Tel, 084 580 6172
- **Rinkies Hobby World**, ??
- **Model Train Exchange**, Shop 10 NBS, Building 310 Oak Avenue, Randburg. Contact Paul Mollison 011 787 6121, fax 011 886 2725.
- **Blackmark Trains**, for new and second hand, Contacts Mervyn on 083 734 8686.
- **ESSWEX** on Cnr DF Malan and Milner streets, Northcliffe. Phone 011 888 3610.

13.2 Wood and associated hardware

- H & S Timbers (Pty) Ltd. Wilstead Avenue, Benoni. 011 422 3223. fax 011 421 3810

13.3 Steel and associated hardware

- STEELMATE (PTY) LTD,16 Top Road Boksburg North,
  Tel 0861 0861, fax 011 918 2836
- STEELMATE (PTY) LTD, Apex Branch, 318 Main Reef Road, Apex Industrial Sites, Apex, Benoni, 011 421 9640, fax 011 421 4037

13.4 Electrical Items

- East Rand Electrical Wholesalers, Howard Avenue Benoni. Telephone 011 422 2310, fax 011 421 0066
- ACDC Express, Pepper Square Shopping Mall, corner of Cynthia St and Oosthuizen Road, Bardene Boksburg, phone 011 020 3650

13.5 Electronic Items

Plugs sockets switches, diodes and transistors etc

- GT Electronic Components cc, First Floor, Furniture City, 139 North Rand Road East Rand Mall. Tel; 011 823 1458/9, fax 011 826 7035
- Electronic Components, North Rand Road, East Rand Mall opposite Shell Petrol Station
- RSE Electronic, sales@rseelectronics.co.za WWW.rseonlineshop.co.za, 011 334 4158, Unit b Rosettenville Road, Village Main, Johannesburg

13.6 Suppliers of cork sheet for road/track bed.

- Aluvin Securiseal (Pty) Ltd, Cnr Refinery and Sharland Streets, Driehoek, Germiston,1400, Tel 011 825 3648, Fax 011 825 6123
- Any MIDAS or motor spares dealer should also have in stock. 6 mm thick required, usually comes in sheets of 500 x 400 mm.