MODEL RAILROADING BASICS 101

Presented by Division 6 of the North Central Region, National Model Railroad Association

Part 1 – Design and Benchwork

HELLO and welcome to our series of lessons to get YOU, started in a great hobby, MODEL RAILROADING! This first session is about designing your layout and benchwork basics. As with many subjects in our hobby (and life) there are many ways to do something. These tips are designed to give you some basics and then through research, questions/answers... we hope you will find what best works for you. This handout will cover a bit more than what was actually discussed at our Division 6 meeting. Our meetings are limited on time and these basic subjects could be talked about for a whole meeting. But, we want to give you an overview at the meeting, this handout to take home and do that research and start on your hobby journey. Enjoy!!

LAYOUT DESIGN

There are many aspects to a layout design.... era (time frame of your models), space you have to work with, possible scenery plans, operations (running your trains like a real railroad) and more. Let's tackle each of these, one at a time.....

ERA – so... what kind of trains do you like the best? Steam, diesel, both, older, modern? While this will be YOUR layout and you can do anything you want on it, sometimes, focusing on a smaller era helps in the building process and the buying of future models. With an era, you do not need to buy as much, since many models do not "fit" into your era. One era that is popular is the "transition era". This was the 1950's and it's popular because railroads were changing from steam power to diesel power, so both can be used at the same time on a model railroad. A modern railroad could also do the same... where diesel power is moving the freight and passengers, while a special steam powered excursion train makes an appearance every so often. Again, picking an era helps your planning greatly... if you can settle on one. If not... that's fine... run what makes you happy! As you get older and more into the hobby and railroading history, you can certainly change to a specific era then, if you want!

ACTUAL DESIGN – The first consideration in a design is space! How much do you have available for a layout? Is it a whole room?, basement?, or just enough for a 4x8 piece of plywood? There are several ways to design your layout... cad programs can let you do it on a computer. There are already designed layouts available in books, if they fit your space. And one that is simple... graph paper!! If you take a piece of graph paper (the kind with lines both horizontal and vertical), measure your space and draw that space on the paper. Use the graph lines (squares) as a "scale" guide. Each line is 2, 3 or 4 or 6 inches apart. So draw your space onto the paper so it fits. Mark these "walls" or boundaries in black marker so they stand out. Also mark any doors, windows, pipes that are in your space. Once that is done... make LOTS of copies!! Keep that original, just in case you need more copies, as you will soon find out that it takes many tries to design your layout. With those copies... start outlining the actual layout area... not the track, but the "benchwork" where the track will be. Try to keep these guidelines in mind as you design.... wide aisles for 2 or more people (3 feet if possible) and access to doors, windows and pipes in case of maintenance issues. Benchwork should also be only as wide as needed for track and some scenery. It also needs to be no longer than your arm's reach! That is usually about 30" for most people. If your benchwork is wider, it will be harder to reach track and scenery. Now try designing the track plan... where does the track go, curves, sidings (where industries are), crossings. This is where your many tries will happen as you do one design, you'll think that maybe if you change "this or that" it will improve... so that is why you have many copies of your space! Keep going... use one part from one try, match it to another part from another try.... soon, you will have a track design you really like! Once you settle on that design... make a few copies of that!

OTHER DESIGN ELEMENTS – Now that you have a track plan, let's look at some other aspects of design – Yes... when designing a layout many factors should be looked at to see if it all "fits". OK... in your track plan do you have sidings? What type of industry will be there? If you have several sidings, consider making the industries ones that must interact with each other. Example – one siding can be a coal mine, another a power plant that needs that coal to make electricity! With that example, trains will need to switch out hopper cars at

the mine and take full ones to the power plant. Then empty hoppers from the power plant need to go back to the mine to be filled again. That is operations!! (more on that later!!) SO... when you pick industries to fit the space on your track plan, now you know what type of structure kits to buy.

How about roads? Design some roads on your plan because cars and trucks need to also get to those industries. Don't worry about roads that seem to go no-where.... remember, you can't model the whole world, so consider your layout a "slice" of the world. This means it's very real to have a road that goes from an industry to the edge of your layout. We imagine in our minds that the road continues to a town or city, but because your layout is just a "slice" you don't need to model the entire road and city it goes to!

How about general scenery – location? Is your railroad located in the west with lots of large mountains? The great plains of the mid-west, or some big city out east? This too will help determine what buildings and basic scenery forms will happen on your layout. Let's use out west as an example. On your plan, draw the outline of the base of a mountain. Does it go over your tracks and thus requires a tunnel for the track to pass through? Cool!! As you draw in these features, your layout plan becomes more complete and that will aid in the building of your layout.

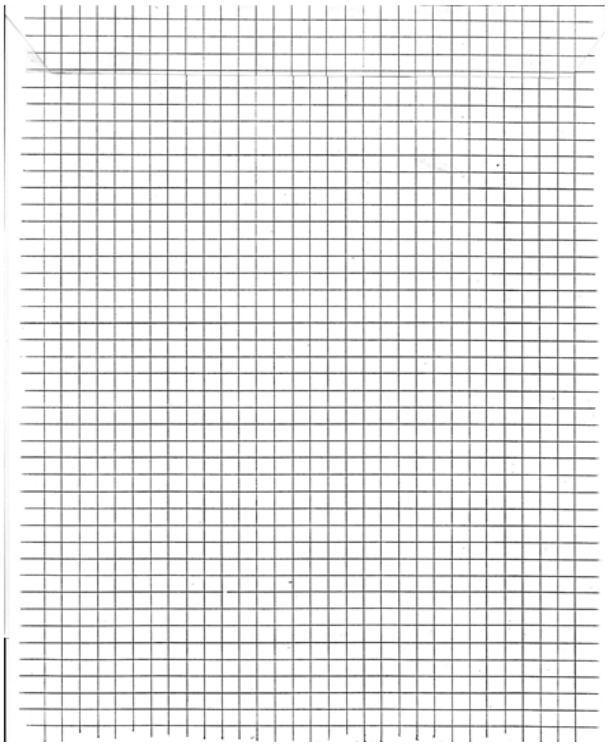
How about other buildings – stores, houses, churches, etc.... These you can add on your plan just about anywhere! Several small buildings can make a town. A few houses make a neighborhood. It easy and fun to fill in many of your blank spaces with these great layout details that will bring your model railroad to life!

Water! Yes, the world has water in it and your railroad will encounter those water features. Is it a river? Or maybe a coast scene? Even small brooks and ponds will enhance your layout. Like roads... your water feature can start on your layout and run to the edge, where we imagine it continuing on. Draw those on your plan too, IF you want them.

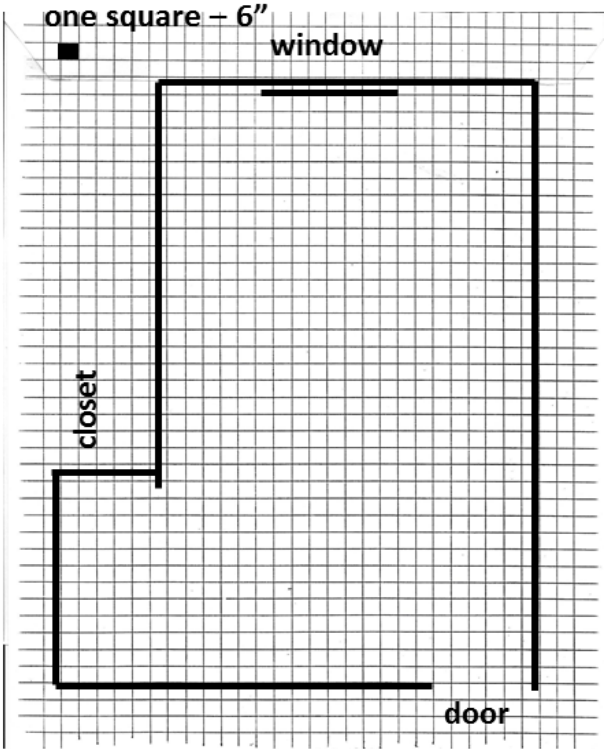
We can also consider backdrops. A backdrop will make your layout "larger"! While we have considered your layout that slice of the world.... a backdrop or center divider (if you are doing a free standing layout) will add to the scenery and the look of distance! A simple backdrop of light blue sky and maybe a few low green hills will really add to your layouts look! Roads and water can also be painted on to give them a distance look too! A backdrop does not have to be straight. If you need it to change directions, try to make that a curve. The sky does not have corners.... a curve will help blend it all together!

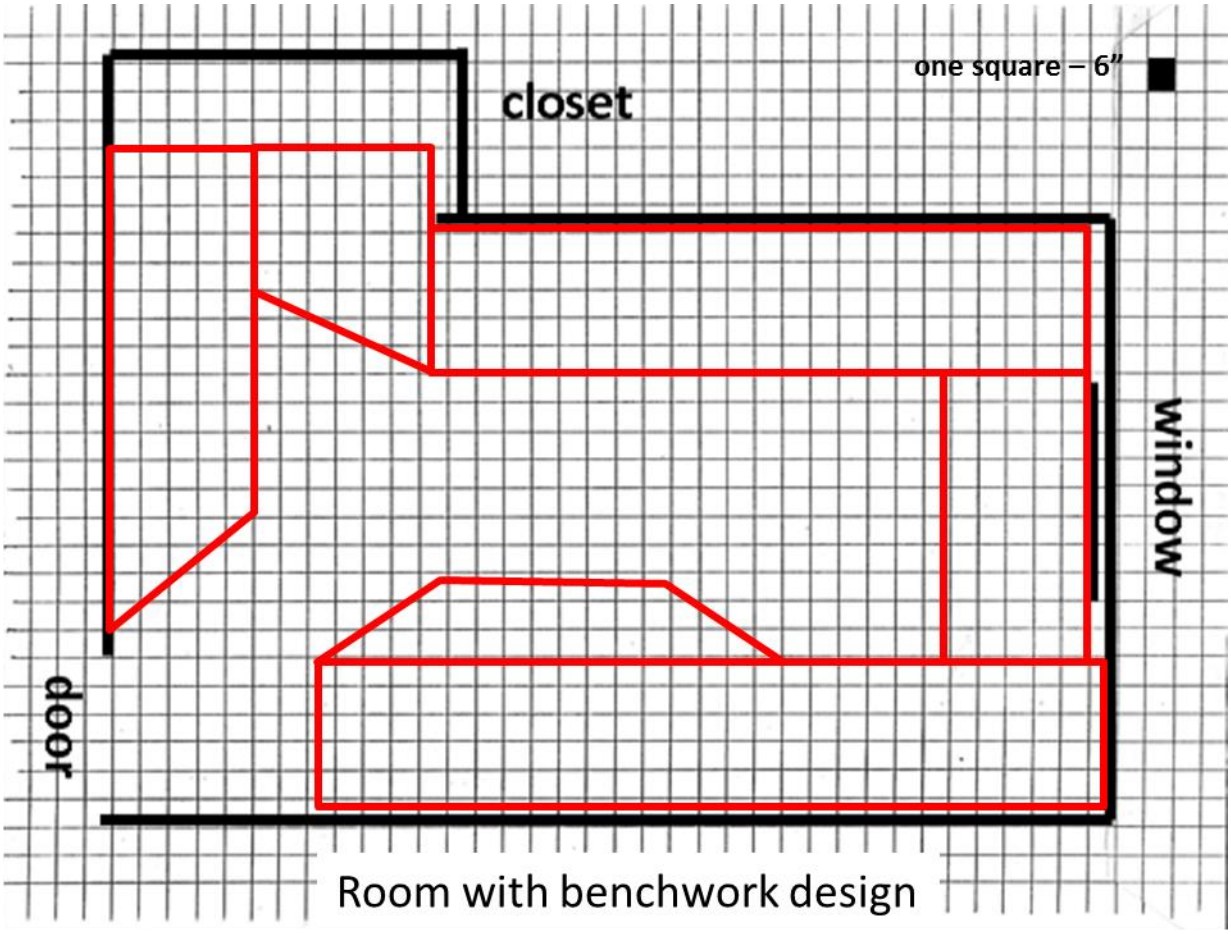
See some examples of layout design on the next few pages of this handout.
SO... now you have a PLAN!!! Congratulations! Now it's time to start even more fun.... building!!!

Standard graph paper with lines about ¼" apart

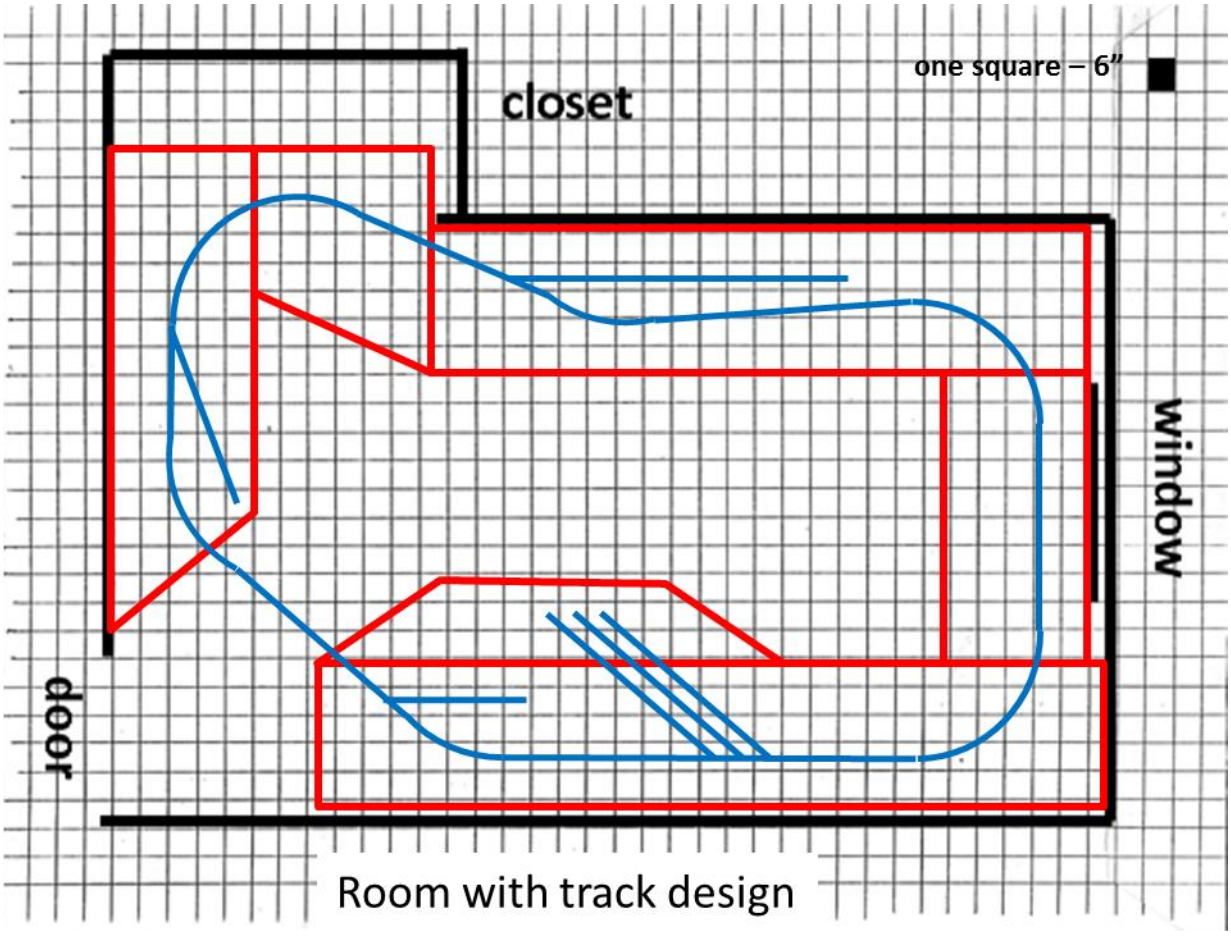


graph paper with room outline and features

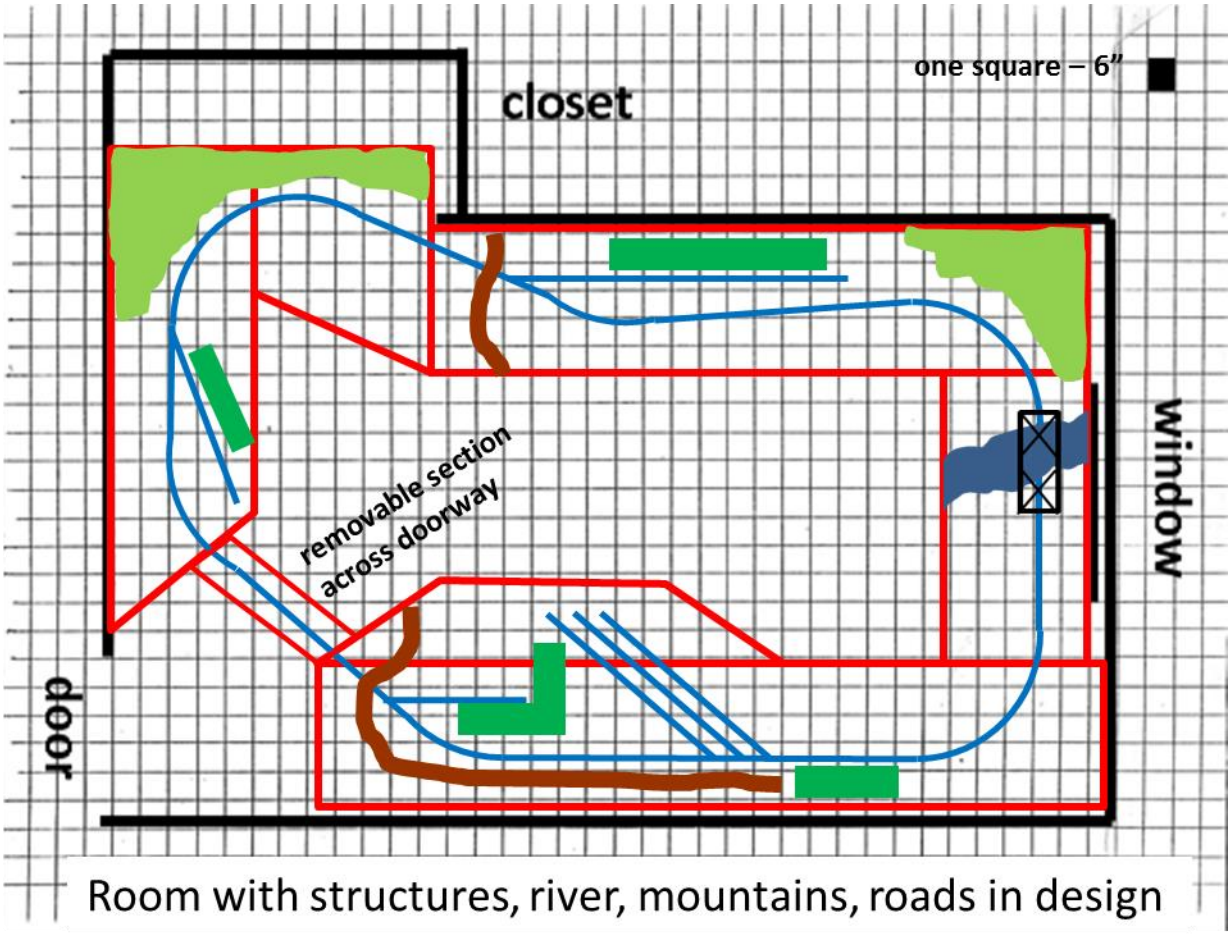




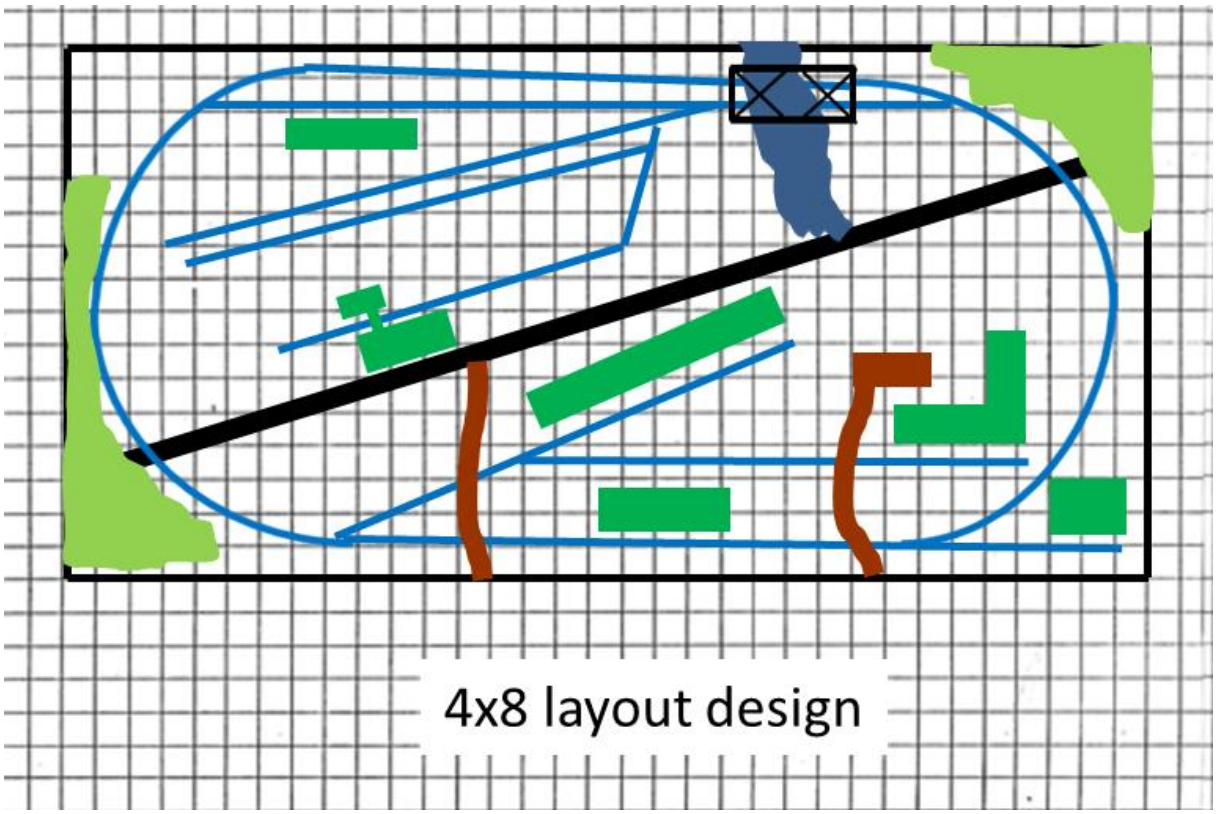
Room with benchwork design



Room with track design



Room with structures, river, mountains, roads in design



4x8 layout design

BENCHWORK

Benchwork is what we call the foundation of our layouts. It is the wood structure that holds everything... track scenery and electrical wires. Again, there are several ways to construct benchwork. The two most popular are L-girder and open grid. Let's look at these.....

L-GIRDER BENCHWORK was designed in the 50's and has held-up over the test of time. It promotes flexibility and strength. Using 1x4 and 1x2 lumber boards, you screw them together to make an L shape. Two of these on legs with supports, form the base structure. Then stringers/cross braces are placed on top to give the framework for the track. These upper boards are moveable to where they need to be or to avoid something that needs to hang down under the layout (turnout motors or wires). L-girder benchwork is generally free standing benchwork.

OPEN GRID BENCHWORK is like building a wall or grid out of 1x4 boards. (1x3 can also be used) Two sides with stringers/cross brace in-between spaced about every 16-24 inches. Screw these together, place "sideways" and support with legs and leg supports. This type of benchwork can also be attached to the wall for extra support and less legs. Open grid benchwork does use less wood, but it is not as easy to modify if something under the layout is in the way of a stringer/cross brace. If your design has features of valley's or rivers that will be below the track level.... open grid allows that section of the layout to be easily recessed! Open grid benchwork also gives a better edge to the layout for adding a fascia board later.

BENCHWORK BASICS – Once you decide which benchwork style will work best for your design, there are some tips that apply to both. These will help make building benchwork better....

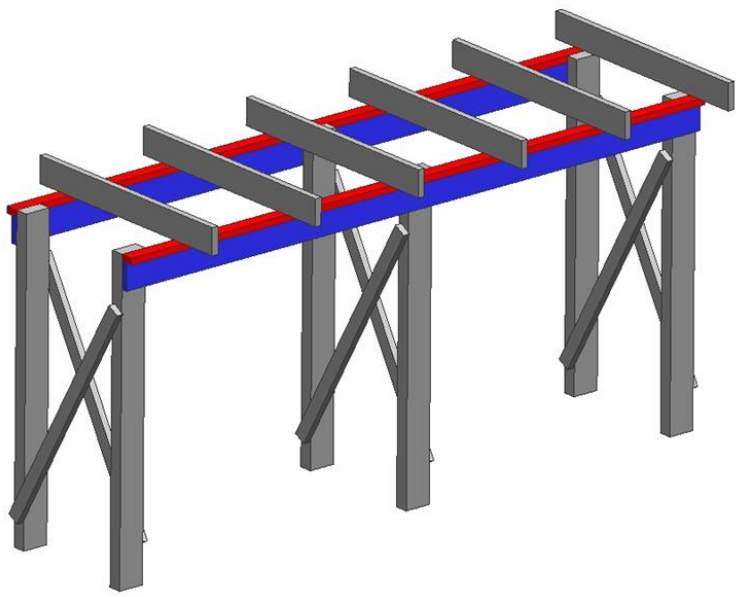
1) Always use screws, not nails! Drywall screws are great for putting benchwork together! It is stronger than nails and makes it easy to take apart, if necessary. The best length of screws is 1.5" (or so).
2) When using screws, drill a counter-sink pilot hole first. The wood we usually use is pine and it can split easily. Drilling pilot holes and using a counter-sink at the same time, helps to keep the wood from splitting and gets the screw head into the wood.
3) When buying your wood boards, 1x4 or 1x3, do not buy the cheaper type with rounded edges. These boards are usually not very straight! It's better to spend a bit more and get the higher quality wood. Also, the longer the boards, usually the straighter they are! Thus, buy boards as long as possible, even if you have to cut them to get them in the house.
4) For legs to support your benchwork, 2x4's work great and you can usually get 2 legs per 8' long board. 1x3 or 1x4 boards screwed together to form an L shape will also work well. Depending on how wide your benchwork is, angled brace legs that go from the front edge to the base of the wall work well and eliminates legs getting in the way at the front of the layout.
5) Benchwork height? The height of your benchwork also depends on your height and where you will enjoy your trains the most. The newest thoughts are that model railroads should be build a bit higher, 48-55" from the floor. This gives most people a more straight-on view of their models, like watching trains in the real world. Building layouts at a lower height gives you a "bird's-eye" view and bending over to work on them can be a pain, really! But... again, the height is up to you!
6) Your benchwork needs to be level! Use a level to get your benchwork level when attaching your legs.
7) Your backdrop can be several different materials, drywall, hardboard and even sheet aluminum. It may also be a combination of these materials. Sheet aluminum has the advantage of being seamless for a long distance, but needs drywall behind it to keep it flat and steady. Hardboard (Masonite) works good and can bend some if needed, but is usually only good on one side, so a free standing backdrop would have to be double pieces for painting purposes. Even though we are nowhere near the scenery part of building your layout, now would be a good time to paint your backdrop. Painting it sky blue now will save you from getting paint on your track or structures later on!

Please see the examples of benchwork on the next few pages of this handout.

More information, tips and standards can be found on www.NMRA.org website.

These benchwork systems give you the framework for the track or roadbed, which we will cover in the next session of MODEL RAILROAD BASICS 101!!

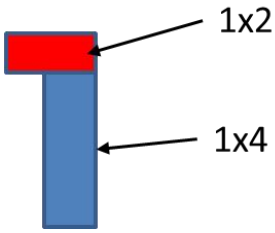
Benchwork – L Girder System



The L Girder System of benchwork was pioneered back in the 1950's and remained popular for many years. It is still used today, but most model railroaders use a grid type of benchwork.

Advantages – placement of cross bracing is easy to move if needed.

Disadvantages- uses more wood than is needed so cost is higher

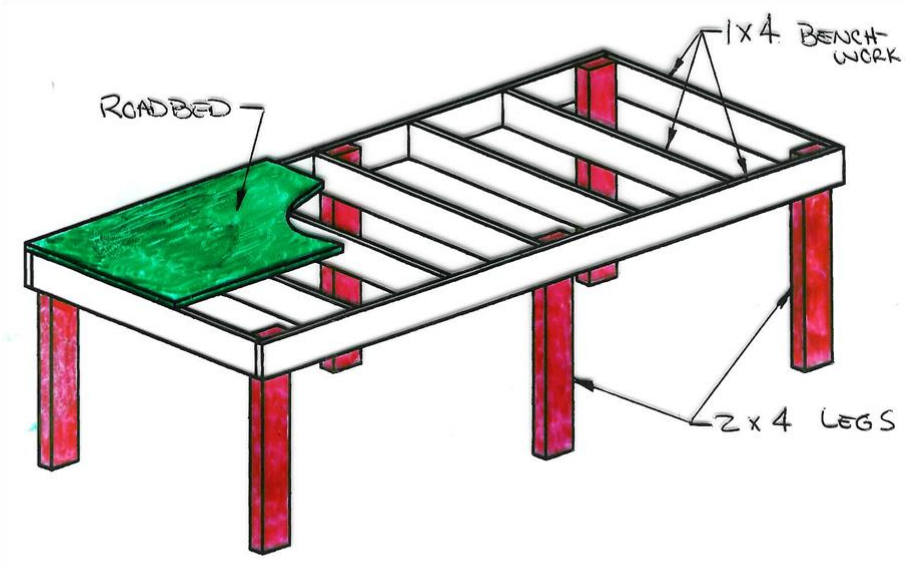


Benchwork - Grid System

The Gird System of benchwork has also been around for many years. It is based on the same functions as stud wall construction.

Advantages – less wood needed to get a strong structure and easier to build

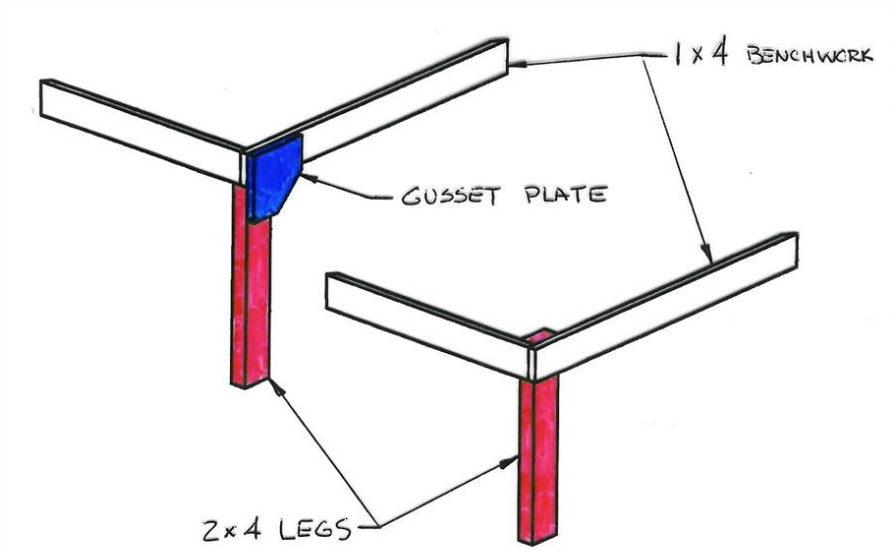
Disadvantages- placement of cross bracing is not easy to move if needed, once constructed.



Benchwork – Legs

The legs for your benchwork can also be 1x4 lumber, but better is 2x4, giving you a very sturdy support. Two ways to attach the legs-

1. Simply attach legs to benchwork with screws
2. Let benchwork set on top of leg and use gusset plate to attach with screws.
3. If possible, set legs inward from your aisle 6", giving you "toe room" when you are standing next to the layout.



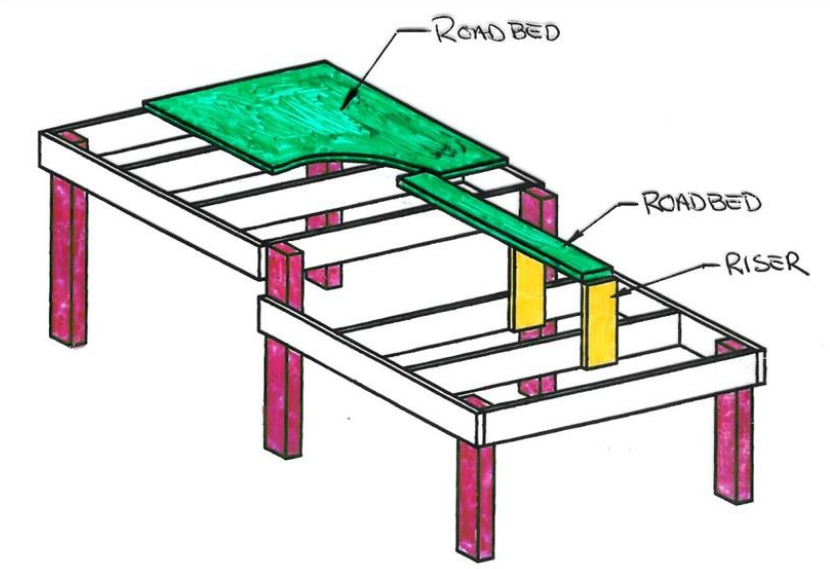
Advantages & Disadvantages- gusset plate method is a bit stronger, but does not allow for leveling easily. Simply attaching to benchwork does allow for leveling, but depends on screws for main support. However, this seems to work JUST fine!

Benchwork – different levels for scenery

Using the grid style, different levels can be made by simply lowering the grid section and using risers to support the roadbed.

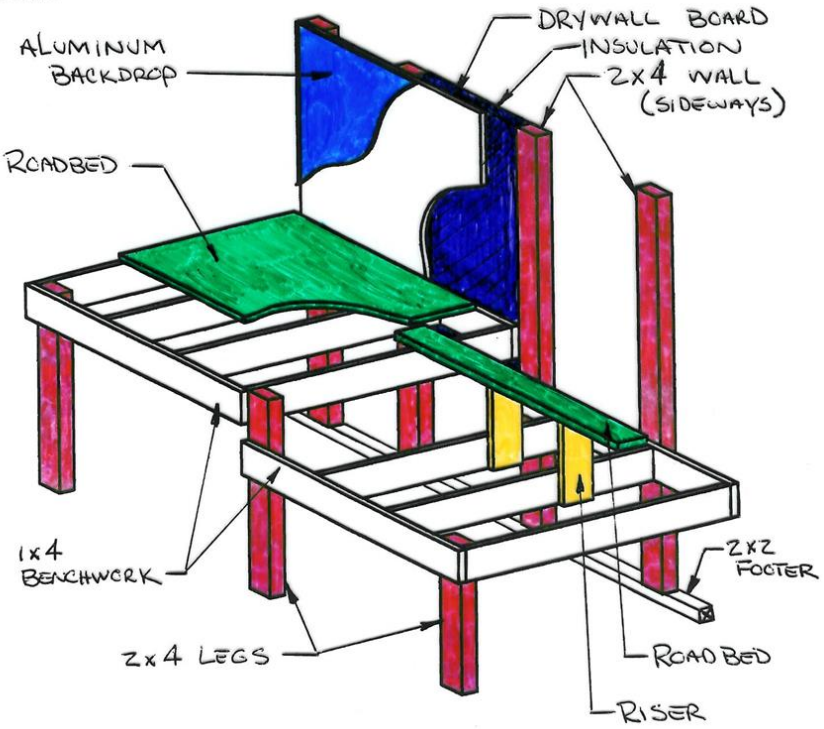
Risers are 1x4 and as long as you need.

By doing benchwork like this, scenery can be made below the track grade! This does take a bit of planning to know which sections need to be lowered and by how much.



Benchwork – total look

Here's a look at a section of a layout including benchwork, support wall, backdrop and roadbed.



Division 6 – the Motor City Division,
(part of the North Central Region, National Model Railroad Association)
Presents.....

MODEL RAILROAD BASICS 101!!

Come and learn EVERYTHING about building a model railroad! YOU CAN do it!!

For the next 8 months, at our monthly Division 6 meetings, we'll be including a segment on Model Railroading Basics! Here is what YOU will learn.....

January 17 - design & benchwork
February 21 - track
March 20 – DCC and track wiring
April 17 – locos, cars, couplers
May 15 – basic scenery
June 19 – structures
July - operations!
August - weathering

Our meetings are held at the Livonia Senior Center, located at 5 Mile and Farmington Roads. The meeting is from 7:30pm - 10pm. ALL are welcome, especially children, teens and young adults!! Our meetings are friendly, upbeat and informative! We hope to see YOU there!!