

IKEA Train Storage System

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June 1, 2007

NOTE: "Ikea", "GORM" and "Masonite" are registered trade marks.

The unit I have designed is modular, economical, easy to build, sturdy, fits all G gauge rolling stock, works well and is constructed from readily-available materials — provided you have an Ikea store handy.

I had built a train storage cabinet several years ago and made some mistakes. It was way too difficult to build for the limited storage it offered, it cost too much, and loading and unloading it was awkward. Since then I had accumulated a lot of trains and I needed a

storage unit with a relatively small footprint that would hold them all.



If you want to build one you will have your own requirements, but I'll assume you are building exactly the unit I built. This way I can mention some of the discoveries I made about constructing this size unit, and I can tell you what it will cost.

The basic building block is an Ikea "GORM" shelving unit, which is 34 3/8" x 21 3/4" x 68 1/2" high. (The Ikea catalog states the size of the shelves but I have added the dimensions of the posts also.) As supplied, the

kit consists of 4 posts with holes drilled every 5", 4 shelves, 16 lag screws to attach the shelves to the posts, and a metal "X" brace (with four self-tapping screws) to keep the unit square. The product is made in that Scandinavian country of Canada, of pine. The shelf boards and posts are 3 1/2" wide and about 5/8" thick. The finish is just like that of dimension lumber, that is, a bit rough but good enough to use without sanding. Each unit (item 000.585.19) costs \$34.99 through June 30, 2007 (it was \$29.99 last year). Extra shelves (item 400.585.17) are \$7 and pairs of posts (item 000.585.24) are \$4. Thus the cost for 4 individual shelves and 4 posts is \$36, or a bit more than buying the kit. Keep

this in mind, especially if you build a different size unit. This project requires 7 shelving units and an additional 4 pairs or posts.

Ikea doesn't deliver. The shelving unit kits are packaged with only a few straps. If your car cannot accept a quantity of these kits as is, you can disassemble the kits with a pocket knife and fit them in. In the next photo I have arranged the 28 shelves as they will be assembled in the unit, moving defects where they are less obvious. This will give you an idea of the volume of lumber you will be transporting from Ikea.



The posts have pairs of holes in them, as Ikea expects you to gang the shelves together to form a long unit 21 3/4" deep. We are not going to do that. Rather we will gang four of them back to back, and when we are done we'll have a unit 88 7/8" wide by 34 3/8" deep by 68 1/2" high.

The two end units will each accept thirty short cars up to 20 5/8", loaded through the ends, and the two inboard units will each accept eighteen long cars up to 34 3/8", loaded through the side.

I decided to space the shelves 10" apart and to include a shelf at the top of the unit to provide storage for odds and ends, and to give some protection for the trains. Using this spacing there is room for 6 shelves for trains, the bottom one having a bit of extra headroom at 15". It turned out that this deep shelf helped out when it was time to do the final assembly because I could get my body into this cavity to attach some bolts.

Because the 4 shelving kits I needed included only 16 of the 28 shelves I would need, I bought 7 kits, giving me exactly 28 shelves and 12 extra posts. These extra posts, and a few more, were all needed for my design, as you will see.

The shelves are attached by lag screws through the uprights, leaving protruding hex heads. Thus, if we were to try to gang two units together back to back, the hex heads would touch, but not the posts. So wherever two units touch, I added an extra post with 3/4" holes cut to accept the two adjacent hex heads. See the next photo. There are 6 pairs of posts that needed this treatment, so that used up half of the 12 spare posts. I used 1" drywall screws to attach a pair of posts to the right side of shelving units A, B and C. (I will refer to the 4 shelving units as "A" through "D". The 2 end shelving units A and D will be called "short" units, as they will accommodate short cars, and units B and C will be called "long" units.) To give a bit of extra strength and depth to the short units I also applied 4 of the remaining posts to the posts on the ends.



Time for a bit of measuring. I have a mixture of Aristo-Craft, LGB and Bachmann trains, and I like long locos and cars. The length of car a shelf will accommodate is greater than the size of the shelf, since the car can extend beyond the shelf. But because I was going to apply a back to the unit, and eventually will add doors, I could not allow any car to extend beyond the posts. The

long shelves easily fit all LGB products. They handle Aristo-Craft E-8s, Heavyweights, Streamline cars and Smoothside Observations. The only thing I have by any manufacturer that will not fit is the AC Smoothside Coach, and it is only about 1/4" too long. This is easily remedied by boring a hole in the back where the coupler hits. I use the short shelves for all boxcars, tenders and many locos. A few items, like LGB field railroad cars and AC Eggliners, can double-up on a short shelf. I made a CAD drawing of all my rolling stock, using rectangles of the correct length, and moved them around on the computer to determine that this mixture of long and short shelves would handle my collection. But let's get back to the construction. . . .

I like to use track on which to store trains, but track is too pricey at \$3/foot. Fortunately Aristo-Craft still has aluminum track in their warehouse for a more reasonable price of \$51 for a carton of 48 one-foot sections. (They also have the 4' curves.) (**NOTE: See footnote at end of article**). I believe they have PLENTY of it, but I was unable to negotiate a better price. You can find this item (ART 12100) on their web store only by searching for key word "aluminum", but I recommend calling them to place your order. For this project I purchased 4 cartons for a total of \$244 including shipping to Virginia. The track is handsome, like SS track, with the familiar joiners, screws and little blue drivers. Here are photos of a carton of 4 boxes of track, a single box of track, and a comparison of SS (top) vs aluminum track. See the photos on the next page.

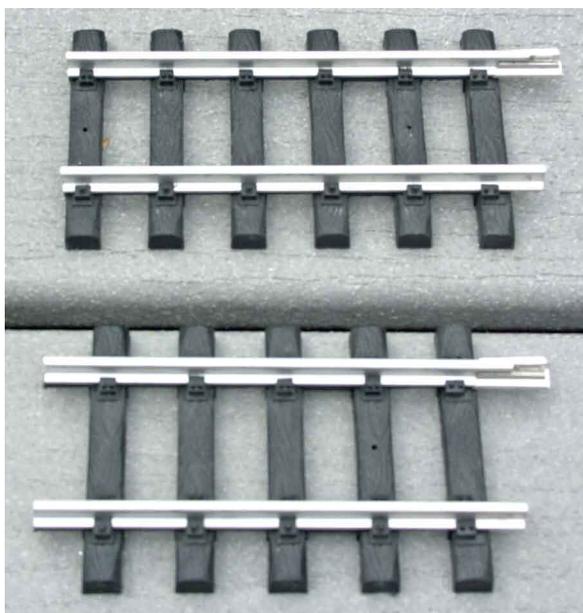


If you build the exact unit I am describing, with the same track spacing, you will have only 12 sections of track left over, and you'll do a minimum of cutting. For any other dimensions you've got some arithmetic to do.

A one-foot track section is not exactly 1 foot long, as it is actually 30cm, or 11.81". This is not a consideration at this size, but it's very important when designing a layout. That said, I will call these sections "1 foot". I wanted to use 2 1/2' of track on the longs and 1 1/2' on the shorts. The track spacing I chose is 6", and this turned out to be the ideal spacing. Short shelves have 5 tracks and the longs have 3. To populate all 12 of my short shelves required 12 x 5 x 1.5 feet of track, or 90 feet. To populate the 12 long shelves required 12 x 3 x 2.5 feet of track, or 90 feet. The grand total is 180 feet, and my order was for 192 feet. I like not having much left over (in fact, I have one box left over, as

each carton contains 4 boxes.)

One little snag arose when making the 6" track sections. There is a tie in the exact middle of a track section, and it would look awful to cut the tie in half. So I chose to cut alongside this middle tie, giving me "6 inch" sections that were 2 lengths. See photo below. After more arithmetic I decided to use the longer "6 inch" sections on the short shelves, and the shorter ones on the long shelves. How many track sections had to be sawed in half? This number is derived by dividing by two the sum of 12 shelves times 8 tracks, and the answer is 48. This gives us 48 short and 48 long "6 inch" pieces. But I needed 60 long pieces and only 36 short pieces! I could have used the remaining 12 track sections, but decided that was wasteful. I just used 12 skimpy pieces to complete the short shelves, and they worked fine. I have none of those hateful little track scraps left over.



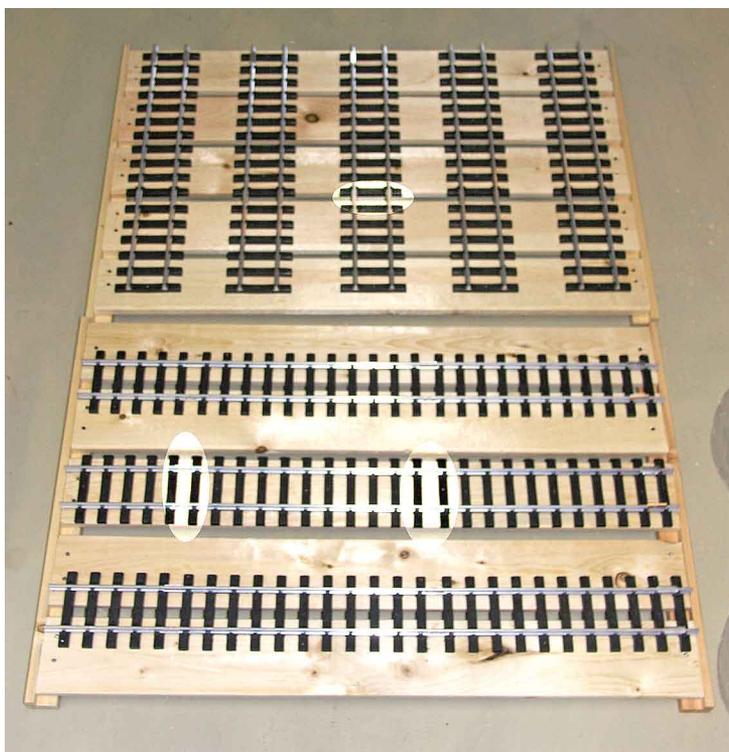
If you have no idea what I just related, that is understandable. No reason to reread this but these are the kinds of computations you will have to go through if you want to deviate from my design. The photos may clear all this up.

Below is my jig for cutting track. It consists of a 2x6 planed to the exact width of a section of track, with 2 shallow table saw cuts where the rails meet, two scraps of wood with a slot for a 32tpi bimetal hacksaw, and a means to clamp it to a work surface. Note that the saw is positioned just to the right of the middle tie. Aluminum track takes 40 strokes to cut, where SS track takes 130.



I said that the 6" track spacing was the best choice. This gives me room to fit in even those chubby Bachmann 1:20.3 center cab locos, and for the other stuff there is room for my hands to position the wheels on the track. The 10" shelf spacing is also exactly right. The actual clearance from the top of the track to the shelf above is 8 3/4".

It turns out that the 5 boards that make up a shelf are perfectly spaced for the purpose of attaching 3 long tracks with the chosen 6" spacing. I used a total of 6 ounces of wire brads, size #16 x 3/4" (\$2.67) to attach all my track. I placed the long (2.5') track sections over the gap between shelf boards 1-2 and 4-5, and down the middle of shelf 3 (just eyeball it), and nailed them in place. I aligned the front end of the track with the end of the shelf board, which is 1/2" back from the edge of the shelf. Here is a photo of both a long and a short shelf.



I found that placing something heavy (like my small anvil) on the track kept it in place while pounding in the nails. It was also necessary to place a board under the shelf so it did not bounce (see photo on next page).

Attaching the 5 short (1 1/2') track pieces across the shelf boards for the short shelving units was a bit more work, but not much. I made 2 story boards with marks for the 5 tracks at the requisite 6" spacing, and simply laid them down alongside the shelf when positioning the track. The clamp is not really necessary. Align the end of the track with the edge of the shelf that will be on the outside of the unit. The track will not quite extend to the other edge of the shelf.



My future plans include sealing the unit against dust and critters. Accordingly I installed disposable furnace filters size 20"x25" underneath the 4 bottom shelves. See the photo at left.

You don't want you expensive cars rolling off the shelves. They can't roll

out the back because we will be adding backs in a later step. To stop them rolling out the front, take those unused track joiners and place them on the TOPS of the rails at the outside, between the first and second ties (see the previous photo with the anvil). Most will go on with finger pressure and will not go anywhere. A few may need crimping. This system provides the absolute minimum of interference when inserting and removing your trains, and it might just be free. This design uses 180 pieces of track, so 360 joiners are available. A total of 264 are actually needed to hold



the track together, so you have 96 left over. You will need 192 joiners to use as stops, so if you want to use this technique you'll need to find 96 more. This was easy for me since my outdoor layout used rail clamps. By the way, you can't use a single joiner as a stop: It's not enough. Of course, you don't need any stops on the tracks where you will store your locos since, as building contractors always say when they have just violated the building code, "it ain't going anywhere".

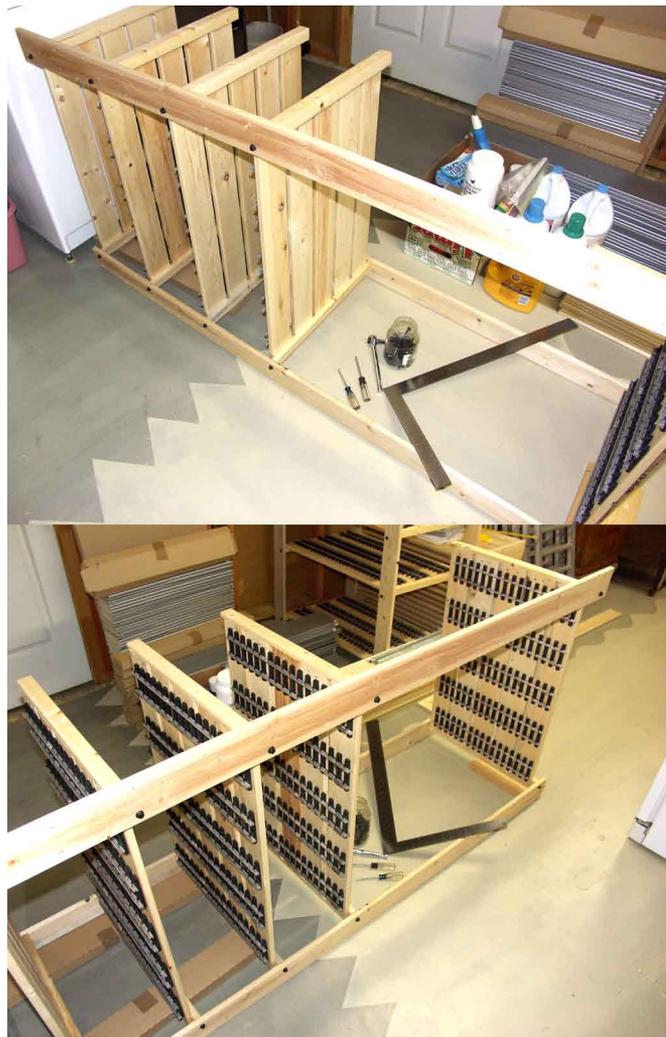
As you can see by now, I'm a detail person. . . .

OK, you've populated all your shelves with track. If you have not already done so, I suggest labelling all shelves (on the rear) with a letter (A-D) and a number (1-7) to indicate the unit and shelf position. Remember to orient the shelves so the joiner-stops are on the outside and, hopefully, the correct ends of the tracks are on the outside. All the "6 inch" pieces should be towards the back of their shelves. You don't want to assemble a unit with the shelves the wrong way 'round. Some shelves may have defects, like knot holes. You may wish to use those with ugly tops on the top of the unit and those with ugly bottoms on the bottom. I went further with this logic and oriented the best-looking areas of the shelves towards the outside.

Assembly of the shelves to the posts is uneventful, but be mindful of exactly how you will support this ungainly structure while it is being built. Use a 3/8" drive ratchet with a 6-point, 10mm socket (or just a 10mm combination wrench). I assembled some with their

backs on the floor and some with their sides on the floor (see photo).

Before hoisting them upright attach an X brace. These braces must be installed on the **INSIDE** of each shelving unit. See the next photo. For the short units place the brace at the end of the tracks. For the long units it does not matter whether the brace is on the left or right side. I do suggest, however, that you place them symmetrically, one to the left and one to the right. Think about whether the ends of the braces are going to interfere with the placement of any doors, sides or backs that you will be using. I recommend keeping the ends of the braces inside the plane of the shelf ends. See the photos of the completed unit if this is unclear. Do not hesitate to remove and reinstall these braces as needed to get them positioned properly. It only takes a minute. In fact on several occasions I installed extra braces (remember that you have 3 extras because you bought 7 kits) just to keep a unit rigid while I was manhandling it.



After you have completed the attaching of the shelves and X braces to the posts you are half done with the project. Place units A and B together in roughly their final resting place. Temporarily clamp them together with C clamps and then level them using shims at the 6 points where they touch the floor. My installation was in a basement, not far from a floor drain, so the floor sloped considerably, and a lot of shims were required. Eventually I was satisfied with the levelness, plumb, trueness and the way the two units mated. Now you should be able to bolt the two units together, through some of the unused, inboard holes in the uprights. Remember that wherever two posts meet you must insert a 3rd post with 3/4" holes at the locations where the shelf lag screw heads protrude. I used 4 screws on the front and 4 on the rear. Get 1/4" x 2.5" partially-threaded hex-head machine screws. You will need a total of 16 screws, 16 nuts and 32 flat washers. The cost for these fasteners will be about \$5. With a pair of units bolted together you will get an idea of how rigid the final product will be.

Next do the same with the pair of units C and D. It is possible to move around a pair of shelving units, but not all four. If you do so the strain is too much on you and the shelves.

Now try to clamp all four units together and level them. When you are satisfied with the levelness of the entire 4-unit system, mark your floor so you can return the unit to the exact position when final assembly is done. Carefully mark your stacks of shims so you can replace them later. I used rubber bands on the stacks and then glued the shims together to form custom-thickness blocks. I also trimmed them to 3 1/2" long to better hide them under the legs. I labelled them 'Front' or 'Back' with the designation 'A', 'AB', 'BC', 'CD' or 'D', referencing the names of the 4 units. You will have up to 10 of these blocks of shims. If you are installing the unit on a finished floor you may have no shims at all (fat chance).

It's time for the "final" touches. Separate the four units and work on the two shorts together. At this point there is nothing to prevent your short cars from rolling off the back of their tracks. You must build stops out of extra posts. At this point you have 10 of these. Cut 12 pieces each 27" long and drill 5 pilot holes about 1 1/4" from an edge (the width of a yardstick). Insert 5 #6 x 1" drywall screws. You want the pilot holes to be a bit loose as you will be drawing the 27" stop blocks into the back of each shelf. See the photo below.

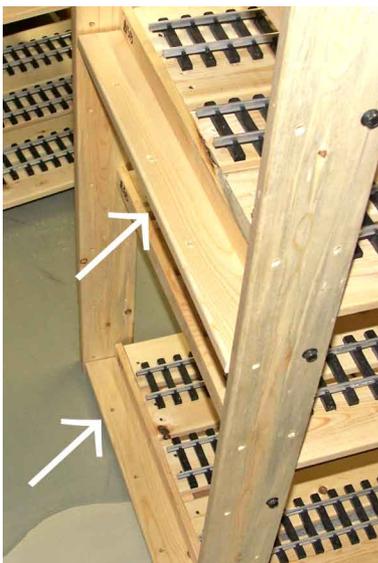


Note how these stop blocks tuck in nicely between the X brace and the shelves, EXCEPT on the shelf in the bottom of the photo, where I had to trim the block. You may not have to do this if you have thought through your placement of the X brace better than I did. I should also mention that by installing these blocks we are limiting the length of short cars which can be stored to 20 5/8", whereas you could use a different system if you have a need for more real estate. The shelf unit at the end of the tracks will be B or C, which are

long units, so you could, in theory, let your short cars intrude into the long cars' space.

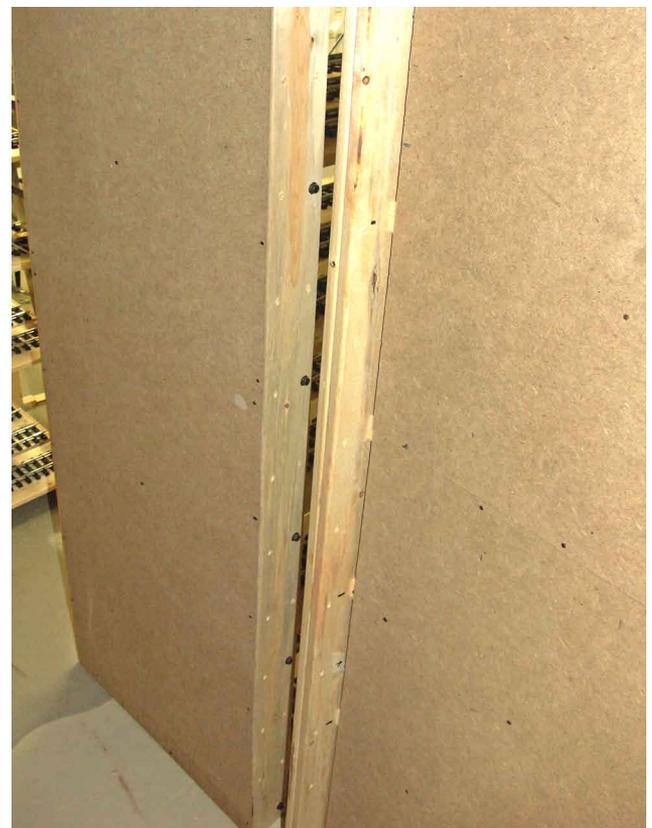
At this point you have 4 extra posts to use for the next step. You could also use some scraps of lumber from around the house, as no one will ever see these next pieces.

The long units must have backs applied. This can be Masonite, Luan plywood or what-have-you. Without a back your expensive, long cars will roll off the track. Rather than use the system of stops we used on the short units, I used sheets of Masonite which I bought at Ikea's "As Is" department for nearly nothing. I suggest you investigate this section before leaving the store, as much of what Ikea sells involves assembly with materials like this. To return to the carpentry mentioned above: I chose to extend 4 of the 7 long shelves of units B and C to the rear until they were flush with the backs of the posts. See photo below.



This gave me a solid set of nailing surfaces on which to tack my Masonite backs. I needed a total of 8 pieces, each 19.75" long, which I screwed to the undersides of the shelves using drywall screws. After cutting these pieces from the remaining 4 posts, I had only 1 complete post left.

The backs of one each long and short unit are shown in the photo below. Note how the long unit back is applied to the posts, but the short unit back is applied to the sides of the shelves.



All that remains is final assembly. Bolt together the pairs of shelf units and move them back to the place you marked on the floor. See the completed half unit in the photo on the following page. Note the painted Masonite back.

Insert 8 machine screws between units B and C and install the blocks of shims. With luck everything is still level. With the backs applied and all bolts tightened the unit is extremely solid. Use a leaf blower to clean the sawdust left over from the manufacturing process. The cost for the entire unit was \$512.93 (plus

tax of course). This included \$260.93 at Ikea, \$244 for track, \$8 for fasteners. I am not including the cost of shims or filters, as you may not need these. You do need backs on, at a minimum, units B and C, but the cost is nominal.

Next year I will seal my unit against dust, mice and crickets. I will place a single sheet of plywood across the top, cover the front sides of the short units, and install 4 doors. Three boards will be placed on the bottom shelves to cover the gaps between shelving units. One little 120v computer fan will draw air through the floor, across the trains and out the top, to prevent moisture from the concrete floor from settling on the trains. This carpentry can be done with the trains in place.

Note that I used screws and bolts throughout. If it were necessary to move this unit, (or for my widow to sell it), it could be disassembled and taken out through any door.

If you want to build one of these you could vary the configuration by using 2, 3 or 5 shelving units. A single unit would not be rigid enough without adding a back and sides.



FOOTNOTE: Since this article was written, AristoCraft has chosen to raise the cost of their old aluminum track stock by 167%, at the same time as they raised the cost of brass and stainless steel track by 100% (June 2007). While they have tried to relate the rise in cost of the current products to raw materials prices, there is no ready way to spin the rise in the cost of aluminum track, which hasn't been manufactured in perhaps 15 years.

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