

# Scratchbuild A Backwoods Water Tank

## Part I - Introduction

By Dwight Ennis



Over the years, I have found few things in this hobby as satisfying to me personally as scratchbuilding!! To take a few sticks of wood and perhaps some commercial castings and then build something up according to one's own design, with the end result being a beautiful model - few things can compare with that!! Fletch's ongoing MasterClass is a perfect example. What he might call kitbashing, I call scratchbuilding, at least on the level of "bashing" that he's doing in this fine series.

Many people are afraid of scratchbuilding. They fear that they don't have the talent, or that it won't turn out right. Or they simply have no idea where to begin, or how to go about it. The fear is groundless. It doesn't take "talent" but rather a working familiarity with the techniques, and if something doesn't turn out right, all one has wasted is a little material and some time. Just salvage what you can and try again. The remaining two points, knowing where to begin, and how to go about it, are what I will try to illustrate here.

It is my hope to guide the modeler, step-by-step, through the process of building this rectangular backwoods-style water tank. I've taken a photo of each step along the way as I constructed mine, and I will do my best to explain each step in enough detail that anyone can do everything necessary to end up with a beautiful model. The techniques learned in building this structure are applicable to any model, so if you can build this one (and there's no reason anyone can't), you can build just about any other wooden structure. There's enough variety in this one model to cover the techniques used in building bridges, trestles, warehouses, stations - just about any wooden structure you might want to put your hand to. Also, this isn't the easiest of models one could start with, but the difference between something easy and something that looks complicated or difficult is only in the number of steps needed to complete things. Taken one thing at a time, the steps themselves are the same.

Scratchbuilding is, for the most part, the art of "cutting things to fit." One holds a the material for a needed piece next to the location where the piece is needed, and makes a small notch with a hobby knife indicating the needed length. I'll be illustrating this technique along the way. When I built my tank, I didn't even prepare most of the drawings beforehand. Only where spacing was critical, such as the tank supports and the bent positions were drawings prepared in

advance, and even these drawings could have been a lot simpler than I made them (I was a draftsman for 25 years, so I easily get carried away when doing drawings). My point here is that drawings are often, if not usually, unnecessary when scratchbuilding a project, due to the "cut to fit" nature of the endeavor. All the same, I've prepared a complete set of drawings for this project.

One last thing before we move on. Scratchbuilding, like all modeling, is an art form. There are as many ways to approach a project as there are ways to paint a portrait. Obviously, I'll be illustrating my way of building this project, but there are lots of other ways to achieve the same end. Don't be afraid to experiment, since my way isn't necessarily the right way - it just happens to be the way I decided to do it. On the next thing I build, I might do things a little differently as the need arises.

I hope after building this tank, you'll have the confidence to try other projects of your own creation.

## Part II - Building the Water Tank

I model in 1:20.3, and generally build structures to 1:20, which I find makes measurements easier since  $0.05" = 1"$  instead of  $0.049" = 1"$ . Besides, 1:20 is only 1.5% bigger than 1:20.3 - a discrepancy which I doubt even the most serious rivet counter could notice, particularly since there's no definite prototype anyway. But back to scale, since I built this to 1:20, that's the scale of all drawings and real measurements. I've tried to give lumber sizes in actual dimensions, so if you're working in a different scale, use appropriate conversions. Drawings can be printed and reduced on a photocopier. The following is a conversion table to make it easier.

Scale	Multiply Dimensions By:	Reduce Drawings By:
1:22.5	0.8888	88.8%
1:24	0.8333	83.3%
1:29	0.6896	68.9%
1:32	0.6250	62.5%

## Needed Tools

The biggest hurdle to overcome when scratchbuilding in Large Scale is obtaining the wood itself. Those building in the smaller scales have a multitude of scale stripwood to choose from, either from the local hobby shop or via mail order. Unfortunately, such is not the case in Large Scale. To my knowledge, only Kappler supplies F-Scale lumber, but being made from basswood, I don't consider it a viable material for outdoor use. Garden Texture sells redwood and cedar lumber, but in fractional-inch sizes, with the thinnest being  $3/16"$  - almost  $4"$  in 1:20.3.

It's for this reason that I cut my own lumber from redwood 2 x 4's and 2 x 6's. However, in order to do so, it has been necessary to invest in some tools capable of doing the job. As an example, this project requires a number of scale 2 x 12's for the tank walls. This works out to an actual size of  $0.10 \times 0.60$  (as I said, when cutting lumber, and for most other measurements, I work in 1:20 and drop the point-three, so  $0.05" = 1.0"$ ). Cutting the  $0.60"$  dimension out of a redwood 2x4 is easy enough on my 10" table saw (and I had that saw before I started using it for Large Scale lumber cutting). I first cut the boards to a length of no more than three feet. This keeps

them manageable. I then cut strips 0.60" wide, so I end up with strips 0.60" by about 1-7/8" (a finished 2 x 4 isn't really 2 inches wide), by three feet or so long.

Cutting the 0.10" from these strips is another matter entirely. I have a healthy respect for table saws above all other power tools!! This respect is about one notch below paranoia!! There's no way in creation that I'm going to get my fingers that close to a blade capable of removing those fingers in a heartbeat!! Besides, the blade takes a 1/8" wide swath out of whatever it cuts, turning a lot of otherwise usable lumber into sawdust. I therefore tried my band saw, but found that the blade walked too much, giving me boards of inconsistent thickness over their length.

I ended up by breaking down and buying the MicroLux Tilting Arbor Table Saw (#80463), from Micro-Mark, along with the Featherboard and High Fence Attachments (#80898). I waited until they went on sale, so the total cost was about \$330.00 plus shipping. That's a lot of money for a tool, to be sure - about twice as much as I originally paid for my 10" table saw. While it grieved me at the time, I haven't regretted the purchase. It's a great little tool for specialized work that does a terrific job doing just what I need it to do. Also, while still demanding the respect due any power tool capable of doing serious injury, it doesn't present nearly the danger to my digits or person as would the larger saw if trying to do the same job. That alone justifies the purchase in my opinion. In addition, cutting lumber to length is a breeze, and while it can be done with a miter box and razor saw, it's faster and easier with this little saw. You can't use a scalpel, hobby knife, or NSL Chopper here as you might in the smaller scales.

The only other power tools I used to construct this project was a small drill press and a Dremel Tool. I have a drill press about two-feet tall that sits on my workbench, and which cost me about \$100.00 a few years back. While not absolutely essential to this project, trying to drill all the holes needed by hand while keeping them square would be a real pain. I strongly urge you to get some kind of small drill press. Dremel makes such a tool in the form of an attachment to be used with their rotary tool if you wish to go that route. Either way, you'll save yourself a lot of grief by investing in such a drill press. Like the saw described above, the initial investment may seem steep at first, but you only need to buy such tools once, and you'll use them over and over again for many years to come. They more than pay for themselves in the long run. In this article, I'm going to have to assume that you have a way to cut the necessary material, and that you have a drill press.

The Dremel Tool was used only to hollow out the spout, since the spout casting had a solid core. There are probably other ways to achieve this, but I happen to own a Dremel Tool, so that's what I used.

By way of hand tools, you're going to need plenty of clamps. I use a variety of types, as you'll see from the photos: small C-Clamps, bar clamps, and a few of the X-Acto clamps. All these are available for a few bucks each from local sources - Orchard Supply or Home Depot or equivalent for the C-Clamps, and the hobby shop for the others, or you can get them from Micro-Mark. For my part, I have four 1" c-clamps, two 1-1/2" c-clamps, and two 2-1/2" c-clamps. I also have a couple of full-sized 8" c-clamps out in the garage, and two or three full-sized bar clamps. I only used these once or twice, and there were alternative routes I could have gone, but having them available made things easier.

Speaking of bar clamps, I couldn't have easily gotten along without two of Micro-Mark's 12" Miniature Bar Clamps (#14256). There were, in fact, several times I wished I had a couple more. Since finishing this tank, I've already bought four more of these indispensable little clamps. They cost \$13.95 each, and are well worth every penny!

For measuring, I use a 12" machinist's scale with graduations in thirty-seconds and sixty-fourths on one side, and tenths and hundredths on the other. As I said, I build to 1:20 and drop the point-three, so one-tenth of an inch on the scale equals two inches in 1:20, the smallest width I've had to cut (with one exception, but that was on another project). I use this ruler to set the fence on the saw prior to ripping scale lumber. I suppose you

could also use a scale ruler for 1:20.3, but all of the rulers I've seen for this size don't start at the end, requiring it's end to be cut off if one wishes to use it in this capacity. Use whatever you wish or already have here.

You'll also need at least one small square. I have a set of small machinist's squares that I got from Micro-Mark (#15216), but a tri-square will also work, as will a small draftsman's triangle, or anything that will allow squaring up pieces.

A set of small drill bits from #61 to #80 is also essential, not only for this project, but for most others including locomotive repairs, etc. A set costs about \$20.00 or less, and can be purchased from a hobby shop or through Micro-Mark.

You'll also be using Blacken-It, a chemical blackener for brass and other metals. Blacken-It is also sold at my local hobby shop, or is available through Micro-Mark (#60864). One bottle should suffice for this project. You'll need two shallow containers also, one for the blackener and one for rinse water. I use a Tupperware container for the blackener that I swiped from my wife. For the rinse water, I've been using the bottom cut from a 2-liter soda bottle.

The rest of the tools needed you probably already have, so I won't go into them separately - razor saw and miter box, small pair of needle nose pliers, small diagonal cutters, scalpel or hobby knife, tweezers, paint brushes, etc.

## Material List

The following is a list of the wooden parts needed to make this project.

Qty.	Scale Size	Real Size (1:20)	Description
25	2 x 12 x 11'-8"	0.10 x 0.60 x 7.00 *	Tank Walls, Top and Sides
9	2 x 12 x 10'-8"	0.10 x 0.60 x 6.40	Tank Wall, Bottom
16	2 x 12 x 8'-10"	0.10 x 0.60 x 5.30	Tank Walls, Front and Rear
12	6 x 8 x 10'-4"	0.30 x 0.40 x 6.20	Tank Supports, Top and Bottom
12	6 x 8 x 9'-6"	0.30 x 0.40 x 5.70	Tank Supports, Sides
6	6 x 8 x 8'-0"	0.30 x 0.40 x 4.80	Tank Supports, Front and Rear
12	8 x 8 x 8'-4"	0.40 x 0.40 x 5.00 *	Leg, Bent
8	8 x 8 x 12'-0"	0.40 x 0.40 x 7.20 *	Horizontal Beam, Top and Bottom, Bent
8	2 x 6 x 9'-0"	0.10 x 0.30 x 5.4	Horizontal Sway Brace, Bent
16	2 x 6 x 11'-8"	0.10 x 0.30 x 7.00	Diagonal Sway Brace, Bent
2	2 x 6 x 12'-0"	0.10 x 0.30 x 7.20	Horizontal Sway Brace, Trestle Work
6	2 x 6 x 12'-4"	0.10 x 0.30 x 7.40	Diagonal Sway Brace, Trestle Work
2	2 x 6 x 8'-8"	0.10 x 0.30 x 5.20	Diagonal Sway Brace, Trestle Work
3	8 x 18 x 14'-0"	0.40 x 0.90 x 8.40 *	Foundation Beam
2	8 x 8 x 13'-8"	0.40 x 0.40 x 8.20 *	Water Tank Support Beam, Outer
2	8 x 8 x 14'-8"	0.40 x 0.40 x 8.80 *	Water Tank Support Beam, Inner
4	6 x 8 x 11'-0"	0.30 x 0.40 x 6.60	Inner Brace, Vertical, Frost Box
4	6 x 8 x 2'-10"	0.30 x 0.40 x 1.70	Inner Brace, Horizontal, Front and Rear, Frost Box
5	6 x 8 x 1'-4"	0.30 x 0.40 x 0.80	Inner Brace, Horizontal, Sides, Frost Box

32	1 x 8 x 4'-1"	0.05 x 0.40 x 2.45	Sheathing, Front and Rear, Frost Box
21	1 x 8 x 2'-7"	0.05 x 0.40 x 1.55	Sheathing, Sides, Frost Box
3	1 x 8 x 6'-4"	0.05 x 0.40 x 3.80 *	Door, Frost Box
2	1 x 8 x 2'-2"	0.05 x 0.40 x 1.30	Horizontal Brace, Door, Frost Box
1	1 x 8 x 3'-10"	0.05 x 0.40 x 2.30	Diagonal Brace, Door, Frost Box
1	2 x 6 x 2'-7"	0.10 x 0.30 x 1.30	Threshold, Door, Frost Box
2	2 x 2 x 6'-4"	0.10 x 0.10 x 3.80 *	Vertical Framing, Door, Frost Box
1	2 x 2 x 2'-7"	0.10 x 0.10 x 1.30	Horizontal Framing, Door, Frost Box
2	6 x 8 x 16'-6"	0.30 x 0.40 x 9.90 *	Vertical Support, Spout Hanger
1	6 x 8 x 5'-6"	0.30 x 0.40 x 3.30 *	Horizontal Support, Spout Hanger
2	6 x 8 x 5'-4"	0.30 x 0.40 x 3.20	Top Brace, Spout Hanger
2	2 x 12 x 4'-0"	0.10 x 0.60 x 2.40	Backing Boards, Spout Hanger
2	2 x 4 x 22'-6"	0.10 x 0.20 x 13.50 *	Vertical Support, Ladder
20	2 x 4 x 1'-8"	0.10 x 0.20 x 1.00 *	Rung, Ladder
2	2 x 4 x 3'-4"	0.10 x 0.20 x 2.00	Mounting Support, Ladder
1	2 x 5 x 8'-0"	0.10 x 0.25 x 4.80 *	Scale, Water Gauge
1	2 x 2 x 8'-0"	0.10 x 0.10 x 4.80 *	Backing Board, Water Gauge
2	2 x 4 x 1'-4"	0.10 x 0.20 x 0.80	Hatch Frame, Short Side
2	2 x 4 x 1'-10"	0.10 x 0.20 x 1.10 *	Hatch Frame, Long Side
2	1 x 2 x 1'-4"	0.05 x 0.10 x 0.80	Hinge Plate, Hatch Frame
2	1 x 8 x 2'-2"	0.05 x 0.40 x 1.30 *	Hatch Cover
2	1 x 4 x 1'-4"	0.50 x 0.20 x 0.80	Brace, Hatch Cover

**\* Most lengths given are approximations. Actual length will depend upon other factors. Lengths marked with an asterisk are actual lengths. The remaining boards will be sized to fit.**

You'll also need the following additional non-wooden materials...

<b>Qty.</b>	<b>Part Number</b>	<b>Manufacturer</b>	<b>Description</b>
5	2512	Detail Associates	0.052" Diameter Brass Wire - 6 x 12.0/pkg
1	230	Evergreen Scale Models	5/16" Diameter Styrene Tube - 3 x 12/pkg
1	167	Evergreen Scale Models	0.080 x 0.156" Styrene Strip - 8 x 12/pkg
1	189	Evergreen Scale Models	0.250 x 1/4" Styrene Strip - 5 x 12/pkg
1	297	Evergreen Scale Models	1/4" x 1/4" Styrene Angle - 3 x 12/pkg
1	268	Evergreen Scale Models	5/16" x 3/32" Styrene Channel - 3 x 12/pkg
1	245	K & S Engineering	0.064 x 1/4" x 12" Brass Strip
1	246	K & S Engineering	0.064 x 1/2" x 12" Brass Strip
1	125	K & S Engineering	1/16" Diameter Brass Round
24	1 x #18		Brass Escutcheon Pin
29	3/4 x #20		Wire Brad

**(For material sold in packages, Qty. refers to number of packages.)**

You'll also need some flat material such as smooth plywood upon which to construct a couple of jigs. More on that a little later.

In terms of commercial parts, you'll also need...

<b>Qty.</b>	<b>Part Number</b>	<b>Manufacturer</b>	<b>Description</b>
20	OM-07B	Ozark Miniatures	Nut-Bolt-Washer Casting 3/4" Bolt - 2" Hex Nut - 20/pkg
1	OM-07	Ozark Miniatures	Nut-Bolt-Washer Casting 1/2" Bolt w/Nut and Washer - 55/pkg
1	OM-16-1B	Ozark Miniatures	Blackened Brass Chain, 11 links/inch, 1 foot
1	1001	Custom Finishing	O-Scale Freight Car Grabs, PS Style - 4/pkg
1	15260	Micro-Mark	Brass Strap Hinge - 4/pkg
1	GW-11 *	Grey Wolf Miniatures	Water Spout and Rack

**\* Available through [Hartford Products](#) - make sure and purchase three extra lengths of chain because that supplied is too short for this project.**

**(For material sold in packages, Qty. refers to number of packages.)**

There's one last thing I need to reiterate here. When scratchbuilding, and especially when cutting one's own material to width, many dimensions will be approximations, particularly those lengths that will be dependent upon the hand-cut width of other pieces. This will be illustrated in the next section. The important thing to know up front is that one can't usually just cut all the material before assembling the project as if it were some kind of kit. The exception to this is when ripping material to width. When ripping the actual lumber sizes I'll need, I try and cut enough strips of that size to cover the entire project. This not only makes for consistency throughout the model, but prevents me from having to go back later and rip more material, which will invariably end up being a slightly different size.

With the preliminaries out of the way, we're ready to start!!

## **Downloading the Drawings**

Each chapter in this series will have links to 1:20 scale full sized drawings near the beginning. I made sure these would fit on a standard 8-1/2 x 11 piece of paper, and I've converted each to an **Adobe Acrobat PDF file**. To open/view these files will require that you have **Adobe Acrobat Reader** installed on your system, a free program used to share documents and drawings. If you don't have the **Acrobat Reader**, you can [download it here](#). Once you have the **Acrobat Reader** installed, download each drawing and print one or more copies of it. The PDF files are designed to print 1:1, to make sure the **Shrink to Fit** box is **unchecked!!**

In **Part III**, we'll construct the water tank itself, and the jigs needed to make it.