Scratchbuilding

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Scratchbuilding
Thank you

- Lloyd Keyser
- Martin Lofton
- Frank Hodina
- Aaron Gjermundson
- Bill Welch
- Ron de Pierre
- Jon Cagle
- Tom Madden
- Charles Dean
- Ed Rethwisch
- Bob Hundman
- Ryan Mendell

Scratchbuilding

What are your goals and “perspective”?

- Contest model
- Pattern for personal use
- Sales
- Layout model

Scratchbuilding

This presentation focuses on “old school” techniques. There are now many areas where 3D solid modeling on a computer is easier and superior to what I am presenting here. I fully embrace those tools. However, I understand that they come with a learning curve and costs that may be more expensive in time and money than just sitting down and making it from scratch. To summarize, I understand that technology has changed and there are other (and in many instances, better) ways to do things.

Make one, not two!

It can be incredibly difficult, if not impossible, to make two identical sides or ends. Focus your efforts on making one perfect part and copy it yourself or have it duplicated for you

Don’t reinvent the wheel

If you can modify a commercially available part, then there is likely no need to scratchbuild it. Focus your efforts on the things where you can create something new. In this vein, many details can be harvested from other sources and repurposed. In some instances, they may not even be the same type of detail. However, in many instances, we are *simulating* the prototype, not duplicating it exactly

Don’t let perfect be the enemy of good

Don’t obsess over very minor imperfections*. Clean them up as you’re able and move on, particularly if the end product is for you and maybe friends. Paint and weathering can hide a lot of sins.

*the exceptions are things that are supposed to be straight, aligned, etc., but are not. The human eye is amazing at detecting even the slightest such differences and people will notice those flaws. As such, use good tools for ensuring that things are square and in alignment (see tools portion of this presentation.)

Don’t overthink things!

Many people get lost in the “analysis — paralysis” trap, thinking that if they only had a better tool, technique, material, etc., then the pattern would practically make itself. I have been there and the only result is no result. Some of my best modeling has been when I have had an obstacle without knowing how I’d overcome it and I just sat down and got the job done.

If you need inspiration for overcoming “analysis — paralysis” refer to “The Waiting Place” section of *Oh, The Places You’ll Go!* by Dr. Seuss

Just get started

You likely already possess most of the necessary skills. Start with something modest and spread your wings from there. Once you familiarize yourself with the materials and techniques, your imagination will take over and you will start to envision how to make things.

Modify an existing model with a couple scratchbuilt details and go from there…

References

Since you will not be starting out of thin air, what do you need as your reference?

I have made patterns using engineering drawings/ blueprints, diagram sheets, field notes, and photos. Obviously, the more info you have at your disposal, the better. That said, if your goal is simply to have a string of cars for your layout, then photos and some basic dimensions from a *Official Railway Equipment Register* may provide all you need to get started.

References

While this presentation is intended to help with gaining a basic understanding, I highly recommend consulting others' work to provide a foundation of thought. Good sources include the various scratchbuilding articles by Bob Hundman in *Mainline Modeler* (*MM*), the kitbashing articles by Mark Feddersen in *MM* and Richard Hendrickson in numerous publications, my material in *RMC* and the work of many in *Prototype Railroad Modeling*. A heavy kitbash can be more instructive than scratchbuilding.

References

- Drawings/Blueprints - archives and historical societies may have these, as well as many produced in publications, both model periodicals as well as industry publications (*Car Builder's Cyclopedia*, *Railway Age*, *Railway Mechanical Engineer*, etc.)
- Diagram sheets - historical societies as well as some private sellers offer reprints
- Field notes - cars still exist and can be photographed and measured
- Photos - photos combined with some key dimensions can be enough to make a model

Materials

I prefer to use styrene as my primary material and augment it with shim stock vinyl and brass, as needed. That said, if you are more comfortable with wood, brass or some other material as your primary medium, then go with what works for you.

In general…

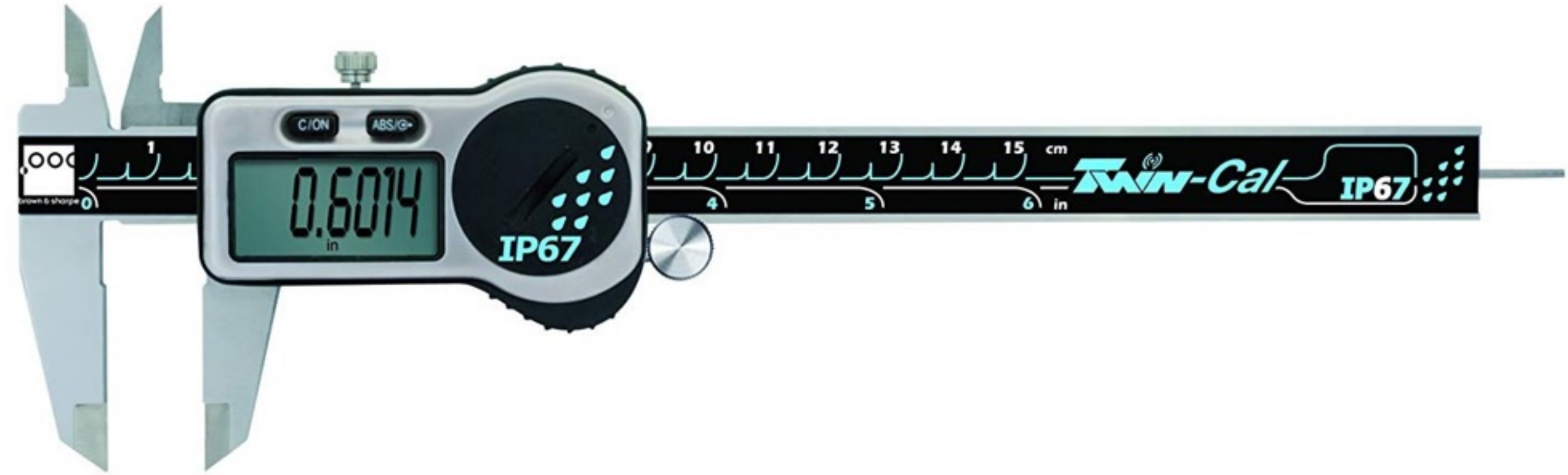
- What follows is not meant to be a thoroughly expansive treatise; it is a compilation of my thoughts on making freight cars and is more a work-in-progress
- There are many types of projects I haven't tried and materials and techniques I haven't used. Your efforts and experiences will differ. Do what works for you!

- Start small
- Develop your skills
- Move on to more difficult projects

Stuff to help…

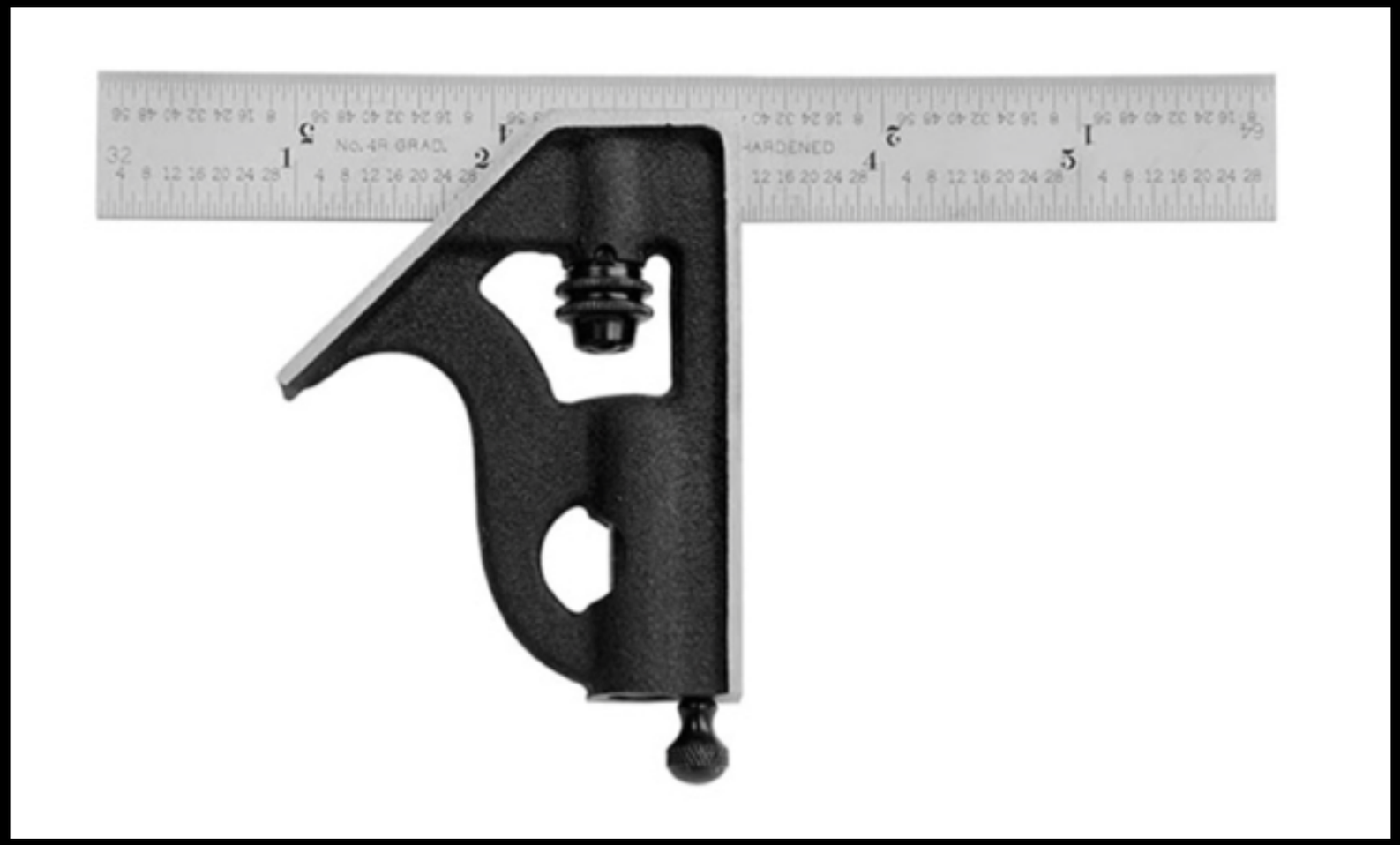
- Tools (following pages)
- Adhesives
  - MEK (or your favorite solvent cement)
  - Barge Cement or Goo thinned with MEK for joining dissimilar materials
- Future floor wax — can be used a simple adhesive and to seal details for casting
- The usual
  - Files
  - Drills
  - Very, very fine brushes
  - Cutting tools, e.g. the ubiquitous no. 11 blade

Calipers



- Don’t get the least expensive; stainless jaws a must
- Measuring to 0.0001"
- Indispensable for laying out, locating, and spacing details such as structural members

Squares



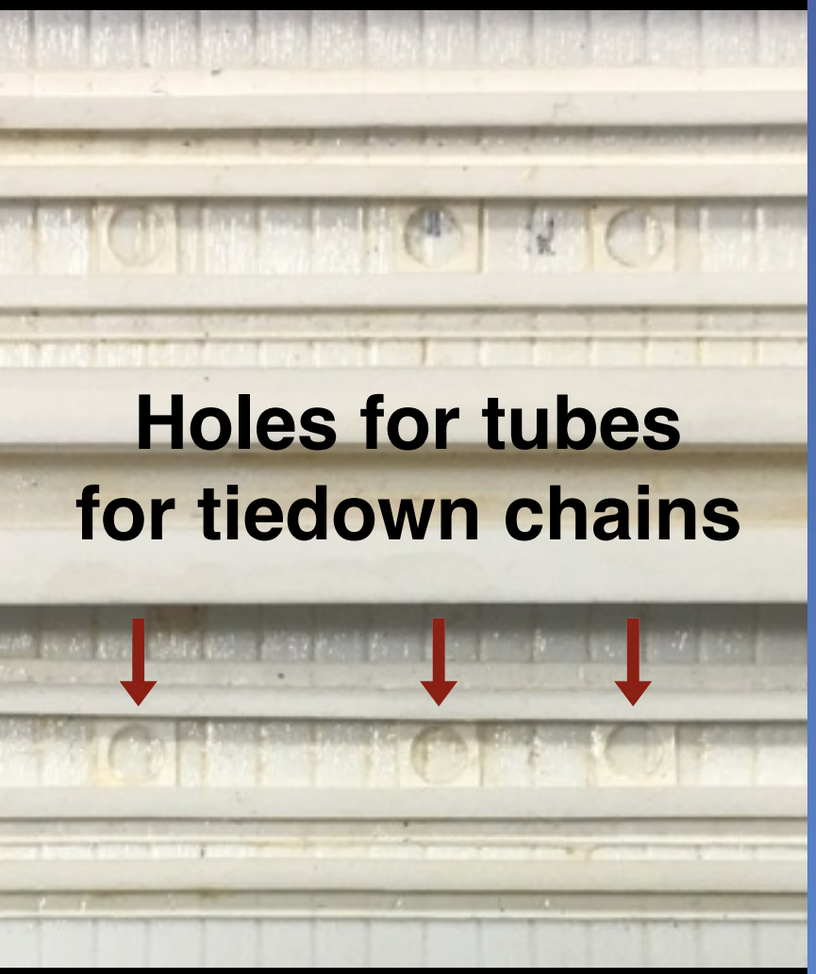
- Don’t go cheap
- Starrett and Brown & Sharpe are excellent
- Indispensable for squaring components when pattern making

The Chopper Northwest Shortline

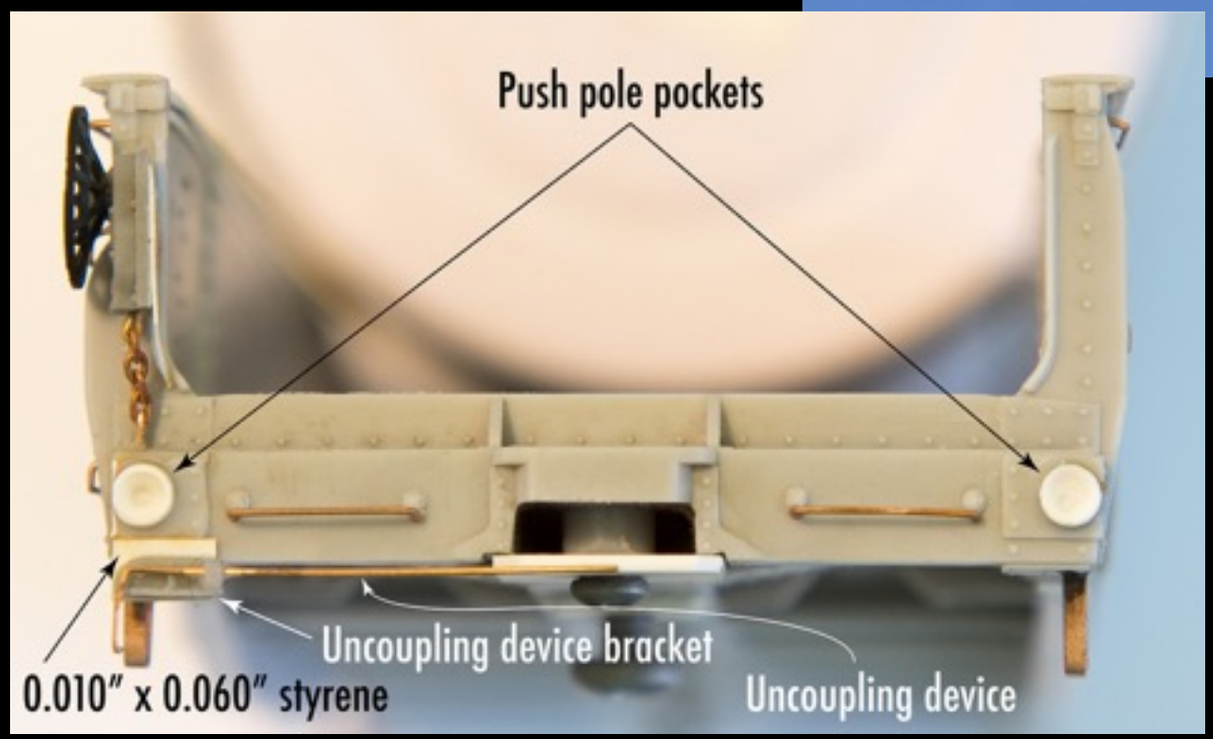
- Easily create pieces of the same length

The True Sander Northwest Shortline

- To square edges either just for straightness or to improve assembly (good to make sure sides in “flat” resin kits are square and of the same length)



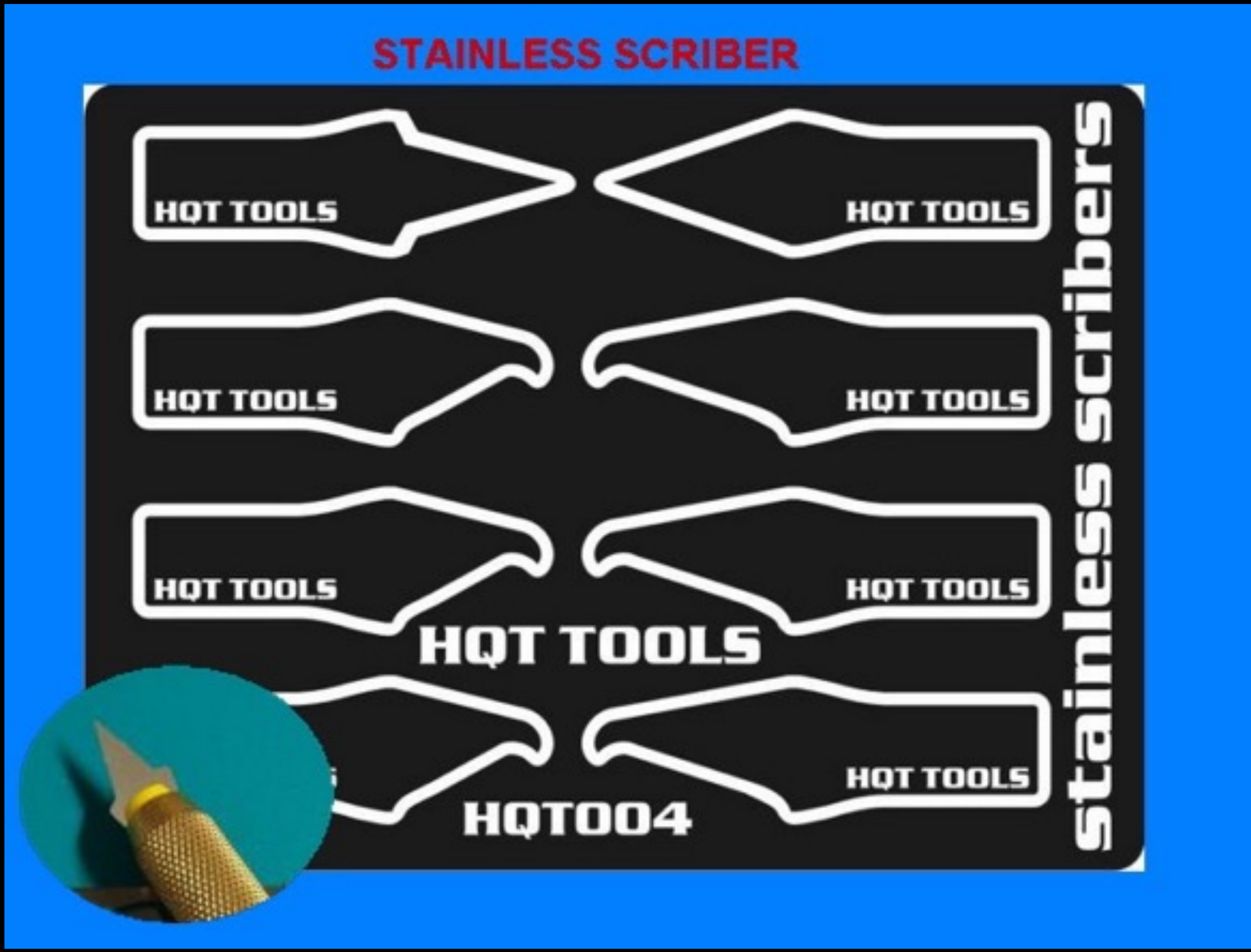
RP Toolz punch and die

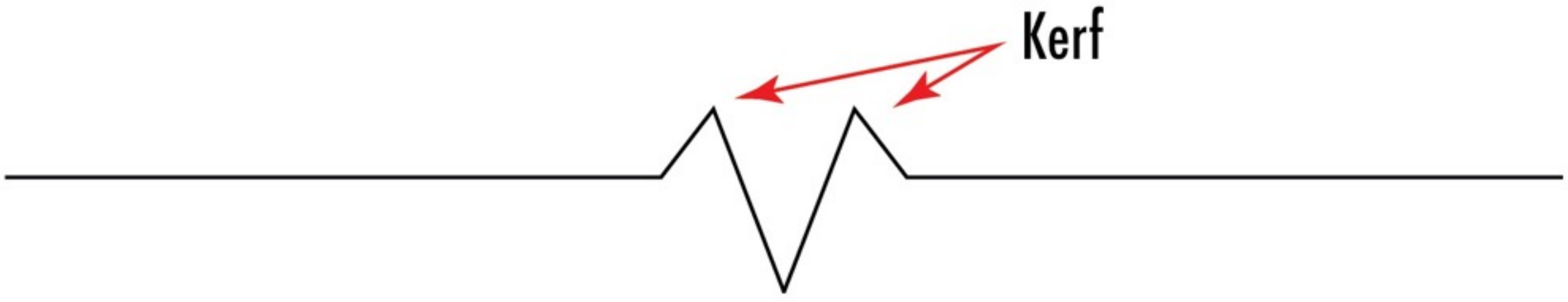


- Round shapes are common
- Can be used for push pole pockets or other applications

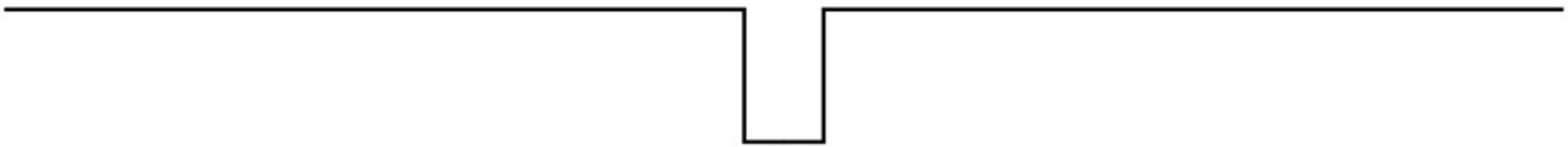
Scribers

- Used for panel lines, sometimes wood joints, as guides for straight lines to glue material, etc.
- Don’t necessarily have to be called scribers. Can be blades, dental picks, etc. Use what works for you.





Profile of “traditional” scribe line with no. 11 blade



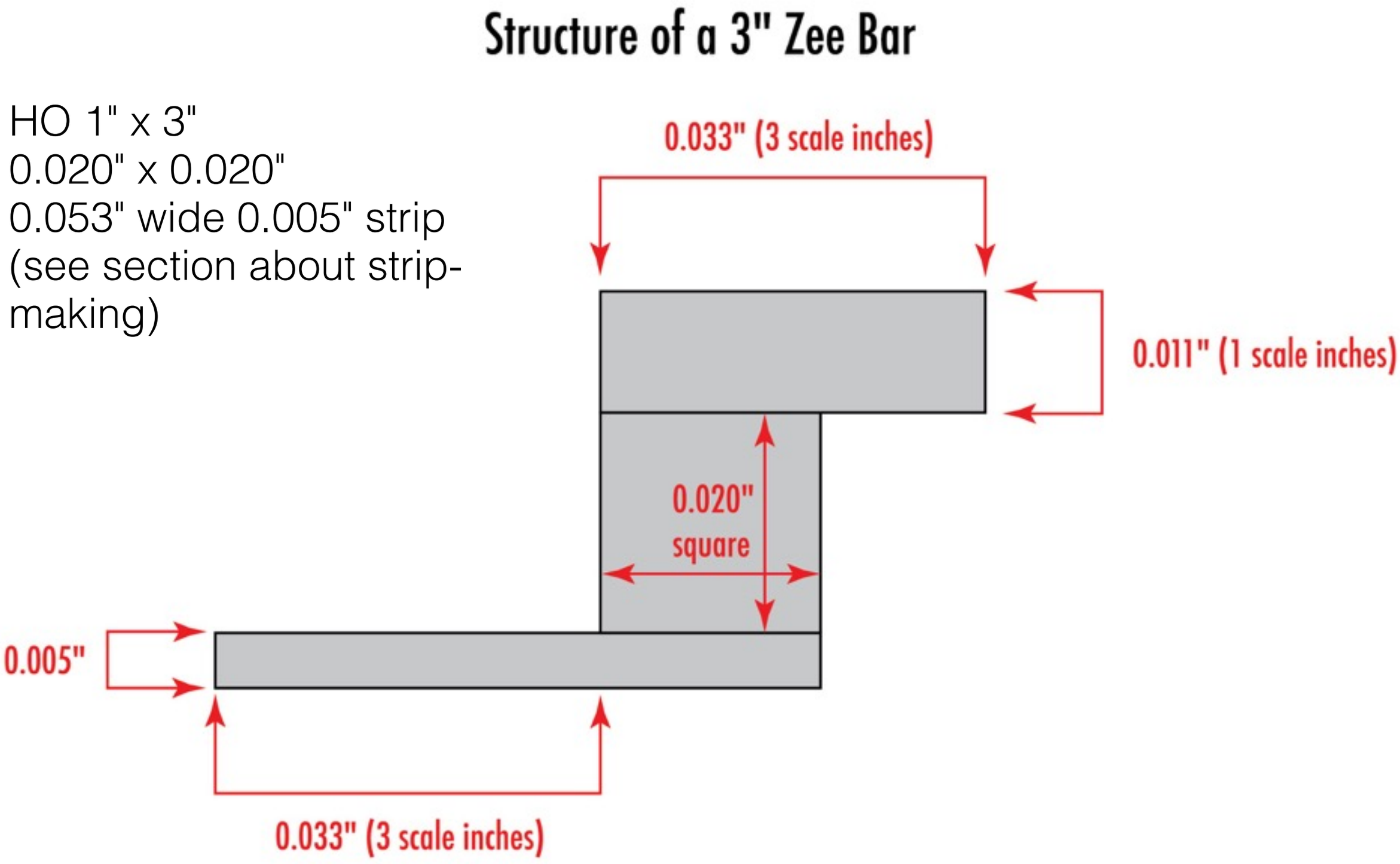
Profile of scribe line with etched scriber tool

Single Sheathed Cars

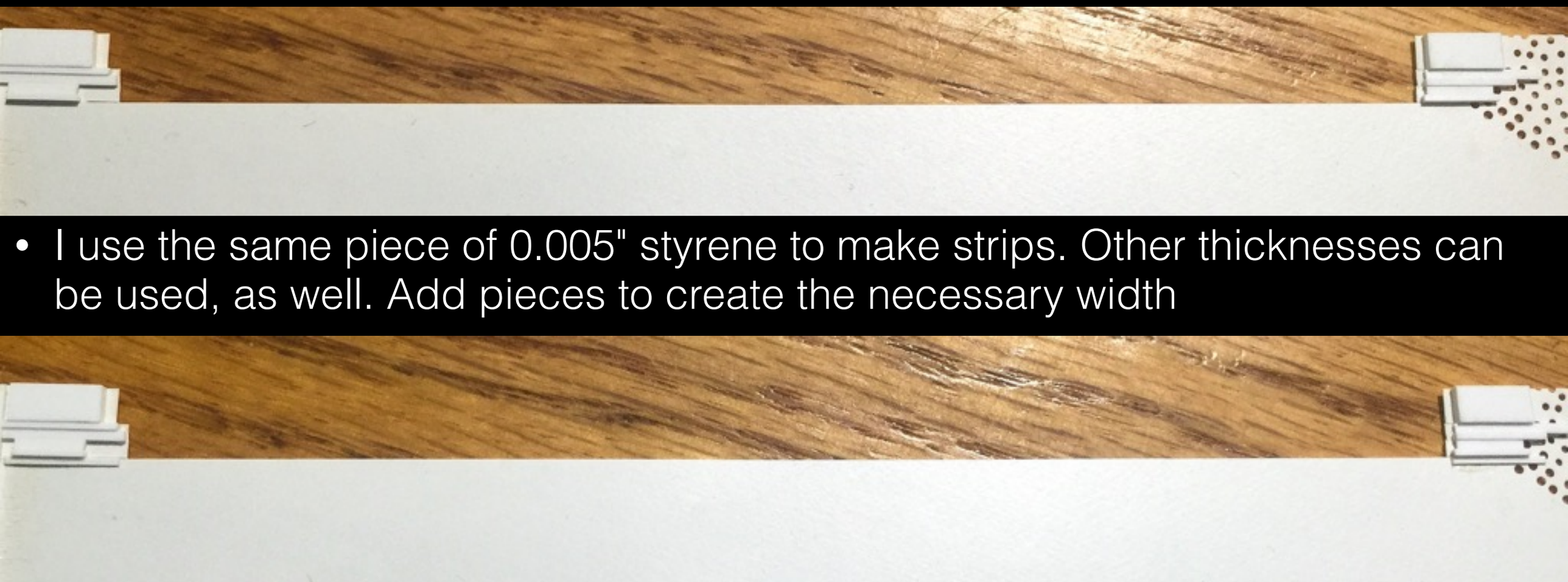
- Most boards in single sheathed cars are 5¼" wide, although 5⅛" is a common dimension as well as 3¼".
- Fortunately, 5¼" wide = ~0.060" ; that is what we will cover herein
- I start with the thickest styrene sheet I can use, ⅛"
- Ensure that the edge is perfectly straight
- Side sills are typically 9" channel sections, or 0.100" in HO
- I use 0.040" x 0.100" for the side sills and 0.040" x 0.060" for the sheathing boards
- Lay out the side sill keeping it straight relative to the edge of the styrene
- Then lay in the number of side sheathing boards needed
- A narrower width board is common adjacent to the side plate (at top); the side plate overlays boards that are narrower, meaning that the face of the side plate is usually flush with the face of the sheathing boards. The narrow upper side sheathing board and/or the side plate may need to be slightly “shorter” or “taller” (width) relative to the prototype to ensure that the overall car side height is as close as possible to the prototype

Single Sheathed Cars

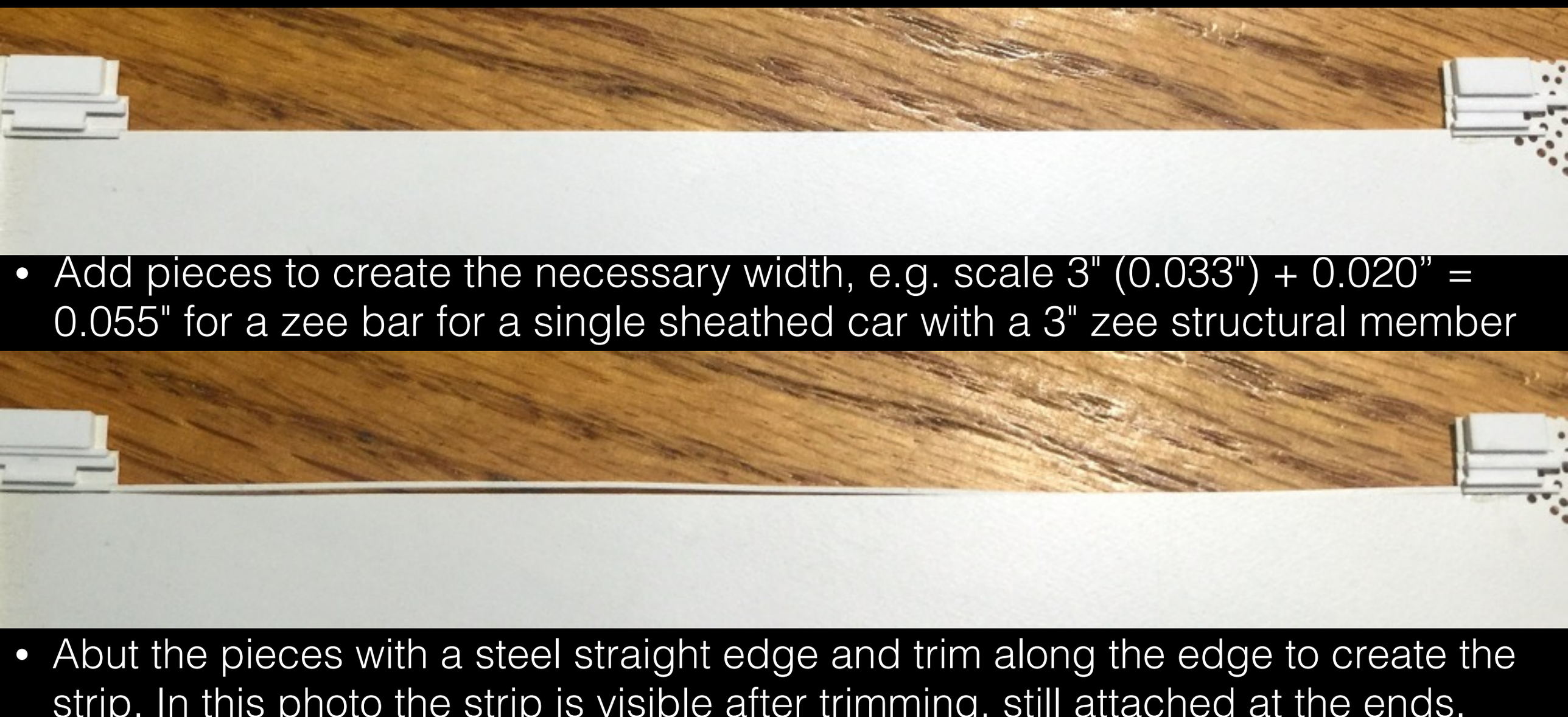
- HO 1" x 3"
- 0.020" x 0.020"
- 0.053" wide 0.005" strip (see section about strip-making)



Single Sheathed Cars — Making Strip



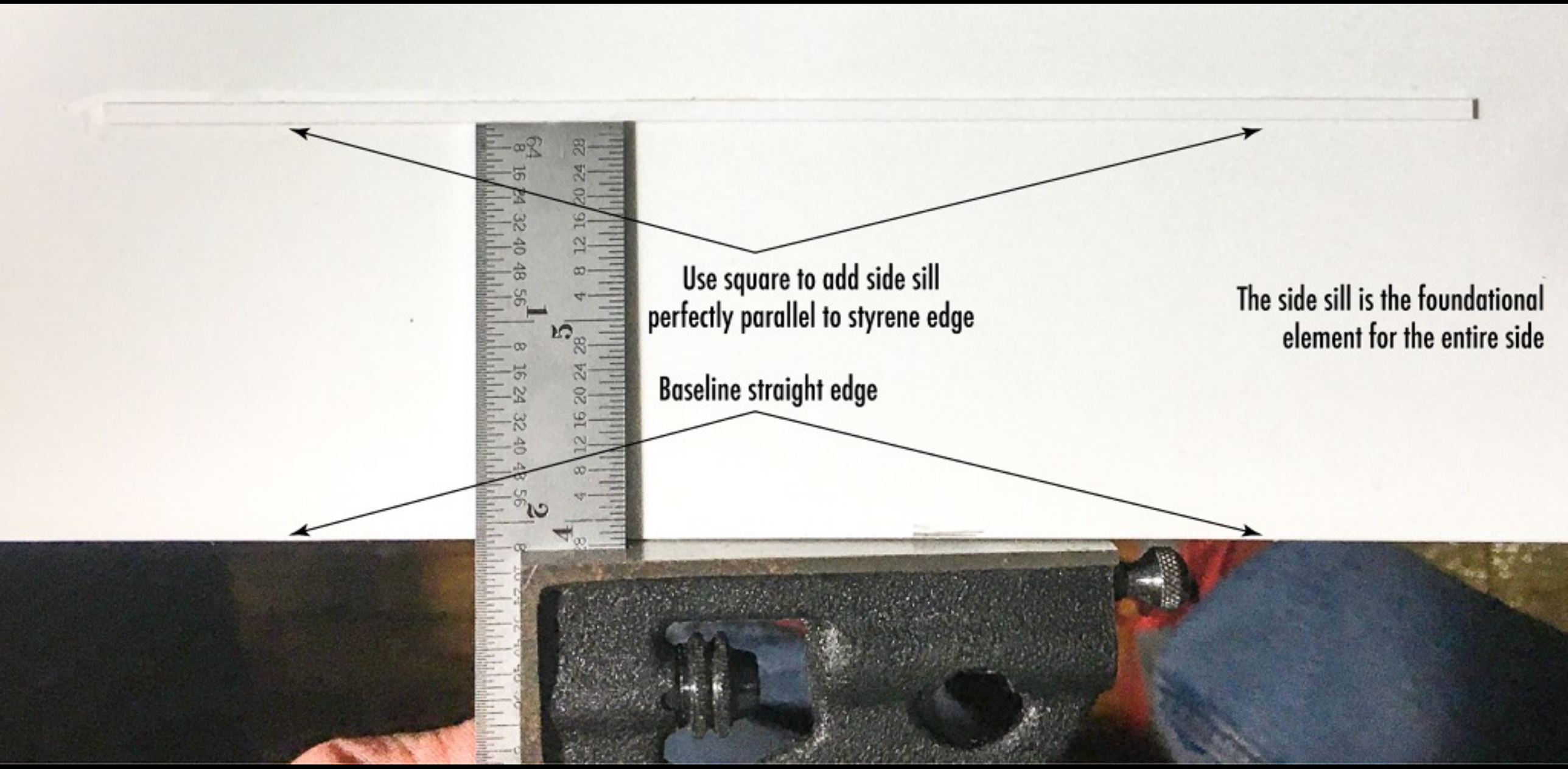
- I use the same piece of 0.005" styrene to make strips. Other thicknesses can be used, as well. Add pieces to create the necessary width



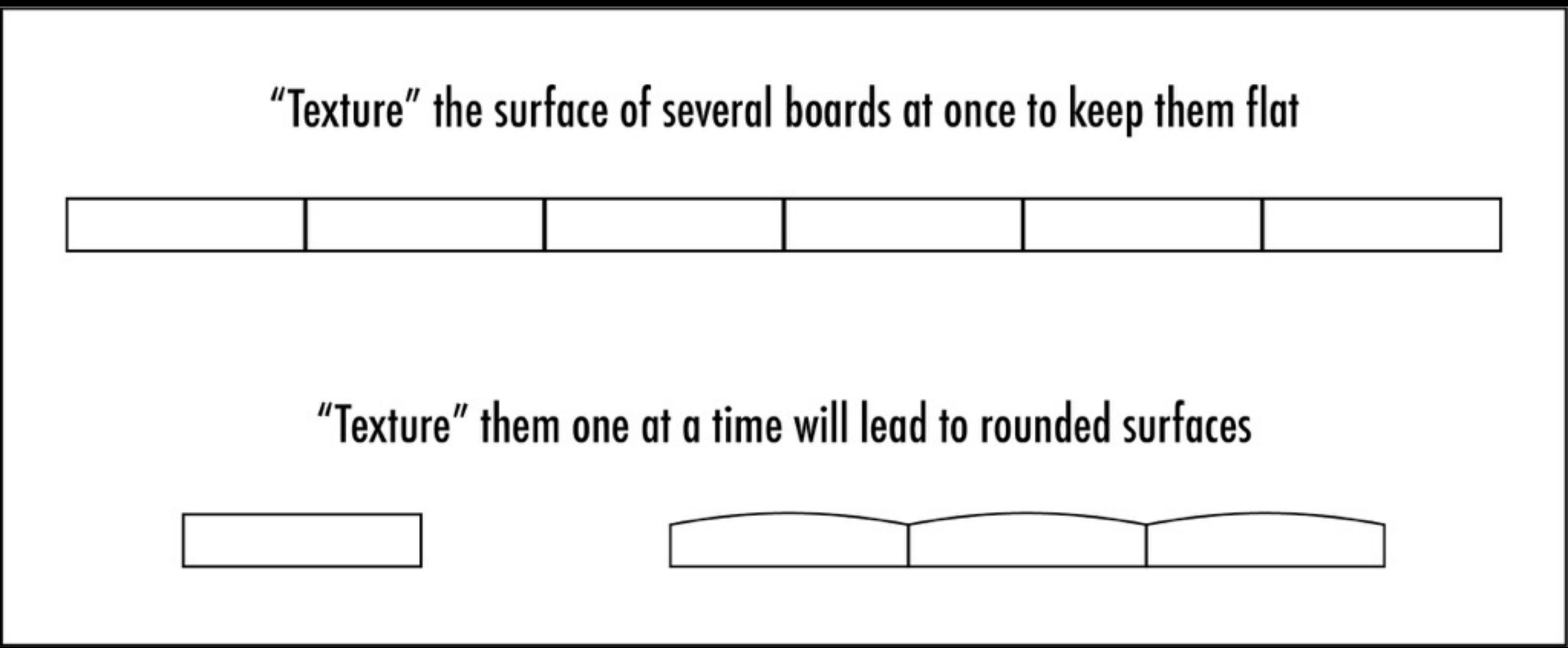
- Add pieces to create the necessary width, e.g. scale 3" (0.033") + 0.020” = 0.055" for a zee bar for a single sheathed car with a 3" zee structural member

- Abut the pieces with a steel straight edge and trim along the edge to create the strip. In this photo the strip is visible after trimming, still attached at the ends.

Single Sheathed Cars
The “Foundation”

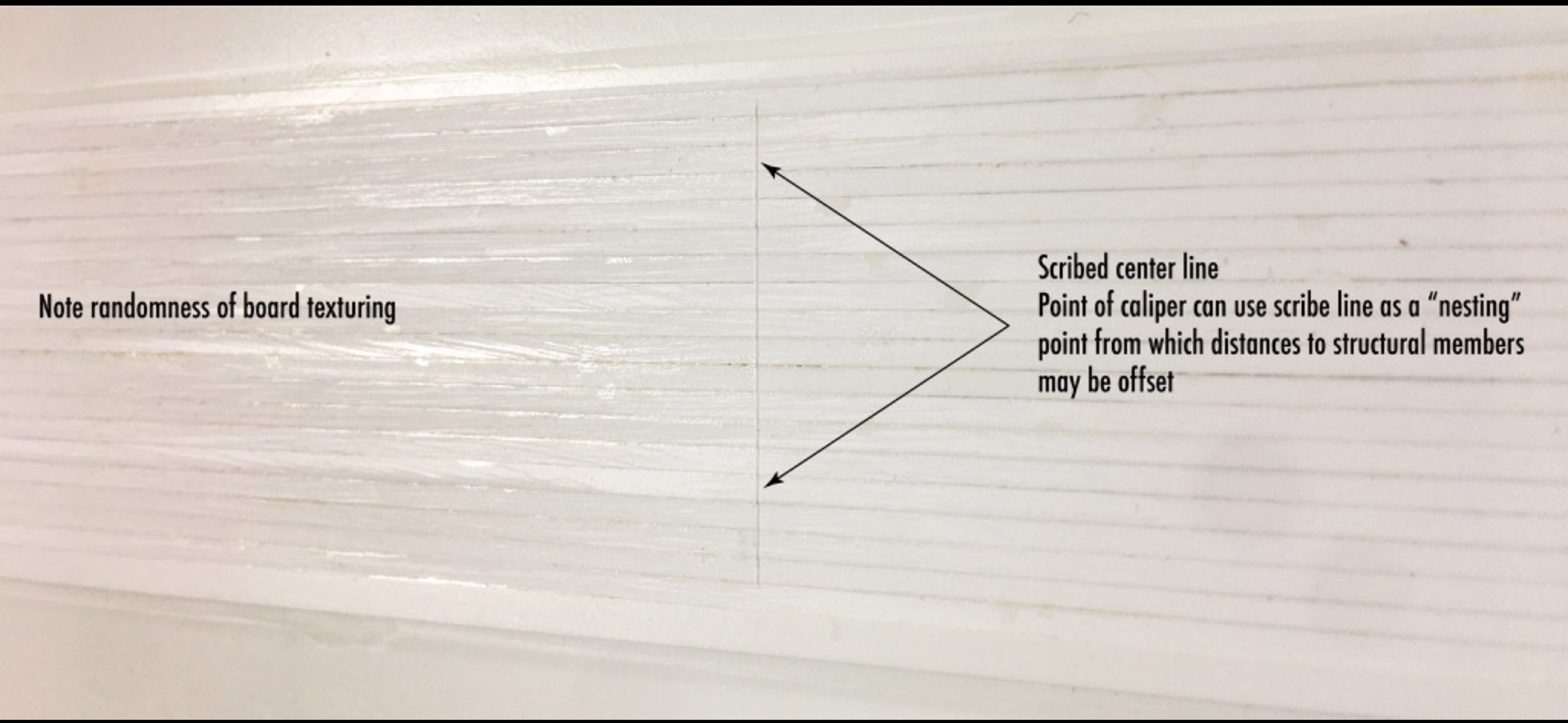


Single Sheathed Cars
Texturing Sheathing Boards with Sandpaper

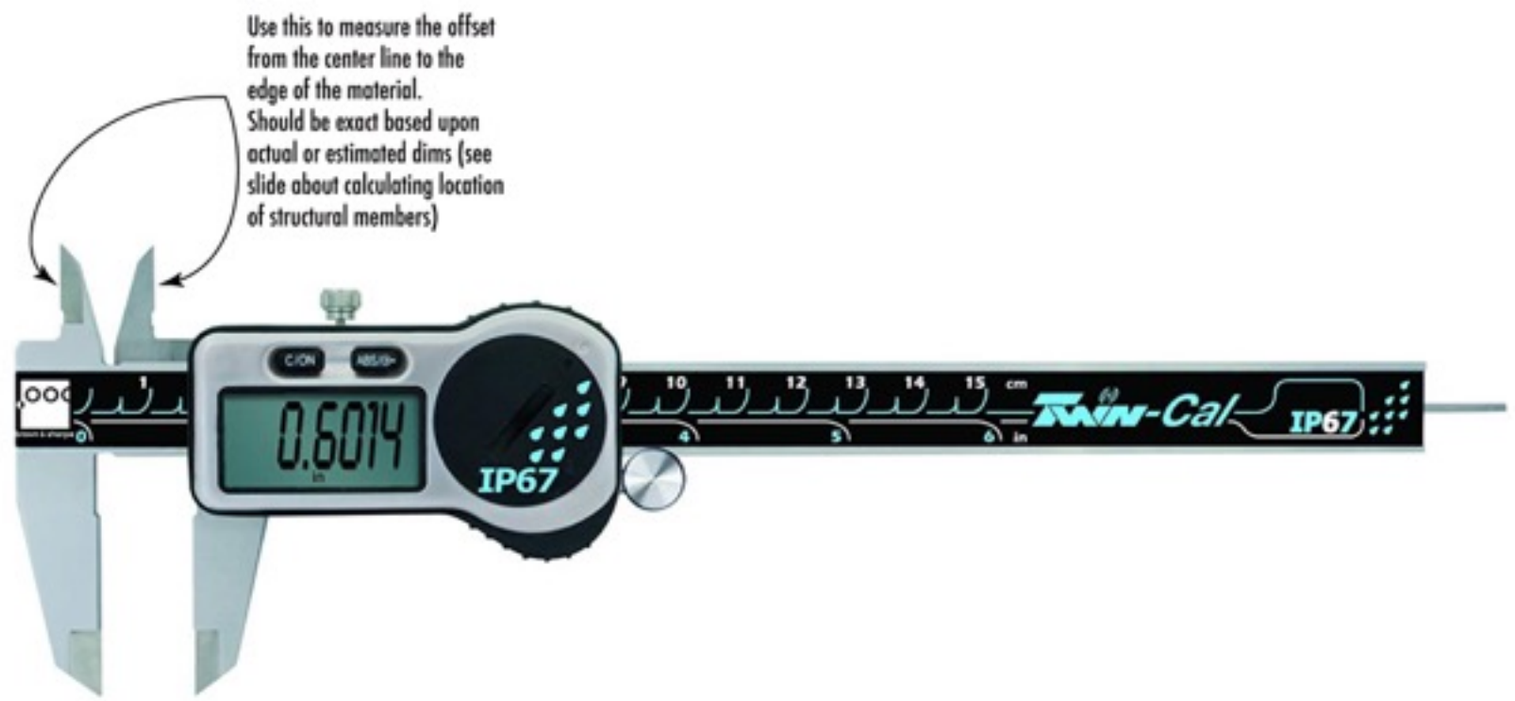


- If you sand the surface of the boards to create surface texture, do them in groups laid out touching at the edges and drag sandpaper across all at once. When done, you can drop them like pickup sticks and select at random as you add to the side

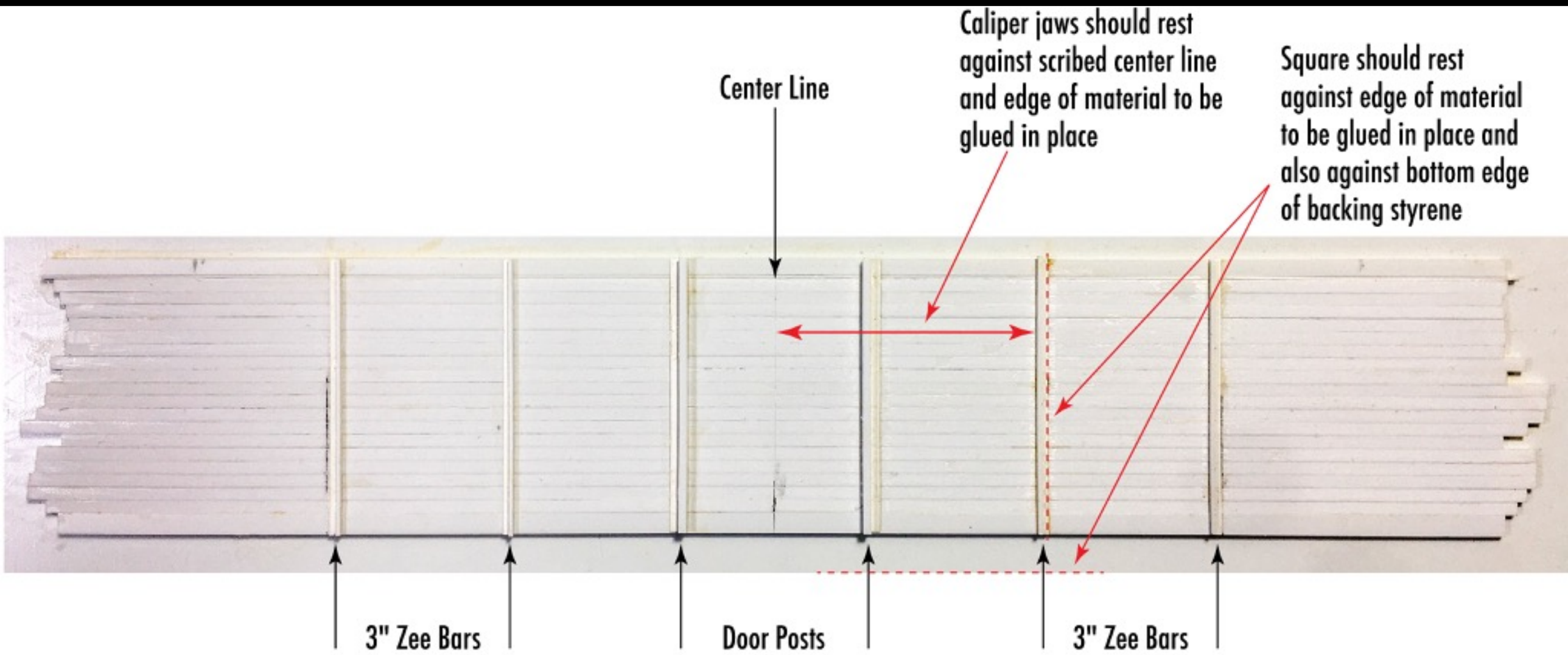
Single Sheathed Cars



Single Sheathed Cars



Single Sheathed Cars

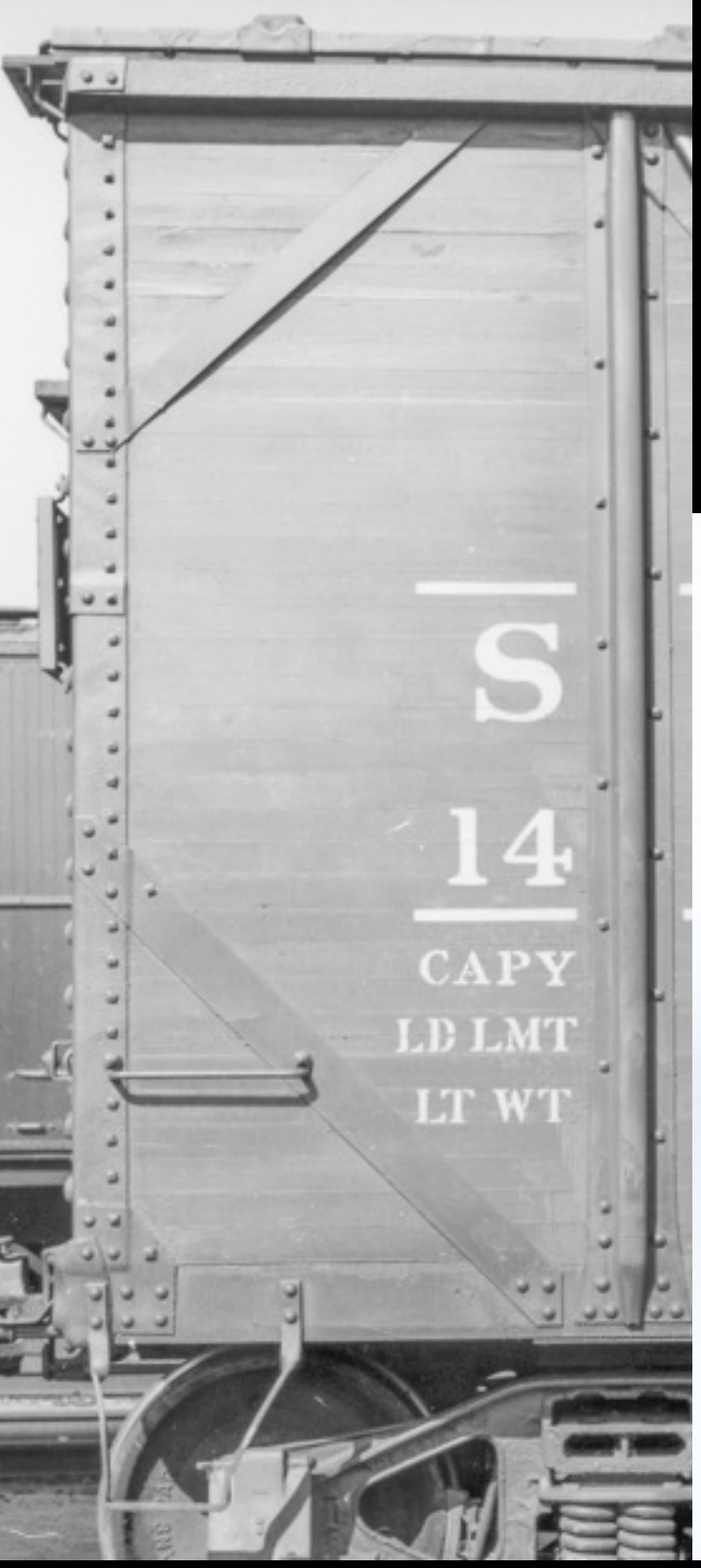


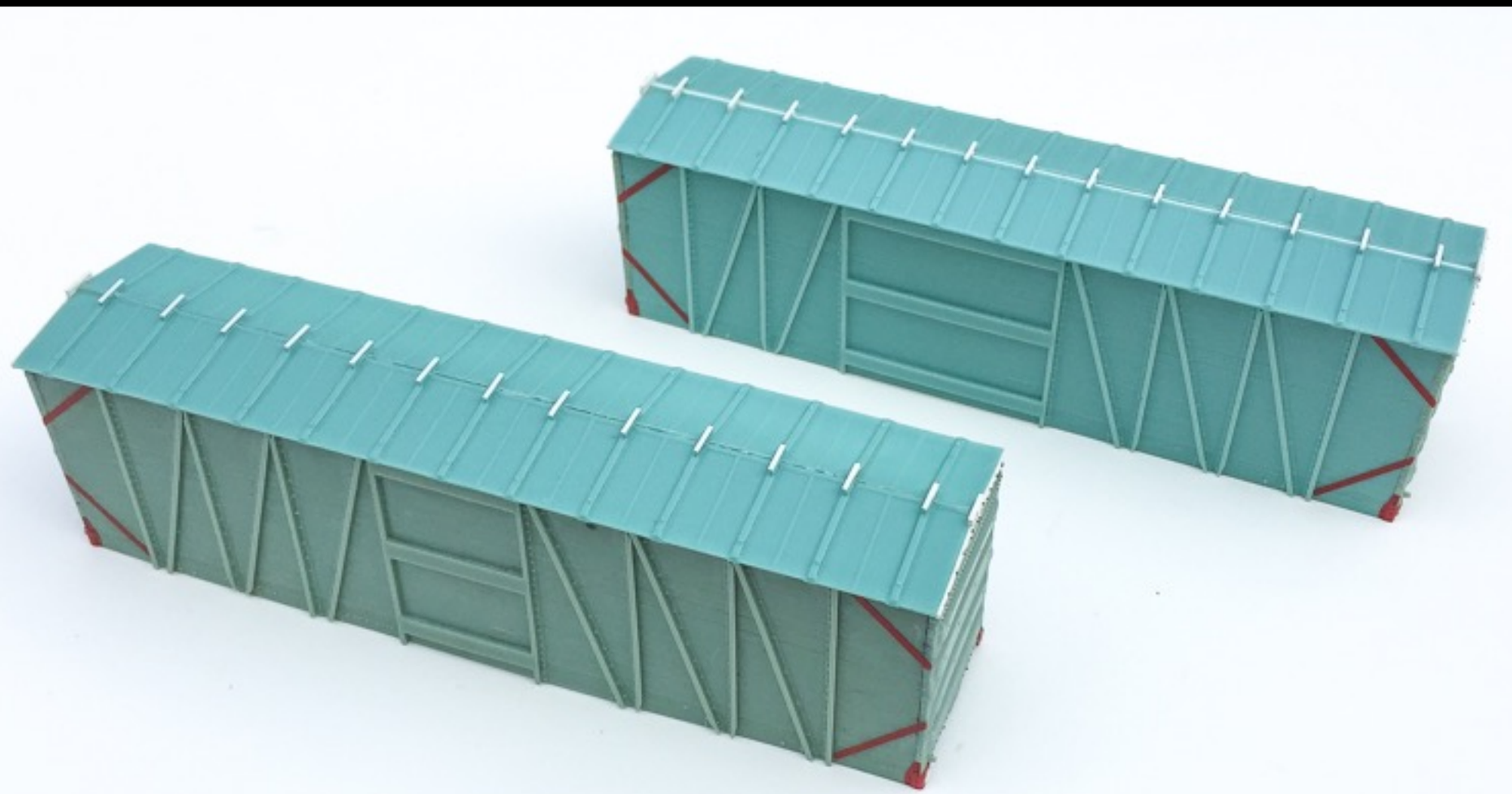
- I generally add the 0.005" strip (0.033" + 0.020" for a 3" zee bar) to the side first and then add the 0.020" x 0.020" followed by the 1" x 3", although you can also add an “assembled” zee straight to the side if that works for you

Single Sheathed Cars

- The narrow width boards on this car were cut to the exact width (3¼”) using 0.005" styrene cut to width and then glued to a “sub”side. The overall result was ok

Single Sheathed Cars





- Some details, such as corner straps and wraparounds, as well as end eaves, are best added after the body is assembled for a better fit or to create a continuous piece, not possible if added to the side and end corner as separate details

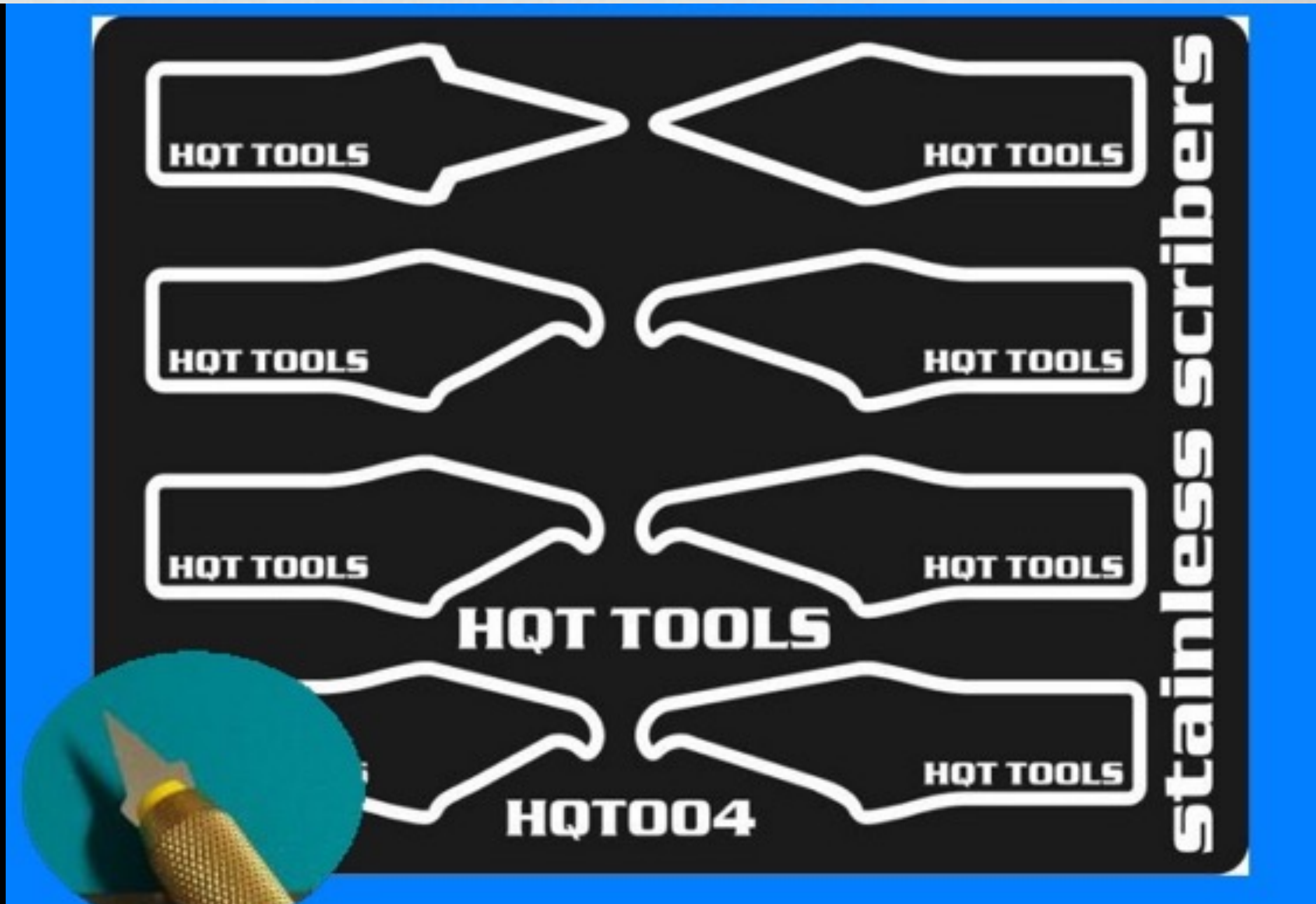
Steel Car - Union Pacific B-50-17 Box Car

My first effort at scratchbuilding — ~15+ years ago

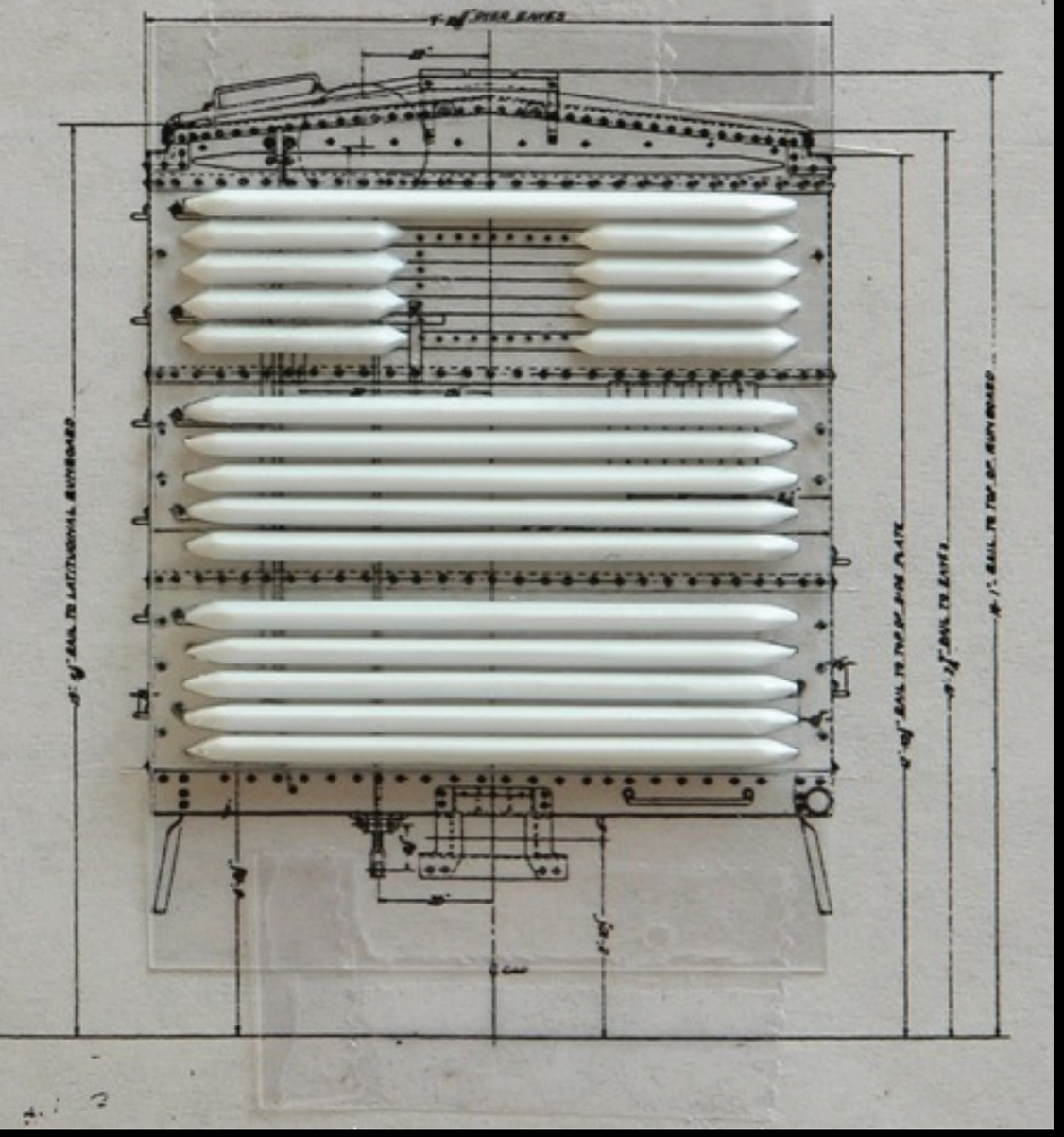
- Clear 0.005" styrene overlay on a drawing; what is shown here is that overlay after being affixed to styrene backing
- Rivets glued individually
- Panel lines lightly scribed with a no. 11 blade
- A very adequate result

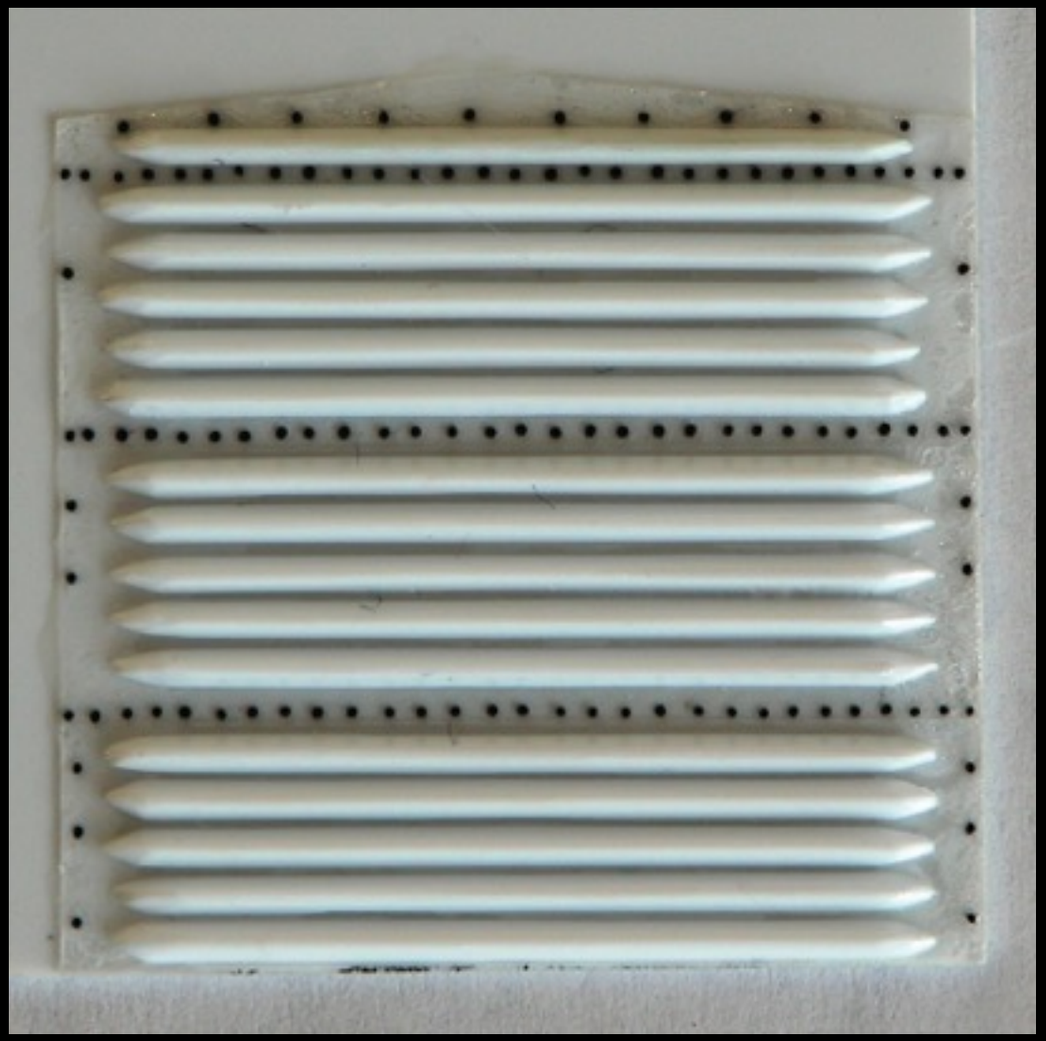
Steel Car - Chicago and North Western Riveted PS-1 Auto Car

- Side scratchbuilt by scribing panel joint and other lines with an etched scribing tool
- These etched tools fit in a standard hobby knife handle
- Provide a more “square” groove with less kerf
- Rivets from Archer

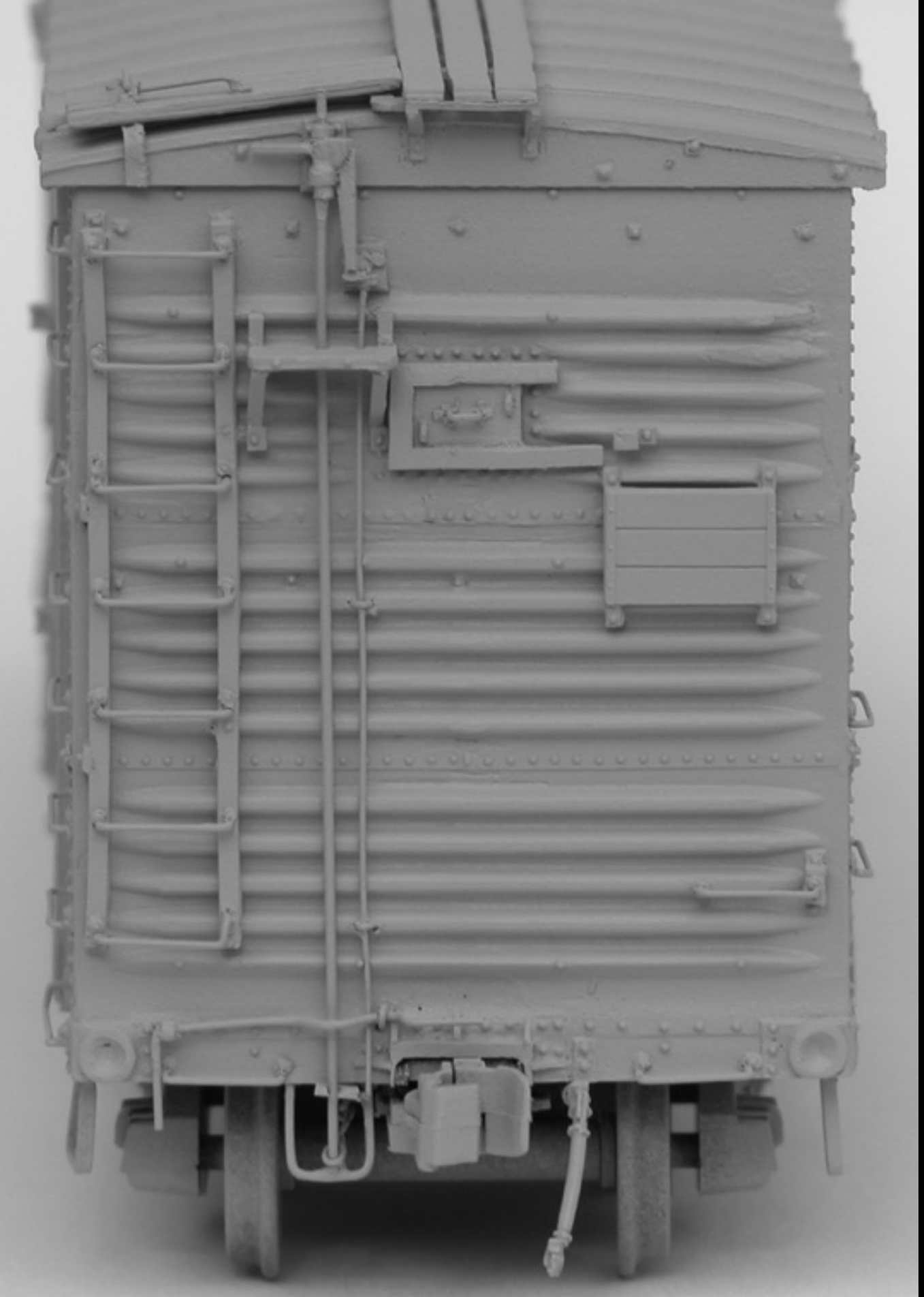


Ends - UP B-50-17 Box Car



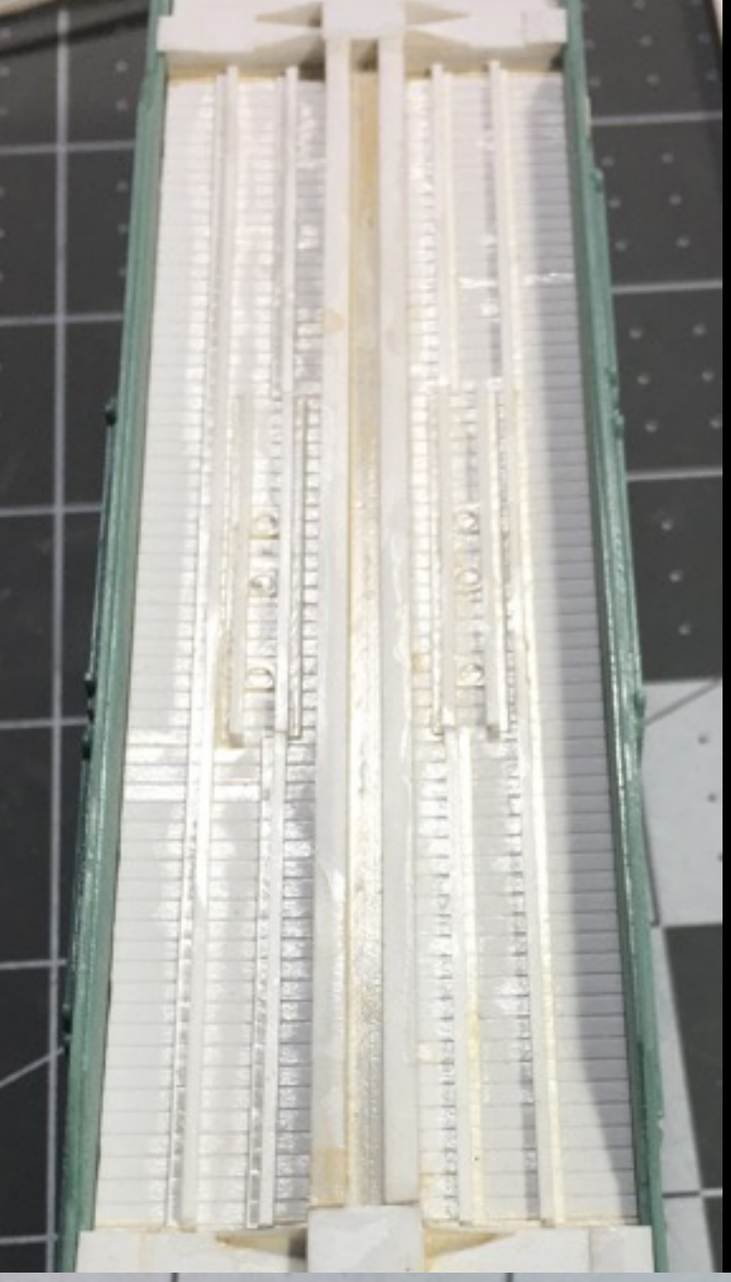


- Clear 0.005" styrene overlay on a drawing; what is shown here is that overlay after being affixed to styrene backing
- Rivets glued individually
- Murphy ribs created from individual pieces if triangular strip styrene
- A less than ideal result; better option is to chop up Tichy ends



Northern Pacific 50' Auto Car - an alternate approach to Murphy ends

- Tichy ends chopped and reassembled
- Over a dozen individual pieces reassembled
- Not perfect, but a much better result than the UP B-50-17 end



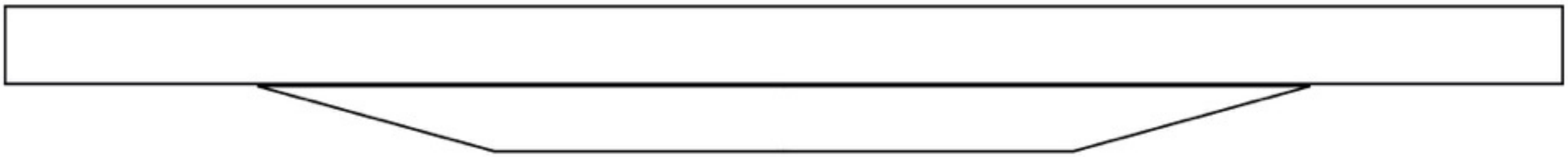
Underframes

Every one is unusual, if not unique (even “standard” designs are not always completely standard)

- Create the center sills first
- Then bolsters
- Then crossmembers
- Then details
- Advise consulting other kits as well as prototype information

Fishbelly Center Sill Underframes

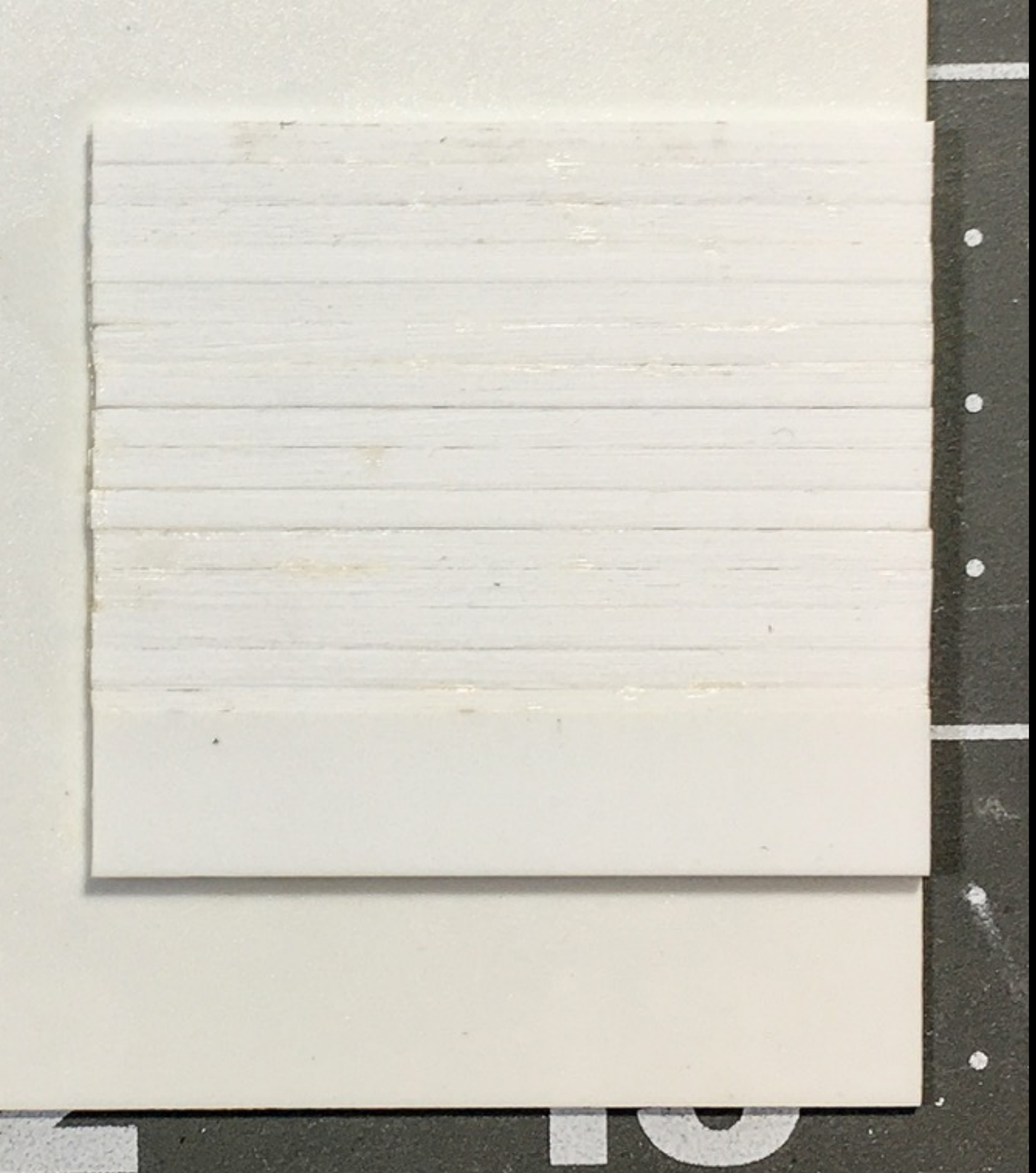
Fishbelly center sills created from two pieces of styrene glued on edge: one is a rectangle and the other cut to the shape of the fishbelly. They are glued and puttied and sanded as need and then flanges are added



Doors

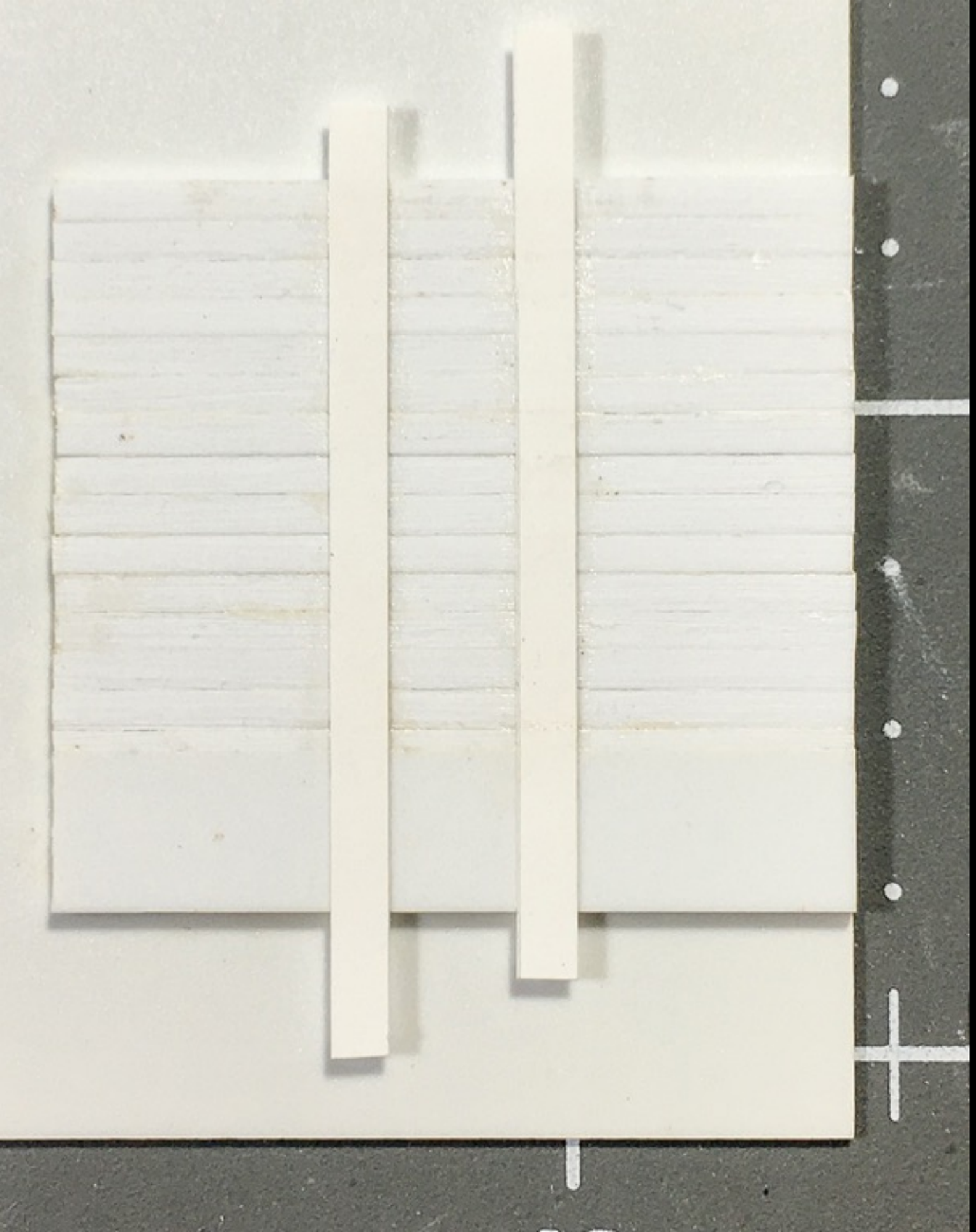
Again, every one is mostly unusual, if not unique

- If steel, try to chop up an existing part; if wood, start with 0.020" thick Evergreen scribed material for HO
- Harvest hardware (rollers, stops, latches, etc.) from commercial sources
- Scratchbuild the rest!
- Remember that the doors are wider than the opening



Profile — Central Vermont End

- 0.020" backing
- 0.040" x 0.250" end bottom
- 0.040" x 0.030" board section (on prototype part of board is behind bottom of end)
- rest of boards are 0.040" x 0.060"

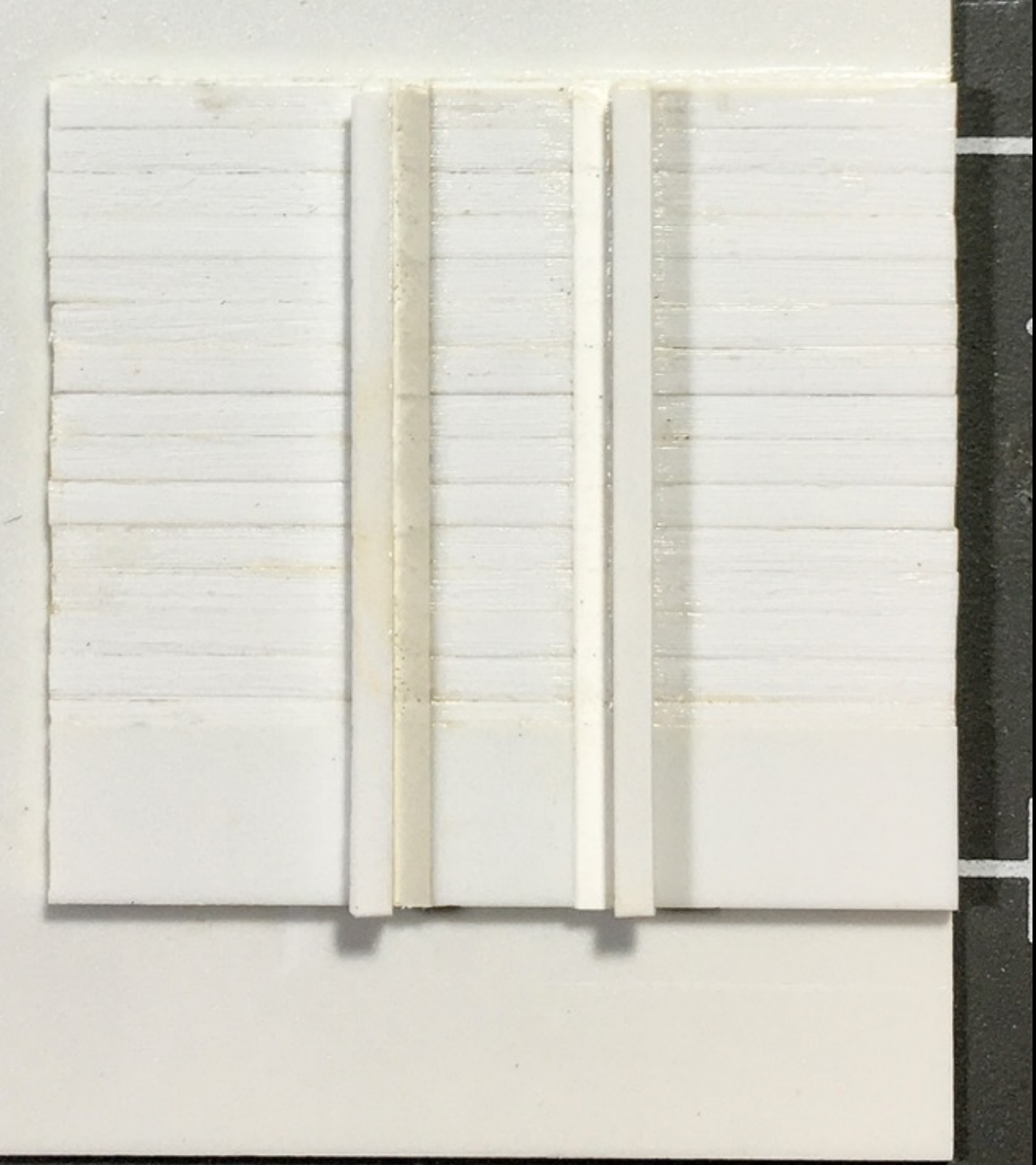


Profile — Central Vermont End

- 0.088" strips added for 5" zee bars
- These are the first part of the simulated zee bar

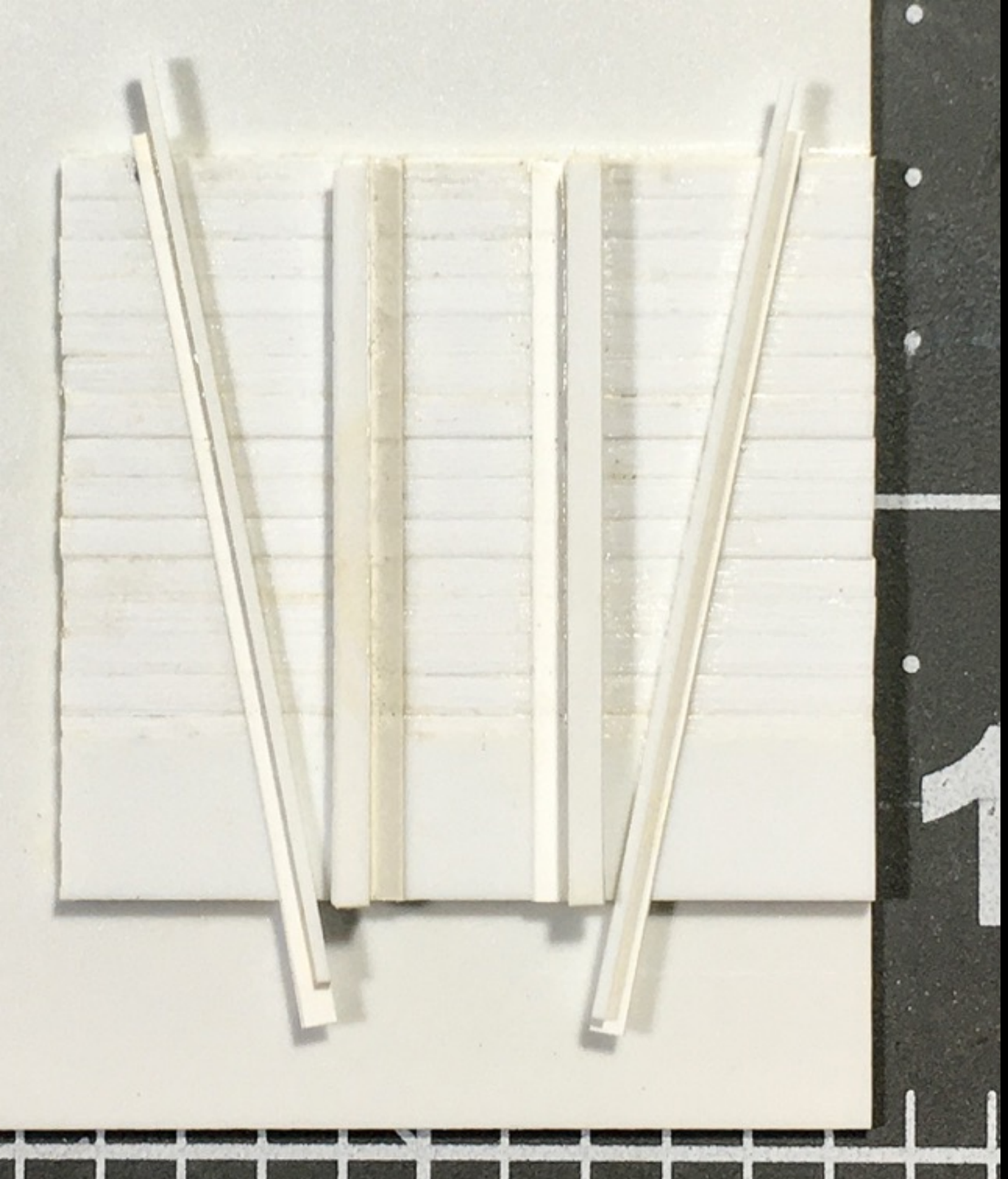
Profile — Central Vermont End

- 0.040" x 0.030" strips added as the second part of the simulated zee.
- Five inches of the zee is still visible



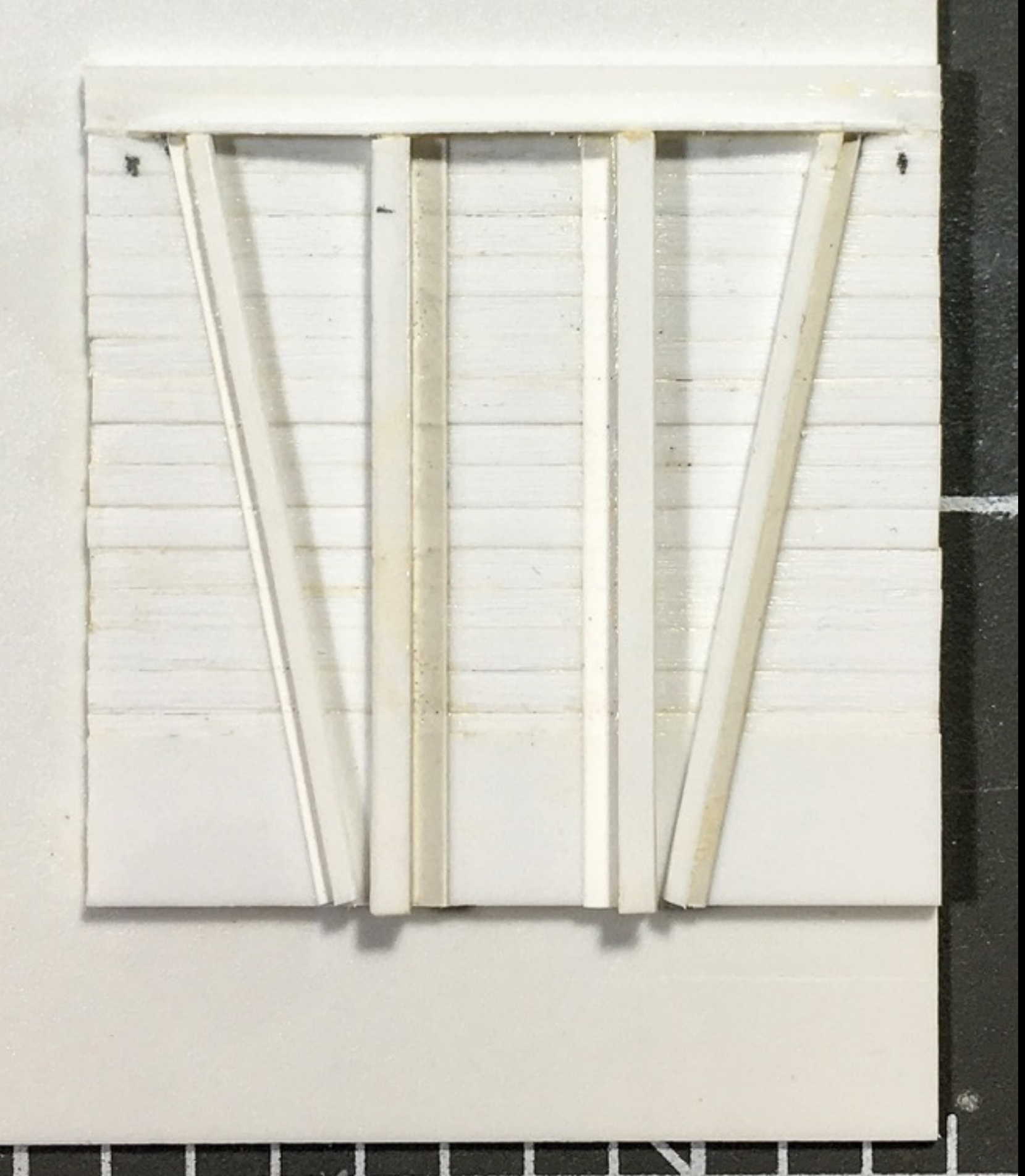
Profile — Central Vermont End

- 0.010" strips, 5" in width added to complete the 5" zee bars
- these strips were created using the strip making technique described elsewhere in this file, except 0.010" styrene was used



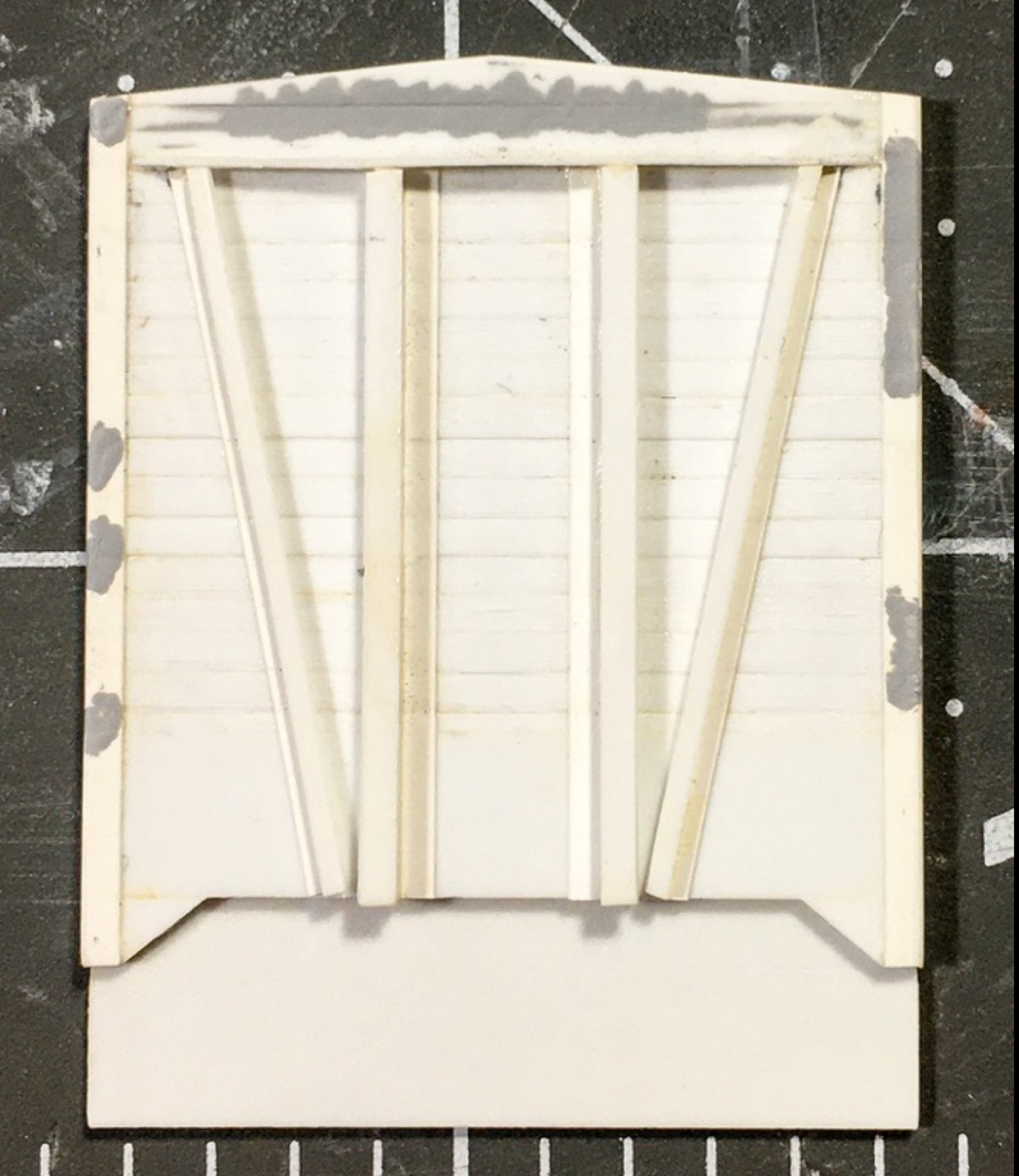
Profile — Central Vermont End

- 3" zee bars created in similar fashion (see graphic on zee bars earlier in file)
- Located per prototype drawing



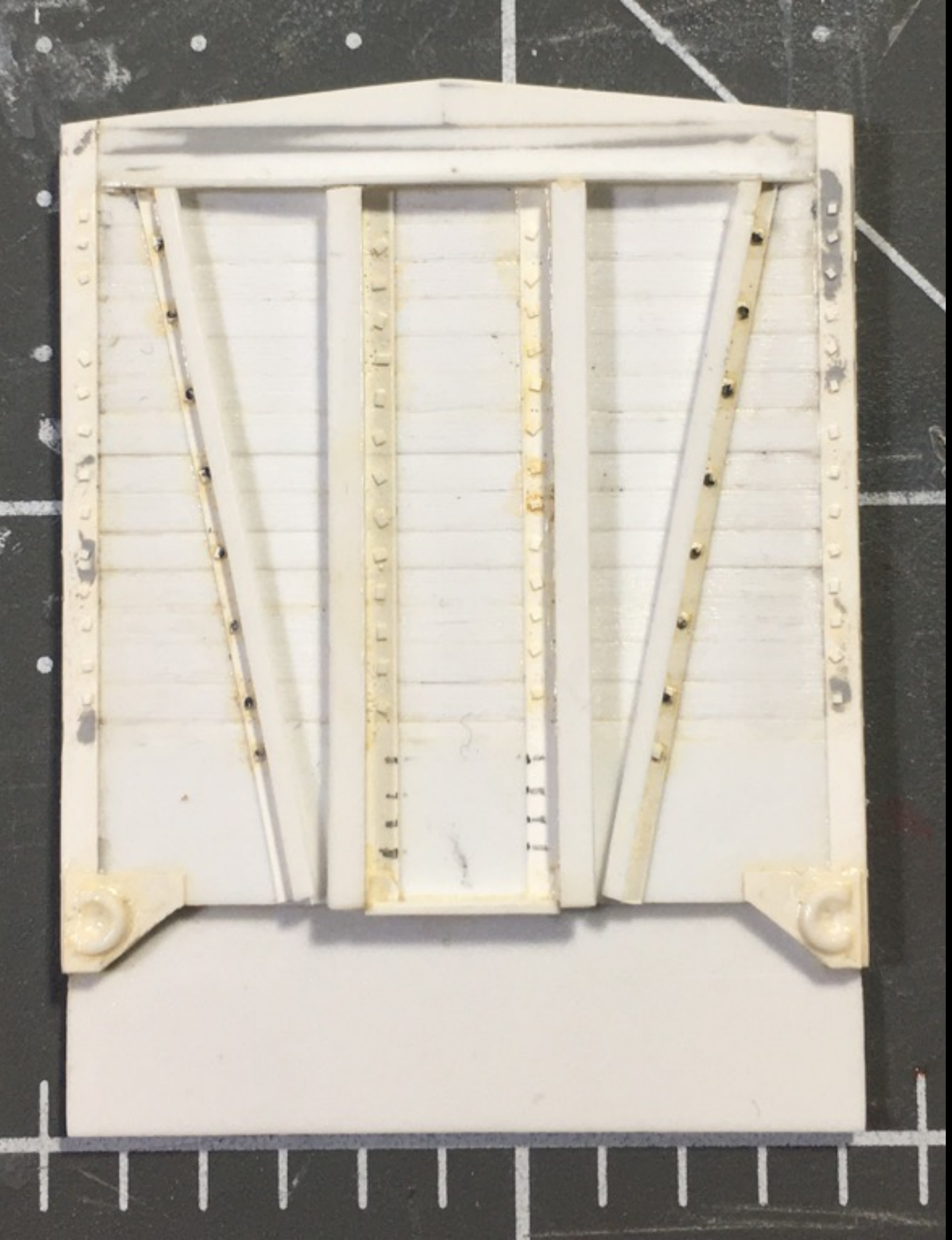
Profile — Central Vermont End

- 1x3 “caps” added to top of diagonal zees
- 0.010" strip added on edge at top of zees and trimmed to shape
- 8" styrene added at top



Profile — Central Vermont End

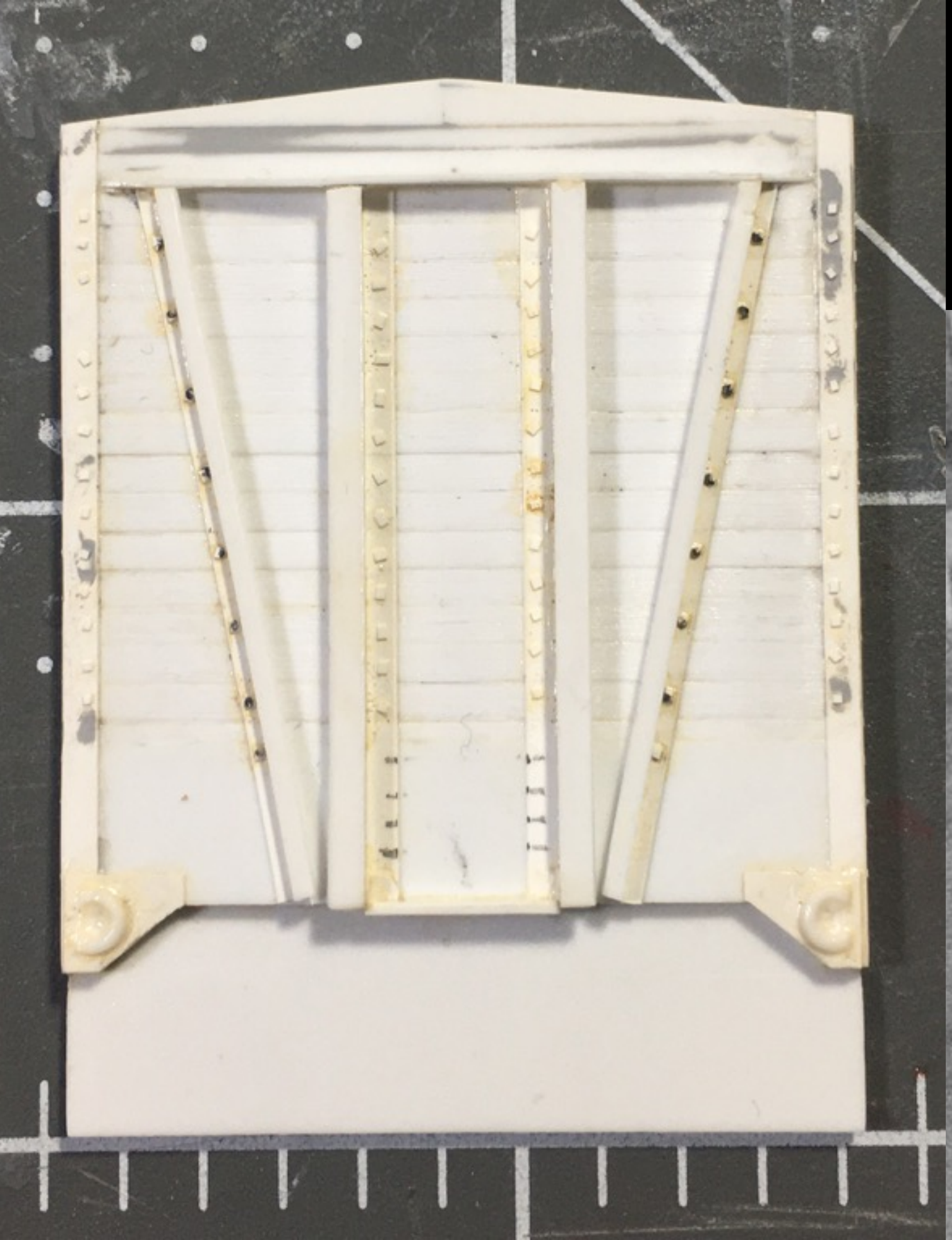
- peak added; 6" tall at center
- 5" wide corners of 0.005" styrene added to simulated corners
- putty/filler added in a few places where styrene was “pitted”



Profile — Central Vermont End

- bottom corners created from 0.040" x 0.100" strip
- 0.005" overlay added
- push pole pockets created from tube (3/32") and drilled out to shape
- carriage bolts simulated with 0.010" square of 0.005" styrene

Profile — Central Vermont End



Getting your feet wet:
Seaboard Air Line AF-4 PS-1 Auto Car

- Find a “starter” project
- This one has:
  - Modified scratchbuilt side sills
  - Door track extension at upper left
  - Door posts
- Learn to scratch something and create custom size styrene strips

Resources

- Rivets — Archer - http://www.archertransfers.com
- Tools — UMM-USA - http://umm-usa.com/onlinestore/index.php

Scratchbuilding

This will be posted to prototopics.blogspot.com