Getting started—Modeling with styrene

All about working with this versatile material/**Jack Burgess**

For many modelers, material selection for scratchbuilding projects is based primarily on past experience and personal preferences and not necessarily upon logically looking at all of the materials now available. In addition, many ardent scratchbuilders insist that the materials chosen for a model duplicate that of the prototype. In other words, metal (such as brass) should be used to duplicate metal, while wood can only be properly duplicated with basswood. A few adhere to this rule with almost religious zeal.

However, most of these same modelers do not hesitate to accept an imported brass passenger car with etched brass sides intended to represent a wood car, and they will eagerly purchase a mass produced, injection-molded styrene model of a diesel locomotive.

New materials and techniques have also clouded this issue. For example, beautiful craftsman kits are available with parts cast in plaster, urethane or epoxy resins with each of these materials commonly being used to represent stone, wood, metal, tarpaper or even canvas.

My own rule of thumb for choosing material is based not on the material of the prototype but other factors, including strength, ease of use, and finish. The strength of brass is a decided advantage with very small, exposed parts or delicate assemblies, such as wrought iron railings, grab irons and caboose ladders. Basswood is my choice for unfinished wood structures, including bridges, trestles, and unpainted outbuildings. Styrene is my overwhelming favorite for duplicating painted prototypes, including freight cars and buildings.

Styrene and grain

Generally, the major opposition traditional scratchbuilders have to the use of styrene is the lack of "grain." For large scale models, including ¼" scale, this may be an arguable point. However, I model in HO and am not convinced that grain is a prototype feature which we should be duplicating in this scale.

Hold a full-size unfinished board at arm's length and you will definitely see the wood grain. Various fine furniture finishes are intended to highlight this grain. However, looking at this same board in HO scale at arm's length would be equivalent to viewing it at a distance of approximately 3/16" from the scale board. In reality, we tend to view models at a distance of maybe 10"-12" (depending on your eyesight). This is equivalent to seeing this same real board at a distance of approximately 85 HO scale feet. At this distance, we no longer see grain per se, but may instead only see variations in color.

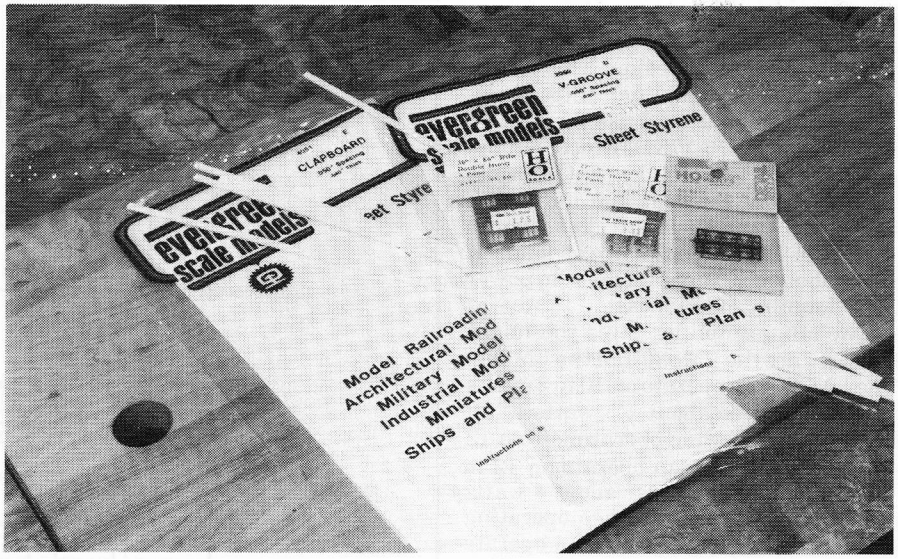
Place a coat of paint on that same real board and look at it from 85 feet (or even 40 feet) and I doubt you will see any clue that this is wood rather than plywood, tempered hardboard, or even aluminum siding. Thus, I do not feel it necessary or appropriate to add grain to styrene when representing a painted, well-maintained structure or car. However, just in case you need a crutch (or are working in larger scales), some techniques for adding grain are described further along in this article.

Materials

Master model builder Al Armitage first published a series of articles advocating the use of styrene for scratchbuilding back in the 1960's. These articles included techniques for making your own styrene strips, as well as scribing styrene to represent tongue and groove siding. However, styrene was not as readily available at that time, and the requirements for scratchbuilding with it seemed beyond the capabilities of many modelers. For example, most modelers found it nearly impossible to cut acceptable narrow strips from sheet stock.

All of that changed with the introduction of the Evergreen Scale Models product line in 1976. Brian Ellerby of Evergreen Scale Models developed a proprietary method of scribing styrene and also began marketing a complete line of dimensional styrene strips. This line has now grown to include scale board and batten, clapboard siding, and even raised metal rib roofing material. The Evergreen line of styrene sheets, scribed styrene, and styrene strips is readily available in a variety of thicknesses and widths. I like to keep a good supply of all the various sheet sizes (.010", .015", .020", and .040"), as well

PHOTOS BY JACK BURGESS



The materials for building with styrene include styrene sheet in several thicknesses, strip styrene (it comes in both dimensional and scale sizes) and styrene detail parts.

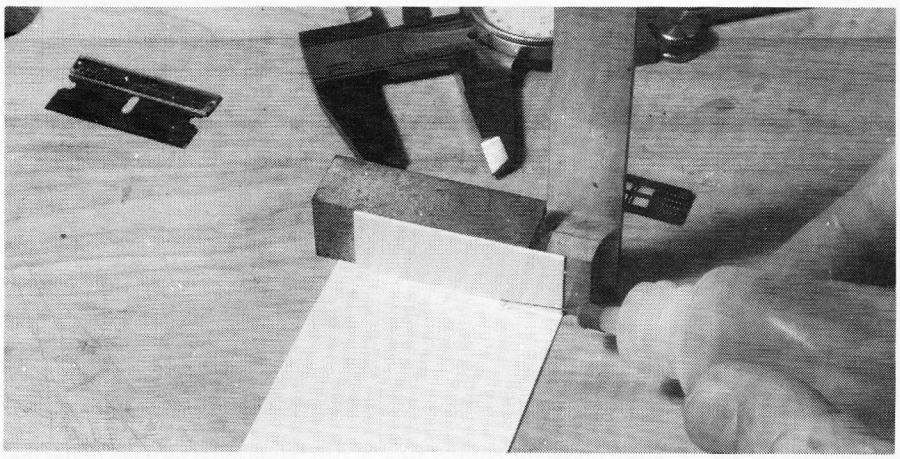
as a good supply of the entire HO line of styrene strips (1×2's through 6×6's) and scribed styrene. As an additional bonus, styrene is obviously totally compatible with all of the plastic detail parts from such sources as Grandt Line and Detail Associates. This compatibility eliminates the need for special glues or solvents when bonding these parts to a styrene model.

Unlike wood or cardstock, styrene is unaffected by moisture. Therefore, the bracing that is normally required in a wood model is unnecessary with a styrene model. There are two general exceptions, however. First, extremely thin, unsupported styrene (.010" and .015") may need bracing simply because of the limited structural strength of the material itself. Styrene may, therefore, not be an appropriate choice for a prototypically thin, unsupported element such as an building awning. Here, brass may be a better alternative. Second, I have found that scribed styrene may eventually bow slightly if unbraced in larger applications. My guess is that the scribing operation during manufacturing results in changed surface tensions, which may eventually create problems if not properly braced. For example, the sides of a 40-foot double-sheathed boxcar may eventually bow in unless braced. Bracing is unnecessary for smaller expanses.

Although bracing can easily be done with with ⅛"- square styrene strips, I many times use .040" thick sheet styrene cut approximately ¼" wide and glued on edge. This type of bracing is superior to square styrene strips if interior detailing is not planned; it creates a very stiff rib behind a wall.

There are a number of bonding agents sold that are specifically formulated for gluing styrene. Styrene "glues" work totally different from glues used for wood (where the glue actually penetrates into the wood) or glues for metal or dissimilar materials, such as epoxies and cyanoacrylate cements which bond through chemical reactions. Styrene glues instead "melt" the surfaces being bonded and then quickly evaporate, "welding" the styrene surfaces together. The requirements for a styrene glue are that it be capable of slightly melting the surface of the styrene and then, just as quickly, evaporate. The speed at which these actions occur can be controlled, resulting in a glue with a "slow" setting time or a quicker setting time. Since the styrene glue is extremely thin, it can be easily pulled into a joint by capillary action. While tube cements are also available for styrene, I don't recommend them since proper application of a liquid cement can accomplish the job without the possibility of excess glue being pushed out of construction joints.

Although a number of brands of solvent cements are available for building styrene models, I prefer a common solvent, methyl ethyl ketone (MEK). It is generally used as a cleaning agent and can be purchased by the quart or gallon at larger hardware stores or at plastics dealers. It is extremely volatile and therefore should be used only in areas with good ventilation and away from flames. Like lacquer thinner and toluol, which is used in Floquil Dio-Sol, MEK should be used with care. Avoid prolonged contact with the skin and do not breathe the vapor. Because it is so volatile, MEK has an extremely fast setting time. Testor's liquid cement also contains MEK, but because of additional ingredients it is less volatile and therefore has a slightly slower setting time. If you are uncomfortable working with this type of chemical or the setting time is too fast for you, experiment with some of the commercial glues, such as Tenax-7R or the Testor's cement.



MEK or other solvent-type styrene cements are best applied with an A-West needlepoint applicator. A machinist's square will insure that assemblies are square when being glued.

Tools

The tools necessary to scratchbuild with styrene are not extensive and can generally be grouped by purpose: measuring, layout, cutting, and bonding, plus a few specialized tools.

For years, authors have advocated applying liquid styrene cements with a fine tipped brush. Various designs of wood or foam blocks have been devised to avoid accidently tipping the bottle over and spilling the cement. However, one of the distinct advantages of scratchbuilding with styrene is the speed at which materials can be bonded and the joints dry, allowing almost continuous construction. (For me, cyanoacrylate cements can be too slow!)

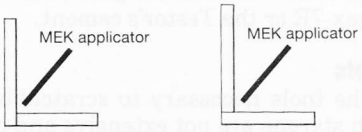
In my opinion, the "brush and bottle" procedure is a disadvantage since your concentration is interrupted by the need to pick up the brush, accurately hit the bottle opening, and apply the cement. While this may seem a minor point, it becomes more important if you are also concentrating on holding a joint in correct alignment while executing these additional tasks.

For my money, the ultimate styrene cement applicator is an A-West No. 16 needlepoint applicator. A-West (Box 1144, Woodstock, GA 30188) makes a number of applicators with various sizes of stainless steel needles. The No. 16 has the smallest diameter opening and works very well with MEK. Since MEK will slowly evaporate through the bottle itself, fill the bottle to a depth of no more than ¼" of MEK. After several years of use, the bottle will eventually craze and crack, indicating time for a replacement. In the meantime, the A-West bottle does an admirable job. It is also much simpler and safer, both environmentally (due to a reduced chance of spillage) and for your health (with less chance of inhaling fumes) than using an open bottle of cement.

MEK is extremely thin and is well-suited for the No. 16 needlepoint. Experimentation may be needed when using products with more or less viscosity to match the viscosity to the size of the point. A correct combination should result in a drop of cement accumulating on the needlepoint a second or two after you turn the bottle over. You should not need to squeeze the bottle to make the solvent flow.

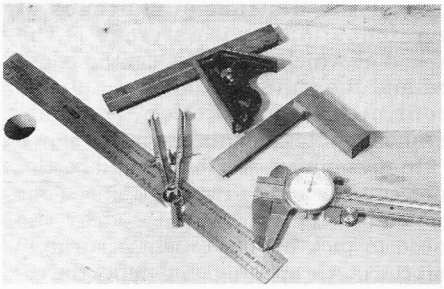
With this type of applicator, it is a simple job to accurately place the MEK exactly where desired. Hold the pieces in correct alignment and apply a drop or two of MEK along the joint; capillary action will pull it along the balance of the joint. When gluing detail parts in

Modeling with styrene



With a joint positioned vertically on the workbench, solvent cements will flow through the seam and glue the assembly to the work surface. A better arrangement is to position the joint horizontally when bonding the parts.

Gluing joints



place, position these and then apply a drop of MEK adjacent to the part rather than directly on it. Again, capillary action will take care of the rest as long as the drop of MEK is close enough to the part to be pulled in.

A drop of MEK will result in a glossy "stain" on the styrene after it dries. As long as you don't touch these spots before they thoroughly dry (ten seconds or so), these stains will disappear once the model is painted. (Incidently, the stains will disappear with painting if Floquil paints are used, but not immediately with Accu-paint or certain acrylics; however, an application of Dullcote over the Accu-paint will solve the problem for non-lacquer based paints.)

A modeling knife with a No. 11 blade has long been the traditional tool of choice for cutting styrene. However, I prefer single-edge razor blades. Single-edge razor blades are very inexpensive when purchased in 100-lot quantities from a hardware store. I'll use several single-edge razor blades for a medium-size structure to insure that I always have a sharp edge. I think it is primarily what you get used to.

The NorthWest Short Line Chopper is also indispensable for cutting styrene strips to length. However, many long-time Chopper users will acknowledge that continued use degrades its accuracy over time as the base gets continually scored by the action of the razor blade. One simple remedy includes creating a new "fence" with .040"; one can also install a section of replaceable base under the cutting area, shimming the hinged arm up to maintain a square cut.

Styrene layout is similar to working with many other materials and is easily accomplished with a variety of squares, scale rulers, draftsman dividers, and dial calipers. Draftsman dividers are extremely usefully in producing a series of identical measurements by "walking" the dividers across the styrene surface and using the points to mark the cut lines. Be sure to use draftsman dividers (available in blueprint and drafting supply outlets) rather than machinist's dividers. Draftsman dividers have a threaded screw to adjust the dividers rather than relying on friction.

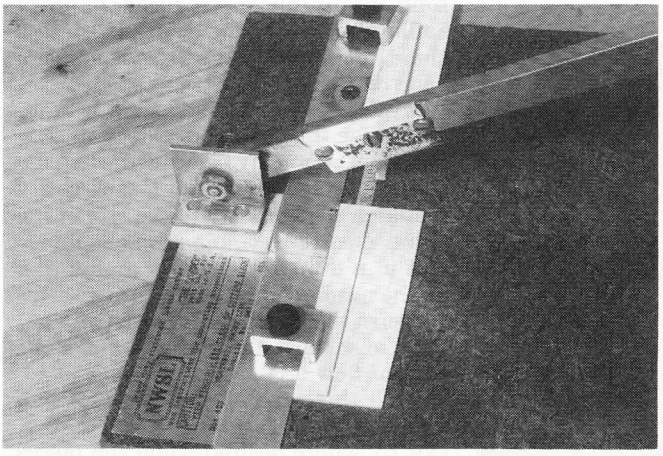
Dial calipers are also invaluable in working with styrene. Prototype dimensions (in inches) can be quickly converted to a scale dimension by dividing by your scale ratio. Thus, 3'-0" (36") is equal to 0.414" in HO scale (36" divided by 87 = 0.414").

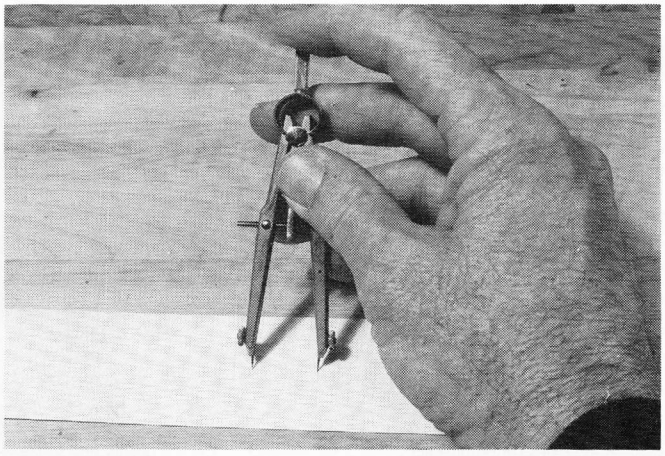
There are a few specialized tools which can also be helpful in styrene scratchbuilding. These will be discussed further in this article where appropriate.

Planning

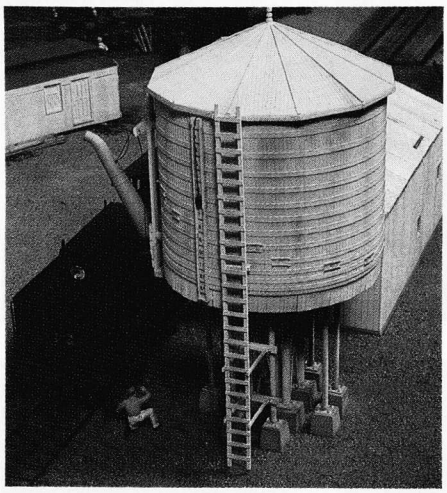
Most beginning scratchbuilders will generally work from a published plan for their initial projects. Planning for them may be limited to getting together the necessary styrene materials and scanning the catalogs for the appropriate styrene detail parts, such as doors, windows or boxcar hardware. More complicated projects may require a simple sketch to visualize the three-dimensional aspects of the model or confirm a general approach. There are also some other planning issues which may be appropriate to address:

- Will the resulting structure have a multi-color paint scheme? If so, the choices are to pre-paint various parts before assembly or mask and spray the completed assembly.
- Is interior detailing a consideration? Interior detailing generally requires a removable roof, which complicates construction and also makes any required interior bracing more complex and/or difficult.
- What about material thicknesses? The .040" styrene usually used for walls on an HO scale model may be inappropriate if the thickness of the material can be seen. The thickness of the material being used also affects layout. Be sure to make allowances for it on the ends and sides of a structure or freight car with overlapping walls.

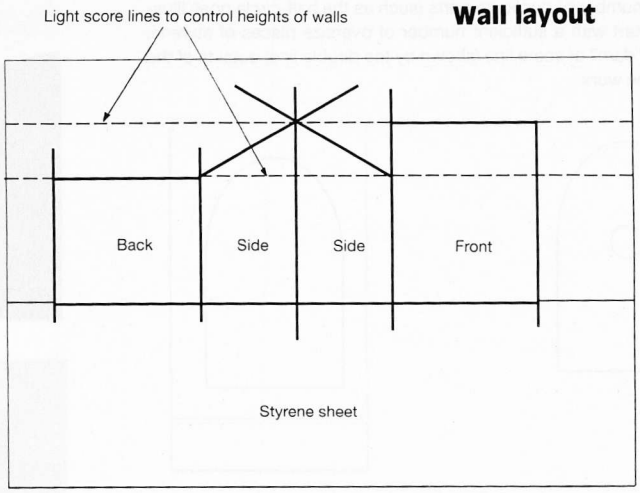




The tools needed for laying out the work are common ones: scale rules, squares, draftsman's dividers and dial calipers. The NorthWest Short Line Chopper is an indispensable tool for cutting strips to length. To offset a worn hardboard base, place a piece of .040" sheet under the cutting area. A .040" shim must be used under the cutting arm hinge to keep it parallel. Note the new fence. Draftsman's dividers may be used to "walk off" dimensions; circle the points with a pencil.



With the exception of the "cast iron" legs, this model water tank is all styrene. The body and tank bands were pre-curled.



Wall layout

Layout of a typical "lean-to" structure. First score a line to become the bottom of the four sides; then lightly score guide lines for the height of the front and the back. Using dividers, set the width of the two sides; reset the dividers and mark the width of the front and back. Now deepen the appropriate score lines and snap the parts apart.

- Peaked roofs can cause minor problems if not planned for in the early stages of a project. If possible, allow the peaked (gable) ends or sloped sides of a structure to overlap the straight sides. This will avoid odd "flat spots" as thick as the siding at the tops of the walls which interfere with the installation of the roof.
- Buildings with decorative trim at the corners or fascias are easier to plan and build since this trim can cover exposed joints if the trim is wide enough. Much of the trim on actual buildings is there for the same purpose.

Layout

My first rule of layout is to *always* use a square when cutting sheet styrene. You are then assured that all edges are square and that all edges of the remaining stock are square.

Unlike wood, styrene is cut by scribing and "snapping." It is unnecessary and undesirable to cut through styrene except for the thinnest sheets, such as .010" and .015". Instead, the styrene should be scored with several reasonably-light passes of a razor blade or knife. It can then be snapped on the score line, resulting in an easy and clean line.

Because of this method of cutting, it is important to start all layout away from the edge of the styrene sheet to insure that sufficient styrene is available to hold onto while you snap it off. While this produces a certain amount of waste, layout will be more accurate and the resulting pieces will not require clean-up.

Whenever possible, plan the layout of the various pieces in such a way to simplify measurement and minimize errors. For example, use dividers or calipers to transfer identical measurements to the sheet stock. Thus, lay out the shared dimensions of both the front and back of a structure with the dividers before resetting them. The errors which could be introduced otherwise may seem minuscule, but they do accumulate. It is best to eliminate them whenever possible. Identical pieces can also be laid out adjacent to each other, insuring equal heights or widths and again reducing errors. If you are using dividers, circle the prick points with a No. 2 pencil immediately to avoid losing them or confusing them with other marks. Even if I am taking measurements from a scale ruler, I prefer to utilize dividers if more than a single part is to be laid out. Also, the thickness of a pencil point is way too large to be acceptable for general layout. Wherever possible, complete all layout work before starting your cutting and snapping.

Scoring and snapping

A square should be used whenever appropriate for scoring. I prefer to hold the square in such way that it is both tight against the sheet and does not slip while scoring. Out-of-square cuts can result when using just a steel ruler or draftsman's triangle. If you find that the steel rule or the blade of the try-square continually slides on the material, use contact cement to apply a strip of emery cloth to the back as an anti-skid pad.

The first pass with a razor blade or modeling knife should be very light, with the intent to only lightly break the surface of the styrene and provide a positive path for subsequent passes. Then go back with additional light passes. If the square or ruler slides while making these light scoring passes, you are most likely using too much pressure, especially against the straightedge. Usually, two or three light passes and one heavier pass will be sufficient to score the styrene.

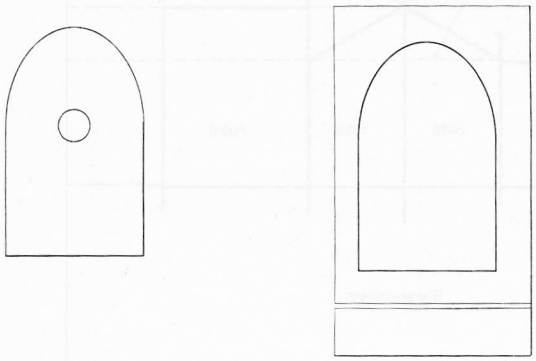
When laying out pieces with a pencil, it is obvious that the T-square or triangle must be moved away from the intended line by one-half the thickness of the lead to draw a line where desired. A draftsman's lead holder and rotary pointer are useful for this work; equipped with a No. 2 or No. 3 lead, the "older style" lead holder and pointer can be more accurate than the new, thin-lead drafting pencils. Likewise, when scribing styrene, the square must be moved slightly away from the mark to insure that the score line is correctly located and centered on the mark.

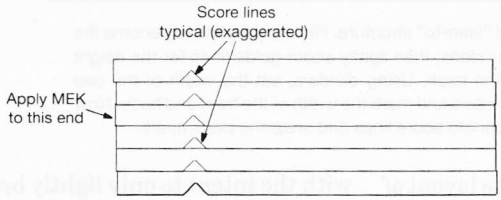
If you use a divider or other means to produce a prick point to mark the line, you have an added bonus. Position the square appropriately and then, ever so lightly, slide the razor blade or knife along the square. If you have judged correctly, you will feel the blade "drop" into the prick point. This is an easy way to insure that cuts are exactly where desired, again minimizing errors.

Once all of the layout lines have been scored, snap the resulting pieces from the sheet styrene. If various pieces have nearly identical measurements, it is worthwhile to mark these before you snap them apart. For parts which are almost square, mark the top of the pieces for future reference.

Modeling with styrene

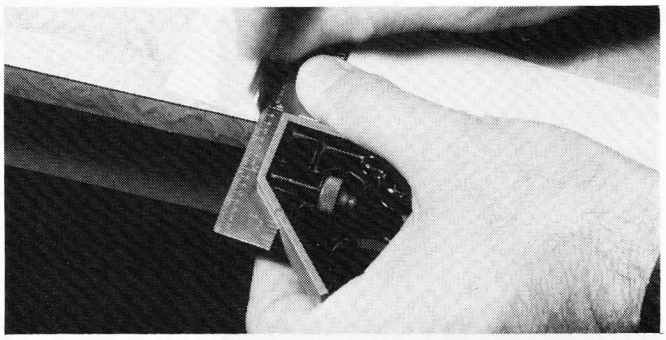
To cut a number of duplicate parts (such as the half-circle ones illustrated), start with a sufficient number of oversize pieces of styrene. Scribe a "dam" or score line (shown by the double line) outside of the area of the work.

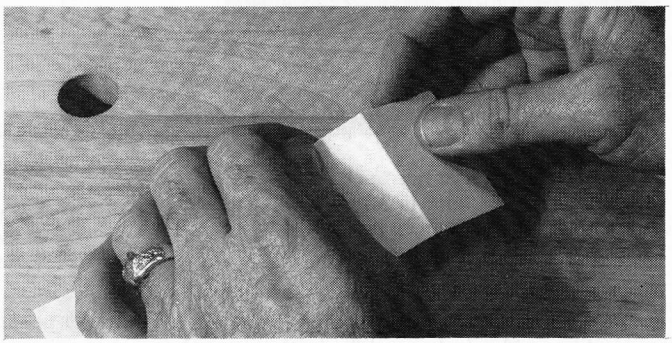




Stack the pieces together and apply MEK to the joints on the "waste" end of the stack as shown. The score lines will prevent the MEK from flowing through the layers to the opposite end of the stack. File the stack to the desired shape and cut apart.

Making multiple parts





When cutting styrene with a square, hold the base of the square over the edge of the workbench or cutting board. Use your thumb to hold the blade tightly on the sheet and support the square with your index finger. Score the sheet, then snap it off.

Windows

Although window framing can be built up from individual strips of styrene, the variety of window castings on the market will many times allow commercial parts to be used. However, regardless of whether windows are scratchbuilt or commercial castings are used, the window and door openings must still be cut out.

Assuming that commercial castings are being used, the first step is to accurately mark the wall sides for the required openings. This step can be simplified immensely if dial calipers are available.

First, adjust the dial calipers to allow the window castings to lightly fit between the caliper blades and then lock the measurement with the thumb screw or slide lock. The sharp inside measurement blades can now be used to transfer the width of the casting directly to the wall sides (do this on the inside surfaces). Complete the same procedure for the height of the window openings and use these prick points to lightly scribe that measurement on the insides of the walls. To keep these lines from disappearing, wipe your finger on a dusty portion of your workbench and rub it across the light score line. The dust will collect in the score lines, making them readily visible.

The traditional procedure at this point generally involves deepening these score lines with a knife, scoring diagonally from corner to corner, and then breaking out the pieces to leave the window opening. While this will work, there is a simpler way—use a Radio Shack nibbling tool.

Nibbling tools are used in the electronics industry and by electronic hobbyists to cut large holes in sheet metal. All that is needed is an initial hole large enough to insert the head of the tool. The nibbling tool can then be used to bite off small pieces of material until the opening is the desired size. The straight face of the nibbling tool can be used to nibble right up to a score line or square corner.

The Radio Shack nibbling tool (part No. 64-823, selling for around $12.00) is perfectly suited for our use. Other modelers have told me that more expensive nibbling tools are available, but their design is "compromised" by improvements suited primarily for cutting large holes in sheet metal.

Starting the tool requires a hole equal to the size of the head of the nibbler. Twirl a knife with a sharp No. 11 blade vertically in the center of the window to start a small hole. This hole can then be enlarged by "carving" with the blade until the nibbling tool head can be inserted into the opening. It is then a simple matter to nibble out to the score lines.

Assembly and bonding

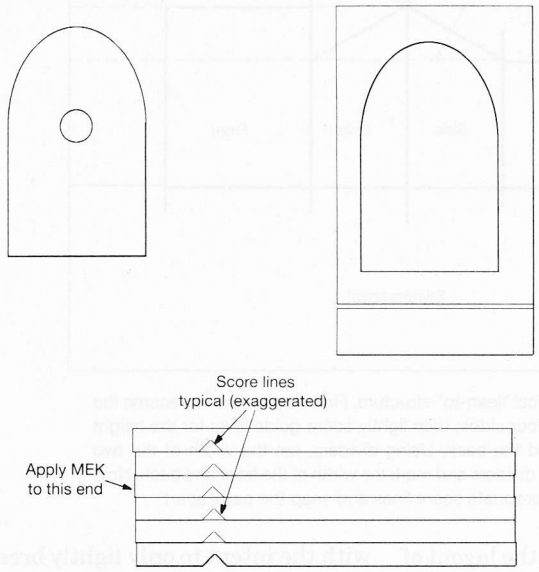
Neat, square joints are essential to a satisfactory model. Because of the speed at which styrene can be bonded, it is essential that pieces be held in correct alignment when the MEK or cement is applied. As you gain practice with styrene, simple solutions become more obvious, including the use of machinist's squares or steel blocks to provide support and correct alignment of parts.

In planning assembly, it is important to remember the capillary action which occurs with MEK or other styrene bonding agents. Capillary action will pull the solvent along a joint and, more importantly when planning assembly, through one. Keep gravity in mind and use it to your advantage, rather than letting it become a disadvantage. Applying MEK to a vertical joint will result in the solvent flowing through it and bonding the part to the working surface. When possible, position the seams or parts horizontally to minimize this problem.

To hold small parts while the MEK is applied, use tweezers, the tip of a knife blade, or a steel scriber rather than your finger. MEK has an amazing ability to seek out fingers and inevitably will leave a nice three-dimensional fingerprint on the model. Incidently, a

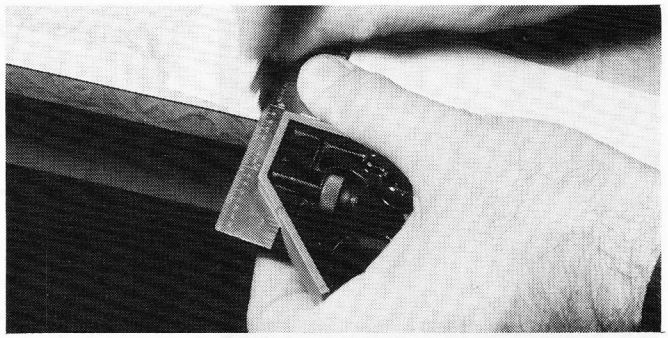
Modeling with styrene

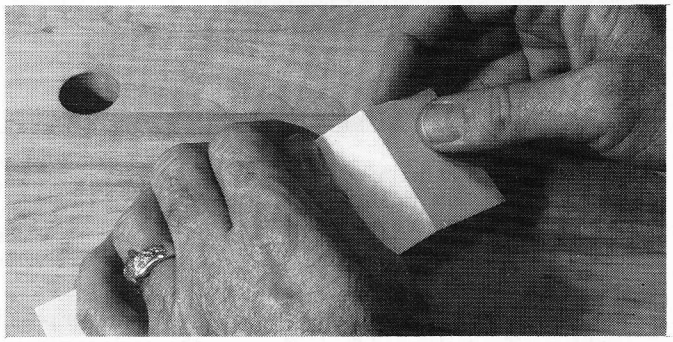
To cut a number of duplicate parts (such as the half-circle ones illustrated), start with a sufficient number of oversize pieces of styrene. Scribe a "dam" or score line (shown by the double line) outside of the area of the work.



Stack the pieces together and apply MEK to the joints on the "waste" end of the stack as shown. The score lines will prevent the MEK from flowing through the layers to the opposite end of the stack. File the stack to the desired shape and cut apart.

Making multiple parts





When cutting styrene with a square, hold the base of the square over the edge of the workbench or cutting board. Use your thumb to hold the blade tightly on the sheet and support the square with your index finger. Score the sheet, then snap it off.

Windows

Although window framing can be built up from individual strips of styrene, the variety of window castings on the market will many times allow commercial parts to be used. However, regardless of whether windows are scratchbuilt or commercial castings are used, the window and door openings must still be cut out.

Assuming that commercial castings are being used, the first step is to accurately mark the wall sides for the required openings. This step can be simplified immensely if dial calipers are available.

First, adjust the dial calipers to allow the window castings to lightly fit between the caliper blades and then lock the measurement with the thumb screw or slide lock. The sharp inside measurement blades can now be used to transfer the width of the casting directly to the wall sides (do this on the inside surfaces). Complete the same procedure for the height of the window openings and use these prick points to lightly scribe that measurement on the insides of the walls. To keep these lines from disappearing, wipe your finger on a dusty portion of your workbench and rub it across the light score line. The dust will collect in the score lines, making them readily visible.

The traditional procedure at this point generally involves deepening these score lines with a knife, scoring diagonally from corner to corner, and then breaking out the pieces to leave the window opening. While this will work, there is a simpler way—use a Radio Shack nibbling tool.

Nibbling tools are used in the electronics industry and by electronic hobbyists to cut large holes in sheet metal. All that is needed is an initial hole large enough to insert the head of the tool. The nibbling tool can then be used to bite off small pieces of material until the opening is the desired size. The straight face of the nibbling tool can be used to nibble right up to a score line or square corner.

The Radio Shack nibbling tool (part No. 64-823, selling for around $12.00) is perfectly suited for our use. Other modelers have told me that more expensive nibbling tools are available, but their design is "compromised" by improvements suited primarily for cutting large holes in sheet metal.

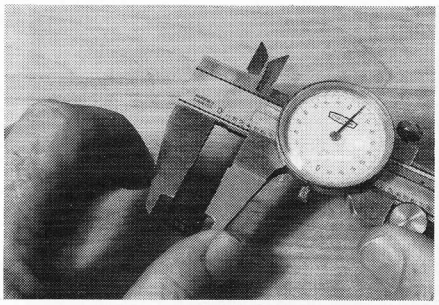
Starting the tool requires a hole equal to the size of the head of the nibbler. Twirl a knife with a sharp No. 11 blade vertically in the center of the window to start a small hole. This hole can then be enlarged by "carving" with the blade until the nibbling tool head can be inserted into the opening. It is then a simple matter to nibble out to the score lines.

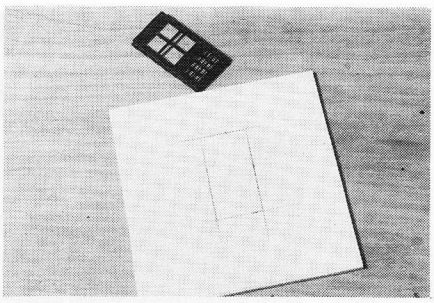
Assembly and bonding

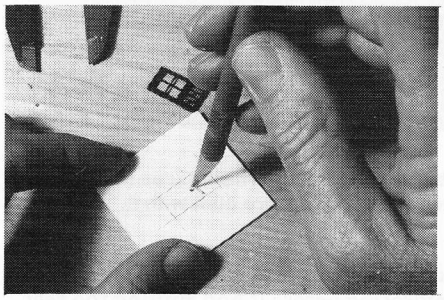
Neat, square joints are essential to a satisfactory model. Because of the speed at which styrene can be bonded, it is essential that pieces be held in correct alignment when the MEK or cement is applied. As you gain practice with styrene, simple solutions become more obvious, including the use of machinist's squares or steel blocks to provide support and correct alignment of parts.

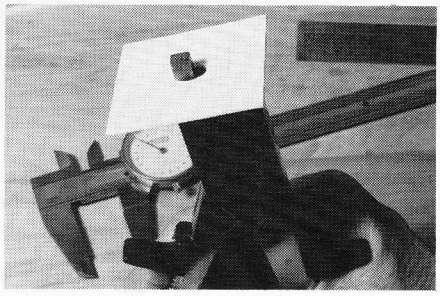
In planning assembly, it is important to remember the capillary action which occurs with MEK or other styrene bonding agents. Capillary action will pull the solvent along a joint and, more importantly when planning assembly, through one. Keep gravity in mind and use it to your advantage, rather than letting it become a disadvantage. Applying MEK to a vertical joint will result in the solvent flowing through it and bonding the part to the working surface. When possible, position the seams or parts horizontally to minimize this problem.

To hold small parts while the MEK is applied, use tweezers, the tip of a knife blade, or a steel scriber rather than your finger. MEK has an amazing ability to seek out fingers and inevitably will leave a nice three-dimensional fingerprint on the model. Incidently, a

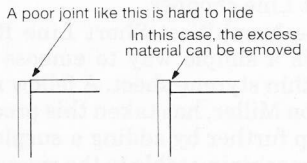








Cutting window openings begins with measuring the width and height of the window casting with dial calipers and transferring those dimensions to the model. Dividers may also be used. With the locations marked, score the opening and darken the score lines. Twirl a No. 11 blade in the middle of the window opening to make a pilot hole, then carve out the hole until it is large enough to insert the head of a Radio Shack nibbling tool. Finish by nipping off the styrene in the window opening up to the lines.



Watch joint alignment at corners. Note that it is much easier to correct alignment problems if an edge overlaps a side, rather than vice-versa.

Joint alignment

sheet of ¼"-thick plate glass makes a good surface for assembling models; have a piece about 18" square cut at a glass shop and get the edges polished and "broken."

The need to align and bond strip styrene onto a sheet brings up another simple procedure. Rather than take a chance of accidently moving a long strip while bonding it in place, first lightly scribe the location for one edge of the strip. Then slide the strip or part up to the line. The ridge caused by the scribing will provide a "stop" to maintain the correct alignment while the MEK is applied. Hold it in place with the tip of a knife while bonding it in place.

More complex projects require more complex solutions. Tight corner joints on large models are critical and, at the same time, easy to misalign. Good corners are especially important when using scribed styrene since it is nearly impossible to correct a misalignment through filling or filing without destroying the adjacent scribing.

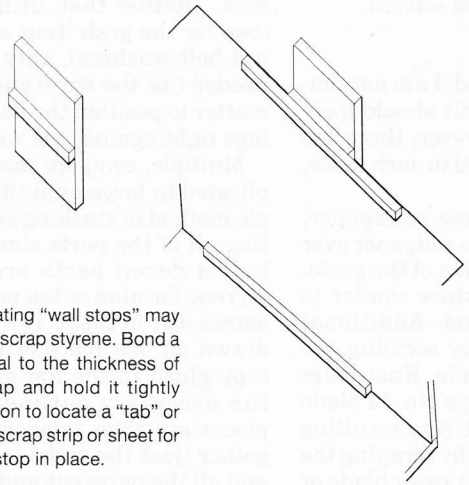
For such joints, I prefer to first bond a guide or stop along each corner joint, which helps align the side in a manner similar to the tabs on injection-molded kits. The guide is simply a piece of scrap styrene strip carefully set in from the edge a distance equal to the thickness of the adjacent wall. In other words, if you are using .040" styrene, the stop should be .040" in from the edge.

In order to accurately locate the stop, make a small jig by gluing a piece of square styrene strip, equal in width to the thickness of the wall, to a piece of scrap styrene. With the jig held firmly on the edge of the wall, slide the guide up tight against the jig and hold it with a probe. Remove the jig and bond the stop in place. It will be set the correct distance from the edge, equal to the thickness of the wall; the adjacent wall will butt up against the stop and be correctly positioned.

This technique can also be used to construct removable roofs so that the roof will "lock" in place. Glue similar strips or tabs to the underside of the roof so they fit tightly against the inside of the sides and ends.

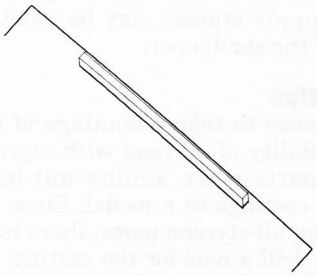
Whenever possible, small parts, such as wall battens, roof rafter tails, boxcar fascias, and building trim should be cut oversize, bonded in place, and then cut to length. This is much easier than attempting to cut a piece exactly to length, locate it correctly, then bond it in place. This works especially well for adding rafter tails to a building, since no matter how careful your measurements are, the length of the rafter tails will vary along the roof edge. Make the model "match itself" whenever possible.

When adding corner trim to a build-

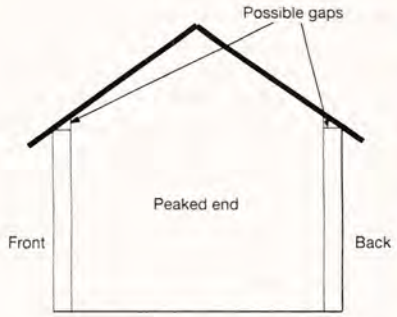


A spacing jig for locating "wall stops" may be constructed from scrap styrene. Bond a strip of styrene equal to the thickness of the wall to the scrap and hold it tightly against the wall section to locate a "tab" or guide strip on it (use scrap strip or sheet for the stop). Bond the stop in place.

Alignment tabs



The tab will insure that the adjacent wall is correctly located in relation to the edge.



In this view exaggerating the thickness of the walls of a gable-ended structure, note the gaps which result at the tops of the side walls if the sides overlap the peaked ends. To avoid this problem, have the peaked ends overlap and cover the sides.

Planning peaked ends

Styrene construction offers fast, crisp assembly for modeling. The boxcar (YV 613, a Harriman car purchased used by the line), shelter and railings were built with it.

ing, cut the material overlength, bond it to one side, cut it to length, and then add the adjacent trim piece. To get the trim correctly located and flush with the corner, hold a steel ruler or acrylic draftsman's triangle on the opposite side, position the trim, and lightly tack it in place (while at the same time keeping the MEK from flowing along the joint and bonding the ruler or triangle to the building). Then go back and touch the joint with more solvent.

Wood grain

As previously indicated, I am not convinced that all HO models should have visible wood grain. However, there are occasional exceptions and in such cases, grain is simple to add.

Using a piece of coarse sandpaper, such as 50 grit, drag the sandpaper over the styrene in the direction of the grain. This will result in a texture similar to heavily-weathered wood. Additional texture can be added by scribing the styrene with a knife blade. Knot holes can be added by twisting a No. 11 blade vertically where desired. Any resulting "fuzz" can be eliminated by scraping the surface with the edge of a razor blade or with steel wool. A stainless steel or brass-bristle brush (sold in stained glass supply stores) may be used in place of the sandpaper.

Other tips

It is easy to take advantage of the compatibility of styrene with styrene detail parts when adding nut-bolt-washer castings to a model. Since we are using all-styrene parts, there is no need to drill a hole for the casting. Instead, slice off the head from the sprue flush with the bottom of the washer, position it on the model, and bond it in place with a drop of MEK. When slicing the nut-bolt-washer from the sprue, use an easy, slicing motion rather than a chopping or cutting motion. The correct slicing action is similar to that used to slice a ripe tomato. If done properly, the nut-bolt-washer will not fly across the room but will be dropped, right side up, on the workbench to be easily picked up with your tweezers.

This works especially well for adding nut-bolt-washer detail adjacent to grab irons when scratchbuilding freight cars. Rather than drilling four holes (two for the grab irons and two for the nut-bolt-washers), only two holes are needed (for the wire) and it is a simple matter to position the heads of the castings tight against the wire grab irons.

Multiple, complex shapes can be duplicated in large quantities by the simple method of stacking styrene and cutting all of the parts simultaneously. If half a dozen parts are needed, cut styrene for nine or ten parts (to provide extras just in case). The pattern can be drawn on one piece or a paper photocopy glued to the top piece to provide the necessary outline. The styrene pieces are then temporarily glued together (just the ends) to create a stack and all the parts cut and/or filed simultaneously, resulting in a number of duplicate pieces. They can then be cut apart and applied to the model.

This trick has been around for a long time for working with brass or wood. However, when working with styrene, one additional step is necessary. If the stack is bonded together at the ends, it is likely that MEK will migrate from the "waste" end of the pieces to the "good" portion at the center, bonding the pieces and making it impossible to later separate them. To prevent such MEK migration, first scribe a score line or "dam" on each piece between the waste and good portions. Apply MEK at the waste end. The ridge caused by the score line will prevent the solvent from migrating across it and ruining the rest of the stack.

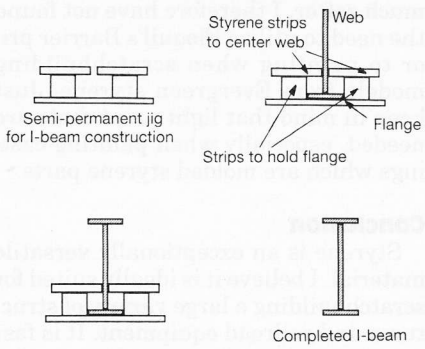
Plan ahead on how to separate the pieces and how to consistently cut each part to length. Several methods are possible, including holding the parts together in a vise and cutting them apart all at once with a razor saw, or chopping them to length using the NorthWest Short Line chopper.

The NorthWest Short Line Riveter tool is a simple way to emboss rivets into thin styrene sheet. A fellow modeler, Jon Miller, has taken this procedure a step further by adding a surplus X-Y axis machining table to the riveter. The addition of a dial indicator for each direction results in a fast and accurate tool.

Since most riveting is done in thin styrene (.005" and .010"), this is a good time to mention some precautions in using MEK or similar solvents when laminating thin sheet styrene to large surfaces. Although .010" strip styrene normally is not a problem, large thin sheets can easily be "melted" by the bonding agent, resulting in depressions in the surface. The distortion occurs before the MEK completely evaporates.

Two solutions are possible. MEK can be applied to the thicker base first and allowed to nearly evaporate before the thinner styrene is applied. Practice this in advance to check your timing. In some instances, it may be possible to bond only the edges of the thin stock, eliminating the problem of trapping MEK between the layers. Another approach is to use cyanoacrylate cement for such applications, eliminating the evaporation problem totally.

Although ABS plastic (i.e., Plastruct) comes in a large assortment of I-beams and angles for use in fabricating models which use structural steel, note that



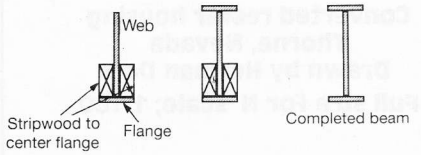
A semi-permanent jig for producing I-beams may be constructed from strip styrene. The web is assembled to the first flange, then the piece is inverted to add the second one.

I-beam jig

neither MEK nor typical styrene solvent cements will bond ABS plastic. One must either use a special, slower-acting solvent such as that marketed by Plastruct when working with the harder ABS or go to a more aggressive fast solvent like Rez-N-Bond, a brand designed for acrylics and sold at plastic supply houses.

However, I rarely use Plastruct components because of the thickness of the webs and flanges. I fabricate my own I-beams and channels from strip styrene. Making up a typical I-beam is a straightforward task using scale 1"×3"'s, 1"×10"'s, 1"×"12's, etc. as dictated by the prototype. The only trick is to accurately glue the three pieces together with the web centered on the flanges.

If only a few I-beams are needed, one can use stripwood to accurately space the web. Two pieces of stripwood are selected whose thickness, together with the thickness of the web, equals the width of the flange. It is then a simple matter to hold the web and the two wood guides together on the flange to get a square joint with the web centered on the flange. Hold the two pieces of wood about an inch from the end of the beam (with the end angled downhill from the wood guides, if possible) and apply a drop of MEK to the joint near the end. As soon as the joint has dried, slide the wood guides further along and work your way up the flange, adding MEK as you go. (The wood won't be bonded to the styrene by the MEK but may spread any errant MEK, ruining the part). Flip the assembly over and add the remaining flange in the same manner.



For a temporary jig to make I-beams or channel, stripwood of the appropriate width is used to center the web on the flange. After gluing the first flange in place, turn the assembly over and attach the second flange in a like manner.

Temporary I-beam jig

This is fine for a few parts, but projects which require more I-beams justify a more formal jig. Such jigs were used in fabricating my four-foot long "all-steel" Barrett Bridge out of styrene. The jig was made up on a scrap piece of .040" styrene. Two strips of styrene were positioned on the jig to hold the flange in place while the web was held vertically and centered by the balance of the jig. As before, a flange was added to the web, the completed assembly turned upside down, and the second flange added.

Since the entire jig is constructed of styrene, it is very easy to cement the beam being fabricated to the jig itself. To avoid this, use the jig to hold the parts in proper alignment and bond the joint an inch or so beyond it. This keeps the MEK from migrating onto the jig. Tipping the jig and parts to be bonded on a slight "downhill" will also help. Once you get the hang of the operation, a 50-foot long I-beam can be fabricated in just a few minutes.

Wood scratchbuilders have long known that wood can be formed into complex, curved shapes by soaking in hot water and being allowed to dry in a jig conforming to the final shape. A similar technique can also be used to preform styrene. For example, if scribed styrene for a water tank is forced into a curved shape beforehand, joint problems will be eliminated which would arise if the styrene is not pre-bent.

Because styrene does not have a structural grain, a slight variation of this traditional technique must be used. Styrene cannot be wrapped around a mandrel or form, held in place with rubber bands and dipped in boiling water. Uneven pressure on the styrene when using this method will warp it.

Instead, cut the scribed styrene to the correct height but over length. Find a container (such as a 35mm film can) whose inside diameter is slightly less than the final desired diameter of the structure. Put the curled styrene in the film can and lower this into a pot of boiling water. The styrene will quickly soften and conform exactly to the inside diameter of the container. Pull it out and run cold water over the styrene, dry it and it is ready to use.

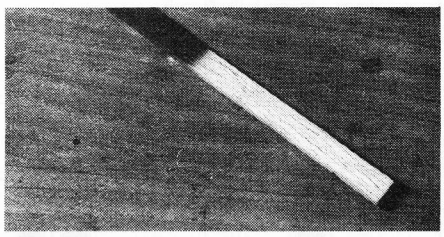
Paper shingles, such as Campbell's and Builders in Scale laser-cut shingles, are popular scratchbuilding materials. Applying shingles to a styrene roof can be simplified if they can be adhered to a paper-compatible base, rather than directly to the styrene. To accomplish this, cut a piece of plain paper slightly larger than each roof section. Apply spray-on adhesive to one side of the paper and glue it to the roof. After it has dried, cut the excess typing paper from the roof with a knife or razor blade, add penciled guidelines, and do the shingles in the normal manner.

Although plaster is a traditional material for duplicating bridge abutments and piers, as well as water tank footings and the like, more complex abutments or footings require considerable effort to correctly construct the forms for pouring plaster. I have therefore switched to styrene for duplicating such footings and abutments. The front and back of the footing are constructed of .040" styrene, while the sides are constructed of .020". Cut the sides slightly oversize, assemble the "box" and add an oversize top. Now, carefully remove the excess material from the assembly. Slightly round or "break" the corners, and smooth the final assembly with steel wool. Cutting the sides oversize and filing them to size will result in invisible joints at each corner.

A standard bastard file may be too coarse for some applications, leaving file marks on the part. In such cases, especially for breaking corners and removing excess material from corners as a result of misalignment, consider using a razor blade or modeling knife. Hold the blade perpendicular to the edge to be "filed" down and lightly draw it across the edge, removing the excess by scraping. This will quickly remove excess material without damage to adjacent surfaces or the possibility of leaving file marks.

Assembly and cutting jigs

Because of the speed of construction



When desired, wood grain effects on styrene sheet or strip may be done with coarse sandpaper or a metail-bristled brush.

possible with styrene, I use a lot of it for fabricating quick assembly or cutting jigs. A piece of .040" styrene with a scrap strip of styrene bonded to it at the correct angle will produce a simple jig for use with a NorthWest Short Line chopper to cut different angles (such as rafter tails). Add a stop and you have a jig for not only cutting a particular angle, but also for cutting the piece to length at the same time.

Styrene can also be used to fabricate quick jigs for holding parts in proper alignment for bonding. All of my scrap styrene is thrown into a box and used for such quick jigs. Sometimes, two or three tries will be needed to produce a fixture for a particular job, but the effort pays off in neater assembly.

Painting

I am basically an impatient modeler. I want to see the finished model come together as quickly as possible. This is not necessarily a problem if the model is to be painted a single color. However, if the trim and windows will be a contrasting color from the rest of the structure, conventional wisdom normally dictates pre-painting.

My hesitation with pre-painting is that it can easily lead to problems during later assembly. While pre-painted windows can many times be glued in place from the inside, it is difficult to glue pre-painted trim in place without damaging an adjacent prepainted surface. I am therefore a disciple of the "mask and spray" school of thought. I prefer to assemble an entire structure, airbrush the base color, and then mask and airbrush the trim and windows. While this may seem time consuming, masking with small pieces of Scotch brand Magic Mending Tape can go relatively quickly. Each modeler must decide on his/her preferred approach.

Whether or not one chooses to prepaint, modeling with styrene almost dictates the use of an airbrush for painting. While brush painting can be used, producing a smooth surface on a styrene model is much more difficult than producing an acceptable surface on a wood model. I generally use Floquil, diluting it with Dio-Sol as necessary. Sheet styrene is less susceptible to problems from Floquil than is injection-molded styrene, such as that used in plastic kits. Such molded styrene is much softer. I therefore have not found the need to utilize Floquil's Barrier prior to painting when scratchbuilding models from Evergreen styrene. Just keep in mind that light paint coats are needed, especially when painting castings which are molded styrene parts.

Conclusion

Styrene is an exceptionally versatile material. I believe it is ideally suited for scratchbuilding a large variety of structures and railroad equipment. It is fast to work with and requires no special surface preparation.

My Yosemite Valley Railroad currently has 30 or more scratchbuilt structures, of which 20 are styrene. All of my scratchbuilt railroad cars are also styrene, with the exception of a single scratchbuilt brass passenger car. Fifty more structures are needed and a majority of these will be styrene, as will an additional 50-60 railroad cars. Simple models can be completed in a single evening, a necessity with this many models to build. If you haven't tried styrene, give it a try. If you are already a styrene devotee, hopefully I have shared a few tricks for you to try.

N SCALE NICHE:
REFRIGERATOR CAR HOUSING

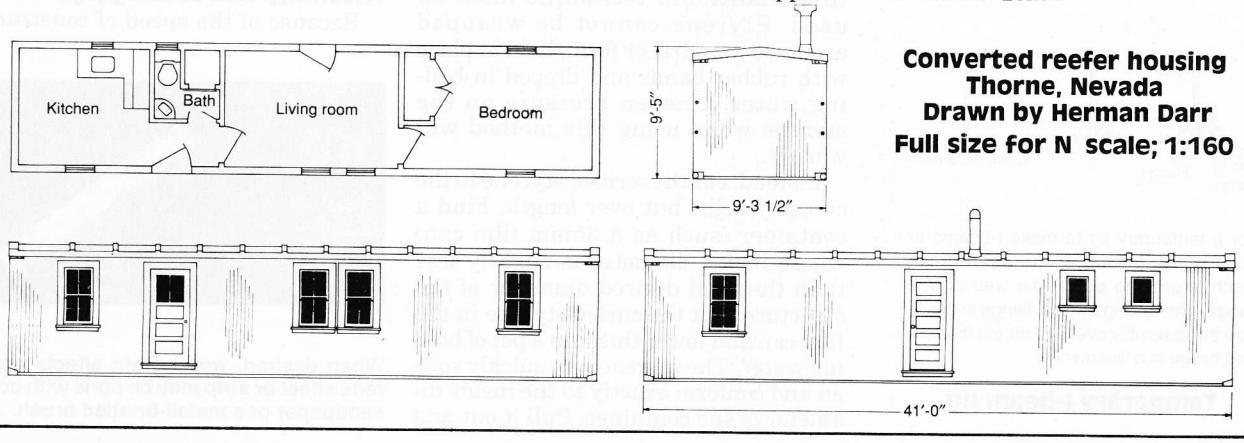
Has your railroad run out of housing for section crews at a remote location? Southern Pacific's solution to such a problem may be your answer. During WWII, they needed additional housing at Thorne, Nevada, because the expansion of the U.S. Navy Ammunition Depot at nearby Hawthorne resulted in greatly increased rail traffic.

Located alongside a remote, high desert lake, Thorne station is six miles east of Hawthorne and serves as the connection with the ammunition plant's own railroad. Military traffic was heavy enough to warrant use of SP's older cab-forward locomotives and they were hard on the light rail of the Mina Branch.

The SP found that its subsidiary Pacific Fruit Express had retired several reefers that could be converted into living quarters for married employees. (One car was still lettered PFE 15959.) The unneeded hardware was stripped off, the steel underframes removed and the cars remodeled with available materials. While not spacious accommodations, they were insulated, which could be appreciated at the 4,000-foot elevation.

Two of carbody homes lasted into the 1950's before being sold for use at storage buildings at the rodeo grounds at Hawthorne. To model such conversions, remove the unwanted details, including ice hatches, and add plastic windows and doors. Paint the cars in your railroad's structure colors. The SP used buff yellow with brown trim. Build a suitable foundation of old ties, add steps, a utility pole and wires, and a fuel tank or coal box to complete the scene.

—HERMAN DARR



Converted reefer housing
Thorne, Nevada
Drawn by Herman Darr
Full size for N scale; 1:160