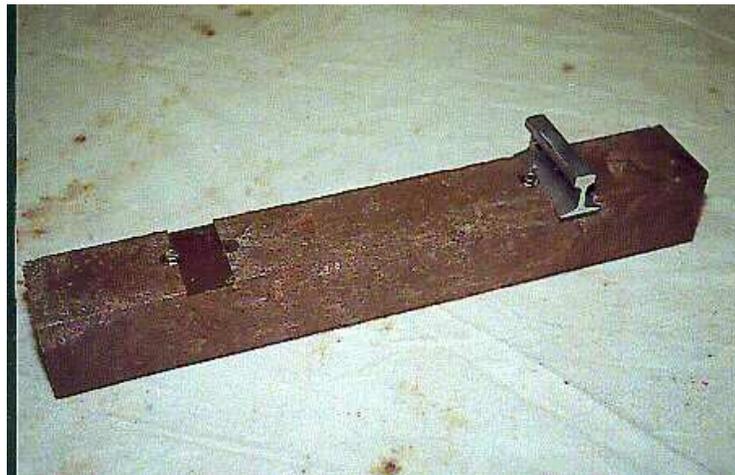


Recycled Plastic for Ties

By Bruce Mowbray



First a little trip back in time. Earlier in my time with the live steam hobby and during my membership with a formal live steam club, I was always involved with track work. Making and installing track panels, track laying, switch building and track maintenance were all part of this involvement. In this time as track worker, I learned the first three rules of track building. Those three rules are 1) Drainage 2) Drainage and 3) Drainage. If the track bed does not drain well, an increase in track maintenance will result. Not only will the track heave more in the winter months due to frost, the ties will rot due to trapped moisture. Track tends to heave a little no matter how much drainage is provided. Each spring, I would walk along the track and tamp a little here and lift a little there to get our club track back in shape for the coming season. Over the years, I noticed the ballast would fill with dirt and drainage would be hampered. This would cause another problem to come to light. The pressure treated, wood ties we used would rot. To fix this, the ballast would have to be removed from around the tie, the tie replaced and clean ballast put down. It seemed that if one tie was rotted, a few ties either way along the track would be rotted, too, or at least showed signs of decay and would soon need replacing. This job of replacing ties was my least favorite. It seemed like it took all day to replace a handful of ties and I always went home with sore fingers from digging the ballast out from between the ties. I often asked myself why I did this for fun.

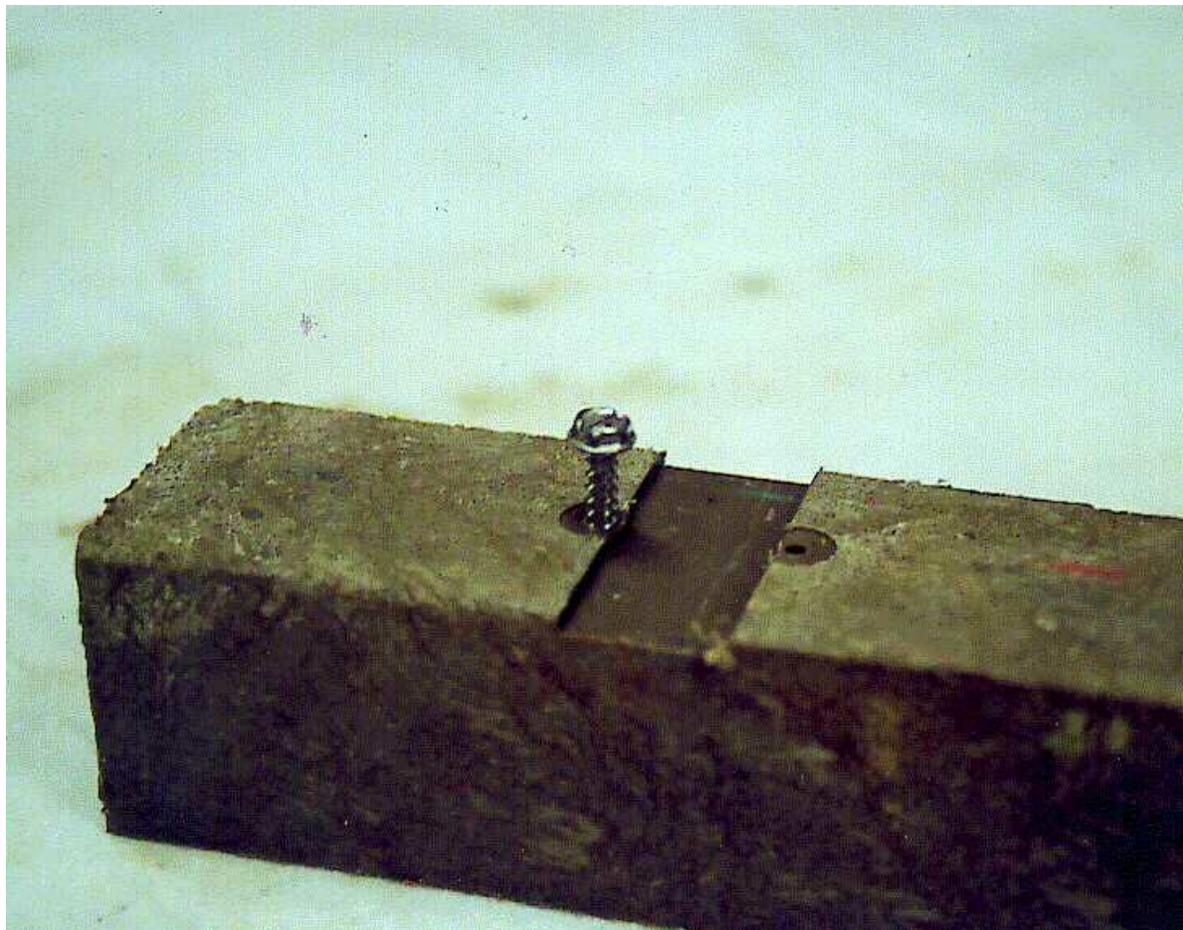
Jump ahead to the present (summer, 2001). I have since moved to the Endless Mountains region of Pennsylvania. An area far away from a club track. Needing a place to run my trains, I decided to build my own track. Remembering back to the days of sore fingers, I searched for a way to avoid the dreaded tie replacement job. The only way to avoid the problem of rotting was to find an alternative material from which to make ties. Back in the early days when I belonged to the club, we used ties soaked in creosote. Then, we switched to pressure treated ties. Both of these materials decayed in less than 7 years after installation and so these materials were not considered for my railroad. Also, the handling and cutting of pressure treated lumber carried many health risks and creosote has been all but banned in this part of Pennsylvania.

Next I looked into cast concrete ties. These looked very similar to the full size concrete ties and would provide a good long lasting tie. The drawbacks to them were they were expensive to buy and very labor intensive to make. Concrete also breaks down over time when subject to freezing temperatures, especially with the small cross section that a model tie would have. The next material I looked into was a wood chip / plastic blend of material commonly called "Trex". Recent studies with this product showed that the wood portion of the Trex makeup was sustaining bacteria and this bacteria was causing the wood fibers to break down or decay. The wood fibers in Trex are what give the material its strength. Trex is also VERY expensive.

The next and final material I researched was recycled plastic lumber. This material is a solid plastic made from recycled plastic beverage containers. There are no wood fibers to break down and it is available in many sizes and colors. Is safe to handle and is guaranteed to last forever. It cuts easily using standard wood cutting tools, drills easily and will not split, warp or crack the way wood does. Even when cut, the exposed plastic surface will not decay, as happens when cuts are made in pressure treated lumber and the less treated center of the wood is exposed. The chemical additives that are in the recycled lumber make it U.V. and weather proof. These chemicals are added to the raw plastic when it is in semi liquid form before being extruded into the shape of lumber. This ensures a thorough penetration of the stabilizing additives. The recycled plastic lumber is very durable and will not sustain a flame. It stands up well to rough treatment such as a nick from a derailed wheel flange. Even if moisture gets into a nick or screw hole, the inner plastic is unaffected. The greatest advantage of recycled plastic lumber is it is totally unaffected by moisture. Here in Northeast PA, the ground is made up of mostly clay. This type of soil holds moisture like a sponge. Even when the proper ballast base is used, the amount of moisture in the ground will keep the ties damp, especially in shady areas of the line.

Recycled plastic is available in different sizes. My supplier sells 2x2's, 2x4's, 2x6's, 4x4's as well as a few custom shapes and sizes. The dimensions are full size. A 2x4 is a full 2 inches x 4 inches, not 1 1/2 inches by 3 1/2 inches. Working with the recycled plastic is very easy. With no health problems to worry about, standard eye and hearing protection is all that is needed when using power saws to cut the plastic material. There are no worries about absorbing arsenic through the skin nor problems from breathing the harmful sawdust. In fact, the sawdust it makes is not the dusty type found when cutting wood. It's somewhat stringy and heavy and is easily removed from the table and chop saw. It cuts easily using a sharp coarse carbide tipped blade in the table saw and chop saw. It likes to be pushed through quickly to avoid melting. A little shot of silicone lube on the blade keeps any buildup to a minimum. Drilling the ties before using screws is a must. Even though it is possible to drive a screw into the material without a pilot hole, the screws hold better if a hole is drilled first. There is also less heat generated and less chance for the screw to melt its way into the plastic instead of threading.

I chose to use 2x4's cut to 14 1/4 inch lengths then ripped to 2x2's. The material is available in 12 feet long lengths and cutting it to 14 1/4 inch ties, then ripping the 2x4's into 2x2's, works out to 20 ties per length. I am using 3 ties per foot of track. Since I am building my track on site, and not using the panel method,



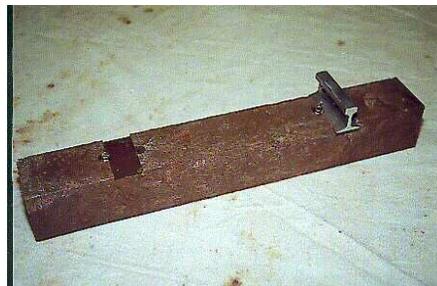
I slotted and predrilled my ties in the shop. The onsite building method was chosen as the plastic material is quite heavy and moving track panels around would be difficult for one person. I slotted and drilled my ties on my CNC milling machine but this could have been done with a simple router fixture and drill press.

This slotting and drilling of the ties makes gauging easy on the construction site as I didn't have to fiddle with track gauge tools. The nominal 7 1/4" gauge was used on the straight sections and a gauge of 7 3/8" was used for curved sections. Also the screw holes were



spot faced, with a homemade spot face/drill

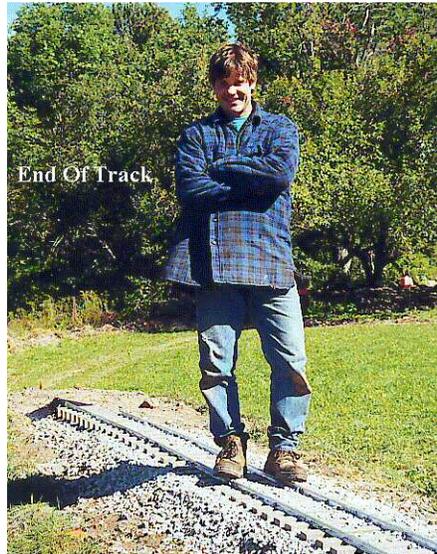
(see photo) to a specific depth in relation to the depth of the slot (see photo tie3). This allowed me to put the screw in tight and the rail would still slide along and provide movement from heat expansion / contraction. This small amount of extra work made on site track assembly very easy and quick. With the help of one person, I was able to lay 120 feet of track in 8 hours. That included right of way preparations, track laying, ballasting, and tamping. Another savings with on site construction is more efficient use of full lengths of rail. There is no trimming of rail ends to get the panels to fit together. The rail ends were also pre-drilled in my shop. Now most of you are wondering about cost of this ideal tie material. The price for a single 2x4x12 foot length of recycled plastic lumber is \$8.75. I get 20 ties from each 2x4. My cost per tie is 44 cents. Compare this to the use of a pressure treated 2x4x12 which costs \$5.85 and when cut into 10 ties, the price is 58 cents per tie. Remember that ripping a pressure treated tie will expose the less treated center, so this shouldn't be done. When purchasing recycled plastic lumber, it is best to buy it directly from the recycler/manufacturer. Since it is very heavy, trucking becomes expensive. Also when buying, ask for factory seconds. The only defects on seconds are the boards are not perfect in color, small blemishes appear in the surface and the color may not be uniform from board to board. This is not a problem for us as these inconsistencies make the ties look more prototypical. On an earth friendly note, using recycled plastic lumber reduces the burden on landfills. Each recycled plastic 2x4x12 contains between 250 and 300 recycled beverage containers. It doesn't break down over time and it doesn't leach harmful chemicals into the ground. It requires very little energy to manufacture and its production produces no harmful byproducts. With this new material I am using for ties, I have one less maintenance headache and have more time to enjoy my railroad.



As of now, summer 2001, my first section of track has been down for 1 year. It has made it through its first winter freeze and spring thaw. Except for some minor leveling, the track is in good shape. One thing I did notice is that some of the joint sizes have changed. There are some joints that now appear wider than others. Close inspection of the track reveals, the rails have crept along the ties, much like an inchworm, enough to make the joints uneven. To keep this from happening in the future, I will over tighten the screws on the 3 ties in the center section of the rail This will keep the rail from moving along the ties. Another item of interest is when I moved here in 1995, I installed a short section of track with plastic ties. I still have this test section of track in place and the ties show absolutely no change in appearance or strength. The screws are just as tight as when I put them in 6 years ago and the surface of the tie has not broken down from UV exposure at all. If this is any indication of how well the ties will perform on the rest of my track, I am happy with my decision to use recycled plastic for my ties.



About the author



Bruce Mowbray is a 41 year old self employed machinist. He was introduced to livesteam at 13, and built his first livesteam locomotive in high school. Born on Long Island, NY, Bruce was once a member of the Long Island Livesteamers. Now Bruce lives in Northeastern Pennsylvania where the nearest club track is 175 miles away. This meant having his own track was a necessity. Bruce is currently building his private 7-1/4" gauge track and hopes to be done with it by the end of fall 2001.