Atlantic Shore Line Locomotive 100
Curatorial Report no. 8
10 September –16 December 2007
by Donald G. Curry, Shop Manager

We're back into the box and back into action. Now that the main hall of Town House Shop is too cold to do anything effectively, we're taking advantage of the comfort of the heated box next to the wood shop. The new door of 2006, added insulation to the roof and general caulking have made it quite easy to heat and maintain good working conditions. Randy Leclair also did some work to the doors in the adjacent box where 100's trucks are. He added extra insulation at the top to keep the heat from pouring out and made the doors close a bit more tightly. (They really need total replacement, *a la* Dean Look, who did such a fine job on the other box doors.) We need supplementary heat to make it possible to work there at all.

Present work is continuing on two basic fronts:

- No. 2 end deck framework
- No.1 truck

End no. 1. **Tom Dow** left the no. 1 end basically complete and ready to go. We picked up where he left. He had the heavy bolster assembly up and in place for fitting. We then removed it, replaced some of the assembly bolts which had turned out to be a bit too short. We also stained the 2 x 8 southern yellow pine (SYP) filler across the top of the bolster to keep out moisture. The reinforcing plates on top required sand blasting, priming and painting. We also had to drill out the original holes in the plates just a bit as corrosion in them had made them small enough so the paint on the bolts was scraped off as they were installed. (Because the original bolts were almost all corroded away to nearly nothing, we carefully primed and painted all the new ones to prevent it from happening again.) Now the bolster is up in place and fully bolted on. This allowed us to remove the various jacks that had been keeping the end straight, so we could use them on the no. 2 end.

As a preventative measure, we applied "Seep 'n Seal' epoxy to the tops of the sills on the no. 1 end. eventually it dried but, because it dates from 1998, we wonder if it's going to do its job so will be using the West System epoxy for the remainder.

End no. 2. Initially we thought this end was in better shape than the no. 1 but, when we got into it with our 'dental picks', we found it was just as deteriorated. Using the same techniques developed by Tom Dow, we removed between 64 and 72 inches length and three inches depth from sills 2, 3, 4, 5 and 6. (No. 7 was still solid enough and we are replacing the outside sills nos. 1 & 8 with the 'new' full-length timbers.)

We found the undersides of several of these are also quite bad. No. 2 is rotted out in the center for about 1 ft. on each side of the bolster. No. 5 (it and no. 4 absorb the force of the coupler) suffered from longitudinal splitting, so we have chiseled and sawn off most of its bottom. At the bolster, under each of the eight sills, is a 2 x 8 notch for the bolster filler. These notches have 'eroded' upward at least ½ in. and some more than that, so we are chiseling and routing out an inch or more to get to a solid area to which we will epoxy 'new' wood. So far we have removed about 5 ash cans filled with chopped up rotted SYP from this end an amount which is about equal to that which we removed from the no. 1 end.

The ex I. S. M. belt sanding the cut-down sill tops

Five 'new' 3 x 5 in. sill tops have been cut and dadoed (for the reinforcing plates). The wood had a number of splits which were filled with Epoxy and now are as solid as new. [1](For filler, to save epoxy, we used SYP sawdust and chips. [2] We also used no. their 406 Colloidal Thickener.)[3]
Again, with the working of the bolster back and forth because of the badly corroded bolts and water-softened wood of the sills plus the total disintegration of the 2 x 8 in. spacer plank on top of the bolster, the notches in the bottoms of the sills required reshaping. We rebuilt those in the bottom of each of the 6 inner sills, carving them and adding 'new' wood (SYP) blocks to make up the differences. Because their bottom sides must all must line up with the flat top of the wood beam set on top of the steel bolster, it was necessary to create a 'virtual' bolster, which consisted of a 4 x 4 beam leveled across two jacks in line with where the bolster would go. To get their tops even it was necessary to have another beam across front, supported by another big Norton screw jack and appropriate shims.

[1] In many cases it is critical to add a filler to the epoxy resin-hardener mixture. First it extends the coverage but also, it makes it possible to fill interstices and bridge gaps.
[2] This seems to be a problem with the replacement SYP. It 'shells' apart following growth rings.
[3] Because of the difficulty of access, it is very difficult to make the mating surfaces of the replacement and original woods as smooth as they would be in a normal joint. To make up for this roughness, the thickener enables you to build up a thickness of resin mixture that, when the piece is installed and clamped down, will force the resin to cover a fill in the gaps.

Sills 5 & 4 showing deteriorated areas

Sill 5 with rotted area routed out

New sill tops – We milled out five 'new' SYP sill tops including dadoing out for the metal reinforcement plates. Prior to installing them we have to do more 'dental' work by installing filler pieces in the milled-out grooves in the remaining parts of the sills.

Preserving the integrity of the original sills - It was important that we not simply cut a sill all the way through because it would be extremely difficult to make any kind of splice that would hold, so we were careful to preserve enough of the original wood in each sill so it would 'stand' on its own. It is amazing how solid they were considering in sill no. 2 we had removed about 75% of its cross-section!

Sill 2 bottom after removing deteriorated wood

Sill 2 bolt hole area removed-new bottom installed

The quality of the original (very) old-growth SYP is incredible. The growth rings are extremely tight and the wood is very hard making chiseling difficult. Although the 'new' wood from Barnstormers! had cracks and 'shelling' much of it also had the same tight grain. Try finding anything like that at The Home Depot where the rings run about 3 or 4 to the inch instead or 30 or 40!

New sill bottom showing jack and many clamps

Plugs at the bolts. Because the bolster will have forces exerted on it in both longitudinal directions every time the locomotive is moved, it is necessary to return as much strength as possible to these areas. As the bolts worked back and forth, the holes themselves have enlarged. This was coupled by much of the surrounding wood has softening up or disintegrating along grain lines. (SYP tends to split apart in this manner.) On at least four (and probably five) of the longitudinal sills, we have had to carve out about 2 in. wide by as much as 18 in. longitudinally for a SYP plug to be dropped into these holes. After fitting, it is coated with thickened West System and clamped down in position. Then un-thickened epoxy is poured in around it so it fills up the inevitable gaps. (It's important to close up any gaps at the bottom or the resin will run out onto the floor below.)

Norm Down has painstakingly blasted the reinforcing plates and bolster hardware, primed some and **Burt Rendall** has primed the rest for this end. The second body bolster is now ready for assembly. Dean had to weld the cracked center casting.

Randy Leclair cleaned up, primed (with Chassis Magic) and painted (with black *Awlgrip*), the four 1 ¼ in. 32 ft. through rods, so they will be ready to install when the sills are completed.

Truck work – Last year **Randy Bogucki** started replacing the corroded ends of the brake beams, but his new job with GE in Erie, PA, took him away. So **Dean Look** just completed the first pair. Because they were somewhat crudely forged by Laconia (or Alco), it was difficult for Dean to tell what original dimensions should

be so he had to take a guess. The ends of these locate the brake shoe heads, which must be correctly placed to keep the brake shoes in line with the treads of the wheels. We won't know until we actually install them how much 'tweaking' will be necessary. Two more are still in place on the no. 2 truck to be used as patterns

One of Santa's Elves (Chelsey Pino) watching Dean Look prepare to machine a new end for a brake beam

All the original truck parts have been blasted, primed and painted and moved into the 'truck box' awaiting assembly. Dean got a good price of $280 to machine the eight rebabbitted journal bearings from Dean's Economy Machine in East Machias, Maine. (Dean in this case, is a last name, in case you were wondering.)

Dean is currently fabricating eight new motor mount angle brackets. The originals were badly corroded. These were originally bent out of a piece of 1 x 4 in. steel, something we would find nearly impossible to do without the 'bulldozer' the original manufacturer used. Instead he has cut two blocks from the 1 x 4 in. stock and milled a 45^{o} angle on each which will allow a place for the weld.

Air Compressor – Dean machined the new oilite bronze bearings and delivered them to A. C. Electric, where they await a slow time at A. C. so the rebuilding can be continued.

Traction motors – The four GE80 traction motors are complete and have been awaiting our readiness for their installation—which will very likely not be before spring.

A concern - In the meantime, we have some concerns regarding all the traction motors in cars in our collection. Because they are idle the majority of the time they tend to absorb moisture in their windings, especially the armatures. Over the past two months we have been taking measurements of the insulation resistance quality in various traction motors in our cars. This is measured in megohms (millions of ohms), using a megohmmeter (commonly called a megger).

If there is any dirt, especially carbon, electricity will find its way to ground. This is amplified in the damp conditions, which are very commonly found at Seashore[4]. If this leakage current is great enough, it will cause

[4] This condition is amplified on occasion by salt air from the ocean, propelled by storm winds.

heat and quickly burn up through the winding causing a hole, often with spectacular results as in traction motor armatures of our 1227 and 5821.

We have been working very closely with the National Tramway Museum in England (Crich) through personal contacts I have made there. Especially helpful are John Markham, Mike Crabtree and John Shawcross, all of whom are very closely involved with their workshop and preventative maintenance on their trams. John Markham, who started the programme, says they have not had an armature failure in 40 years of operation. This is because every armature has been removed at some time or another, thoroughly cleaned; dried and given a dip varnish and baking treatment.

Every year, each traction motor is dried before any power is applied to it. The drying is done by blowing heated air through the motor housing from the bottom, through the armature and out the top of the housing, using a purpose built blower-heater combination. Up to four units may be operated at once, each consuming less than a kilowatt of power.

In most of the motors we have checked, and especially those which have been recently overhauled, we have found the insulation resistance at or very close to zero megs; not satisfactory at all. For a number of reasons we are uncertain of what sort of treatment was given by the various motor shops involved.

Regarding no. 100's motors, we know all four motors were thoroughly cleaned and baked dry and given a brush coat of insulating varnish. Because the original cotton-based insulation still remains on the armatures we are concerned that the same sort of moisture absorption will occur in these motors too. The motors for Chicago car 225 were received from treatment by a motor shop in Connecticut, returned and left outside under a tarp for about a year before they could be gotten two. We gave it a drying treatment, which after about 144 hrs. of continuous passage of warm air, got the resistance up to over 20 megs[5]. However, within three days, it has gone back to near zero. So we have asked A. C. if they would take one of the 100's motors and make a test case out of it.

We have asked them to put it outside, albeit under the cover of a tarp, and check its insulation resistance over a period of time. If it has dropped very low (below 1 meg.) we will have to consider further treatment of the insulation. To my knowledge, they have not had time to do this test yet.

[5] It should be noted that the insulation resistance of a hot (just dried) armature is extremely low but it will rise to its maximum after cooling off for a day or so.