Atlantic Shore Railway
Locomotive 100
Curatorial Report no. 10
14 January – 2 February 2008

Things are coming together! Wednesday 30 January marked a significant event. All pieces[1] of the southern yellow pine underframe have been cut and given trial assembly. Several will be removed, given a coat of Seep 'n Seal and then permanently assembled, protected from moisture intrusion.

To get to this point, after the inner sills had been rebuilt, there were two other very major hurdles that had to be overcome.

Long (side) sills 1 and 8 (the outside sills which eventually will have the lettering ATLANTIC SHORE RAILWAY and the Laconia Car Company logo on them) are now in place. This job was made quite easy with the small battery-operated fork truck, donated several years ago by member **John Stoffel**.[2] Each 30-ft. sill was first prepared by filling all the cracks with a mixture of West System epoxy and sawdust (the sawdust being cheaper than commercial fillers and just as effective) and sanding it smooth. Then the bottom and inner sides were painted with Cabot's Barn Red decking stain to match the stain originally applied by Laconia Car Co.[3]

The car body bolsters, now firmly bolted into place, projected out to the side. First one end of the sill was set on, then the other, carefully maneuvering it right to the end of the bolster. Then, drilling up from the bottom with the long 13/16 in. drill, holes were made for the ¾ in. square-head bolts that constituted the first anchors for the sills. After all was done there were 10 bolts on each side holding the sills in place: two at each bolster, two at each needle beam and one at each end. Every joint is caulked with *Phenolseal* almond colored adhesive caulk.

Randy was the 'heavy' in the drilling 'department'. We used a very big old Craftsman drill which had no trouble turning the 13/16 in. drill. However, despite its age (at least 100 years), the SYP was full of sap. This tended to make the chips from the drill stick to it and plug up the hole. In fact, on several holes we had to run the drill all the way through; then 'unchuck' the drill and remove it from the bottom. The holes were still filled with jammed chips so they had to be forcibly driven out with punches and re-drilling. We discovered that spraying "P.B. Blaster"[4] on the drill was quite helpful. Several people including Dean Look & Bob Reich commented on the scent of pine that wafted out of the box during this operation!

Randy Leclair using the big drill to make holes for bolts to fasten sill assembly together.

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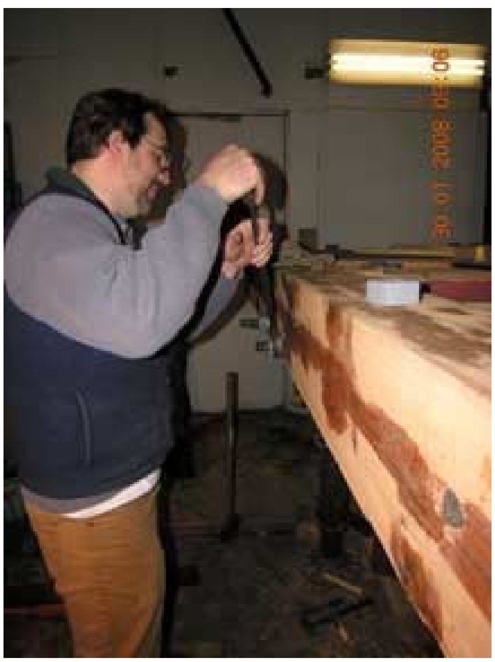
[1] Except for some very minor filler and support blocks
[2] The fork lift had been out of service for quite some time because of a bad battery. Thanks to a connection by Chuck Griffith, we now have a gel-type battery, designed for such limited operations as this.
[3] It is our intention to treat the same areas on all the sills in the same manner. This means scraping layers of grease and dirt that have accumulated over the years and there will be some areas that are now inaccessible. We have started this time consuming process but there is still much to do.
[4] A penetrant used mostly for loosening rust-bound bolts.

The other hurdle to overcome was the fabrication and installation of the 8 x 9 x 105 in. end sills. Last summer **Tom Dow** fabricated the one for the no. 1 end. This past week we fabricated the second. One of the challenges was to lay out the tenons on the ends of the eight longitudinal sills. Because of deterioration and twisting with age, these sills were irregular so each had to be laid out individually. Because of the weight of the piece and the irregularity of the mortises, they were done on the drill press using various sizes of multi-spur bits from 1 ¼ through 1 ¾ in. and to a depth of 2 ¼ in. This created about one barrel of SYP chips.

The end sill was then raised with the fork lift and rested on the end projections of the end sills. Then next 'trick' was to fit the ends of the 16 tenons into their mating mortises. To help this we did as Laconia did and chamfered the ends and sides of each with a small bevel. When we went to install the no. 1 end sill a couple of weeks ago, it went on only so far and then didn't cooperate. This writer had to leave but the crew of **Norman Down**, **Lloyd Rosevear** led by **Randy Leclair** managed to get it on about half way using 'gentle persuasion' of large sledge hammers.

The giant clamp - The next morning we devised a giant clamping system to get the sill on the rest of the way. There are four 1 ¼ in. round rods running from end to end of the car and out through each end sill. The ones on the corners are bent down in the center of the car and come out at each corner through the pole pocket casting. In the center are two others (between sills 3 and 4 and 5 and 6). These are straight from one end of the car to the other and serve as the major anchors that hold the couplers and take the strain when 100 pulls a freight car. Because the side rods are bent somewhat U-shaped, it was impossible to have them exert any tension at this point.[5] However the straight ones can be used to create lots of tension. On the no. 1 end, they are passed through the two 1 ⅜ holes drilled through the sill about 2 in. above the bottom. Then large flat washers and heavy hex nuts are put on and the rods pushed right against the sill. On the no. 2 end, a large plate with two holes was put over the two rods; then pipe spacers are put over the rods followed by nuts and washers. Now when the nuts are tightened, they will exert tremendous force on the sill forcing it to pull up tight into place, which they did very nicely.



Randy tightening bolts on no. 2 end.

The anchors on the no. 1 end, 31 feet away.

Two weeks later, after the no. 1 sill had been installed, the same process was used again on the no. 2 end and that's where the end sill, now installed, will remain.

Big blocks – The next task under each end sill was to fit the big square x 84 in. pilot support blocks and under them the thinner block that contains the lower coupler mounting bolts (1 ¼ x 17 in.) These plus the end sill form a giant 3-decker "sandwich" which provides the support for the coupler and the pilot. This whole assembly is held together by eighteen ¾ in. specially made square head bolts of various lengths, depending on how many layers they go through.

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[5] Ultimately with proper blocking below and above the rods, these will serve to support the center of the frame as well as pull the end sills keeping them in place.

In the middle front of this assembly is a block made of two 6 x 6 (approx) x 16 ¼ in. SYP blocks. The long rods go through two holes in the top block and the two long bolts go through the bottom two. The assembly also is held together by two vertical bolts. In front of all this is the heavy cast steel coupler mount, held by the hex nuts on the through-rods and bolts. The lower bolts also go through two wrought steel angle braces behind the pilot block with two bolts in each going up through sills 4 and 5 and reinforcing plates dadoed into those sills.
All the pieces are now in place and bolted permanently together. In fact, in the areas where they were coated with Seep 'n Seal, they're probably 'glued' together.

Donald Curry & Randy Leclair lining up the through-bolts to go through the end sill.
Norman Down giving a little help to getting it in place.

Protecting the underframe - To protect the underframe wood we are applying a coat of "Seep 'n Seal" epoxy to as many as possible of the surfaces of the various components. Even the 'triple deck' stack of the end and pilot sills was thoroughly coated on the hidden surfaces. (We will still use the Barn Red stain in other areas.) This is a thick jelly-like material mixed 8 parts resin to 1 part catalyst. It is then applied with a brush. What we have on hand and have had for some time, is from 1998. We were concerned that it might not cure because some epoxies have a limited shelf life. Also on the first trial, last fall, it seemed to take forever to set up so it wasn't sticky. Those mixed this week seem to have cured quite well. They cure to a hard, glossy transparent surface.

In scraping down the sills we found on the top surfaces that had been protected from weather (especially the area under the compressor hood [no. 2 end]) that a good durable mixture of a white paint remained. None is visible on the outer sill ends.[6] So to give the same appearance without the use of white lead, we will have to use what paint over the epoxy, sanded after curing to give adhesion.[7]

The through-rods – **Dean** had welded new threaded rod to the ends of the center through-rods so the big hex nuts threaded on them easily. However the thread on the side (truss) rods, although nominally the same, was just a bit larger. The special big square nuts which also hold on the pole pocket, at each corner, are difficult to thread on and hopefully we'll be able to get them on far enough so the rod will project slightly through them. **Dean** did go over each one and cleaned them up as best he could. (We noted with interest that at least two of these nuts had been brazed together.)

The couplers – are held on by the two center through rods and two 1 ¼ x 17 in. home-made square-heads under the sills and projecting out through the bottom layer of the end 'sandwich'. They hold a pair of Laconia-forged brackets which, after sandblasting, turned out to be in perfect condition. It is interesting to follow the grain of the metal in them and in the bolts indicating how they have been forged. The heads of the bolts are nuts held on by peining over the end of the rod. The coupler mount is spaced out from the end sill, thus clearing the pilot, by a pair of 6 x 6 in. (approx) x 16 ¼ in. blocks, also held by the same bolts. There is also a pair of vertical bolts holding the two together. To these bolts attach heavy steel straps (about 2 x ½ in.) which appear to be some sort of brace for the coupler.[8] Both of these were quite badly before we started on the project. Very likely they caught on the ties as they hung so low, which caused them to be bent back on themselves.

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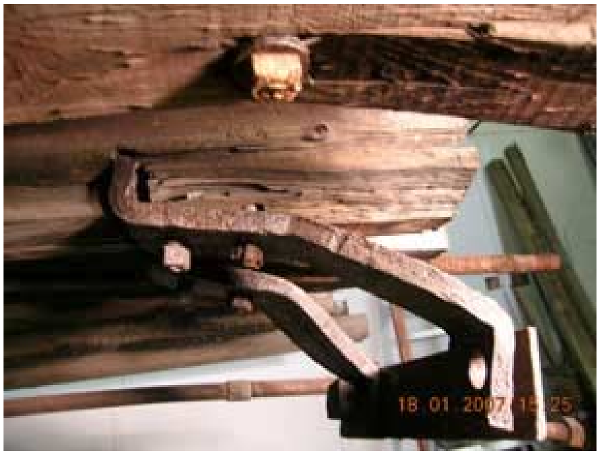
[6] This was probably a white lead mixture.
[7] We had considered using ice and water shield, a rubber-like sheet metal but **Paul Kochs** said there might be a problem with water getting trapped underneath it.
[8] Because they are so badly bent, and the pilots were removed long before this work started, we have yet to figure out how they fit into the picture. The photos don't show them.

The coupler mount is a heavy (about 100 lbs.) steel or malleable iron casting with a hole in each corner for the above rods and bolts. Both mounts are in good condition, only requiring sand blasting and painting. The knuckle assembly and pins have yet to be assembled.

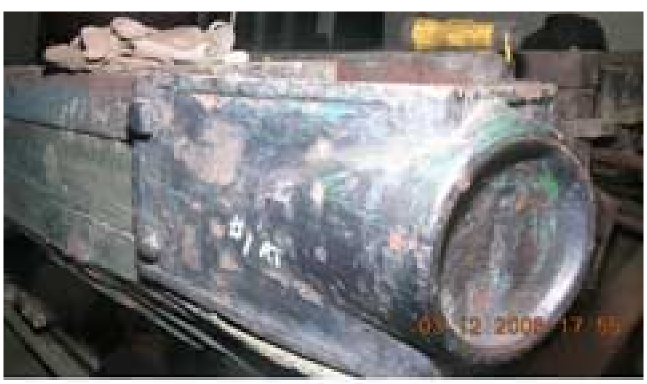
This morning we installed the first set of coupler mounting brackets under the no. 1 end. Then the long bolts were pushed out through them and the wood coupler mounting blocks. When we went to put the actual coupler mount on we discovered it wouldn't fit. The spacing on the two bolts and two rods, which should have formed a rectangle, didn't. We used a small (4-ton) hydraulic jack between the top rod and bottom bolt to push the bolt down, which it did but not quite enough, so we will very likely have to heat up one or both bolts to get bend them slightly.



Coupler mounting brackets before and after

Poling pockets – On each corner is the poling pocket, used for pushing a car on an adjacent track to the one on which the locomotive ran. They are made of malleable iron or cast steel and have become slightly bent over the years. Dean straightened them out and welded in a patch where a chunk was missing. (Try and find which one it is!) The front surface has the hole for the truss rod and th side surface has holes for two special round-head bolts. We would not have known this detail except fortunately one rather rusted c original one remained.[9] Dean fabricated new bolts with the special high round head by taking a ¾ x 6 ½ in. square-head bolt, turning it round and then adding weld to give it enough material to turn to the proper shape in the lathe. For that he ground a special rounding-over tool.

The original bolt was not quite a carriage bolt in that it did not have the square under the head to keep it turning in the wood. To do this, Dean welded on a small lump so, when the bolt is driven into the hole in the wood it won't turn.



Poling pocket before and after. (Still to be blasted and painted)

[9] On the no. 2 end, the bolts were all square head.

Next steps to completing the underframe – We're going to start with the least adjustable area and work to the most flexible.

1. Through-rods –
    a. Truss rods – These are supported above the bolsters by oak blocks, making the outer 'stretches' of the rod horizontal. YUCo appeared to have held them in with rather large common nails. We're not sure how they did that because of access and splitting the hard wood. The rod then bends down and goes under the two needle beams (cross sills), one under each end of the cab. At these points originally was a cast iron saddle. Fortunately we have one but the other three will use the YUCo substitutes—a 1 x 3 in. channel about 6 in. long, nailed up into a spacer block between the rod and the needle beam. It's difficult to see how effective or even necessary this truss rod was because the bowed-down middle section of the rod makes it very difficult to tighten. Unlike a loaded freight car, the cab is quite light weight and there is a heavy about 5 x 7 x 120 in. reinforcing beam under the cab bolted[10] to the inside of each sill. This further stiffens the already very strong 5 x 11 ½ in. side sills. To get them tight now will largely be done by making an appropriately thick block which can be driven between the truss rod and the needle beam.
    b. Coupler rods – These will also be supported by appropriate thickness blocks, but, because they are straight, all will be on top of the bolsters and needle beams.
2. Air brake equipment –
    a. Brake cylinder – This is fastened to a large block about 5 in. thick. (**Dick Avy** removed all the original corroded bolts.) It is bolted up through the no. 1 and 2 sills with six 5/8 in. bolts.
    b. Reservoirs (3)
    c. Triple valve
    d. Piping
    e. Levers, etc.
3. Motor and controller wiring – We have all new wire and the original wiring is still largely in place as a routing guide except where it had to be cut to remove certain components.

Air brake work – has started. Now that they have been given the initial hydro-hammer test, the replacement main reservoir and the original have gone to A. C. Electric for sand blasting. They will be re-tested upon their return. Because the replacement tanks are not the same as the originals there has been some pressure to have new ones fabricated but we do not feel we can afford to do this.

Chuck Griffith and **Dick Avy** disassembled, cleaned and sand blasted the brake cylinder. They replaced the original leather cup with a new rubber one and pressure-tested the cylinder. It functions and has only a very slight leak.[11]

Dick has disassembled the two train line cocks, which he will now clean and lubricate.

GE CP 30 Air compressor – On 28 January, **Randy Leclair** and **Donald Curry** paid a visit to A. C. Electric. We noticed that 100's air compressor is still on the shelf where it was after its initial disassembly and cleaning by a gentleman on their staff who has since retired. (A. C. is quite busy so this project is likely to be waiting for a while.) We checked with our air brake "guru", **Dave Garcia** about what we might expect in the way of mechanical problems, especially piston rings. He said that, if there is a problem, we may have to have them made and he is in the process of looking for sources. He also suggested that, if the bore of the cylinder is out-of-round, it may have to be bored and sleeved. (This is because the cylinders are horizontal and the weight of the piston causes them to wear downward.) None of this has been checked yet.

Truck work – **Bill Pollman** is actively assembling the first truck. He has the two brake beams, the brake heads, hanging swing links and their brackets attached. The safety chains which suspend the brake beams were badly corroded so **Dean** fabricated a new set of four. We are hoping to save a set of four for the second truck. These are made with a hand-forged eye bolt on each end and special links separated by a short length of chain.

The motors are held up on spring mounts. Across the back of each of the four traction motors is a heavy steel beam (¾ x 5 ½ in. x 47 in.) The originals were heavily corroded so new ones have been made. Using the originals as a pattern, **Dean** drilled them out. Part of the mounting system is a sort of "U-shaped" casting with a square hole at the bottom (for the mounting bolt) and another hole across the top through for another bolt which actually pins the motor to the mount. These had pounded themselves badly out of shape over the years so **Chuck** and **Dean** have built up the missing steel with weld and machined them back to a uniform shape.

Dean brought back the eight rebabbitted and bored-to size journal bearings which will have to be individually fitted (scraped) when the weather moderates. (Right now it would be a very cold job sitting in a snow bank next to the wheelset!)

The traction motors – As part of the recent visit to A. C. Electric, we were interested in the insulation resistance of 100's four GE 80 traction motors, which are now completely overhauled. They are in storage there because we do not have a good place and will very

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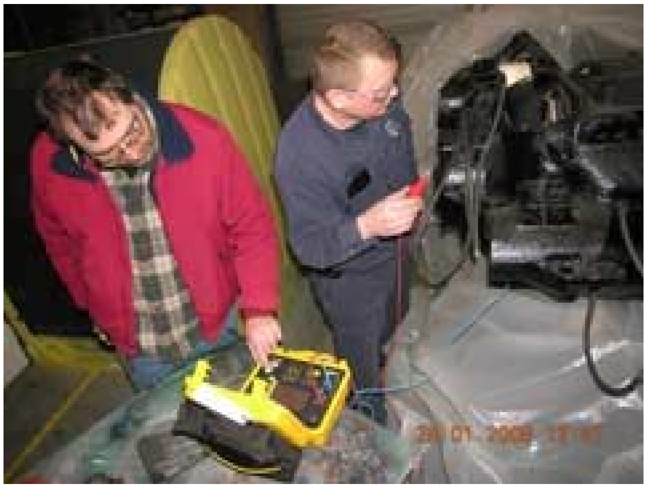
[10] With another special type of round-head bolt which **Dean** will form from some 5/8 x 11 in. carriage bolts.

[11] The original leather cup, which is really in very good shape, has been put into storage.

likely remain there for another year until the second truck is done. Using our new AEMC 1060 megohmmeter[12] we tested the insulation and came out with an amazing 2.5 gigohms! That's 2,500 megohms or 2,500,000,000 ohms! (Have I got the right number of zeros?)We were rather pleased that it would measure that closely.




Randy Leclair monitoring the new AEMC 1060 megohmmeter while Roger Paradie makes the connection to the overhauled GE 80 motor at A. C. Electric

Cab sash – **Bob Reich** and **Dean Look** continue to work diligently on the 10 sash for the cab. At least two of them had been given some quick repairs some time in their more recent lives with the use of some rather clever home made corner brackets. We're going to repair the sash so they're strong but also put the brackets back on to show what YUCo had to go through to keep 100 running. Bob made new tongues for the bottom of at least one sash. All corners are being glued and built up with West System epoxy.

An amazing new photo – The other day Phil Morse suggested I check the following:
-----Original Message-----
From: pmorse@gwi.net [mailto:pmorse@gwi.net]
Sent: Thursday, January 24, 2008 8:17 PM
To: Phil Morse
Subject: Fw: Check out Maine Memory Network: Item 21694, Full Page View

Maine Memory Network: Item 21694, Full Page View

which I did with the following fascinating result:

Phil later told me that it was Mike Simonds who originally located this. Thanks Mike!

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[12] megger

If you look very closely you will see this is actually 100's sister locomotive, no. 101. That makes this photo even rarer for two reasons. First it shows the coal hauling operation in progress and secondly it shows 101 in its extremely short lifetime as a steeple cab. (Nov. 1906 until some time in mid 1908, when it became an express car, giving up its cab to 102.)

Another thing is the weight that this very small and very light (there were no counter weights in these locomotives) was pushing up the rather steep grade. There must have been a lot of spinning. We wonder what sort of 'run' they had to take and what was going on inside its K-28 controller. How did those two men on top of the cars maintain their balance in the 'run'? Was the nearer guy relaying a 'stop' message from the further one? Did they stop in time?

You will be glad to know that various people including **Peter Folger** are working on getting a good high resolution copy of the photo. Meanwhile this is fascinating in its own right!