



Photo Credit: Jeff Terry



2020 – GETTING READY

As you have undoubtedly read in the *Currents* the Museum is closed through June and the Board will meet in mid-June to determine if we will operate in July. (At this point the consensus, although not official, is that the earliest operations will start is August). The Board and Museum Officers continue to err on the side of caution and safety to our volunteers and our guests and will only open once it is deemed to be safe and once we have the necessary procedures and practices in place.

To that end, a core group of the Operations Committee has met and is creating policies and procedures that will ensure safe operations with appropriate social distancing once the Board approves a reopening date. Well in advance of reopening we will communicate the new operating model. To gauge interest in operating this season a survey will be distributed shortly to the operating volunteers on their willingness to operate and to ask for an indication (not a commitment) of what times during the week they might they be interested in volunteering as part of a reduced schedule.

The survey has two primary questions:

1. Are you willing to volunteer to operate this year?
Yes/No/Unsure at this time
2. If you are willing to operate, what shifts are you interested in?
Specific selections based on likely schedule – weekends, Wed/Friday afternoon (CHSL), and possibly Tuesday/Farmers Market (ESL)

I want to thank all of you who submitted your 2020 Recertification Quiz and remind those of you who have not responded with your quiz, that completing the quiz remains a requirement to operate the streetcars. If you are interested in taking the quiz, please contact me (bruce.gustafson@optum.com) at your convenience and I will send it to you. The quiz should take 15 minutes or so to complete. In addition to the quiz to operate in 2020, a recertification/ "check ride" is required for all 2nd year operators and anyone who operated less than 10 hours in 2019. Information on the check rides will be distributed once the Board approves an opening date.

Lastly, thank you again for your patience and continued interest in the Museum.

MECHANICAL UPDATE – DICK ZAWACKI

When the Museum opens, Dick and the shop crews will have TCRT car numbers 1300 and 322 available for Como-Harriet and DSR car numbers 78 and 265 available for Excelsior.

In this edition Dick provides a more detailed view on the work being done on two of the cars undergoing major rework.

TCRT 1239

While L&S Electric was performing final tests on the two GE 241-B motors that they refurbished for use in TCRT 1239, they observed an etching or "frosting" of the armature shaft and the bronze/Babbitt bearing it contacts on one motor. The second motor did not show this problem. From their experience, L&S knows that these "shaft currents" are caused by an induced voltage created between the armature shaft and the bearings. The result is a flow of electricity through the lubricating oil film, causing microscopic arcing between the motor shaft and the bronze/Babbitt bearing. They verified that our motor has a 25 DC volt differential between the shaft and bearing. While 25 volts may not seem like a lot, in our context and over the life of the motor, it can be ruinous. Therefore, something needs to be done to eliminate this voltage differential.

In similar circumstances, L&S installs what is known as a "grounding brush" between the motor shaft and the motor housing. The grounding brush makes constant contact between the armature shaft and the motor housing, thus

providing a path for the voltage to be grounded to the motor housing. This eliminates the possible arcing or "frosting" on the armature shaft. This is a common solution and grounding brushes are often installed on motors as a form of insurance.

So why does one 241-B motor exhibit a problem and not the other? Can another armature be refurbished and installed to solve the problem? Do we save money by installing a grounding brush on just one motor? What is the cost? If we install the grounding brush on one motor are we simply delaying the onset of the problem? Will running one motor that has a unique configuration (i.e., with the grounding brushes vs. all the others not having the grounding brushes) lead to service lapses at MSM? Since 1239 can operate on only 2 motors (as opposed to the 4 it is designed to have) and we have chosen to save money by having the other two motors refurbished in the future, will those two motors exhibit the shaft current problem when they are refurbished?

The comments from Craig Voltin (our contact at L&S) below led us to the decision to modify both 1239 motors presently at L&S as well as the two identical GE Canada 241-B motors that will be repaired in the future (it's pretty rare that the technical crew is unanimous in a decision like this). See Craig's comments below:

"There is a very good likelihood that replacing the armature will not correct the problem. Things like air gap, pole iron, stator frame condition and pole iron shims can all contribute to shaft currents along with many other things. You could have 10 identical DC motors and only one could end up with shaft currents or may develop them over time. That's why in many cases most industrial customers error (sic) on the side of caution and install grounding brushes." Craig Voltin, L&S Electric.

In other words, it is difficult to predict when or under what circumstances shaft currents will occur. It's simply better to ensure that no voltage difference can exist between the armature shaft and bearing by adding the grounding brushes between the shaft and the motor housing (and thus to the bearing) on every motor. The cost of installing the grounding brushes on the current two motors will be higher because L&S must disassemble the motor, install the brushes, and reassemble and test the motor. The cost of installing the grounding brushes on the other two motors that will be refurbished in the future will be less because the installation will be part of the refurbishing process and will not involve extra disassembly and reassembly. However, the additional cost will be small if our motors develop shaft current problems in the future. Due to the design of our motors, L&S could not install the grounding brushes like they do on most motors. L&S did come up with a unique solution that will be used to solve the problem.

Based on our experience running 1300 last season, we know that we can operate 1239 on 2 motors. Both 1239 and 1300 are of similar size and similar weight. Last year we ran 1300 on two 50 horsepower motors. The GE 241-B motors are also 50 horsepower, so we are confident that 1239 will be able to operate on 2 motors. With the knowledge that MSM will have much less income this year, we decided to put off refurbishing the 2 remaining motors until at least next year.

Winona 10

During initial operational testing of the car, a short circuit occurred in one motor, which caused a failure in the insulation on the coil windings of the motor armature. The 1890's vintage GE-800 motor for Winona 10 is rated at 25 horsepower. We sent the motor to be repaired at AC Electric in Bangor, Maine, because L&S Electric does not have the experience to repair a motor of this vintage. The repair involves removing and replacing all of the coil windings in the armature. A coil winding is just what the name implies--a length of wire that is wound into a specially shaped coil that fits into the slots in the motor armature. There are 54 wire coils in Winona 10's motor.

After a number of coil winding companies declined to make the coils for our motor, Swiger Coil in Cleveland, Ohio, agreed to take on the job because they have previous experience winding coils for vintage motors. The difficulty in making coils for our motor is that coils on modern motors are wound symmetrically and our coils are not symmetrically wound. This means that the two ends of the wire coil for our motor do not come off of the coil at the same point or in the same way. Modern equipment is designed to wind coils symmetrically. Therefore, Swiger needs to alter the way they wind the coils for our motor. Currently, Swiger is in the process of making sample coils that AC Electric can use to evaluate how well they fit into the armature. Usually, the coil design needs to go through several modifications based on how well the sample coils fit into the armature. At this point Swiger and AC Electric are in the process of

making and evaluating new coils for our motor. We expect to have more information about their progress in the next few weeks.

CAR SHOP & OTHER SUPPORT TEAMS - 2019 SUMMARY

I would like to belatedly recognize the members who volunteer time to work behind the scenes in order to keep the Museum operating as smoothly as it does. For those groups that I have missed I will attempt to recognize them in a following edition.

The combined shop crews put in almost 3,900 hours in 2019.

CHSL Shop Crew

(2019 Hours)

NAME	SHOP
Jones, Karl	355.0
Prestholdt, John	275.5
Schramm, Tom	273.0
Stephens, Dennis	229.5
Willmore, Jim	225.0
Conners, Pete	185.0
Miller, Mike	115.3
Digre, Mark	104.5
Anderson, Miles	100.0
Isbrandt, Russ	73.3
Franske, Ben	53.5
Bacon, Jack	48.5
Peterson, Jerry	42.0
Trockman, Isaac	30.0
Desbonnedt, Patrick	18.5
Coulter, Larry	5.8
Layeux, Tim	5.0
Gacek, Barb	2.0
Sparr, Gary	1.5

Total 2,142.8

ESL Shop Crew

(2019 Hours)

NAME	SHOP
Howie Melco	529.0
Scott Heiderich	254.0
Scott Wardroph	228.0
Dick Zawacki	200.0
Steve Mages	120.5
Ken Blake	113.5
Mark Brothen	93.0
Carl Floren	79.0
Tom McGruder	45.0
Dave McCollum	41.5
Mike Kimitch	29.5
Luke Swanson	9.0
Michael Miller	6.5

Total 1,748.5

ESL – Other Support Work

The following list identifies individuals at ESL who worked on building maintenance, ground keeping, car cleaning, preparing for special events, etc. I will work to get a comparable CHSL list for the next edition.

(2019 Hours)

NAME	TOTAL
Jim Kertzman	216.0
Karen Kertzman	194.0
Dave McCollum	103.5
Scott Heiderich	96.5
Dick Zawacki	90.5

NAME	TOTAL
Carl Floren	84.0
Tom Dulebohn	41.0
Howie Melco	40.0
Bill Graham	14.0
Steve Mages	11.0

Total 700.5

OVERHEAD POWER UPGRADE – BEN FRANSKE

For those who have not heard as much about this project, these are the immediate benefits/changes:

- Automatically cuts overhead power if one or more power phases are lost. Can be manually overridden with a pushbutton for 5 minutes (then you need to press the button again to override another 5 minutes) to prevent damage to the overhead supply system.
- Upgrades all indicator lights to more reliable LEDs
- Cleans up wiring and terminal strips in control cabinet

Future planned enhancements that will require additional software programming or hardware:

- Emergency power-off remotely from the depot (or potentially the car) to de-energize entire overhead system. Can require going back to barn to reset after emergency off.
- Power status monitoring from the depot and from off-site
- Date & time logging of all power events (overhead on/off, phase loss, etc.) with ability to email someone automatically if a phase goes down, etc.

Installation will be done during the period June 11-17. This should take 2-3 days, but additional time is being planned for contingencies.

In addition to this upgrade project another project is planned to monitor incoming power quality to the overhead and shops with meters in the back of the ready barn. That project is strictly monitoring, not control, and will be able to monitor incoming line voltage on each phase as well as amperage draw from both the shop and the overhead system both on-site and remotely.

FEEDBACK ON 2020 RECERTIFICATION QUIZ

Listed below are the questions that were frequently missed (based on the 75 quizzes submitted), along with some information explaining the answer we were expecting. As a reminder, the purpose of the quiz is to get everyone to think about the situation and the appropriate way to respond in a safe and controlled manner.

There is no better place to start than Rod's annual trick question:

19. When acting as a crossing guard you should wear a reflective safety vest. (Think carefully – this is a trick question!) - **The answer is False. The crossing guard MUST wear a vest.**

Questions nos. 1 and 2 were frequently missed. The correct answer for both questions lies in the principle of being ready to move as soon as you receive permission for the other operator.

1. Before moving the streetcar forward, the Motorman should:

- a. ask permission to move the car, then place the reverser in the forward position
- b. place the reverser in the forward position, release the brake, then ask permission to move the car
- c. **place the reverser in the forward position, then ask permission to move the car**
- d. make sure the reverser is in the neutral position, then ask permission to move the car

The answer we are looking for is C. The idea is that you must be ready to move as soon as you receive confirmation from the Conductor. With option C, the motorman, once receiving permission, would ring the bell and release the brake. With option D, the motorman, once receiving permission, would move the reverser into the forward position, ring the bell, and release the brake.

2. Before beginning backing movements, the Conductor must:

- a. **place the rear brake handle in the full apply position, then request permission to move the car**
- b. request permission to move the car and, when received, place the rear brake handle in the full apply position
- c. place the rear brake handle in the lap position, then request permission to move the car
- d. request permission to move the car and, when received, place the rear brake handle in the lap position

The answer we are looking for is A. In this case you need to make sure the brake is applied. As soon as the motorman moves the air to the rear of the car, which he will do as soon as you have asked for permission, there would be no brakes applied if you do not have the rear brake handle applied.

13. When the car is in motion, a rapid series of four or five bells (or buzzers) from the other Operator means you should immediately cut power and slow down.

The answer we are looking for is FALSE. When you hear 4 or 5 bells you must immediately come to a complete stop.

15. An orange or red cone placed alongside the track indicates there are workers nearby; you should cut power and proceed slowly.

The answer we are looking for is TRUE, although the question lacked some necessary information. When you approach the orange cone at the side of the tracks you ring the bell and slow down. If the crew is visible to you and does not wave you through, you must stop.

However, if you do not see any workers, you do not have to stop and can proceed cautiously.

OPERATIONS BULLETINS IN EFFECT

CHSL

○ 20C-1 - Operation of Cars at 42nd Street

The motorman on a northbound trip and the conductor on the southbound trip do not have to request permission to move forward from the other operator once the car has come to a complete stop at 42nd Street.

The revised sequence of operations is summarized below:

- Approach 42nd Street and come to a complete stop at the location indicated by the stop sign.
- As appropriate ensure that the flagman is stationed in the correct position and has established control over any nearby traffic.
- The leading operator (motorman on northbound trips, the conductor on southbound trips) can move the car across the street when he/she determines that it is safe to do so. The leading operator does not request permission to move.

ESL

○ 20E-1 - Operation of All Streetcars in the Excelsior Car barn Yard

The Foreman is the only crewmember authorized to operate a streetcar within the ESL car barn yard. The ESL car barn yard is defined as all track leading from the mainline switch into the yard lead with two left-hand switches, and all three yard tracks including the tracks inside the ESL car barn. Track #1 is defined as the track nearest the ESL mainline with the other two tracks numbered 2 and 3 in a southward direction.

While operating a streetcar within the ESL car barn yard, Foremen must observe the position of the switch points to ensure that the switch is correctly set for the track onto which the streetcar should go. After determining that the switch is set correctly, the streetcar can then proceed.

○ 20E-2 - Movement of DSR Car No. 265 in/out of the Car Barn

Extreme care must be taken when moving Duluth Street Railway (DSR) car no. 265 in or out of the car barn.

Movement to/from Track 1

- When leaving the car barn on track 1 slowly proceed through the first frog to ensure that the trolley wheel goes through the frog successfully.
- When putting the car away the trolley wheel will follow the track 2 wire when going through the frog. To correct for this, the Foreman must STOP the car allowing the Conductor to MOVE THE TROLLEY WHEEL TO THE TRACK 1 wire. The crew should continue to monitor the car as it slowly moves toward the car barn.

Movement to/from Track 2.

- *It is necessary when leaving the carbarn on track 2 to STOP right before the Trolley wheel goes through the first frog (2 - 3') AND MOVE THE WHEEL TO THE TRACK 3 wire. Then slowly proceed forward and the wheel should go through the frog OK. IF this is not done the wheel WILL DEWIRE.*
- *When putting the car away the wheel will follow the track 3 wire when going through the same frog. STOP AND MOVE WHEEL TO TRACK 2 wire.*

QUESTIONS?

If you have any questions, please send them to me (bruce.gustafson@optum.com) and I will do my best to get you an answer and will publish those that have a broad impact to the operator community.