



First Overhaul for the Hiawatha Light Rail Vehicles
LRV101 September 7, 2009



Removal of the Power Truck



Rebuilding of Center Truck



Power Truck has been removed and the rebuilt Electronic Hydraulic Control Unit is being installed



Center and Power Truck Rebuild Area



Electronic Hydraulic Unit Rebuild Area



Traction Motor Rebuild



Mike DeWolf and Dale Heidelberg



Rail Operations
Maintenance Division

LRV Overhaul Assembly
Station # 6
Wheel Press

Date

9 Oct 09

Axle Serial Number

68
T380501

GB side Hub S/N

T36044-21

Coupler Side Hub S/N

T36044-5

Assembly Order	Description	Employee Number	Foreperson Sign Off	Q/A Sign Off	Comments
Coupling side Bearing and Wheel Installation					
1.00	Prepare axle for bearing installation, Record Axle and Hub Serial Numbers on this sheet	68261	V.G	5562	
2.00	Prepare bearing for installation	68261	V.G	5562	
3.00	Lubricate bearing seat and bearing ID with Molycote paste	68261	V.G	5562	
4.00	Place snap ring on axle	68261	V.G	5562	
5.00	Slide bearing on as far as possible on coupler side	68261	V.G	5562	
6.00	Lift axle into press	68261	V.G	5562	
7.00	Place end of axle into hollow extension	68261	V.G	5562	
8.00	With Mount switch in 60 Ton position Extend ram until clearance is taking up.	68261	V.G	5562	
9.00	Center and Level Axle	68261	V.G	5562	
HP #1	HOLD POINT	Ensure above task are completed to spec			
10.00	Extend ram on 60 ton mode and push bearing on until it is against stop. DO NOT EXCEED 28 Ton Seat Force	68261	V.G	5562	
11.00	Retract ram and place axle back on stand	68261	V.G	5562	
12.00	Install bearing box and snap ring. Readjust axle support on coupling side	68261	V.G	5562	
13.00	Prepare wheel and wheel seat area. Apply Molycote paste	68261	V.G	5562	
14.00	Place wheel on axle extension using wheel clamp and hoist.	68261	V.G	5562	
15.00	Place axle assembly in press	68261	V.G	5562	

Assembly Order	Description	Employee Number	Foreperson Sign Off	Q/A Sign Off	Comments
16.00	Extend ram until clearance is taking up.	68261	V.G	5562	
17.00	Center and level axle.	68261	V.G	5562	
18.00	Set up operator and recorder screen accordingly	68261	V.G	5562	
HP #2	HOLD POINT	Ensure above task are completed to spec			
19.00	Hold Extend ram switch using a slow feed rate until wheel is pushed on and pressure spikes. Press should stop when it sees pressure spike. Record Press Force Pressure (45-75 Ton) <u>65</u> Record Seat Pressure (25 Ton + Max Press Pressure) <u>90</u> HUB Serial # <u>T380501</u> <u>T36044-5</u>			5562	
Gear Box side Bearing and Wheel Installation					
20.00	Prepare axle for bearing installation	68261	V.G	5562	
21.00	Prepare bearing for installation	68261	V.G	5562	
22.00	Place snap ring on axle	68261	V.G	5562	
23.00	Slide bearing on as far as possible on coupler side	68261	V.G	5562	
24.00	Lift axle into press	68261	V.G	5562	
25.00	Place end of axle into hollow extension	68261	V.G	5562	
26.00	With Mount switch in 60 Ton position Extend ram until clearance is taking up.	68261	V.G	5562	
27.00	Center and Level Axle	68261	V.G	5562	
HP #3	HOLD POINT	Ensure above task are completed to spec			
28.00	Extend ram on 60 ton mode and push bearing on until it is against stop. DO NOT EXCEED 28 Ton Seat Force	68261	V.G	5562	
29.00	Retract ram and place axle back on stand	68261	V.G	5562	
30.00	Install bearing box and snap ring. Readjust axle support on coupling side	68261	V.G	5562	
31.00	Prepare wheel and wheel seat area. Apply Molycote paste	68261	V.G	5562	
32.00	Place wheel on axle extension using wheel clamp and hoist.	68261	V.G	5562	



Coupler



Pantograph



Master Controller



Articulation Joint

Blank



Good morning

It is my pleasure today to update you on the progress of the light rail vehicle overhaul program. Since the opening of the Hiawatha line back in 2004 the light rail vehicle have accumulated close to 400,000 miles.

With the manufacture recommendation that the components be overhaul at the 400,000 miles, the scheduled overhaul has begun.

LRV101 was the first LRV delivered in 2003 and was the first to be overhauled. Lrv101 completed the overhaul and was placed back in service on September 14th. We have started on the second Lrv slated for overhaul and LRV111 is expected to be back in revenue service on October 26th.

Each overhaul will take approximately 3 weeks.

- Week 1 all components will be Removed and Replaced and the LRV recertified
- Weeks 2/3 all removed components will be rebuilt
- Rebuilt components will then be used on the next overhauled LRV

Components to be R/R and overhauled:

•Complete Braking Systems:

- Caliper, Rotors, Electronic Control Units, Track Brakes, all flexible hydraulic hoses, Primary Suspension and the Hydraulic Suspension Legs

•Traction Motors:

- Will be completely disassembled, inspected and new bearing and special grease installed.
- Traction motors will also receive break in time on the test stand before installation on the truck.

•Power and Center Trucks:

- Will be completely disassembled and all wear items replaced. Some of these item s are;
- Wheel bearing, primary suspension components, all flexible hosing, vibration control devises.

Couplers:

Will be completely disassemble, all new bushings installed

Pantograph:

Will be completely rebuilt will all new wear items replaced

Sliding Segments in floor of Articulation Joint:

All rust is removed from the articulation area, and new wear plates installed.

HVAC Systems:

Rebuild of A/C Motors, Compress or oil change, refrigerant filter change.

Combined Power Control Units:

Rebuild the A/C cooling motors and remove all components for cleaning of cooling fins.

•Master Controllers:

- Complete rebuild of all wear components.

•Flushing of Hydraulic System:

- All piping will be completely flushed using the hydraulic flushing machine, the system will be cleansed to a particulate level lower than NAS Class 6 or better

•Recertification of the LRV:

- Test equipment is connected to the LRV and the LRV will be operated both at low and high speeds.

- The information will then be charted and recorded and kept in the car history book.

- Items recorded:

- Speed

- Braking pressures

- Braking rates (mph of deceleration) standard (3 mph / per second)

- Functionality of all systems

- Acceleration rates (3 mph per / second)

- AMP draw of each traction motor

- Total AMP and voltage draw from OCS

- Wash Rack Mode (vehicle speed setting of 1.5 mph)

I would also like to mention the QA department that has been overseeing the rebuild of all the components and the vehicle itself. Rick Carey, Mike DeWolf and Paul Swanson are have been developing the assembly control sheets to aid in the assembly of the component. These sheets have been developed thru the experience that was gain during the inspection of the Hiawatha and North Star procurements. These assembly control sheets are used used by the Electro- Mechanics during assembly to track progress and incorporate hold points where the Working Foreperson and the QA department need to inspect the work complete and sign off before the Electro-Mechanic can proceed further. At the completion of the overhaul for the vehicle, the information will be electronically scanned in to a fold for storage.

Total Grant Money \$8.3m

Total Parts	\$5,130,158
Total Labor	<u>\$1,836,000</u>
Total	\$6,966,158

Per LRV

Parts	\$190,006
Labor	<u>\$68,000</u>
Total	\$258,006