ATTACHMENT C

TECHNICAL SPECIFICATIONS
1. **REHABILITATION OF WHEELSETS**

   A. All wheelsets shall be inspected to determine if they need to be replaced, rehabilitated or remanufactured in accordance with the Association of American Railroads (AAR) and applicable Original Equipment Manufacturer (OEM) requirements including requalification of components and all necessary repair work.

   B. The wheelsets for the Gallery IV passenger railcars and the MP36PH-3C locomotives shall be profiled to meet the wide flange wheelset configuration.

   C. All major work, such as repairs or replacement, shall be approved in writing by VRE prior to the commencement of work by the Contractor.

2. **WHEELSET REPAIR**

   A. The Contractor shall inspect wheels for flange wear and rim thickness, as well as visually inspect for thermal cracks and other defects. Following inspection, the Contractor shall recommend a course of action in writing to VRE for approval.

   B. The Contractor shall rebuild the journal bearings. If the bearings are defective and cannot be rebuilt, the Contractor shall recommend, in writing to VRE, replacement with new or rebuilt journal bearings.

   C. If the wheelset is not otherwise condemnable, the Contractor shall perform all repairs to rehabilitate the wheelset.

   D. If the wheel rim thickness will be less than 1-1/2 inches after truing, the Contractor shall notify VRE in writing for approval prior to proceeding with wheel replacement and the rehabilitation work.

3. **WHEELSET OVERHAUL**

   The Contractor shall notify VRE in writing if any wheelsets require rehabilitation, necessitating that wheels and bearings be replaced. The Contractor shall provide all documentation required to rehabilitate the wheelset.
3.1 Axles General

The Contractor shall provide axles that meet the requirements of the latest version of the AAR Manual of Standards and Recommended Practices (MSRP) Section G and all recommended practices of Federal, State, and other regulatory agencies.

3.2 Re-Qualified Axles

A. The Contractor shall perform all requirements to re-qualify wheelset axles in compliance with applicable AAR requirements. If the axle cannot be re-qualified, the Contractor shall submit a request in writing to VRE for the axle to be scrapped at a reasonable and approved scrap value, which shall be credited to VRE.

B. The Contractor shall perform all required tests in accordance with Federal, State, and other regulatory agencies.

C. The bearing seats shall be inspected, and minor defects removed in accordance with governing regulations. However, the Contractor shall recommend a course of action in writing to VRE when journal bearing seats require re-machining.

D. The Contractor shall retain proper records, as specified by the AAR, and furnish them to VRE upon delivery of each wheelset.

3.3 New Axles

A. If new axles are provided by the Contractor, they shall meet all applicable AAR requirements.

B. A record of all heat numbers shall be included with the bill of lading and packing list for each wheelset. Certified copies of chemical and physical test results as specified in the latest version of the AAR MSRP Section G for Grade “F” axles, shall be maintained and delivered to VRE by the Contractor.

C. Axles shall be ultrasonically tested according to the AAR MSRP Section G.

D. The Contractor shall provide as required, standard sized axles which shall not be turned undersize.
E. For passenger railcar wheelsets, the Contractor shall provide an axle that meets or exceeds Specification M101 of the AAR MSRP. This axle shall be Grade F and accommodate an “F” style bearing.

F. For locomotive wheelsets, the Contractor shall provide an axle that meets Specification M101 of the AAR MSRP. This axle shall be Grade “F”, double-splined and accommodate a “GG” style bearing.

3.4 Journal Bearings

A. New or reconditioned journal bearings provided by the Contractor shall meet all applicable AAR requirements.

B. For passenger railcar wheelsets, the Contractor shall provide Class “F” (6-1/2” x 12”) – No Field Lubrication (NFL) bearings with a 1-1/2” plug in a 100-tooth geared axle end cap.

C. For locomotive wheelsets, the Contractor shall provide Class “GG” (6-7/8” x 12”) – NFL bearings with a 1-1/2 plug in a plain axle end cap.

D. The Contractor shall ensure there is no mixing of manufacturers with respect to bearing parts when using VRE approved reconditioned bearings.

3.5 Wheels

A. The Contractor shall provide wheels that meet the class, heat-treated, hub, rim, and machining requirements in accordance with the AAR MSRP and all other applicable regulatory agencies, in order to maintain VRE’s railcar and locomotive fleets.

B. The Contractor shall supply wheels that are manufactured in accordance with the AAR MSRP.

C. In accordance with Paragraph 19.0 of AAR Specification M-107, the Contractor shall ensure and deliver to VRE proof of certification of the ladle analysis of the steel used and of the ultrasonic and magnetic particle testing conducted on the wheels.

D. The Contractor shall ensure wheels are dynamically balanced within 1.5 pounds (0.68 kg) at the outside diameter of the rim. The Contractor shall provide written certification to VRE that this standard has been achieved.
4. **TRACTION MOTOR COMBO SERVICES**

The Contractor shall receive traction motor/wheel/axle assemblies from VRE and perform repairs to return the assemblies to useful service. The assemblies may need new wheels, wheel profiling, traction motor repair or a combination of these services. Following receipt and inspection of each traction motor/wheel/axle assembly, the Contractor shall recommend a course of action in writing to VRE for approval.

4.1 **Wheel Renewal**

A. The Contractor shall perform the following work to renew locomotive wheels:

1. Disassemble the traction motor/wheel/axle combination;
2. Qualify the axle; ensure that both ends of the axle are splined, splines shall be added if they are not present; replace the axle if it does not qualify;
3. Qualify the traction motor’s seventeen (17) tooth pinion and the axle’s sixty (60) tooth bull gear;
4. Replace the “GG” roller bearings with new or rebuilt bearings;
5. Reassemble the traction motor/wheel/axle combination;
6. Include new support bearings, oil seals and gear case seals; and
7. Test for performance, noise, vibration, and excessive heat from the support bearing.

B. VRE will provide new locomotive wheels (wide flange E40” class B with a 1:20 taper).

4.2 **Wheel Profile**

A. The Contractor shall disassemble the traction motor/wheel/axle combination to facilitate profiling the wheels and perform the following services:

1. Qualify the seventeen (17) tooth traction motor pinion;
2. Qualify the sixty (60) tooth axle bull gear;
3. Replace the support bearings, oil seals and gear case seals with new; and

4. Apply new or reconditioned “GG” bearings.

B. The Contractor shall perform the following work to profile locomotive wheels:

1. Profile wheels with a wide flange and 1:20 taper tread; and

2. Qualify the axle; ensure that both ends of the axle are splined, splines shall be added if they are not present; replace the axle if it does not qualify.

C. The Contractor shall test for performance, noise, vibration, and excessive heat from the support bearing.

4.3 Disassembly and Reassembly of the Motor from the Wheel/Axle Combination

A. The Contractor shall perform the following work to disassemble and reassemble the traction motor/wheel/axle combination:

1. Qualify the axle; ensure that both ends of the axle are splined, splines shall be added if they are not present; replace the axle if it does not qualify;

2. Qualify the sixty (60) tooth bull gear on the axle and replace if needed; and

3. Replace the support bearings, oil seals and gear case seals with new.

B. The Contractor shall test for performance, noise, vibration, and excessive heat from the support bearing.

4.4 Motor Services (Basic Overhaul)

A. The Contractor shall perform the following motor services:

1. The traction motors covered by this specification shall be overhauled following the latest revision of the Electro-Motive Diesel (EMD) Maintenance Instruction (M.I.) 3950 Traction Motor Overhaul Sections 1 - 7, and to at least the minimum requirements listed within.
2. All disassembly, cleaning, inspection, measurements, repairs, parts, seals, gaskets, consumables, assembly, and testing shall be included in the basic overhaul price. This shall include bearings, teflon seals, nose support wear plates, brush holders, cable ends, shrink tubing, and thread repair.

3. The following shall not be included in the basic overhaul price.
   
a. Missing Material

b. Armature
   i. Armature Rewind
   ii. Replace Armature Shaft

c. Bearing Housings
   i. Replace Bearing Housing Pinion End
   ii. Replace Bearing Housing Commutator End

d. Main Field Coils
   i. Replace Main Field Coils
   ii. Reinsulate Main Field Coils

e. Interpole Field Coils
   i. Replace Interpole Field Coils
   ii. Reinsulate Interpole Field Coils

f. Frame
   i. Complete Weld and Machine Traction Motor Frame
   ii. Build Up Axle Bores

g. Commutator
   i. Remanufacturer Commutator
   ii. Remove and Reinstall Commutator

h. Cables
   i. Replace Main Power Cables
   ii. Replace Cable Assemble Interpole #1 to #4
   iii. Replace Cable Assembly Interpole #1 to #2/3 to #4

4. If requested by VRE, the Contractor shall provide proof that the repaired motors have been rebuilt to the OEM specification.

5. Renew the seventeen (17) tooth pinion gear.
6. The Contractor shall provide to VRE all documentation that details the repairs, remanufacturing, testing, and performance of the traction motor. The Contractor’s paperwork shall include clearly defined minimum and maximum allowable tolerances and the actual recorded measurements.

5. **ASSEMBLY**

A. Mounting of wheels on axles shall be in accordance with the applicable practices specified in the AAR MSRP and shall uphold the requirement that the axle center is located from the backing ring radius and not the axle ends.

B. Wheel pairs shall be matched, not to exceed one-half tape size difference per axle set. Mounted wheels shall be concentric between bearing seat diameters and tread at the plane of the taping line within 0.007 inches Total Indicator Readout (TIR) and not to exceed 0.015 inches TIR, out of parallel to each other or to a plane perpendicular to the center line of the axle per AAR requirements.

C. All operations of boring wheels, assembly, and pressing same on axle, and press tonnages obtained, must be in accordance with the manufacturer’s recommendations and the applicable recommendations in the AAR MSRP.

D. The wheel back-to-back dimension shall comply with AAR MSRP for passenger vehicle applications. The Contractor shall provide the required and requested documentation to VRE.

E. The Contractor shall maintain the AAR requirements of radial, plane, and parallelism for the mounted wheels. In the absence of such requirements, the following shall apply: Radial – 0.008-inch, Plane – 0.015-inch and Parallelism – 0.150-inch.

F. The Contractor shall supply and ensure supplied wheels mounted on the axles so the balance mark on one (1) wheel is at the 12 o’clock position while the balance mark on the opposite wheel is at the 6 o’clock position.

G. Mounting of bearings shall be in accordance with the manufacturer’s recommendations and all applicable parts of the AAR Roller Bearing Manual and Section H, Part II of the AAR MSRP.

H. Bearing caps shall be replaced or renewed in kind on a wheelset as recommended by the Contractor and approved by VRE.
I. Data sheets including serial numbers, measurements, and pressure diagrams of wheel and bearing mounting shall be supplied by the Contractor to VRE for each wheelset.

6. SCHEDULE OF PRICES DETAILS

The following scenarios shall be used for completing ATTACHMENT D – BID FORM AND SCHEDULE OF PRICES. These scenarios by no means limit the actual work that may need to be carried out to rehabilitate a passenger railcar wheelset or Wheels, Axle, Combo, Traction Motor (WACT), but are the anticipated work scopes.

A. Replace Passenger Railcar Axle

The Contractor shall perform the following tasks:

1. Inspect the received wheelset.
2. During the inspection, it is determined that the passenger railcar axle must be replaced and the wheels need to be profiled.
3. Remove and rebuild the journal bearings as defined in Section 3.4.
4. Dismount the wheels and retain them for application to the new axle.
5. Provide a new axle as defined in Sections 3.1 and 3.3 and prepare for use.
6. Bore the wheels so that the wheels and axle have the proper press fit.
7. Mount the wheels to the axle with proper back-to-back spacing for wide flange wheels following all AAR and applicable OEM requirements.
8. Profile the wheels to a wide flange configuration, removing all defects and correcting a high/thin flange.
9. Apply the rebuilt journal bearings to the axle.

B. Profile Passenger Railcar Wheelset

1. Inspect the received wheelset.
2. During the inspection, it is determined that the wheels on the passenger railcar wheelset need profiling and no other defects noted.

3. Remove and rebuild the journal bearings as defined in Section 3.4.

4. Profile the wheels to a wide flange configuration, removing all defects and correcting a high/thin flange.

5. Apply the rebuilt journal bearings to the axle.

C. **Replace Passenger Railcar Wheels**

1. Inspect the received wheelset.

2. During the inspection, it is determined that the passenger railcar axle is serviceable, however, the wheels must be replaced.

3. Remove and rebuild the journal bearings as defined in Section 3.4.

4. Dismount and recycle the wheels.

5. Qualify the axle as defined in Sections 3.1 and 3.2.

6. Provide two (2) new wide flange profile wheels as defined in Section 3.5 and prepare for use.

7. Bore the wheels so that the wheels and axle have the proper press fit.

8. Mount the wheels to the axle with proper back-to-back spacing for wide flange wheels following all AAR and applicable OEM requirements.

9. Apply the rebuilt journal bearings to the axle.

D. **Replacement of Passenger Railcar Wheelset**

1. Provide a new axle as defined in Sections 3.1 and 3.3 and prepare the axle for use.

2. Provide two (2) new wide flange profile wheels as defined in Section 3.5 and prepare for use.

3. Bore the wheels so that the wheels and axle have the proper press fit.
4. Mount the wheels to the axle with proper back-to-back spacing for wide flange wheels following all AAR and applicable OEM requirements.

5. Provide two (2) new Class “F” journal bearings as defined in Section 3.4 and apply them to the axle.

E. Profile Locomotive Wheelset

1. Inspect the Wheel Axle Combo Traction Motor (WACT).

2. During the inspection, it is determined that the wheels of the WACT need profiling and no other defects noted.

3. Separate the wheelset from the traction motor.

4. Remove the journal bearings from the axle and rebuild as defined in Section 3.4.

5. Qualify the axle as defined in Sections 3.1 and 3.2.

6. Profile the wheels to a wide flange configuration, removing all defects and correcting any high or thin flange.

7. Apply the rebuilt journal bearings to the axle.

F. Replace Locomotive Wheels

1. Inspect the WACT.

2. During the inspection, it is determined that the wheels of the WACT need to be replaced and no other defects noted.

3. Separate the wheelset from the traction motor.

4. Remove the journal bearings from the axle and rebuild as defined in Section 3.4.

5. Dismount and recycle the wheels.

6. Qualify the axle as defined in Sections 3.1 and 3.2.

7. Qualify the bull gear.

8. Two (2) new wide profile wheels will be provided by VRE.
9. Bore the wheels so that the wheels and axle have the proper press fit.

10. Mount the wheels to the axle with proper back-to-back spacing for wide flange wheels following all AAR and applicable OEM requirements.

11. Apply the rebuilt journal bearings to the axle.

12. Provide new support bearings.

13. Reassemble the WACT and add proper fluids.

14. Test for performance, noise, vibration, and excessive heat from the support bearing.

G. Replace Locomotive Axle

1. Inspect the WACT.

2. During the inspection, it is determined that the axle of the WACT needs to be replaced and no other defects noted.

3. Separate the wheelset from the traction motor.

4. Remove the journal bearings from the axle and rebuild as defined in Section 3.4.

5. Dismount, qualify and reuse the wheels.

6. Dismount, qualify and reuse the bull gear.

7. Supply a replacement axle as defined in Sections 3.1 and 3.3.

8. Mount the bull gear to the new axle.

9. Bore the wheels so that the wheels and axle have the proper press fit.

10. Mount the new axle with proper back-to-back spacing for wide flange wheels following all AAR and applicable OEM requirements.

11. Apply the rebuilt journal bearings to the axle.

12. Provide new support bearings.
13. Reassemble the WACT and add proper fluids.

14. Test for performance, noise, vibration, and excessive heat from the support and motor bearings.

H. **Basic Overhaul of D78 Traction Motor**

1. Inspect the WACT.

2. During the inspection, it is determined that the traction motor of the WACT needs a basic overhaul and no other defects noted.

3. Separate the wheelset from the traction motor.

4. Remove the journal bearings from the axle and rebuild as defined in Section 3.4.

5. Rebuild the traction motor as defined in Section 4.4.

6. Apply the rebuilt journal bearings to the axle.

7. Provide new support bearings.

8. Reassemble the WACT and add proper fluids.

9. Test for performance, noise, vibration, and excessive heat from the support and motor bearings.