

The logo for Knoxville Locomotive Works (KLW) features the letters 'KLW' in a bold, white, sans-serif font. The letters are set against a dark green rectangular background that has a yellow border. The background of the entire page is a dark grey with faint white line drawings of various mechanical and electrical components, including switches, gauges, and panels.

**KLW**

# Locomotive Specification

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**Buyer Name**

**KLW NZE 32CE DE T4L Locomotive**



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## 1 Project Information

- 1.1 Customer: TBD
- 1.2 Locomotive Type: KLW NZE 32CE DE T4L Locomotive
- 1.3 Quantity of Locomotive(s): 1
- 1.4 Frame: TBD
  - 1.4.1 CSXT TBD
- 1.5 Trucks: Blomberg B Trucks
- 1.6 Contract Number: TBD
- 1.7 Purchase Order Number: TBD
- 1.8 Equipment Specification Revision:
- 1.9 Revision Date:
- 1.10 Specification Acceptance (Customer Initials): \_\_\_\_\_
- 1.11 Acceptance of Specification by KLW (KLW Initials): \_\_\_\_\_

## 2 Introduction

This Specification is approved for use by the \_\_\_\_\_, Engineering and Quality Assurance Departments.

The Federal Railroad Administration (FRA) issues numerous Notices of Proposed Rule Making (NPRM) which are reviewed by the industry. The locomotive manufacturer is to keep themselves aware of all required changes. The affected sections within this specification are to be covered and meet FRA requirements at the time the new rule takes effect. These changes will have to be incorporated, as required per the Code of Federal Regulation (CFR), at the time new requirements take effect. Commercial impact of these changes will need to be reviewed by the supplier and end-user for price effect to the equipment.

## 3 Specific Definitions

To avoid undue repetition, the following terms, as used in this specification, shall be construed as follows:

- a. AAR means Association of American Railroads.
- b. "Acceptable / successful delivery" means locomotive meet all requirements indicated herein for delivery and inspection.

- c. AISI means American Iron and Steel Institute.
- d. ASME means American Society of Mechanical Engineers.
- e. AWS means American Welding Society.
- f. CFR means Code of Federal Regulations.
- g. FRA means the Federal Railroad Administration.
- h. "Mechanically and operationally identical" means the chassis of the locomotive may differ while still meeting Specification parameters but engine and other mechanical and moving parts are identical between each locomotive. Spare parts for these units shall be interchangeable among the locomotive.
- i. \_\_\_\_\_ means the legal entity \_\_\_\_\_
- j. KLV means the Knoxville Locomotive Works, Inc.

## 4 Compliance

As applicable, the locomotive must satisfy the following:

- a. AAR Interchange Rules
- b. AAR Manual of Standards and Recommended Practices Section-M, Locomotive and Locomotive Equipment
- c. AISI standards
- d. ASME, Boiler and Pressure Code Section IX, Welding Qualifications
- e. AWS, D 15.1 - Railroad Welding Specification
- f. CFR, Title 49, Transportation
- g. FRA regulations
- h. The Official Railway Equipment Register

## 5 Work Required by the Specifications

These Specifications relate generally to KLV's provision of quantity one (1) mechanically and electrically refurbished locomotive equipped with a new Ultra-Low Emitting (ULE) single engine certified to United States Environmental Protection Agency Tier 4 emissions requirements. The locomotive will provide 3,200 BHP with a starting tractive effort of 115,000 pounds +/- 3%. Delivery destination for the locomotive is **City, State** and will be defined by **Buyer** to KLV at least 30 days prior to delivery availability from the Knoxville, Tennessee locomotive manufacturing facility. Seller shall be responsible for paying the cost for the transportation of the Locomotive by rail from Seller's site in Knoxville, Tennessee to Buyer's premises in **City, State**. Buyer shall assume responsibility for risk of loss for the Locomotive while in transport from Knoxville, Tennessee to the Buyer's premises in **City, State**. Buyer shall provide adequate insurance to cover such risk of loss thereafter at the project site until Seller has received full payments and applicable taxes for the Locomotive. Title to the Locomotive shall pass to Buyer upon receipt of full payment of the Purchase Price for the Locomotive plus applicable taxes.

## 6 Technical Requirements/General Information

### General Configuration Requirements

- a. Refurbished locomotive with a new single engine prime mover.
- b. Emissions - Each locomotive shall be in compliance with the US EPA refurbished Switcher Locomotive Standards (40 CFR Parts 92 and 1033) and EPA certified/CARB verified.
- c. 3,200 brake horsepower per locomotive.
- d. AR10/CA5 traction alternator.
- e. 18KW AC aux gen.
- f. Atlas Copco GAR37 electric air compressor.
- g. Locomotive weight is to be 392,000 LBS, +/- 3%.
- h. Starting tractive effort of 115,000 pounds, +/- 3%.
- i. Chassis is not to exceed a nominal 58 feet length, end sheet to end sheet.
- j. AAR standard type E alignment control couplers with type 390/391 alignment control draft gear to be inspected and free of defects. If defects are found, they will be replaced with new or requalified couplers of the same type.
- k. GP Blomberg B trucks with single shoe four-cylinder rigging, high friction shoes, and outboard (axles one and four) sanders
- l. Conform to AAR Plate-C clearance dimensions.
- m. AAR S-5506 Fuel tank. Fuel tank capacity shall be approximately 4,000 gallons. DEF tank shall be a nominal 800 gallons.
- n. Traditional GP cab design per AAR Rules and Regulations as applicable to remanufactured locomotive.
- o. Traditional yard switcher car body (short hood end = "front").
- p. KLW shall provide three different manuals: 1. Operator's Manual; 2. Service & Maintenance Instructions Manual; 3. Parts Manual.
- q. KLW shall provide locomotive operator and maintenance training at location of delivery, as outlined in Section 18, "Training Requirements ". Training requirements include hands-on operations with on-site personnel.

## 7 MAINTENANCE

- 7.1 The locomotive will be designed to generally support a 184-day maintenance plan.
  - 7.1.1 Air, Fuel, and Oil filters are sized with capacities to allow for 184 days in typical usage between change-out. Fuel and air filters may need to be changed at 92-day intervals dependent on the quality of fuel being delivered to the project site and air ambient quality.

## 8 FRAME

- 8.1 The frame shall be stripped, steam cleaned, media blasted, and primed.
- 8.2 The frame shall be reinforced and ballasted as necessary to meet weight requirements and balance as outlined in the technical requirements of this specification.

- 8.3 End sheets will be repaired or replaced as needed and will be equipped with adjustable pilot plates.
- 8.4 Step skirts and steps will be requalified and replaced as necessary (49CFR231.30).
- 8.5 Coupler pockets will be repaired or replaced as necessary and will be conformed to meet the draft gear requirements outlined in the technical requirements of this specification.
- 8.6 Qualified draft gears and couplers as outlined in the technical requirements of this specification shall be installed.
- 8.7 The frame shall be equipped with four jacking pads located at the longitudinal bolster centers on either side of the frame.

## 9 TRUCKS AND HANDBRAKE

Requalified two axle Blomberg-B trucks with the following features:

- 9.1 Axle/Gear/Wheel and Traction Motors
  - 9.1.1 Reconditioned wheelset assemblies with "Fat 40" 41" wheelsets with a minimum 3" or better wheel. Gear ratio 62:15.
  - 9.1.2 Requalified gear cases to utilize polymer seals and be crater grease filled. Gear cases to be fastened with new clamp and Tee bolt assemblies.
  - 9.1.3 Requalified or rebuilt GG axle bearing boxes.
  - 9.1.4 Requalified D77/78 traction motors with new glad hand boots.
  - 9.1.5 All nose springs to be requalified.
  - 9.1.6 Requalified support bearings.
- 9.2 Brake Rigging and hand brake
  - 9.2.1 Requalified brake rigging, guides, and bushings with four-cylinder single shoe arrangement.
  - 9.2.2 Requalified 9 X 8 brake cylinders.
  - 9.2.3 New V-330 or equivalent hi friction brake shoes.
  - 9.2.4 An electric hand brake will be provided on the short hood end.
  - 9.2.5 Electric handbrake must be applied in order to self-load.
  - 9.2.6 Electric handbrake must not be wired hot all the time.
  - 9.2.7 Request to load with handbrake applied will result in trainline 2 (attendant call) and trainline 10 (wheelslip).
- 9.3 Springs and hardware
  - 9.3.1 Requalified coil and elliptical springs.

- 9.3.2 Requalified polymer pedestal liners to be installed.
- 9.3.3 Requalified center bowl liner and dust boot to be installed.
- 9.3.4 Requalified traction motor blower boots to be installed.
- 9.3.5 Qualified truck frame, tie bars, bolsters, spring planks, coil spring seats, swing hangers, swing hanger blocks, and safety hangers.

## 10 CAB

The standard steel fabricated GP cab shall be requalified and located near the front-end of the locomotive main frame.

### 10.1 Control Stand

- 10.1.1 Requalified AAR control stand.
- 10.1.2 Requalified controller with dynamic brake selector.
- 10.1.3 Requalified horn valve.
- 10.1.4 Requalified sand and bell switch.
- 10.1.5 Requalified or new Salem 795 series Brake Pipe/Brake Cylinder and Main Reservoir/Equalizing Reservoir gauges.
- 10.1.6 Requalified or new air flow indicator.
- 10.1.7 New or requalified Quantum speedometer with Overspeed and Crew Alerter (mounted atop the stand)
- 10.1.8 Requalified indicator light cluster.
- 10.1.9 Requalified or new analog ammeter.
- 10.1.10 Requalified or new slide switches
- 10.1.11 Requalified or new AESS reset switch
- 10.1.12 Enclosure to include power and antenna cords. Sinclair low profile “ice skate” (aka “shark fin”) antenna to be applied to cab roof within plate C requirements.
- 10.1.13 Requalified or new head light rotary control switch (center off, dim, and bright selection toward end switch is rotated towards with master on/off slide switch for each respective end).
- 10.1.14 Ditch lights shall be controlled by the headlight rotary control switch and shall be on when the headlights are on bright.
- 10.1.15 12VDC inverter.

### 10.2 Cab Seats

- 10.2.1 Two (2) mid-back seats with armrests mounted as follows:
  - 10.2.1.1 One (1) seat in the engineer’s position.
  - 10.2.1.2 One (1) seat on the Conductor’s side.

### 10.3 Cab Amenities (Cab layout to be approved by customer)

- 10.3.1 Clean Cab conformance standards
- 10.3.2 LED cab lights will include engineers and conductor's reading lights.
- 10.3.3 Emergency brake valve to be applied on the conductor's side of the cab.
- 10.3.4 New first aid kit (P/N HPI10PWLSL or equivalent).
- 10.3.5 FRA cab card and daily inspection card holder.
- 10.3.6 Fuse Holder.
- 10.3.7 New 20.5LB type ABC fire extinguisher and bracket.
- 10.3.8 Two (2) coat hangers.
- 10.3.9 Cab door cushion pads.
- 10.3.10 Cab door closure bars.
- 10.3.11 Flexible hinge guard on cab doors.
- 10.3.12 Padded sun visors.

### 10.4 Cab Flooring/Ceiling

- 10.4.1 Cab flooring to be 11/16" marine grade lumber with diamond plate rubber mat laminate trimmed in aluminum.
- 10.4.2 Ceiling material to be perforated metal.

### 10.5 Cab Awnings/Wind Deflectors/Doors/Windows/Wipers

- 10.5.1 Two (2) metal folding awnings shall be provided, one on each side of the locomotive cab.
- 10.5.2 Four (4) wind deflectors with full length mirrors shall be provided, two on each side of the locomotive cab.
- 10.5.3 Aluminum type cab doors to be applied. The short hood door shall have the locking mechanism on the exterior of the door, which can be secured with a padlock. Both the front and rear cab doors shall have provisions to lock the doors from inside of the cab. A latch design will also be made available to hold both doors open.
- 10.5.4 Window Glass will be high impact front and rear window material and glazing according to FRA 49 CFR 223. Sliding sash windows to have Type II unitized with armrests.
- 10.5.5 All four corners will have new electric wiper motors with protective covers. Arms & blades will be new.

### 10.6 Nose

- 10.6.1 LED lighting

## 11 S-5506 FUEL TANK

- 11.1 Bottom of fuel tank to top of rail shall comply with CFR 49 requirements.
- 11.2 Fuel tank will have a nominal 4,000-gallon diesel fuel capacity. It shall include a nominal 800-gallon capacity internal retention tank for collection of effluents which will be routed from the frame sump. Where applicable, an external 200-gallon DEF tank shall be applied.
- 11.3 Two Snyder Twist Lock fuel filler necks to be installed, one on each side of the fuel tank.

## 12 CAR BODY

- 12.1 Car body will be new construction including roof hatches and doors and will house the engine-alternator assembly, accessory drive assembly, auxiliary generator, compressor assembly, coolant expansion tank, and all necessary blowers and filters.
- 12.2 The interior of the car body shall be equipped with a new 20.5LB type ABC fire extinguisher and bracket.
- 12.3 Handrails will be provided on all exterior walkways.
- 12.4 MU crossover platforms, safety chains, break-away bars, and break-away links.

## 13 EXTERIOR LIGHTS AND NUMBER BOARDS

- 13.1 Step lights shall be LED and will be located to illuminate each corner switching step.
- 13.2 Platform lights shall be LED and be located at the base of the long hood nose, the end of the long hood traction motor blower duct, and the stairwell at the short hood entrance to the cab.
- 13.3 Ground lights shall be LED and will be positioned under the frame on either side of the cab near the centerline of the sliding sashes.
- 13.4 Two number boards on the upper section of the long hood nose and the upper section of the short hood end of the cab shall have black on white lettering and be illuminated by LED lighting.
- 13.5 Headlights shall be Halogen (75VDC each).
- 13.6 Ditch lights shall be Halogen (75VDC each). The ditch lights will be steady burn only and will illuminate on the end toward which the direction lever is thrown and when that end's headlight is also selected to the bright setting. A slide switch will be included on the control stand to turn power on and off to the ditch light system.

## 14 AIR SYSTEM (MU Equipped)

### 14.1 Air Brakes

- 14.1.1 CCB26 air brake system with rebuilt components.
- 14.1.2 994 air dryer.
- 14.1.3 Two (2) No. 8 vent valves.
- 14.1.4 Brake pipe angle cocks will be non-vented.
- 14.1.5 Independent brake valve control pressure set for 72 psi.
- 14.1.6 Automatic and independent brake exhaust will be vented to a position below the cab floor.
- 14.1.7 Instantaneous PC knockdown to idle & unload during emergency application. PC knockdown to idle during overspeed.

### 14.2 Air Compressor

- 14.2.1 New variable speed electric-driven Atlas Copco GAR37 air compressor assembly.
- 14.2.2 Air compressor will be adjusted to maintain nominal 140 psi main reservoir pressure.
- 14.2.3 Air compressor will provide a nominal displacement at idle operating rpm and maximum operating rpm.

### 14.3 Main Reservoirs, Filtration, Drain Valves, and Safety Valve

- 14.3.1 Unit will be equipped with two main reservoirs.
- 14.3.2 Two final filters (Salem 824, 818 Series) shall be provided. Manual drain valves of each filter.
- 14.3.3 Two main reservoir manual/automatic drain valves (Salem 880 Series) shall be provided, one per reservoir. The drain valve exhaust will be directed to prevent "ballast blowing" and will be exhausted away from personnel.
- 14.3.4 A safety valve set at a nominal 148 PSI will be provided to protect the main reservoirs from over pressure.

### 14.4 Cut-out Cocks

- 14.4.1 Standard ball-type cut-out cocks shall be fitted in the auxiliary supply lines to the:
  - 14.4.1.1 Horn
  - 14.4.1.2 Front-end sand system
  - 14.4.1.3 Rear-end sand system
  - 14.4.1.4 Truck cut-out cocks

## 15 Audible Warning Devices

### 15.1 Horn and Bell

- 15.1.1 The horns will be Nathan K3LA type and will be located on the car body near the center of the long hood within the Plate C requirements. The bell will be Graham-White Electronic Series 373.

## 16 SANDING

### 16.1 Control

- 16.1.1 Manual sand will be applied to the outboard axles in the direction of movement (reverser position).
- 16.1.2 Automatic sanding for wheel adhesion in direction of travel.
- 16.1.3 During testing at 0 MPH, sand will be applied for a maximum of 60 seconds in the direction that the reverser is thrown and the manual sand switch is activated.

### 16.2 Sand Traps, Fillers, and Boxes

- 16.2.1 A total of four sand traps with rotary shutoff valves.
- 16.2.2 Sand fill on the short hood end shall be on top of the nose.
- 16.2.3 Sand fill on long hood end shall be accessible from walkway.
- 16.2.4 Sand boxes with wash out panels at each end with a nominal 15 cubic feet capacity provided (maximized as much as practical).

## 17 MULTIPLE UNIT CONTROL

Multiple unit control is provided. The following modifications / features are provided:

### 17.1 Receptacle

- 17.1.1 Single 27-point receptacle at each end with AAR standard pin assignments.
- 17.1.2 "Dummy" receptacle to be provided at each end.

### 17.2 Walkway Ramps

- 17.2.1 Fixed walkway and hand railing provided on both ends with provision to secure MU cables under walkway.
- 17.2.2 Chains with breakaway links to be installed.

## 18 ELECTRICAL SYSTEM

### 18.1 Detail of Electrical System

- 18.1.1 All wiring and cabling to be new Exane.
- 18.1.2 Electrical cabinet with interiors to be painted white
- 18.1.3 Electrical equipment in cabinet to be new or rebuilt, including reverser contactors, power contactors, battery switch, and breaker switch panel. LED lighting inside electrical cabinet. Low voltage carrying relays and current rectifiers to be new or rebuilt.
- 18.1.4 110 VAC outlet with USB port inside the electrical cabinet (cab side).
- 18.1.5 All temperature and pressure sensors new.
- 18.1.6 Provision to lockout handbrake breaker.

### 18.2 Dynamic Braking

- 18.2.1 Extended range dynamics.
- 18.2.2 Standard potential control train lined on #24 wire.
- 18.2.3 Linear Control System in which braking effort is regulated by grid current – i.e., variations in control handle position result in corresponding variation in braking effort so that as speeds vary braking varies inversely.
- 18.2.4 Dynamic braking will be maintained in the event of any emergency application, break-in two, PC knockdown, etc.
- 18.2.5 Self-load feature will be included with dynamic braking.

### 18.3 Batteries

- 18.3.1 New batteries for the 24V and 64V systems.

### 18.4 Battery Charging

- 18.4.1 Rebuilt Auxiliary Alternator to provide charging to the 64V system. 18 KW will be available at all engine speeds. Engine-mounted alternator will provide charging to the 24-volt system.

### 18.5 Ground Relay Reset

18.5.1 Automatic ground relay reset provided with fault logging.

18.6 Main Alternators

18.6.1 Rebuilt AR-10/CA5 alternator assembly applied as part of the new diesel engine-alternator package.

18.7 Microprocessor Control System

18.7.1 The Microprocessor will control the following contactors:

Power Contactors, Reverser Contactors, Engine Starting and Shutdown control, Traction Motor Cut Out, Ground Relay Reset, and Load Shedding contactors.

18.8 Monitor and Display Parameters

18.8.1 The Microprocessor will monitor and display the following functions:

Alternator voltage, all Traction Motor Current, Throttle Notch, Power Contactor Position, Reversing Switch Position, Battery Charging Voltage and Current, Engine Status, Essential Train-line Status, Total Horsepower, Locomotive Speed, Main Reservoir Pressure, Warning: Movement in Direction Opposite of Reverser Selection, Megawatt hours, Starts per day, and Sanding Status.

18.9 Battery Saver

18.9.1 Unit will be equipped with a battery saving system, for 64 Volt and 24 Volt system.

18.10 Systems Control

18.10.1 The Microprocessor will control the following systems:

Wheel Slip Detection and Correction, Traction Power Regulation, Engine Controls, and Sanding.

18.11 Fault Monitoring

18.11.1 The Microprocessor will log everything it monitors, not limited to the following fault conditions:

Ground Fault, Over-Current, Traction Motor Open Circuit, Contactor or Relay Fault, Battery Charging Failure, Air System Pressure Failure, and Engine Fault Codes.

18.12 Fault Log Snapshot

18.12.1 The Microprocessor will "Snapshot" everything it monitors, not limited to the following parameters with a fault log:

Traction Horsepower, Throttle Notch, Speed, Traction Motor Current, Power Contactor Status, Reverser Contactor Status, Alternator Current, Battery Charging Voltage, Train-line Status, Sanding Status.

### 18.13 Traction Motor Cut Out

18.13.1 The control system will provide individual traction motor cut-out via the control system touch screen.

18.13.2 Remote monitoring equipped

18.13.3 Locomotive to include CHMM (Crash Hardened Memory Module).

### 18.14 Automatic Engine Start Stop

The Locomotive will be equipped with an AESS system with parameters which meet current AAR specs.

18.14.1 The conditions for auto shutdown are as follows:

- a. BC – The brake cylinder pressure must be 68 PSI or higher.
- b. Speed – The locomotive speed must be zero.
- c. Throttle – Must be in idle.
- d. Reverser – The Reverser must be centered.
- e. 64V Bat Volt – The Battery voltage must be 70V or higher.
- f. 24V Bat Volt- The Battery voltage must be 25V or higher.
- g. 72V Bat Amps – The Battery current must be less than 30A.
- h. 24V Bat Amps – The Battery current must be less than 30A.
- i. Coolant – The engine coolant temperature must be 120°F (49°C) or higher.
- j. Air Temp – The ambient air temperature must be 0°F (-18°C) or higher.
- k. MR2 PSI in any mode (lead or trail)– At least 125 PSI

If all the parameters above are in range and the idle timer is 0, the AESS system will shut down the engine. For the last 14 seconds prior to shutting down the engine, a buzzer in the engine area and cab will sound.

When in ASD, if any AESS parameter is out of range, the engine will start and the idle timer will be set to 15 minutes. 12 seconds prior to auto restart, a buzzer in the engine area and cab will sound.

18.14.2 The conditions for auto restart are as follows:

- l. BC – The brake cylinder pressure falls below 60 PSI.
- m. Speed – The locomotive speed is not zero.
- n. Throttle – The throttle is notch 2 or above with the GF switch opened.
- o. Reverser – The Reverser is in forward or reverse.
- p. 64V Bat Volt – The Battery voltage falls below 63V.

- q. 24V Bat Volt– The battery voltage falls below 23V.
- r. Coolant– The engine coolant temperature falls to 50°F (10°C).
- s. Air Temp – The ambient air temperature falls to -13°F (-25°C).
- t. 64V Bat Amp – This parameter is not used for restart.
- u. 24V Bat Amp – This parameter is not used for restart.
- v. MR2 PSI in Lead/Run– 105 PSI

When in auto-shutdown (ASD), if any AESS parameter is out of range, the engine will start and the idle timer will be set to 15 minutes. 12 seconds prior to auto restart, a buzzer in the engine area and cab will sound.

**DISCLAIMER – KLV recommends all end users to have a handbrake test procedure implemented. AESS parameters will monitor speed when handbrake is applied and restart the engine but a short period of time will be required to charge the air brake system.**

## 19 GENERAL ENGINE SPECIFICATION

19.1 The engine parameters to be included are:

- 19.1.1 MTU Series 4000 V12 (ethylene-glycol)
- 19.1.2 Engine shall achieve a continuous power rating of 3,200 BHP.
- 19.1.3 Engine protection alarm and shutdown functionality for low oil pressure and coolant levels.
- 19.1.4 Engine shall be EPA certified to Tier 4 and CARB verified.
- 19.1.5 Engine skid to be fitted with 25-gallon engine oil reserve tank.

## 20 PAINTING AND STENCILING

- 20.1.1 Paint specifications shall conform to AAR standards for locomotives.
- 20.1.2 Primer shall be one coat of primer.
- 20.1.3 Finish paint shall be two coats.
- 20.1.4 Painting shall be completed with one coat of clearcoat.
- 20.1.5 Paint scheme, lettering, and fonts shall be provided by customer.
- 20.1.6 Interior of car body and components to be painted suede grey.
- 20.1.7 Interior of cab and under cab floor to be painted suede grey.
- 20.1.8 Control stand to be painted flat black or coated with Rhino Lining.
- 20.1.9 Required decals shall be applied.

## 21 TESTS

- 21.1 Cab noise shall conform to Title 40 Part 229.121 and be documented.
- 21.2 Horn will comply with Title 49 Part 229.129 and will be documented.
- 21.3 The following performance tests will be conducted and documented:
  - 21.3.1 Perform load test at each throttle position with the highest throttle position achieving alternator rated output for a minimum of 2 hours. The engine shall make 2,900 traction horsepower (+/-5%).
  - 21.3.2 Locomotive System Commissioning.

## 22 PERFORMANCE

- 22.1 Maximum speed – 60 MPH
- 22.2 Maximum continuous tractive effort – 90,500 lbs. +/-2%
- 22.3 Minimum continuous speed – 8.5 mph
- 22.4 Maximum tractive effort – 115,000 lbs. +/-3%
- 22.5 Total Rated Brake Horsepower – nominal 3,200.
- 22.6 Total Rated Tractive Horsepower – nominal 2,900.

## 23 LOCOMOTIVE SUPPORTIVE DOCUMENTS AND UMLER REGISTRATION

- 23.1 Following delivery of the locomotive to the project site in **City, State**, KRW shall provide complete locomotive Documentation Packages to designated customer personnel. The informational content will be supplied in the format of: One (1) reproducible electronic copy and one (1) physical copy.

The Documentation Packages provided will include:

- Copy of blue card
- Copy of cab level noise test
- Copy of horn test
- Copy of load test
- Copy of periodic inspection check off
- Plate C dimensions

- Scale weight sheet
- Photos (front, rear, conductor's side, and engineer's side views)
- Major Component Serial Number Matrix

23.2 KLW shall provide a quantity of one (1) each of the following manuals and schematics (in hard copy or digital format):

- Parts Catalog
- Service Manual & Maintenance Manual
- Operator Manual
- Wiring Diagram/ Electrical Print
- Air Brake Diagram
- Air Brake Maintenance Manual
- Air Brake Troubleshooting Guide

23.3 KLW shall assist in registering the locomotive data in the AAR Universal Machine Language Equipment Register (UMLER) System for interchange movements and ownership. KLW will install AEI transponder tags.

## 24 FINAL ACCEPTANCE

24.1 Final and successful acceptance will be considered on the date of interchange at the customer's location in **City, State**.

24.2 KLW will power on each locomotive in the presence of the customer's personnel and/or its designees prior to acceptance. Customer shall verify Specification compliance at the point of final acceptance and confirm acceptance to KLW. Any locomotive not meeting commissioning acceptance will be the responsibility of KLW for corrective action and repair(s).

24.3 At Final Acceptance inspection, the following inspection checklist shall apply:

24.3.1 General overall appearance is clean and structurally correct as originally designed.

24.3.2 Structural damage is non-existent.

24.3.3 Unit is free from any corrosion or oxidation.

24.3.4 Unit is properly stenciled according to specification.

24.3.5 Hood, doors, and end arrangements conform to standards and operate properly.

24.3.6 The underframe (including coupler pockets) shall be damage-free, structurally intact, and have legible manufacturer's builder plates.

24.3.7 Check coupler knuckle for proper operation and condition.

24.3.8 Check air brakes for proper operation.

24.3.9 Check wheels.



- 24.3.10 Start and check for leaks.
- 24.3.11 Run locomotive at multiple throttle settings, loaded, for a given duration, followed by shutdown and temperature check.
- 24.3.12 Locomotive shall operate for two hours performing the customer's general operations which may include but not be limited to: switching, hauling freight, setting out cars, and picking up cars.

## 25 TRAINING REQUIREMENTS

- 25.1 KLW shall provide on-site operator, hands-on maintenance, service, and troubleshooting training to customer's personnel for 2 days.
- 25.2 Training shall be scheduled to be held on a mutually agreed upon date at the customer's specified location or locations after the applicable delivery.

## 26 SPARE PARTS

- 26.1 A recommended spare parts list shall be provided.

## 27 QUALITY ASSURANCE & WARRANTY FOR BREAKDOWN / MALFUNCTION OR DAMAGE

- 27.1 Quality Assurance Plan
  - 27.1.1 Within thirty (30) days of Contract Award, KLW shall provide documentation which describes how it intends to ensure the final product meets or exceeds the Specifications herein.
- 27.2 Warranty
  - 27.2.1 KLW shall guarantee that its products will meet all applicable specifications and other specific product and work requirements including those for performance of this Contract and will be free from defects in materials and workmanship.
  - 27.2.2 Specific warranty details are included in the contract under separate exhibit.

## 28 SAFETY PROVISIONS



- 28.1 All work performed by KLW will follow all OSHA standards.
- 28.2 KLW personnel and its contractors shall meet site specific requirements for entry. Any safety training expense required by buyer for seller entry or access to property will be the responsibility of the buyer.

## 29 WARRANTY

- 29.1 Specific warranty details are included in the contract under separate exhibit.

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