TECHNICAL SPECIFICATION OF THE L-KOPIA / LKO LD OEM CLEARANCE LASER SYSTEM

1. SCOPE

This specification covers the LKO/L-KOPIA Clearance Laser System, including software and hardware.

The LD system allows total clearance and track center surveys and will include;

- cross sectioning, area and volume calculations in tunnels
- regular clearance testing of bridges, signals, platforms, etc.
- continuous track center measurement
- videotaping either separate or together with laser survey (optional).
- ballast volume calculation (optional)

2. GENERAL

2.1
The LKO/L-KOPIA LD Clearance Laser System is normally used on rail bound or hi-rail vehicles for the inspection and calculation of obstructions within the general clearance envelope.

2.2
The LKO/L-KOPIA LD Clearance Laser System can measure railroad clearances both day and night. It maintains short track occupancy and follows a "non-touch" concept. The general accuracy is +/- 10 mm and a calibration target is used to obtain the accuracy under different conditions.

2.3
The LKO/L-KOPIA LD Clearance Laser System scans 360-degrees and is a time of flight concept (LADAR).

2.4
The LKO/L-KOPIA LD Clearance Laser System gathers data as follows together with identifying any track infringement object;

- distance in mile, feet or kilometer
- track super elevation
- the name or number of obstructions
- curve
- track identification
- track segment
- direction of travel
- date of data collection.

2.5
The LKO/L-KOPIA LD Clearance Laser System software is capable of generating "standard cross sections" whilst stationary, "minimum composite cross sections" whilst moving on track and "average composite cross sections" for tunnel volume calculation.
Resulting coordinates is in imperial or metric with "X" being width, "Y" as height and "Z" being distance in mile, feet or kilometers.

3. DETAILED SPECIFICATION

3.1
General
The LKO/L-KOPIA LD Clearance Laser System uses a "real time concept" so that operators can visually observe and measure as necessary any structures that are identified as being inside the clearance envelope. A measuring sequence only requires one key to start and one key to stop. All clearance data is oriented from centerline of track and top of rail. The clearance laser system have track center measuring capabilities (measuring center line to center line distances between two adjacent tracks simultaneously). The clearance laser system can operate in both directions with the same efficiency.

3.2
Performance
The laser system meets the following operating criteria;

- minimum scanning speed of 9,600 to 43,200 points/sec
- minimum accuracy of 10 mm root mean square on individual points
- high resolution (one point every 0.125 – 0.375 degrees)
- scans 360 degrees
- have a measuring range from 0-210 feet (0-70 meter).
- the system is 100% eye safe (Laser Class 1)
- the system is capable of operating in darkness and full daylight.
- the laser unit is light, compact and temperature controlled.

3.3
Power Supply
The clearance laser operates on 24 volt DC and LKO/L-KOPIA provides any electrical filtering system that may be required.

3.4
Travel Speed
The system has the capability of saving minimum and average composite cross sections then the carrier vehicle travels in speeds up to 55 miles per hour (90 Km/hour) if accepting lower accuracy.

3.5
Software/hardware
The system is delivered with (or customer has) Windows XP PRO as operating system (both for the collecting and the processing of the data from the Clearance Laser System). The software offered with the Clearance Laser System is capable of simulating and on screen show any load, train or car configuration, including truck centers and overhangs. The LKO/L-KOPIA software allows viewing the results in graphic form on screen.

Below please find minimum requirements for the onboard computer:

Speed: CPU, 850 MHz
RAM: 256 MB PC 133 SDRAM
1 PCI slots for L-KOPIA APPLICATIONS
10/100 PCI NIC (network card)
20 GB HD
XP Professional OS

3.6
Training
Any system purchase is accompanied with an appropriate training program covering activities in both the field part and the office part. The training should be planned to be completed within a one week period which will include installation on a vehicle.

3.7
Inspection
All units will be quality tested by the manufacturer prior to shipment.

3.8
Packing and Shipment
The clearance laser system will be shipped in sufficient protective packing.
Approximate dimensions for shipping will be indicated in the offer.

4. ADDITIONAL REQUIREMENTS

4.1
The system is delivered with a comprehensive operators manual together with drawing of the specialized bracket, laser connectors and cabling required for installation on the AMTRAK Clearance Laser Vehicle.

4.2
The system will operate effectively within a range of;

Maximum ambient temperature:	103 F (45 C)
Minimum ambient temperature:	12 F (-10 C)
Maximum relative humidity:	95 - 100 %
Minimum relative humidity:	65 - 70 %
Maximum altitude:	4,500 ft (1,500 m)
Minimum altitude:	-45 ft (-15 m)

4.3
L-KOPIA ensures that any exposed items of hardware have adequate weather protection.

5. TRACK OPERATING PARAMETERS

5.1
Track gauge: 56.5 inch (1435 mm)

6. SUBMISSION

6.1
L-KOPIA can provide a price list of recommended spare parts for a service period of two years. The Purchaser will determine the quantity and timing of any spare parts purchase.