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Standardized Technical Specification

PRIIA 305 Next-Generation Equipment Committee  
Diesel-Electric Passenger Locomotives

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# **Chapter 1**

## **Executive Summary**

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## 1.0 Executive Summary

### 1.1 Overview

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This Specification defines the system and performance requirements for the design, development, construction and testing of a passenger locomotive. The locomotive shall be diesel-electric powered (related alternative technologies will be considered) for use in intercity corridor and commuter passenger service.

The locomotive shall be capable of operating at a sustained speed of 125 mph.

### 1.2 Regulatory Compliance

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The locomotive shall comply in all respects with the applicable standards and recommended practices of the Federal Railroad Administration (FRA), Association of American Railroads (AAR), American Public Transportation Association (APTA), NRPC (Amtrak) and all applicable Federal and State laws, rules and regulations and all industry recommended practices in effect at the time of the signing of the Contract. These standards and practices shall continue to apply during construction of the locomotive, up to the time of acceptance of the locomotive at the time of delivery.

If a conflict is discovered or arises among any of the above requirements, the following order of priority shall govern:

1. FRA/US Environmental Protection Agency (EPA)
2. Purchase Agreement and Specifications
3. APTA Standards and Recommended Practices
4. AAR Standards and Recommended Practices
5. NRPC (Amtrak) or other railroad specific requirements in accordance to the contract specification

### 1.3 Basic Features and Characteristics

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This section is intended as a quick guide of the basic features, characteristics and requirements for a high reliability, fuel efficient locomotive for passenger rail service. Designed for 125 mph operating speed (as defined by 49CFR Section 238.5/Tier 1):

- Diesel-electric propulsion with Alternating Current (AC) traction motors
- Lowest possible weight and unsprung mass
- Streamlined design
- Full width locomotive cab
- Amtrak environmental and operating conditions as specified in Amtrak Specification 963
- US EPA Tier 4 emissions (2015)
- High fuel efficiency, in particular with regard to specific passenger service requirements
- Modular design
- Low maintenance and life cycle costs
- Electronically controlled air brake
- Dynamic brake with blending operation
- Push-Pull and Multiple Unit (MU) operation

Main data:

- Traction power sufficient for eight multi-level car train (two locomotives) 125 mph
- Head End Power (HEP) 3-phase 480V 600kW minimum
- Fuel tank size - US gallons 1,800 gal, Estimated Range 1,100 to 1,250 miles
- Operational with 6 in. cant deficiency
- Incorporate Crash Energy Management (CEM) features
- Compliance with Amtrak Clearance Diagram D-05-1355 (latest revision)

**1.4 Dimensions, Weights and Environmental Operating Design Considerations**

The locomotives built to this Specification shall be suitable in all respects for use over lines throughout the United States. Locomotive weights, dimensions and operating performance requirements are detailed in the paragraphs following.

The minimum design service life shall be 25 years. Life should apply to entire locomotive except consumables as well as planned overhauls and replacements.

**1.4.1 Track and Profile**

|                               |  |
|-------------------------------|--|
| Nominal gauge                 | 4 ft 8.5 in.   |
| Minimum horizontal curve      | 250 ft radius horizontal curve (23 degree curve) for coupled locomotives and for a locomotive coupled to an 85 ft car. |
| Minimum vertical curve        | 1000 ft radius (concave or convex) for coupled locomotives and for a locomotive coupled to an 85 ft car.               |
| Maximum track super elevation | 7 in.  |

Operation may be on all classes of track maintained to FRA standards, for speeds of up to 125 mph.

**1.4.2 Clearances**

Locomotive design and construction shall conform to the Amtrak Clearance Diagram D-05-1355 (latest revision) and the following:

Within the 180 days following Contract Award, the Contractor shall submit a detailed static outline diagram of the proposed locomotive. This diagram shall also show the dynamic movement of the locomotive and carbody about its center of gravity and roll axis, and it shall indicate the change in vertical height for each of the following conditions:

- New and fully worn wheels
- Full and empty supplies

Also indicated on this diagram shall be:

- Locomotive length and truck centers
- Maximum pilot and mid-point lateral off sets for 2° curvature and 7 in. super elevation
- Location of vertical and lateral center of gravity

**1.4.3 Weights**

The contractor shall implement a weight optimization program in order to produce the lightest locomotive consistent with the requirements of this specification and with optimal adhesion and tractive effort characteristics. Maximum loaded weight of the locomotive shall be consistent with the track dynamic force limit as specified in Chapter 6. The weight differential

over each truck at the rail of a fully loaded locomotive shall not exceed five percent of the total locomotive weight.

#### 1.4.4 Cant Deficiency

The locomotive shall be capable of being qualified for operations up to 6 in. cant deficiency in accordance with 49CFR Section 213.57 and 49CFR Part 329 (as appropriate)..

#### 1.4.5 Dimensions

The dimensions stated in this section are for guidance only. The contractor shall specify the optimum proposed dimensions based on the parameters established by existing clearances and the dynamic characteristics of its proposed locomotive.

|   |   |
|---|---|
| Wheel arrangement                                 | 4 axle or 6 axle                                    |
| Overall length over coupler pulling faces         | 72 ft maximum, consistent with curving requirements |
| TOR to top of locomotive; new wheels, no supplies | According to clearance diagram                      |
| Wheel diameter                                    | 40 in. to 44 in.                                    |

##### 1.4.5.1 Supplies and Output Characteristics

|                                       |   |
|---------------------------------------|---|
| Installed nominal diesel engine power | Consistent with operating requirements                |
| HEP output capacity                   | 480V, 3-phase, 60 Hz, 600 kW + 10%, power factor 0.85 |
| Starting tractive effort (minimum)    | 65,000 lbs  |
| Fuel capacity, minimum usable         | 1,800 US gal  |
| Sand capacity                         | 20 cu ft (4 sandboxes 5 cu ft each)                   |

#### 1.4.6 Operating Performance

##### 1.4.6.1 Push-Pull Operations

The locomotives shall be designed and constructed to be used in push-pull operations. The electrical and communications systems shall be trainlined using standard 27-pin trainline equipment.

##### 1.4.6.2 Compatibility

The locomotive shall be compatible with other rail equipment owned and operated by the Customer, Amtrak or agencies such as Caltrans, Metra, NJT and others.

##### 1.4.6.3 Speed

The locomotives shall be designed, constructed and tested to operate at a sustained speed of up to 125 mph on tracks approved by FRA for that speed. Design and test speed shall be as prescribed by regulation

##### 1.4.6.4 Operating Environment

The environmental criteria for the locomotive shall be consistent with Amtrak Specification 963 (latest revision). For the locomotive's operation and diesel engine performance, EPA conditions for Tier 4 emissions and AAR standard conditions for diesel engine performance shall apply.

Rain, snow, sand and dust as usual in different North American regions shall be considered.

#### 1.4.6.5 Trucks

The truck shall have either a four-wheel or six-wheel design.

The trucks shall be optimized with regard to:

- Minimized dynamic forces vertical and lateral
- Minimized unsprung mass
- High running stability
- Minimized wear
- Minimized load transfer between axles at high traction force
- Easy maintenance and replacement

#### 1.4.6.6 Conventions

All AAR conventions as to the identification of ends, sides, and wheel and bearing locations shall be used. A key plan shall be provided on all drawings to aid in the identification, location and orientation of the items depicted.

### **1.4.7 Maintenance Intervals**

Maintainability and ease of access to locomotive components shall be designed into the locomotive body. No component or system shall require less than 92 day service intervals, except for brake shoes or brake pads, fuel, sand, water, oil and other consumable items.

\* End of Chapter 1 \*