Standardized Technical Specification

PRIIA Diesel Multiple Units (DMUs)

Requirements Document

Draft Revision 1.0

Table of Contents

1.0 Introduction [Informative]

The requirements in this document describe the desired features for DMU rail vehicles. Specific features or functions that are deemed appropriate by the Technical SubGroups shall have priority over these requirements and shall be reflected by specific language in the vehicle specification. Such exceptions must be identified by the Technical SubGroups and are subject to review and approval by Executive Board

The following requirements are derived from the PRIIA 305 mandate.

Technical:

- 110 mph maximum capability.
- For operation in corridor service (routes up to 600 miles in length).
- Standardization – consider areas such as:
  - vehicle structure for common platform for all vehicle types within the fleet;
  - component attachments (e.g. truck, seats, tables, HVAC);
  - components at a fit/form/function/input/output level (e.g. truck, wheels, axles, couplers, cab controls / displays, seats, cab seats, intercar jumpers, intercar gangways, HVAC units, static inverters, batteries, lighting, tables, door systems, etc.);
  - seek commonality in components between PRIIA vehicle types where appropriate (bi-level, single level, locomotive, etc.).
- New Technology – consider areas such as:
  - Collision Energy Management (energy absorbing coupler, deformable anticlimber, collapsible structural members, trigger levels, interior fixtures (energy absorbing tables), etc.);
  - Environmentally responsible (energy efficient, low weight, low noise and vibration, consideration of recycled materials / material recyclability, low impact HVAC refrigerant, energy efficient lighting, etc.);
  - Train data networks (Ethernet, IP address based components, etc.).
- Compliance with all applicable regulations.
- Compliance with Americans With Disabilities Act and relevant regulations.
- Reliability and Maintainability Requirements - Cost effective to operate.

Process:

- Inclusive development to include key stakeholders:
  - Amtrak
  - States
  - FRA
  - Industry, such as
    - Vehicle Suppliers;
    - Component / System Manufacturers.
- Live specification with change management.

- Configuration management for vehicle development and specification leading to conformed specification.
- Traceability of such processes to support PRIIA 305 Executive Committee approval.

2.0 Requirements [Normative unless otherwise indicated]

2.1 Car Types and Arrangements

2.1.1 Key Requirements

a. All car types shall be based on a standardized design that facilitates tailoring of interior equipment arrangements and functionality to meet the needs of Amtrak, different state agencies and classes of service.

b. Car designs shall be modular to the extent practical in order to minimize the amount of additional design required to adapt to the needs of different state agencies and classes of service.

c. With the possible exception of the propulsion system carbody and attachment points shall be designed to permit any car type defined in this specification to be converted to any other car type defined in this specification without requiring modifications to the carbody.

d. The DMU vehicles shall be fully compliant with FRA's requirements for structural strength, crashworthiness and testing per 49CFR Part 238, as follows:

1. The DMU vehicles shall meet or exceed 49CFR Part 238 Tier 1 structural requirements and applicable portions of 229 .

2. The carbody and DMU vehicles shall meet or exceed APTA Standard SS-C&S–034-99 for the Design and Construction of Passenger Rolling Stock.

e. The DMU vehicles shall be designed for a service life of 40 years.

f. The DMU vehicles shall comply with all applicable ADA requirements.

g. Platform Boarding

1. Both powered and unpowered_cars shall have capability for both high and low platform boarding as defined by the customer.

h. Standardization

1. DMU vehicle designs shall provide for standardization with other PRIIA passenger rail cars to the maximum extent practical.

2.1.2 Car Types

DMU vehicles may be powered or unpowered. The following generic car types shall be considered (functionality of interiors may be combined):

a. Standard Coach

b. Business Class Coach

c. Café / Food Service Car

d. Cab Control Car

e. Baggage Car

2.2 Capacity and Consist Performance

2.2.1 Consist Configurations

a. DMU: Normal operation:

1. All trainlined functions for both powered and unpowered DMU vehicles shall operate as specified for designated consist lengths.

2.2.2 Consist Performance

a. Maximum speed: 110 mph under existing Tier 1 equipment requirements, bi-directional running.

b. Duty cycle

1. Normal duty:

i. Continuous operation for up to 20 hours and 1200 miles per day.

ii. Representative operating profile shall be defined by the purchaser.

c. Operating range with 10% reserve of all fluids (supply and waste) and supplies:

1. Distance: 600 miles

2. Duration: 20 hours

2.3 Dimensions, Clearances and Track Geometry

2.3.1 Overall DMU Vehicle Dimensions

a. DMU vehicles shall fully conform to Amtrak's standard single level clearance diagram (drawing D 05-1335, latest revision)

2.3.2 Track Geometry

a. The DMU vehicles shall be designed and tested for revenue operation at all appropriate speeds up to 110 mph, on all classes of track from FRA Class 1 to Class 6.

b. Track quality shall be assumed to be minimally compliant for each class of track, per FRA regulations and AREMA standards.

c. Ride quality standards and testing methods shall be as specified in ISO 2631 (most recent version).

2.4 Environmental Conditions

The DMU vehicles shall be designed to operate within the environmental extremes defined in Amtrak Specification 963 (most recent version). All systems must function normally for purchaser's specific elevation requirements which can range from 0 up to 9200 ft. above sea level.

2.5 Carbody

a. All exterior doors, vestibules, and diaphragms be designed to prevent ingress and buildup of snow and ice.

2.6 Interiors

a. Interiors will provide a modern attractive appearance to customers in line with Purchaser's requirements.

b. Power outlets shall be provided at every passenger seat.

c. Interior will comply with all ADA regulatory requirements.

2.7 Electrical

a. All DMU vehicles are equipped with MU (push – pull) control trainline jumper cable in order to be interfaced with rolling stock equipment when required.

2.8 Food Service

a. Food service and all vestibules permit easy, safe movement and negotiation by wheel chairs.

b. Provision, at the election of the purchaser, for vending machines (un-manned service)

2.9 Water and Waste

a. Bathrooms are well ventilated and bathroom exhaust is directed away from Passenger exterior side doors.

3.0 Propulsion

Propulsion System Architecture

- The propulsion system architecture shall be subject to approval by the Customer.
- Power will be matched to anticipated makeup of the consist and speed accounting for unpowered cars.
- There may be more than one engine working together in a powered car to provide the required traction power, HEP and redundancy.
- The total propulsion system shall meet EPA Emission requirements.
- Each propulsion unit shall operate independently. Failure or mis-operation of one unit shall not adversely affect operation of the others.

Formatted: Indent: Left: 0.25", Space After: 0 pt, Line spacing: single

- The propulsion system may incorporate the HEP alternator.
- Propulsion power will be distributed throughout the consist to provide optimum acceleration, traction and flexibility when separating a longer consist into shorter standalone consists.
- In a powered car, there will be 2 or more powered axles. Preferably these will be on separate trucks. If 2 axles on a truck are driven, then they shall be driven independently or the system must allow for wheel diameters differences without loss of efficiency.
- The engine may drive a mechanical transmission, hydraulic torque converter type transmission or diesel-electric with motor drives.
- Engines with their associated transmissions and/or generators and protective devices shall be formed into a propulsion module that allows for fast and easy replacement and off-vehicle testing.
- Cooling may be part of the propulsion module remote mounted.
- The propulsion module will be vibration isolated on the car shell with sound barrier that minimizes exterior and interior noise and vibration. The propulsion system shall have external noise levels no higher on-high way trucks.
- Final drives may be a right angle drive with or without a reversing gear. It may also be a parallel gear box that is typical of electric motor drive.
- Dynamic braking on hydraulic units shall be provided by means of a retarder for mechanical systems and rheostatic braking for electric motor driven systems. Dynamic braking shall be rated at no less than 50% of the total traction power.
- Dynamic braking will be blended with friction braking. The propulsion control logic unit shall be able to provide a command for friction brake traction. Alternative division of functions between propulsion and friction braking may be proposed based on equivalent performance.
- A state-of-the-art slip-slide protection system shall be provided.
- The propulsion system and its main sub-assemblies shall incorporate a Local Diagnostic and Test System (LDTS) to perform self-test, fault detection, relevant signal recording, status logging and self-diagnosis, and shall communicate such information in the on board internal computer stored data logging architecture as proposed by the Contractor and approved by the Customer.
- Shore power, controls and the LDTS system shall be sufficient to encourage engine shutdown and restart to minimize idle time and avoid a prolonged manual inspection for each cycle. AESS may be part of this system.