

5.2 Shosholoza Meyl – High level user requirement

High level User Requirement Specifications for the new long-distance Shosholoza Meyl rolling stock

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ABBREVIATIONS

AC:	Alternating Current
CTC:	Centralised Train Control
DC:	Direct Current
DMU:	Diesel multiple unit
kV:	Kilovolt
Passenger car:	Sitter or sleeper cars
PRASA:	Passenger Rail Agency of South Africa, previously SARCC
RSR:	Railway Safety Regulator
SARCC:	South African Rail Commuter Corporation of South Africa, now known as PRASA
Spoornet:	State-owned logistics provider, now known as TFR
TFR:	Transnet Freight Rail, a division of Transnet, previously known as Spoornet
Utility car:	Dining, kitchen, or power car

1 Overview

1.1 Introduction

PRASA was established in April 2009 to house the operations of Metrorail, Shosholoza Meyl, Autopax and Intersite (Property Management). The consolidation was part of Government's key objective to achieve modal integration as well as to improve the performance of public transport services.

Coupled to the above, the Corporate Plan of PRASA 2009/10 – 2011/12 [i] highlight the following objectives:

- Sustainable passenger rail service delivery
- Improved performance of passenger rail services in terms of the quality and levels of services to passengers
- Improved efficiency in the delivery of services
- Improved effectiveness of asset management
- Effective targeting of subsidies to achieve desired socio-economic and transport objectives
- Improved oversight by Government
- Improved accountability to the users

Underpinning these objectives is the need to renew the existing rolling stock fleet. PRASA has committed to the replacement of the rolling stock fleet over the next 18 years.

1.2 Shosholoza Meyl Services

Shosholoza Meyl provides long distance inter-city rail transport nationally on both PRASA and TFR networks. Its core market, approximately 85% of its business undertaking, is the provision of a basic and affordable passenger train service. In addition to the economy service, the following train services are also provided:

- Tourist trains
- Premier trains
- Peak and special trains (including contract trains)
- Baggage and car transportation.

Tourist trains utilise standard passenger seating cars, sleeping cars, catering cars and utility cars.

Premier trains also offer passenger seating cars, sleeping cars, catering cars and utility cars recently upgraded to higher levels of service and passenger comfort. These services are provided on selected routes.

1.3 Logistics and Maintenance

Shosholozza Meyl owns all rolling stock assets including 3kV DC and 25kV AC electric locomotives and diesel-electric locomotives.

Locomotives are maintained in the Braamfontein Metrorail maintenance depot in Johannesburg and the Saltriver Metrorail maintenance depot in Cape Town. Passenger and utility cars are maintained in dedicated depots in Johannesburg and Cape Town with some repair work delegated to the Metrorail depots.

1.4 Rolling Stock Replacement

Due to declining investment over the last three decades, which threatens the reliability, sustainability and safety of the long-distance passenger rail service, PRASA is considering the recapitalisation of the Shosholozza Meyl fleet to enable adequate response to its mandate [ii].

Concurrent with the roll out of new rolling stock, existing rolling stock will be phased out in a manner ensuring that passenger demand is met without undue disruptions to train services.

1.5 Estimated Rolling Stock Requirement

Based on the Funding Motivation for the Acquisition of New Railway Rolling Stock for Shosholozza Meyl Operations, July 2010 [ii], the estimated requirements are:

Locomotives: 124 (76 3kV DC locomotives, 21 24kV AC locomotives, 27 diesel-electric locomotives)

Passenger cars: 1195 cars

Whilst replacement of locomotives and passenger cars is considered the most likely solution, alternatives may also be considered, for example distributed power multiple unit trains.

The rolling stock numbers, for each locomotive traction type (section 2.1.1) and each type of car (section 3.2), will be confirmed following the conclusion of a market demand study.

The main focus of this User Requirement is the replacement of passenger and utility cars. A User Requirement shall be developed following the outcome of the conclusion of the traction assessment (Section 2.1.1).

2 Vehicle principle of design

Rolling stock shall provide environments and levels of service comparable to international norms attracting passengers from other modes of transport and stimulating the growth of the local tourism industry. General requirements are set out below.

2.1 Principle of Design

All requirements are intended to be met by common standard freely available rolling stock products as far as is practical rather than requiring a bespoke or custom-made design.

Alternatives to existing design and technologies will be considered if the current design and technologies are not compatible with the requirements of this project.

2.1.1 Design and Technology

Modular construction of various passenger and utility cars are required.

A number of different traction options are being considered which include:

- Conventional locomotive traction, comprising both diesel-electric and electric locomotives
- Diesel / 25kV AC / 3kV DC hybrid locomotives
- Distributed power electric trains (25kV AC / 3kV DC dual voltage)
- Distributed power DMU trains
- Diesel / 25kV AC / 3kV DC hybrid multiple units

PRASA and its technical advisors are currently considering the merits of these traction mode choices and will consider these choices as part of a market engagement. It will then indicate the preferred solution in a final specification to be put to the market at the envisaged tendering stage. Locomotive design aesthetics akin to passenger cars are a requirement.

2.1.2 Maximum Train Length

Consistent with the current practice of using 22 cars per train (cars are 20.84 m in length), maximum train length shall be 450 m, excluding locomotives.

2.1.3 Standards and Quality

All such standards and specifications shall be internationally recognised and be motivated and demonstrated to be appropriate for the rolling stock required for this project.

A full regime of standard specifications and standards shall be used, rather than applying only certain selected specifications of an ad hoc nature which might not be fully compatible. Any alternative and additional specifications shall be evaluated and, if deemed appropriate, approved by the client.

2.1.4 Durability

Rolling stock must be maintainable and up-gradable within acceptable limits of expenditure for a minimum of 40 years. Vehicles shall be constructed of corrosion resistant material consistent with the varied climate and regions of South Africa (manufacturer to demonstrate corrosion resistance). Stainless steel piping shall be preferred.

2.2 Performance

2.2.1 Speed

Irrespective of mode of traction, rolling stock shall be designed to operate at a maximum of 120 km/h.

2.2.2 Dynamic Comfort Levels

Levels of noise, vibration, acceleration and retardation as well as rotational motion inside the rolling stock shall be maintained at a sufficiently low level to provide comfortable travel under all travel conditions.

2.2.3 Traction Supply

Shosholoza Meyl operates on both electrified (3kV DC and 25kV AC) and non-electrified lines. Rolling stock shall be capable of operating over all specified routes including 25kV AC, 3kV DC and non-electrified lines. The rolling stock shall be as flexible as possible to allow through journeys without the change of traction units. However, this must be balanced against capital cost, operating cost and environmental impact. No definitive decision has been made on the most appropriate solution. It is recognised that it may be necessary for more than one type of train/locomotive traction to achieve this.

2.2.4 Vehicle Gauge

The vehicle gauge, axle loads etc. shall allow operation over all specified routes. See Network Information and Infrastructure Interface for further information [iii].

3 Service level parameters

The strategy of Shosholozza Meyl is to provide for different market segments but based on standardised technology wherever possible. It is expected this will promote better passenger services as a whole, as well as inherently improving the total life cycle costs.

3.1 Classes of Accommodation

PRASA is seeking to provide a single class of accommodation for each train in the following Shosholozza Meyl market segments:

- Intercity trains (long distance, high density trains, replacing current economy trains)
- Tourist trains (long distance, low to medium density trains replacing current premier and tourist trains)

3.2 Train Formation

Depending on the service requirement at that time, train formation could comprise any combination of the following passenger and utility cars:

- Sitter cars
- Sleeper cars
- Dining cars
- Catering / grill cars

Although power cars for the generation of train auxiliary power are envisioned, costed options for an integrated auxiliary power supply within the locomotive are also sought (refer Section 2.1.1, Design and Technology).

3.3 Sitter Cars

Sitter cars must provide systems and environments that are attractive offering high levels of comfort to passengers.

- Only seating space shall be provided; no special provision shall be made for standing passengers. Seating layout shall allow for the maximum number of seated passengers per car commensurate with providing a high degree of comfort for journeys in excess of 24 hrs.
- Each seat shall be fitted with a retractable table, either in the armrest of the seat or the seatback directly in front.
- The seating layout shall be reconfigurable to make provision for future requirements / market segments.

- Secure overhead hand luggage space shall be provided (similar to aircraft hand luggage space). Lockers shall be provided in vestibule areas for storage of larger luggage items. Alternative proposals shall be considered.
- Washing and toilet facilities shall be provided at both ends of the car.
- Controlled emission toilets shall be provided with sufficient capacity to retain all effluent on the car until servicing at the end of the journey.
- Proposals for storing and powering of refreshment trolleys or kiosks shall be considered.

3.4 Sleeper Cars

Selected train services may include sleeper cars.

- Sleeper cars shall be divided into compartments accommodating four or six passengers with bench-type seating during the day converting to double or triple level bunk-beds at night.
- Compartments shall contain a washing facility.
- Shower and toilet facilities shall be provided at each end of the car respectively. Proposals for integrated facilities shall be considered.
- Shower facilities shall provide hot and cold water.
- A number of sleeper cars shall have accessible compartments for passengers using wheel chairs. Proposals for fitting accessible compartments with shower / washing and toilet facilities shall be considered. Also refer to Section 3.8.
- Controlled emission toilets shall be provided with sufficient capacity to retain all effluent on the car until servicing at the end of the journey.

3.5 Dining Cars

Selected train services may include dining cars.

- Dining cars shall be fitted with seats and tables for serving sit-down meals prepared in the catering / grill car.
- Dining cars shall provide seated capacity for approximately 44 passengers.

3.6 Catering / Grill Cars

Selected train services may include catering / grill cars.

- Catering / grill cars shall have a fully equipped modular kitchen including adequate cold storage, facilities for preparing and cooking of food, disposal equipment and hot and cold water supplies allowing extended operating times between replenishment of supplies.
- Tanks shall be provided to retain waste water on the train until servicing at the end of the journey.

3.7 Minimum Passenger and Utility Car Equipment

Passenger and utility cars shall, as a minimum, be equipped as described below.

3.7.1 Access at Halts without Platforms

Innovative designs facilitating access at halts with no platforms shall be considered. Also refer to Section 3.8.

3.7.2 Heating and Air-Conditioning

- All cars shall be equipped with heating and air conditioning systems.
- Sitter car heating and air conditioning shall be centrally controlled by the train steward. Access to the central control unit shall be restricted.
- Heating and air conditioning in sleeper car compartments shall be individually controlled.
- The heating and air conditioning system shall be self contained, roof mounted and easily removable by maintenance personnel. The system shall be according to international best practice.

3.7.3 Head Room

- Floor to ceiling headroom at any position within the passenger saloon shall provide adequate clearance according to ergonomic principles consistent with the vehicle gauge.

3.7.3 Side Doors and Gangway Doors

- In-swinging or sliding side doors for passenger access/egress shall be provided at each end of the car.
- Lockable, slam-lock gangway doors shall be provided.
- Special care shall be given to access/egress and inter-vehicle access requirements of Special Needs Passengers without the need for specialised design or adaptation of passenger areas.

3.7.4 Gangways

- Gangways shall provide safe passage between cars.
- Proposals for the provision of completely sealed off, easy engaging / operated gangway enclosures shall be required.
- Gangway enclosures shall be tamper proof and vandal resistant.

3.7.5 Windows

- The base specification shall include vandal proof opening windows. A manually operated lock shall be fitted to each window.
- Windows shall provide good visibility. The window size must provide adequate natural light in all passenger and utility cars.
- Windows shall be fitted with blinds.
- Windows shall be of robust construction and vandal proof as far as is practical.
- Fitment shall be tamper proof allowing removal by maintenance personnel only.

3.7.6 Interior Lighting

- Ceiling mounted fluorescent lighting shall be provided and laid out to give an even illumination of passenger and utility car interiors.
- The use of suitable long life low energy LED type lighting shall be considered for as many applications as possible.
- Lighting arrangement shall be consistent with international best practice and norms for long distance style passenger rolling stock.
- Light fittings shall be of robust construction, fully rustproof and designed for ease of inspection and maintenance by maintenance personnel.

3.7.7 Passenger Information, Communication and Entertainment

Proposals for an integrated passenger information, communication and entertainment system shall be required. The system is envisioned to provide:

- “Next Station” announcements
- On-board announcements / travel information
- Video / music entertainment (similar to aircraft onboard systems)
- Help Points shall be provided enabling passengers to contact a person of authority in an emergency situation e.g. security or passenger illness
- A costed option for the supply of CCTV in cars shall be provided

3.7.8 General

220V power outlets shall be provided in sitter, sleeper and dining cars (for operating shavers, etc.). Proposals for load control shall be required.

3.8 Special Needs Passengers

Universal train access compliant with South African legislation and policies shall be provided for Special Needs Passengers [iv]. Special care shall be given to the layout, without the need for specialised design or adaptation, of commuter areas and equipment with respect to the requirement of special needs passengers.

The following shall be incorporated:

- Access for passengers using wheelchairs (certain vehicles shall be fitted with a storable, lockable ramp to facilitate wheelchair access where vehicle floors and platform heights are not level. These vehicles are to be distinguishable from other vehicles)
- Features to aid people with difficulties in walking, gripping, reaching or balancing (including non-slip surfaces, handrails and handholds)
- Facilities to assist blind and partially sighted people
- Facilities for people who are deaf or hard of hearing

Proposals for the supply of a medical emergency facility and the integration thereof on passenger or utility cars shall be required.

4 Minimum engineering requirement

This section describes the minimum engineering requirement of passenger and utility cars. Where not specified, proposals shall include service proven designs, sub-systems and components to international norms and standards.

4.1 Crash Safety

Passenger and utility cars shall be of adequate design and construction to:

- Withstand in-service collisions associated with rough shunting without any damage
- Ensure the integrity of the passenger compartment in the case of a collision with a locomotive or goods vehicle.
- Be in line with accepted European or American norms and guidelines including energy management / dissipation of kinetic energy.

4.2 Braking System

- A pneumatic braking system of service proven design providing optimum braking performance shall be fitted on all passenger and utility cars.
- The braking system design shall incorporate simplicity, reliability and maintainability.
- A mechanical spring loaded parking brake shall be provided on each passenger and utility car.

4.3 Drawgear and Couplers

- Drawgear shall be able to absorb maximum buffing and pulling forces imposed under all operating conditions throughout the train.
- Couplers shall be compatible with existing locomotives (see Network Information and Infrastructure Interfaces for further information).

4.4 Bogies

- Bogies shall be fabricated to internationally accepted standards and service proven designs. Self-levelling air suspension bogies shall be provided. The train floor level shall be maintained at all loading conditions.
- Dimensions and suspension design shall ensure that the vehicle body and equipment remain within the permanent way structure gauge at all times.
- Adequate provision shall be made to facilitate maintenance activities.

- Provision shall be made to prevent bogie / body separation in the event of a derailment.
- Bogies shall provide optimal performance in respect of tangent track stability at operating speed, curving, crush loading conditions and ride quality.

4.5 Maintainability

- Rolling stock must be designed with ease of maintenance in mind.
- All equipment that has a maintenance requirement must be readily accessible and easily exchangeable.
- Rolling stock must interface with the dedicated depot “Shore Supply” system.

4.6 Cleanability

- Rolling stock interiors and exteriors shall be designed and manufactured to be easily cleaned.
- Light and regular cleaning shall be done with automated external washing plants.

4.7 Resistance to Vandalism

Passenger and utility cars must be designed and manufactured to be vandal resistant and minimise the effect and repair costs of any incidents of vandalism.

4.8 Fire and Emergency Equipment

- The design of passenger and utility cars shall incorporate provision for the operator to mount fire extinguishing equipment in each car.
- Accessibility of this equipment shall prevent misuse and be adequately protected against impacts / hazards associated with normal operating conditions.

4.9 Vermin

Rolling stock must be designed to prevent damage arising from vermin.

5 Legislation and standards

5.1 Noise Regulation

The external and internal noise generated by rolling stock under all conditions must comply with noise levels specified by South African standards or in the absence thereof, relevant International standards [v].

5.2 Safety Regulation

All design, construction and commissioning life cycle requirements for engineering and operating systems shall be done in accordance with the National Railway Safety Regulator Act 16 of 2002 (as amended) [vi] and relevant standards as well as the Occupational Health and Safety Act 85 of 1996 [vii].

5.3 Quality

Preference shall be given to manufacturers whom have implemented a recognised quality management system. The accepted quality system in South Africa is with ISO 9001:2000, ISO 9001:2008 and ISO 14000.

6 References

- i. PRASA Corporate Plan, 25/02/2010
- ii. Funding Motivation for The Acquisition of New Railway Rolling Stock for Shosholoza Meyl Operations, July 2010
- iii. Network Information and Infrastructure Interface Report, March 2011
- iv. Design Guidelines to Improve Accessibility of Commuter Rail in South Africa, SARCC, April 2008
- v. Noise Control Regulations in Terms of Section 25 of the Environment Conservation Act, Act 73 of 1989, Department of Environmental Affairs, GNR 154 of January 1992
- vi. National Safety Regulator Act, No. 16 of 2002 (as amended)
- vii. Occupational Health and Safety Act, No. 85 of 1993