TECHNICAL SPECIFICATION

REQUIREMENTS FOR REFURBISHMENT/UPGRADE OF AIRCONDITIONING UNITS ON

BLUE TRAIN SETS

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Product Development (Coaches)

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CHANGE CONTROL

Control	Name and Designation	Signature	Date
Compiled & Reviewed	Jacques Posthumus Senior Engineer Product Development Coaches		22/07/2016.
Approved	Daniel Kraal Act. Principal Engineer Product Development Coaches		07/10/16

LIST OF REVISIONS

Rev	Date	Name	Modification

DISTRIBUTION LIST

Name	Email	Company
Sugen Govender	Sugen.Govender2@transnet.net	Transnet Engineering
Daniel Kraal	Daniel.Kraal@transnet.net	Transnet Engineering
Jacques Posthumus	Jacques.Posthumus@transnet.net	Transnet Engineering
Gordon Westwood	Gordon.Westwood2@transnet.net	Transnet Engineering
Albert van der Westhuizen	Albert.vanderWesthuizen@transnet.net	Transnet Engineering
Jan Corna	Jan.Corna@transnet.net	Transnet Engineering
Douw White	Douw.White@transnet.net	Transnet Engineering
Dawie Coetzee	Dawie.Coetzee@transnet.net	Transnet Engineering
Deon Lotter	Deon.Lotter2@transnet.net	Transnet Engineering

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1.0 SCOPE

1.1 This specification covers the requirement for the refurbishment/upgrade of four (4) Luxury accommodation coaches on both Blue Train sets i.e. two coaches on the short train (750) and two on the long train (751).

1.2 The refurbishment/upgrade will include but is not limited to:

1.2.1 New refurbished/upgraded system for three compartments and corridor per coach
1.2.2 New refurbished/upgraded system for the water chilling system
1.2.3 New compartment heat exchangers with associated valves, electric fans and heaters.
1.2.4 New chiller and associated water pumps.
1.2.5 New condenser and compressor.
1.2.6 New fresh air fans

Important to note is that equipment that are removed from the coaches must be stored and used for spares on the coaches still in service fitted with this type of equipment.

2.0 STANDARDS

2.1 In addition to SANS air conditioning specifications / codes of practice, the following standards are applicable to this specification:
BS EN 60085
SANS 60034

2.2 Tenderers shall ensure that they are in possession of the latest issue of the above mentioned standards or those that supercede them.

3.0 COMPLIANCE

3.1 Except where otherwise provided for in this specification, all equipment offered shall comply with the requirements of the relevant standard specification of the South African National Standards if published,

otherwise with the relevant standard of the British Standards institution in force at the time of tendering.

3.2 Where equipment offered complies with the recognized standard of the country of manufacture and not specifically with standards required by this specification, such equipment will be considered at the discretion of the Transnet Engineering. In this case tenderers shall state fully all respects in which the equipment offered departs from the standard laid down in this specification.

3.3 The tenderer must indicate, clause by clause, either that his tender complies in every respect with this specification or, if not, precisely how it differs from the specification. Alternative quotations may be submitted but all deviations from this specification must be clearly stated. A broad statement that the equipment is in accordance with the specification is not acceptable. Failure to comply with these requirements may preclude a tender from consideration.

4.0 TECHNICAL DATA SHEET

4.1 The technical data sheet forming Annexure A to this specification must be completed fully by the tenderer.

4.2 The heating and cooling load calculations must accompany this data sheet.

4.3 Failure to submit this data sheet and calculations may preclude a tenderer from consideration.

5.0 OPERATING ENVIRONMENT

5.1 Ambient temperatures encountered may range from minus 10º C to plus 45º C dry bulb, with relative humidity varying from 15% to 86%.

5.2 The range of altitude varies from sea level to 2 000 metres above sea level.

5.3 General atmospheric conditions will range from heavily saline to dry and dusty.

5.4 The contractor must note that acceleration forces in a train can be high. These accelerations can be caused by shunting or in during train dynamics. Tenderers shall clearly indicate what precautions they would take to prevent or minimise risk of failures caused by such accelerations.

Longitudinal	2g
Lateral	1g
Vertical	1,5g

5.5 The contractor must understand that the air conditioning system will be mounted on a passenger coach that will be moving at 100 km/h and the condenser will be exposed to all the elements on the underframe of the coach.

6.0 TESTS

6.1 After installation of the equipment, the successful tenderer in conjunction with Transnet Engineering will be required to run each air-conditioning unit continuously for a period of at least 12 hours to check that all equipment is functioning correctly. This test will be done at the tenderers premises as well as on the coach.

6.2 All protection shall be checked on the units before handing over to the Administration.

6.3 A suitable itemized commissioning sheet shall be drawn up for prior approval by Transnet Engineering and a certified copy submitted to Transnet Engineering for each unit supplied.

7.0 INSPECTION

7.1.1 Transnet Engineering reserves the right to inspect the equipment at any stage during manufacture and on completion thereof.

8.0 PACKING

8.1 The equipment shall be packed in such a manner that it will be adequately protected during handling and transport by road and rail and sea where applicable.

9.0 GENERAL REQUIREMENTS

9.1 Available power supply is 230/400 V 50 Hz AC. Units operating from 3 phase 400 V AC will be preferred. The power supply is derived from diesel powered generating sets and tenderers must indicate suitability and / or precautions to be taken with this type of supply.

9.2 The cooling capacity of the current system must be revisited to ensure that the correct sized units are offered.

9.3 The current system is a water chiller system with a condenser, chiller, water plant, compressor and control equipment mounted in a cradle on the under frame of the coach. The cradle dimensions (footprint) cannot be altered as it fits amongst other components on the under frame.

9.4 The controls of the air conditioning units will be such that when all power is removed from the units and are then re- applied the air-conditioning must retain the last setting. The air-conditioning must start-up automatically when power is applied to the coach.

9.5 The coach interior is equipped with 4 (luxury) evaporator/heat exchanger units. Each of these units operates independently from each other and provides a temperature range of 16°C - 26°C in each compartment. The corridor is also air-conditioned at the same temperature range.

9.6 The refurbishment/upgrade to be done in conjunction with Transnet Engineering. The final placement of components should take cognizance

of the fact that **all** pieces of equipment must be readily accessible for maintenance purposes.

9.7 **Accommodation coaches (compartments):**

The conditioned air will be routed into the compartments via existing ducting systems that are located in the compartment roof. The inlet and return air louvres are located in the compartment with a louvered door between the compartment and the en-suite bathroom ensuring that the conditioned air is distributed evenly. The evaporator is located in the roof above the shower stall and is equipped with heating elements to provide the required temperature. The temperature and fan speed is selected via controls in the compartment. The temperature set point must be indicated via a LED/LCD display.

9.8 **Accommodation coaches (corridor):**
The conditioned air is provided to the corridor via an existing ducting system running above the luggage racks in the roof with four (4) outlets. The return air louvre is situated in the vestibule area at number 1 end of the coach. The corridor conditioned air also enters the Butler compartment through a door louvre to distribute the air evenly.

9.9 Accessibility, ease of maintenance and simplicity of control and operation are the essential requirements of the equipment.

9.10 The equipment shall be of proven design.

9.11 All the equipment shall be dust proof and watertight, especially the equipment to be mounted on the underframe.

9.12 It is essential that all equipment be as silent as possible in operation and silent block mountings and sound insulating material must be used throughout to attain this, in particular in regard to condenser and air circulating fans. Ambient plus air conditioner equipment noise should not exceed 70 db.

9.13 Since the coaches are fitted with double glazed non-opening windows in the compartments as well as in the corridor the provision of fresh air required. It must also be noted that coaches are coupled with a

continuous corridor without inter-leading doors therefore adjacent coaches influence each other's corridor temperatures.

10.0 INTERIOR CONDITIONS

10.1 Conditions inside the compartments areas are to be maintained within the limits of 16°C and 26°C. The conditioned air is heated with elements to reach the upper temperature level. Precaution must be taken to ensure that heating elements can only operate with adequate air flow over them. Heating elements operating in still air will heat the surrounding area quickly and can cause a fire.

11. AIR CONDITIONING EQUIPMENT

11.1 The equipment shall be adequately rated and matched to maintain the conditions specified elsewhere in this specification with a reasonable ratio of "ON" to "OFF" cycle.

11.2 All equipment must be particularly robust to withstand severe shocks. All "plug in" components will have some form of retaining clip or bracket to prevent it from working loose due to vibration.

11.3 The condenser will be air cooled only.

11.4 The compressor shall be of rugged design suitable for transport operation; tenderers shall give a full description of the design and construction.

11.5 Tenderers shall state what precautions have been taken against liquid "slugging" and how oil separation is achieved in the system.

11.6 Liquid and oil level indicators with adequate sight glasses shall be provided in this case of a customized built air conditioner system.

11.7 The evaporator shall be a complete unit with main air-circulating fan, motor, cooling coils and heating elements.

11.8 A suitable drained condensate pan shall be provided, insulated and waterproofed and easily accessible for inspection purposes. The pan will have two outlet pipes on opposite sides that will extend to lower than the sole bar on either side of the coach. These drain pipes will have a diameter of at least 25mm and will have no sharp bends.

N.B. The drain pan will have a sufficient depth, so that when installed and the coach is canted to an angle of 5 degrees to the sides or length wise, the condensed water will not spill over the sides of the drip pan. The supplier must provide witnessed evidence that his product conforms to this requirement.

11.9 The main supply fan shall be suitable for silent operation.

11.10 High - and low pressure switches, shall be provided in the case of a customized air conditioner system. The settings of the cut-out switches shall be adjustable. Hi-Lo pressure switches shall be dust proof and watertight.

11.13 The refrigerant shall preferably be 134A or better.

11.14 Filters:

11.14.1 Filters shall be provided for recirculated air and fresh air.

11.14.2 A removable filter or filter element shall be provided that can be easily cleaned.

11.15 Valves and accessories:

11.15.1 Where solenoid liquid or hot gas line valves are employed, the piston type will be preferred. The diaphragm type will not be accepted.

11.15.2 The expansion valve shall be of the thermostatic type.

11.16 Control panel:

11.16.1 The controls for each air conditioning unit will be of the wired type, permanently mounted, preferably in a flush enclosure with a “coach key” lock. (Transnet Engineering will advise). Wireless remote controls will not be accepted. Also see item 9.7 above.

11.16.2 All circuits shall be protected by suitably rated circuit breakers.

11.16.3 All the switchboard equipment, such as circuit breakers and switches etc. shall be easily accessible by technicians for adjustment.

11.16.4 On removing this cover or opening of door panel, all wiring and connections are to be exposed to allow removal of individual faulty components from the front end without disturbing the rest of the equipment.

11.16.5 The air-conditioning control panel shall have its independent main circuit breaker with suitable electrical protection.

11.16.6 The air conditioning control panel shall be clearly marked.

11.16.7 All marking shall be done by means of engraving and sandwich board or similar and shall be permanently secured by means of nickel plated self tapping screws. The use of Dyna tape is not acceptable.

11.16.8 All notices and component description are to be in English.

11.16.9 Indicator lights shall be provided.

11.17 Heating:

11.17.1 Heating shall be accomplished with heating elements situated near the evaporator.

11.17.2 Tenderers shall give full details of the heating system.

11.18 Thermostat:

11.18.1 The temperature control thermostat shall be of the infinitely variable heavy duty industrial type. The bulb and capillary tube power unit is preferred, but other types may be offered. This unit to be located such that it can only be adjusted by technical service staff.

12 POWER CONSUMPTION

12.1 The starting and running current of each unit in cooling and heating mode will be stated as well as the voltage rating and tolerance.

13.0 AIR DUCTS

13.1 The ducting is already installed in each coach. The ducting must be inspected to ensure serviceability.

14.0 AIR DISTRIBUTION

14.1 Diffusers shall be fixed to the ducts by means of collars and provided with guide vanes to ensure uniform air distribution over the face of the diffuser. Diffusers could be according to the tenders design, old diffusers are not necessarily to be re-used.

15.0 SPARES

15.1 The successful tenderer will be required to carry stock in the Republic of South Africa for sufficient spares for the equipment offered and to supply such spares as and when ordered by Transnet Engineering.

15.2 Tenderers shall give an assurance at the time of tendering that they can comply with clause 15.1

15.3 Tenderers shall submit a detailed list giving descriptions, catalogue numbers, quantities and prices per each for recommended spares which they consider should be held by Transnet Engineering.

15.4 The recommended spares shall include sets of any special tools required. These shall be detailed.

16.0 INSTRUCTION BOOKS

16.1 The successful tenderer will be required to supply as part of the contract 3 copies of each of the following manuals or books directly applicable to the air-conditioning equipment supplied:

Maintenance and Operating manuals containing the following information:

a. General Data.
b. General description of all equipment, gauges, instruments and devices.
c. Preparation for operation
d. Operating procedure.
e. General Maintenance Data.
f. Detailed instructions for the periodical checking and adjusting of any equipment.

Any other information which the contractor consider essential for proper functioning and maintenance of the equipment supplied.

16.2 **Workshop manual** containing the following information:

General data

General description of all equipment gauges, instruments and devices.

Detailed instructions for stripping, overhaul, assembly and final adjustment or testing of individual equipment

Detailed Instructions concerning the use of any special tooling or equipment for stripping, maintaining and testing of any equipment supplied.

Schedule of wear limits (where applicable) and detailed life limits of any equipment supplied.

Any other information which the contractor considers essential for the proper stripping, overhaul, assembly, adjustment and testing of the equipment supplied.

16.3 **Parts list** catalogues made up, if found convenient of separate publications for each of the component assemblies and indicating the following:

a. Catalogue item number for each and every part.
b. Full description of each and every part.
c. Any other information which the contractor considers essential for the purpose of identifying the component part.

16.4 Each manual and/or catalogue shall be neatly bound in hard serviceable covers on which the volume and title are printed.

16.5 All information in the manuals and/or catalogues shall be given in a clear legible manner, and the paper used shall be of good quality and glossy finish to ensure frequent use without rapid deterioration.

ANNEXURE A
TECHNICAL DATA SHEET

(To be completed by tenderers)

1.0 TECHNICAL DATA

1.1 Tenderers shall furnish in full the information required per clauses.

1.2 Compressor and Condenser:

1.2.1 Make of compressor:

_____

1.2.2 Compressor type and model:

_____

1.2.3 Number of cylinders:

_____

1.2.4 Electrical supply voltage _____

1.2.5 Compressor speed in RPM :

_____

1.2.6 Type and charge of refrigerant in kg :

_____

1.2.7 Oil charge (compressor) :

_____

1.2.8 Type of capacity control :

_____

1.2.9 Material and construction of condenser coils : _____

_____

1.2.10 Electrical power absorbed by the compressor:
_____ kW

1.2.11 Normal capacity of condenser:
_____kW

12.12 Condenser fan

1.2.12.1 Type and make :
_____

1.2.12.2 Power:
_____kW

1.2.12.3 Speed in RPM:
_____

1.2.12.4 Type of bearings:
_____

1.2.12.5 Supply voltage:
_____

1.2.12.6 Type of enclosure :
_____

1.2.13 Evaporator

1.2.13.1 Make and type number:
_____

1.2.13.2 Overall coil dimensions:
_____

1.2.13.2 Material and construction of coils :
_____

1.2.13.4 Type and make of refrigerant control :
_____

1.2.13.5 Fan capacity:

_____

1.2.13.6 Fan characteristic curve :

_____

1.2.13.7 Size of outlets to ducting :

_____

1.2.13.8 Outlet velocity of air:

_____

1.3 Control Equipment Thermostat:

1.3.1 Type:

_____

1.3.2 Make:

_____

1.3.3 Model number:

_____

1.3.4 Range:_____

1.3.5 Differential:

_____

1.4 Power requirements:

1.4.1 Starting current:

_____

1.4.2 Running current:

_____

1.5 Capacity:

1.5.1 The cooling and heating capacity to be stated: Cooling _____Heating _____

1.6 Mass:

1.6.1 Tenderers shall state the mass in kg of major component parts of the air-conditioning unit.

_____

Tenderer (Print):_____

Tenderer signature: _____

Date: _____