TECHNICAL SPECIFICATION

SUBJECT : GRADER INDUSTRIAL EQUIPMENT

DOCUMENT NO : TPT – TS – GIE

REV NO : 00

DATE : September 2024

1 Contents

1. Description of the *Goods*

1.1 Background

The Grader Machine shall be utilised to clear roads, storage areas, rehabilitate roads, storage areas such as and similar within the Port Terminal environment and contain and dispose at approved sites / areas. The Super Grader Machine shall be capable of operating efficiently in harsh terrain i.e. potholes, uneven surfaces, water drenched roads, etc.

The machine shall be fitted with a powered steering system capable of making quick, easy turns (minimal turning radius) ensuring that operate close to obstacles and curbs is achieved without damaging the tyres and equipment.

The Grader machine shall be supplied complete and fully assembled in all respects, including standard equipment supplied by the manufacturer and shall comply with the South African Occupational Health and Safety Act, Act 85 of 1993/as amended or equivalent international standard such as ISO, DIN, etc.

The spillages, cargo storage and road transport operations generate an essential need of grader machine to reclaim cargo road repairs cargo storage etc.

1.2 Specific Requirements

1.2.1 In order to achieve the objectives of the Grader Equipment Project the following is the detailed scope of work to:

1.2.1.1 The Grader machine must be designed to operate in a coastal corrosive environment, under heavy dust laden conditions, suitable for the handling of coarse, abrasive material, sludge, slurries and be able to operate on any floor surface.

1.2.1.2 Engine safety should be Low oil pressure, electronic engine control and system monitoring.

1.2.1.3 The grader must deliver maximum productivity and durability. The engine, direct-drive power shift transmission and load sensing hydraulics work together ensuring the power and precision required.

1.2.1.4 Road maintenance: reshaping the roads to maintain and restore the surface to a reusable road.

1.2.1.5 Site preparation: the grader must be to cut material and move material within the operational areas and interlinking roads for cargo reclaiming or cargo storage and construction purposes.

1.2.1.6 Grader finishing: the machine must be able to prepare road or site surface for laying down stelcon paving's and other constructive activities.

1.2.1.7 Hauling roads maintenance: the grader will reshape, restore the interconnected hauling roads for smooth travelling surfaces for an equipment. The grader is required to provide a travelling surface that will be safe and efficient for the movement of haulers trucks and light motor vehicles.

1.3 Ergonomics

1.3.1 Operator's Cabin

1.3.1.1 The driver's cabin shall be ergonomically designed to ensure that visibility, safety and comfort is not compromised. The cabin must be fitted with side and rear mirrors that are suitably positioned for maximum visibility.

1.3.1.2 The cabin shall be fitted with a comfortable, full suspension, fully adjustable, sprung type seat, in accordance with EN 13059, complete with arm rests and seat belt, upholstered with a good quality material, and ensuring easy reach of controls and instrumentation.

1.3.1.3 The machine shall be fitted with a locally supported air-conditioning system, with spares available locally. Ambient temperatures encountered may range from 0º C to +45º C dry bulb, with relative humidity varying from 15% to 100%. Accessibility to all parts of the air-conditioner, ease of maintenance and simplicity of control and operation are essential.

1.3.1.4 When operator's cabin door/s is left open the air-conditioner shall switch off after a predetermined time lapse. (Supplier to indicate the time period.)

1.3.1.5 The air-conditioner shall have a heavy-duty air filter due to harsh working condition in in a bulk or multi-purpose terminal.

2. Technical Requirements

2.1 Chassis

2.2.1 The machine shall be constructed with a heavy-duty, low maintenance chassis.

2.3 Diesel Engine and Transmission

2.3.1 Engines shall be robust and have sufficient power for the duty required.

2.3.2 The engine shall be easily accessible for maintenance purposes.

2.3.3 The truck speed shall not exceed forty kilometres an hour set on request due to limitations inside the port.

2.3.4 An efficient three-stage dry type air cleaner (stage 1 - spinner, stage 2 - centrifugal, stage 3 - dry element) shall be fitted.

2.3.5 The exhaust shall be sufficiently silenced in such a manner as not to adversely affect the engine performance to any great extend and shall be reasonably positioned.

2.3.6 A full-length stainless-steel exhaust shall be fitted.

2.3.7 The exhaust outlet must be bottom mounted to prevent the ingress of water under any operational or non-operational conditions.

2.3.8 The outlet manifold must be protected by a heat shield if exposed when the engine compartment is opened.

2.3.9 An efficient pressure fed engine lubrication system is required and shall incorporate an external oil filter of the full flow type, utilising elements of the replaceable cartridge type.

2.3.10 The cooling system shall be filled with a coolant mixture which complies with the engine manufacturer's specifications.

2.3.11 An engine monitor and cut-out system shall be fitted to protect the engine from overheating, low oil pressure and over revving under no load conditions.

2.3.12 The following functions shall be monitored: water temperature, water level and oil pressure.

2.3.13 The engine shall be fitted with an Electronic Management System (EMS), which shall also allow for shutting the engine down when the seat is not occupied for a predetermined time lapse. (Supplier to indicate the time period. However, facility must be available to allow Purchaser to adjust time.)

2.3.14 The engine shall comply with the euro standards with regard to emissions as well as be compatible to the fuel quality standard available in South Africa.

2.3.15 An automatic transmission shall be fitted in alliance with power output on engine.

2.3.16 A PTO failsafe system shall be used due to accommodate water cannon and dust suppression operation.

2.4 Brake system

2.4.1 The machine shall be equipped with hydraulic actuated brake system as per OEM specifications.

2.4.2 The brake system shall be meet ISO 3450-2011 standards.

2.4.3 As well as a secondary brake that is a dual circuit control system that applies two service brakes.

2.5 Tyres and rims

2.5.1 The machine shall be supplied with heavy duty pneumatic tyres.

2.5.2 Tyres manufactured in the Republic of South Africa or standard tyres which are readily available in South Africa must be supplied.

2.5.3 Tyres and rims must conform to the standards as laid down in ERTO or S.A.N.S. ARP 007 and ARP 008 and shall be of an approved brand.

2.5.4 The wheels shall not foul or touch the chassis at maximum oscillation.

2.5.5 Wheel nut position indicators shall be provided for all wheel nuts.

2.6 Electrical system

2.6.1 All electrical lights must be capable of effective visibility and functionality in extreme operating conditions such as rain, fog and mist.

2.6.2 A warning horn and reverse buzzer shall be fitted and shall be in the range of 80 - 85 decibels.

2.6.3 The machine shall be fitted with the following minimum lighting system:

- 2 x LED headlamps
- 2 x LED taillights
- 2 x LED stop lights
- 6 x LED Working lights (Two front and two rear)
- 2 x LED front and 2 x LED rear direction indicator lights
- 2 x LED reverse lights coupled to an automatic reverse warning sound mechanism.
- 2 x Amber strobe lights shall be fitted in such a manner as to not hinder the operator (front and rear).

2.6.4 All electric wiring must be colour coded, numbered, grommeted, sleeved, trunked and securely. clamped.

2.6.5 Wire numbers to be carried through into the schematic diagrams and detailed drawings.

2.6.6 Referenced specifications for electrical:

- SABS 1376 Parts 1, 2 and 3 (Lights for motor vehicles)
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2.7 Painting

2.7.1 The machine shall be painted in accordance with Specification EEAM-Q-008 (Corrosion Protection).

2.7.2 The manufacturer's standard painting procedure can be used if it is equivalent or better than that called for above and has been approved by the Supply Manager.

2.7.3 The total paint dry film thickness shall not be less than 250µm.

2.7.4 The colour scheme of the Grader shall be as follows:

2.7.5 Red to colour specification RAL 3020

2.7.6 No other colours shall be accepted.

2.7.7 Drain holes must be provided in areas where water can accumulate.

2.7.8 The paintwork shall be covered by a ten-year corrosion guarantee.

2.8 Signage and markings

2.8.1 A data plate as required by the South African Road and Traffic Act shall be fitted.

2.8.2 Durable, ultraviolet resistant and weather resistant warning signs shall be provided at all locations that impose a danger.

2.8.3 Durable, ultraviolet resistant and weather resistant information signs shall be provided to assist the driver/maintenance staff with operation/maintenance.

2.8.4 A fuse diagram shall be displayed at the fuse box.

2.8.5 The Transnet Logo (white on the red background) is to be provided on each side of the machine. (Position and size to be agreed upon.)

3. Safety and Environment

3.1 Safety Requirements

- The machine shall comply with the South African Occupational Health and Safety Act, Act 85 of 1993/as amended.
- All surfaces where operating or maintenance personnel shall tread must be laid out with non-slip material.
- Suitable fire extinguishers shall be provided.
- Fast reacting electric e-stops to be fitted where necessary.
- Walkways with harness attachment point for where working-at-heights are required.
- Detailed decals to indicate component locations.
- Warning decals where necessary

4. Maintenance

4.1 Manual lubrication

· All grease points must be clearly marked by means of a yellow circle of approximately 2,5cm in diameter.

· Grease points that are not easily reachable must be provided with a steel extension tube to an accessible position.

4.2 Accessibility

All replaceable items including (but not limited to) critical components shall be designed for easy access, removal and replacement.

5. General

5.1 The machine and all components fitted shall be new.

5.2 All components shall be installed and fitted according to the manufacturer's specifications and recommendations.

5.3 All electrical and mechanical components shall have been tested for reliability and extended lifetime in the conditions to be expected.

5.4 The machine will only travel within the boundary of the port, and it shall comply with the requirements of The South African Road Traffic Act, where applicable.

5.5 The Grader must be designed for all parts and components to be easily assembled, adjusted and removed.

5.6 The machine must be supplied with detailed maintenance, operating, training and spares manuals (in English), including technical data for each spare, as well as general arrangement drawings and a bill of materials. Maintenance manuals to have sufficient information to allow terminal to capture maintenance schedules in terms of inspections, servicing and replacement of parts. Three hardcopies and two electronic copies of the operating, maintenance, training and spare parts manuals shall be provided, as well as a training manual for each trainee.

6. Referenced Specifications

6.1 Standard specifications

The following, not necessarily comprehensive, list of standard specifications is relevant:
ANSI/AWS D1.1 Structural Welding Code - Steel
BS-EN 287 Part 1 Approval testing of welders/fusion welding
BS-EN 288 Part 3 Specification and approval of welding procedures for metallic materials
BS 5135 Metal arc welding of carbon and carbon manganese steels
BS 3923 Methods for ultrasonic examination of welds
BS 2600 Radiographic examination of fusion welded butt joints in steel
BS 5493 Code of practice for protective coating of iron and steel structures against corrosion
DIN 1026 Metric channels
ISO R657 Angles
SANS 135 ISO metric bolts, screws and nuts (hexagon and square) (coarse thread, free fit series)
SANS 136 ISO metric precision hexagon-head bolts and screws, and hexagon nuts (coarse thread medium fit series)
SANS 064 Preparation of steel surfaces for coating
SANS 763 Hot-dip (galvanized) zinc coatings
SANS 1091 National colour standards for paint
SANS 1431 Weldable structural steels
SNS 1376 Parts 1, 2 & 3 Lights for motor vehicles
SABS 1327: 1981 Electrical connectors for towing and towed vehicles
SANS 1207 & SANS SV 1051 Braking
Regardless of which specifications are actually worked to when manufacturing Plant and Materials, such Plant and Materials shall be capable of satisfactorily passing all tests laid down in the standard specifications called for.

7. Employer specifications

The following Employer specifications are relevant:
EEAM-Q-004 Gearing, shafts, bearings, brakes, lubrication, vee-belts, keys and keyways
EEAM-Q-006 Structural steelwork
EEAM-Q-008 Corrosion protection
EEAM-Q-009 Quality Management