



A Division of Transnet SOC Limited

## CONTAINER AND AUTOMOTIVE BUSINESS

### SPECIFICATION

## REACH STACKER SPECIFICATION FOR TFR CAB TERMINALS

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## **1. Scope**

This specification is for a diesel engine driven reach stacker with hydraulically actuated lifting that will be utilised for the handling of ISO standard 20 and 40 foot containers, as well as damaged and out of gauge containers.

The reach stackers shall be suitable for stacking, rail / stack-yard transfer of containers, in a container / break bulk terminal configured for various types of operations.

The reach stacker 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 for mobile lifting equipment such as ISO, DIN, etc.

The reach stacker shall be able to negotiate speed bumps and full oscillation of the rear axle is required to allow for working on uneven surfaces.

## **2. Operational Requirements**

### **2.1 Equipment Design and Characteristics**

2.1.1 In terms of stacking capability, the reach stacker must be capable of stacking single lift with a minimum stacking height of 5 high, 9 ft 6” containers (first 2 rows and 4 high in the 3<sup>rd</sup> row). The reach stacker shall be capable of the following minimum load at respective reaches:

SWL = 45 000 kg @ 1st reach, i.e. 2000 mm from front of front tyre

SWL = 35 000 kg @ 2nd reach, i.e. 3850 mm from front of front tyre

SWL = 19 000 kg @ 3rd reach, i.e. 6400 mm from front of front tyre.

### **2.2 Ergonomics**

#### **2.2.1 Operator's Cab**

2.2.1.1 A fully enclosed, centre mounted cab with a sky view window, which is ergonomically designed, well insulated and weather proof, providing maximum drivers visibility and comfort is required.

2.2.1.2 Build-in retractable sunshades must be available for the 2x side windows as well as sky view window. These sunshades must fully close and when fully opened, must cover the entire window.

2.2.1.3 A comfortable, fully adjustable (height, forward and back, and tilt), spring type seat, in accordance with EN 13059, complete with retractable arm rests on left and right of drivers seat, seat belt, head rest, and upholstered with a good quality material shall be fitted. Seat must have a 'dead-mans switch' which ensures that no motion is possible unless the seat is occupied.

2.2.1.4 The boom and attachments shall be operated from a multi-function joystick.

2.2.1.5 The noise inside the cab shall not exceed 65 dB.

2.2.1.6 All glass shall be tinted heat-treated toughened safety or toughened laminated glass.

2.2.1.7 Electric windscreen wipers and windscreen washers shall be provided on the front, rear and top windows.

2.2.1.8 Sliding side windows are required, lockable in the open and closed positions.

2.2.1.9 The cab doors, one on each side, must be hinged type, locked in the closed position, and equipped with a stay to hold it in the open position and must be lockable with a key to open.

2.2.1.10 An interior light must be fitted.

2.2.1.11 The operators cab shall be air-conditioned as per the requirements of section 3.1.13.

2.2.1.12 Bolt on wide view mirrors must be fitted on both sides of the cab.

2.2.1.13 A demister/heater, in addition to an air conditioner, with a minimum two speed blower shall be supplied.

2.2.1.14 The cab shall be equipped with a monitor which is connected to a camera which will provide the driver with a view of the area behind the machine.

2.2.1.15 Steering wheel must be fully adjustable, i.e. forward, back, up, down.

2.2.1.16 The cab shall be fitted with a camera which will start automatically recording once the reach stacker is started, and stop operating once the reach stacker is switched off. The camera must record at a minimum resolution of 720p, must be positioned so that it can record the driver, display screen as well as the container that is being handled. Video must be time stamped. On board storage must be available capable of storing a minimum of 500 hours of video. Transfer of recorded video must be easily assessable and by means of USB connection. Video must be stored in a format that is easily playable eg. MP4, MPEG, mkv.

### **3. Technical Requirements**

#### **3.1. Chassis**

3.1.1 A steel chassis is required.

3.1.2 Lifting/towing points must be positioned on the unit and available in the minimum as follows:

- 2x in the rear
- 2x in the front
- 2x on the spreader

#### **3.2 Engine**

3.2.1 Engines shall be robust, four stroke diesel, liquid cooled and have sufficient power for the duty required.

3.2.2 The air cleaning system (cyclone or similar) shall be designed to prevent the ingress of dust into the engine.

3.2.3 The exhaust outlet must be of the 'goose neck' type to prevent the ingress of water under any operational or non-operational conditions.

3.2.4 The exhaust pipe and outlet manifold must be protected by a heat shield.

3.2.5 An engine management and cut-out system shall be fitted to protect the engine from over heating, low oil pressure, over revving and other abnormal conditions.

3.2.6 The engine management system shall allow for shutting the engine down, whilst ensuring that the terminal operational equipment remains operational, 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 the time period.)

3.2.7 The engine shall comply with 'EUROMOT IIIA' with regard to emission standards.

3.2.8 Ignition must be turned on by push start buttons rather than conventional keys. Individual drivers must be allocated tags which will enable the reach stacker to start.

3.2.9 Engine oil level can be viewed via a dipstick and must also be indicated on the operators dash without the use of the dipstick.

### **3.3 Transmission**

3.3.1 A fully automatic transmission is required.

3.3.2 The transmission must be fitted with a tamperproof mechanical or electronic forward/reverse protection device. It must prevent the driver from engaging reverse whilst the machine is still moving forward and vice versa.

3.3.3 Transmission oil level can be viewed via a dipstick and must also be indicated on the operators dash without the use of the dipstick.

### **3.4 Drive Axle**

3.4.1 A wide track, double reduction, heavy duty front axle is required.

3.4.2 The axle shall incorporate oil submerged wet disc brakes.

### **3.5 Rear Axle**

3.5.1 The reach stacker shall be equipped with an oscillating type rear axle.

3.5.2 The reach stacker shall be equipped with a hydrostatic power steering system.

3.5.3 A double acting steering cylinder mounted between the rear wheels shall be fitted.

3.5.4 The power steering system must be effective at engine idling speed.

### **3.6 Road Wheels**

3.6.1 Tyres manufactured in the Republic of South Africa or tyres which are readily available in South Africa shall be fitted.

3.6.2 Tyres and rims must conform to the standards as laid down in ERT0 or S.A.N.S. ARP 007 and ARP 008, and shall be of an approved brand.

3.6.3 The front and rear tyres must be the same size and ply rating, and the rims interchangeable between front and rear.

3.6.4 A tyre pressure monitoring system shall be provided.

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

### **3.7 Hydraulic System**

3.7.1 An efficient filter must be incorporated in the suction line to the hydraulic pump.

3.7.2 The oil reservoir shall be fitted with a sight glass suitable for visual inspection of the fluid level.

3.7.3 Test points for testing hydraulic pressures must be fitted. These points must be grouped together. Where possible, steel tubing, which shall be treated with suitable corrosion protection, in lieu of rubber hosing, must be used for hydraulic lines.

3.7.4 All hydraulic fittings shall be wrapped with a petrolatum impregnated tape or sprayed with a petrolatum primer to prevent corrosion.

3.7.5 A load sensing hydraulic system featuring variable displacement pump technology shall be provided.

### **3.8 Fuel Tank**

3.8.1 The tank capacity must allow for enough fuel for an eight hour shift, with a minimum tank capacity of 500L.

3.8.2 The fuel line between the tank and the fuel pump must be fitted with an in-line strainer.

3.8.3 A water trap and in-line fuel filter shall be fitted after the pump.

3.8.4 The fuel cap(s) must be lockable with an attachment to the body of the reach stacker.

3.8.5 The tank must be fitted with a lockable manual drain valve.

3.8.6 The tank must be manufactured from 500L stainless steel.

### **3.9 Electrical**

3.9.1 A 24 volt negative earth system is required.

3.9.2 An alternator (current regulator) shall be supplied.

3.9.3 Two heavy duty 12/16 volt batteries must be supplied and fitted in a suitable lockable corrosion proof battery carrier or tray. Details of battery carrier to be supplied.

3.9.4 A battery isolating switch must be fitted.

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

- 2 x headlamps
- 2 x LED tail lights
- 2 x LED stop lights
- 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 LED lights positioned on the front of the reach stacker and directed at the twistlocks of a 12m trailer.

3.9.6 In addition to the above the machine shall be fitted with working lights located in the following positions:

- One on each side of the outer boom

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- One on each side of the counterweight, to illuminate to the rear of the machine, to switch on only when reverse is engaged
  - One on each side of the spreader to illuminate the rear twist locks
  - One amber rotation light at the top of the unit

3.9.7 All electric wiring must be colour coded, numbered, grommited, sleeved, trunked and securely clamped. Wire numbers to be carried through into the schematic diagrams and detailed drawings.

3.9.8 A lockable and easily accessible fuse panel shall be supplied.

3.9.9 An electrical power take off point for boost charging the batteries shall be supplied and fitted with a two pin female receptor rated for 600V 175A . (“ANDERSON” or equivalent)

3.9.10 Electronic components must be protected from the surge in power whilst jump starting. Details of protection system used shall be furnished.

3.9.11 A spare 12 Volt connection shall be made available in the operator’s cabin for the connection of a two-way radio

3.9.12 A mounting bracket and spare 24 V connection point shall be made available in the operator’s cabin for mounting and connecting the terminal operational equipment to.

### **3.10 Boom**

3.10.1 An extra heavy duty and robust boom is required. The boom should be designed for strength, twist and stability at all heights.

3.10.2 The boom telescopic cylinder must be easily removable

3.10.3 The boom hoist cylinders are to be of robust construction.

### **3.11 Instrumentation**

3.11.1 The following instruments or gauges, amongst others, shall be fitted and these must be clearly visible to the operator at all times:

- Speedometer with odometer
- Container counter must be available which records each time a container is lifted and stores the information.
- Container weight in Kilograms which records each time a container is lifted and stores the information.
- Temperature indication for engine coolant and over heating
- Electric fuel level indication
- Engine oil pressure indication or warning light
- Engine hour meter
- A back lit instrument panel is required

3.11.2 The machine shall be equipped with a 'Load Moment' indicator system. Full details of system shall be furnished.

3.11.3 All additional instruments and gauges that will be fitted shall be listed separately.

3.11.4 Fault finding hardware and software, with output connection to a laptop computer, shall be supplied. Supplier shall load software onto client's laptop, and provide the training related to the fault finding system.

3.11.5 An override system shall be available to allow for a 110% statutory load test to be conducted.

### **3.12 Telescopic Spreader**

3.12.1 The spreader must have a lifting capacity of at least 45 000kg under the twist locks.

3.12.2 The spreader must be fitted with an integral hydraulic side shift of 800mm to either side of the centre line.

3.12.3 The spreader shall have a minimum rotation of +180° /-95 ° for full rotational ability of containers.

3.12.4 The rotation speed shall be controlled infinitely variable to maximum speed.

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3.12.5 Lateral tilting of at least 5 degrees to each side is required.

3.12.6 The spreader controls shall have an interlock to prevent the spreader colliding with the boom when rotating at steep boom angles.

3.12.7 Removable Alignment guides must be fitted to the corners nearest to the machine to guide the spreader onto the container.

3.12.8 The spreader must be fitted with hydraulically operated floating ISO twist locks at each of the four corners and suitable indicators must be fitted to indicate whether the twist locks are in the locked position. These indicators must be clearly visible from the cab.

3.12.9 All connections, i.e. electrical and hydraulic, must be of a type that can be connected with the minimum of delay. The hydraulic couplings should be of the self sealing leak proof type.

3.12.10 The spreader must be painted black to colour code RAL 9005. Yellow chevron warning markings must be fitted to the sides of the spreader.

3.12.11 The safe working load must be stamped and painted on the spreader by the manufacturer.

3.12.12 Test certificates must be supplied with the spreader, including test certificates for each of the twist locks.

3.12.13 The spreader shall be fitted with hooks at each corner for the fitting of slings with a minimum carrying capacity of 40 tons.

### **3.13 Air-conditioner**

3.13.1 Ambient temperatures encountered may range from 0° C to +45° C dry bulb, with relative humidities varying from 15% to 100%.

3.13.2 All the components must be dust proof and watertight.

3.13.3 The air must be distributed environmentally and not directly onto the driver, and must regulate the temperature between 18° C and 24° C (dry bulb).

3.13.4 Braided flexible tubing must be used to make connections to the compressor.

3.13.5 Air-conditioner shall be locally supported with spares available locally.

3.13.6 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.)

3.13.7 The air-conditioner shall have a heavy duty air filter if Reach Stacker is used in a bulk or multi-purpose terminal, and a medium duty air filter if used in a container or Ro-Ro terminal. The Supplier shall refer to the Goods Information for the terminal where the unit is intended to be used.

### **3.14 Painting**

3.14.1 The reach stacker shall be painted in accordance with Specification EEAM-Q-008 for Corrosion Protection. (The manufacturer's standard painting procedure can be used if it is equivalent or better than that called for above. Full details of these specifications and procedures shall be clearly stated if tenderer proposes to use another system, and is to be approved by Transnet.

3.14.2 The colour scheme of the vehicle shall be as follows:

- Cab painted red to colour specification RAL 3020.
- Chassis, boom and wheel rims red to colour specification RAL 3020.

3.14.3 No other colours will be accepted.

3.14.4 All joints on the chassis must be thoroughly sealed with an approved sealer to prevent rusting between mating surfaces.

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

3.14.6 All paintwork shall carry a minimum ten year warrantee against corrosion.

### **3.15 Signage and Markings**

3.15.1 A machine data plate and a load chart shall be fitted in the cab.

3.15.2 Warning stickers shall be provided at all locations on the reach stacker that impose a danger.

3.15.3 Information stickers in specific locations to assist the driver/maintenance staff with the operation/maintenance of the reach stacker shall be supplied.

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

3.15.5 Retro-reflective tape shall be fitted to both sides and the rear of the reach stacker

3.15.6 The Transnet Logo, in white, is to be provided on each side of the machine. (Position and size to be agreed.)

## **4. Safety and Environment**

### **4.1 Safety Requirements**

4.1.1 The reach stacker shall comply with the South African Occupational Health and Safety Act, Act 85 of 1993/as amended.

4.1.2 Access steps and safety handrails shall be provided on both sides of the reach stacker.

4.1.3 All surfaces where operating or maintenance personnel shall tread must be laid out with non-slip material.

4.1.4 Warning stickers shall be provided at all locations on the reach stacker that impose a danger.

4.1.5 Suitable fire extinguishers shall be provided.

4.1.6 An audible hooter shall be fitted with a minimum sound level of 93dB as per SANS 10169:2004.

4.1.7 An automatic reverse warning sound mechanism shall be fitted, and shall be in the range of 80 - 85 dB.

4.1.8 An amber strobe light shall be fitted in such a manner as to not hinder the operator.

4.1.9 The reach stacker shall be fitted with a monitoring system that will enable the unit to be started only by registered personnel by means of a tag. The monitoring system must be able to control the below aspects:

4.1.9.1. Engine protection systems including low oil pressure, low battery voltage, critical water temperature, low coolant and fuel level. Engine shut-off must be available when unit idles for 10 minutes and all lights must switch off after unit idles for 5 minutes.

4.1.9.2. Monitoring systems must include when each driver logged on and off a reach stacker, driver exceptions such as over speed, over rev, ignition left on, excess idle.

4.1.10 Emergency stop button must be available in the operators cabin which allows for the disengagement of all motions when activated.

4.1.11 Manual bypass button must be available in the operators cabin which allows for the twistlocks to be operated bypassing the indication system. The bypass must have a special key that will enable it to operate. Monitoring system must track each instance whereby the bypass button was utilised.

4.1.12 The reach stacker must be designed to operate in excessively dusty terminals and also be able to withstand uneven terrain. A dual stage air filter must be used. An indication on the operators dash must be indicated when air flow restricted, indicating blocked air filter. Warning must be given when reduced air flow and the reach stacker must shut off when air flow is critically low. Air filter must have a dust reservoir which empties by vibration as the unit operates.

## **4.2 Environmental Requirements**

### **4.2.1 The machine shall be recyclable.**

## **5. Maintenance**

### **5.1 Lubrication**

5.1.1 A list of all recommended lubricants and the associated application shall be furnished by the supplier before the machine is delivered.

5.1.2 The machine must be fitted with a centralised manual greasing system.

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

## **5.2 Accessibility**

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

## **6. General**

6.1 All components fitted and supplied shall be new.

6.2 The machine shall be to I.S.O. Metric Standards, and instrumentation gauges, dials, etc. shall be graduated in Systeme International (S.I.) units.

6.3 An automotive pedal control layout is required.

6.4 Vee-belts and pulleys shall be to an established standard.

6.5 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.

6.6 The vehicle will only travel within the boundary of the terminal; however it shall comply with the requirements of The South African Road Traffic Act where applicable.

## **7. Referenced Specifications**

### **7.1 Standard specifications**

The following, not necessarily comprehensive, list of standard specifications are relevant:

ANSI/AWS D1.1 Structural Welding Code - Steel

BS-EN 287 Part 1 Approval testing of welders/fusion welding

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BS EN ISO 15614-1:2004+A2:2012 Specification and qualification of welding procedures for metallic materials.

BS EN 1011-2:2001 Welding. Recommendations for welding of metallic materials Arc welding of ferritic steels

BS EN ISO 17640:2010 Non-destructive testing of welds. Ultrasonic testing. Techniques, testing levels, and assessment

BS EN ISO 17636-2:2013 Non-destructive testing of welds. Radiographic testing X- and gamma-ray techniques with digital detectors

BS 5493 Code of practice for protective coating of iron and steel structures against corrosion

DIN 1026 Metric channels

ISO R657 Angles

BS EN ISO 898-1:2013 Mechanical properties of fasteners made of carbon steel and alloy steel Bolts, screws and studs with specified property classes. Coarse thread and fine pitch thread

BS 3692:2001 ISO metric precision hexagon bolts, screws and nuts.

SANS 121/ISO1461 Hot-dip (galvanized) zinc coatings

SANS 1091 National colour standards for paint

SANS 1431 Weldable structural steels

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.

## **7.2 Employer specifications**

The following Employer specifications are relevant:

EEAM-Q-006 Structural steelwork

EEAM-Q-008 Corrosion protection

EEAM-Q-009 Quality Management

TPT\_TS\_RS Rev 6 – Reach Stacker Technical Specification

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