

FUNCTIONAL SPECIFICATIONS FOR CONTAINER AND PALLET TRANSPORTER (7000 KG)

1 MOBILITY

1.1 Be able to transport a full load at a creeping speed up to maximum of 5-10 kph and at a cruising speed of 25kph and able to climb a gradient of 1:20 with motion even after coming to a halt at the gradient.

1.2 Have a capacity to convey two LD1 or LD3 containers.

1.3 In case of breakdowns, have facility for towing by tractor with a draw bar pull of 2,000kg.

Recessed towing eyes to be provided at the front and the rear complete with a tow bar to be stowed on the equipment.

1.4 To have dual speed selector (Rabbit and Tortoise mode) for driving.

Lower speed at 6kmh (the engagement of tortoise speed mode shall be visible by means of an external indicator green light) and Fast speed at 25kmh.

2 STATUTORY REQUIREMENTS

2.1 The manufacturer of the unit shall be responsible for:

2.1.2 its design and structural standards by ensuring that it meets or exceeds IATA, OSHA, SAE and other relevant standards where applicable and also has all the latest safety features

2.1.3 meeting the requirements of the Singapore Aerodrome Act and the Vehicle and Equipment Construction and Use Rules

3 PLATFORM DESIGN, GUIDE RAILS AND STOPS

3.1 Front end of platform to have two full length powered rubber lagged rollers to receive and discharge weights of not more than 7,000 kg effectively.

Rear end platform to have one full length powered rubber lagged roller.

Rest of the full length powered rubber lagged rollers to be installed alternately.

3.2 All powered rollers of platform to be hot dipped galvanised of not less than 0.6mm thickness and fully rubber lagged on outer surface. End shaft should be splined type.

- 3.3 All non- powered rollers of platform to be hot dipped galvanised and of not less than 0.6mm thickness.
- 3.4 Transfer rollers to have lock collars on each ends to prevent from running from side to side during loading /unloading process.
- 3.5 Stoppers at front and rear for retention of container and pallet to be fully automated. Install warning light if stopper is unserviceable & does not affect forward & reverse equipment mobility.
- 3.6 Transfer speed of rollers to be 25 metres per minute (fast speed) and 18 metres per minute (idling speed).
- 3.7 Front & rear end of transporters to have 6 cm thickness rubber bumper Triangular Shaped. To be divided into two section.
- 3.8 Front & rear stoppers to be spring loaded self -return. Robust and heavy duty quality springs to be used.
- 3.9 Front / Rear stoppers to have safety features if the stopper is not raised the equipment can't move forward or reverse.
A bypass switch shall be installed at drivers console for NORMAL & BYPASS Mode for recovery & Long Cargo purposes.
- 3.10 All stopper brackets that protrude below the chassis are to be fitted with protection guards.
- 3.11 Drive rollers to be individually powered by hydraulic motor (chainless concept). Preferred brand for hydraulic motor is Danfoss OMR series.
- 3.12 Platform to be able to be fully lowered during driving mode to prevent premature damage to raised hydraulic cylinder. Platform to rest on stopper when fully lowered and not directly on the lift cylinder.
- 3.13 Roller flange bearings must come with good quality locking device to prevent slackening. All power rollers shaft/ motor to be spline type & not using key way type.

4 STABILITY

- 4.1 Transporter to be structurally designed to operate efficiently with no noticeable vibration and noise under all load and driving condition.

5 OPERATING SYSTEMS

5.1 Transporter to be powered by diesel engine.

Preference for Perkins engine with Euro 4 emission standard or higher as required by local Land Transport Authority at time of registration.

(Supplier to be familiar with local laws on exhaust emission as onus on them to register with LTA). With the latest emission control compliance.

5.2 Engine to incorporate use of an external expansion tank in radiator cooling system. (recycle of radiator coolant)

5.3 Engine to be equipped with safety cut-off devices (i.e. engine to shut down when low engine oil pressure and engine overheating is detected.), starter interlock, cold starting enable switch, if any, to be incorporated in electrical system.

Fuel injection pump must have fuel cut off solenoid (24V) which is removable & easy access.

5.4 Transporter should use heavy duty pneumatic tubeless tyres with appropriate suspensions system to dampen shock.

5.5 Environment

5.5.1 The Transporter shall be designed to function outdoors. Specifically, the nature of operation demands rugged, impact-resistance hardware whose functions and controls shall be foolproof and failsafe.

5.5.2 As the Changi airport is located by the sea, stringent rust control measures should be observed in the design of the Transporter. All hydraulic lines shall be of stainless steel, and all guides and rails galvanised. Outdoor conditions are as follows:

- Shall be designed to suit in Singapore weather and operation condition.
- Temperature : 20°C to 50°C
- Relative Humidity : 0% - 100%
- Strong wind from the sea and annual tropical monsoon, can erode paint and body work. Anti-rust/corrosion prevention technique, together with primer and corrosion resistant paint are essential

5.5.3 Suppliers must certify that the equipment will operate reliably under the requirements stated in Clause 5.1 "Environment"

6 SAFETY

6.1 System Safety

6.1.1 All control methods, circuitry, mechanical equipment and operating procedures must be designed to provide maximum safety for operating personnel. Designs shall minimise potential damage to equipment or the contents of the cargo handled. Failsafe techniques must be employed to prevent the occurrence of unsafe conditions, which could result from an equipment failure, or improper implementation of operating procedures

6.2 Personnel Safety

6.2.1 The Transporter must be convenient and safe to use and control functions to be performed must be simple to minimise possible errors. Convenient means for emergency system shutdown must be provided.

6.2.2 The Transporter must provide adequate means for ensuring the safety of maintenance personnel. Devices such as disconnect switches, circuit breakers, overload control relays and lockouts, both electrical and mechanical, must be provided to prevent the accidental activation of those positions of the system under operation maintenance. These devices must be located in areas where access is restricted to maintenance personnel.

7 CONTROL SYSTEM

7.1 Consoles

7.1.1 All controls to be grouped in console in front of driver's position.

Console to have the specified control elements such as joysticks, selector switches, and indicator lights to augment operations.

All control console and elements to be heavy duty and weatherproof IP67.

Positioning of forward/reverse Joystick to be on the Left hand side & Rollers Joystick on Right hand side of driver's console. (Position taken, seated on the driver's seat)

Joysticks for Forward/reverse speed should incorporate a Service function for Rollers

As for Rollers it should be 1 Joystick to control all the rollers Forward and for reverse it controls only the front section. An additional 1 toggle switch to be install only to control the back rollers for reverse functions

All joysticks & toggle switches are to be of heavy duty and weather proof type.

- 7.1.2 Console functions to be identified in English using elementary concise terms and supplemented by graphic symbols.
- 7.1.3 Console to be designed in accordance with sound human engineering principles.
- 7.1.4 Console to conform to requirements specified in para 3.1(vibrations) and to use weather proof tight boxes, switches, joysticks and lights.
- 7.1.5 All identification & Emergency Aluminium plates with engraved wordings to be mechanically affixed to console face.
- 7.1.6 All electrical control levers and joysticks to avoid use of internal mechanical linkages to transmit control action.
- 7.1.7 Controls required in the group, subgroup and components specifications to be of the 'momentary' or 'maintain' types as defined as follows:

Momentary - Operator activates control to initiate function. Function continues independently.

Maintain - Operator to hold control for continuous function.
- 7.1.8 Mushroom head emergency stop push buttons to disrupt electrical power to be employed where an emergency may require immediate shut down.
- 7.1.9 Indicator lights not to be affected by extraneous light. Should be LED type and IP67 approved.
- 7.1.10 Control elements e.g. switch, pushbuttons, handles, etc. to be selected for ease of operations in the specified environment.
- 7.1.11 Control elements such as switches, pushbuttons, indicator lights, bulbs, etc. to be easily replaceable.
- 7.1.12 Resettable Circuit breakers shall be used in place of fuses.

7.2 Interlocks and Limits

- 7.2.1 Failsafe interlocks and limits e.g. check valves, to be provided to ensure safe operations as specified in the groups, subgroups, and components specifications.

Supplier to be responsible for integration of all additional interlocks and limits that may be necessary by the characteristics of the elements selected for combination into a total system.

Interlocks and limits to be included for the protection of personnel, equipment and cargo in performance of the operational functions specified for the subgroups and elements comprising the group.

Low skill level of operator competence and intelligence, and conditions of personnel inattention to be assumed in design of interlocks and limits.

7.3 Emergency Operation

7.3.1 Alternative system, preferably powered by the equipment battery, for basic operation of lowering of stopper and operation of rollers.

Alternatively, stoppers may be lowered and rollers free-wheeled by an easily accessible relief mechanism by Equipment operator alone.

In the event of towing, there shall be a simple and quick system for motor by-pass and brake release mechanism. Instruction for emergency operation must be on a decal or aluminium plate and all operation clearly displayed.

7.3.2 Accumulator to be installed & mounted at “**Vertical**” position for the purpose of emergency braking & steering.

7.4 Hydraulic System

7.4.1 Maximum operating pressure of the hydraulic system not to exceed 3500 psi.

7.4.2 For other operations, e.g. rollers, operating pressure not to exceed 2000 psi.

7.4.3 Hydraulic components e.g. pump motors, cylinders and valves to be of reputable make/brand and have after sale and service representative in Singapore.

Information to be submitted together with tender submission.

7.4.4 Repair kits (seals) must be available for all components and part numbers of manufactured provided. All Hydraulic components shall use Viton seals.

7.4.5 A well design hydraulic system is essential (hydraulic oil cooler to be installed), taking into account appropriate operating temperature and reputable hydraulic filters to ensure system cleanliness.

- 7.4.6 Hydraulic tank gauge to install LOW level warning Buzzer & indicator when there is hydraulic leak or low level hydraulic oil with indicator and buzzer.
- 7.4.7 Hydraulic return filters to be 10 to 12 microns to be installed in the hydraulic tank.
- 7.4.8 Steel pipes to be used on main lines and hydraulic hoses to be connected from main line and final components such as platform, cylinder, motors, control valves, etc. Hose preferably of High Impulse type, weather proof can withstand heat & abrasion.
 - All hydraulic hoses shall be fitted with sleeve on both ends of ferrule.
 - Viscosity of the hydraulic oil to be VG68, i.e., suitable for Singapore weather.
- 7.4.9 Hydraulic & diesel tanks to be separated & not on top of each other. To imprint the Diesel and Hydraulic Tank capacity on to both tanks in Litres.
- 7.4.10 Braking system (hydraulic) to be hydro static braking.
- 7.4.11 All hydraulic pipes to run outside along tray and cross member. Must not be obstructed by other components.
- 7.4.12 Hydraulic tank to have a high contamination prevention breather able to trap water vapour and foreign particles.
- 7.4.13 Use of flexible hydraulic hose should be minimised and to use steel pipes whenever possible instead of flexible hoses in areas of less movement. All hydraulic hoses should be fitted with sleeves on both ends of ferrule. VG68 Hydraulic Oil is to be used for tropical climate.

7.5 Electrical System

- 7.5.1 To be of 24 volts system with heavy-duty maintenance-free battery of not less than 96AH. Charging system to be designed for high charging at low engine speed at rated capacity of no less than 55AH.
- 7.5.2 Lightings:
 - 1. Airport approved LED B16 Model blinking APRON Amber light with a pole height of 2.55 meter when fully raised and 2.40 meter when fully lowered IP67 rated or higher
 - 2. LED Headlights (front and rear) IP67 rated or higher
 - 3. LED Sidelights (front and rear) IP67 rated or higher

4. LED Flashing indicators IP67 rated or higher
5. Rear reflectors
6. LED Reversing spot light with horn (Ambience) higher DB (110DB), reverse LED blinking light IP67 rated or higher
7. LED Rear brake lights IP67 rated or higher
8. LED Brake light indicator on control panel IP67 rated or higher
9. Horn IP67 rated or higher
10. 1 LED work light behind panel of engine compartment IP67 rated or higher

All lightings should only be on when units is started.

- 7.5.3 Electrical junction weatherproof boxes to be placed where they will cause minimum obstruction during troubleshooting and maintenance of other components. With proper rubber damper or mounting.
- 7.5.4 All wires and harness wrap with fire retardant material to be routed along cross member and not inside cross member or sandwiched between components.
- 7.5.5 Wiring number to be large and clearly visible at both ends of wires.
- 7.5.6 To install heavy duty protection guard for front & rear light assemblies. Design shall be subject to Owner's approval prior to fabrication to ensure less prone to damage due to local operation usage.
- 7.5.7 Electrical junction box should have another separate electrical wiring connectors for Auxiliary connections (10 or more connections)

7.6 Additional Features

- 7.6.1 Hard cushion rubber seat with drainage hole to be provided for operator with suspensions to absorb shocks while driving.
- 7.6.2 Operator's seat sensor to be install to ensure that when the operator gets out of his seat the engine will cut off if the forward or reverse switch is selected to Forward / Reverse direction.
- 7.6.3 Fuel tank cap to be of lockable type and painted green in colour without key and come with long strainer.
- 7.6.4 Keyless Ignition switches to be common with existing SATS Transporter fleet.
- 7.6.5 Accelerator pedal to be of mild steel.

- 7.6.6 Operator's cabin to be of low-bed type for ease of accessibility and more leg room.
- 7.6.7 Master switch to be mounted near operator's panel for easy accessibility.
- 7.6.8 Engine covers to be fabricated with a frame for firm support and strength and to be flushed design on both sides.
- 7.6.9 Design for front and rear axle to be of "heavy duty" type allowing for ease of maintenance and repairs during breakdowns.
- 7.6.10 Fuel supply lines are not to be hidden or routed between any areas that are difficult to reach. Preferably clear type fuel line for easy visibility.
- 7.6.11 Engine assembly is preferred to be mounted on modular tray for easy removal with engine mounted flat instead of on "V" mountings. Engine mountings to ensure that correct mountings are used to prevent excessive vibrations to other engine components.
- 7.6.12 Air filter holder to be of metal type.
- 7.6.13 Engine thermostat housing to be of cast iron material.
- 7.6.14 Radiator top and bottom cover to be of copper. (Not Plastic Material)
- 7.6.15 Battery compartment to be easily accessible & not bolted. Fitted with hinged and manual sliding lock. Preferably to install a Battery quick connector (SB175A) for easy "Jump Start " when batteries is weak.
- 7.6.16 To have dual speed selector for driving. Lower speed at max 5 - 6 kmh and Fast speed at 25kmh with external GREEN indicator light at driver front consoles for Lower Speed indicator.
- 7.6.17 A Low Fuel sensor to be install with a red blinking LED lights and buzzer to sound when diesel fuel is low at ¼ tank.
- 7.6.18 A No Charging red LED light's to be install for alternator if it's not charging the battery.
- 7.6.19 A reverse camera (install behind) with weather proof LED Monitor display unit and cover to be install at the driver's station.
- 7.6.20 There is 2 long hydraulic hoses that joints the rear left & rear right hydrostatic drive motor, it shall have hydraulic pipes build in-between to joint the hyd. hoses on each end into 4 shorter hoses.
- 7.6.21 Guard brackets for operators driver's console panel.
- 7.6.22 Guard brackets for rear hydraulic tank gauge indicator oil level.

- 7.6.23 To install strobe lights for reversing (8 LED light on each sides, rear right and rear left). Weather proof type.
- 7.6.24 A 0.82m camera pole to be mounted behind the driver compartment with the top having a flat plate.

8 Painting and Anti-Corrosion Treatment

- 8.1 Two under coats of primer with marine coating agent and finishing coat.
- 8.2 Surface and corrosion preventive treatment must be done prior to the application of paint.

The Transporter colour scheme is as follows: According to SAS Corporate Identity & details of which will be given upon award.

The successful Tenderer shall provide the colour scheme for SATS's approval before painting.

- 8.3 All Logo's, Body and registrations numbers to be fixed once approval by the relevant governing authorities.
- 8.4 All working member surfaces i.e. rollers (drive chains excepted) must be of non-corrosive material or hot-dipped galvanized to prevent rust and corrosion.

9 AFTER SALES RESPONSIBILITY

- 9.1 One spot light to be mounted on the bridge (at operators console) pointing into the cargo hold
- 9.2 One spot light to be mounted on the bridge behind the operator's console pointing towards the rear platform
- 9.3 Battery master switches to be positioned on the right side of the Transporter
- 9.4 Jumper start connector (if provided) to be positioned on the right side of the Transporter.

10 WARRANTY

- 10.1 Warranty period of Two Years from the date of successful completion of commission. The warranty shall cover all components, material and workmanship.

- 10.2 The warranty period shall be extended by the number of days; the unit is immobilized due to technical defects, design defects, material or component failure and poor workmanship.
- 10.3 If the unit is defective during the warranty period, the Tenderer / manufacturer shall provide all labour and tooling to rectify the defects within 3 working days period. All costs shall be borne by the Tenderer / manufacturer.
- 10.4 10 years warranty for main chassis.

11 ACCEPTANCE TEST

11.1 General

- 11.1.1 Supplier to perform all necessary inspections and tests to demonstrate that the equipment meets all requirements of these specifications. Supplier's records of inspections and tests to be kept complete and available to SAS at all times. Records or reports of inspections and tests to be signed and approved by supplier. SAS has right to witness any test to determine if the equipment meets all specified requirements. An acceptance test to be conducted in accordance with a test plan and procedure provided by supplier and approved by SAS. Supplier to provide adequate personnel to assist SAS in inspecting and testing the equipment in Singapore.
- 11.1.2 Reasonable notice to be given to SAS prior to performance of final acceptance test. SAS or its appointed representatives to witness all acceptance tests and indicate acceptance by signing and dating the test data sheet.
- 11.1.3 Tests and inspections identified in these specifications represent minimum requirements for acceptance of the equipment and do not necessarily represent complete final test requirements as variations in equipment types and designs may require additional specific tests. Supplier to develop test plan and procedure that will insure performance of the specified tests as well as the additional tests, which may become necessary.
- 11.1.4 The test program must verify system compliance with the requirements specified herein. In general, load capabilities, speed, stop and guide function, sensors, controls, alignment, ruggedness, deflection, smoothness of acceleration and deceleration, noise, continuous cycling, unitised load flow and safety features will be verified.
- 11.1.5 During the performance of the specified tests there must be no damage to the cargo, containers or equipment. All mechanisms and stops must operate as described. None of the components must overheat and shut down due to overload, malfunction or misapplication.

11.2 Final Acceptance

- 11.2.1 The tender price is to be valid for 3 years from the commissioning of the first unit.

12 Manuals and Drawings

- 12.1 Delivery of the unit will not be accepted without complete sets of manuals. Manuals content and format must be acceptable to SATS.

- 12.2 Three complete sets of Workshop manuals & two sets in CD ROM shall be provided for the Transporter, main hydraulic pump, hydraulic drive motor & engine which contain the following information :

Operating instruction, system description and specification.

- Maintenance, troubleshooting and component removal / installation instruction
- Part number list
- The manuals must be written in English
- The following documents and drawings shall be provided

- 12.3 Drawings with detailed dimensions of the unit

- Detailed hydraulic circuit diagrams with components location
- Detail electrical circuit diagrams with components location
- Proposed Preventive Maintenance schedule
- The listed parts are recommended to be stocked in Singapore during the warranty period to minimize downtime due to unavailability of spares

13 OTHERS

- 13.1 The supplier shall provide a factory engineer to commission the Transporter on delivery. The engineer is required to provide Practical training to SAS Trainers and Maintenance staff on the following;

Operations

- Preventive maintenance, Emergency Procedures, Troubleshooting & Diagnostic checks.

13.2 Parts Availability

- 13.2.1 The supplier must guarantee the availability of all spares and replacement parts and sub-assemblies required by any equipment items supplied for a minimum fifteen-year operational period. Such parts must be either available from component manufacturers when an unmodified commercial component is required or from sub-contractors when "special" components are required.
- 13.2.2 The supplier must guarantee the availability of all spares and replacement parts and sub-assemblies required by any equipment items supplied for a minimum fifteen-year operational period. Such parts must be either available from component manufacturers when an unmodified commercial component is required or from sub-contractors when "special" components are required.
- 13.2.3 The supplier must provide a recommended spare parts list and must hold stock of value no less than 10% of the contract value (items and numbers as approved by SAS) in Singapore for the duration of the warranty period. They should also ensure the availability of spares support (on site) within 48 hours

13.3 Preventive Maintenance Package

- 13.3.1 Preventive maintenance should be provided by the supplier for a period of 5 years after commissioning the units. All servicing costs to be quoted separately in the PRICING/ DELIVERY SCHEDULE.