UPGRADE AND RETROFIT THE EXISTING WIRE BRUSH BOOTH TO A SHOT BLAST BOOTH.

TRANSNET ENGINEERING

SALT RIVER

REFERENCE: FAI_SRX_SPEC_21

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1. INTRODUCTION / SCOPE OF WORK

This specification defines the requirements for the upgrade and retrofit of the existing wire brush booth into a shot blast booth at Transnet Engineering, Salt River. The facility will be used for surface preparation of maritime and railway-related components during refurbishment and maintenance activities.

The Contractor shall be responsible for the design, manufacture, supply, installation, testing, certification, training, commissioning and handover of a complete operational facility. The specification states minimum requirements and does not relieve the Contractor of applying sound engineering practice or identifying omissions necessary for safe and proper operation.

1.1 Complete scope and deliverables

- Project management, detailed design, engineering calculations, drawings, risk assessments and statutory approvals.
- Upgrade and modification of the existing booth structure, doors, cladding and associated infrastructure.
- Civil works, structural foundations and foundation design submissions.
- Hot-dip galvanized structural steelwork, platforms, access systems and corrosion protection.
- Heavy-duty floor grating, lifting arrangements and maintenance access.
- Modification and reinstatement of the existing narrow-gauge rail and trolley system.
- Full-length floor-scraper abrasive recovery system with two independently driven sections.
- Bucket elevator, separator, independent extraction and abrasive storage hoppers.
- Two 200-litre blast pots, hoses, nozzles and controls.
- Cross-draft dust extraction, filtration, ventilation and associated performance testing.
- Compressed-air reticulation and one 1 000-litre vertical air receiver.
- Dedicated breathing-air system for two operators.
- Electrical distribution, control panels, interlocks, protected lighting, warning beacons, emergency stops and safety systems.
- Operators rescue or lifeline system, guarding, signage and access control.
- Engineering certification, ECSA professional sign-off, Approved Inspection Authority certification and statutory approvals.
- Commissioning tests, lighting verification, extraction performance tests and calibrated test records.
- Operator and maintenance training, operating manuals, maintenance manuals, spare-parts schedules and as-built drawings.
- Warranty and defects obligations shall be governed by the applicable NEC contract documents and not duplicated in this technical specification.

2. SITE INSPECTION/ GEOGRAPHICAL LOCATION

The facility shall be installed in Bay 4 at Transnet Engineering, Salt River, Cape Town, Western Cape. Tenderers shall attend the compulsory site inspection and verify dimensions, levels, services, interfaces,

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access routes, lifting requirements, operating constraints and the condition of the existing booth and rail infrastructure.
Site information, access obligations, reliance on information and allocation of site-condition risk shall be governed by the applicable NEC contract documents. The Contractor must nevertheless verify physical dimensions and interfaces before design, manufacture or installation.

3. TECHNICAL REQUIREMENTS

The Shot Blast Booth, associated equipment, services, controls, pressure vessels, structural works, electrical installations, and commissioning activities shall comply with the latest applicable South African legislation, regulations, standards, and Transnet Engineering requirements.

3.1 Applicable Legislation, Regulations and Standards

Clause	Reference	Application
4.1.2	National Environmental Management Act 107 of 1998	Environmental compliance
4.1.3	National Environmental Management: Air Quality Act 39 of 2004	Dust and emissions
4.1.4	National Building Regulations and Building Standards Act	Structural and building works
4.1.5	Railway Safety Regulator Act	Rail interfaces
4.2.1	SANS 10142-1	Low-voltage electrical installations
4.2.2	SANS 347	Pressure equipment conformity
4.2.3	SANS 10227	Pressure equipment inspection and testing
4.2.4	SANS 10400	Structural/building requirements
4.2.5	SANS 60529	Enclosure IP classification
4.2.6	SANS 12100	Machinery safety/risk assessment
4.2.7	SANS 14120	Guards
4.2.8	SANS 14119	Interlocked guards
4.2.9	SANS 4414	Pneumatic safety
4.2.10	SANS 8501	Visual assessment of blast-cleaned steel
4.2.11	SANS 8502	Surface cleanliness testing
4.2.12	SANS 8503	Surface profile measurement
4.2.13	SANS 11124 / SANS 11126	Blasting abrasives
4.2.14	SANS 193	Fire dampers, where applicable
4.2.15	SANS 10108	Hazardous locations, where applicable
4.2.16	SANS 10114-1	Interior lighting and illuminance

4. SPECIFIC REQUIREMENTS

4.1 Shot Blast Booth

Clause	Requirement
4.1.1	Upgrade and retrofit the existing wire-brush booth into a complete shot-blast booth at Bay 4.
4.1.2	The facility shall comprise the booth, abrasive recovery, bucket elevator, separator, hoppers, two blast pots, extraction, compressed air, air receiver, breathing air, electrical, controls, lighting and safety infrastructure.
4.1.3	Minimum internal dimensions shall be 8 000 mm (L) x 4 500 mm (W) x 4 000 mm (H).
4.1.4	Any listed proprietary component shall be read as “or approved equivalent”.
4.1.4	The booth shall safely support simultaneous operation by two operators using two blast pots.

4.2 Structural Works

- Existing booth structures, doors, supports and lighting shall be assessed, repaired, modified and upgraded where required.
- Structural steelwork, platforms, supports, cladding and foundations shall be designed and certified by an ECSA-registered Professional Engineer in the appropriate discipline.

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- Design calculations, drawings, loads, material grades, corrosion-protection system and foundation data shall be submitted for approval before manufacture or construction.
- No structural manufacture or civil work may commence before approval of the applicable design submission.

4.3 Floor and Rail System

Clause	Requirement
4.3.1	Heavy-duty removable steel grating shall support a minimum imposed load of 5 000 kg and include certified lifting points.
4.3.2	Fine screens shall prevent oversized (dimensions strictly 6 mm) objects entering the recovery system.
4.3.3	The existing narrow-gauge rail and trolley system shall be modified, aligned, levelled, anchored and fitted with end stops and guidance arrangements.
4.3.4	Track gauge: 1,067 mm. Rail profile: SAR 48 kg/m (minimum) Minimum rail mass: 48 kg/m. Rail steel grade and material standard: R260 pearlitic rail steel to BS EN 13674-1. The selected rail shall be compatible with the existing trolley wheel profile and verified design loads.
4.3.5	The trolley safe working load, wheel loads, buffers, supports, anchors and rail stresses shall be supported by calculations and drawings approved before implementation.

4.4 Abrasive Recovery System

- A full-length floor-scraper recovery system shall collect and recover blasting media. 8 000 mm (L) x 4 500 mm
- The scraper shall comprise two independently driven sections, each covering approximately half the booth length.
- Blades shall be adjustable and replaceable without major dismantling.
- The bucket elevator shall transfer recovered abrasive to the separator and storage hoppers.
- The separator shall remove dust, fines and contaminants and feed reusable media to storage hoppers with isolation and controlled feed arrangements.
- The bucket-elevator and separator extraction shall operate independently from the main booth extraction system.
- The abrasive recovery system shall have a minimum scraper conveyor capacity of 10 tons per hour, a minimum bucket elevator capacity of 10 tons per hour, and a minimum air-wash separator capacity of 10 tons per hour. The system shall further be equipped with an abrasive storage hopper with a minimum capacity of 2,000 kg and an abrasive reserve hopper with a minimum capacity of 2,500 kg. The complete abrasive recovery and cleaning system shall be designed for continuous operation at the maximum shot flow rate generated by all blast wheels operating simultaneously, without causing overflow, blockages, excessive abrasive losses, or any reduction in cleaning efficiency.

4.5 Blast Pots

- Two 200-litre blast pots shall be supplied, each complete with at least 20 m blast hose, nozzle assembly, dead-man control and isolation.
- Blast pots and the air receiver shall comply with the Pressure Equipment Regulations and SANS 347 and shall be certified by an Approved Inspection Authority.

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- One vertical air receiver shall have a minimum volume of 1.0 m3, design pressure of 1 000 kPa and working pressure of 690 kPa.
- The air receiver shall include a pressure gauge, safety valve, drain, isolation, inspection openings, permanent data plate, corrosion protection and manufacturing data book.

4.6 DUST EXTRACTION AND VENTILATION

Clause	Requirement
4.6.1	Provide a complete cross-draft system for continuous simultaneous blasting by two operators.
4.6.2	Average booth cross-draft velocity: 0.5 m/s minimum, measured at the defined measurement plane, with a design target of 0.75 m/s to 1.0 m/s under normal operating conditions (simultaneous blasting by two operators).
4.6.3	The dust extraction and ventilation system shall provide a minimum of 20 air changes per hour (ACH) throughout the blast booth.
4.6.4	The dust extraction system shall be equipped with high-efficiency filter elements capable of achieving a minimum filtration efficiency of 99.9% for particles of 1.0 micrometre (µm) and larger.
4.6.5	Maximum particulate emission concentration at discharge: 10 mg/Nm³, measured in accordance with SANS 9096 or an equivalent approved isokinetic stack sampling method.
4.6.6	Minimum visibility acceptance criterion during representative blasting: Visibility shall be maintained at not less than 2 m throughout the occupied working zone of the booth.
4.6.7	The dust extraction system shall be designed such that the distance from the booth extraction face to the dust collector does not exceed 15 m, and the distance from the dust collector to the fan/extractor does not exceed 5 m. The discharge stack shall terminate at a location that prevents the re-entrainment of dust into buildings, ventilation intakes, or occupied work areas. The stack outlet shall extend to a minimum of 3 m above the highest roofline within 15 m of the stack and shall not be less than 6 m above ground level, unless otherwise required by site-specific environmental and occupational health regulations.
4.6.8	The ventilation and dust extraction system shall be designed to provide uniform airflow throughout the entire blasting enclosure. No dead-air zones shall be permitted within the booth, including corners, recesses, and areas behind workpieces where dust may accumulate. Airflow distribution shall ensure the effective capture and removal of airborne dust, abrasive fines, rust particles, mill scale, and other contaminants generated during blasting operations. The system shall maintain airborne contaminant concentrations below 5 mg/m³ (8-hour Time-Weighted Average) for respirable nuisance dust and below 10 mg/m³ (8-hour Time-Weighted Average) for inhalable/total dust, or below the applicable South African Occupational Exposure Limits (OELs), whichever is more stringent. Continuous operation shall not result in excessive dust accumulation, impaired visibility, or localized areas of inadequate ventilation.
4.6.9	The system shall include fans, ducting, dust collector, filtration, hoppers, access, differential-pressure indication, controls and safe waste removal.
4.6.10	Submit airflow calculations, pressure-loss calculations, fan duty, filter data, duct layout and equipment selections before manufacture.
4.6.11	Commissioning shall include calibrated velocity, volume-flow, differential-pressure, visibility and emissions tests against the accepted design criteria.

4.7 COMPRESSED AIR SYSTEM AND BREATHING AIR

- Existing compressed-air operating pressure is 600 kPa to 690 kPa. The Contractor shall verify available flow and pressure for two blast pots and all auxiliary demand.
- Pipework shall be sized to limit pressure loss and shall include drains, isolation and safe maintenance provisions.
- A dedicated breathing-air system, independent from blasting air, shall supply two operators simultaneously.
- The breathing-air system shall supply clean, breathable compressed air to all operators at a minimum flow rate of 170 to 250 L/min per operator at a delivery pressure of 5.5 to 8.5 bar, as recommended by the helmet manufacturer. Air quality shall comply with SANS 8573-1 Class 2.2.1 or better and shall be free from oil, excessive moisture, odors, toxic gases, and particulate contamination. The system should include audible and visual alarms with activation set points at 5.0 bar minimum

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breathing-air pressure, 10 ppm carbon monoxide (CO), and -20°C pressure dew point or equivalent air-quality deviation. Breathing-air filters shall be inspected monthly and replaced at intervals not exceeding 2,000 operating hours or 6 months, whichever occurs first, or in accordance with the manufacturer's recommendations.

- Tender data shall include compressor/air-source duty, filtration stages, moisture removal, manifold, hoses and operator connections.

4.8 ELECTRICAL, CONTROLS, LIGHTING AND SAFETY

Clause	Requirement
4.8.1	Maintained illuminance shall be not less than 300 lux, measured 1.0 m above floor level throughout the blasting area.
4.8.2	The bidder shall submit a lighting calculation showing luminaire layout, maintained illuminance, uniformity, maintenance factor, glare control and shadow reduction.
4.8.3	Lighting levels shall be verified during commissioning with a calibrated lux meter and recorded on a grid agreed before testing.
4.8.4	The electrical equipment shall be suitable for operation in a shot blasting environment containing abrasive media, dust, and vibration. Internal luminaires and junction boxes located within or directly exposed to the blasting enclosure shall have a minimum protection rating of **IP66**, providing complete protection against dust ingress and protection against powerful water jets used during maintenance and cleaning
4.8.5	Luminaires shall have impact protection and be replaceable from outside the booth where practicable.
4.8.6	Access doors shall be interlocked to prevent blasting when open. Failure of extraction, breathing air or critical safety circuits shall inhibit blasting.
4.8.7	Emergency-stop devices shall be provided at each access point, operator work position, and other locations where personnel may be exposed to hazards. The emergency stop function shall immediately bring the equipment to a safe state and prevent automatic restart following reset. The safety-related control system associated with the emergency-stop function shall achieve a minimum Performance Level (PL) d, Category 3, in accordance with SANS 13849-1, or an equivalent safety integrity level. All safety circuits shall be fail-safe, monitored for faults, and designed such that a single fault does not result in the loss of the safety function.
4.8.8	Flashing warning beacons and audible/visual warning shall operate automatically while blasting is enabled.
4.8.9	Mandatory PPE, hazard and emergency signage shall be installed at all access points.
4.8.10	Electrical drawings, protection settings, cable schedules, earthing details, interlock cause-and-effect and test certificates shall be submitted.

4.9 DESIGN SUBMISSIONS, INSPECTION AND APPROVAL HOLD POINTS

- Design basis and site verification report.
- General arrangement and interface drawings.
- Structural, rail, trolley and foundation calculations certified by the appropriate ECSA-registered Professional Engineer.
- Ventilation calculations and equipment selection.
- Pressure-equipment design and Approved Inspection Authority plan.
- Electrical single-line diagrams, controls narrative, interlocks and lighting calculation.
- Risk assessment, safe operating concept and rescue plan.
- Inspection and test plan identifying witness and hold points.
- Commissioning procedures and acceptance criteria.

4.10 TESTING, COMMISSIONING AND HANDOVER

- Factory and site acceptance testing shall be completed against approved procedures.

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- Tests shall include functional operation, safety interlocks, emergency stops, rail/trolley function, abrasive recovery capacity, dust extraction, compressed air, breathing air, illuminance and pressure-equipment certification.
- Calibrated instruments and traceable certificates shall be used. All non-conformances shall be closed before final acceptance.
- Provide operating and maintenance manuals, training records, statutory certificates, commissioning results, spares lists and as-built drawings.

4.11 GOVERNANCE REFERENCES REQUIRING CONFIRMATION

Any provisions relating to liability, indemnities, insurance, payment terms, delay damages, warranties extending beyond the technical deliverables, dispute resolution, contract data, or CIDB contractual allocations shall be addressed exclusively within the applicable NEC procurement and contract documentation following review and approval by the Legal, Governance, and CIDB functions. To avoid duplication and potential conflict between contractual and technical requirements, all contractual conditions, commercial arrangements, payment mechanisms, risk and liability allocations, and other master agreement terms are intentionally excluded from this technical specification and shall be governed solely by the relevant NEC contract documents.

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