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1 Technical Specification

1.1 Specification – Repairs to Reinforced Concrete Structures below the Water

Repairs or remediation to the underwater concrete structures shall be in accordance with the following specifications:

- Completely remove all loose, delaminated and weak concrete, oil, grease, laitance and other contaminants. Prepare concrete using acceptable mechanical means and concrete cleaners or degreasers as necessary to obtain clean, sound and rough concrete surfaces exposing coarse aggregate.
- Where surfaces are not underwater or within tidal zones, pre-soak concrete surfaces thoroughly for a minimum of eight hours with potable water. Concrete shall be saturated and free of standing water at time of placement.
- Where reinforcement is exposed, mechanically prepare surfaces to remove all rust, scaling, oxidation, marine growth and other contaminants. Where a delay in grouting may occur, coat reinforcement with a suitable corrosion inhibitor or coating.
- All repair / grouting should be done at a minimum 25 mm thick to a maximum of 150 mm. Larger/deeper placements may be accomplished by extending grout with a clean washed coarse aggregate to Engineers specification.
- We recommend that all underwater grouting be dry-packed. It must be noted that dry-pack placement should be limited to small application areas. However, should we discover excessive structural damage after the dredging process, alternative methods like underwater pouring or pumping should be adopted where it is not practical for dry-pack placement.
- A dry-pack consistency is achieved when the mixed grout can be squeezed into a ball by hand without crumbling. Only enough water should come to the surface to moisten the hands.

- Use a ram with a square cut end and hammer to evenly compact the grout against solidly braced backing boards, combining each layer (approximately 12mm thick) to the previously placed layer over its entire surface.
- Each placed layer shall be visually inspected for placement uniformity.
- Striking force should be sufficient for compaction of the grout without affecting plate alignment.
- Placement shall be continuous until grouting is complete.
- The *Contractor* must follow all processes specified on the material data sheets when preparing the repair areas.
- The applicator must apply the repair mortar to the repair area as per the requirements of the supplier's material data sheet.

1.2 Specification – Repairs of Reinforced Concrete Structures Above the Water

1.2.1 Spalled Concrete

Spalled concrete that is visible on some concrete elements must be repaired in following way:

Surface Preparation

- Mark out all of the defective areas of concrete to be removed. These shall be agreed with the *Supervisor* and recorded before proceeding with the repair works.
- Propping of the soffit and formwork of the concrete structures shall form part of the *Contractor* design. The design must be signed off by a Professionally Registered Engineer or Technologist (ECSA).
- The concrete surfaces to be repaired must be free from dust, loose or friable materials, surface contaminants and any other materials which could reduce the bond of the repair materials.

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- All delaminated, weak, damaged and deteriorated concrete and where necessary sound concrete, shall be removed by suitable mechanical means or very high pressure water techniques (Up to 110 MPa).
 - Tie-wire fragments, nails and any other metal debris embedded in the concrete must also be removed.
 - The edges of areas where concrete is removed shall be cut to an angle of more than 90° to avoid undercutting but not more than 135° to reduce the possibility of shrinkage / debonding / cracking at the adjacent sound concrete interface.
 - These areas shall be roughened sufficiently to provide a mechanical key between the original concrete and the repair mortar.
 - Where the repair depth corresponds to the depth of concrete cover and the concrete removal exposes steel reinforcement; the breaking out shall continue to expose the full circumference of the steel, plus a further 20 mm behind the bars. Breaking out shall continue along the reinforcement until non-corroded steel is reached. In cases where the exposed rebar has been reduced in diameter by 20%, the Contractor is required to remove and replace with the originally specified rebar for the section of the berth.
 - Care must be taken to ensure that any reinforcement exposed is not further damaged during the removal or raster and replacement of rebar.

Steel Reinforcement

- Rust, millscale, mortar, concrete, dust and other loose and deleterious material which could reduce bond, or contribute to corrosion, shall be removed.
- The steel surfaces shall be prepared to a minimum standard equivalent to SA 2 ½ according to ISO 8501-1.
- The steel surfaces shall be prepared using abrasive blast cleaning or high pressure water techniques (Up to 60 MPa).

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- Where exposed reinforcement is contaminated with chlorides or other materials which could cause corrosion, the reinforcement shall also be cleaned by low pressure water jetting techniques (Up to 18 MPa).

Corrosion Protection

- Apply the anti-corrosion protective coating by brush or by spray onto the prepared reinforcement. Care must be taken to ensure complete application behind the reinforcement.
- Two coats must be applied and sufficient time must be allowed for first coat to harden before applying the second coat.

Bonding Primer

- Apply the bonding primer into the substrate with a stiff brush, filling all of the profile.
- The subsequent application of the repair mortar shall then be done 'wet on wet'.

Repair Mortar

- The repair work can either be hand placed or can be poured with a free-flowing structural repair concrete, whichever is the most practical.
- Ensure that the bonding primer is still 'tacky' when the repair material is applied using 'wet on wet' techniques.

Hand Placement

Apply a wet sprayed / hand placed fibre reinforced repair mortar or high build repair and profiling mortar depending on depth by hand using traditional techniques, or mechanically using 'wet' spray equipment. When the repair depth exceeds the maximum allowable thickness of the repair material, it shall be applied in several layers. The previous layer must have hardened sufficiently, so as not to be disturbed by the subsequent application. The first layer must not be smoothened in order to provide a mechanical key and ensure a good mechanical bond for the subsequent layer.

Repair Grout

Formwork prior to the mixing of the material and seal grout tight. Different ways of grouting are applicable, such as pouring from the top as well as pumping from the bottom. Care must be taken that air can escape. The use of a rod will assist in releasing entrapped air. Slight knocking on the formwork might be of help to avoid air pockets. Place the free-flowing structural repair concrete directly after mixing ensuring that any displaced air is allowed to escape. A sufficient hydrostatic head must be maintained to keep the product flowing. The repaired area must be protected from rain until initial set has been achieved. The repair grout must be cured by keeping wet to avoid rapid loss of water. Normal curing practices should be applied as for any other cementitious material. Formwork finishes shall be specified by the *Project Manager*.

Corrosion Inhibiting Impregnation Paint

- Apply 3 coats of the corrosion inhibiting impregnation paint until saturation by brush, roller, low pressure or airless spray equipment.
- After the application of the last coat, as soon as the surface becomes mat, do a low pressure water cleaning (water hose).
- The day after application, the treated surfaces shall be cleaned by pressure washing (10 MPa) to remove any traces of soluble salts that may have deposited at the surface.

Silane Based Repellent Impregnation Cream

Apply one coat of the Silane Based Water Repellent Impregnation Cream using a brush, roller or airless spray.

1.2.2 Crack Repairs

- The surface over the entire length of the crack should be wire brushed to remove laitance from the concrete. If the surface of the concrete is unsound chase a "V" cut at least 10 mm deep and 20 mm wide into the crack. All debris should be removed.

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- Drill into the crack using the 6 mm bit. Drill at least 50 mm deep. Ensure that the crack lies within the sides of the hole.
 - Using a fine stiff wire, scratch out the debris/dust that may block the crack in the sides of the hole.
 - Holes should be between 250 mm and 300 mm centres, the finer the crack the less the centre spacing.
 - Seal the grease nipples into the holes with a collar of a two-component repair epoxy mortar. Cover the head of the nipple with a short length of rubber or plastic tubing to ensure the inlet is kept free of epoxy. Also ensure that the outlet is kept free of epoxy.
 - Having sealed the nipples into the crack, seal the entire face of the crack applying about 3 mm thick and approximately 50 mm wide. Where the crack is chased out the chase should be filled and finished flush with the concrete surface.
 - Allow to cure overnight.
 - After curing (24hrs), open the non-return ball valves of the nipples by forcing in pins
 - Fill the injection gun with correctly mixed low viscosity injection liquid. Starting at the lowest point of the crack or at one end, if the crack runs horizontally, pump in liquid resin. Continue pumping until resin exudes from the next nipple. Remove pin and carry on pumping for a few more strokes of the gun.
 - Disconnect gun from inlet and attach it to the nipple from which resin exuded.
 - Continue this sequence working either up or along the crack. After about 30 minutes return to the first nipple that was filled, re-open the ball valves with pins and try to pump in further resin. This can usually be done as the resin may have seeped away into finer cracks or pockets of honeycomb. If foamy resin extrudes continue filling until clear resin is evident.
 - Once injection of crack has commenced, work must continue until the crack has been filled.

- Before injection work starts, a rough calculation should be made as to the amount of resin that will be needed to fill the crack. This need to be approved by the *Supervisor* before the *Contractor* continues with the work.
- Twenty-four hours after injection, the surface seal and protruding nipples may be cut off with a grinding wheel.

1.2.3 Minor Honeycombing

- The concrete surface should be sound, clean, properly cured, free from oils, grease or surface contaminants.
- All loose materials and surface laitance must be removed by high pressure jet blasting or similar mechanical means.
- The prepared surface should be thoroughly soaked with clean water until uniformly saturated, leaving no standing water.
- Apply the cementitious pore sealer and levelling mortar by trowel to the pre-wetted substrate.
- As soon as the mortar has started to set, it can be rubbed down with a wooden or plastic float or sponge finished.
- Extra water should not be added to improve workability once setting has started.

1.3 Material specifications

The following "Material Specification" for mortars, grouts, structural steel is applicable:

- BASF, SIKA and other similar approved.
- S355JR or S355JOW (...J2W preferred)
- Any other specific material specifications are provided on the detailed manufacturing drawings.

The following “Welding Consumable Specifications” are applicable:

- Electrodes: BOEHLER (or similar approved) E7018L
- MIG Wire: BOEHLER (or similar approved) SG2 / BOEHLER (or similar approved) EMK 6
- Flux Core: BOEHLER (or similar approved) TI 46-FD

The following “Corrosion Protection Specifications” are applicable:

- BASF, SIKA, Jotun, Hempel or International Paints or similar, 60-month marine guaranteed, corrosion protection specification

1.4 Specification – Repair Products for use Below Water

1.4.1 Introduction

Note: That tables below provides an example of the performance requirements for the products to be used by the *Contractor* in repairing the structure. Any product stipulated for use by the *Contractor* shall have similar performance requirements. Furthermore, the *Contractor* shall issue all technical data sheets and material safety data sheets to the *Employer* for its approval. Only on the approval from the *Employer* shall the *Contractor* be allowed to proceed with the use of the product that it has preferred.

Where there are identified areas displaying damage to below water concrete structures, the following product is used:

- Repair Mortar

As the presence of atmospheric oxygen is mostly diminished below water, damaged areas of the structure can be repaired by the direct application of cementitious mortars.

1.4.2 Rapid Setting Mortar for Underwater Application

The Performance compressive strength requirement of 50mm cubes placed at 21°C are listed in table 1.

Table 1: Performance Data For Repair Mortar

Age	Compressive strength
1 day	10 MPa
3 days	18 MPa
28 days	27 MPa

1.5 Specification – Repair Products for use Above Water and in the Tidal Zone

1.5.1 Introduction

Where there are identified areas displaying damage to below water concrete structures, the following products shall be used:

- Zinc based primer
- Repair mortar
- Silane based corrosion inhibitor

These products are required in combination due the presence and effect of atmospheric oxygen on the reinforced concrete structure above water and falling within the tidal zone.

1.5.2 Zinc Based Primer

The technical product properties for a zinc based primer specific for use in marine environments is listed in table 2. The product should be applied directly to the freshly blasted steel rebar.

Table 2: Typical Properties for Zinc Based Primer

Appearance:	Thick grey liquid
Specific gravity	220 at 25°C
Tack free time: (approximate)	20 mins at 25°C 5 mins at 40°C
Recoat Time :	5 Hours at 25°C 2 hours at 40°C
T.Z.C. in DFT	>90%
D.F.T. per coat	> 50 microns
Application temperature:	min. 10°C max. 40°C

1.5.3 Repair Mortar

The technical product properties for a high strength, rapid setting, shrinkage compensated, fibre reinforced, and structural repair mortar with an active corrosion inhibitor specific for use in marine environments is listed in table 3. The product should be applied on top of the previously blasted and primed structural rebar embedded in the concrete structures. The typical properties when tested at 2.81 water /20 Kg powder is listed in table 3.

Table 3: Technical Properties for a High Strength Repair Mortar

Appearance:	Grey Powder
Application thickness Overhead Max	10 -50 mm /layer not more than 30mm/layer
Density	Approx. 2.2g/cm ³
Mixing water per 20 kg bag	Approx. 2.4-2.8 liters
Working time	Approx. 30 minutes
Application temperature: (support and material)	Between + 5°C and + 35 °C

Compression Strength EN1260 -after 3 hours - after 1 day - after 7 days - after 28 days	≥ 15 MPa $\geq 15-30$ MPa ≥ 40 MPa ≥ 60 MPa
E-Modulus (28 days) EN 1504-3	≥ 20 GPa
Adhesion (28 days) EN 1504-3	≥ 2 MPa
Adhesion after Freeze/Thaw EN 1504-3	≥ 2 MPa
Adhesion after Thunder/Shower EN 1504-3	≥ 2 MPa
Adhesion after Adhesion after dry cycle EN 1504-3	≥ 2 MPa
Capillary absorption-EN 13 05 7	≤ 0.5 kg/m ² h ^{0.5}
Rapid chloride permeability ASTM C 1202.2012	Approx. 300 coulombs (very low)

1.5.4 Corrosion Inhibitor

The technical product properties for a Silane based corrosion inhibitor specific for use in marine environments is listed in table 4. The product should be applied on top of the repair mortar that had previously been applied to the damaged concrete areas.

Table 4: Typical Properties for a corrosion Inhibitor

Appearance	Clear Liquid
Density	0.88g/cm ³
pH	7 to 8
Flash Point	63°C
Viscosity	0.95mPas

2 Quality Management Specifications

2.1 Definitions

TERM, ABBREVIATION	MEANING
Data	All drawings/documents/information required to be supplied under the Contract
Data Pack (DP)	A compilation of manufacturing data, certification, inspection and testing records prepared by the <i>Contractor</i> to verify compliance with the Contractual requirements.
<i>Employer</i>	The <i>Employer</i> is Transnet National Ports Authority.
Field Inspection Test (FIT)	A document that details the checks, requirements and test parameters for each type of equipment to permit field installation and pre-commissioning of the equipment.
Inspection Release Report (IRR)	A document issued to the <i>Contractor</i> by the <i>Employer</i> advising release of the Materials for shipment. This does not relieve the <i>Contractor</i> of its obligations in accordance with the Terms and Conditions of the Contract.
Inspection Waiver Report (IWR)	A document issued to the <i>Contractor</i> by <i>Employer</i> advising that the <i>Employer</i> has waived final inspection

	for the materials listed in this document. The issue of this Report does not preclude further inspection by <i>Employer</i> , is issued without prejudice and does not relieve the Supplier/ <i>Contractor</i> from the guarantees and obligations included in the Contract
Project Quality Plan (PQP)	A document that outlines the <i>Contractor's</i> strategy, methodology, resources allocation, Quality Assurance and Quality Control coordination activities to ensure that Goods and Services supplied meet or exceed the requirements defined in the Contract, drawings, codes and standards.
Quality Control Plan (QCP)	A document outlining specific manufacturing / construction inspection and testing requirements, including responsibilities, test acceptance criteria, nomination of witness and hold points.
Technical Query (TQ)	This refers to a document used by the <i>Contractor</i> to formally clarify a Technical Query related to the scope of supply. This should not be used where a non-conformance has already been initiated.

2.2 Applicable Documents

2.2.1 General

All work performed shall comply with the requirements contained herein, the documentation referenced in the Contract and the latest revision/edition of the relevant Codes and Standards referenced herein.

2.2.2 Statutory Regulations

Occupational Health & Safety Act, Act No 85, of 1993 and Regulations as amended.

2.3 Quality System

2.3.1 General

The *Contractor* shall be responsible for all quality activities necessary to ensure the Work meets the requirements specified in the Contract, and shall manage and coordinate all Quality aspects of Work in accordance with the requirements of this Specification, and the *Contractor's* PQP and QCP's once reviewed and approved by the *Employer*.

The *Contractor* shall ensure that all Sub-Suppliers/Sub-*Contractors* also conform to the requirements contained herein.

2.3.2 Contractor Quality System Requirements

The *Contractor* shall have, maintain and demonstrate its use to the *Employer*, its documented Quality Management System. The *Contractors* Quality Management System should be in accordance with the International Standard ISO 9001.

The *Contractor* shall submit its Quality System documentation as stipulated below to the *Employer*:

- Project Quality Plan
- Quality Policy
- Index of Procedures to be used
- Programme of internal and external audits

2.3.3 Contractor Documentation Requirements

The *Contractor* shall develop and maintain a comprehensive register of documents that will be generated throughout the project, and shall include all quality related documents. The register shall be submitted to TNPA for review.

The *Employer*, TNPA, shall indicate those documents required to be submitted for information/review and/or acceptance and this shall be indicated in the *Contractors'* Document Register. The register shall indicate the dates of issue of the documents taking

into account sufficient time to allow TNPA review/acceptance cycle prior to the document being required for use.

2.4 Quality Assurance

2.4.1 Project Quality Plan

Where specified, the *Contractor* shall submit a PQP to TNPA within 28 days after the Contract start date. The PQP shall detail how the *Contractor's* Quality System will be applied to the Scope of Work specified herein and shall address the following:

- Satisfying the technical and quality requirements of the *Contractor's* Scope of Work, and relevant elements of the applicable ISO 9001 standard.
- Include all quality activities relevant to the Scope of Work, identifying all procedures, reviews, audits, controls and records used to control and verify compliance with the specified Contractual requirements.

Include a listing of all special processes (e.g. welding and non-destructive testing, cube testing etc.) envisaged for use, including confirmation of personnel certification as required:

- Include all proposed method statements (for site based work activities).
- Include a description of the *Contractor's* project organisation, with key positions and responsibilities identified and individuals named. The organisation structure shall also indicate the resources committed to the management / coordination of QA / QC activities.
- Include a listing of all Quality Control Plans (QCP's), and associated Field Inspection Checklists (FIC's), as applicable
- Identify in the Project Quality Plan any Sub-Supplier/Sub-*Contractor* work. Sub-Supplier/Sub-*Contractor* plans shall be approved by the *Contractor*, and a copy forwarded to the TNPA
- Include the proposed Authorised Inspection Authority (where applicable - for pressurised equipment and systems)

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- Include a schedule of proposed quality records

The PQP shall be controlled and re-submitted for approval when required to incorporate any change necessary during the Contract duration to ensure that the document is maintained as an effective control, change management and records. The change management will be done to an agreed policy or procedure.

Note: Where the *Contractor* is required to provide a PQP, no work shall commence until the PQP is approved by the *Employer*, TNPA.

2.4.2 Procedures

The *Contractor's* PQP and procedures shall address the system elements and activities appropriate to the Scope of Work, in compliance with the specified Quality Standard. Where specified, the *Contractor* shall submit copies of Quality Procedures for review. In addition, the *Contractor* shall ensure that copies of all Procedures relevant to the Scope of Work are available for reference by TNPA at each work location.

These will include the following:

Document Control

The *Contractor's* Project Quality Plan shall provide a description of how *Contractor* and Sub-Supplier/Sub-*Contractor* documents are to be managed. The description shall address as a minimum:

- Management tools and databases
- Receipt, registration and maintenance
- Internal and external distribution to *Employer*, third parties and Sub-*Contractors*
- Management of Codes, Standards and Specifications
- Internal review and approval routines and authorities
- How it is ensured that the correct revisions of documents are available at the point of use including retention periods for all documentation.

Design Control

Where the *Contractor* is responsible for any aspect of design related to their Scope of Work, the Quality Plan shall describe the *Contractor's* methods and procedures for the control of these design activities.

Procurement

Where the *Contractor* is responsible for any aspect of procurement related to their Scope of Work, the Quality Plan shall describe the *Contractor's* methods and procedures for the control of these activities.

Contractor Audits

The *Contractor* shall:

- Carry out audits in accordance with its Quality System at its own and Sub-Supplier/Sub-*Contractor's* facilities to ensure project quality requirements are being achieved.
- Include a QA Audit Schedule in the *Contractor* PQP submitted to TNPA prior to commencement of the Scope of Work. The Audit Schedule shall include all audits to be implemented by the *Contractor* and Sub-Supplier/Sub-*Contractor* during the execution of the Contract.
- Where stipulated in the Contract, perform an audit within three months after the Contract start date and thereafter at a minimum frequency of three months. Audit reports shall be submitted to TNPA at the completion of each Audit. Where unsatisfactory performance is evident, additional audits shall be performed by the *Contractor* as directed by TNPA.

2.5 Inspection and Testing

The *Employer*, TNPA, may, at its discretion perform surveillance inspections at the *Contractor's* premises, Sub Supplier/Sub-*Contractor's* premises or at the location of the Scope of Work. Dependent on the nature of the Scope of Work and the frequency of inspections, TNPA may elect to have inspection personnel resident at the place of manufacture, fabrication, or assembly.

The *Contractor* shall ensure free entry and access is given to TNPA, certifying authorities and statutory authorities to inspect the Scope of Work and review procedures and quality records at all parts of the *Contractor's* and Sub-Supplier/Sub-*Contractor's* premises, or at the location of the Scope of Work while any work or test is in progress. The *Contractor* shall provide TNPA with all necessary tools, calibrated measuring equipment, safety equipment and workspace to verify or witness tests in progress. While TNPA is at the *Contractor's* premises, the *Contractor* shall provide, free of charge, reasonable facilities including office facilities and reasonable access to a telephone, facsimile machine and computer connection point. The *Contractor* shall provide notice in writing in within a reasonable time frame as agreed upon, to allow the attendance of TNPA and other representatives at nominated witness and hold points stipulated within the approved QCP.

2.6 Special Processes

It is the *Contractor's* responsibility to ensure that all processes which require prequalified procedures and/or work methods are tested and qualified before work begins. This typically covers such activities as welding, non-destructive testing, special fabrication techniques and painting. Unless specified such procedures are the *Contractor's* responsibility and do not require submission to TNPA before work begins. When such procedures are requested, no work shall commence until procedures are approved by TNPA.

It is the *Contractor's* responsibility to ensure all operators are qualified for the processes in accordance with the procedure and/or applicable standards.

Records of the qualifications of operators shall be maintained by the *Contractor* and made available to TNPA when requested.

Records of the qualification of procedures and processes shall be maintained by the *Contractor* in accordance with the applicable procedure or code.

2.7 Welding Procedures

Where the *Contractor's* Scope of Work includes fabricated weldments, Welding Procedure Specifications (WPS) defining the method, preparation and sequences to be adopted to

achieve satisfactory welded joints shall be provided for all weld types required in the execution of the *Contractor's* Scope of Work. The procedure shall only be submitted to TNPA when requested in the Contract.

WPS shall include all welding essential and non-essential variables for each process used, including appropriate test results and shall comply with the standard or code pertaining to welding required in the execution of the *Contractor's* Scope of Work.

When requested in the Contract, a suitably marked "weld map" shall be completed by the *Contractor* for all items to be fabricated. A summary of WPS shall be prepared and when used, shall be identified on the weld map. Where TNPA approval is required, fabrication shall not commence until written approval of WPS and Welding Procedure Qualification Records (WPQR) is received by the *Contractor*. No welding fabrication will be accepted that is not covered by a TNPA approved WPS/WPQR.

Where the *Contractor's* Scope of Work includes fabricated weldments, Welding Procedure Specifications (WPS) defining the method, preparation and sequences to be adopted to achieve satisfactory welded joints shall be provided for all weld types required in the execution of the *Contractor's* Scope of Work. The procedure shall only be submitted to TNPA when requested in the Contract.

WPS shall include all welding essential and non-essential variables for each process used, including appropriate test results and shall comply with the standard or code pertaining to welding required in the execution of the *Contractor's* Scope of Work.

When requested in the Contract, a suitably marked "weld map" shall be completed by the *Contractor* for all items to be fabricated. A summary of WPS shall be prepared and when used, shall be identified on the weld map. Where TNPA approval is required, fabrication shall not commence until written approval of WPS and Welding Procedure Qualification Records (WPQR) is received by the *Contractor*. No welding fabrication will be accepted that is not covered by a TNPA approved WPS/WPQR.

Welding Procedure Qualification (WPQ) tests may be witnessed by TNPA and/or an independent inspection authority. Testing of the specimens prepared during the WPQ Tests shall be carried out by an independent approved testing laboratory independent of the *Contractor*. In certain instances, a certificate to EN 10204 3.1 B may be required. Where actual weld deposit analysis and weld metal physical properties are required for procedure qualification, the information shall be taken from the procedure qualification

tests. Data listed in the catalogues of the manufacturer of welding consumables is not acceptable.

Welders/welding operators shall be qualified in accordance with the relevant welding code prior to commencing production fabrication. Specific Welder Qualifications (WQ's) records will be reviewed by TNPA in the *Contractor's* works.

A register of welders qualified to work shall be maintained by the *Contractor*.

2.8 Material Traceability

Where, and to the extent that material traceability is required, the *Contractor* shall provide its procedures for the maintenance of material identification throughout all phases of manufacture. Methods of identification, routines for re-stamping or stencilling as appropriate shall be defined and agreed with the *Employer*.

Adequate records shall be maintained throughout construction enabling traceability of key materials from final product back to original material certificates. The material traceability records shall form part of the final handover pack that is submitted by the *Contractor*.

The *Contractor* shall prepare a schedule of materials and equipment that are subject to traceability requirements.

2.9 Non-Conforming Products

The *Contractor* shall establish and maintain procedures to control material or products that do not meet the specified requirements.

All *Contractor* products and/or materials identified as not conforming to requirements shall be dealt with promptly as follows:

- If the *Contractor* discovers material or product which is not in accordance with the requirements of the Contract, i.e. a non-conformance (NCR), the *Contractor* shall promptly initiate the non-conformance procedure in terms of the *Contractor's* Quality Management System, advise TNPA promptly, and provide a copy of the NCR to TNPA
- If TNPA or its agent identifies a non-conformance a TNPA NCR may be raised
- Originals of all closed out NCR's shall be included in the DP

Corrective and Preventative Action

If the *Contractor* proposes a disposition of any non-conforming materials or product which varies from the requirements of the Specification or Contract, such a proposal shall be submitted in writing to TNPA whose decision on the proposal shall be obtained in writing before the nonconforming material or product is covered up or incorporated into the Works, or is the subject of any other disposition.

The disposition of non-conformances which do not vary the requirements of the Contract, specification or drawings may be approved by the *Contractor* following discussion and agreement with TNPA.

Technical Queries

For clarification of technical issues (only), *Contractor* may submit a Technical Query (TQ) to TNPA in accordance with the Contract.

The TQ shall clearly identify all elements of the query, and all supporting documentation and/or drawings shall be attached where appropriate.

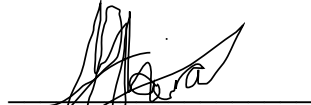
Completed original TQ's shall be included in the Data Pack.

2.10 Quality Records

Contractors shall maintain Quality Records necessary to provide objective evidence that demonstrates and verifies achievement of the QA / QC requirements associated with the Scope of Work. All Quality Records, including original source material test certificates and non-destructive test reports, shall be retained by the *Contractor* during the project, and be provided to TNPA at the times, and in the quantities specified in the Contract. The *Contractor* shall collate all quality records in the Data Pack and submit the Data Pack to TNPA in accordance with the Contract and all referenced standards and specifications. This Data Pack shall be compiled progressively, and shall be available for review at all phases of manufacture or construction activities.

The Scope of Work shall not be complete until the *Contractor's* DP including the quality records from Sub-Supplier/Sub-*Contractors* have been reviewed and accepted by TNPA. The Data Pack shall be compiled progressively during the execution of the Scope of Work and shall be made available for review by TNPA as required.

Compiled By:



Signature

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Designation: Engineer - Port of Durban

02/08/2020

Date

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