ANNEXURE 6: SCOPE OF WORKS

TECHNICAL SPECIFICATIONS:

STRUCTURAL ENGINEERING WORKS

a) Concrete, Formwork and Reinforcement

This section covers the construction of all new reinforced concrete and associated concrete works requirements for the proposed construction of the security wall, as directed by the Engineer.

- Particular Specifications

The following specifications shall apply:

NB: All in situ concrete work (mass and reinforced) shall comply with SANS Specification 1200G ("8 Measurement and Payment" is not applicable) supplemented by the clauses in this section. Where SANS Specification 1200G and the clauses in this section are in conflict the clauses in this section shall take precedence.

In addition the "Model Preambles for Trades" as recommended and published by the Association of South African Quantity Surveyors, 1999 Edition, shall be read in conjunction with and shall apply to all items in the Bill of Quantities not covered by the 'SANS Standardised Specifications' SANS 1200 Series. Where the term "plain concrete" appears in SANS Specification 1200G it shall be read as "mass concrete".

SANS 1200 G	: Concrete
SANS 2001 (Structural)	: CC1 Construction Works: Concrete Works
SANS 1083: 2006	: Aggregates from natural sources
SANS 10100-2:2000 execution of work.	: The Structural use of concrete – Part 2: Materials and
SANS 50197-1:2000 criteria. Part 1: Common cements	: Cement – composition, specifications and conformity

SANS 1491-1:2005 : Portland cement extenders – Part 1 Ground granulated blast furnace slag.
SANS 1491-2:2005 : Portland cement extenders – Part 2 Fly ash.
SANS 1491-3:2006 : Portland cement extenders – Part 3 Condensed Silica Fume

1.1.1.1 Cement

Common cements, complying with SANS 50197-1 shall be used for all concrete work. On no account shall masonry cements be used for concrete work, even if the strength designations are the same as for common cements.

The Supervisor for test purposes may require samples of cement from any one, or from every consignment. Cement in any consignment from which a sample may have been taken for testing shall not be used until it has been approved. Allowance must be made for possible delay in that tests may take 10 days to carry out.

Bags of cement shall be stacked in a waterproof, solidly constructed shed with a central door and a floor rendered damp-proof with a tarpaulin. The bags of cement shall be closely stacked (but not against walls) in order to reduce air circulation in such a manner that the cement is used in the order in which it was received, i.e., first in first out.

1.1.1.2 Alkali reactive concrete

Alkali Reactive Aggregates shall not be used in this project. The equivalent Na2O content of the concrete shall not exceed 2, 0 kg/m3 where % Na2O equivalent = % Na2O + (0,658 x %K2O)

1.1.1.3 Aggregates

Fine and coarse aggregate shall comply with the relevant clauses of SANS 1083.

No aggregate shall be delivered for use in the works until approval is given.

Sand (fine aggregate):

The fine aggregates shall comply with the requirements of SANS Specification 1083. Other aggregates may be approved if they have a satisfactory history and / or test results.

No aggregate may be used until it has been approved. Samples having a mass of 25kg (16.5 litres) of the proposed aggregate to be used may be required by the Supervisor for test purposes. Samples having a mass of 25kg shall be forwarded every 3 months during concreting work and also if the source of supply is changed. Allowance must be made for possible delay in that the tests may take 14 days to carry out.

1.1.1.4 Admixtures

Admixtures containing chlorides will not be permitted in reinforced concrete.

1.1.1.5 Cover blocks

Cover blocks used to ensure the cover to reinforcement shall be made of cement mortar.

Cover blocks shall be dense and have a minimum 28 day crushing strength of 30 MPa and shall be cured in water for at least 14 days before being used.

Cover/spacer blocks made of plastic will not be permitted.

1.1.1.6 Concrete quality

Prior to the start of any concrete work on site, the Contractor shall submit a quality assurance plan which will ensure compliance with specification and provide acceptable documentary evidence that all specified operations have been carried out satisfactorily.

Where the minimum dimension to be placed during a single pour is larger than 600mm, and the cement content of the reinforced concrete exceeds the following:

Cement Types I and II/ * S : 400 kg/m3

Cement Types II/B-V and II/B-W : 450 kg/m3

The Project Manager may require that measures be instituted to reduce heat development in the concrete.

1.1.1.7 Unreinforced concrete

Class A Concrete:

Filling to cavity of hollow walls.

1.1.1.8 Unreinforced concrete cast against excavated surfaces

15 Mpa/19mm Concrete

Surface blinding under footings and bases.

1.1.1.9 Reinforced concrete

30 MPa/19mm Concrete:

- Foundation bases,
- Precast Columns,
- Precast Panels.

1.1.1.10 Batching

All cementitious binders shall be batched by full sack or by mass batching with approved precision weighing equipment.

All aggregates shall be precisely measured by mass using approved precision weigh-batching equipment, unless otherwise permitted by the Project Manager.

Should any variation in the composition of the aggregate become apparent, the Project Manager shall be notified, and a further sample of aggregate submitted immediately for his approval.

1.1.1.11 Concrete placing

The size, shape and depth of any excavation shall be approved by the Project Manager before concrete is placed.

Unless otherwise permitted by the Project Manager, no concrete shall be placed until the fixed reinforcement has been accepted by him and confirmed in writing by way of a release certificate.

1.1.1.12 Grouting

25 MPa non-shrink cementitious grout:

Bedding approximately 25mm thick under base plate including chamfered edges all round.

1.1.1.13 Curing compound

Unless otherwise directed by the Project Manager, the curing compound shall be:

- An approved trafficable, resin-based, white pigmented, membrane forming for slopes flatter than 1:1.
- An approved clear, aesthetically acceptable, membrane forming for all other concrete surfaces, including beam and slab soffits.

The curing compound shall comply with specification ASTM C309, except that the maximum permissible water loss in the test shall be 0, 40 kg/m2.

Alternatively, the curing compound shall be acceptable if the treated concrete retains 90% or more of its mixing water when subject to the test set out in BS 8110 Part 1 – Chapter 6.6.

1.1.1.14 Curing compound application

The total application rate of the curing compound shall be the greater of the supplier's specification or 0.90 l/m2. On textured concrete surfaces, the total application rate shall be 0.90 l/m2.

In cases of concrete surfaces with run-off problems, it may be necessary to apply more than one coat of membrane forming curing compound to obtain the specified total or cumulative application rate.

Curing in accordance with SANS 1200 G shall commence on all concrete surfaces as soon as it is practical in the opinion of the Technical Officer.

On unformed surfaces the curing compound shall be applied after finishing and as soon as the free water on the surface has disappeared and no water sheen is visible, but not so late that the liquid curing compound will be absorbed into the concrete.

On formed surfaces, the exposed concrete shall be wet with water immediately after the forms are removed and kept moist until the curing compound is applied.

Application of the curing compound shall begin once the concrete has reached a uniformly damp appearance with no free water on the surface.

Application of the compound may be done by hand or power spray.

The compound shall be applied at a uniform rate with two applications at right angles to each other to ensure complete coverage.

Pigmented compounds, without a thixotropic agent, shall be adequately stirred to assure even distribution of the pigment during application.

Unless otherwise directed by the Project Manager, the initial 24 hour curing of concrete surfaces not covered by formwork shall be carried out by ponding, covering with constantly wetted sand or mats, or continuous spraying in accordance with SANS 1200 G when the following climatic conditions occur:

1. Wind velocity greater than 5 m/s

   and/or

2. Ambient temperature is above 25 °C

   and/or

3. The relative humidity is below 60 %

If plastic shrinkage occurs, the concrete, while still plastic, shall be re-vibrated, floated and re-coated with curing compound as if no curing has previously taken place.

1.1.1.15 Curing period

The curing period for concrete containing only CEM 1 shall be 7 days.

The curing period for concrete containing CEM 1 plus cement extenders (MGBS, FA) shall be 10 days.

The curing period will start on completion of the concrete pour and for formed surfaces shall be included the time for which forms are still in place after the pour.

1.1.1.16 Concrete records

The Contractor shall maintain the following daily records for every part of the concrete structure and shall make these available at all times during the progress of the work for inspection by the Project Manager:

i. The date and time during which concrete was placed
ii. Identification of the part of the structure in which the concrete was placed
iii. The mixed proportions and specified strength
iv. The type and brand of cement
v. The slump of the concrete
vi. The identifying marks of test cubes made
vii. Curing procedure applied to concrete placed
viii. The times when shuttering was stripped, and props removed
ix. The date of despatch of the cubes to the testing laboratory
x. The test results

The records shall be delivered to the Project Manager each week except in the case of sub-standard concrete when the Project Manager shall be informed immediately.

1.1.1.17 Tolerances

Deviations shall be within the limits listed in SANS 1200 G for degree of accuracy II unless otherwise specified.

1.1.1.18 Testing and monitoring

Frequency of sampling and testing shall be as specified in SANS 1200 G

1.1.1.19 Cost of test

The costs of making, storing and testing of concrete test cubes as required under clause 7 'Tests' of SANS 1200 G shall include the cost of providing cube moulds necessary for the purpose, for testing costs and for submitting reports on the tests to the Project Manager. The testing shall be undertaken by an SANAS accredited materials laboratory or institution nominated by the Contractor to the approval of the Project Manager (Test cubes are measured separately)

If the quantity of concrete from which samples were taken exceeds 40 m^3, it shall be subject to the testing of a minimum of 3 sets of samples per day from each grade of concrete placed in each independent structure.

If the quantity of concrete from which samples were taken is less than 40 m^3, it shall be subject to the testing of a minimum of 2 sets of samples per day from each grade of concrete placed in each independent structure.

If the Contractor disputes the results of the tests on concrete cubes, the concrete represented by the cubes will be considered acceptable if the Contractor, at his own cost, proves to the

satisfaction of the Project Manager that the estimated actual strength of cores taken from the structure, determined in accordance with SANS Standard Method SM 856, is not less than the specified strength.

If the strength of the concrete fails to meet the acceptance criteria stipulated, the Project Manager may in his sole discretion and in addition to the options listed in SANS 1200 G:

i. Accept the concrete subject to approved remedial measures being undertaken by the *Contractor*; or

ii. Permit the concrete to remain subject to the payment of a penalty

The penalty referred to will be determined as follows:

Penalty = V x R x F

Where,

V = Volume (in the opinion of the Project Manager) of concrete of unsatisfactory strength represented by the test result.

R = Relevant scheduled rate

$$F = 1 - \sqrt{\frac{Average\ strength\ of\ unsatisfactory\ concrete}{Specified\ strength\ +\ 6\ MPa}}$$

Where the relevant scheduled rate (R) includes the cost of formwork or

$$F = 1 - \frac{Average\ strength\ of\ unsatisfactory\ concrete}{Specified\ strength\ +\ 6\ MPa}$$

Where the relevant scheduled rate (R) excludes the cost of formwork or where no formwork was involved.

1.1.1.20 Formwork

Reusable moulds to be used to cast base and plinth for the column footings. Formwork as described below shall be used where moulds cannot be used.

Rough formwork (degree of accuracy ii)

Rough Formwork to Sides:

- Strip footings.
- Bases.
- Rectangular columns in foundations.

1.1.1.21 Reinforcement

High tensile steel reinforcement to structural concrete work:

- In various diameters and lengths
- Mild steel reinforcement to structural concrete work
- In various diameters and lengths
- High tensile steel reinforcement to structural concrete work
- Fabric reinforcement:
- Fabric reinforcement type as specified on structural drawings.

1.1.1.22 “No Fines” Concrete

“No-fines” concrete, for grading flat concrete roofs and the like to falls, shall be in the proportion of 12 parts 19 iron cubical stone to 1 part cement mixed with 20 litres water per bag of cement and be laid to falls of not less than 15mm per linear metre for mastic asphalt and not less than 20mm per linear metre for sheet roof covering. For heavy load applications special mix designs may be required

1.1.1.23 Steel Work

Governing Codes and Standards

ANSI/AWS D1.1	:	Structural Welding Code - Steel
BS-EN 287 Part 1	:	Approval testing of welders/fusion welding
BS-EN 288 Part 3	:	Specification and approval of welding procedures for metallic materials
BS 5135	:	Metal arc welding of carbon and carbon manganese steels
BS 4360/SANS 50025:		Weldable structural steel
BS 2573 Part 1	:	Classification, stress calculations and design of structures
BS 3923	:	Methods for ultrasonic examination of welds
BS 2600	:	Radiographic examination of fusion welded butt joints in steel
DIN 1026	:	Metric channels
ISO R657	:	Angles
SANS 10094	:	The use of high strength friction grip bolts and nuts
SANS 135	:	ISO metric bolts, screws and nuts (hexagon and square) coarse thread free fit series)
SANS 136	:	ISO metric precision hexagon-head bolts and screws, and hexagon nuts (coarse thread medium fit series)
SANS 435	:	Mild steel rivet

1.1.1.24 Structural Steelwork

The design of all structural steelwork shall be such as to provide a robust and rigid structure requiring the minimum of maintenance and providing a long service life. In the design of steel structures, due cognisance shall be taken of environmental and wind load conditions as specified in the main specification.

Due to the highly corrosive conditions experienced in South African coastal regions, the permissible stresses shall not exceed those set out in British Standard No. 2573.

All steel sections shall be manufactured in accordance with the following standards:-

i.	BS 4360/SANS 50025	:	Weldable structural steel
ii.	BS 4 Part 1	:	I and H sections
iii.	DIN 1026	:	Metric channels
iv.	BS 4 Part 1	:	Structural steel, hot rolled sections
v.	ISO - R657	:	Angles
vi.	BS 4848 Part 2	:	Hot finished hollow sections
vii.	BS 6363	:	Cold formed sections
viii.	BS 29	:	Forgings
ix.	BS 3100	:	Steel castings
x.	BS 1452	:	Cast iron

All steel plates and rolled steel sections used in the construction of the structures shall be of steel made by the open hearth process (acid or basic) and shall comply in every respect with BS 4360, "A" quality Structural Steel for Bridges and General Building Construction, Grade 43A or Grade 50B or SANS 50025 grade S355JR, where sections sizes allow. That is, the percentage of phosphorous and sulphur shall not exceed 0,06.

The above is laid down as a standard, but tenders will also be considered for rolled steel not conforming strictly to the above standard. Full particulars of the guaranteed properties of the steel tendered for should in this case be furnished, i.e. chemical composition, tensile strength, yield point, reduction in area, bend tests, etc.

Forgings and drop forgings shall be free from flaws and surface defects of any kind and be accurately finished to the prescribed dimensions.

Steel castings shall be sound, clean and free from all defects and distortion of any kind and should, except where otherwise specified, conform with the conditions and tests specified in B.S. No. 3100/Latest Edition, for grades A, B and C according to requirements. They shall be thoroughly annealed and all working parts and bearing surfaces shall be machined and turned accurately with correct finish.

The dimensional and out-of-square tolerance as specified in the above Standards shall also apply to built-up components. Edge preparations, welding techniques, straight beds and material fit-up shall be considered when welded joints are designed.

The shape of all members and connections must allow easy accessibility for maintenance painting of all surfaces. No members shall comprise a double member which cannot be painted and maintained.

Structural details must be so designed as to eliminate or seal off any cavities or pockets where water or condensation could collect and promote corrosion. Horizontal members with upstanding flanges require special drainage.

All hollow sections shall be completely closed and airtight, and all welding is to be of such size and quality as to ensure complete airtightness. No tapping or drilling of holes into sealed sections will be permitted.

1.1.1.25 Welding

All the provisions of BS 5135 shall be complied with as far as applicable.

Design of weld joints shall be such that crevices, overlaps, pockets, arc strikes and dead ends do not exist.

All joints shall be completely seal welded in accordance with BS 5135. Special care must be taken to prevent the ingress of moisture into the tubular members by ensuring that each such tubular member is airtight. “Stitch” welding will not be permitted. Only continuous welding will be accepted.

Weld cracks, undercut, or pock marks will not be accepted.

All welds on the load bearing frame structure, containers, piping, pipe line flanges, etc., shall be continuous and shall be visually inspected for cracks and other discontinuities.

Welds on the main chords must be tested ultrasonically in accordance with BS 3923 or X-rayed in accordance with BS 2600 and those on minor joints by the dye-penetrant method. The equipment required for these tests must be supplied by the Contractor and the testing done at his cost.

Steel, except in minor details, which has been partially heated, shall be properly annealed. (Electrically welded structural members excepted.)

All brackets, clamps, lugs, straps, suspenders, etc. required for attaching mechanical and electrical equipment must be welded on prior to erection and special precautions must be taken not to damage welds or puncture tubes during erection.

The welding of all rails shall be done by an approved method.

Welding shall only be carried out by a coded welder according to SANS 10044, BS-EN 287 Part 1 and BS-EN 288 Part 3 or ANSI/AWS D1.1.

All parts to be welded shall be thoroughly cleaned and dried before welding. The welding will only be done in dry surroundings and all steps taken to prevent hydrogen embrittlement.

Where materials of different compositions are joined by welding, especially carbon steel to chrome steel, the filler welding method and post welding treatment shall be such that embrittlement and other degradation of both steel and filler is prevented.

It must be ensured that welded joints are ductile.

1.1.1.26 Fasteners

All bolts, nuts and rivets shall be manufactured in accordance with the following standards:-

- SANS 135 : Commercial bolts and nuts Grade 4.6
- SANS 136 : Precision bolts and nuts Grade 8.8
- SANS 10094 : Friction Grip Bolts and nuts Grade General
- SANS 435 : Rivets

All friction grip fasteners shall be hot dip galvanised, including high tensile bolts (and their nuts and washers), structural rivets and Huck bolts.

All holding down bolts and nuts and brackets, as well as all fixing bolts, studs, nuts and washers shall be of stainless steel. Fixing rivets shall be of either stainless steel or brass.

Bolts and set screws shall be locked in an approved manner and shall not be stressed in tightening to beyond the recommended loads.

The quality of friction grip bolts, nuts and washers, bolt lengths, sizes of holes, tightening standards, surface condition of clamped components, shop and site assembling and acceptance inspection of friction grip joints shall comply with the latest edition of SANS 10094. Certificates shall be supplied for all bolts of grade 8.8 and 10.9.

All bolt and rivet holes must be accurate to size and location, the centres of holes shall not be placed nearer the edge of a plate than 1,5 diameters with an extra allowance of 3mm for sheared edges. All holes in the structural work shall be drilled or otherwise punched to a diameter not exceeding 1,5mm less than the diameter of the finished hole on the die side, and afterward reamed out to the exact size.

Where possible the adjoining parts forming a connection shall be drilled or reamed together, with holes not exceeding 1,5 mm diameter the rivet or bolt for which it is made. No rough or broken edge shall be left around any of the holes.

For turned and fitted bolts, the holes shall be accurately drilled or reamed; the diameter of the hole shall not exceed the finished diameter of the bolt by more than 0,25mm.

The holes, after assembly of the parts, shall be true throughout the thickness of all the parts and perpendicular to the axis of the member.

Rivets shall be cup-headed or countersunk as required, unless otherwise specified. No rivet head shall contain less metal than does a length of the rivet equal to 1,25 times its diameter. All loose and defective rivets shall be cut and replaced by sound ones; also others when required for the purpose of examining the work. Rivets shall be driven with pressure tools whenever possible and pneumatic hammers shall be used in preference to hand driving.

All field rivets must be supplied with shanks of suitable length for pneumatic riveting.

Bolts shall be of such a length as to accommodate a full nut when tightening up, and project at least two thread pitches beyond the nut. Excessive projection of threads beyond the nuts should be avoided.

All bolts having countersunk heads shall have strong feathers forged on the neck and head to prevent turning and the bolt holes shall be cut to receive same. All nuts and bolts (excluding countersunk bolts) shall be furnished with circular washers of sufficient thickness, the outside diameter being at least twice the nominal diameter of the bolt, and washers fitted correctly.

Where bolt heads or nuts are seated on bevelled surfaces of beams or channel flanges, bevelled washers must be inserted.

1.1.1.27 Joints and Mating Surfaces of Members

Mating surfaces of members to be joined by high tensile steel bolts in friction grip shall be cleaned and primed as specified for the rest of the steelwork. Mating surfaces shall lay flat against each other to eliminate gaps which may allow ingress of water. After joining, the edges shall be sealed with an approved brand of Butyl/ Rubber sealing compound by means of a suitable caulking gun or shall be seal welded.

Other joints shall be formed by one of the following methods:

i. The mating surfaces of members shall be blast cleaned, primed and protected prior to sub-assembly by the liberal application of caulking compound. While the compound is still wet, the members shall be bolted together and caulking compound which is squeezed out shall be completely removed.

ii. The mating surfaces shall be protected with the full corrosion protection system as specified, the surfaces joined together and the joint so formed shall be sealed with butyl rubber sealer.

iii. After being cleaned and primed the surface shall be joined together and the joint so formed shall be seal welded.

iv. The primer coating on mating surfaces must be applied not more than 4 hours after cleaning and the edges must be sealed within 3 weeks of assembly of the part.

1.1.1.28 Fabricated Parts

All fabricated parts shall be properly fitted during assembly to result in properly aligned equipment having a neat appearance. Fabrications of load bearing members shall have no abrupt changes in cross section and regions of severe stress concentration. All sharp corners accessible by personnel during erection or operation shall be ground, rounded, or removed by other methods. Burrs, welding spatter and stubs of welding wire shall be removed.

1.1.1.29 Corrosion Protection

Scope

PRASA requires that the Contractor supply, install and guarantee a robust marine grade corrosion protection system for use on all steelwork. The Contractor may select either a 3-Coat or 1-Coat system. The corrosion protection system selected for use shall be from an internationally recognised and reputable supplier e.g.: Hempel, Jotun, International Paints. The selected corrosion protection system shall carry a minimum 5year guarantee, defined as a maximum of 1% of the total area of corrosion protection breakdown per year. The Contractor shall be required to repair yearly, any corrosion protection breakdown exceeding 1% of the total surface area. The paint supplier shall carry the guarantee for the first 5years. A guarantee certificate, from the paint supplier, is required prior to the construction Works. The final paint selection by the Contractor shall be approved by the Engineer before its application.

Sequence of Corrosion Protection Application – 3 coat system

- High pressure wash, clean and remove oils and contaminants,
- Descale,
- Grit blast to SA 2 ½,
- Remove all slag and waste,
- Stripe coat using 1st coat primer: angles, stiffeners, edges, corners, welding seams and all areas inaccessible by spray painting,
- Spray 1st primer coat to all surfaces,
- Allow sufficient drying time,
- High pressure wash to remove dust before next coat application,
- Stripe coat using 2nd coat primer: angles, stiffeners, edges, corners, welding seams and all areas inaccessible by spray painting,
- Spray 2nd primer/intermediate coat to all surfaces,
- Allow sufficient drying time,
- High pressure wash to remove dust before final coat application,

- Stripe coat using final coat: angles, stiffeners, edges, corners, welding seams and all areas inaccessible by spray painting,
- Spray final coat to all surfaces,
- Allow sufficient drying time.

Paint specification – 3 coat system

- 1st Coat Primer to be 150 microns DFT,
- 2nd Coat Primer to be 150 microns DFT,
- Coat to be 160 microns DFT.

Paint Application

The application instruction covers surface preparation, application equipment and application details for corrosion protection to steelwork according to the requirements of IMO Resolution MSC.215 (82): Performance Standards for Protective Coatings on Steelwork.

- The steel surfaces shall be prepared so that the coatings achieve an even distribution at the specified nominal dry film thickness. Adequate adhesion ensured by removing weld spatter and any other surface contamination,
- All welding seams shall be partially dressed to remove irregular profiles,
- Surface pores, pits and craters shall be sufficiently open to allow penetration of the paint,
- Sharp edges shall be treated to a round radius of minimum 2mm,
- Before blasting any deposits of grease or oil must be removed from steel using a suitable detergent followed by fresh water hosing,
- Minor spots of oil grease may be cleaned with thinner and clean rags,
- Steel must be abrasive blast cleaned to SA 2 ½,

- Welds as well as shop primed areas with damage, burn marks and rust must be blasted to SA 2 ½,
- Surfaces with deposits of black iron oxides from gas cutting markings shall be cleaned by light abrasive sweep blast,
- Welds coated with temporary primer after welding must be cleaned by hard abrasive sweeping, preferably abrasive blast,
- Spot checks for possible salt contamination of the surfaces must be executed,
- Overlap zones must be treated with great care,
- Relative humidity shall be 85% or below, the steel temperature shall be 3-5 degC above the dew point,
- The paint layer must be applied homogeneously and as close to the specification as possible,
- The finished coatings must appear as a homogeneous film with a smooth surface. Any defects of bubbles, voids, visible abrasive residue shall be marked, and appropriate repair affected.

1.1.1.30 High Security Steel Double Welded Mesh Fencing

Scope of work

The works for the fencing shall include the following:

- Design, supply, fabrication and installation of High Security Fencing (hereafter referred to as HSF) with unobstructed views (e.g. Clearvu or similar approved).
- Design, supply, fabrication, and installation of security gates (e.g., Clearvu or similar approved).
- The final fence height above finished ground level is to be 4m for Station fences and 3m for substation fences.

And any other work arising out of or incidental to the above, or required by the Contractor for the proper completion of the works in accordance with the true meaning and intent of the contract documents.

Supporting specifications

This part shall be read in conjunction with the following SANS and PRASA standard specifications.

SANS	
SANS 1200 HC	Corrosion protection to structural steelwork
SANS 1200 H	Structural steel work
SANS 1200 GA	Concrete (small works)
SANS 1200 AH	General (Structural)
SABS 0100-2: 1992	The Structural use of concrete – Part 2: Materials and execution of work.

Submittals

- Certificate of compliance for materials and coatings,
- Shop drawing for HSF and gates,
- Submittal requirements are identified within the Specification,
- Quality control program shall be submitted to the Engineer for review prior to commencement of any work.

Method Statement

A detailed method statement is required; setting out what quality control procedures will be implemented with respect to:

- Procedures, methods and equipment for the manufacturing, galvanizing and anti-corrosion coating of the HSF and gates.
- Procedures, methods and equipment to be used for the construction of the concrete bases, plinths, etc.
- Procedures, methods and equipment to be used for the installation of the HSF and gates.

1.1.1.31 Security Fencing Performance Standards

The security fence shall conform to the following performance standards:

- The fence shall be resistant to penetration by a reciprocating saw, angle grinder and acetylene torch.
- The fence shall be anti-climb.
- The fence shall be anti-cut.

1.1.1.32 Security Fencing Standards and Reference Codes

The fence shall comply with the following testing standards:

- CSIR Test : 050036, 050056, T09998
- SABS Test: 2536/YM139
- NATO Stock: 5660-99-458-7414
- ICAO: ICAO Security Manual

1.1.1.33 Security Fencing Specification

The fence must conform to the following specifications:

- The fence shall be installed and in operation for a minimum of 10 years prior to any maintenance being required
- The fence must provide unobstructed views
- The fence shall have a minimum embedment of 500mm below finished ground level.
- Post finish shall be galvanized and suitably powder coated.
- Posts shall be set in 500 x 500 x 600mm deep foundations.
- The panel width shall be to manufacturer specification and 3m and 4m in height. (Modular split to manufacturer specification).
- Panels shall be double skin welded mesh with nominal aperture size (centres) 12.7 x 12.7mm to manufacturer specification with a minimum wire diameter of 3mm.
- Panel post finish shall be flush providing no climbing aid.
- Panel and fixtures shall be galvanized and powder coated.
- All steel materials shall be of commercial quality, galvanized steel.
- All posts shall be galvanized, one piece and without joints. All posts supplied with moisture proof caps.
- Zinc coating shall be smooth and essentially free from lumps, globs, or points.
- Miscellaneous material shall be galvanized.
- All HSF posts shall be set as per the construction drawings

- A 100mm high toughened steel Shark Tooth spike shall be affixed to panel edge, internally at 150mm intervals using Anti-vandal bolts.
- Spike finish shall be galvanized, then powder coated.
- A 500mm deep 'underdig' shall be secured to the lower edge integrated angle.

Requirements

- Certificate of compliance for materials and coatings
- Shop drawing for HSF panels and gates. These must be approved prior to erection.
- Quality control program shall be submitted to the Project Manager for review prior to commencement of any work
- Product Performance Guarantee Certificate (min 10 years). The Contractor to provide the certificate to PRASA for review before acceptance.

1.1.1.34 Gates

- Gates shall be swing gate or sliding gates as specified in drawings
- All connections and joints shall be welded to form rigid frames or assembled with corner fittings.
- Hinges shall not twist or turn under the action of the gate, shall be so arranged that a closed gate cannot be lifted off the hinges to obtain entry.
- All fittings, brackets and rear wheel tracks shall be standard manufactured products for the intended application.
- This Contract calls for the design, supply, fabrication and installation of a sliding HSF gate.

- The gates must be manufactured of steel and match the HSF panel specification as listed above. It must be to the full fence height.
- The gates must be galvanized and corrosion protected using the same method as for the fence.

Posts

All gate posts shall be as per the drawings with a minimum 30 MPa (28-day compressive strength) concrete, 19 mm aggregate.

1.1.1.35 Fence construction

Install all fencing and gates in accordance with the drawings, specifications, instructions, and as specified lines and grades indicated. Line posts shall be spaced at intervals specified by manufacturer. Terminal posts shall be set at abrupt changes in vertical and horizontal alignment.

Posts

- Post holes shall be cleared of loose material. Waste material shall be disposed of by the Contractor. The ground surface irregularities along the fence line shall be eliminated to the extent necessary
- Posts shall be set plumb, and follow the indicated alignment. All posts shall be set to the depth indicated on the design documents. Concrete shall be thoroughly consolidated around each post, free of voids, and finished with a domed shaped surface, with the base of dome at grade elevation. Concrete shall be allowed to cure prior to installing any additional components to the posts.

Concrete

- Concrete footings shall be carried down to at least the depth indicated on the design documents and shall not be smaller than the dimensions shown. Where a rock layer is encountered within the required depth to which the post is to be erected, a hole of a diameter slightly larger than the largest dimension of the post may be drilled into the rock and the post grouted in. Then the regular concrete footing shall be placed between the top of the rock and the top of the footing elevation as shown on the design documents. Posts shall be approximately centered in their footings. All concrete shall be placed promptly and consolidated by tamping or other approved methods.
- Where the ground is firm enough to permit excavation of the post hole to neat lines, the concrete may be placed without forms by completely filling the hole. Curing may be achieved by covering the concrete with not less than four inches of loose moist material immediately after placing concrete, or by using a curing compound. All excess material from footings, including loose material used for curing, shall be disposed of as directed by the Engineer
- Where the ground cannot be satisfactorily excavated to neat lines, forms shall be used to place concrete for footings. Under these conditions the earth and forms coming in contact with the concrete shall be moistened and all ponded water shall be removed from the hole prior to placing concrete. When forms are removed, the footing shall be backfilled with moistened material, and thoroughly tamped. The top of the concrete shall then be covered with not less than 100 mm (4 in) of loose moistened material or use curing compound if the 7-days cure is not completed. All excess material from footings, including loose material used for curing, shall be disposed of as directed.

Gates

- Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Slide gates shall be installed as recommended by the manufacturer.
- Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- Lubricate hardware and other moving parts.

1.1.2 **Quality Management Specification**

1.1.2.1 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 Supplier/Contractor to verify compliance with the Contractual requirements.
Employer	For the purposes of this document, the term Employer has the same meaning as applied to the term Employer.
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 Supplier/Contractor by the Employer advising release of the Materials for shipment. This does not relieve the Supplier/Contractor of its obligations in accordance with the Terms and Conditions of the Contract.
Inspection Waiver Report (IWR)	A document issued to the Supplier/Contractor by Employer advising that the Employer has waived final inspection for the materials listed in this document. The issue of this Report does not preclude further inspection by Employer, is issued without prejudice and does not relieve the Supplier/ Contractor from the guarantees and obligations included in the Contract
Project Quality Plan (PQP)	A document that outlines the Supplier/Contractor's 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 Supplier/Contractor 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.

1.1.2.2 Applicable Documents

1.1.2.2.1 General

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

1.1.2.3 Statutory Regulations

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

1.1.2.4 Quality System

1.1.2.4.1 General

The Supplier/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 Supplier/Contractor's PQP and QCP's once reviewed and approved by the Employer.

The Supplier/Contractor shall ensure that all Sub-Suppliers/Sub-Contractors also conform with the requirements of this Specification.

1.1.2.4.2 Supplier/Contractor Quality System Requirements

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

The Supplier/Contractor shall submit its Quality System documentation to the Employer at the time of tender and at Contract Phases as detailed below:

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

1.1.2.4.3 Supplier/Contractor Documentation Requirements

The Supplier/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 PRASA for review.

The Employer, PRASA, shall indicate those documents required to be submitted for information/review and/or acceptance and this shall be indicated in the Supplier/Contractors' Document Register. The register shall indicate the dates of issue of the documents taking into account sufficient time to allow PRASA review/acceptance cycle prior to the document being required for use.

1.1.2.5 Quality Assurance

1.1.2.5.1 Project Quality Plan

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

- satisfying the technical and quality requirements of the Supplier/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 Supplier/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 Supplier/Contractor, and a copy forwarded to the PRASA
- Include the proposed Authorised Inspection Authority (where applicable - for pressurised equipment and systems)
- 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 Supplier/Contractor is required to provide a PQP, no work shall commence until the PQP is approved by the Employer, PRASA.

1.1.2.5.2 Procedures

The Supplier/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 Supplier/Contractor shall submit copies of Quality Procedures for review. In addition, the Supplier/Contractor shall ensure that copies of all Procedures relevant to the Scope of Work are available for reference by PRASA at each work location.

These will include the following:

<u>Document Control</u>

The Supplier/Contractor's Project Quality Plan shall provide a description of how Supplier/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 Supplier/Contractor is responsible for any aspect of design related to their Scope of Work, the Quality Plan shall describe the Supplier/Contractor's methods and procedures for the control of these design activities.

Procurement

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

Supplier/Contractor Audits

The Supplier/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 Supplier/Contractor PQP submitted to PRASA prior to commencement of the Scope of Work. The Audit Schedule shall include all audits to

be implemented by the Supplier/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 PRASA at the completion of each Audit. Where unsatisfactory performance is evident, additional audits shall be performed by the Supplier/Contractor as directed by PRASA

1.1.2.6 Inspection and Testing

The Employer, PRASA, may, at its discretion perform surveillance inspection at the Supplier/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, PRASA may elect to have inspection personnel resident at the place of manufacture, fabrication, or assembly.

The Supplier/Contractor shall ensure free entry and access is given to PRASA, certifying authorities and statutory authorities to inspect the Scope of Work and review procedures and quality records at all parts of the Supplier/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 Supplier/Contractor shall provide PRASA with all necessary tools, calibrated measuring equipment, safety equipment and workspace to verify or witness tests in progress.

While PRASA is at the Supplier/Contractor's premises, the Supplier/Contractor shall provide, free of charge, reasonable facilities including office facilities and reasonable access to a telephone,

facsimile machine and computer connection point. The Supplier/Contractor shall provide notice in writing in within a time frame as agreed upon, to allow the attendance of PRASA and other representatives at nominated witness and hold points.

1.1.2.7 Special Processes

It is the Supplier/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 Supplier/Contractor's responsibility and do not require submission to PRASA before work begins. When such procedures are requested, no work shall commence until procedures are approved by PRASA.

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

Records of qualification of operators shall be maintained by the Supplier/Contractor and made available to PRASA when requested.

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

1.1.2.8 Welding Procedures

Where the Supplier/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 joint shall be provided for all weld types required in the execution of the Supplier/Contractor's Scope of Work. The procedure shall only be submitted to PRASA 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 Supplier/Contractor's Scope of Work.

When requested in the Contract a suitably marked "weld map" shall be completed by the Supplier/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 PRASA approval is required, fabrication shall not commence until written approval of WPS and Welding Procedure Qualification Records (WPQR) is received by the Supplier/Contractor. No welding fabrication will be accepted that is not covered by a PRASA approved WPS/WPQR.

Where the Supplier/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 joint shall be provided for all weld types required in the execution of the Supplier/Contractor's Scope of Work. The procedure shall only be submitted to PRASA 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 Supplier/Contractor's Scope of Work.

When requested in the Contract a suitably marked "weld map" shall be completed by the Supplier/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 PRASA approval is required, fabrication shall

not commence until written approval of WPS and Welding Procedure Qualification Records (WPQR) is received by the Supplier/Contractor. No welding fabrication will be accepted that is not covered by a PRASA approved WPS/WPQR.

Welding Procedure Qualification (WPQ) tests may be witnessed by PRASA 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 Supplier/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 PRASA in the Supplier/Contractor's works.

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

1.1.2.9 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 DP.

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

1.1.2.10 Non-Conforming Products

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

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

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

<u>Corrective and Preventative Action</u>

If the Supplier/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 PRASA 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 Supplier/Contractor following discussion and agreement with PRASA.

Technical Queries

For clarification of technical issues (only), Supplier/Contractor may submit a Technical Query (TQ) to PRASA 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 TQN's shall be included in the DP.

1.1.2.11 Quality Records

Supplier/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 Supplier/Contractor during the project, and be provided to PRASA at the times, and in the quantities specified in the Contract. The Supplier/Contractor shall collate all quality records in the DP and submit the DP to PRASA in

accordance with the Contract and all referenced standards and specifications. This DP 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 Supplier/Contractor's DP including the quality records from Sub-Supplier/Sub-Contractors have been reviewed and accepted by PRASA. The DP shall be compiled progressively during the execution of the Scope of Work and shall be made available for review by PRASA as required.

1.2 Punitive Measures/Actions to be Instituted Against the Contractor Resulting from the Issuing of NCR`s to the Contractor for First Time and/or for Repeat/Similar Non-conformities

Should the Contractor breach any of its accepted and approved designs, methodologies, procedures, practices, techniques, construction norms, specifications, Codes or Standards pertaining to the project resulting in an NCR being issued to the Contractor, the Engineer shall institute their entitled discretionary procedures/powers as follows:

- The Contractor shall remedy, following the Engineer`s guidance and/or to the Engineer`s acceptance, the defect for which the NCR was raised, with the complete cost of the remediation being carried by the Contractor. Furthermore, while the Contractor may not have a financial penalty instituted against them in this instance, the time implication/impact of the rework that must be completed by the Contractor shall in no way negatively impact/prejudice the project's approved schedule i.e.: Any late completion by the Contractor possibly resulting from the reworks due to NCR close-out requirements shall not be considered as mitigation against the enforcement of punitive penalties against the Contractor as stipulated in the Contract. The Client shall record impacts to the schedule resulting from NCR close-out requirements, in detail, and

shall use these time-delays as justification for the enforcement of penalties against the Contractor should that scenario arise

- Any subsidiary services, engineering or otherwise, that are disabled from performing any services/duties due to Contractors performing NCR close-out requirements shall issue the Client with a standing time invoice, which the Client shall use to extract the punitive costs for reimbursement from the Contractor i.e.: the Contractor will be fully and solely responsible for all these punitive costs

1.3 Pre-Preparation for the Works Execution

The Contractor shall fully inspect the site and ensure that the site is in an acceptable condition to commence with the Works. Any deviation from the Contractors expectations as it pertains to existing infrastructure damage, site access etc shall immediately be raised with the Supervisor

The Contractor shall take all precautions necessary to prevent any damage to components especially to electronic components installed on structures (if any) which could be affected by the welding work if applicable.

1.4 Service and Maintenance

For all Plant and Works, the Contractor shall provide the Engineer with the operating and maintenance procedures and instructions. These documents shall be in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust all parts of the Plant. The Works and the supply of Plant shall not be considered to be complete to commence commissioning and ultimately take-over until these documents have been supplied to the Engineer

1.5 General Obligations of the Contractor

The Contractors obligations as contained in this document shall be deemed to cover, but not be limited to, the following:

- The project scope shall include the design, manufacture, supply, installation, erection, and commissioning of all Plant and Materials as required for completing the Works. The Contractor shall supply all necessary manpower, labour, supervision, materials, services and testing devices for all aspects of this project as indicated hereunder and the Contractors quoted amount for the Works shall be deemed to cover all cost and expense thereof
- Project Management of the complete Scope of Work including planning, scheduling and reporting verbally to the Engineer on a daily basis and in writing by means of reports, updated project schedule etc. weekly. The Contractor shall make available, their specialist planning resource on a weekly basis, to supply and present the updated project schedule to the Client and the Engineer. Weekly written progress reports shall be issued to the Engineer for approval
- Implementation of an appropriate quality system including stringent quality control for all Plant and Materials stipulated in this document
- Submission and gaining Engineers approval of all quality control plans (in accordance with ISO 9000) and conforming to requirements as contained in this document
- Submission of a detailed Level 3, MSP generated, project schedule 1week after award and updated weekly or as advised by the Engineer for the project as well as for all Plant and Materials and Services to be supplied by Others
- The Contractor shall allow for any relevant information gathering exercises e.g. sample extraction and testing, dimensions, layouts, access routes, review surrounding structures, identify rigging points, checking, etc., to ensure that all Plant and Materials shall be erected in accordance with all the PRASA specifications and PRASA/Engineers' requirements

- Selection of appropriate Codes of Practice, Standards, Procedures and Specifications applicable to the Works
- Remove, replace, modify, reinstall and make good all existing equipment, Plant and Materials
- Supply, installation, statutory compliance to relevant Codes and Standards and safe storage of all Plant, Equipment and Materials required to completely negate the detrimental effects to construction progress resulting directly or indirectly from loss of electrical power on site
- Installation of all chemical anchors, bolts, fasteners, washers, nuts, clamps, brackets, fixing and securing elements as required
- All specialized equipment, tools, brackets, supports, packers, shims, etc., necessary to complete the Works in accordance with the Engineers specifications, appropriate codes and the Project Standards
- Supply of all construction lighting and associated support structures, access platforms, etc. as required for the successful Erection of all Plant and Materials
- Should any flooding of work areas occur for whatever reason, related to the Contractor or not, the Contractor at their cost shall supply all required clean-up equipment including drainage pumps
- The Contractor shall engage the services of a certified (by relevant South African statutory organisation) welding inspection organisation for the execution and performance of all NDT, dye pen, Ultrasonic, X-ray and any other testing as required on all remediation work installations as is required by the appropriate codes, standards and the Project Standards
- The Contractor shall plan, in detail, the installation and erection sequence of the Plant and Materials to allow for accessibility for rigging purposes and the availability of respective pieces of Plant and Materials based on their delivery to site
- Within the Site, removal and disposal of all scrap and rubble generated by the Contractor to the scrap lay-down or dumping area
- Site safety supervision, personal protection and safety equipment

- Supply of all equipment and personnel required to comply with the Occupational Health and Safety Act, 1993. The Contractor shall take special note of the requirements of the latest editions of Construction Regulations
- Comply with the Employers Environmental Management Plan
- Complete all documentation to the satisfaction of the Engineer in order for the Taking Over Certificates as appropriate to be signed off by the Employer
- Assistance during Test on Completion (Pre-Commissioning and Commissioning) which shall be co-ordinated and directed by the Engineer
- The Contractor shall attend to all punch list items (Punch list A, B and C) as outlined by the Engineer upon the completion of the installation and during Tests on Completion (Pre-commissioning and Commissioning)
- Supply of all Contractors Documents, designs, drawings including all “As Built” drawings for Plant and Materials, specifications and details, NDT and hydraulic testing procedures and results

1.6 Contractor Document Submission after Award

The following documentation shall be included with the Contractors submission:

1.6.1 Final design report detailing all components, systems, Plant and Works tendered

1.6.2 Safe working area plan

1.6.3 Emergency plan

1.6.4 Lifting/rigging studies

1.6.5 Qualification documentation (all those resources involved with fabrication, quality, supervisory and HSE)

1.6.6 Approved and signed-off by Professional Engineers and Naval Architect: Engineering, Inspection, Assessment reports, drawings and programmes /schedules.

1.6.7 Approved or evidence of approved welding procedures relevant to this Project scope of works

1.6.8 Insurance cover

1.6.9 Detailed Method statements for the individual Works

1.6.10 SHERQ plan

1.6.11 Supervision and site management plan

1.6.12 Maintenance plans

1.6.13 Pre-commissioning and Commissioning plans

1.6.14 Detailed Quality control plans

1.6.15 Detailed Work instruction/procedures

1.6.16 Quality control dossier

1.6.17 Compilation of “Completion Certificates” certified by the Employer

1.7 General requirements for the Works

Surface preparation and painting is done in accordance with a 60month supplier guaranteed specification as well as the PRASA specification

It shall be noted by the Contractor that all corroded areas are to be prepared to bare metal. Welding works over primed metal has to be approved by the Engineer.

Should members or plates be found below acceptable thickness based on the original size these members/areas shall be pointed out to the Engineer who shall advise on the way forward.

All connecting flanges and 'fish plates' on the internal structure shall be inspected and checked for corrosion, and internal Rivets are to be replaced with new welded connections as required. If Rivets are not corroded or loose, the Rivets can be left in place.

All Rivets are to be replaced by welding where required.

All welds shall be checked for cracks. NDT or any other required weld testing procedure as approved by the Engineer shall be carried out on at least 30% of all welds. Any cracks found are repaired. A welding procedure specification for the repairs of the cracks is provided by the Contractor to the Engineers' acceptance.

All welding consumable specifications stipulated herein shall be strictly adhered to.

Should the Contractor deviate from the project requirements, PRASA reserves the right to stop the Works with the Contractor to rectifying the areas of concern.

The Contractor shall provide a detailed method statement stipulating how the Works are to be carried out in a safe manner. The method statement is to include stability calculations, and indicate weight to be added to crane(s) to stabilize when lifting. (If required)

All cable tray brackets, stairways, walkway and platform stringers, brackets, bracing and gussets that have excessive corrosion shall be replaced. The welding of stainless and mild

steel, if applicable, shall be accomplished with 309L electrodes where a gap of minimum 1mm between the different steels is required.

1.8 Requirement for submission of Contractor's Works

The Contractor submits 1 (one) electronic copy and 2 (two) paper copies of all documentation. The Engineer and Client shall approve these.

1.9 Review and Acceptance of Contractor Documentation

The Project Manager comments on the proposals and forwards the comments electronically to the Contractor.

(One) paper copy of the approved drawings is stamped 'Approved by Employer' and returned to the Contractor.

The approval of the any drawings and documentation by the Engineer is done in principle only and does not mean the approval of the details contained therein.

1.10 As-built drawings, operating manuals and maintenance schedules

a. As-built drawings are due 14 days before the Works completion.
b. All submissions are in triplicate.
c. By submitting drawings, the Contractor represents that he has determined and verified all site measurements, site instruction criteria, materials, catalogue numbers and similar data, or will do

so, and that he has checked and co-ordinated each of his drawings with the requirements of the Works and the contract documents, taking into account drawings of all other relevant disciplines.

d. At the time of submission, the Contractor informs the Engineer in writing of any deviation between the approved drawings packs and the requirements of the contract documents.
e. The Engineer will review and approve drawings with reasonable promptness (so as not to cause a delay) only for conformance with the design concept and the contract requirements.
f. The Engineer may, at his discretion and depending on the number of discrepancies, require amendment and resubmission prior to approval. Drawings are resubmitted until approved prior to any portion of the Works related to the drawings being commenced.
g. Should the Contractor during drawing amendment, alter any portion of his drawings not specifically required by the Engineer; he points this out in writing when resubmitting the drawing.
h. Approval of the Contractor's drawings is in no way indemnifies him from being responsible for the correctness of the drawings and satisfactory operation of the installation.

2 CONSTRUCTION

2.1 Temporary Works, Site services & construction constraints

a. The Contractor complies with the Employer's Site entry and security control, permits, and Site regulations.
b. The Employer provides coded ID cards to all Contractors' employees for access / egress of personnel (and Equipment) within the Site boundaries.

2.2 Site services and facilities

a. For the duration of the Contract, the Project Manager provides an area, free of charge, for the Contractor to establish his offices, lay down areas, stores, Workshops, and other Contractor's Equipment.
b. The Employer provides the following connections to services within the Site for Contractor's use:

i. 50mm Isolation valve for construction Potable Water.
ii. Circuit breaker for construction power at 380 Volts, 3-Phase and Neutral, 50 Hz.

c. The Contractor provides a connection to the Employer's water borne sewage network. Where no suitable connection to a sewerage system is feasible, portable chemical type toilets may be used.

2.3 Facilities provided by the Contractor

a. The Contractor ensures that this site establishment area is compliant with the relevant safety regulations and restrictions, is clearly sign posted, and has a suitable security fence, lighting and the necessary access control gates.
b. All costs for preparation of the site establishment area are for the Contractor's account.
c. The Contractor submits details of the layout of his site establishment to the Project Manager for his acceptance.

d. The Contractor installs a metering device, accepted by the Project Manager, immediately downstream at each of the Employer's connections from where he draws services. The Contractor provides the Project Manager details of his monthly consumption of potable water and power.
e. The Contractor is responsible for his own connection to the Employer's services and for the reticulation of his services from the connection point. The cost of meters, connections, reticulation and all other usage costs associated with the provision of services are for the Contractor's account.
f. The Contractor provides the Project Manager with a "Certificate of Compliance" (COC), by an "Accredited" Person as defined by the OHS Act, in respect of his construction power electrical installation. The Project Manager only makes construction power available upon receipt of the COC.
g. The Construction Manager (or his nominated representative) conducts routine inspections of the Contractor's construction power reticulation and power tools. If found to be un-safe and / or non-compliant with statutory requirements, the electrical power supply is disconnected until the Contractor rectifies all defaults.
h. The Contractor provides, at his cost, a sufficient number of toilets and maintains them in a clean and sanitary working condition.
i. The Contractor provides temporary lighting and fencing around every section occupied by him during the construction of the Works.
j. Such fencing demarcates and secures the construction area. The fencing is erected before any work starts and is removed only upon completion of the work in that area.
k. The Contractor includes for all costs for such lighting and fencing, including access control into and out of these restricted areas.
l. Wherever the Contractor provides facilities (either his own or for the Project Manager and/or Supervisor) and all items of Equipment, involving, inter alia, offices, accommodation, laboratories, Materials storage, etc., within the Working Areas, then the Contractor makes good and provides full reinstatement to the land (including all apparatus of the Employer and Others in, on or under the land) and surrounding areas to its original standard, upon dismantling of such facilities and items of Equipment.
m. Upon completion, and within one month of the date of acceptance of the Works, the Contractor completely removes from the Site and Working Areas all his Equipment, including the foundations

of any structures, stores, office accommodation or any other asset belonging to him, and leaves the Site and Working Areas in a tidy condition to the satisfaction of the Project Manager.

n. No excess or discarded materials or Equipment may be buried or dumped within the port boundary.

o. Demolition of all permanent and temporary structures, surfaces etc. shall be first approved by the Project Manager prior to the work being carried out.

p. The Employer does not provide any security for the Site and Working Areas. The Contractor provides same and indemnifies and holds indemnified the Project Manager and Employer against any claims and actions that may arise out of Site and Working Area security.

q. No housing is available for the Contractor's employees. The Contractor makes his own arrangements to house his employees and transports them to site in a closed vehicle specifically designed for passenger transport (bus or similar) which is in a roadworthy condition.

r. Wherever the Employer provides facilities for the Contractor's use and the Contractor adapts such facilities for use, then the Contractor makes good and provides full reinstatement to the land (including all apparatus of the Employer and Others in, on or under the land) and surrounding areas to its original standard upon dismantling of such facilities and hand-back to the Employer.

2.4 Survey control and setting out of the Works

The Contractor shall ensure that they complete monthly laser alignment surveys to ensure that the structure has not deformed.

2.5 Excavations and associated water control

a. Probability of Asbestos Contamination in Excavations:

ii. The Contractor ensures his staff and labour are equipped with the necessary PPE and are trained to recognise asbestos contamination.

iii. On encountering asbestos contamination, the Contractor immediately stops all work in the affected area, he summonses the Engineer and secures the area.

iv. The Engineer arranges for a specialist waste disposal Contractor to collect, bag, remove and dispose the contaminated material from the excavation or bulk earth Works.

v. The Contractor continues with the excavation or bulk earth Works on receipt of a written instruction from the Engineer.

2.6 Underground services, other existing services, cable and pipe trenches and covers

a. As a guide only, the Project Manager provides the Contractor with drawing(s) showing various known existing underground services for his information. The position of these services is approximate and it is possible that other services exist which are not reflected, and which may affect the Works.

b. The Contractor establishes the location of the various existing services situated within the Site and Working Areas, and records all such information on "marked-up" drawing(s) which remain available for reference at all times.

c. The Contractor exercises due care and attention in carrying out any excavation work to avoid damage or disruption to existing services. The Contractor accordingly consults the Project Manager prior to undertaking any excavation work.

d. Should the Contractor fail to exercise the requisite care and attention in carrying out the excavation work, the Contractor will be held liable for any claims arising out of damage caused by such excavation.

2.7 Control of noise, dust, water and waste

Before moving Equipment onto the Site, Working Areas and commencing operations, the Contractor submits his proposed methods of construction which demonstrate the measures taken to avoid and or reduce any nuisance arising from dust, noise and vibration for acceptance by the Project Manager.

2.8 Giving notice of work to be covered up

The Contractor notifies the Supervisor in writing of any elements of the Works which are to be covered up. This notification is given not less than 24 (twenty four) hours prior to the proposed covering up.

2.9 Restrictions to access on Site, roads, walkways and barricades

a. The Contractor is specifically excluded from entering the Employer's Operational Areas which are adjacent to the Site and Working Areas. The Contractor plans and organises his work in such a manner so as to cause the least possible disruption to the Employer's operations.
b. The Contractor ensures the safe passage of Contractor's traffic to and around the Site and Working Areas at all times that includes providing flagmen, protective barriers, signage, etc. for protection, direction and control of traffic as detailed in the project specifications
c. The Contractor ensures that any of his staff, labour and Equipment moving outside of his allocated Site and Working Areas does not obstruct the operations of the Port. To this end access routes are allocated and coordinated by the Project Manager.
d. The Contractor ensures that all his construction staff, labour, and Equipment remains within his allocated and fenced off construction area.
e. All Contractor's staff and labour working within PRASA boundary complies with PRASA operational safety requirements and are equipped with all necessary personnel protective equipment (PPE).

2.10 People restrictions on Site; hours of work, conduct and records

a. The Contractor keeps daily records of his people engaged on the Site and Working Areas (including Sub-Contractors) with access to such daily records available for inspection by the Project Manager at all reasonable times.
b. The Contractor has access to the site from 07h00 to 17h00 daily on all working days Monday to Friday. The Contractor will be required to obtain permission from the Project Manager to Conduct

Works out of the hours stipulated. Basic conditions of employment will be adhered to – a 45-hour week will apply, with a maximum of 10 hours' overtime.

2.11 Title to materials from demolition and excavation

a. The Contractor has no title to all materials arising from excavation and demolition in the performance of the Works with title to such materials remaining with the Employer. The Project Manager instructs the Contractor to label, mark, set aside and/or dispose of such materials for the benefit of the Employer in accordance with ECC3 Clause 73.1.

2.12 Cooperating with and obtaining acceptance of others

a. The Employer (including the agents of the Employer) operates on Site during the entire duration of the Contract period.
b. Others, Contractor to be notified once appointed by the Employer, operate on Site during the entire duration of the Contract period.

2.13 Publicity and progress photographs

a. The Contractor does not advertise the Contract or the project to any third party, nor communicate directly with the media (in any jurisdiction) whatsoever without the express written notification and consent of the Project Manager.
b. The Contractor obtains the permission and approval of the Project Manager before erecting any notice boards or using the details of the contract in any advertising media.
c. The Contractor provides a complete digital photographic record of the progress of the construction of the Works to the Project Manager, monthly as part of the Contractor's monthly programme narrative report

2.14 Completion, Testing, Commissioning and Correction of Defects

On or before the Completion Date, the Contractor completes everything required to provide the Works including the items listed below which is to be done before the Completion Date. The Project Manager cannot certify Completion until all the works including those listed below have been done and is also free of Defects, which would have, in his opinion, prevented the Employer from using the Works and others from doing their work.

Item of work	To be completed by
As built drawings as specified in the Works Information	Within 14 days prior to Completion.
Performance testing of the *Works*	To be conducted on completion of the Works.

2.14.1 **The *Contractor* is permitted to carry out the following *Works* after Completion:**

- Defects during maintenance period.

2.14.2 **Use of the Works is required before Completion has been certified**

None.

2.14.3 **Provision of materials, facilities and samples for tests and inspections**

The Contractor provides the following:

a. The Contractor is to provide all materials, facilities and apparatus required for any test and /or inspections required by the Works Information.

b. The Contractor is to provide samples as required by the Works Information.

2.14.4 **Access given by the Employer for correction of Defects**

The Contractor complies with the following constraints and procedures of the Employer where the Project Manager arranges access for the Contractor after Completion:

a. Safety, access control and work procedures as determined by the Project Manager.

b. These may be the same as communicated elsewhere within this Works Information as at the starting date / access date, or as the Works are now in use by the Employer's occupation of the Site, the same may be incrementally or substantially changed post Completion.

3 PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

3.1 Investigation, Survey and Site Clearance

The *Contractor* carries out the following investigations at the Site:

a. Conducts an investigation to determine all the existing services on the site. Marks and records all these services.
b. Maintains a concise record of the conditions of all existing site infrastructure and services

3.2 National Standards

The latest editions and/or amendments of the following Standards and Codes shall be considered a minimum requirement. In the event of differing requirements, the most stringent Code or Standard shall apply:

a) Occupational Health and Safety (OHS) Act No. 85 of 1993;

b) South African National Standards;

c) DIN or British Standard Specifications. / DIN, EN and ASME Standard Specifications;

d) N.O.S.A. Safety Guidelines;

3.3 Civil Engineering and Structural Works

3.3.1 Code of Practice for Steel Construction

The relevant sections of this document shall conform to the requirements of the SANS 1200 H Series of Standards.

3.3.2 Rolled Steel

All structural steelwork, except where otherwise stated, shall be of rolled steel and shall comply in every respect with SANS 1431 for evadable structural steel. Structural steelwork shall be designed in accordance with SANS 10162.

3.3.3 Steel Castings

Steel castings shall be sound, clean and free from all defects and distortion of any kind and should, except where otherwise specified, confirm with the conditions and tests specified in SANS 407 : 2000 for the particular purpose according to service. They shall be thoroughly annealed and all working parts and bearing surfaces shall be machined and turned accurately with correct finish.

3.3.4 Steel Forgings

All steel forgings shall be free from flaws and surface defects of any kind and be accurately finished to the prescribed dimensions. They should conform to the conditions and tests specified in BS. No. 24, Part 4.

3.3.5 Workmanship and Finish to Steelwork

The workmanship and finish shall be of the best quality throughout with every individual part accurately made to size and form so as to fit exactly on erection. Generally, the workmanship on any steelwork shall be in accordance with the recommendations of SANS 1200H series & SANS 2001: CSI. Cutting of steelwork may be affected by shearing, cropping or sawing. Sheared or cropped edges shall be dressed to a neat and workmanlike finish and shall be free from any

distortion. All holes for turned and fitted bolts shall be accurately drilled or reamed and the diameter of the hole shall not exceed the finished diameter of the bolt by more than 0, 25 mm. All steelwork which has been partially heated shall be properly annealed except in applications of minor detail.

3.3.6 Galvanising of Steelwork

This shall be in accordance with SANS 121: 2000 latest revision and the relevant Project Standards

Note: on National Standards: Where given, these are a minimum requirement, and not limited. Equivalent Standards are acceptable, but must be specified.

3.4 Materials, fabrication and finishing

All materials, where applicable, shall conform in respect to quality, manufacture, tests and performance, to the Project Standards, South African National Standards/the International Electro technical Commission, or where no such Standard exists, the appropriate British Standard. Materials not specifically stipulated shall be of the best commercial quality.

All welding activities performed by the Contractor shall be in accordance with appropriate codes, standards and the Project Standards and shall also include the following:

3.4.1 **All welds shall be laid smooth and external welds strip polished;**

3.4.2 **All stainless steel and 3Cr12 welds shall be pickled and passivated.**

3.5 Ease of Operation and Maintenance

All Plant and Materials supplied by the Contractor shall be designed and constructed for ease of operation and maintenance to ensure that the availability, reliability requirements and operating time efficiencies stated in the Specifications are achieved and maintained throughout the life span of the Plant and Materials.

The Following shall also be noted:

3.5.1 All operational, maintenance and inspection points shall be safely accessible;

3.5.2 All working platforms shall be wide enough for safe and easy passage

The Contractor shall provide a specification and procedure that shall suggest the safest and most efficient operation to carry out the cleaning and maintenance of all Plant and Materials to be supplied by the Contractor as well as outline and supply all specialist tools required for these operations.

3.6 Safety equipment and name plates

The Contractor shall secure all safety equipment, guards, notices and nameplates associated with all Plant and Materials erected by the Contractor. This will include but is not limited to the following items:

3.6.1 Hot surface guards

3.6.2 Railings and chains

3.6.3 Signage and notices

3.6.4 Name plates

3.7 Scaffolding

The Contractor shall contract with a certified scaffolding contractor who will supply and erect all scaffolding. The Contractor shall manage their activities to ensure the timely and safe supply and erection of all scaffolding needed for the Erection of all work under this Contract as defined in the Scope of Work. The Contractor shall give the scaffolding contractor 48 (forty eight) hours' notice of scaffolding required. No standing time or extension of time shall be claimed by the Contractor due to unavailability of scaffolding if 48 (forty eight) hours' notice was not given.

3.8 Erection Planning

The Contractor shall develop and submit to the Engineer a detailed erection plan for the erection of all Plant and Materials, 10 (ten) days after the award date. The erection plan shall outline the following as a minimum:

3.8.1 Critical Path definitions

3.8.2 Installation start Dates

3.8.3 All site progress meeting dates

3.8.4 Installation milestone dates

3.8.5 Installation and Erection completion dates

3.9 Rigging

Before undertaking heavy lifting and rigging, the Contractor must undertake a rigging study and all rigging activities must have the following in place:

3.9.1 The rigging study must be reviewed by the Engineer and the Employers Safety Officer prior to any heavy lifting and rigging activities being undertaken by the Contractor;

3.9.2 The rigging study must be co-ordinated with the overall site planning and activities schedule.

The Contractor shall supply all qualified and experienced personal required to effectively and efficiently position, align, install and erect all Plant and Materials supplied (by others) in a timely manner. This shall also include the installation of all rigging equipment fixed and mobile, such as crawl beams, crawls, “A” frame, gantries, hoists, etc. as required to lift, suspend, position and align, etc.; all Plant and Materials in their respective positions and in accordance with the manufacturer’s specifications and the Project Standards.

3.10 Workmanship

The Contractor shall only employ competent staff to execute the Works and submit a competency and compliance certificate of each employee (e.g. welding certifications or certificates, fitter qualifications, etc.) to the Employer for approval.

The Contract shall be executed in accordance with good engineering practice and the relevant standards, codes, statutory requirements and the Project Standards applicable to the satisfaction of the Employer.

Should any material or workmanship supplied and performed by the Contractor not be to the satisfaction of the Engineer/Employer; it shall be rectified at the cost of the Contractor and all rejected material removed from Site. The Contractor shall be responsible for the correct and complete installation of all Plant and Materials supplied by others.

Inspections by the Engineer shall not release the Contractor from his responsibilities within the Contract unless covered by a formal Take over Certificate.

3.11 Painting and Corrosion Protection

The Contractor shall carry out all preparation, priming, protection coating, painting and finishing activities as required in accordance with both the Project Standard Technical Specification for Corrosion Protection as supplied by in this document and by PRASA

The final coat of paint or touch ups on Plant and Materials supplied by others shall be done by the Contractor.

Touch ups shall be limited to any damages, scratches, scraps etc. which occurred during the offloading, storage, retrieval, assembly, positioning, alignment, installation, erection and securing of all Plant and Material or unless approved by the Employer. All painting activities shall be undertaken by competent personnel supplied by the Contractor.

3.12 Lubrication

The Contractor shall ensure that all initial fluids, lubrication oils and greases, associated mechanisms and equipment required by all Plant and Materials and supplied by others are installed correctly and in accordance with the manufacturer's specifications. This shall also include consumables such as oil filters and chemicals, etc.

The Contractor shall ensure that all Plant and Materials installed, modified, removed and reinstalled by the Contractor are correctly lubricated prior to Commissioning.

3.13 Health, Safety and Environmental requirements

The Contractor shall comply with all applicable health, safety and environmental regulations and requirements for all persons entitled to be on the Site.

The Contractor shall be responsible for the precautions and measures to ensure the health and safety of all individuals on the Site and temporary areas (if applicable) outside of the Site, but utilised by the Contractor, with the prior approval of the Employer.

This shall also include any areas that may adjoin those areas or otherwise be affected or potentially endangered by the Works. The Contractor shall be responsible for the adequacy, stability and safety of all Site and Temporary Areas operations, methods of construction, all Contractor's Equipment, Temporary Works and structures.

The Contractor shall provide and/or install for all necessary safety protection equipment (e.g. rotating parts guards, hot surface insulation/guards, railings) and necessary Contractor's Personnel, in accordance with the applicable legislation in South Africa, including the Occupational Health and Safety Act (1993) of South Africa. The Contractor shall take special note of the requirements of the Construction Regulations, 2003.

The Contractor shall comply with the Employer's Environmental Management Plan Requirements.

The Plant's noise level shall be less than 85 dBA when measured at any point further than three metres from the source(s) of the noise.

3.14 Quality Control Plan

The QCP shall be approved by the Engineer and shall conform to the requirements of ISO 9001 (2000) and shall incorporate the following as a minimum:

3.14.1 A detailed organisation chart;

3.14.2 A list of Subcontractors;

3.14.3 A list of the applicable quality assurance procedures;

3.14.4 A list of applicable Codes and Standards for design, construction, inspection and tests;

3.14.5 The Contractor's inspection plans;

3.14.6 Any Subcontractor's inspection plans;

3.14.7 Provisional programmes for expediting Works to be executed by Subcontractors;

3.14.8 Procedures to manage the non-conformance of Plant and Materials

3.14.9 An audit schedule for Contractor/Subcontractor activities.

The QCP shall indicate Hold Points and Witness Points proposed by the Contractor. The Engineer will determine, in consultation with the Contractor and the Employer, and notify the Contractor, the Hold Points and Witness Points to be witnessed by the Engineer and/or the Employer.

The Taking-Over Certificate shall not be issued to the Contractor until all the Hold Points on the QCP have been witnessed and approved by the Engineer and/or Employer as required.

The Contractor shall be responsible for updating the QCP regularly throughout the Contract. The QCP shall be required to demonstrate compliance with the requirements of the Contract.

The Engineer shall be entitled to audit any aspect of the QCP and details of all procedures and compliance documents shall be submitted to the Engineer for information, before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer, evidence of the prior approval by the Contractor itself shall be apparent on the document itself.

The Contractor shall maintain the Contractor's Data Book for the Works at all times, and the Contractor's Data Book for the Works shall be made available to the Employer at all times during the Contract for review and approval by a Third Party Inspector.

3.15 Storage of existing Plant and Materials

Plant and Material to be stored for future use by the Employer shall be transported by the Contractor to a storage area to be advised by the Employer. All Plant and Materials shall as far a practically possible, be stored above the ground on wood block, palettes, etc.

3.16 Welders Certification

All welders employed by the Contractor shall be subjected to a welding test prior to carrying out any work on Site by an Approved Inspection Authority employed by the Contractor. These tests shall be co-ordinated and supervised by the Contractor. The testing process shall consist of each welder performing a series of test welds which shall be inspected by the Approved Inspection Authority to be supplied by the Contractor. The Inspection Authority shall provide the Engineer`s Third Party Inspection Authority and the Site Manager with full certification for all welders tested. The Contractor shall be responsible for the supply all test materials, welding rods, welding machines and any other material and equipment required to carry out the above tests.

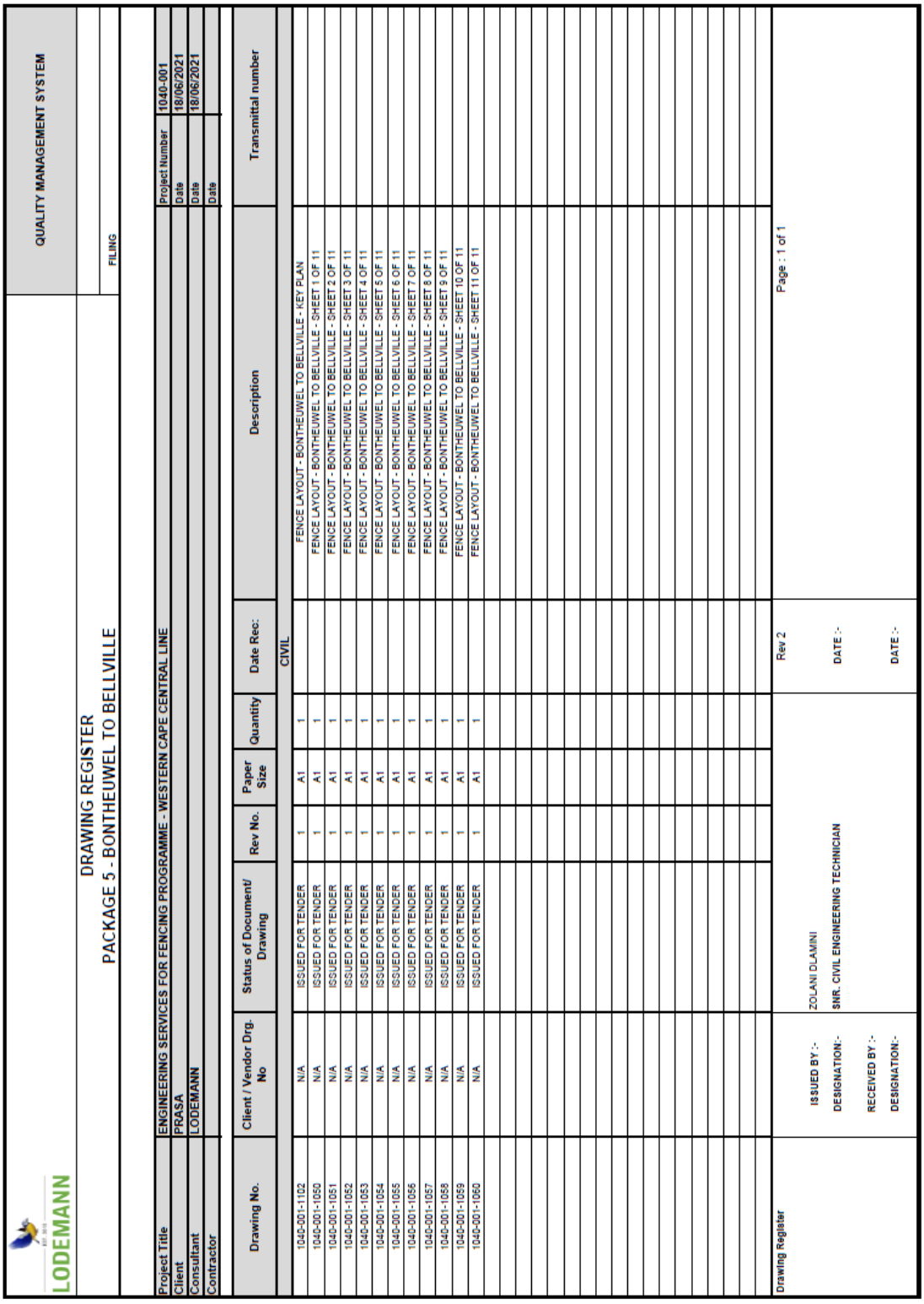
3.17 Weld maps, weld inspection and weld failures

The Contractor shall allocate each welder a unique hard stamp number prior to starting any work on Site. These numbers shall be used by the Contractor to outline on each drawing the welds to be carried out by the relevant welders. These drawings shall serve as a weld map to be used by the Engineers Third Party Inspection Authority's inspector during testing. In addition each welder shall hard stamp their own unique number next to each weld produced by them on Site. All hard stamps and hard stamp equipment and materials shall be provided by the Contractor.

The Engineers Third Party Inspector shall identify the welds to be tested by the Contractor. These shall include all NDT, X-ray; die pen or any other test as required by the relevant codes, standards and the Project Standards. For every weld failure, 2(two) additional equivalent tests shall be conducted for welds carried out by that same welder. Should these tests uncover further weld failures, testing of 100% of all that particular welder's welds may be conducted by the Contractor under the supervision of the Engineers Third Party Inspector. In the event that 30% of all welds produced by a particular welder fail the tests carried out during the 100% testing period, that particular welder shall be immediately be removed from Site The cost of all the additional testing, all rectification work and the removal of unsuitable welders shall be for the Contractors account.

4 LIST OF DRAWINGS

4.1 Civil Works Drawings



LODEMANN

QUALITY MANAGEMENT SYSTEM

FILING

DRAWING REGISTER
PACKAGE 5 - BONTEHEUWEL TO BELLVILLE

Project Title	ENGINEERING SERVICES FOR FENCING PROGRAMME - WESTERN CAPE CENTRAL LINE			Project Number	1040-001
Client	PRASA			Date	18/06/2021
Consultant	LODEMANN			Date	18/06/2021
Contractor				Date	

Drawing No.	Client / Vendor Drg. No	Status of Document/ Drawing	Rev No.	Paper Size	Quantity	Date Rec:	Description	Transmittal number
CIVIL								
1040-001-1102	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - KEY PLAN	
1040-001-1050	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 1 OF 11	
1040-001-1051	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 2 OF 11	
1040-001-1052	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 3 OF 11	
1040-001-1053	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 4 OF 11	
1040-001-1054	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 5 OF 11	
1040-001-1055	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 6 OF 11	
1040-001-1056	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 7 OF 11	
1040-001-1057	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 8 OF 11	
1040-001-1058	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 9 OF 11	
1040-001-1059	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 10 OF 11	
1040-001-1060	N/A	ISSUED FOR TENDER	1	A1	1		FENCE LAYOUT - BONTHEUWEL TO BELLVILLE - SHEET 11 OF 11	

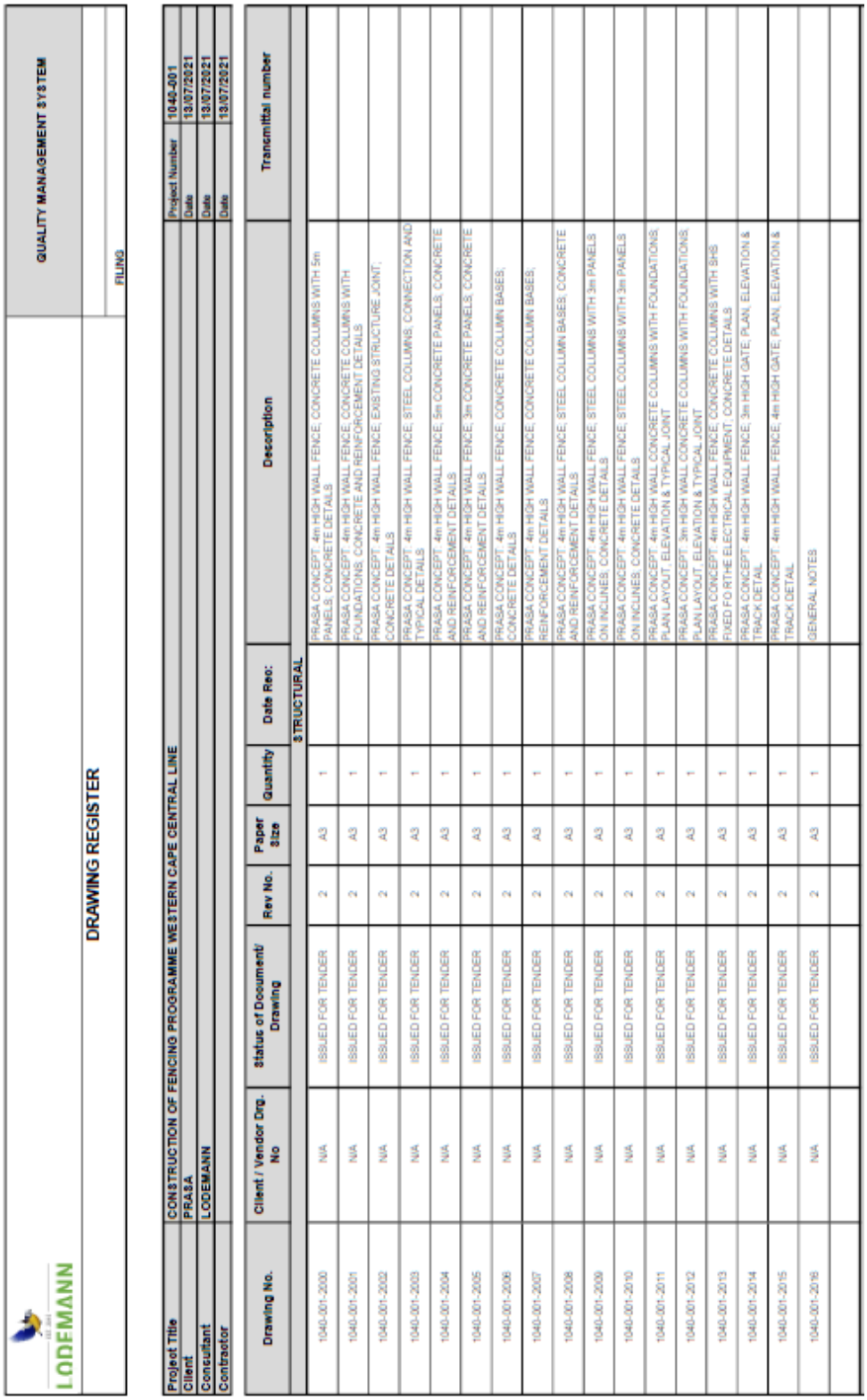
Drawing Register

ISSUED BY :- ZOLANI DLAMINI
DESIGNATION:- SNR. CIVIL ENGINEERING TECHNICIAN
RECEIVED BY :-
DESIGNATION:-

Rev 2
DATE :-
DATE :-

Page : 1 of 1

4.2 Structural Works Drawing List



LODEMANN

DRAWING REGISTER

QUALITY MANAGEMENT SYSTEM

FILING

Project Title	CONSTRUCTION OF FENCING PROGRAMME WESTERN CAPE CENTRAL LINE
Client	PRASA
Consultant	LODEMANN
Contractor	

Project Number	1040-001
Date	13/07/2021
Date	13/07/2021
Date	13/07/2021

Drawing No.	Client / Vendor Drg. No	Status of Document/ Drawing	Rev No.	Paper Size	Quantity	Date Rec:	Description	Transmittal number
						STRUCTURAL		
1040-001-2000	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; CONCRETE COLUMNS WITH 5m PANELS; CONCRETE DETAILS	
1040-001-2001	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; CONCRETE COLUMNS WITH FOUNDATIONS; CONCRETE AND REINFORCEMENT DETAILS	
1040-001-2002	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; EXISTING STRUCTURE JOINT; CONCRETE DETAILS	
1040-001-2003	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; STEEL COLUMNS; CONNECTION AND TYPICAL DETAILS	
1040-001-2004	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; 5m CONCRETE PANELS; CONCRETE AND REINFORCEMENT DETAILS	
1040-001-2005	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; 3m CONCRETE PANELS; CONCRETE AND REINFORCEMENT DETAILS	
1040-001-2006	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; CONCRETE COLUMN BASES; CONCRETE DETAILS	
1040-001-2007	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; CONCRETE COLUMN BASES; REINFORCEMENT DETAILS	
1040-001-2008	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; STEEL COLUMN BASES; CONCRETE AND REINFORCEMENT DETAILS	
1040-001-2009	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; STEEL COLUMNS WITH 3m PANELS ON INCLINES; CONCRETE DETAILS	
1040-001-2010	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; STEEL COLUMNS WITH 3m PANELS ON INCLINES; CONCRETE DETAILS	
1040-001-2011	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL CONCRETE COLUMNS WITH FOUNDATIONS; PLAN LAYOUT, ELEVATION & TYPICAL JOINT	
1040-001-2012	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 3m HIGH WALL CONCRETE COLUMNS WITH FOUNDATIONS; PLAN LAYOUT, ELEVATION & TYPICAL JOINT	
1040-001-2013	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT 4m HIGH WALL FENCE; CONCRETE COLUMNS WITH SHS FIXED FO RTHE ELECTRICAL EQUIPMENT; CONCRETE DETAILS	
1040-001-2014	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT; 4m HIGH WALL FENCE; 3m HIGH GATE; PLAN, ELEVATION & TRACK DETAIL	
1040-001-2015	N/A	ISSUED FOR TENDER	2	A3	1		PRASA CONCEPT; 4m HIGH WALL FENCE; 4m HIGH GATE; PLAN, ELEVATION & TRACK DETAIL	
1040-001-2016	N/A	ISSUED FOR TENDER	2	A3	1		GENERAL NOTES	

5 MANAGEMENT AND START UP

5.1 Management meetings

a. It is the Employer's specific intention that the Parties and their agents use the techniques of partnering to manage the contract by holding meetings designed to pro-actively and jointly manage the administration of the contract with the objective of minimising the adverse effects of risks and surprises for both Parties.
b. The *Contractor* attends management meetings at the Project Manager's request. These meetings are to be held fortnightly or as regularly as maybe determined by the Project Manager. At these meetings the *Contractor* presents all relevant data including safety, health and environmental issues, progress, quality plans, Subcontractor management, as may be required.
c. Meetings of a specialist nature may be convened as specified elsewhere in this Works Information, or if not so specified, be convened by persons at times and locations to suit the Parties, the nature and the progress of the *Works*. Within five days of the meeting the person convening the meeting shall submit records of the meeting to the Project Manager.
d. All meetings shall be recorded in a register, using minutes prepared and circulated by the person who convened the meeting. Such minutes (or register) shall not be used for the purpose of confirming actions or instructions under the contract as these shall be done separately by the person identified in the conditions of contract to carry out such actions or instructions.

5.2 Documentation Control

All documentation shall conform to the latest revisions of the following, i.e.:

a. SANS 10111 - Code of Practice for Engineering Drawings, or
b. ISO 9001:2000 - Quality Management Systems Requirements.

5.3 Safety risk management

The *Contractor* shall comply with the health and safety requirements contained in Annexure A to this *Works* Information.

5.4 Environmental constraints and management

The *Contractor* performs the *Works* and all construction activities within the Site and Working Areas in accordance with the provisions of the specification Standard Environmental Specification (SES), Project Environmental Specifications (PES) and specification Construction Environmental Management Plan (CEMP) contained in Annexure B, C and D as well as section C of the Scope of Works

The *Contractor* ensures that its Subcontractors comply with the requirements of the CEMP.

The CSHEO submits daily, weekly and monthly checklists as required by the CEMP to the ProjEM.

The CEMP is:

a. *Contractor*'s Declaration of Understanding.
b. Environmental method statements for construction operations.
c. Materials handling, use and storage.
d. Re-vegetation and rehabilitation.
e. Environmental closure certificate.
f. Environmental inspections and audits.
g. Environmental alignment meetings.

The roles and responsibilities of the various personnel acting on behalf of the Project Manager and who communicate directly with the *Contractor* and his key persons with respect to the CEMP and environmental issues are:

a. The Construction Manager (CM) is responsible for environmental management on the Site and Working Areas and reports to the Project Manager with specific tasks to.
b. Implementing the Employer's CEMP.
c. Monitor *Contractor*'s compliance to the CEMP.

The Project Environmental Manager (ProjEM) is responsible for ensuring that the *Contractor* complies with the CEMP and acts on behalf of the Project Manager.

The Project Environmental Officer (ProjEO) reports to the PSSM and ProjEM, conducts the day-to-day tasks to ensure that the *Contractor* complies with the CEMP and acts on behalf of the Project Manager.

5.5 Quality assurance requirements

5.5.1 Quality system

The supplier shall maintain an effective quality system in accordance with the relevant requirements of SABS/ISO9000 Series, or equivalent standard, to ensure and demonstrate that material, workmanship, procedures and services conform to the specified requirements.

A copy of the contractor's / supplier's Quality Manual may be requested for review by PRASA followed, at PRASA option, by Quality Assessments or Surveillance's to obtain evidence that a satisfactory quality system is being maintained.

5.5.2 Work Procedures Plan

Within a maximum of two (2) weeks following Contract Award or as per order condition, the Contractor shall produce a Work Procedure Plan. This Procedure Plan, as a MINIMUM, identifies the following:

- Order Number, Job Title.
- Organogram with nominated personnel, including signatures and initials.
- Scope of Job, Equipment, Structure(s)
- Basis for Designs and Fabrication, e.g. codes and specifications.
- Communication e.g. contacts address, telephone number, facsimile number, numbering systems and formats.
- Bar Chart (Time Schedule) for production, supplies and repair works including Sub-Suppliers.
- Control documents, e.g. issuing and receiving, transmittals.
- Numbering of Documents.
- Specific Procedures and/or General Procedures list to be utilized.
- Internal Quality Audits and/or Surveillance's to be performed with actual dates.

5.5.3 Quality Control Plan

5.5.3.1 The Contractor shall provide a Quality Control Plan (Inspection and Test Plan) specifying his proposed quality control activities for the entire scope of supply and scope of works. The Quality Control Plan shall incorporate, as a minimum, an INSPECTION CHECK LIST. The Quality Control Plan shall reference the procedures, codes and standards which apply to the listed activities, the acceptance criteria, the records to be produced and similarly it shall incorporate all Sub-contractors and suppliers activities. The Quality Control Plan shall be prepared on the Contractors / Suppliers standard format.

5.5.3.1.1 Deviations from this Quality Control Plan may only be permitted following acceptance in writing by the Engineer and/or the appointed Third Party Inspection Authority.

5.5.3.1.2 The Contractor shall not undertake any work in advance of the review and acceptance of the Quality Control Plan without the written consent of PRASA.

5.5.3.1.3 During the review of the Quality Control Plan / Inspection and Test Plan, Inspection and Test intervention points will be included by PRASA and, where applicable, the Third Party Inspection Authority to indicate their intended monitoring during manufacturing, fabrication and installation.

5.5.3.1.4 The Contractor / Supplier shall ensure that any work sub-contracted will be covered by Quality Control Plans / Inspection and Test Plans generated by the relevant Sub-contractor or Supplier.

5.5.4 Pre-Inspection Meetings

Pre-inspection meetings may be held at the discretion of PRASA. In such cases, the content of the agenda shall include, but not be limited to, the following:

- Documentation: Method of Submission, review etc.
- Quality Control Plan: Agreement of inspection, witness, review and hold points, Agreement of contacts for notification, etc.

- Code Data book / QC Dossier: Agreement to contents and format.
- QC Procedures: Agreement to Scope.
- AIA: Authorised Inspection Authority requirements.
- Communications: Responsible persons.
- Non-destructive Testing: Personnel qualification, method and extend required.

5.5.5 **Inspection**

5.5.5.1 Definition: Inspection means all activities such as measuring, examining, testing, gauging one or more characteristics of material or service and comparing these with specified requirements to determine conformity.

5.5.5.2 Inspection Point Definition:

- **Hold Point = H**: This indicates an inspection or test which is considered vital to quality, integrity and safe functioning of the material or services and which can only be achieved at this point. The Contractor shall not proceed beyond this point beyond this point without written approval by PRASA and/or the appointed Third Party Inspection Authority.
- **Witness Point – W**: This indicates an inspection or test which may be equally as important as a Hold Point, but which can be waived by the appointed Third Party Inspection Authority or PRASA.
- **Review Point – R**: This indicates that information collected is required to be reviewed and approved. The job may continue past the review point, however, if the information is inadequate or does not satisfy the requirements, may necessitate additional work.
- **Inspection Points – I**: During the review of the Quality Control Plan, Inspection points will be added by PRASA and where relevant, the Third Party Inspection Authority to indicate the intended monitoring of the Contractor's and/or Sub-Contractor's quality control.

5.5.5.3 Contractors Inspection

The Contractor shall as a minimum, carry out the inspections as detailed in the Quality Control Plan and maintain the required records for verification by PRASA and/or Third Party Inspection Authority. For sub-contracted material or services, the Contractor shall ensure that controls are effective, including, where necessary, monitoring at the Sub-Contractor's works and retention of

the necessary records. Signing-off of the Quality Control Plan progressively by all relevant parties is a mandatory requirement following the indicated inspection activity.

5.5.5.4 Readiness for Inspection

5.5.5.4.1 Material or services shall be deemed ready for inspection by PRASA only when:

- Material or services shall be deemed ready for inspection by PRASA only when:
- The Contractor has firstly carried out his own inspection at the stage identified on the relevant Quality Control Plan and is satisfied that material, workmanship and services meet the specified requirements. Documented evidence shall be maintained by the Contractor including signing-off the Quality Control Plan.
- All applicable certificates and quality documents are available for review at the inspection location. Immediately following receipt by the Contractor ALL material and certification (including welding consumables), the Contractor shall review these certificates and endorse them "Verified to Code/Specification Requirements" including date and name. Immediately following, the material and certification shall be presented to PRASA and/or the appointed Third Party Inspection Authority for review and endorsement.

5.5.5.5 Notification of Readiness for Inspection

- Notification by fax/email/ telephone is required for both Hold and Witness points at least two (2) working days in advance of "Readiness of Inspection" or as agreed at the pre-inspection meeting. Review points do not require prior notification.
- The Contractor shall ensure that the latest revisions of approved drawings and/or procedures with evidence of acceptance by PRASA, his nominated representative or Third Party Inspection Authority are available.
- Contractors are advised that it is a condition of Purchase / Contract that all costs of PRASA inspector, Engineer and/or Third Party Inspection Authority will be passed on to the Contractor for aborted inspection visits. A visit is considered aborted if:
- The Contractor / Supplier advises "readiness" for inspection and upon arrival of PRASA Inspectors, Engineer(s) or Third Party Inspection Authority, the material or Services and/or the associated documentation is not ready; or if PRASA personnel identifies that material or services are to specification such that the Contractor's Inspector should have identified the non-conformity prior advising readiness for PRASA or Third Party Inspection Authority inspection.

- NOTE: An inspection report to this effect shall be generated by the PRASA Inspector, Engineer or Third Party Inspection Authority and countersigned by the Contractor's duly authorised representative. This report shall form the basis of back-charges to the Contractor / Supplier by PRASA. In addition, a non-conformance report shall be raised by PRASA, the Engineer or the Third Party Inspection Authority which shall be replied to by the Engineer within twenty-four (24) hours.

5.5.5.6 Inspection Waiver

- Any PRASA Witness, or review or Hold point may, at the sole discretion of PRASA, be waived, which will be followed by an inspection waiver report.

5.5.6 Materials of Construction

- All material shall be purchased and certified in accordance with EN 10204 ff. requirements as a minimum. The term "Purchaser" in EN 10204 shall mean the Contractor. The certificates shall report mechanical properties in the heat treated condition and must be accompanied by the relevant verified furnace charts.

5.5.7 Assessment/Audit/Surveillance

- PRASA reserves the right to conduct a Supplier Quality Assessment, prior to the award of any Purchase Order, to verify that the Contractor's system complies with the relevant quality standard. Additionally, PRASA may conduct a Quality Assurance Audit or Surveillance at any time after the award of a Purchase Order. Four (4) days notification of a QA Audit and twenty-four (24) hours notification of a QA Surveillance will be given by facsimile / email to the Contractor's nominated QA/QC representative.
- Should the Contractor's quality system be found deficient during their assessments, audits or surveillance's, the Contractor will be given opportunity to carry out corrective action within a period of time to bring his system up to the required standard. A follow up audit surveillance will be carried out to verify that the Contractor has carried out the necessary corrective actions.

- If, during a follow-up audit or surveillance, it is found that the required corrective actions have not been carried out, PRASA reserves the right to take such actions as necessary to rectify the deficiencies. It is a pre-requisite that the Contractor fully supports any such actions
- Surveillance by Inspectors will also be carried out by PRASA as an alternative method of monitoring the Contractor's quality control. This will normally take the form of a verification of a Section of the Quality Control Plan where the physical and documentary evidence will be required to verify compliance with the Quality Control Plan.

5.5.8 Non-Conformities

5.5.8.1.1 Non-Conformity is defined as a deficiency in characteristic, documentation or procedure which renders the quality of an item, work or service unacceptable or indeterminate in accordance with specified requirements. Such Non-Conformities shall be identified by the Contractor/Supplier/PRASA and/or Third Party Inspection Authority.

5.5.8.1.2 Such non-conformities require the issue of a Non-Conformity Report (NCR) by the Contractor/Supplier in compliance with his own QA system. The NCR then becomes the means by which the Non-Conformity is identified and triggers the need for corrective action and measures.

5.5.8.1.3 The non-conforming material, work or service shall be reviewed by the Contractor in accordance with documented procedures and it might be:

- Re-worked to meet the specified requirements
- Accepted, with or without repair; or
- Re-graded for alternative application; or
- Scrapped

5.5.8.1.4 All proposed re-working or repair shall, together with the relevant procedures, be firstly reviewed by PRASA and/or Third Party Inspection Authority where applicable.

5.5.8.1.5 The Contractor shall ensure that his procedures provide for the identification and segregation of all non-conforming materials, work or services.

5.5.9 Recording 'AS-BUILT' sizes

5.5.9.1.1 The Contractor shall complete the "as-built" details wherein all actual weld sizes, material thicknesses shall be recorded.

5.5.9.2 The actual point of measurement will be clearly indicated.

5.5.10 Contractor Document Submissions

5.5.10.1.1 When the Contractor submits his documents for re-view, he shall, where relevant, submit them to the PRASA document handling nominated contact. Transmittals shall only cover one item per PO and shall be submitted in complete sets in order to perform a full review, e.g.. WPS's, weld procedure, weld map summary, material lists and GA drawings and calculation, etc.

5.5.10.1.2 Handover Acceptance System

The Purpose of this system is to provide essential handover and acceptance information to all parties engaged in the design, construction, modification, demolition, refurbishment and commissioning of plant and equipment at the Cape Town dry-dock. The information and guidelines required to achieve a smooth sequence between all construction and commissioning activities, and thereafter the successful start-up operations and transfer of ownership of plant and equipment to PRASA.

5.5.10.1.3 This procedure provides for a sequenced, construction completion and checkout of plant / equipment leading up to the transfer of care, custody and control to PRASA.

5.5.10.2 This procedure adopts a two package handover system:

- Quality Control Dossier
- Management Package

5.5.10.3 Quality Control Dossier and Management Package Compilation

- The Contractor shall in accordance with this procedure and requirements in the Purchase Order / Technical Specifications, compile the Quality Control Dossier and Management Package with the accepted contents.

- The Contractor shall compile the Quality Dossier which includes the Code Data Book (format as stipulated in this document) in accordance with this procedure to ensure that all requirements have been met and the relevant documents are included in the Quality Control Dossier.
- For multiple disciplines e.g. new installations, fabrications, modification or welding works, the QC Dossier shall be developed for each discipline or system.
- Management Package: consists of:
- Completed “Punch-List”, signed off by operations, area manager and the Engineers appointed 16.2 responsible for the area/unit.
- Drawing Package “as-built”
- Vendor Data Documentation as per Bill of Material of detail designs and as built documentation.

The Engineer shall:

- Collect and compile the Management Package in accordance with this procedure, to ensure all requirements have been met. This ensures that:
- The QC Dossier has been signed off by and the Inspection Authority (where applicable)
- The plant/facility/equipment has been commissioned (or handed over) by and with operations,
- All required performance tests have been successfully carried out by operations and maintenance department,
- Copies of approved test run certificates have been inserted into the Management Package.
- All maintenance documents have been updated and new instructions been inserted.

The Contractor submits his Quality Management System documents to the Project Manager as part of his programme under ECC3 Clause 31.2 to include details of:

a. Quality Plan for the Contract
b. Quality Policy

c. Index of Procedures to be used and
d. A schedule of internal and external audits during the Contract

The *Contractor* develops and maintains a comprehensive register of documents that will be generated throughout the Contract including all quality related documents as part of its Quality Plan.

5.5.11 Code Data Book

The Code Data Book shall have the following content and format:

- Cover Page:
- A - MANUFACTURER / CONTRACTOR
- B - ENGINEERING CONTRACTOR (if applicable)
- C - AUTHORISED INSPECTION AUTHORITY (or certifying body)
- D - PURCHASE ORDER NUMBER
- E CONTRACT NUMBER
- F EQUIPMENT / PLANT / WORKS DESCRIPTION
- G - MAUFACTURERS SERIAL NUMBER (if applicable)
- H - CODES AND STANDARDS USED

1. Index of Contents
2. Release of Notes (Contractor/AIA/Client)
3. “As-Built” drawings
4. Authorised Inspection Authority Certificate of Compliance
5. Design Calculations

5.6 Tests on Completion

5.6.1 Introduction

The required tests on completion shall consist of the following:

- Pre commissioning
- Commissioning
- Trial operation
- Performance

The Contractor shall complete all pre-commissioning and commissioning tests on all Plant and Works completed under this Contract. In order to achieve this the Contractor shall fulfil the following requirements:

- Development and supply of commissioning and test plans for the approval of the Engineer
- Implementation of formal handover procedures and documentation from construction to commissioning

5.6.2 'Punch List' category Items

- Category A: Items which compromise safety and integrity of personnel, plant, equipment and infrastructure and must be completed following the pre-commissioning tests but prior to the commissioning and trial operation tests being undertaken
- Category B: Items which require correction prior operational acceptance and are required to be remedied following the commissioning and trial operation tests but before Employers taking over
- Category C: Items required to be remedied during the defects notification period

5.6.3 Pre commissioning

The Contractor shall complete all pre-commissioning tests and all Punch List Category A items shall be compiled during these tests and be attended to prior to the commencement of the commissioning tests.

5.6.4 Commissioning

The Contractor shall as soon as practical after carrying out the pre-commissioning tests and once all Punch List Category A items have been attended to, carry out the commissioning tests.

The Punch List Category B items shall be compiled during these tests and be attended to prior to the commencement of the trial operation tests.

5.6.5 Taking Over

Prior to the Employer being required to take-over the Plant all The Punch List Category B items shall be remedied.

The Works and the Plant shall be taken over when the Tests on Completion have been passed and punch List Category B items have been attended to.

5.7 Programming constraints

5.7.1 Tender Program

A summary program, hereinafter referred to as the "Tender Program" for the duration of the contract are submitted by the Contractor, reflecting all Milestone deliverables and Events.

The level of this program must at least be "compatible" to the Price Schedule columns and or the breakdown of sections in the bills of quantities as applicable. The incidence of Payment Schedules or Cash Flow Forecast, submitted with the Contractor’s program must be based on this program.

The Contractor’s Programs are evaluated by the Project Manager to assess the Contractor's ability to plan his portion of the project to the extent necessary for the high degree of mutual co-ordination demanded by the Project.

Non-compliance with this specification may lead to the disqualification of the tenderer. At the Project Manager's discretion, the Contractor may be requested to prepare and submit a new Contract Program.

5.7.2 Initial Program, Contract Program and Subsequent Revisions

a. The Contractor submits a program within 1 weeks of the date on which he was notified of having been awarded the contract / order.
b. Any program submitted which does not supply all the required documentation set out in this document shall be deemed to be rejected, whether or not the Project manager does so in writing.
c. This Initial Contract Program, hereinafter referred to as the "Initial Program", is be drawn up at the level of detail necessary in the opinion of the Project Manager to ensure effective control over the work, usually to Level 4 detail.
d. A "Summary" or "ham-mocked" program is submitted with the Initial Program. The summarized activities are inserted in such a way that the Milestone Dates as well as major interfaces of services and/or other contracts logically required for the completion of the contract are clearly shown. The start and finish of the summarized or ham-mocked activities are clearly indicated on the detailed network.
e. Unless stated to the contrary, the Project Manager will examine and comment on the Initial Program within 2 weeks of submission and the Contractor amends and submits this program, hereinafter referred to as the "Contract Programme" for approval within a further period of 5 days.
f. The Project Manager may not in every instance be able to provide all information or working drawings, where applicable, of every aspect of the Works but such non-availability will not be deemed to be an excuse for non-presentation of programs. In such instances the relevant part of the program should be based on the Contractor's best estimate with a statement on which assumptions or drawings it is based.
g. Should the Project Manager so require, or should problems occur during the execution of the contract, the Project Manager might request that portions of the program be expanded to enable closer control to be exercised e.g. site construction and commissioning programs. In such cases the more detailed Works fit exactly into the logic and time span of the Contract Program, but may be presented as separate programs.

h. Minor revisions to the Contract Program may be introduced from time to time by mutual agreement. Should the Project Manager require a major revision to the Contract Program, such revision will be specified to the Contractor in writing.
i. The Project Manager specifies the date by which the Contractor is required to submit the revision in question. This date is not, unless otherwise agreed, be less than 2 weeks from the date of notice.
j. Revised Payment Schedules are required based on the revised Contract Program. These revisions are made when changes occur in this program and must be updated every month to include actual payments.
k. Should the Contractor require a major revision affecting the logic or dates of the program, such revision will be specified to the Project Manager in writing for approval before the revision is performed.
l. A revision to the program does not invalidate the "Date of Completion" in terms of the General Conditions of Contract and as given in the appropriate schedules. Changes to these dates can only be effected through a contract amendment.
m. Progress is monitored against the latest revised program and payments controlled by the latest revised Payment Schedule accepted by the Project Manager.

5.7.3 Progress Reporting

a. The Contractor updates the program and supplies the progress reports to show actual and expected progress compared to the latest agreed Contract Program. Progress information may be verified by the Project Manager at any stage.
b. Progress reports on design, manufacturing, shipping, transport and site progress are submitted separately as per Table 1: Progress Reporting Requirements.
c. The methodology to define work content in the progress curves needs to be agreed to between the Contractor and Employer within 5 days of Contract Award and may include parameters such as man-hours, m^3 concrete, tons of steel, length of cable and cable rack to be installed, number of terminations, etc.
d. The work content needs to be specifically designed to suit the type of work and to effectively indicate actual progress against planned progress.
e. Progress reports are submitted in line with the requirements as specified in the table below.

TABLE 1: PROGRESS REPORTING REQUIREMENTS

ITEM	DESCRIPTION	FREQUENCY
1.	General Planning Report and revised network if logic has changed since the previous report.	Weekly
2.	Critical Activities Report. (Look ahead)	Weekly
3.	Milestone Report.	Weekly
4.	Updated Bar Charts.	Weekly
5.	Updated Program Graphs.	Weekly
7.	Progress S-Curves.	Weekly
8.	Expediting Report	Weekly
9.	Milestones of Deliverables	Weekly

f. The Contractor uses Microsoft Projects for his programme submissions or a similar programme software package equivalent to Microsoft Projects 2003 or later version subject to and with the prior written notification and acceptance by the Project Manager.

5.7.4 Reporting and monitoring

The Contractor submits programme narrative report to the Project Manager at weekly intervals in addition to the intervals for submission of revised programmes stated under Contract Data Part One. Contractor submits monthly programme narrative report to the Project Manager.

The Contractor completes an assessment of all activities in progress and to completion to determine percentage complete, forecast completion dates, deviations from the Accepted Programme and proposes remedial actions to rectify deviations.

The Contractor shows on each revised programme he submits to the Project Manager a resource histogram showing planned progress versus actual, deviations from the Accepted Programme and any remedial actions proposed by the Contractor.

a. The Contractor submits the programme narrative report detailing the status and performance of operations on the Site and Working Areas; status and performance of operations outside the Working Areas; manpower histograms; plant and equipment histograms; S-curve of overall progress; and critical action items (top 10). Report indicates “progress this period” and “progress to date”.

b. The Contractor’s weekly programme narrative report, updated and issued weekly, includes:

i. Level 4 Project Schedule – showing two separate bars for each task i.e. the primary bar must reflect the current forecast dates and the secondary bar the latest Accepted Programme.
ii. 3-week Look-ahead Schedule – showing two separate bars for each task i.e. the primary bar must reflect the current forecast dates and the secondary bar the latest Accepted Programme.
iii. Manpower Histogram – reflecting actual, forecast and planned activities
iv. Plant and Equipment Histogram – reflecting actual, forecast and planned activities
v. S-curves – reflecting the actual percentage complete versus the planned percentage for the overall contract utilising the earned values.

c. The Contractor’s monthly programme narrative report is submitted a week before the last Friday of each month, or as required by the Project Manager. The report indicates “progress this period” and “progress to date” and include, but is not limited to, the following:

i. Summary of progress achieved during the reporting period.
ii. Latest Accepted Programme.

6. MATERIAL AND CONSUMABLES CERTIFICATIONS

6.a Material List

6.b Material Map (Outline Drawings)

6.c Mill Test Certificates marked with item number.

6.e Heat treatment charts, NDE and mechanical testing.

7. WELDING DOCUMENTS

7.a Weld Map(s)

7.b Weld Procedure Specification Summary

7.c Welding Procedure Specifications

7.d Procedure Qualification Records

7.e Welder Performance Qualification Test Record Summary

7.f Weld Consumables Certification

7.g Pre- and Post heating Procedures

8 INSPECTION REPORTS

8.a Quality Control Plan

8.b Dimensional Inspection Report (sizes etc.)

8.c Heat Charts and Certificates.

9 NON-DESTRUCTIVE TESTING DOCUMENTS

9.a NDT Map

9.b NDT Procedure Record Summary

9.c NDT Personnel Qualification Record Summary

9.d NDT Reports