TRANSNET NATIONAL PORT AUTHORITY

Road and Perimeter Lighting for the New Liquid Bulk Facility at the Port of Ngqura

TENDER NUMBER: TNPA/2021/11/0008/RFP

WORKS INFORMATION

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DOCUMENTATION SIGN-OFF SHEET

ROLE	CAPACITY/ FUNCTION	SIGNATURE	DATE
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I, the undersigned hereby approve this procedure (TNPA).

ROLE	CAPACITY/ FUNCTION	SIGNATURE	DATE
Review & Acceptance:	Siyabonga Tshaka Project Manager		20-07-2021
Reviewed and Accepts document for adequacy and practicability. Comments:			
Approved:	Thokozani Mhlongo Engineering Manager		07/10/2020
Approves document for use. Comments:			

I, the undersigned hereby approve this procedure (Client).

ROLE	CAPACITY/ FUNCTION	SIGNATURE	DATE
Approved:	Jean Meintjies Technical Manager:Electrical		2021/08/31

PART C3: SCOPE OF WORK

C3.1 *EMPLOYER'S WORKS* INFORMATION

Contents

Section 1

1 Description of the *Works*

1.1 Executive overview

The *Works* that the *Contractor* is to perform *involve* electrical and civil *Works* for construction of the Port of Ngqura Road and Security Lighting.

The scope of the *Works* includes the following:

- The Supply, Delivery, installation and commissioning of all the associated works for the Road and Perimeter lighting.
- Design, supply and installation of Lightning protection and Earthing of the structures.
- The Supply delivery and Installation of Minisubstations and cabling, to power the Lighting and associated Infrastructure
- Supply, delivery, installation, testing and commissioning of power supply cables to the existing pump-station, including monitoring cables and SCADA integration with minisubstation.
- Commission and testing of the entire installation and hand over to the Employer.

1.2 *Employer's* objectives

The *Employer's* objectives are to construct and commission the Road and Security Lighting for the operations of the Transnet National Ports Authority and Transnet Port Terminals, and of various Tank Farm Operators and other industrial users.

In addition to the above, the *Employer's* objectives are to achieve Completion of the *Works* by meeting the Completion Date whilst still maintaining the highest environmental, quality and safety standards and whilst minimising disruptions to on-going port and terminal operations and the operations and activities of other stakeholders.

1.3 Interpretation and terminology

For the purposes of this contract for all matters regarding technical decisions, Acceptance of Engineering related technical documents, Testing, Commissioning and any matters pertaining to the context of the Occupational Health and Safety Act, the *Contractor* is required to cooperate with the *Employer's* Engineers/Professional Engineers as per Core Clause 25.1 and Core Clause 14.2 as delegated by the *Project Manager* and the *Supervisor,* for the former and as applicable in the context. The instructions received by the *Contractor* shall be interpreted as lawful in matters pertaining to the former if the Instruction has been endorsed by both the *Project Manager* or *Supervisor*, and the *Employer's* Engineers/Professional Engineers as applicable in the context. The *Employer's* Engineers shall be named post award of the contract and prior to commencement of the *Works*. The *Contractor* is further advised that, in compliance to NEC3 ECC Core Clause 25.1, that co-operation with the *Employer*s Engineers and other representatives of the *Employer* (Others) is a requirement of this contract and the *Contractor* is to allow, grant and facilitate all reasonable access that may be required by the *Employer's* Engineers and Others as applicable, for the provision of the *Works*.

The following abbreviations are used in this *Works* Information:

2 Engineering and the *Contractor's* design

Abbreviation	Meaning given to the abbreviation
AIA	Authorised Inspection Authority
BBBEE	Broad Based Black Economic Empowerment
CEMP	Construction Environmental Management Plan
CD	Compact Disc
CDR	*Contractor* Documentation Register

CDS	*Contractor* Documentation Schedule
CRL	*Contractor* Review Label
CSHEO	*Contractor*'s Safety, Health and Environmental Officer
CM	Construction Manager
DTI	Department of Trade and Industry
DWG	Drawings
EO	Environmental Officer
HAW	Hazard Assessment Workshop
HAZOP	Hazard and Operability Study
HSSP	Health and Safety Surveillance Plan
INC	Independent Nominated Consultant
IP	Industrial Participation
IR	Industrial Relations
IPP	Industrial Participation Policy
IPO	Industrial Participation Obligation
IPS	Industrial Participation Secretariat
IRCC	Industrial Relations Co-ordinating Committee
JSA	Job Safety Analysis
CIRP	*Contractor*'s Industrial Relations Practitioner
Native	Original electronic file format of documentation
PES	Project Environmental Specifications
PHA	Preliminary Hazard Assessment
PIRM	Project Industrial Relations Manager
PIRPMP	Project Industrial Relations Policy and Management Plan
PLA	Project Labour Agreements
PSIRM	Project Site Industrial Relations Manager
PSPM	Project Safety Program Manager
PSSM	Project Site Safety Manager
ProgEM	Programme Environmental Manager
ProjEM	Project Environmental Manager
QA	Quality Assurance
R&D	Research and Development
SANS	South African National Standards
SASRIA	South African Special Risks Insurance Association
SES	Standard Environmental Specification
SHE	Safety, Health and Environment
SHEC	Safety, Health and Environment Co-ordinator
SIP	Site Induction Programme
SMP	Safety Management Plan
SSRC	Site Safety Review Committee
SCADA	Supervisory Control And Data Acquisition
TPT	Transnet Port Terminals
TNPA	Transnet National Ports Authority
ISPS	International Ship and Port Facility Security

PSIRA	Private Security Industry Regulatory Authority.

2 Engineering and the *Contractor's* design

2.1 *Employer's* design

2.1.1 The *Employer's* design for the *Works* is:

a) Electrical:

2.1.1.a.1 The high level schematic designs of the LV reticulation, distribution and protection systems for the Road and Security Lighting.

2.1.1.a.2 The selection of all electrical Plant and switchgear associated with the MV and LV systems.

2.1.1.a.3 The selection of all cable associated with these systems.

2.1.2 The *Employer* grants the *Contractor* a licence to use the copyright in design data presented to the *Contractor* for the purpose of the *Works* (and the *Contractor*'s obligation under paragraph 2.2 of the *Employer's Works* Information) ONLY.

2.2 Parts of the *Works* which the *Contractor* is to design

All designs undertaken by the Contractor as per the below clauses are required to be endorsed by an ECSA Registered Professional Engineer/Professional Technologist suitably experienced in the relevant discipline.

2.2.1 The *Contractor* is to design the following parts of the *Works* and will be responsible in his design for the overall integration of the design of the works with the designs of the *Employer*.

a) All supporting infrastructure required to implement all of the *Employer*s' high level designs.

2.2.1.a.1 These may include, but is not necessarily limited to, cableways, cable support systems, conduit systems and arrangement, piped systems and pipe support systems, and the selection of fasteners and fastening systems for these items, where not specified, referenced or detailed by the *Employer*.

b) All detailed designs of all MV and LV distribution panels.

c) The detailed Earthing and Lightning Protection design in accordance with the *Employer's* high level designs and minimum requirements and specifications.

d) The detailed Earthing and Lightning Protection design in accordance with the *Employer's* high level designs and minimum requirements and specifications.

e) The *Contractor* shall submit detailed drawings and Workshop details for all designs, both *Contractor*'s designs and *Employer's* designs, to the *Project Manager* for acceptance by the *Employer's* Consultant or the *Employer's* Engineers.

f) Concrete mix designs, descriptions and properties for foundations, bases, and wearing and levelling courses

g) All and any equipment, formwork, and temporary work associated with the provision of the *Works*.

2.2.2 The *Contractor* is responsible in his design for the overall integration of the design of the *Works* with the design of the *Employer* as stated under 2.1 *Employer's* design above for the following parts of the *Works:*

a) All supporting infrastructure required to implement all of the *Employer*s' high level designs. These may include, but is not necessarily limited to, cableways, cable support systems, conduit systems and arrangement, piped systems and pipe support systems, and the selection of fasteners and fastening systems for these items, where not specified, referenced or detailed by the *Employer*.

b) All detailed designs of all MV and LV distribution panels. The *Contractor* is wholly responsible for all design coordination, integration and liaison activities involved with the *Works*, and shall take all measures necessary and make all arrangements with the *Project Manager* for activities such as meetings, inspections, endorsements, and any other activities required for the timeous completion of the *Works* and to the appropriate quality. When these activities

require the involvement of the *Employer's* Professional Engineering team or any other stakeholders, the *Contractor* is required to make these arrangements with due consideration of the *Employer's* Professional Engineering team's availability and the availability of other stakeholders. The *Contractor* shall submit detailed drawings and *Works*hop details for all designs, both *Contractor*'s designs and *Employer's* designs, to the *Project Manager* for acceptance by the *Employer's* Consultant or the *Employer's* Engineers.

c) Concrete mix designs, descriptions and properties for bases, foundations and wearing and levelling courses

d) The design of light poles, base plates and luminaire fixtures and fittings where required for the provision of the *Works.*

e) All and any equipment, formwork, and temporary work associated with the provision of the *Works*.

2.2.3 Unless expressly stated to form part of the design responsibility of the *Employer* as stated under 2.1 *Employer's* design above and whether or not specifically stated to form part of the design responsibility of the *Contractor* under this paragraph 2.2, all residual design responsibility and overall responsibility for the total design solution for the *Works* rests with the *Contractor*.

a) The *Contractor* shall engage the services of ECSA registered Engineers and/or Technologists for all aspects of the *Works* for which the *Contractor* is to design as per Clauses 2.2.1 and 2.2.2 above.

b) The *Contractor* shall thus be wholly accountable and responsible for all aspects of his designs, including the implementation of all Statutory Safety, Health and Environmental Regulations of South Africa and the particular requirements, specifications, and regulations of the *Employer* pertaining to Health and Safety, Environment, Quality and Engineering.

c) The *Contractor* shall be wholly accountable and responsible for the implementation of the aspects of his designs including commissioning, putting into service, and handover of his constructed designs to the *Employer*, and his duly appointed ECSA registered Engineers shall be held accountable and responsible for these aspects of the *Works* for the lifetime duration of the *Works*.

2.2.4 Acceptance of documentation by the *Project Manager* will in no way relieve the *Contractor* of is responsibility for the correctness of information, or conformance with his obligation to Provide the *Works*. This obligation rests solely with the *Contractor*.

2.2.5 After review, a copy of the original reviewed/marked-up drawing/document, with the *Project Manager's* consolidated comments and document status marked on the *Contractor* Review Label, is scanned and the copy shall be returned to the *Contractor* under cover of the project's Transmittal Note for revision or re-submittal as instructed.

2.2.6 The *Contractor* shall allow the *Project Manager* 2 weeks (unless otherwise stated and agreed) to review and respond to the *Contractor*'s submission of their documentation, i.e. from time of receipt by the project to the time of despatch. However, work shall proceed without delay in the event of late return of the documentation by the *Project Manager* with prior notification in writing by the *Contractor*.

2.2.7 On receipt of the reviewed documentation the *Contractor* shall make any modifications requested/marked-up and resubmit the revised documentation to the *Project Manager* within 2 weeks. Queries regarding comments/changes should be addressed with the *Project Manager* prior to re-submittal.

2.2.8 Any re-submittals, which have not included the changes/comments identified, will be returned to the *Contractor* to be corrected. The *Contractor* shall re-issue the revised documentation incorporating all comments and other specified details not included in the previous issue within 2 working days of receipt of the marked-up document.

2.2.9 The *Contractor* is required to undertake design safety reviews with the *Project Manager* the NEC *Supervisor,* the *Employer's* Engineer's and Professional team, the *Employer's* Health and Safety Officers, the *Employer's* Environmental Officers, the *Employer's* Quality Assurance and

Quality Control Officers and any other Specialists and/or Subject Matter Experts (SME) as deemed by the *Employer* necessary for the provision of the *Works*.

2.3 Other requirements of the *Contractor's* design

2.3.1 The *Contractor*'s design complies with the following:

a) All Statutes, Standards, Specifications, Policies, Conventions, Requirements as referenced in Paragraph 4 of this document and all Statutes, Standards, Specifications, Policies, Conventions, Requirements as referenced in any Annexures thereto.

2.4 Use of *Contractor's* design

2.4.1 The *Contractor* grants the *Employer* a licence to use the copyright in all design data presented to the *Employer* in relation to the *Works* for any purpose in connection with the construction, re-construction, refurbishment, repair, maintenance and extension of the *Works* with such licence being capable of transfer to any third party without the consent of the *Contractor*.

2.4.2 The *Contractor* vests in the *Employer* full title guarantee in the intellectual property and copyright in the design data created in relation to the *Works* as follows:

a) All supporting infrastructure required to implement all of the *Employer*s' high level designs. These may include, but is not necessarily limited to, cableways, cable support systems, conduit systems and arrangement, piped systems and pipe support systems, and the selection of fasteners and fastening systems for these items, where not specified, referenced or detailed by the *Employer*.

b) All detailed designs of all MV and LV distribution panels. The detailed Earthing and Lightning Protection design in accordance with the *Employer's* high level designs and minimum requirements and specifications.

c) Concrete mix designs, descriptions and properties for bases, foundations and wearing and levelling courses

d) The design of light poles, base plates and luminaire fixtures and fittings where required for the provision of the *Works*.

e) All and any equipment, formwork, and temporary work associated with the provision of the *Works*.

f) Concrete mix designs, descriptions and properties for wearing and levelling courses

g) All and any equipment, formwork, and temporary work associated with the provision of the *works*.

2.5 Design of Equipment

2.5.1 The *Contractor* submits his design details for the following categories of his proposed principal Equipment to the *Project Manager* for his information only:

a) Any formwork required to Provide the *Works*
b) Temporary electrically powered compressed air systems and pneumatic equipment that may be required to Provide the *Works*
c) Small electrically powered equipment
d) Equipment designed for the lifting of personnel to access any areas necessary to Provide the *Works*, which are not at ground level.
e) Equipment designed for the lowering of personnel to access any areas necessary to Provide the *Works*, which are below ground level.

2.5.2 The following principal Equipment categories deployed for the *Contractor* to Provide the *Works* require its design to be accepted by the *Project Manager* under ECC Clause 23.1:

a) Temporary petrol or diesel powered compressed air systems and pneumatic equipment that may be required to Provide the *Works*
b) Small petrol or diesel powered equipment
c) Specialist Equipment required to Provide the *Works*
d) Rigging platforms and specialised rigging Equipment that may be required by the *Contractor* to Provide the *Works*.
e) Temporary access platforms, ladders, walkways, scaffolds, and any other temporary structures required to Provide the *Works*.

2.5.3 The design of Equipment is considered in terms of this contract as *Contractor*'s design and any and all applicable requirements of 2.2, 2.3, 2.4, and 2.5 of this document shall apply.

2.6 Equipment required to be included in the *Works*

2.6.1 Any shuttering/formwork that is left in-situ as required by the design of the *Works*, notwithstanding it be *Employer's* Design or *Contractor*'s design, and necessary for the provision of the *Works*.

2.7 As-built drawings, operating manuals and maintenance schedules

2.7.1 The *Contractor* provides the following:

a) As-Built/Final Documentation

2.7.1.a.1 In undertaking the *Works* (including all incidental services required), the *Contractor* shall conform and adhere to the requirements of the *Contractor* Document Submittal Requirements Standard included in Annexure N (Refer DOC-STD-0001 Rev 03).

2.7.1.a.2 The *Contractor* prepares two (3) marked up hard copies of the latest revision of the *Employer* documents/drawings to represent the As-Built/Final status.

2.7.1.a.3 The mark-ups shall be in RED pencil or pen and be complete and accurate. The *Contractor* submits same to the *Project Manager* under cover of a *Contractor*'s Transmittal Note.

4 x CD Roms with Adobe Acrobat (.pdf) and "Native" formats

2.7.2 **As-Built/Final Documentation**

In undertaking the '*Works*' (including all incidental services required), the Supplier shall conform and adhere to the requirements of the '*Contractor* Document Submittal Requirements' Standard included in Annexure N (Refer DOC-STD-0001 Rev 03)

2.7.3 **Installation, Maintenance and Operating Manuals and Data Books**

In undertaking the '*Works*' (including all incidental services required), the Supplier shall conform and adhere to the requirements of the 'Data Books and Manuals' Standard included in Annexure N (Refer DOC-STD-0001 Rev 03) and the '*Contractor* Documentation Submittal Requirements' Standard included in Annexure N (Refer to DOC-STD-0001 Rev 03).

3 Construction

3.1 Temporary *Works*, Site services & construction constraints

3.1.1 The *Contractor* shall comply with the requirements of the *Employer* with regard to site entry, security control, permits, and site regulations.

a) The *Contractor* complies with the following requirements of the *Employer:*

3.1.1.a.1 The *Contractor* shall attend all necessary Safety Inductions and ensure that all personnel engaged in the provision of the *Works* are inducted as directed by the *Project Manager*, NEC *Supervisor*.

3.1.1.a.2 The *Contractor* and all personnel engaged in the provision of the *Works* shall attend all Safety Inductions as required by the TNPA Control Officer as directed through the *Project Manager*

3.1.1.a.3 The *Contractor* and all personnel engaged in the provision of the *Works* shall attend all Safety Inductions as required by the *Employer's* Safety Officer, *Employer's* Electrical Engineer and/or as directed by the *Project Manager*.

3.1.1.a.4 All work subsequent to and during the energizing of the New minisubstations shall be supervised by a Transnet Category C "Green" for work that does not involves MV switching operations; and a Transnet Category A "Brown" certified officer for work that involves MV switching operations.

3.1.1.a.4.1 The *Contractor* shall make arrangements for the Transnet Category A "Brown" officer to arrange access to the substations during the execution of the *Works*.

3.1.1.a.5 All personnel working or accessing the substation are required to sign the Substation Register and indicate the time of entry, time of exit and the details of the work carried out.

3.1.1.a.5.1 The *Contractor* shall obtain access permits from the TNPA Permit Office, and the TCP Safety Officer before accessing the site.

3.1.1.a.5.2 The *Contractor* shall obtain the relevant work permits from the TNPA control officer, and the *Employer's* Safety Officer before performing any work.

3.1.1.a.6 The *Contractor* shall at all times comply with the Transnet MV Safety Instructions "Blue Book" whilst providing the *Works*.

3.1.1.a.7 The Safety Inductions, Access Permits and Work Permits are part of this contract and the *Contractor* shall make allowance for it in his *Price* and *Programme.*

3.1.1.a.8 The *Contractor* shall ensure that all relevant safety inductions and access permits are obtained well before the Site Access Date as reflected in the Contract Data.

b) The Port of Ngqura is a designated Security Areas under the ISPS requirement, and in terms of this, all access into the Port area will be strictly controlled. Compliance to these security requirements, including labour transport and access requirements, obtaining and maintaining access cards for the *Contractor*'s personnel on Site is part of this contract, and the *Contractor* shall make allowance for it in his *Price* and *Programme*.

c) The *Contractor* shall obtain the TNPA entry permits for all of the *Contractor*'s personnel within the Port of Nqqura in accordance with the access control requirements of the Port and the *Contractor* shall make allowance for it in his *Price* and *Programme*. The *Contractor* is also required to obtain the relevant permits for his Sub-*Contractor*s and all suppliers. The *Contractor* is required to make applications for these permits on behalf of his workers, suppliers and Sub- contractors, and is to nominate a single person to liaise with the relevant port and terminal authorities the *Contractor* shall make allowance for it in his *Price* and *Programme*.

d) The *Contractor* provides all staff working within the Port of Ngqura with *Contractor* identification cards which detail the person's name, identity number and the foreman / engineer responsible. The provision of construction personnel with ID cards is considered part of this contract, and shall be made by the *Contractor* to a standard acceptable to the *Project Manager* and the *Contractor* shall make allowance for it in his *Price* and *Programme*.

e) The *Contractor* is to be in constant consultation and cooperation with the Port's security operations to ensure compliance with all the required security procedures and the *Contractor* shall make allowance for it in his *Price* and *Programme*.

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

a) Access route to Site

3.1.2.a.1 All vehicles are subject to security checks and all Plant and Equipment brought into the facility and leaving the facility are required to be security cleared by the relevant authorities (*Project Manager* and TNPA Security Manager) before access or exit is granted, as the situation may require.

3.1.2.a.2 The *Contractor* is required to arrange for the clearing of the items with the *Project Manager* and the TNPA Security Manager well in advance of the access or exit requirement to avoid delays in the provision of the *Works*.

3.1.2.a.3 The *Contractor* ensures that any of his staff, labour and Equipment moving outside of his allocated Site and Working Areas does not obstruct the *Employer's* operations. To this end access routes are allocated and co-ordinated by the *Contractor* in liaison with the *Project Manager*.

3.1.2.a.4 The *Contractor* ensures the safe passage of *Contractor*'s traffic to and around the Site and Working Areas at all times. This includes providing flagmen, protective barriers, signage, etc. for protection, direction and control of traffic.

3.1.2.a.5 The *Contractor* shall provide designated, signed and demarcated walkways for all personnel who are required to traverse between the different working areas on site. Personnel outside of the designated walkways are required to be conducting work activities, and when traversing, are required to use the designated walkways.

3.1.2.a.6 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) Barricades and fencing around site

3.1.2.b.1 The *Contractor* shall be responsible for providing a temporary barricade fence between the port operations and the construction site and maintaining, providing, and/or relocating the fence, if required for construction purposes, to ensure the boundary fence is continuous, and the *Contractor* shall make allowance for it in his *Price* and *Programme*.

3.1.2.b.2 The *Contractor* shall ensure that his site access gate is manned 24hrs a day for the duration of the *Works* and over any builder's breaks, by a Security Provider acceptable to the *Project Manager* and registered with the PSIRA and the *Contractor* shall make allowance for it in his *Price and Programme*.

c) Restrictions to access on Site

3.1.2.c.1 The *Contractor* is prohibited from entering the *Employer's* Operational Areas.

3.1.2.c.2 The *Contractor* plans and organises his work in such a manner so as to cause the least possible disruption to the *Employer's* operations.

3.1.2.c.3 The *Contractor* ensures that all his construction staff, labour, and Equipment remains within his allocated and fenced off construction areas.

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

3.1.3.a.1 The working hours shall be in accordance with the requirements of the Department of Labour or with the agreement of the relevant trade unions. This information relating to working hours shall be supplied to the *Project Manager* prior to commencement of the proposed working hours.

3.1.3.a.2 The *Contractor* complies with a nine (9) hour a day, five (5) day a week standard work day/week for all activities to be undertaken by his people (including Sub-contractors) employed on site.

3.1.3.a.3 Work times (i.e. start and end times within a standard work day) shall be as mutually agreed with the *Project Manager*.

3.1.3.a.4 In the event that the *Contractor* requests to work overtime to make up for time lost due to his own delays, the *Contractor* will be liable for the supervision cost required from the *Employer*'s team during the *Works*.

3.1.3.a.5 The *Contractor* keeps daily records of his people, Plant and equipment engaged on the Site and Working Areas (including Sub-*Contractor*s) with access to such daily records available for inspection by the *Project Manager* at all reasonable times

3.1.3.a.6 Minimum requirements of people employed on the Site are as follows:

3.1.3.a.6.1 South African identity document or passport/ visa and work permit for foreign nationals;

3.1.3.a.6.2 Employment of local labour only for unskilled and semi-skilled job categories as per PIRPMP;

3.1.3.a.6.3 Secondment of skilled core/ permanent employees if skills are not locally available;

3.1.3.a.6.4 Pre-employment medical examinations; and

3.1.3.a.6.5 Induction in IR matters and conditions of employment on the Project.

3.1.3.a.7 The *Contractor* complies with the requirements of the IRCC involving the engineering construction *Contractor*s engaged (including all future *Contractor*s) by the *Employer*.

3.1.4 Health and safety facilities on Site

a) The *Contractor* is referred to the Health and Safety specifications: HAS-STD-0001 Rev 0 as contained in the List of Annexures of this document.

b) The *Contractor* complies with the requirements stated under paragraph entitled "Safety Risk Management" of the *Employer's Works* Information.

3.1.5 Environmental controls, fauna & flora, dealing with objects of historical interest

a) The *Contractor* is referred to the Environmental standard specifications and Construction environmental management plan as contained in the List of Annexures.

b) The *Contractor* complies with the CEMP, SES and PES in the construction of the *Works*, all as described under paragraph "Environmental constraints and management" of the *Employer's Works* Information.

3.1.6 Title to Materials from demolition and excavation

a) The *Contractor* has no title to any materials arising from excavation and demolition in the performance of the *Works* with title to such materials remaining with the *Employer*. The *Contractor* informs the *Project Manager* immediately upon encountering any such materials who shall then instruct the *Contractor* how to label, mark, set aside and/or dispose of such materials for the benefit of the *Employer* in accordance with ECC3 Clause 73.1

3.1.7 Cooperating with and obtaining acceptance of Others

a) The *Contractor* performs the *Works* and co-operates with:

3.1.7.a.1 The *Contractor* performs the *Works* and co-operates with the *Employer* (including the agents of the *Employer*) who operate on Site during the entire duration of the Contract period.

3.1.7.a.2 The *Contractor* performs the *works* and co-operates with The TNPA Control Office and agents of the TNPA Control Office, as directed by the *Project Manager*, who operate on Site during the entire duration of the Contract period.

3.1.7.a.3 The *Contractor* performs the *Works* and co-operates with Others, of whom the *Contractor* is to be notified once appointed by the *Employer*, who operate on Site during the entire duration of the Contract period.

3.1.8 Publicity and progress photographs

a) The *Contractor* shall obtain the permission and approval of the *Project Manager* before erecting any notice boards, using the details of the contract in any advertising media or revealing any details of the contract to the public.

b) 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*.

c) The *Contractor* provides a notice board showing the *Employer*'s details, The *Project Manager's* details and the *Contractor*'s details at the Site.

d) The Contractor shall submit the graphic design and the structural support designs of the notice board to the Project Manager for acceptance before fabricating or erecting it.

e) The *Contractor* provides progress photographs at monthly intervals in digital format as part of the *Contractor*'s monthly programme narrative report. The photos shall include detailed, close up photos of construction activities.

3.1.9 *Contractor*'s Equipment

a) The *Contractor* keeps daily records of his Equipment used on Site and the Working Areas (distinguishing between owned and hired Equipment) with access to such daily records available for inspection by the *Project Manager* at all reasonable times.

b) The *Contractor* complies with the following permissions and restrictions in the use of Equipment as required by the *Employer*:

3.1.9.b.1 Equipment used by the *Contractor* to Provide the *Works* shall be assembled and disassembled within the *Contractor*'s Work Area and Site boundaries or lay-down areas as authorised by the *Project Manager*.

3.1.9.b.2 The *Contractor* is required to remove all equipment that is not part of the *Works* from site after completion of the *Works* and before de-establishment of the site.

3.1.9.b.3 All and any equipment used by the *Contractor* for the provision of the *Works* shall comply to the *Employer's* SHEQ regulations and restrictions, or any other statutory Health and Safety requirements as directed by the *Project Manager* in liaison with the *Employer's* Engineers or the *Employer*s Consultants.

3.1.10 Equipment provided by the *Employer*

a) The *Employer* shall not provide any Equipment to the *Contractor* for the purposes of this contract.

3.1.11 Site services and facilities:

The *Employer* provides the following facilities for the *Contractor*:

a) For the duration of the Contract, the *Project Manager* will provide an area, free of charge, for the *Contractor* to establish his offices, lay down areas, stores, workshops, and other *Contractor*'s Equipment.

b) The locations of the potential lay down areas will be identified at the site clarification meeting. The *Contractor* may establish a site camp anywhere within the boundary of this area that does not impede the provision of the *Works*.

c) The *Contractor* shall ensure that the area used has a suitable continuous security fence and the necessary access gates.

d) All preparation and fencing, etc. shall be done by the *Contractor* and shall be allowed for in his Price, this includes clearing away and leaving clean and clear at Completion.

e) The *Contractor* shall provide everything else necessary for Providing the *Works*.

3.1.12 Connections to services for *Contractor*'s use:

a) No supply point for potable water on Site and the *Contractor* will have to make his own arrangements.

b) No connection for electricity is available on site and the *Contractor* will have to make his own arrangements.

c) No connection to a sewer system will be made available and thus the *Contractor* will have to make provision for the containment and disposal of foul water from toilets, ablutions, basins, etc.

d) The Contractor shall provide everything necessary for Providing the Works in accordance with this contract and attached Annexures.

3.1.13 Wherever the *Employer* provides facilities if applicable in the context of this contract, (including, *inter alia*, temporary power, water, waste disposal, telecommunications etc.) for the *Contractor's* use within the Working Areas 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*.

3.1.14 Facilities provided by the *Contractor:*

a) The *Contractor* ensures that the 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 to be allowed for in the *Contractor*'s Price.

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, which is acceptable to the *Project Manager* and the *Employer's* Engineers, immediately downstream at each of the *Employer's* connections (if applicable in the context of this contract) 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 included in Price.

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 *Supervisor* (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* shall be responsible for providing water and power for all other Working Areas where not provided by *Employer.*

i) The *Contractor* provides, at his cost, a sufficient number of toilets and maintains them in a clean and sanitary working condition.

j) The *Contractor* provides temporary lighting and fencing around every section occupied by him during the construction of the *works*.

k) 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.

l) The *Contractor* includes for all costs for such lighting and fencing, including access control into and out of these restricted areas.

m) 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.

n) Upon *Completion* 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*.

o) No excess or discarded materials or equipment may be buried or dumped within the port boundary.

p) Demolition of all temporary structures, surfaces etc. shall be first approved by the *Project Manager* prior to the work being carried out.

q) 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.

r) 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) accepted by the *Project Manager*.

s) 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*.

t) The *Contractor* shall provide, maintain and remove lockable portable chemical type toilets.

u) The *Contractor* shall provide a suitably sized construction power supply by means of either municipal supply, or Generation Plant equipment, as required.

3.1.14.u.1 The *Contractor* shall be wholly responsible for the provision of this power supply, and shall make all the necessary arrangements for the supply, and the maintenance of the supply for the duration of the W*orks*.

3.1.15 The *Contractor* shall provide the following facilities for the *Project Manager* and *Supervisor*:

a) Furnished air-conditioned offices. (2No in accordance to SANS 12200A 8.3.2.1a)

3.1.16 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, compound areas 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.

3.1.17 Unless explicitly stated as a responsibility of the *Employer*, Site services and facilities, Connections to Services for *Contractor*s' use, and all residual requirements for the provision of facilities and all items of Equipment necessary for the *Contractor* to Provide the *Works* remains the responsibility of the *Contractor*.

3.1.18 Existing premises, inspection of adjoining properties and checking work of Others

a) The *Contractor* will be held responsible for any damage to the existing structures and surfacing caused by the *Contractor* during the execution of this contract; fair wear and tear excluded, and shall repair it to the satisfaction of the *Supervisor* on conclusion of the *Works*.

b) For this purpose a joint inspection with the *Supervisor* will be carried out prior to occupation of the site(s) and any existing damage noted.

c) The *Contractor* is required to forward a photographic report following the inspection to the *Project Manager* for record purposes.

3.1.19 The *Contractor* inspects and surveys following areas adjacent to the Site in accordance with this *Works Information* and in conjunction with the *Project Manager*:

a) The Port of Ngqura East Bank Tank Farm Access roads and parking areas used exclusively by the *Contractor* and the *Employer*s' Personnel involved in the provision of the *Works* or the administering of the contract. Access roads that are used by both the *Contractor* and TNPA for their operations are excluded from this requirement.

b) A perimeter extending 1.0m beyond the demarcated and fenced off Site Area.

3.1.20 Survey control and setting out of the *Works*

a) The *Employer* provides the following information and survey controls for the *Contractor*:

3.1.20.a.1 Survey control points for the setting out of the *Works*. The *Contractor* will be responsible for the setting out of the *Works*.

3.1.20.a.2 For the purposes of this contract the datum level shall be Chart Datum (CD) (Port), which is 0.836m below Mean Sea Level (MSL).

For example:	+0,00m CD (Port)	=	-0.836 MSL
	+0.836 CD (Port)	=	+0,00m MSL

3.1.20.a.3 The *Contractor* validates the information provided by the *Project Manager* and records all existing and final levels on a drawing and presents this to the *Project Manager* for acceptance.

3.1.21 Excavations and associated water control

a) The *Contractor* complies with the following requirements:

3.1.21.a.1 Where applicable, the *Contractor* protects all excavations against any water ingress whether by seepage, rains, storms, floods or any other means.

3.1.21.a.2 Where applicable, the *Contractor* immediately removes any water found in the excavation by pumping and / or bailing and provides all necessary Equipment (pumps, pipes, etc.) to do so.

3.1.21.a.3 In the event where the pumped water will be discharged into a watercourse, the pumping out of water must conform to the provisions contained in the Coastal Water Discharge permit – refer to list of Annexures.

3.1.21.a.4 Water is cleared in such a way that it cannot seep or flow back into the excavations.

3.1.21.a.5 The *Contractor* shall install shoring where necessary, and in all deep excavations to ensure that the sides of the excavation does not collapse.

3.1.21.a.6 The *Contractor* shall comply with the *Employer's* SHEQ policy in all respects for the Provision of the *Works* involving deep excavations.

3.1.21.a.7 The *Contractor* is referred to Paragraph 4 of C3.1 and is required to comply with all requirements relating to excavations and water control contained in, Paragraph 4 of C3.1 and Paragraph 6. of C3.1 or annexed thereto.

b) All activities related to excavations and water control forms part of this contract, and the *Contractor* shall make allowance for these activities in his Price and Programme.

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

a) Where the *Contractor* encounters existing underground services or existing service cables, the *Contractor* undertakes the following:

3.1.22.a.1 The *Contractor* is required to liaise with the *Project Manager*, and the *Supervisor* and the *Employer's* Engineers, and establish as accurately as possible the location of the various existing services situated within the Work Area and record all such information on a suitable "marked-up" drawing for reference at all times.

3.1.22.a.2 In addition to the above, the *Contractor* shall consult the *Project Manager*, the *Supervisor* and the *Employer's* Engineers, prior to undertaking any excavation work.

3.1.22.a.3 Where the *Contractor* encounters existing underground services / existing services cables / pipe trenches, the *Contractor* is to notify the *Project Manager*, the *Supervisor* and the *Employer*s Engineers.

3.1.22.a.4 Where the encountered services are causing a delay in the provision of the *Works*, the *Contractor* shall approach the *Project Manager*, the *Supervisor* and the *Employer's* Engineers for a decision by submitting a Field Engineering Query (FEQ).

3.1.22.a.5 The *Contractor* shall then provide the solution described in the answered FEQ.

3.1.22.a.6 The *Contractor* must thereafter exercise due care and attention in carrying out the agreed excavation *Works* and any *Works* as may be directed by the *Project Manager* to avoid damage or disruption to existing services.

3.1.22.a.7 The *Contractor* shall be liable for all claims arising out of any damage caused by such excavation if the *Contractor* fails to exercise the requisite care and attention in carrying out the excavation.

3.1.22.a.8 The cost of locating and protecting, if necessary, services shall be included in the rates for the services intersecting and adjoining the trenches.

3.1.22.a.9 A group of cables intersecting or adjoining a trench will be regarded as one service.

3.1.22.a.10 The existing services shall be protected when excavating.

3.1.22.a.11 The costs of protecting these services shall be included in the rates for excavation and compaction.

3.1.22.a.12 All existing services shall be treated as in service and "live". All necessary Safety Instructions of the *Employer* and statutory requirements as per the OHSAct and its Regulations shall be complied with in the handling of the "live" service.

3.1.22.a.13 In the case of electrical services the *Contractor* shall trace, locate and identify all cables within the service and record the information as per this *Works* Information above.

3.1.22.a.14 The *Contractor* shall also comply with all of the relevant *Employer*'s Specifications in Paragraph 4 below and any annexed thereto in the reinstatement of the services

3.1.23 Control of noise, dust, water and waste

a) The *Contractor* complies with the following:

3.1.23.a.1 Before moving Equipment onto the Site and Working Areas and commencing the *Works*, the *Contractor* submits his proposed methods of construction which demonstrate the measures taken to avoid and or reduce any environmental and health issues arising from dust, noise and vibration for acceptance by the *Project Manager*.

3.1.23.a.2 The *Contractor* shall comply with the requirements of "Environmental constraints and management" of Section C3.1 *Employer's Works* Information.

3.1.23.a.3 The *Contractor* shall comply with the requirements of "Safety risk management" of Section C3.1 Employer's Works Information.

b) The *Contractor* is to provide dust suppression as per the CEMP, PES and SES documents to ensure that dust levels resulting from the *Contractor*'s construction traffic are kept to the required safety and environmental standards as specified in the relevant project environmental specifications.

3.1.24 Sequences of construction or installation

a) The *Contractor* complies with the following:

3.1.24.a.1 The *Contractor* is hereby informed of the requirements of maintaining the continuity of supply to the Port of Ngqura, and is required to arrange and sequence his *Works* so as to ensure that there is no disruption to the Port.

3.1.24.a.2 Should it be impossible to avoid a disruption as described in (a.1) above, the *Contractor* shall notify the *Project Manager*, *Supervisor* and the *Employer*s Engineers 21 days before the anticipated disruption and request authorization to commence with the aspect of the *Works* that will cause the disruption. The *Contractor* shall not proceed without said authorization to proceed.

3.1.25 Giving notice of work to be covered up

a) 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 48 (forty eight) hours prior to the proposed covering up.

b) The *Contractor* shall not cover the *Works* without the authorization of the *Supervisor*.

c) The *Contractor* shall make the *Project Manager* and *Supervisor* aware of any tests and inspections required by the *Employer*'s Quality Management Procedures. Notification of required test and/or the *Employer*s Engineers inspections to be given 24 (twenty four) hours in advance.

3.1.26 Hook ups to existing *Works*

a) The *Contractor* is referred to Item 4 of C3.1 *Employer's Works* Information for details on the hook ups to existing *Works*. The *Contractor* is to take due cognisance of the requirements of the SCADA System and its hook-ups to the SCADA in other Port of Ngqura Substations and existing substations that are operational and "live".

3.2 Completion, testing, commissioning and correction of Defects

3.2.1 The *work* to be done by the Completion Date

a) On or before the Completion Date or Sectional Completion Date, the *Contractor* shall have done everything required to Provide the *Works* including removal of his establishment and equipment from the respective sites but excluding the work listed below which may be done after the Completion Date but in any case before the dates stated.

b) The *Project Manager* cannot certify Completion until all the work except that listed below has 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**
Submission of all data packs, quality assurance records and as-built drawings	30 days after Completion

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

a) The *Contractor* shall not be permitted to carry out any *works* after Completion has been certified.

3.2.3 Use of the *Works* before Completion has been certified

a) The *Employer* uses the following part / parts of the *Works* before Completion is certified by the *Project Manager* which do not constitute take over by the *Employer* for the reason(s) stated:

3.2.3.a.1 All Cable, Switchgear, Protection relays, Control Systems Plant and Software or any other Electrical or Mechanical Plant installed by the *Contractor* so that the *Employer* may maintain the functionality of systems and existing Plant that is required by the *Employer* to conduct the *Employer's* operational activities, and the operational activities of TNPA.

3.2.3.a.2 All Cable, Switchgear, Protection relays, Control Systems Plant and Software or any other Electrical or Mechanical Plant installed by the *Contractor* so that the *Employer* may maintain the continuity of the Electrical Supply to the Port of Ngqura.

3.2.3.a.3 Any temporary or permanent Lighting installation installed by the *Contractor* that may be required by the *Employer* to be used for the night time operational activities of TNPA or others, as required by the *Project Manager*.

3.2.4 Materials facilities and samples for tests and inspections

a) The *Contractor* provides the *Employer* with the following materials, facilities and samples during the provision of the *Works*, as per ECC Clause 40.2:

3.2.4.a.1 The *Contractor* is required to provide all materials, facilities and samples for any tests required in Paragraph 4 Plant and Material Standards and Workmanship below.

3.2.4.a.2 The *Contractor* shall furnish samples of any Plant and Materials that is other than, or different to, that specified by the *Employer's* Engineers, to the *Supervisor* for Acceptance by the *Employer's* Engineers. The *Contractor* is prohibited from installing said Plant without the required prior authorization from the *Employer*s Engineers.

3.2.4.a.3 The *Contractor* shall furnish samples of any Plant and Materials that is other than, or different to, that required by the *Employer's* Engineering Specifications, that shall be utilised in the *Contractor*'s Designs, to the *Supervisor* for Acceptance by the *Employer's* Engineers. The *Contractor* is prohibited from installing said Plant without the required prior authorization from the *Employer's* Engineers.

3.2.4.a.4 The *Contractor* shall furnish samples of any Plant and Materials that is proposed to be used in the *Contractor*'s Designs, to the *Supervisor* for Acceptance by the *Employer's* Engineers. The *Contractor* is prohibited from designing with, and subsequently installing said Plant and Materials without the required prior authorization from the *Employer's* Engineers.

b) Samples, tests and inspections required of the *Contractor*, shall be as specified in Paragraph 4 of C3.1 or any other standards, specifications or statutory requirements referred to therein or annexed thereto.

c) The *Contractor* shall give notice to the *Supervisor* of the required inspection not less than 48 hours before the inspection is required.

d) The *Employer* will not provide any materials or facilities for the use of the *Contractor*, to perform tests and inspections.

3.2.5 Pre-Commissioning Tests and Commissioning

a) The *Contractor* is referred to the list of Annexures for TGC's High Level Commissioning Plan for details of the inspections tests and activities required for commissioning of Plant. Where the word or expression in the former document reads "Equipment" the meaning is "Plant" and vice versa.

b) The *Contractor* shall arrange for Factory Acceptance Testing of selected Electrical and Mechanical Plant, as required by the *Employer's* Engineers at the supplier's premises and/or factory of manufacture before any Plant is despatched to Site.

c) The Factory Acceptance Testing shall be witnessed by the *Employer*s Engineers, but in doing so; the *Employer*s Engineers assume no responsibility or accountability for the proper functionality of the Plant in any way whatsoever.

d) The *Contractor* shall arrange for Factory Acceptance testing for Electrical and Mechanical Plant at the factory of manufacture before the Plant leaves the factory.

e) The *Contractor* shall arrange Site Acceptance Testing for the selected Plant when it arrives on Site.

f) The Site Acceptance Testing shall be witnessed by the *Employer*s Engineers, but in doing so; the *Employer*s Engineers assume no responsibility or accountability for the proper functionality of the Plant in any way whatsoever.

g) The *Employer* will make its own arrangements for attendance of FATs and will carry all costs associated with its personnel attending FATs.

h) The *Contractor* shall appoint an independent ECSA registered commissioning engineer to conduct and coordinate the commissioning activities. The Curriculum Vitae of the commissioning engineer shall be submitted to the *Project Manager* and *Employer's* Engineers for acceptance before his appointment.

i) The *Employer's* Engineers and/or the *Project Manager* reserves the right to reject the proposed commissioning engineer if he is deemed unsuitable to carry out the commissioning activities as required by the *Employer* and the *Employer's* Engineers.

j) The installation shall be comprehensively tested and commissioned as individual and integrated systems as may be required by the configuration, after the *Works* are substantially complete.

k) The *Contractor* shall provide adequate and competent personnel for testing and commissioning of every particular installation and for the full duration of the commissioning process.

l) The commissioning shall include interaction between other systems and others where interdependence of installations is encountered.

m) The commissioning process shall, after all testing has been completed be the final proving ground of the systems and during this procedure the installations shall be subjected to all possible inputs and actions which may be encountered under operational conditions.

n) The *Contractor* shall prove the full operation, working and compliance of the installation in accordance with the specifications.

o) A detailed programme of the planned commissioning procedures shall be submitted to the *Project Manager* and *Employer's* Engineers at least 4 weeks before commissioning commences.

The commissioning programme shall include but is not limited to:

- A schedule of equipment to be commissioned, the proposed tests to be conducted and the testing methods and the range of acceptable results,
- Commissioning check sheets,
- Commissioning programme dates and duration

p) The *Contractor* shall supply all relevant test equipment, monitoring devices, network analysers, protocol testers/analysers etc. required to test and commission the complete *Works*.

q) An accurate record of all commissioning and testing is to be taken and included in the handover documentation as a permanent record.

r) The *Contractor* shall perform any and all tests as required by any Sections or Clauses of the *Works* Information and any and all tests required by the *Employer*s Specifications annexed thereto, and any and all tests required by any applicable SANS Standard, or other Standard, and/or as directed by the *Employer's* Engineers and the *Project Manager*.

s) Testing and commissioning is considered part of the *Works* and is to be done before completion.

3.2.6 Take over procedures

a) The *Contractor* provides the following assistance to the *Employer*:

3.2.6.a.1 The *Contractor* ensures that all the required documentation as described in the *Works* Information is presented to the *Project Manager* before Completion.

3.2.6.a.2 The *Contractor* ensures that the *Project Manager* has a full and accurate dossier of As-built documents that represent the buildings, Plant, Switchgear, Services and systems (SCADA and other systems) that reflect the status of the completed *Works* for Mechanical, Electrical, Control and Instrumentation, General Layouts and Detail Drawings, (and including Plant within the *Works*) to present to the *Employer*.

3.2.6.a.3 The *Contractor* ensures that the *Project Manager* has a full and accurate dossier of Maintenance and Operating Manuals that represent the buildings, Plant, Switchgear, Services and systems (SCADA and other systems) that reflect the status of the completed *Works* for Mechanical, Electrical, Control and Instrumentation, General Layouts and Detail Drawings, (and including Plant within the *Works*) at the earlier of take-over or Completion.

3.2.6.a.4 Where the *Contractor* has presented Maintenance and Operating Manuals that represent the buildings, Plant, Switchgear, Services and systems (SCADA and other systems) that reflect the status of the completed *Works* for Mechanical, Electrical, Control and Instrumentation, General Layouts and Detail Drawings, (and including Plant within the *Works*) to the *Project Manager* at take-over, the *Contractor* modifies and updates As-built documents as necessary prior to Completion.

3.2.6.a.5 The *Contractor* shall ensure that all cellular, wireless and radio communication link applications, and licencing are made on behalf of the *Employer*.

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

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

3.2.7.a.1 Access into areas already handed over by the *Contractor* for correction of any defect shall be subject to the approval of Port's Operations, and these times shall be communicated to the *Contractor* by the *Project Manager*.

3.2.7.a.2 The areas required by the *Contractor* will need to be temporarily barricaded by the *Contractor* before the *Contractor* commences with any corrective work.

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

a) Where the *Contractor* has to return to Site after Completion to rectify notified Defects, the *Employer* may either impose the same Site access / egress restrictions as communicated elsewhere under C3.1 *Employer's Works* Information at the starting date / access date stated under Contract Data - Part One, or as the *Works* are now in use or the *Employer's* occupation of the Site may be incrementally or substantially changed post Completion, there may be further access / egress restrictions as required by the *Employer* and/The Port of Ngqura

3.2.9 Performance tests after Completion

a) The *Contractor* performs the following performance tests after Completion of the *Works*:

3.2.9.a.1 The *Contractor* shall be required to demonstrate the functionality and performance of the minisubstation SCADA system in its ability to function as an integrated system together with the Port of Ngqura Substation SCADA system (by others) to the satisfaction of the *Employer's* Engineers.

3.2.9.a.2 The *Contractor* is required to demonstrate the functionality and performance of the Protection Relay settings for the Port of Ngqura Substation installation, in its ability to function as a standalone system for the Main Substation, to the satisfaction of the *Employer's* Engineers.

3.2.9.a.3 The *Contractor* is required to demonstrate the functionality and performance of the mini-substation Protection Relay settings and the grading thereof, as a part of the overall integrated Protection Relay settings and the grading thereof, that service all the substations/works linked to the construction and operations of the proposed new Main Substation (by others).

3.2.10 Training and technology transfer

a) The *Contractor* facilitates the following requirements for training workshops after Completion for the *Works* in use:

3.2.10.a.1 The *Contractor* shall provide training for the *Employer's* selected staff in the maintenance and operations of all specialised Plant and Systems and Software including SCADA, Switchgear and Protection Relays.

3.2.10.a.2 The Training shall be comprehensive with printed training manuals and electronic copies of such manuals made available to each delegate.

3.2.10.a.3 The *Employer* envisages that the number of staff required to be trained will be approximately 15, the exact number to be confirmed by the *Project Manager* during the provision of the *Works*.

b) The *Contractor* arranges for the following technology transfer to the *Employer* after Completion for the *Works* in use:

3.2.10.b.1 The *Contractor* shall ensure that the Software Licences for all software required for the operation of all SCADA and control, and Protection systems is licensed in the name of the *Employer*, with full rights of use and operation thereof.

3.2.10.b.2 The *Contractor* shall ensure that all cellular, wireless and radio communication link applications, licenses and rights reside with, and are licenced to the *Employer*.

3.2.11 Operational maintenance after Completion

a) The *Contractor* performs the following operational maintenance in relation to the *Works* after Completion:

3.2.11.a.1 The *Contractor* shall provide technical support and operational maintenance (by means of an OEM service and maintenance contract) to TNPA for the mini-substation SCADA system for a period of 24 months after completion.

3.2.11.a.2 The *Contractor* shall provide technical support and operational maintenance (by means of an OEM service and maintenance contract) to the Port for the mini-substations for a period of 24 months after completion.

3.2.11.a.3 After the expiry of the 24 month period, the OEM shall be required to offer a renewal of these contracts to TNPA, at the same contract Price for the period, plus reasonable escalation, however, TNPA reserves the right to decline the offer.

3.2.11.a.4 The *Contractor* shall provide maintenance contracts for Plant as contained and required anywhere else in this *Works* Information.

4 Plant and Materials Standards and Workmanship

4.1 Plant and Materials

4.1.1 The *Contractor* provides Plant and Materials for inclusion in the *Works* in accordance with the Standard Specifications and/or Project Specifications, unless otherwise stated elsewhere in the *Works* Information provided by the *Employer*. All Plant and Materials are new, unless the use of old or refurbished goods and/or Materials are expressly permitted as stated elsewhere in this *Works* Information or as may be subsequently instructed by the *Project Manager*.

4.1.2 The *Contractor* replaces any Plant and Materials subject to breakages (whether in the Working Areas or not) or any Plant and Materials not conforming to standards or specifications stated and notifies the *Project Manager* and the *Supervisor* on each occasion where replacement is required.

4.1.3 No Plant or Materials will be provided "free issue" by the *Employer*

4.1.4 The *Contractor* provides all Plant and Materials necessary for the *Works*.

4.1.5 The *Contractor* supplies all certification including test certificates, user manuals, maintenance manuals and data books with respect to Plant and Materials procured for the *Works*:

4.2 Investigation, Survey and Site Clearance

4.2.1 The *Contractor* will be responsible for setting out the *Works*.

4.2.2 The *Contractor* validates the information provided by the *Project Manager* and records all existing and final levels on a survey drawing and presents this to the *Project Manager* for acceptance.

4.2.3 Prior to commencing the *Works* the *Contractor* records any defects or inaccuracies related to the existing structures, paving, etc. and presents this record to the *Project Manager* for acceptance. Only items recorded in this manner will be accepted as having pre-existed the *Works* and the remedying of all other damage will be the *Contractor's* responsibility and for his cost.

4.3 Civil Engineering

4.3.1 Standard Specifications applicable to the *Works*

a) The SANS 1200 Series of Specifications are applicable to all Civil Engineering and Structural *Works* associated with this contract. The following interpretations and meanings shall apply:

b) In case of any conflict in interpretation, ambiguity or discrepancy between any SANS 1200 Specification (whether standard or written as a particular project specification) contained in the *Works* Information and the conditions of contract, the conditions of contract take precedence within the ECC3 contract.

c) In case of any conflict in interpretation, ambiguity or discrepancy between any SANS 1200 Specification (whether standard or written as a particular project specification) contained in this paragraph "Civil Engineering" of the *Employer's Works* Information and specific statements contained elsewhere in C3.1 *Employer's Works* Information, the specific statements contained elsewhere shall prevail, without prejudice to the Project Manager's express duty to resolve any ambiguity or inconsistency in the *Works* Information under ECC3 Clause 17.1.

d) Within SANS 1200 A: GENERAL, the following amendments and interpretations shall apply:

Where the word or expression "Employer" is used, read "*Employer*";

Where the word or expression "Contractor" is used, read "*Contractor*";

Where the word or expression "Engineer" is used, read "*Project Manager*" or "*Supervisor*" as the context requires;

Where the word or expression "schedule of quantities" is used, this is deleted in entirety. Assessment and payment is in accordance with the *conditions of contract* (and the ECC main and secondary options stated therein);

e) Within SANS 1200 A: GENERAL 2.3 DEFINITIONS, the following apply:

"Acceptable. Approved (Approval)" is interpreted as either a *Project Manager* or a *Supervisor* communication or instruction in relation to *Works* Information compliance, consistent with the *conditions of contract* as the context requires;

"Adequate" is deleted. The *Project Manager* notifies the *Contractor* where the *Contractor* has not complied with the *Works* Information;

"Measurement and payment" and the further definitions contained within 6.3 c) are deleted. Assessment and payment is in accordance with the conditions of contract (and the ECC main and secondary options stated therein);

f) Within SANS 1200 A: GENERAL 2.6 APPROVAL, the following applies:

"Approval" by either the *Project Manager* and/or the *Supervisor* is without prejudice to ECC Clause 14.1 and, inter alia, ECC Clauses 13.1, 14.3 and 27.1.

g) SANS 1200 A: GENERAL 2.8 ITEMS IN SCHEDULE OF QUANTITIES, is deleted in entirety. Assessment and payment is in accordance with the *conditions of contract* (and the ECC main and secondary options stated therein).

h) SANS 1200 A: GENERAL 3.2 STRUCTURES AND NATURAL MATERIAL ON SITE, applies only to the extent that it is consistent with relevant paragraphs of C3.1 *Employer's Works* Information.

i) Within SANS 1200 A: GENERAL 7.1 PLANT, the following applies:

Where the word or expression "Plant" is used, read "Equipment".

j) SANS 1200 A: GENERAL 7.2 CONTRACTOR'S OFFICES, STORES AND SERVICES, applies but the *Project Manager* resolves any inconsistency with statements included within C3.1 *Employer's Works* Information.

k) SANS 1200 A: GENERAL 3.1 SURVEY, applies only to the extent that it is consistent with relevant paragraphs of C3.1 *Employer's Works* Information.

l) Within SANS 1200 A: GENERAL 3.2 WATCHING, BARRICADING, LIGHTING AND TRAFFIC CROSSINGS, the following applies:

Where the word or expression "specification" is used, read "*Works* Information".

m) SANS 1200 A: GENERAL 3.4 PROTECTION OF OVERHEAD AND UNDERGROUND SERVICES applies only to the extent that it is consistent with the specific statements made elsewhere in C3.1 *Employer's Works* Information and in any case and at all times consistent with the *conditions of contract*.

n) Within SANS 1200 A: GENERAL 5 TESTING, the following applies:

Where the word or expression "Engineer" is used, read "*Supervisor*".

o) SANS 1200 A: GENERAL 8 MEASUREMENT AND PAYMENT, is deleted in entirety. Assessment and payment is in accordance with the conditions of contract (and the ECC main and secondary options stated therein).

p) The principles, meanings and interpretation stated and established within paragraphs 6.3.1 to 6.3.15 with respect to SANS 1200 series and to SANS 1200 A: GENERAL equally apply to the other SANS 1200 specification references [state particulars of SANS 1200 used] used within this paragraph 6.3 of C3.1 *Employer's Works* Information.

4.3.2 General Civil Works

a) **Scope of work**

4.3.2.a.1 The Contractor shall construct all Civil works including excavations and works to hardstand areas where required in accordance with this section and all other relevant Standards and Specifications even though not necessarily explicitly mentioned herein.

SANS 1200 DA - Earthworks (small works)
SANS 1200 DB - Earthworks (pipe trenches)
SANS 1200 MFL- Base (light pavement structures)

b) **Existing services**

4.3.2.b.1 Existing services from Phase 1 of the development have been identified from as-built information, including; raw and potable water supply, electrical, communication, stormwater and sewer infrastructure; however, the *Contractor* will be required to prove services prior to removal. The *Contractor* shall take the necessary precautions to ensure that the services are not damaged.

4.3.2.b.2 The majority of the construction is in a "greenfields" area. Services routed are proposed services and will be connecting to existing services at the Tank farm.

4.3.2.b.3 As soon as any underground service not shown on the drawings is discovered, it shall be brought to the attention of the *Supervisor*. The *Contractor* must in collaboration with the *Supervisor*, ascertain whether or not the service is live. The *Contractor* shall not uplift any such service unless he is instructed to do so.

4.3.2.b.4 The *Contractor* shall be held responsible for any damage to known services (i.e. services that are within the site of the *Works* and are shown on the drawing) and he shall take all necessary measures to protect them. In the event of a service being damaged, the *Contractor* shall immediately notify the *Supervisor*. The *Contractor* shall not repair any such service unless he is instructed to do so. Costs of repairs will be for the *Contractor's* account.

4.3.3 Site Clearance, Earthworks & Layerworks

a) **Scope of work**

4.3.3.a.1 The *works* for the site clearance, earthworks and layer works where the contractor is required to trench and lay sleeves etc. according to the Works Information, includes the following:
4.3.3.a.1.1 Clearing of site.
4.3.3.a.1.2 Exposing of existing services where required.
4.3.3.a.1.3 Bulk excavation and treatment of in-situ material (including dewatering).
4.3.3.a.1.4 Reconstruction of C1 base course where disturbed by the contractor.
4.3.3.a.1.5 Reinstatement of G5 crushed stone sub base where disturbed by the contractor.
4.3.3.a.1.6 Construction of kerbs, fillet and channels where disturbed by the contractor.
4.3.3.a.1.7 Grassing and final landscaping where the contractor has disturbed existing greenery.
4.3.3.a.1.8 And any other work arising out of or incidental to the above, or required of the Contractor for the proper completion of the works.
4.3.3.a.2 All haul within the site boundary shall be treated as free-haul.

b) **Supporting Specifications**

SANS 1200 DM	Earthworks (roads, sub grade)
SANS 1200 M	Roads General
SANS 1200 ME	Subbase
SANS 1200 MF	Base
SANS 1200 MK	Kerbing
SANS 1200 MJ	Segmented paving
SANS 1200 C	Site Clearance
SANS 1200 D	Earthworks
SANS 1200 MH	Asphalt surfacing
SANS 1200 MM	Ancillary roadworks

c) **Earthworks (SANS 1200D)**

4.3.3.c.1.1 Notwithstanding the provisions of subclause 3.1, the materials excavated will not be classified for the purposes of measurement and payment. The unit rate for excavation shall cover excavation in all materials other than hard rock.

4.3.3.c.2 **Spoil site**

4.3.3.c.2.1 All excess material shall be spoiled off site in a spoil area to be identified by the *Contractor*. The *Contractor* is to allow for everything necessary to load, haul, tip, and spread and compact if necessary. Spoiling on Transnet property shall not be permitted unless a specific authority is obtained in writing. The *Contractor* shall provide written confirmation that permission has been obtained from the operator /owner of the spoil site that they have accepted the material and all obligations in regarding to the spoiling of material has been met.

4.3.3.c.2.2 Where hazardous or contaminated material needs to be spoiled, the *Contractor* shall do so at an approved disposal site. The *Contractor* shall be responsible for receipt of a spoil certificate from the spoil site, which he shall copy to the *Project Manager*

4.3.3.c.3 **Exposing existing services**

4.3.3.c.3.1 Should any existing services be encountered, prior to commencing work in any area the *Contractor* shall consult the *Project Manager* in regard to how to treat the services.

4.3.3.c.3.2 The *Contractor* shall assist when required in alterations to services by providing labour, Plant and material and shall carry out the necessary work as instructed by the *Project Manager.*

4.3.3.c.3.3 Responsibility for protection of all known services shall rest solely with the *Contractor* and he shall bear all costs, which may arise as a result of any damage which he may cause to such services or which may arise as a result of his operations.

4.3.3.c.4 **Excavation**

4.3.3.c.4.1 The Contractor is required to excavate the site area to levels as indicated in the Civil Drawings and other drawings as contained in the List of Drawings.

4.3.3.c.4.2 The nature of the material to be excavated on Site is as per the Site Information.

4.3.3.c.4.3 Unrestricted excavation conditions expected to be encountered classify as "soft excavation" in terms of SANS 1200D: Earthworks.

4.3.3.c.4.4 Restricted excavations below terrace/platform level will classify as either "soft excavation" in the transported silty sand, or as "intermediate excavation" in the residual mudstone/mudstone bedrock.

4.3.3.c.4.5 For the purposes of uplifting of underground services, should they be encountered, a trench width of 1m shall be used.

4.3.3.c.4.6 Excavations below about 1.0 metre depth will generally be unstable – as such, allowance should be made for temporary lateral support.

4.3.3.c.5 **Materials**

4.3.3.c.5.1 **Disposal of Material**

4.3.3.c.5.1.1 All vegetation, trees, etc. resulting from site clearance shall be removed off site to a disposal dump to be selected by the *Contractor*. The haulage, dump costs and any levies etc. shall be deemed to be included in his tendered rates. Burning of materials on site shall not be permitted.

4.3.3.c.5.2 **Imported Backfill material**

4.3.3.c.5.2.1 Backfill material shall be selected from the commercial sources (or cut to fill material where the in-situ material meets the criteria set out in the Geotechnical report) and placed in 100 – 200mm layers (or as specified by the engineer). No clay shall be used as backfill.

4.3.3.c.5.3 **Subgrade**

4.3.3.c.5.3.1 Preparation of the in-situ subgrade will be by means of ripping and compaction. In situ subgrade, either transported sand, ripped to a depth of 150mm and recompacted to 93% Mod AASHTO density or mudstone bedrock (no in situ compaction necessary, but if levels are required to be corrected as a consequence of uneven or over excavation, G7 quality soil should be used as correction layers, 150mm thick compacted to 93 % Mod AASHTO density.

4.3.3.c.5.3.2 Compaction of the in-situ subgrade will be done to a minimum of 98% of modified AASHTO maximum density for all materials, to a minimum depth of 150mm and at between –2% and +2% of the optimum moisture content.

4.3.3.c.5.4 **Sub-base**

4.3.3.c.5.5 A 150mm G7 sub- base conforming to the requirements of SANS 1200 ME shall be imported from a commercial source. The layer shall be compacted 150 mm layers to 96 % Mod AASHTO density.

4.3.3.c.5.6 **Base**

4.3.3.c.5.6.1 The base layer shall be 150mm thick using a G2 graded crushed stone, compacted to 98% MOD AASHTO density. The tolerance on the base levels will be -10mm to 0mm.

4.3.3.c.5.7 **Block Paving**

4.3.3.c.5.7.1 80mm heavy duty interlocking concrete blocks (Block type S-A, Class 35) adhering to SANS 1058; construction methodology to conform to SANS 1200 MJ specification. The units as supplied shall be free from cracks that detract from their general appearance. At the point of manufacture no unit shall have any chip of dimension exceeding 15 mm or covering more than 3% of the periphery of the surface that is intended to be exposed. No units shall have any protuberance of height exceeding 3 mm. The surface texture and colour of the units shall fall within the range of texture and colour represented by the manufacturer's approved samples. The colour shall penetrate to a depth of at least 5

mm below the wearing surface of each unit and the coloured layer shall be integrally bound to the body of the unit.

4.3.3.c.5.8 **River Sand**

4.3.3.c.5.8.1 The river sand for the bedding shall be free from substances that may be deleterious to blocks and shall be in accordance with SANS 1200 MJ. It shall be compacted to the required level as per drawing and work specification. Jointing sand shall pass a 1,18mm sieve and shall contain 10- 50% of material that passes a 0,075 mm sieve.

4.3.3.c.5.9 **Level and compact**

The rate tendered shall include all costs for trimming to line and level, spreading and compacting.

4.3.3.c.6 **Backfilling**

4.3.3.c.7 The rate tendered shall include all costs incurred for selecting and transporting approved backfill material, backfilling and compacting to the required level.

4.3.3.c.8 The rate tendered shall include all costs incurred for selecting, backfilling and compacting of material to the required level.

4.3.3.c.8.1 **Paving as laid**

4.3.3.c.8.1.1 The finished paved surface shall present the smooth surface.

4.4 Structural Works

4.4.1 Concrete, Formwork and Reinforcement

4.4.1.a.1 Specifications for concrete

4.4.1.a.1.1 The following specifications shall apply:

4.4.1.a.1.2 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.

4.4.1.a.1.3 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.

4.4.1.a.1.4 Where the term "plain concrete" appears in SANS Specification 1200G it shall be read as "mass concrete".

SANS 1200 G	Concrete
SANS 2001: CC1	Construction *Works*: Concrete *Works* (Structural)
SANS 1083: 2006	Aggregates from natural sources
SANS 10100-2:2000	The Structural use of concrete – Part 2: Materials and execution of work.

SANS 50197-1:2000	Cement – composition, specifications and conformity criteria. Part 1: Common cements
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
S437 (Transnet)	Concrete Pavement

4.4.1.a.2 **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.

4.4.1.a.2.1 **Alkali reactive concrete**

4.4.1.a.2.1.1 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)

4.4.1.a.2.2 **Aggregates**

4.4.1.a.2.2.1 Fine and coarse aggregate shall comply with the relevant clauses of SANS 1083. Where aggregates have constituents, which in the opinion of the *Project Manager*, may give rise to damage due to alkali-aggregate reactions, the provisions of 6.3.3.3 shall be applicable.

4.4.1.a.2.2.2 Evidence of compliance of the aggregates with the requirements of 6.3.3.1 & 6.3.3.2 shall be furnished as early as practical. No aggregate shall be delivered for use in the *Works* until approval is given.
Sand (fine aggregate):

4.4.1.a.2.2.3 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.

4.4.1.a.2.2.4 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.

4.4.1.a.2.3 **Admixtures**

4.4.1.a.2.3.1 Admixtures containing chlorides will not be permitted in reinforced concrete.

4.4.1.a.2.4 **Cover blocks**

4.4.1.a.2.4.1 Cover blocks used to ensure the cover to reinforcement shall be made of cement mortar.

4.4.1.a.2.4.2 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.

4.4.1.a.2.4.3 Cover/spacer blocks made of plastic will not be permitted

4.4.1.a.3 **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.

4.4.1.a.3.1 **Unreinforced concrete**

4.4.1.a.3.1.1 Class A Concrete

4.4.1.a.3.1.2 Filling to cavity of hollow walls.

4.4.1.a.3.2 **Unreinforced concrete cast against excavated surfaces**

4.4.1.a.3.2.1 15 Mpa/19mm Concrete

4.4.1.a.3.2.2 Surface blinding under footings and bases.

4.4.1.a.3.3 **Reinforced concrete**

4.4.1.a.3.3.1 30 MPa/19mm Concrete:

4.4.1.a.3.3.2 Bases

4.4.1.a.3.3.3 Foundation beams.

4.4.1.a.3.3.4 Surface beds cast in panels on waterproofing

4.4.1.a.3.3.5 Walls in foundations (Provisional)

4.4.1.a.3.3.6 Columns in foundations (Provisional).

4.4.1.a.4 **Batching**

4.4.1.a.4.1 All cementitious binders shall be batched by full sack or by mass batching with approved precision weighing equipment.

4.4.1.a.4.2 All aggregates shall be precisely measured by mass using approved precision weigh-batching equipment, unless otherwise permitted by the *Project Manager*.

4.4.1.a.4.3 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.

4.4.1.a.5 **Concrete placing**

4.4.1.a.5.1 The size, shape and depth of any excavation shall be approved by the *Project Manager* before concrete is placed.

4.4.1.a.5.2 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.

4.4.1.a.6 **Construction joints**

4.4.1.a.6.1 Unless otherwise shown on the drawings, the exact position of horizontal construction joints shall be marked on the formwork by means of grout checks in order to obtain truly horizontal joints.

4.4.1.a.6.2 Stub columns, stub walls and stays on footings shall be cast integrally with the footing and not afterwards, even where another class of concrete is being used.

4.4.1.a.6.3 Joint lines shall be so arranged that they coincide with features of the finished work.

4.4.1.a.6.4 Where new concrete is to be cast against a hardened concrete surface, neat cement slurry mixed to a creamy consistency shall be brushed onto the cleaned concrete surface.

4.4.1.a.6.5 Contraction joints shall be smooth and shall have one coat of limewash or PVA applied to the older surface prior to casting the fresher concrete.

4.4.1.a.7 **Slip Joints between Concrete and Brickwork**

4.4.1.a.7.1 Slip joints shall be provided between brickwork and concrete slabs and beams by levelling up and towelling smooth the bearing surfaces of brickwork with 3:1 cement mortar and covering the bearings before the concrete is baste, with two layers of one side smooth tempered hardboard, with the smooth sides in contact.

4.4.1.a.7.2 The ends and sides of beams and edges of concrete slabs shall be separated from the brickwork with 13mm thick bitumen impregnated soft board or expanded polyethylene strips placed vertically against the brickwork before the concrete is cast.

4.4.1.a.7.3 Similar slip joints shall be provided between brickwork and concrete lintels cast In situ, but without soft board or expanded polyethylene strips at ends.

4.4.1.a.8 **Movement Joints**

4.4.1.a.8.1 All movement joints are to be filled in with approved bitumen impregnated soft board or expanded polyethylene strip unless otherwise specified or detailed on drawings. Descriptions (Prices) of movement joints shall be deemed to include formwork.

4.4.1.a.9 **Grouting**

4.4.1.a.9.1 25 MPa non-shrink cementitious grout:

4.4.1.a.9.2 Bedding approximately 25mm thick under base plate including chamfered edges all round.

4.4.1.a.10 **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.

4.4.1.a.10.1 **Curing compound application**

4.4.1.a.10.1.1 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.

4.4.1.a.10.1.2 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.

4.4.1.a.10.1.3 Curing in accordance with SANS 1200 G shall commence on all concrete surfaces as soon as it is practical in the opinion of the *Project Manager*.

4.4.1.a.10.1.4 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 no so late that the liquid curing compound will be absorbed into the concrete.

4.4.1.a.10.1.4.1 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.

4.4.1.a.10.1.4.2 Application of the curing compound shall begin once the concrete has reached a uniformly damp appearance with no free water on the surface.

4.4.1.a.10.1.4.3 Application of the compound may be done by hand or power spray.

4.4.1.a.10.1.4.4 The compound shall be applied at a uniform rate with two applications at right angles to each other to ensure complete coverage.

4.4.1.a.10.1.4.5 Pigmented compounds, without a thixotropic agent, shall be adequately stirred to assure even distribution of the pigment during application.

4.4.1.a.10.1.4.6 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:

Wind velocity greater than 5 m/s
and/or
Ambient temperature is above 25℃
and/or
The relative humidity is below 60 %

4.4.1.a.10.1.4.7 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.

4.4.1.a.10.2 **Curing period**

4.4.1.a.10.2.1.1 The curing period for concrete containing only CEM 1 shall be 7 days.

4.4.1.a.10.2.1.2 The curing period for concrete containing CEM 1 plus cement extenders (MGBS, FA) shall be 10 days.

4.4.1.a.10.2.1.3 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.

4.4.1.a.11 **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*.

- The date and time during which concrete was placed
- Identification of the part of the structure in which the concrete was placed
- The mixed proportions and specified strength
- The type and brand of cement
- The slump of the concrete
- The identifying marks of test cubes made
- Curing procedure applied to concrete placed
- The times when shuttering was stripped and props removed
- The date of despatch of the cubes to the testing laboratory
- 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.

4.4.1.a.11.1 **Tolerances**

4.4.1.a.11.1.1 Deviations shall be within the limits listed in SANS 1200 G for degree of accuracy II unless otherwise specified

4.4.1.a.11.2 **Testing and monitoring**

4.4.1.a.11.2.1 Frequency of sampling and testing shall be as specified in SANS 1200 G.

4.4.1.a.11.3 **Cost of tests**

4.4.1.a.11.3.1 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 independent firm or institution nominated by the *Contractor* to the approval of the *Project Manager* (Test cubes are measured separately)

4.4.1.a.11.3.2 If the quantity of concrete from which samples were taken exceeds 40 m3, 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

4.4.1.a.11.3.3 If the quantity of concrete from which samples were taken is less than 40 m3, 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.

4.4.1.a.11.3.4 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.

4.4.1.a.11.3.5 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:

- Accept the concrete subject to approved remedial measures being undertaken by the *Contractor*; or
- Permit the concrete to remain subject to the payment of a penalty

4.4.1.a.11.3.6 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.

4.4.2 **Formwork**

Descriptions of formwork shall be deemed to include use and waste only (except where described as left in or permanent), for fitting together in the required forms, wedging, plumbing and fixing to true angles and surfaces as necessary to ensure easy release during stripping and for reconditioning as necessary before re-use

Formwork to sides of bases, pile caps, ground beams, etc. have been measured provisionally and will only be paid for where it is specifically prescribed by the *Supervisor* for design reasons. Formwork necessitated by irregularity or collapse of excavated faces will not be measured and the cost thereof shall be deemed to be included in the allowance for taking the risk of collapse of the sides of the excavations, provision for which is made in Earthworks

a) **Rough formwork (degree of accuracy ii)**

4.4.2.a.1 Rough Formwork to Sides: