

PARTNERSHIP IN CONSTRUCTION OF ASH DAMS, COAL STOCK YARDS AND ROADS

SCOPE OF WORKS

DAM AND ASSOCIATED INFRASTRUCTURE CONSTRUCTION SCOPE OF WORK

1 Description of the works

1.1 Executive overview

The *Employer* plans on constructing, rehabilitating Ash Disposal Facilities (ADF) and accompanying infrastructure like Water Return Dams, Access Roads and Coal Stock yards.

This endeavour covers the Supply, Delivery, Transport, Handling, Storage, Erection, Installation, Commissioning, Testing, Adjustment, handing over in complete working order and upholding during the Defects Liability Period of all civil works to be incorporated at the extension of the infrastructure as described below.

The Employer intends to create a partnership with a CIDB grade 9CE Contractor who will execute the works with the Employer as per the projects requirements.

The *Contractor* must provide all equipment, materials, consumables, and services required to complete the Ash Dump and associated Construction work. The scope of the Construction works includes, but is not limited to, the following:

- Construction Storm Water Management.
- Clearing and Grubbing and Surface Preparation, including compaction of all scope of work areas.
- Construct the Ash Dump and all associated infrastructure applicable for Ash Dump
- Construction of the starter walls utilising suitable material from basin excavation;
- Construction of bottom clay layer for the liner system, utilising in-situ clay material;
- Construction of ash delivery berms to form ash delivery channels using suitable material from basin excavation;
- Construction of catwalk berms on top of the ADF basin liner using suitable material from basin excavation;
- Supply and Construction of the gravity penstock decant systems including:
 - Conventional precast concrete rings penstocks for permanent penstocks;
 - reinforced concrete tower penstocks for permanent penstocks (includes reinforced concrete bases and reinforced concrete towers);
 - Conventional precast concrete rings penstocks for intermediate penstock. Individual outlet pipes for both types of penstocks utilising precast concrete pipes for both types of penstocks.
- Supply and installation of wooden catwalk systems from the perimeter wall to the penstock inlets on top of the catwalk berms;
- Supply and construction of the ADF drainage system (leachate collection system) including graded stone wrapped in geotextile with a perforated drainage pipe in a trench and solid HDPE outlet pipes from the inner toe of the starter wall to the dirty water channel located immediately outside the ADF footprint;
- Construction of the subsoil seepage cut-off trenches immediately upstream of the ADF footprint;
- Construct penstock and pipeline under the ash dump.
- Installation of subsoil herringbone drainage network which will drain to an external manholes.
- Furnish and Install a Liner System and All Associated Terrace Preparations, Liner under Drainage and overlying gravel drainage layer as defined on drawings.
- Construct South Return Water Dam including its associated Silt Trap and Pumping Station (where applicable).
- Furnish and Install a Liner System with underdrainage for the South Return Water Dam.
- Clean Water Drains for Co-disposal and all common areas, including all drainage Works.
- Construct Silt Trap(s).
- Dirty Water Drains for Co-disposal and all common areas.

- Ash Dump Dust Suppression System -provision for supply of associated pipes, pumps, and sprinkler systems.
- Terracing and road layer works associated with the Perimeter and Associated Roads and South Return Water Dam Roads.
- Provide Seeding and/or other stabilization methods of scope of work areas as shown on the Drawings. If no information is provided on the drawings, seeding is the default requirement. Also, any disturbed areas past scope of work areas needs to be restored to their original conditions.
- Provide Perimeter fencing where required as per drawings.
- Provide additional fencing requirements for laydown Yard or other *Contractor security* needs (not shown on drawings).
- *Contractor* Laydown yards must have a storm water and erosion control plan submitted by the *Contractor* and approved by the *Project Manager* for implementation and maintenance by the *Contractor*. Laydown yards must be stabilized with grass, rock, or other acceptable methods as approved by the *Project Manager*.
- Stripping of topsoil. Prepare areas as designated on the drawings as topsoil storage areas. All topsoil stripped from Project area is to be stored here until future use.
- Prepare areas for bulk material storage areas. *Contractor* can submit preferred location for *Project Manager's* approval based on work program. Proposed, pre-approved areas for bulk material Storage provided on drawings.

- Prepare and Maintain Temporary Construction Phase Access Roads
- Perform all testing of works including pre-construction material conformance testing (where applicable)
- Thrust blocks for underground piping (where applicable).
- Various piping where applicable per drawings.
- Ash Dump Irrigation System- Provision for supply of pipes, valves, new pumps, and motors
- Fabricate, supply, and deliver Trailer Mounted Storm Water Pump
- South Return Water Dam Miscellaneous infrastructure- provision for supply, installation, and fabrication of associated miscellaneous works.
- Provision to construct a Temporary Dirty Water Diversion Drain to drain/divert dirty water as per Project Managers details.
- Provision to demolish (and remove)/decommission the Temporary Dirty Water Diversion Drain (once the construction of the main works is complete) and restore the area to its original conditions.
Construction and lining of Ash Dump Phases as per sectionalisation requirements. Excavation, lining and construction of Ash Dams and associated infrastructure including spillways and valve chambers
- Construction of temporary Cofferdam within the footprint of Ash Dams
- Provision for reinstatement and rehabilitation of borrow pits (if applicable)
- Provision to implement HDPE liner Electric Leak Location Survey (ELLS) on HDPE liner installed on Ash Dump Phases and South Return Water Dam in accordance with ASTM D8265 as per Detailed Design Environmental Authorisation conditions. *Contractor* must include provision for ELL's trial section (if applicable). *Contractor* must appoint independent supplier / *Contractor* for the ELLS.
- Construct coal stock yard platforms as per provide drawings.

ADF Ancillary Works

The civil works for the ADF ancillary works include the following:

- Construction of Dirty Water Channels from the ADF to the AWRD;
- Construction of Clean Water Channels on the perimeter of the ADF
- Construction of the ADF ring road

Ash Water Return Dam (AWRD)

The civil works for the AWRD include the following:

- Construction of an Ash Water Return Dam as per drawings
- Excavation of the AWRD basin area, creating the dam basin and utilising selected excavated material and disposing of excess material to designated stockpiles within the site premises;
- Construction of the bulk earthworks dam walls utilising suitable material from basin excavation;
- Construction of bottom clay layer for the liner system, utilising in-situ clay material obtained from excavations;
- Installation of a sub-soil drainage system/leakage detection system below the dam basin.
 - Supply and placement of commercial filter sand as per specification
 - Supply and placement of commercial pea gravel as per specification
 - Supply and placement of perforated HDPE pipe (110 mm & 160 mm)
- Construction of termination manholes
 - Supply and installation of submersible pumps.
- Supply and installation of the liner barrier system on the base and inner side slopes of the AWRD wall and into the anchor trenches on top of the wall comprising:
 - HDPE smooth-smooth geomembrane (flat die extrusion);
- Construction of a ballast layer/protection layer of concrete slab over the entire dam basin, including concrete bollard blocks on protection geotextile.
- Supply and installation of safety equipment (UV stable knotted ropes, UV boxes housing life preservers).
- Construction of external spillway.

AWRD Ancillary Works

The civil works for the AWRD ancillary works include the following:

- Construction of two AWRD Inlet Structures/Access Ramps;
- Construction of Outlet Structures and laying of stainless steel pipes for approximately

Coal Stock Yard works

The works include the following demolition works:

- Testing for soil contamination on existing works
- Removal and stockpiling coal pilot layer and stabilised soil from old platforms
- Removing of old steel mesh
- Removal and disposal of old drainage system
- Removal and disposal of old HDPE liner
- Removal and stacking old paving blocks

The works include the following construction works:

- Layer works
- Installation of liners
- Installation of drainage systems
- Reinforced Concrete slabs
- Modified coal pilot layer
- Installation of draw boxes for electrical cables
- Installation of electrical cables
- Control and managing of water around works

Permanent Operating & Maintenance Contractor's Yard

The civil works for the Contractor's yard can include the following:

- Construction of a paved terrace on the yard.
- Construction of buildings and other minor structures on the yard
- Installation of all required services to the yard

Site Services

The civil works for the Site Services include the following:

- Construction of a gravel access road to the Contractor's yard.
- Erection of a security fence on the perimeter of the site.
- Construction of a guard house on the access point to the site.

Mechanical Works

The mechanical works include the following:

- Installation of channel gates in the Silt Traps
- Installation of adjustable weir gates in the Silt Trap
- Installation of channel gates in the AWRD Inlet Structure
- Installation of a crane in the Workshop
- Installation of minor mechanical equipment in the buildings
- Installation of centrifugal Lift Pumps for the water supply

Electrical/Instrumentation Works:

This Specification covers the supply, delivery, installation, testing, commissioning and maintenance for a specified period of the complete Electrical Installation for the constructed facility.

The installation shall be carried out in accordance with the requirements of this specification and

drawings accompanying this document for the Complete Electrical Installation which shall be read as forming part of this document.

This Contract will further include the supply, delivery, installation, testing, commissioning and maintenance for a period of 12 months of the following:

- i. Cables and accessories for the electrical supply for each building.
- ii. Site lighting and cabling.
- iii. Cable sleeves and manholes for electrical and telecommunication sleeves only.
- iv. Electrical Building services.
- v. Testing, commissioning, issuing of Certificate of Compliance and handing over of the complete electrical installation.

Testing, commissioning, issuing of Certificate of Compliance and handing over of the complete electrical installation.

1.2 Employer's objectives and purpose of the works

The objective of the Employer is to create a partnership with an experienced contractor to execute works as and when projects arise. The Contractor should be CIDB grade 9CE.

1.3 Interpretation and terminology

The following abbreviations are used in this Works Information:

Abbreviation	Meaning given to the abbreviation
AFC	Approved for Construction
ADF	Ash Disposal Facility
AASHTO	American Association of State Highway and Transportation Officials
ASGI-SA	Accelerated and Shared Growth Initiative – South Africa
ASTM	American Society for Testing and Materials
B-BBEE	Broad Based Black Economic Empowerment
CBR	California Bearing Ratio
CEC	Compensation Events Committee
CPA	Cost Price Adjustment
DTM	Digital Terrain Model
ECN	Project Management Change Notice

Abbreviation	Meaning given to the abbreviation
ECP	Project Management Change Proposal
ELLS	Electric Leak Location Survey
ER	Project Management Response
EMP	Environmental Management Plan
GCL	Geosynthetic Clay Liner
HDPE	High Density Polyethylene
KKS	Kraftwerk Kennzeichen System (translates German for Power Plant Classification System)
MDL	Master Document List
NDG	Nuclear Density Gauge
NEMA	National Environmental Management Act
OHSA	Occupational Health and Safety Act
OMC	Optimum Moisture Content
OPC	Ordinary Portland Cement
PCD	Pollution Control Dam
PFA	Pulverised Fuel Ash
PPE	Personal Protective Equipment
QCP	Quality Control Plan
RFI	Request for Information
ROD	Records of Decisions
RPO	Responsible Protective Officer
RRD	Rehabilitation Runoff Dam
SABS	South African Bureau Standards
SACPCMP	South African Council for Project and Construction Management Professionals
SANS	South African National Standards
SCP	Standby Conveyor Position
SD&L	Supplier Development and Localisation
SHE	Safety, Health and Environment
TMH	Technical Methods for Highways
TMP	Traffic Management Plan
VAT	Value Added Tax

Abbreviation	Meaning given to the abbreviation
VDSS	Vendor Document Submittal Schedule
WBS	Work Breakdown Structure

2 Management and start up.

2.1 Management meetings

Meetings will be held monthly between the *Project Manager* and the *Contractor* (and any other co-opted members). The appropriate members of the staff represent the *Contractor* at each meeting.

The venue for these meetings is as determined by the *Project Manager*. The *Project Manager* (or someone delegated by the *Project Manager*) writes the minutes of meetings.

Any action of the *Project Manager*, *Supervisor*, *Contractor* and *Adjudicator* implied in the minutes of meetings with contractual implications is confirmed by a separate communication given in accordance with this Works Information and NEC.

The *Contractor* reports the overall progress and as a minimum requirement, the following is addressed:

- a) *Contractor's* current activity progress and planned finish dates.
- b) *Contractor must* report on all items listed in the NEC core clause, 31.
- c) *Contractor's* and *Project Manager's* programme agenda compared for delays and milestone targets.
- d) Current and projected manpower by class.
- e) Health, safety, and quality Management.
- f) The progress of any other relevant activities.
- g) To discuss any technical or commercial issues.
- h) Skills Development and Localisation (SD&L).
- i) CSI and Infrastructure Project Implementation Plan.
- j) Procurement progress.
- k) Problem areas or concerns.

Regular meetings of a general nature may be convened and chaired by the *Project Manager* as follows:

Title and purpose	Approximate time interval	Location	Attendance by:
Risk register and compensation events	Weekly	Venue determined by the <i>Project Manager</i>	Relevant appointed members of a Risk or and Compensation event committee
Overall contract progress and feedback	Bi-weekly	Venue determined by the <i>Project Manager</i>	<i>Employer</i> , <i>Contractor</i> , <i>Supervisor</i> , and Others as determined by the <i>Project Manager</i>
Planning Meetings (Including integration meetings with Others)	Weekly	Venue determined by the <i>Project Manager</i>	<i>Employer</i> , <i>Contractor</i> , <i>Supervisor</i> , Planners and Others as determined by the <i>Project Manager</i>
Safety Meetings	Fortnightly	Venue determined by	<i>Employer</i> , <i>Contractor</i> ,

Title and purpose	Approximate time & interval	Location	Attendance by:
		the <i>Project Manager</i>	<i>Supervisor, Safety Officers and Others as determined by the Project Manager</i>
Payment Assessment Meeting	Monthly – 15 th of every month	Venue determined by the <i>Project Manager</i>	<i>Employer, Contractor, Supervisor, Quantity Supervisors and Others as determined by the Project Manager</i>
Quality and <i>Project Management</i> Meeting	Monthly or as determined by <i>Project Manager</i>	Venue determined by the <i>Project Manager</i>	<i>Employer, Contractor, Supervisor and Others as determined by the Project Manager</i>

Meetings of a specialist nature may be convened as specified elsewhere in this Works Information or if not so specified by persons and at times and locations to suit the Parties, the nature, and the progress of the works. Records of these meetings must be submitted to the *Project Manager* by the person convening the meeting within five days of the meeting.

All meetings must be recorded using minutes or a register prepared and circulated by the person who convened the meeting. Such minutes or register must not be used for the purpose of confirming actions or instructions under the contract as these must be done separately by the person identified in the *conditions of contract* to carry out such actions or instructions.

2.2 Documentation management

The *Contractor* is required to manage documentation in line with the requirements outlined below.

2.2.1 Submission

All submissions to the *Employer*, the language of all documentation is to be in English. Documentation submissions must be through either email or walk-in to documentation centre with CD and/or hard copies. In case submission of documentation is through email, take note of the following:

- Email submissions, one must direct them to the proxy email and copy all recipient(s) as per the distribution matrix, which will be provided by the project manager.
- Use emails strictly as a channel for submitting documentation.
- All information required and intended for use by the *Employer*, may not be part of the body of the email, one must document it.
- Email must not be used as a transmittal; one must use a transmittal template
- The email subject must always include the transmittal number, package number/contract number.

Large file transfer: Documentation submission with the file size that exceeds the outlook maximum size, *Contractor* must submit via the *Employer's* large file transfer portal, CD/DVD, and/or hard drives to the Eskom Project Documentation Centre. The *Contractor* /vendor must notify the *Employer* in advance via email, with the transmittal note attached, to confirm the date, time, and method of submitting large files. Method option may be CD/DVD and/or hard drives, which is a walk into Documentation centre or large file transfer portal.

All submissions, the receiver must acknowledge by sending back a signed transmittal to the sender within two working days upon receipt. Every submission must have the PDF version and the Native (Editable) version. The file name for both the PDF and the Native must be the same, and as minimum contain Documentation Number and revision. One must list all items intended for submission, on the transmittal.

If the pack contains 10 documentations, therefore the transmittal must contain 10 items on the list. The listing must include as minimum documentation number, title, and revision. The example of 10 items, will equate to a pack of 10 PDF files and 10 Native files, because each PDF files must have a native file.

2.2.2 Identification

Documentation must have a unique documentation identifier for audit trail. The transmittal must also have the unique identifier. All other documentation properties must be on the document; to supplement the document number. Minimum properties that must be on the document is the package number, contract, revision number, KKS code, functional area (example Unit 1), document type, document status, compiler, reviewer(s), approver, and approval date.

2.2.3 Revision control

One must use only numeric revision control, and not alpha or alphanumeric. One may not skip revisions, track internal changes via version control, but submission to the *Employer* must maintain a sequential revision control, without skipping numbers. First submission must be revision 0.

Do not revise a record. A document must contain revision control. Design/drawing composed of multiple sheets (example sheet 1 to 10); one must revise all sheets as a batch, even if one only made changes to one sheet. The *Contractor* /vendor must always maintain revision control on the entire batch and submit the entire batch always.

2.2.4 Drawing Management

Use the *Employer's* Drawing template and ensure that all the fields on the title block are populated and all signatures completed. Maintain the revision audit trail on the title block. The last submission of the drawing must be the final as-built drawing, both in PDF and native. The creation, issuing and control of Project Management Drawings are in accordance *Employer's* Drawing Standard and Common requirements 240-86973501. The *Contractor* submits as minimum one hardcopy and an electronic copy to the *Employer*.

The *Contractor* submits editable electronic drawings in Micro Station (DGN) format, and scanned drawings in pdf format. Drawings issued to the *Employer* must not be "Right Protected" or encrypted as the *Employer* must do the necessary configuration management on these documents upon receipt. Electronic drawings must have a watermark indicating the approval phase of a drawing and one must stamp the hardcopies to indicate the phase.

Any additional drawings requested by the *Employer* do not constitute a compensation event. All drawing types including but not limited to the following (General Arrangement, Isometrics, P&IDs, detail drawings), one must submit in the following formats:

- One (1) hard copy.
- One (1) electronic copy in .pdf format
- One (1) electronic copy in the native CAD format, preferably .dwg format

Drawings must be done according to Eskom Drawing Standard and Common requirements 240-86973501.

Drawings are submitted in sufficient time to permit review, comment and/or modifications being made, if such are considered necessary by the Project Manager, without delaying the Contract Delivery and Completion Dates.

2.2.5 Report

The *Contractor* must submit the Vendor Documentation Submission Schedule for review to the *Employer*, within 30 days after the contract is award. After the *Employer* informs the *Contractor* of the decision to accept or reject the schedule, the *Contractor* revises and submits the updated schedule within 48 hours. The VDSS is revisable, and one must discuss any change to reach agreement between all parties, and then properly document the changes. Changes in the VDSS include additional documentation for submission; submission dates; documentation descriptions and document numbers; etc. The *Contractor shall* be responsible for the management of the schedule.

The *Contractor* must compile a documentation register, to track the documentation submission progress, in line with *Contractor* -committed dates on the VDSS. The register for tracking submission progress is the master documentation list (MDL); *Contractor* must submit it monthly to the *Employer*. The MDL must list all other submissions not specified on the VDSS, example letters.

2.2.6 Retention of Documentation

The *Contractor* must retain all documentation, specified on the VDSS. This includes data books. The *Contractor* must keep the documentation for a minimum of 10 years post contract close out. This is in line with the Rules of Conduct for Registered Persons, Project Management Professional Act, paragraph 4(a): "Registered Persons, may not without satisfactory reasons destroy or dispose of, or knowingly allow any other person to destroy or dispose of, any information within a period of 10 years after completion of the work concerned"

The *Contractor* must retain the documentation in electronic format. The *Contractor* must also keep the original ink signed hard copies for the minimum of 10 years post contract close out.

When the 10 years end, the *Contractor* must inform the *Employer* in writing prior to disposal, to confirm if the *Employer* is not in need of any documentation. The correspondence must include the master documentation register, which outlines all retained documentation. It is the *Contractor's* responsibility to ensure that the correspondence has reached the *Employer*, by requesting acknowledgement of receipt. The *Employer* has the maximum of 6 months to respond in writing to the *Contractor*, failure to do so, the *Contractor* may proceed and dispose the documentation after the six months has passed.

2.2.6 Governance

Contractor must comply with the following governance. 348-883860: Format and Layout Specification; 348-883808 Document and Records Management Work Instruction; 240-86973501 Project Management Drawing Standard; 348-885429 Project Management Change Management Work Instruction; 36-943 Project Management Drawings Office and Project Management Documentation Standard; 240-53114186 Eskom Project/Plant Specific Technical Document and Records Management Procedure, 240-83561037 Reporting and Data Requirements Specification for *Contractor* s, 348-942820 Transmittal Template, 200-616427 Data Book Checklist.

2.2.8 Plant Identification

2.2.8.1 Plant Coding Allocation

Coding of the design will be based on the KKS coding system, and the *Employer* will undertake the coding in line with its standards. The KKS coding must be applied during the design review stage(s) and cross referenced to all arrangement drawings, schematics, wiring diagrams, instructions, and manuals and where practical to spare parts list/manuals. The *Contractor* will be required to include allocated coding to the electronic design drawings coding standard we want them to apply.

2.2.8.2 Plant Labelling

The *Contractor* will also manufacture and install KKS labels to identified plant items as per list supplied by the *Employer*. Labels will be manufactured and installed according to the *Employer's* KKS Plant Labelling and Equipment Descriptions Standard. The labelling standard will be supplied as part of the enquiry documents. (240-93576498)

2.2.9 Configuration change control

Any changes to the design baselines will be formally managed according to the Eskom Project *Management* Change Procedure (240-53114026). All design reviews will be conducted according to the Design Review Procedure (240-53113685).

2.3 Health and safety risk management

2.3.1 General

In carrying out its obligations to the *Employer* in terms of this contract, which obligations include, amongst others, providing the *works*; using Plant, Materials and Equipment; and whilst at the site for any reason, the *Contractor* is the "*Employer*" in terms of the Occupational Health and Safety Act (OHSA), No. 85 of 1993, in respect of its activities and in relation to its employees, agents, Sub-*Contractor* /s and mandatories.

The *Contractor* does not consider itself under the supervision or management of the *Employer* regarding compliance with the Safety Health and Environmental requirements.

Furthermore, the *Contractor* does not consider himself to be a subordinate or under the supervision of the *Project Manager* in respect of these matters. The *Contractor* is responsible for the supervision of its employees, agents, Sub-*Contractor* s and mandatories and takes full responsibility and accountability for ensuring that they are competent, aware of the Safety Health and Environmental requirements, whilst executing the *works* in accordance with the Safety Health and Environmental requirements. The *Contractor* ensures compliance with, amongst others:

- a) The provisions of the Occupational Health and Safety Act, No. 85 of 1993 and all applicable regulations (as amended), binding in terms thereof.
- b) The latest versions of standards, procedures, specifications, rules, systems of work and requirements of the *Employer*, copies of which will be provided to the *Contractor* on request.
- c) The Health, Safety and Environmental Plan inclusive of a Traffic Management Plan prepared by the *Contractor* in accordance with the *Employer's* Safety Health and Environmental Specification.

The documentation referred to in paragraphs 2.3.1 is collectively referred to as the Safety Health and Environmental requirements and forms a part of the contract Works Information.

The *Contractor* ensures that its employees, agents, Sub-*Contractor* s and mandatories comply with the provisions of the Occupational Health and Safety Act, No. 85 of 1993, and all applicable regulations binding in terms thereof as well as the *Employer's* Safety Health and Environmental Specification whilst making use of plant, materials, and equipment and whilst at the Site for any reason whatsoever.

The *Contractor* implements a comprehensive health, safety, and environmental management system, based on the ISO 45001 and ISO 14001 requirements, and incorporate the applicable Eskom requirements into their system for utilisation at the project. The Client expects the *Contractor* to engage in safety culture initiatives in line with the Eskom SHEQ Policy and value, Zero Harm.

The *Contractor* must fulfil a role of a *Principal Contractor* in accordance with the OHSACT 85 of 1993, and Construction Regulation 7 (CR 7). Should the *Contractor* appoint Sub-*Contractor* (s), *Contractor* must carry responsibilities of a client as per Construction Regulation 2014.

The *Contractor* must ensure that all statutory appointments and appointments required by the management system are in place, and that all appointees fully understand their responsibilities and are trained and competent to execute their duties. The *Contractor* supervises the execution of their duties by all such appointees.

The *Contractor* appoints a person, qualified and competent in accordance with the safety health and environmental requirements, as the liaison with the *Employer's* Project Safety, Health and Environmental Manager or delegated person for all such matters as pertaining related to safety, health, and the environment. The *Contractor* must ensure that such a person is contactable 24 hours a day and is registered with a registered professional council approved by the Principal Director of the Department of Labour, as per the requirements of the latest Construction Regulations, inclusive of all exemptions and amendments pertaining thereto. As a minimum the appointed Safety Practitioner must have a National Diploma – Safety Management or Environmental Health and be registered with SACPCMP.

The *Employer*, or any person appointed by the *Employer*, may at any stage during the period of this contract:

- Conduct health and safety audits regarding all aspects of compliance with the SHEQ Requirements, at any off-site place of work, or the site establishment of the *Contractor*.
- Refuse any employee, Sub *Contractor*, or agent of the *Contractor* access to the premises if such person has been found to commit an unsafe act or any unsafe working practice or is found not to be qualified or authorised in terms of the SHEQ Requirements.
- Issue the *Contractor* with a stop order should the *Employer* become aware of any unsafe working procedure or condition or any non-compliance with any provision of the SHEQ Requirements.

The *Contractor* hereby indemnifies the *Employer* and holds the *Employer* harmless in respect of any and all loss, costs, claims, demands, liabilities, damage, penalties or expenses that may be made against the *Employer* and/or suffered or incurred by the *Employer* (as the case may be) as a result of, any failure of the *Contractor*, its employees, agents, Sub-*Contractor*s and mandatories to comply with their obligations, and/or the failure of the *Employer* to procure the compliance by the *Contractor*, its employees, agents, Sub-*Contractor*s and/or mandatories with their responsibilities and/or obligations in terms of or arising from the Occupational Health and Safety Act, No. 85 of 1993 and regulations.

Additional requirements on 6.1.1.4 below.

2.3.2 SHE Induction and Access to Site

All the employees of the *Contractor* must attend an Eskom SHEQ induction course provided by the Client before commencement of the contracted work or before they will be allowed to work on the Site. It is the responsibility of the *Contractor* to ensure that all employees have attended the safety induction. *Contractor* must further develop and train all its employees on company specific SHEQ induction. Proof of yearly induction should be always easily identifiable/available.

Only once this induction has been received, will each employee receive a site access permit.

2.3.3 Life Saving Rules

The *Contractor* must comply with Eskom's Lifesaving rules. Violation of these rules will be viewed in a serious light and the consequences will be dealt with via the respective disciplinary processes.

Five Life Saving rules have been developed that will apply to all Eskom Employees, agents, *Contractor*s, Consultants, suppliers, and visitors. Failure to adhere to these rules will be considered a serious transgression. These rules are being implemented to prevent serious injury or death of any employee, labour broker or *Contractor* working in any area within Eskom.

Eskom Life-saving Rules are non-negotiable health and safety rules, which must not be broken under any circumstances. It must be highlighted that Eskom takes a ZERO TOLERANCE stance to violation of these rules. These rules are applicable to any person entering Eskom sites.

The rules are as follows:

Rule 1	<p>OPEN, ISOLATE, TEST, EARTH, BOND AND/OR INSULATE BEFORE TOUCH</p> <p>Any person who performs work on an electrical installation must ensure that it is isolated, tested and earthed before starting any work. (That is plant, any plant operating above 1000 V)</p> <p>No person may work on any electrical network unless:</p> <ul style="list-style-type: none"> • He / she is trained and authorised as competent for the task to be done. • A pre-task risk assessment to identify all risks and hazards must be conducted prior to any work commencing. • An equi-potential zone is created for each worker on the job site by earthing, bonding and/or insulating according to approved divisional procedures. • All conducting material is connected, all staff onsite wear electrical safety shoes and insulating techniques are applied according to standards. • The authorised person (Team leader) has certified and shown all team members that the apparatus is safe to work on. He / she is trained and authorised as competent
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Rule 2	<p>HOOK UP AT HEIGHTS</p> <p>Working at Height is defined as any work performed above a stable work surface or where a person puts himself/herself in a position where he/she exposes himself/herself to a fall from or into. A pre-task risk assessment to identify all risks and hazards must be conducted prior to any work at height commencing.</p>
Rule 3	<p>BUCKLE UP</p> <p>Seatbelts must be always used whilst driving. No person may drive any vehicle on Eskom business and/or on Eskom premises: Unless the driver and all passengers are wearing seat belts.</p>
Rule 4	<p>BE SOBER</p> <p>No person is allowed to be under the influence of intoxicating liquor or drugs while on duty. Under-the-influence' means the use of alcohol, drugs and /or a controlled substance to the extent that:</p> <ul style="list-style-type: none"> • the individual's faculties are in any way impaired by the consumption or use of the substances or; • the individual is unable to perform in a safe, productive manner or; • the individual has a level of any such substance in his body that corresponds with or exceeds accepted medical/legal standards or; • the individual has a level of alcohol in his body that is greater than 0,00 % blood alcohol concentration. • Any level of an illegal substance in the body' irrespective of when the substance was used
Rule 5	<p>PERMIT TO WORK</p> <p>Where an authorisation limitation exists, no person must work without the required Permit to Work (PTW).</p> <ul style="list-style-type: none"> • Work is as defined in the Plant Safety Regulations (OHS) and Operating Regulations for High Voltage Systems (ORHVS) of Eskom. • A Risk Assessment must be carried out jointly by the Authorised (AP) and Responsible Person (RP) on all work before it commences. • The PTW must be issued by an AP, in accordance with the PSR. • The PTW must be accepted in writing by an authorised RP. • The PTW must be shown to everyone working on the job and the risks explained. • The RP must ensure that all staff working on that job are entered on a Workers' Register and the risks explained to each one. • The RP must ensure that the conditions of the PTW are enforced for the duration of the work.

2.3.4 OHS/SHEQ Policy

The *Contractor* must have an OHS/SHEQ Policy authorised by their Chief Executive (OHS Act Section 16(1) appointee) that clearly states overall SHE/Q objectives and commitment to improving Safety and Health of its employees. The Policy should outline the arrangements for carrying out and reviewing that policy. Eskom has a SHEQ Policy (32-727) that clearly states the policy principles by which Eskom operates and the commitment to SHEQ excellence and is authorised by the Chief Executive. *Contractor* must support Eskom SHEQ policy.

2.3.5 Mandatory Agreement

In terms of sections 37(1) and 37(2) of the OHSA, the *Employer* is relieved of all its responsibilities and liabilities pertaining to the activities performed by the *Contractor* (and its employees, agents, Sub-*Contractor*s and mandatories) relating to the *works*; the use of plant, materials, and equipment; and whilst at the Site for whatsoever reason.

The *Contractor* confirms that he has been provided with sufficient information regarding the health, safety, and environmental arrangements applicable to the *works*, the use of Plant, Materials and Equipment, as well as at the Site.

Prior to the *Contractor* commencing with any operations/ activities relating to the *works* and/or prior to gaining access to the Site, the *Contractor* concludes a written mandatory agreement with the *Employer* in terms of section 37(2) of the OHSA and 5(1)(k) under the construction regulations. The aforementioned agreement constitutes a record of the written arrangements and procedures between the *Contractor* and *Employer* regarding health and safety. A signed copy of this agreement is submitted to the Client prior to commencement of any activity on site. The *Contractor* must ensure that a section 37(2) agreement is signed between them and all their appointed Sub-*Contractor* (s)/suppliers for the contract.

2.3.6 Compensation of Occupational Injuries and Diseases Act (COIDA) and UIF requirements

The *Contractor* must be registered with an employment compensation commissioner and submit proof of registration and letter of good standing with the compensation fund or with a licensed compensation insurer for his company based on South African legislative requirements. This must remain valid for the duration of the contract and must be the responsibility of the *Contractor* to ensure validity. The Letter of Good Standing must reflect the name of the *Contractor*.

2.3.7 Legal and Other requirements

It is required that all *Contractor*s on the project comply with the relevant applicable legislation, specifications, and standards in accordance with the scope of the project:

As a minimum but not limited to the following:

- The Constitution of the Republic of South Africa (particularly Section 24 of the Bill of Rights)
- Occupational Health and Safety Act 1993 (Act 85 of 1993) and its Regulations
- Compensation for Occupational Injuries and Diseases Act 130 of 1993
- Any other applicable South African legislation (local, provincial, and National)
- Applicable South African National Standards (SANS)
- Applicable international standards
- Relevant *Employer* Procedures and standards
- ISO 45001 - *Contractor* must use as guidelines.
- Disaster Management Act 57 of 2002: Regulations issued in Terms of Section 27(2) of the Act
- Applicable COVID-19 directives
- Local Authority by Laws

It is the duty of the *Contractor* to ensure that they are familiar with the necessary OHS legislation required. Applicable Acts/regulations should be displayed or available for employees, client and inspector when required.

When there is an amendment to the Acts and/or to the Regulations, the OHS plan must be reviewed, updated accordingly, and send through to the *Employer*. Changes must be communicated to all relevant employees.

2.3.8 Contractor: Details, Accountabilities and Responsibilities

The *Contractor* carries primary accountability and responsibility for the health and safety of his/her employees within his/her working area, as contemplated by Section 37(2) of the OHS Act No. 85 of 1993 and Regulations. None of the additional safety requirements specified by the *Employer* reduces the *Contractor's* accountability and responsibility for the health and safety of his employees within his working area.

The *Contractor* must have a disciplinary process and an organisational structured procedure to deal with employees who have transgressed organisational and legal requirements.

The *Contractor* must provide a list of names and contact telephone numbers of all his employees on site. This list must be updated as and when new employees commence on site.

The *Contractor* must keep a record of all employees, including date of induction, relevant skills, and licenses, and be able to produce this list at the request of the relevant officials. These records must be filed in the OHS File. Every employee must undergo site induction provided by the *Employer* before commencement of the contracted work. Only once this induction has been received, will each employee receive a site access permit.

Employees are responsible for their own health and safety and that of their co-workers in their respective areas of work on the project.

Employees must be made aware of their responsibilities during induction and awareness sessions some of which are:

- Familiarising themselves with their workplaces and health and safety procedures.
 - Working in a manner that does not endanger them or cause harm to others.
 - Keeping their work area tidy.
 - Reporting all incidents/accidents and near misses.
 - Protecting fellow workers from injury.
 - Reporting unsafe acts and unsafe conditions.
 - Reporting any situation that may become dangerous.
 - Carrying out lawful orders and obeying health and safety rules.
 - Declaring to the *Employer* if taking medication which may have intoxicating effects.
- If an employee has a reasonable belief that the work to be undertaken is likely to endanger him/her or any other person/s due to sub-standard acts or conditions, inadequate precautions or a lack of protective equipment or clothing, He / She has the right to refuse to work and must report such situation to the *Employer*.
 - An employee does have the right not to work in any area or perform any task where that employee has reasonable justification to believe that the work situation presents a danger to his/her health and safety, organizational assets, or the environment.
 - It must be highlighted to all employees, that anyone who becomes aware of any person disregarding a health & safety notice, instruction or regulation must immediately report this to the person concerned. If the person persists, stop the person from working and report the matter to the *Employer* Site / Project Manager immediately.

The *Contractor* appointed personnel must be registered in their respective levels as professionals in terms of the legislative requirements (SACPCMP).

OHS professionals (which include Safety Officers) are required to register as professionals with the SACPCMP.

In addition, the *Contractor*:

- Ensures that all statutory appointments (as required in terms of the Occupational Health and Safety Act, No. 85 of 1993 and all applicable regulations binding in terms thereof, as amended) and other appointments required in terms of the *Employer*'s Safety Health and Environmental Specification, are in place and that all appointees are cognisant of their duties and responsibilities in terms of such appointments.
- Ensures that such appointees execute their duties and responsibilities as required by such an appointment.
- Ensures that all personnel brought by itself onto site (including employees of *Contractors* and Sub-*Contractors*) are suitably qualified and trained for the performance of the task, duties, and functions, which will be allocated to them.
- Immediately reports any occupational or other injuries, near miss events, property damage, environmental related incidents as well as any potential threat to the health and safety of individuals at the *works* or on the site, as soon as he becomes aware thereof, to the *Project Manager*.
- Complies with the *Employer's* Environmental, Occupational Health & Safety Incident Management Procedure - 32-95, relating to the reporting and investigation of incidents. The classification of incidents contained in such document are considered final and must be applied by the *Contractor* relating to any incidents/ injuries relating to its employees, agents, *Contractor* s, Sub-*Contractor* s and mandatories whilst on Site.
- Conducts a risk assessment regarding the utilisation of Personal Protective Equipment (PPE) and thereafter ensure that PPE of good quality is issued (at its own cost) to its employees, agents, *Contractor* s, Sub-*Contractor* s and mandatories prior to such individuals accessing the site, alternatively performing activities related to the *works* at the site, as specified in the Eskom PPE Specification.

2.3.9 SHE Organogram

The *Contractor* is required to compile their company organogram for the contract, highlighting the reporting structure from their Senior Management down to their project employees. This diagram must be kept up to date, a copy of which must be given to the client and copy filled in the relevant project SHE files.

2.3.10 Annexure B: *Employer* SHE rules and requirements

Annexure B is the acknowledgement of Eskom's SHE rules, and requirements form signed and submitted by the *Contractor* /Consultant.

2.3.11 Health and Safety file

The *Contractor* must compile a SHE (health and safety) file as per Eskom Power Station Project's safety file requirements. The *Contractor* must also ensure that the health and safety file; which must include all documentation required in terms of the provisions of the Act and these Regulations; is opened and kept on site and made available to an inspector, client, or client's agent upon request.

The *Contractor* at the end of the project must submit health and Safety file.

2.3.12 Cost allocation for OHS Compliance

The *Contractor* must ensure that there is provision for the cost of Occupational Health and Safety measures.

Note: the costing for OHS must not be provided as a lump sum but detailed, that is itemised based on the overall scope of the project (i.e.) Medical surveillance (Medicals), Training, provision of PPE, COVID-19 compliance, safety equipment purchases, resources etc.

2.3.13 Personal Protective Equipment (PPE)

In terms of Section 8 of the OHS Act, the duty of the *Employer* is to take steps to eliminate or mitigate (hierarchy of control measures) any hazard or potential hazard to the safety or health of employees before resorting to PPE.

Contractor's employees on site, including visitors, must use SANS approved risk-based PPE at all times, as a minimum:

- Head protection hard hat (with chin straps).
- Steel toe capped safety boots.
- Eye protection. Wearing of impact Safety Spectacles with side shields. Prescription glasses must comply with the same standard or cover impact safety spectacles must be worn over them.
- Long sleeved and long pants protective clothing.
- High visibility vests.
- Dust mask and/or Cloth masks.
- Refer to General Safety Regulation 2 of the OHS Act.

The *Contractor* must ensure that his employees understand why the personal protective equipment is necessary and that they use them correctly. Training should be provided to employees on the use, care, replacement, and limitation of the provided PPE. Records of training must be kept and made available to the *Employer/Client* or inspector upon request.

Strict non-compliance measures must be administered to any employee not complying with the use of PPE and that employee must be removed from the Site.

Note: Certain areas will be subjected to specific/extra PPE requirement.

2.3.14 Emergency Care

The *Contractor* must develop emergency procedure in line with Eskom Emergency Protocols. *Contractor* must further ensure that Emergency response service is always available to attend to any emergency cases that may arise during the duration of the contract.

The *Contractor* must be responsible to familiarise himself with local municipal disaster management portfolios. A list of emergency numbers must be displayed at notice boards and public areas for ease of access to all employees and visitors. The *Contractor* must ensure that his employees are familiar with the emergency numbers. Emergency numbers will also be part of the OHS induction.

Contractor must have one first aid box for the first five (5) persons and thereafter one for every 50 or team of workers on site or part thereof. There should be a trained and appointed person to render first aid service when required. The first aider(s) must be in possession of a first aid level two (2) training as minimum requirement as per Eskom Emergency planning procedure 32-123.

More first aid boxes must be provided if the risks, distance between work teams or workplace requirements require it (it should be available and accessible for the treatment of injured persons at that workplace).

Minimum contents of a first aid box: (Refer to GSR 3 Annexure of the OHS Act)

A prominent notice or sign must be erected in a conspicuous place at a workplace (SANS1186 approved signs to indicate location of first aid boxes), indicating where the first aid box or boxes are kept as well as the name and contact details of the First Aider of such first aid box or boxes.

The *Contractor* must ensure that alternative arrangements must be made for possible incidents occurring after normal working hours.

2.3.15 Medical Programmes

The *Contractor* must ensure that the employees are registered on a medical surveillance programme and are in possession of a valid medical fitness certificate, completed in South Africa. The certificate of fitness should be relevant to the type of work (risk based) that the employee will be exposed to. This will require each employee to have a risk-based person job specification that will be used as a basis for medical examination.

The *Contractor* must ensure that his employees have undergone pre-entry medical examination before starting work on site, no employee will access site without a valid medical fitness certificate. Periodic medical examination must be done for all employees as work progresses. Upon completion or as and when employees' leave the project, an exit medical examination must be done for all employees involved in the project.

2.3.16 Health Pandemics and Disaster Management

The *Contractor* must ensure proper management and control of any disaster and or pandemics that may come forth during the contract.

The *Contractor* must ensure compliance to all COVID-19 regulations and requirements. A COVID-19 Management plan and risk assessment should be conducted, and appropriate measures taken to minimise exposure to COVID-19. Any new developments regarding COVID-19 and latest updates should be communicated to the employees and visitors to raise awareness.

2.3.17 OHS Plan

The *Contractor* must provide and demonstrate to the Client a suitable and sufficiently documented health and safety plan, based on the Client's health and safety specification contemplated in regulation 5(1)(b) provided by the Client.

The *Contractor* must use the applicable OHS information to develop a suitable and sufficient OHS plan, which will indicate to the Client the level of compliance to the OHS requirements. The occupational health and safety plan must identify each activity to be undertaken by the *Contractor*, the foreseeable internal and external hazards, the specific precautions, and controls that are necessary to ensure that the works proceeds safely and without risks to health or adjacent operations.

Upon discussions with the *Contractor*, a final accepted OHS plan would be signed and approved.

The plan must demonstrate management's commitment to OHS.

The safety plan must be reviewed to ensure that it fully addresses all the issues and complies with the requirements of the OHS Specifications and contract. If necessary, the *Contractor* must amend the OHS Plan as required by the Client.

2.3.18 Hazard Identification and Risk Assessment

It is a legal requirement in terms of Section 8 (2)(d) of the OHS Act for an Employer to continuously carry out risk assessments, to establish which risks and hazards are attached to the health and safety of persons due to any work which is performed, any article or substance which is, handled, stored, transported.

The *Contractor* must prepare and provide to the Client a Baseline Risk Assessment as well as activity-based risk assessments for an intended work (scope of work).

In addition, the *Contractor* must ensure that:

- As far as is reasonably practicable, the safety and absence of risks to health in connection with the production, processing, use, handling, storage or transport of articles or substances is maintained.

- As far as is reasonably practicable, all hazards pertaining to the health and safety of persons and harm to the environment that are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in its business, is clearly identified and, as far as is reasonably practicable, further establishes what precautionary measures should be taken with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons, and provides the necessary means to apply such precautionary measures;
- Such information, instructions, training, and supervision as may be necessary to ensure, as far as is reasonably practicable, the health and safety at work of its employees, agents, *Sub-Contractors* and mandatories is provided.
- As far as is reasonably practicable, no employee, agent, *Sub-Contractor*, and mandatory performs any work or produces, processes, uses, handles, stores or transports any article or substance or operates any plant or machinery, unless the precautionary measures have been taken.
- Such measures as may be necessary in the interest of health and safety are enforced; Work is performed and that plant, materials or equipment is used under the direct supervision of a person trained to understand the hazards associated with it and who has the authority to ensure that precautionary measures required by the *Employer* are implemented; and
- All employees are informed of the scope of their authority as contemplated in OHSA.

2.3.19 Fire Protection

The *Contractor* complies with the requirements of the *Employer's* Safety Health and Environmental Specification, pertaining to fire protection. The *Contractor* ensures that adequate firefighting apparatus is provided at all his work sites, and that his staff is trained in the use of this apparatus.

Precautions are taken to prevent any occurrence of fires or explosions while carrying out any work near flammable gas and liquid systems.

Any tampering with the *Employer's* Fire Equipment is strictly forbidden. All exit doors, fire escape routes, walkways, stairways, and stair landings are kept free of obstruction, and not be used for work or storage at any time. Firefighting equipment always remains accessible.

2.3.20 Radiographic Examinations

If radiographic tests are carried out in the plant, the danger area must be evacuated with the exception only of authorised radiographic workers, and thereafter barricaded. Compliance is according to Regulatory, Eskom's Safety Health and Environmental Specification.

The relevant warning signs at the lockout gates (Barricading) are bolt secured and not by wire or any other means, which could be removed while radiographic tests are in progress, the area is barricaded, and access is restricted until the radiographic process is complete. The radiographic technicians ensure that all the lockout gates (Barricading) are opened/removed on completion of the tests.

When radioactive source (density tests) is brought onto site, the *Contractor* needs to inform the Client Agent/Manager in advance so that the Responsible Protective Officer (RPO) is informed. The *Contractor* must comply with all the said regulations before access is allowed onto the site.

If radioactive sources want to be stored at the site, approval needs to be obtained from the RPO. A proper storage area will be identified by the RPO, and the *Contractor* will ensure that all the necessary signs are erected to warn the employees. Radiation awareness will also be done to all employees.

2.3.21 Behavioural Based Safety Observation (BBSO)

Contractor must incorporate BBSO or VFL programmes within their Health and Safety Management System. The objective of behavioural safety observations is to assess and address the actual safe and unsafe behaviours of people in the workplace; as well as workplace conditions - which are caused by the actions or non-actions of employees, *Contractor*, or their personnel.

2.3.22 Employees' Right of refusal to work in an unsafe situation

Employees have a duty to take reasonable care of their own as well as other person's health and safety at work and to cooperate with the Employer, carry out lawful orders, including reporting unsafe situations and incidents.

Refer to Eskom Procedure 240-43848327- Employees' right of refusal to work in an unsafe situation. The aim of the procedure is to ensure that an environment is created that promotes zero harm by empowering employees and *Contractor*s to take responsibility for their own safety and that of others.

2.3.23 OHS Audits

During this contract, the *Contractor* must be subjected to scheduled or monthly audits by the client to monitor compliance. Eskom reserves the right to monitor and conduct unannounced audits to ensure compliance and provide assurance to the Client representatives and their key stakeholders.

2.3.24 Incident management

All incidents reporting, recording, classification and investigation will be done according to the requirements set out in the Eskom document 32-95 (latest revision).

The *Contractor* must report and investigate all incidents/accidents as required in terms of the legislation.

2.3.25 OHS Performance Status Reports

The *Contractor* must provide OHS statistical and non-statistical reports, dashboards, presentations on weekly and monthly basis.

2.3.26 Meetings

The *Contractor* must attend the monthly safety meeting scheduled by the Client. Ad-hoc meetings must be scheduled to address any Health and Safety related issue.

2.3.27 Work Co-ordination/interface Process

Work coordination process is designed for monitoring and coordination of activities for *Contractor*s working within the same area. It allows work to proceed without risk to the health and safety of Principal *Contractor*'s personnel, visitors, and client personnel.

The following must be taken into consideration:

- Whenever there is more than one *Contractor* working in one area, there must be a documented interface process.
- Where there are agreements between different *Contractor*s, those agreements must be written and signed off by the Client/Project manager.

- It is crucial that there is link between the risk assessment required for the permit to work in terms of PSR and the task risk assessment, as these risk assessments identifies critical controls required to execute the work.

2.3.28 Housekeeping

The *Contractor* must maintain a high standard of housekeeping within the site. Prompt disposal of waste materials, scrap and rubbish is essential.

The Client requires the *Contractor* to conduct housekeeping daily and perform housekeeping inspections (at least weekly) to ensure maintenance of satisfactory standards. The *Contractor* must document the results of each inspection and must maintain records for viewing.

Housekeeping must be done before and after every shift. After completion of every task, the *Contractor* must conduct a proper housekeeping and keep evidence of housekeeping in that area.

Note: Nails protruding through timber must be bent over or removed so as not to cause injury.

In cases where an inadequate standard of housekeeping has developed, compromising the health, safety and cleanliness, all employees have the responsibility to bring it to the attention of the Client. The Client will have the authority to instruct the suspension of relevant works until the area has been tidied up and made safe. Neither additional cost nor extension of time to the Contract must be allowed because of work stoppage.

Emphasis on housekeeping and general safeguarding on construction site CR 27 and stacking and storage on construction site CR 28 is mandatory and must be always complied with.

2.3.29 Inspection Colour Codes

The below table should be used for colour coding on site for monthly and quarterly inspections on tools and equipment. Material to be used on colour coding should be cable ties. The colour coding should be implemented as soon as on the first day of the respective month. Previous month colour coding should be removed and replaced with new ones for the present month. Wrong colour coding on tools and equipment must be deemed as proof that inspection was not conducted for the month on that particular item. Colour coding does not replace the need of daily inspection checklist being conducted daily and kept in the file on site.

Monthly Inspection Colour lode			Quarterly Inspection Colour Code	
January	Blue	Blue	January	Green
February		White	February	
March		Black	March	
April	Grey	Grey	April	Red
May		White	May	
June		Black	June	
July	Pink	Pink	July	Blue
August		White	August	
September		Black	September	
October	Brown	Brown	October	Yellow
November		White	November	
December		Black	December	

2.3.30 Work Stoppage

The temporary stoppage of an activity/activities or task(s) may be due to SHE concerns, including the following circumstances which must not warrant any financial compensation:

- Ad hoc safety intervention by Eskom management: All work of a similar nature may be stopped as the result of an occurrence of a serious incident. The *Contractor* must be required to comply with, and/or verify, the conditions stipulated in the work stoppage instruction pack and;
- Ad hoc safety intervention by any person, especially SHE functionaries, may be due to unsafe work or unsafe behaviour by the *Contractor*. The conditions that gave rise to the work stoppage will determine the corrective measures to be taken urgently to protect the health and safety of employees and protect the environment and plant or equipment, etc.

NOTE: *Work stoppages that are initiated due to SHE related incidents must not warrant any financial compensation claim lodged against Eskom.*

Further note Eskom do have two compulsory work stoppages per annum. Safety discussions will be held on those days and no financial compensation claim lodged against Eskom. This is in line to support our safety culture of Zero Harm.

2.3.31 Hours of Work

All work conducted on site must fall within the legal requirements in accordance with the Basic Conditions of Employment Act. The *Contractor* will notify their Eskom responsible manager/supervisor of any work that needs to be performed after hours according to the agreed arrangements. (The application needs to be submitted timeously). Where applicable, the notification should include proof of application, for overtime, to the Department of Employment and Labour and/or the letter of approval from the Department of Employment and Labour.

2.3.32 Project Close-out

On completion of the project or service rendered, the appointed *Contractor* (s) must close out their project documentation and OHS files and handover to the Eskom Project Manager. All required documentation must be submitted and handed over using relevant medium as per the procedure (Project Closeout and H&S documentation, 348-9942695). A checklist must accompany the submission to verify that all documents are submitted/or handed in to the *Employer*.

2.4 Environmental constraints and management

The *Contractor* provides an Environmental Management Plan applicable during installation and maintenance of *works* to ensure conformance with the requirements of the Water Use License (WUL) Environmental Authorisation (EA), EMP_r and EIA. The plan provides a guideline on the environmental management of the handling of the *works*. All waste will be handled in an environmentally friendly manner and be handled through registered service providers and permitted waste management facilities (this includes transport, handling, and where necessary disposal). The *Contractor* conforms to the “polluter pays principle”, duty of care and other NEMA principles. All of the *Contractor*’s staff complies with the *Employer*’s environmental requirements in accordance with the *Employer*’s Specific Health, Safety and Environmental Specifications, Policies, Procedures and Works Instructions as well as all conditions of the WUL, EA, EMP_r and EIA,

The *Contractor* ensures that all Environmental Authorisation obligations, applicable legislative requirements, EMPr, permits and licenses and *Employer's* specific requirements are fulfilled. This includes all national, provincial, and local environmental legislation and requirements. The *Contractor* issues on a weekly and monthly basis, Environmental Management Conformance, Performance and Expenditure Reports to the *Project Manager and ECO*.

The *Contractor* conducts their environmental management based on the ISO 14001 requirements and implements their environmental management practices accordingly.

The *Contractor* develops and implements as a minimum the following procedures/ method statement:

- Environmental Management Plan
- Site Establishment Procedure
- Site Layout Plan
- Waste Management Procedure
- Spill Prevention, Control and Countermeasures Procedure
- Hazardous Chemical Substances Management and Storage Procedure
- Water Management Procedure (covering potable and Storm Water Management)
- Stockpile and Erosion Management Procedure
- Clear-and-Grub Procedure
- Environmental Rehabilitation Procedure
- Veld Fire Procedure
- Environmental Training Awareness Procedure
- Control of Alien Invasive Vegetation Procedure
- Emergency Preparedness and Response Plan
- Heritage Management Procedure
- Dust Control Procedure
- Auditing and non-conformance management procedure
- Incident management procedure

All environmental procedures/ method statements, as listed above, must be site-specific and submitted to for acceptance by the *Project Manager* before the commencement of construction activities. Additional Procedures may be required.

2.4.1 Waste Management

All waste management activities, which include procurement of control measures, handling and disposal or processing of all waste forms generated on the *Contractor's* site, are conducted according to Waste Management Procedure. All costs associated with waste management are the responsibility of the *Contractor*. Only lawfully permitted sites are to be used.

Spill Management

The *Contractor*, at his cost, has available spill control measures (spill kits, drip trays, etc.), to the satisfaction of the *Employer* but as a minimum in line with the requirements of the EMPr and relevant legislation. All hazardous wastes generated from a spill are disposed of at a licensed disposal facility, at the cost of the *Contractor*, and safe disposal certificates are kept for record purposes.

2.4.2 Dust and Storm-water Management

The *Contractor* implements dust control measures. The *Contractor* ensures that no ponding of stormwater occurs on the construction site and must establish good storm-water management in accordance with the *Employer's* requirements. All cost associated with dust suppression and storm water management are the responsibility of the *Contractor*.

2.4.3 Environmental Rehabilitation

The *Contractor* rehabilitates all areas impacted by construction (e.g. Lay-down, roads, site camp and construction site, etc.) at the end of the project. The rehabilitation is done in accordance with the Project's specialist recommendations and EMPr as provided by the *Employer* to the satisfaction of the ECO. The *Contractor* submits to the *Project Manager* a rehabilitation plan and schedule at least three (3) months before finalisation of the *works* for approval by the *Project Manager*. All rehabilitation costs are the responsibility of the *Contractor*.

2.4.4 Alien Vegetation Control

The *Contractor* controls alien invasive plants and noxious weeds on a continuous basis. All control of alien plants and noxious weeds costs are the responsibility of the *Contractor*. Such a contract must be on an as and when required basis for the duration of the Project.

2.5 Quality assurance requirements

The *Contractor* must comply with all Eskom Quality Management requirements as detailed in the Power Station *Contractor* Quality Specification. A Power Station Specific *Contractor* Quality Specification document must be issued to the *Contractor* upon contract award.

This document is intended to aid field personnel in all aspects of inspection, data collection, reporting, and control onsite. CQA/QC procedures for inspecting and reporting are necessary to ensure that all work is performed to professional standards, in accordance with recognized procedures, and that specific requirements for regulatory submissions are met and that the intent of the design is met.

The *Contractor* and all Sub-*Contractor* s must comply with the *Employer's* quality requirements including those listed in the Employer s specification document, (240-105658000). The *Contractor* uses the QMS for all phases of the Project. The *Contractor* provides evidence of a fully implemented QMS within its own organisation. The *Employer* may, at his sole discretion, carry out an audit on the *Contractor* or Sub-*Contractor's* QMS for acceptance.

2.5.1 The Contract Quality Plan (CQP)

The *Contractor* submits to the Project Manager within 30 days of Contract Date for review and acceptance prior to the commencement of work, a CQP that will detail the *Contractor's* organisation, quality assurance and quality control procedures within that organisation specific to this project. The CQP must be aligned to, and reference ISO 10005:2005 QMS, guidelines for quality plans and in compliance with the guideline in QM 240-105658000.

The CQP will refer to the *Contractor's* QMS documents to be used in this Contract:

- a) The *Contractor's* QMS compliance with the requirements of ISO 9001.
- b) *Contractor's* quality manual or equivalent.
- c) *Contractor's* quality procedures.
- d) *Contractor's* quality forms and work instructions.

- e) *Contractor's* quality system documents referenced in this Works Information.
- f) *Employer's* Works Information, drawings, specifications, standards, and codes, etc.

2.5.2 Quality Control Plan or Inspection and Test Plan

As defined in the approved CQP the *Contractor* drafts and submits to the Project Manager for evaluation and acceptance, prior to the commencement of any works, the requisite Inspection and Test Plan (ITP) or Quality Control Plan (QCP). The ITP/QCP shows each activity from the Works Information. The Project Manager inserts intervention points based on the risk profile of the equipment.

- a) The intervention points include all witness, hold, verification, surveillances, and review points required by the Project Manager. The *Contractor's* failure to allow the intervention points will constitute a non-conformance.
- b) The intervention requirements take into consideration the criticality of the Plant and Materials.
- c) Where intervention points have been bypassed without prior written waiver from the Project Manager, result in the repeat performance of the activity in question and a Non-conformance (NC) is issued.

2.5.3 Operational Documents

The *Contractor* submits as a minimum the following documents, as required by the Project Manager during the execution of the works:

- a) Updated QCP register.
- b) Inspection notifications accompanied by their inspection report.
- c) Non-conformance and Defects registers and reports.
- d) Updated Site and off-site inspection schedules.
- e) Inspection and or FAT / SAT dates.
- f) Inspections completed and outstanding.
- g) Inspection and test reports.
- h) Weekly and monthly contract quality progress report.
- i) Data books for the completed works, before commissioning can commence (refer to the data book specification).

2.5.4 Inspections and Tests

All Plant and Materials are comprehensively tested in accordance with the agreed ITP/ QCPs prior to delivery. The Employer reserves the right to appoint others to inspect all parts during manufacturing, erection, and commissioning to be present at any of the tests specified. The witnessing of tests by the Supervisor or Others, and if the Supervisor chooses to waive the witnessing of any tests, it does not relieve the *Contractor* of his responsibilities.

Tests that are required by the *Employer* are carried out by the *Contractor* during manufacturing, erection, and commissioning to prove compliance with the specification independently of any test that may have been carried out at the *Contractor's* premises.

The Supervisor inspects parts of the Plant at his discretion during manufacturing stages and before shipment as per the agreed ITP/QCP:

- a) The *Contractor* is responsible for the inspection of all the work that is performed, and the Supervisor only verifies that the work is conducted as per the Works Information.
- b) The *Contractor* conducts all inspections in accordance with the accepted ITP/QCP.
- c) The *Contractor* provides suitably qualified personnel to conduct on-and-offsite inspections.
- d) The *Contractor* ensures that all are inspected and approved before the Supervisor is invited for verification.

e) The *Contractor* provides a minimum of five (5) working days' notice for local off-site inspections, 24 hours for local on-site inspection, and 21 working days' notice for foreign inspections. The notice contains copies of the *Contractor's* inspection reports.

2.5.5 Quality Responsibility

The *Contractor's* responsibilities include but are not limited to the following:

- a) The *Contractor* is accountable for the quality of the output and liable for any failures.
- b) Implementation of their QMS on site.
- c) Administration of their QA/QC systems on site.
- d) Verification of approval status of Sub-*Contractor's* Quality programmes, that is, CQP's, QCPs, NC's,

Defects and all their operational procedures and works instructions.

- e) On-and-offsite inspections.
- f) Weekly and monthly progress reporting on quality performance.
- g) The *Contractor* is responsible for defining the level of intervention of QA/QC or inspections in line with the *Employer's* requirements.
- h) The *Contractor* is responsible for defining the level of intervention of QA/QC or inspections to be imposed on his Sub-*Contractor*, Suppliers and Sub-Suppliers and must ensure that these are in line with the *Employer's* requirements.

The Supervisor will be responsible for the following:

- a) Reviews of the quality submissions.
- b) Verification of the *Contractor's* intervention points.
- c) Reviews the *Contractor's* ITP/QCP documents (procedures, test results).
- d) Reviews the data book.
- e) Issue of Defects Certificate.
- f) Checks and marks off materials off site.

2.5.6 Non-Conformances and Defects

Where Non-Conformance (NC) notifications are issued, the *Contractor* acknowledges receipt within the period of reply and proposes corrective and preventive actions to the Supervisor. The corrective and preventive actions will include the implementation and completion dates. Progress on all NCs notifications issued to the *Contractor* must be reported to the Supervisor on weekly basis.

- a) The *Contractor's* Quality Manager keeps a register of all NC notifications issued.
- b) Records of NCs notifications are kept and form part of the data book records.
- c) Deviations from the Contract are treated as a non-conformance.

To ensure reduction of non-conformances, the *Employer* will implement a penalty to the value of R20 000.00 for every NCR issued during the contract period and if not closed within 14 working days.

During the contract execution phase, the *Contractor* will be monitored by the Supervisor for performance on quality related aspects. The monitoring will be in the form of audits and assessments.

2.5.7 Quality Reporting

The *Contractor* submits a monthly quality report, on the last working day of the month. The report includes but not limited to the following:

- a) A register of NCRs and defects.
- b) Updated QCP / ITP register.
- c) QA monthly report summary.
- d) Planned and completed local and foreign inspection dates.
- e) Completed and outstanding Inspections.
- f) Audit findings report.
- g) Risks with Mitigation plan.

2.6 Programming constraints**2.6.1 General**

The *Contractor* submits a single programme that incorporates the programmes of all his sub-*Contractor* s. The interface points between his different sub-*Contractor* s as well as the interface points between the individual sub-*Contractor* s and the *Contractor* are to be clearly identified.

Project Key Milestones (Refer to C1.2 Contract Data Part 1 of *Project Management* and Construction Contract) as supplied by the *Project Manager*, are incorporated into the programme as per the NEC Core Clause 31.2.

2.6.2 Details of the *Employer* and Others who will be occupying the working areas at the same time

In cases where other *Contractor* s are working in the same area as part of the work of this contract, the *Contractor* co-ordinates his work with the *Project Manager* to maintain harmonious working conditions on Site.

During the progress of the *works* the *Contractor* provides access to others who also execute work in the same area, on an as and when required basis.

The *Contractor* makes his own assessment of the problems and difficulties which may be encountered for providing access to and interfacing with others (this includes access difficulties experienced during construction or commissioning phase).

No extra payment or claim of any kind on account of providing reasonable access is allowed.

2.6.3 Computerised Planning and Reporting

The *Project Manager* does not intend duplicating the *Contractor's* programming and planning; however, portions or high-level extractions of the Accepted Programme may be used in the *Employer's* internal master project programme for control purposes.

The *Contractor* submits updated computer files monthly, or at any other time as required by the *Contractor* or as instructed by the *Project Manager*.

The updated computer file shows the logic and all filters and layouts used in the programme. Primavera Project Planner (version 15.1) has been adopted by the *Employer* for all planning, progress monitoring and reporting on the Project.

The *Contractor* obtains this software and applies it for the planning and control of the works in line with the

DAM CONSTRUCTION SCOPE OF WORKS
accepted Work Breakdown Structure (WBS).

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2.6.4 Additional Programme Requirements

The *Contractor* uses the Critical Path Method (CPM) technique for programme and planning.

The programme shows the actual critical path clearly. The preparation of the programme contains a programme basis document. This basis document describes the programme and planning methodology, format, project execution philosophy, resource assumptions, qualifications and any other items that may have a substantive impact on the schedule.

The programme layout takes into account the accepted WBS, reflecting the manner in that the works are to be performed and how control data is summarised, reported, and monitored.

The minimum requirements for the WBS for the works are as per the Works Information.

The following levels of programme are to be used for this project for dynamic integrated project control:

- Management level programme (Level 1)
- Project level programme (Level 2)
- Control level programme (Level 3)
- Discipline speciality programme (Level 4)

The *Contractor* submits the level 3 programme with the tender documentation. The level 4 programme is to be submitted within one month following contract placement.

2.6.4.1 Management Level Program (Level 1)

The management level programme is used to establish work goals and overall time frames for the works. It is a statement of project objectives recorded in graphic form. The management level programme defines:

- Established goals or major milestones key dates.
- The duration of major operations and their relationship to one another.
- Identified Long Lead material items.
- Responsibility assignments for accomplishing project objectives.

2.6.4.2 Project Level Program (Level 2)

A "rolled up" programme from the control level programme is produced. It is separated by Unit, plant area and by Phase (*Project Management*, Procurement, Construction and Commissioning).

2.6.4.3 Control Level Program (Level 3)

The project level programme is prepared representing the significant work activities and deliverables associated with the works. The end product is a time scaled bar-chart schedule developed through use of a logic network. This programme is separated by Unit, by plant area, by Phase, by WBS.

The work within each plant area is broken down by *Project Management* discipline, procurement of tagged equipment and bulks, construction by *Contractor*, and commissioning & start-up. The control level programme is resource-loaded. It forms the basis for progress measurement, progress curves and histograms for each discipline within a plant area.

2.6.4.4 Discipline Specialty Program (Level 4)

The need for supplemental or discipline speciality programme is dependent upon the requirements and/or circumstances of the contract.

The discipline speciality programme developed and maintained by the *Contractor* is generated for tracking and control of various activities and deliverables for all phases of the contract. This programme is usually formatted as a spreadsheet or database report utilising the WBS structure.

This programme typically represents day-to-day tasks which are work unit based and become summarised in the Level 3 activities. Resource information for manpower, Plant, Material and Equipment and reflected in the resource histograms is to be provided by the *Contractor*.

2.6.5 Submission of Revised Programmes and Progress Reporting

The *Contractor* submits two hard copies and one electronic copy in Primavera, of each revised programme and progress report to the *Project Manager* for acceptance. All formally issued reports are to follow the progress reporting requirements as stated below.

2.6.5.1 Weekly Status Reports

A weekly status report is submitted by the *Contractor* to the *Project Manager*. This report is less formal than the monthly report and is used as a tool for the day-to-day management of the project. Contents of a weekly report may include the following items:

- The updated Primavera programme
- Programme summary narrative
- Progress and performance summaries
- Schedule rolling horizon
- Sectional Completion and Key Milestone status

2.6.5.2 Monthly Progress Report

The contents of the report may vary from month to month depending upon the phase of the project and/or the items of management focus. However, the basic framework of the report consists of the following:

- Executive summary (narrative identifying major movement within the reporting period).
- Revised Programme indicating, actual progress of work against last Accepted Programme.
- A one-month look ahead work window.
- Activities completed during current reporting period per discipline, including the activities of the *Employer* and Others.
- Activities in progress during current reporting period per discipline, including the activities of the *Employer* and Others.
- Activities undertaken during next reporting period per discipline, including the activities of the *Employer* and Others.
- Status overview by unit, by plant area, by phase.
- Key issues / Items of concern and corrective actions.
- Progress curves and tabular progress reports.
- Cost and Cash flow.
- Cost curve 'S-curve'.
- Early warning log.
- Compensation event log.
- General planning report (computer generated).

- Critical activities report.
- Updated summary of ham mocked report (computer generated).
- Key event report (computer generated).
- Report selecting all the activities of the *Employer* and Others - (computer generated).
- Updated bar charts.
- Updated resource schedule and histogram (If changed).
- Updated activity schedule (If changed and if applicable, Option A).
- Forecast rate of payment schedule updated with actual progress.
- Statement and report on work ahead and behind progress.
- The monthly progress reporting cycle is based on a month end "cut-off".

2.6.6 Meetings

Meetings are held fortnightly between the *Project Manager* and the *Contractor* (and any other co-opted members). The venue for these meetings is as determined by the *Project Manager* at the inaugural meeting. The *Project Manager* writes the minutes of these meetings. Any action of the *Project Manager*, *Supervisor*, *Contractor* and Adjudicator implied in the minutes of meeting are to be confirmed by a separate communication given in accordance with this contract.

The *Contractor* reports the overall progress and as a minimum requirement, the following is addressed:

- *Contractor's* current activities progress and planned finish dates.
- *Contractor's* planned start and finish dates for the works.
- *Contractor's* and *Project Manager's* programme agenda compared for problematic differences.
- The progress of any other relevant activities.
- To discuss any technical or commercial issues.

2.7 Contractor's management, supervision, and key people

The *Contractor* will provide the *Employer* and the *Project Manager* with an organogram showing the key people and the roles and responsibilities.

The organogram provided must show clear reporting lines between individuals, including individuals from Sub-*Contractors* or joint ventures.

The *Contractor* provides the following key personnel as a minimum:

- a) Dedicated *Project Manager* (Registered with the South African Council for Project and Construction Management Professionals (SACPCMP))
- b) Dedicated Project Planner who has worked in similar projects (multi-disciplinary projects) and has more than three years' Primavera experienced. The *Contractor's* planner must be solely dedicated to the Contract/Project to perform the planning and programming requirements in accordance with this section. During execution, the *Contractor* provides a full-time planner at the Site.
- c) Dedicated Site Construction Manager (Reregistered with SACPCMP)
- d) Dedicated Site Quality Officer
- e) Dedicated Site Safety Manager (Registered with SACPCMP)
- f) Dedicated Site Safety Representatives (Registered with SACPCMP)
- g) Dedicated Environmental Manager /Practitioner
- h) Dedicated Cost *Project Manager*
- i) Dedicated Survey Team

2.8 Invoicing and payment

Within one week of receiving a payment certificate from the *Project Manager* in terms of core clause 51.1, the *Contractor* provides the *Employer* with a tax invoice showing the amount due for payment equal to that stated in the *Project Manager* 's payment certificate.

The *Contractor* must address the tax invoice to Eskom Holdings SOC Ltd and include on each invoice the following information:

- The contract number and title.
- *Contractor* 's VAT registration number.
- The *Employer* 's VAT registration number 4740101508.
- Purchase order number
- Invoice number
- Invoice Date
- Description of service provided for each item invoiced based on the Price List.
- Total invoice amount with VAT showed separately.
- Signed payment certificate need to be attached to invoice.

All invoices in PDF format must be emailed straight from the *Contractor* 'ssystem to an Eskom email address (see email addresses below):

- Email addresses for invoice submission:
 - All invoices: invoiceserilocal85@eskom.co.za or invoiceserilocal86@eskom.co.za
 - The *Project Manager* must be copied when submitting invoices.
- All queries and follow up on invoice payments should be made by contacting the Project Manager.
- For Foreign invoices, the *Contractor* is required to physically deliver hard copies of original documents to the *Project Manager* even though the *Contractor* has e-mailed those invoices.
- The *Contractor* ensures compliance with the tax Requirement for submitting invoices electronically.
- If there is Cost Price Adjustment (CPA) on your invoice, the *Employer* recommends that the *Contractor* issue a separate invoice for CPA so that if there are any issues on the CPA the rest of the invoice can be paid while resolving CPA issues.
- The base invoice number needs to be mentioned on the CPA invoice.
- Electronic invoicing does not guarantee payment but ensures visibility of all invoices and ensures that no invoices get lost. If the Goods Receipt (GR) is not done the invoice will be parked and the system will automatically send an e-mail to the *Project Manager* to do the goods receipt. This is also tracked by the *Employer* through the parked invoice report.
- The *Contractor* can request a parked invoice report from the Finance Shared Services (FSS) Contact Centre which can then be followed up and corrected. You are welcome to forward the details of invoices corrected to the FSS Contact Centre.

At each assessment interval, the *Contractor* submits to the Project Manager a forecast rate of invoicing that includes all the expected payments by the *Employer* to the *Contractor* on a month-by-month basis.

2.9 Insurance provided by the Employer

As stated in the *Employer* 's Construction All Risk Insurance Policy is available on request from Eskom Group Insurance, to be dealt with in accordance with ECC3 Core Clause 87.1, 87.2 and 87.3 and additional requirements are also stipulated in the Z Clauses.

The insurance policies and procedures will form part of the Contract Data and any reference to this will be contained in the Contract Data.

2.10 Contract change management

Changes during a term of the Contract are inevitable and when they occur, they need to be managed within the policies and procedures of Eskom. Changes can be minor which are administrative or substantial which may affect the price and delivery. There are two ways to change a contract:

- a) Bilateral
- b) Unilateral

Bilateral is when both Parties (*Contractor* and *Employer*) agree that a change is necessary. The second one is the unilateral whereby the *Employer* may exercise a right to modify the contract without the *Contractor*'s consent. In case of latter one, the Eskom procurement and supply chain management procedure-32-1034 must be followed.

2.10.1 Contract changes and contract Scope

Eskom commercial policy requires a competitive process, any change upon the type of goods or services needed must be consistent with what was asked during the tender stage. A contract change needs to be within the scope of what was provided during tender stage. A significant difference will not be allowed because it had not been subjected to fair competition. Transparency is one of PPPFA requirements and as a government owned organisation had to comply with.

2.10.2 Administrative changes

These are the changes that are within the scope of contract and do not affect the originally signed contract. These changes are typically executed via a unilateral amendment. Examples include:

- a) Changes in address
- b) Correction of typographical errors not affecting the substance of the contract
- c) Changes as permitted by the language of the contract
- d) Changes in personnel assigned to the contract.

2.10.3 Substantive changes

These are the changes that affect both Parties. They require bilateral amendments. These changes may require one of the Parties to be compensated for such changes.

2.10.4 General Principles of contract change management

Project Management change will be dealt with as per 3.3.1. If either party is in doubt about whether a change falls within the definition of *Project Management* change then it will be processed as a contract change.

Under this contract change management:

- a) Either party may request a contract change. All changes need to be formally communicated prior to the implementation of that change.
- b) Neither party makes a request that is not made in good faith or for good reasons.
- c) The *Project Manager* assesses and documents the potential impact of a proposed contract change before presenting it to Compensation Events Committee
- d) The *Project Manager* has the right to request reasonable amendments to a contract change request.
- e) The *Project Manager* has the right to reject a change and specify his reasons.
- f) No proposed contract change will be implemented by the *Contractor* without prior approval of the *Project Manager*.

- g) If the proposed change is of emergency in nature, approval of emergency instructions will be followed as per paragraph 2.10.9,
- h) Any contract changes necessary to comply with a Change in Law will be implemented as set out in paragraph 2.10.3 & 2.10.4.
- i) Until a change is approved, signed, and issued to the *Contractor*, then
 - i. Unless the *Project Manager* expressly agrees otherwise in writing, the *Contractor* continues to provide the *works* in accordance with the signed contract as if the proposed contract change does not apply; and
 - ii. Any discussions, negotiations or other communications which may take place between the *Project Manager* and *Contractor* in connection with any proposed contract change, including submission of any change communications, is without prejudice to each party's other rights under this Contract.
- j) The *Project Manager* notifies in writing the *Contractor* stating the reasons why the *Contractor* has not reasonably demonstrated the need or justification for the contract change in connection with the specified event. If the *Contractor* disputes the notice, then the matter is resolved in a risk reduction meeting.
- k) Where the *Contractor* does not approve a contract change in respect of a specified event, the *Contractor* notifies his decision within period of reply.

2.10.5 Costs

- a) Each party bears its own costs in relation to the preparation and agreement of each change request and impact assessment.
- b) All contract changes are calculated in accordance with the principles set out in Price Schedule. Any cost savings resulting from the contract change will be passed on to the *Project Manager* by way of reduction in the charges.2.10.6 Contract Change Request.
- c) Either party may issue a contract change request to the other party at any time during the term of the contract.
- d) If the *Contractor* provides a contract change request, he also needs to provide an impact assessment in terms of cost, schedule, and quality.

2.10.6 Impact Assessment

- a) Each impact assessment includes (without limitation):
 - i. Details of the proposed contract change where the contract change is proposed by the *Contractor* including the reason for the contract change and
 - ii. Details of the impact of the proposed contract change on the contract and the *Contractor* 's ability to meet its other obligations under this contract, including without limitation changes to:
 - The works information
 - *Accepted Programme*
 - Other works provided by *others* to the *Employer* including any changes required by the proposed contract change to the *Project Manager*.
 - Interface
 - iii. Details of the estimated cost of implementing the proposed contract change
 - iv. A schedule for the implementation, together with any proposals for the testing of the contract change
 - v. Where applicable details of how the proposed contract change will ensure compliance with any applicable Change in Law and
 - vi. Such other information as the *Project Manager* may reasonably request in (or in response to) the change request.

- b) The *Project Manager* reviews the Impact Assessment and responds within the period of reply or as agreed with the *Contractor*.
- c) If the *Project Manager* requires further information regarding the proposed contract change so that it may properly evaluate the change request and impact assessment, then with the period of reply or as agreed with the *Contractor*, the *Project Manager* notifies the *Contractor* of this fact and details the further information that is required. The *Contractor* provides the relevant Impact assessment within the period of reply or as agreed with the *Project Manager* of such notification. The parties may repeat the process described in this paragraph until the *Project Manager* is satisfied that it has sufficient information to properly evaluate the change request and impact assessment.

2.10.7 Project Manager's right of acceptance of contract changes

Within period of reply of receiving the impact assessment from the *Contractor*, or further information, the *Project Manager* evaluates the change request and the impact assessment in good faith and

- a) Submits all the details of the event to the Project Manager.
- b) Presents the details of the event to the Project manager
- c) Implements the recommendations of the PM.
- d) Notifies the *Contractor* of the rejection of the proposed change. If the *Project Manager* rejects a proposed change, then he may explain his reasons in writing to the *Contractor* within period of reply or as agreed with the *Contractor*.
- e) Require further details on the change request and/or impact assessment in which the *Contractor* makes changes and respond within period of reply or as agreed with the *Project Manager* of such request.
- f) If the proposed contract change is recommended by the Compensation Events Committee, the *Project Manager* notifies the *Contractor* in writing. The *Project Manager* signs off on all deviation to the contract (drawings, specifications, and other relevant documents) before the implementation of such deviations may take place.

2.10.8 Contractor's right of acceptance of proposed changes

The *Contractor* has a right to reject a proposed change if he believes any proposed contract change which is requested by the *Project Manager*:

- a) Would materially and adversely affect the risks to the health and safety of any person
- b) Would require the works to be performed in a way that infringes any Law
- c) Is technically impossible to implement provided that
 - i. The *Contractor* can demonstrate to the *Project Manager* that the proposed contract change is impossible to implement
 - ii. Neither the Accepted Programme nor the Works Information state that the *Contractor* have technical capacity and flexibility require to implement the proposed change.
- d) Would materially and adversely affect the *Contractor's* ability to deliver the works
- e) Would not be possible to implement before contract completion date.
- f) Would cause the *Contractor* to breach any of the Insurances
- g) Would cause the *Contractor* to be in breach of any existing licence, consent, or permit
- h) Would require the consent of *others* to enable the contract change to be implemented and the *Contractor* is unable to obtain the consent of the *others*.
- i) Would result in additional cost to the *Contractor* that is not proposed to be paid to the *Contractor* as part of change.

2.10.9 Emergency Instruction contract changes

- a) The emergency instruction contract change may cover technical, financial, safety and strategic aspects.

- b) The only person who can instruct the *Contractor* to implement such changes is the *Project Manager*. Such instructions need to be subsequently followed by a written formal communication. All changes must be documented, and no payment will be made to undocumented change.
- c) The *Project Manager* is given restricted authority to cover instructions to the *Contractor* that are of an emergency in nature, and which will result in a contract change. Such contract changes are presented to the Compensation Events Committee, by the *Project Manager*, for its retrospective recommendation and ratification by the *Employer*.

2.10.10 Authorisation of contract change

Any proposed contract changes are not authorised, and the *Contractor* does not implement any proposed contract change until the signed letter and other signed documents (e.g., drawings, specifications) are sent to the *Contractor*.

2.10.11 Communications

- a) For any contract change communication to be valid, it must be sent to the *Contractor* as applicable.
- b) All contract change communications may be hand delivered or sent by first class post or facsimile. Contract change communications are deemed to have been received at the following times:
 - i. If hand delivered, then at the time of delivery or, if delivered after 16.00 hours on the next Working Day
 - ii. If posted first class within South Africa at 10h00 on the second Working Day after it put into the post.
 - iii. If sent by facsimile, then at the expiration of four (4) hours after the time of despatch, if despatched before 15h00 on the next Working Day, and in any other case at 10h00 on the next Working Day following the date of despatch.
- c) In proving delivery of a contract change communication, it will be sufficient to prove that the delivery was made, or that the envelope containing the contract change communication was properly addressed and posted (by prepaid first class recorded delivery post) or that the facsimile was properly addressed and despatched, as the case may be.

2.11 Provision of bonds and guarantees

The form in which a bond or guarantee required by the *conditions of contract* (if any) is to be provided by the *Contractor* is given in Part 1 Agreements and Contract Data, document C1.3, Sureties.

The *Employer* may withhold payment of amounts due to the *Contractor* until the bond or guarantee required in terms of this contract has been received and accepted by the person notified to the *Contractor* by the *Project Manager* to receive and accept such bond or guarantee. Such withholding of payment due to the *Contractor* does not affect the *Employer's* right to termination stated in this contract.

2.12 Records of Defined Cost, payments & assessments of compensation events to be kept by the Contractor

The *Contractor* submits the following for compensation event assessment:

- a) Quotation indicating Current market rate if not included in the short schedule of cost components
- b) Labour time sheets
- c) Early warning to the *Project Manager*
- d) *Project Manager's* Instruction
- e) Percentage fee applied
- f) Cost Price Adjustment (CPA) Calculation where short schedule of cost components rates was utilised

- g) Signed Record of Decisions (ROD) or design change request form for *Project Management* design changes
- h) Revised program where key date and completion date is affected
- i) Revised program where instructed to accelerate by the *Project Manager*
- j) Invoice from supplier and service providers.

2.13 Training workshops and technology transfer

The *Contractor* provides training on the Plant regarding operating, maintenance, and *Project Management* aspects. The *Contractor* provides training material and a separate training course for operating, maintenance and *Project Management* personnel.

3 *Project Management and the Contractor's design*

3.1 *Employer's design*

The Design is as per the Client's requirements. The design items are as below:

Detailed Design to be provided and not limited to:

- Detailed area & route ground surveying where required.
- Detailed ash dump liner and drainage design.
- Detailed design of the ash dirty dams and rehabilitation runoff dams.
- Detailed design of the ash dumps clean and dirty water perimeter canals to GN704.
- Detailed design of the initial temporary clean and dirty storm water control drainage works.
- Detailed design of the initial gravel access roads including access to the dams and fence patrol roads.
- Detailed design of the perimeter fencing.
- Works information.
- Specifications.
- Bill of quantities.
- Approved for construction drawings.
- Detailed design report; and
- Detailed design construction duration and cost estimate (priced bill of quantities).
- Operating & maintenance manual.

3.2 *Parts of the works which the Contractor is to design*

The *Contractor must* make provision for any temporary Works as may be required for the purpose of ensuring the safety of adjoining Works and property and for the protection of all persons or animals. The *Contractor must* provide and maintain all necessary temporary protection of finished and/or existing Works liable to be damaged during the progress of the Works by properly covering up, isolating, etc., as required.

The *Contractor must* be responsible for any damage which may occur and must make good at his own expense.

3.3 Procedure for submission and acceptance of *Contractor's* design

All the Designs must be passed on to the *Project Manager* for review and approval prior to placement of any order or procurement of the designs.

3.3.1 Design Review Procedure

Where the *Contractor* has design work in their scope, the *Contractor* is the Design Authority as defined in the Design Review Procedure (240-53113685). The *Contractor* is responsible for following this design procedure and conducting all the design reviews as specified in this procedure. The *Contractor* is responsible for conducting the following design reviews:

- a) Detail Design Freeze Review
- b) Integrated Design Review
- c) Construction Completion Review
- d) Acceptance Testing Review

3.3.2 Project Management Change Procedure

The *Contractor* takes note of the *Employer's* Project Management Change Procedure (240-53114026). A *Project Management* change includes any proposed change originating from *Project Management*, *Contractors*, project management or construction management.

The Project Management Change Procedure applies to the *Employer's* personnel or *Contractors* performing *Project Management* or *Project Management* related work where the quality of the *Project Management* work performed is the direct responsibility of the *Project Manager*.

3.3.3 Process for Submission of Documents

The *Contractor* submits all documents according to the accepted VDSS. The process for the submission of documents is described below:

- a) The *Contractor* submits the documents/drawings to the *Project Manager*.
- b) The *Project Manager's* Document Controller registers the documents.
- c) The *Project Manager's* Document Controller will supply the documents/drawings to all relevant parties within the *Project Manager's* project team.
- d) The *Project Manager's* team reviews the documents/drawings and will submit all comments or inputs to the *Project Manager* and the *Project Manager* submits to the *Contractor* for consideration.
- e) If the *Project Manager* finds major deficiencies in the submitted documents/drawings, the *Contractor* revises the documents/drawings and resubmits to the *Project Manager*.
- f) The *Project Manager* reviews the documents/drawings and if no major deficiencies are found, the *Contractor* organises a Design Review session.
- g) The *Project Manager* and the *Contractor* conduct a Design Review.
- h) If any fundamental errors were found in the designs or further actions are required, the *Contractor* record all concerns raised and revises the designs.
- i) The *Contractor* organises a Design Review session once all designs were revised according to the concerns raised by the *Project Manager*.
- j) If no fundamental errors were found in the designs during the Design Review session, the *Contractor* compiles the Design Review minutes or report and submits it to the *Project Manager*.
- k) The *Project Manager's* Document Controller registers the report.
- l) The *Project Manager's* team reviews the *Contractor's* report/minutes. If the report/minutes are not acceptable, the *Contractor* revises the report/minutes and resubmits to the *Project Manager*.

- m) The *Project Manager* will accept the *Contractor*'s design once the report/minutes are accepted by the *Project Manager*'s team.

3.3.4 Time Required for Acceptance of Designs

The *Project Manager* will return one copy of the drawing marked "Accepted", "Accepted as Noted" or "Not Accepted", as may be appropriate. The notations "Accepted" and "Accepted as Noted" authorize the *Contractor* to proceed with the manufacture of the Plant covered by such drawings subject to the corrections, if any, indicated thereon. Where prints or drawings have been "Not Accepted" or "Not Accepted as Noted" the *Contractor* makes the necessary revisions on the drawings and submit further copies for acceptance in the same procedure as for the original submission of drawings. Every revision shows by number, date, and subject in the revision block on the drawing.

3.4 Other requirements of the *Contractor*'s design

3.4.1 Technical Risk Assessments

3.4.1.1 HAZOP Studies

The *Contractor* carries out formal HAZOP Studies on all systems in their supply. These studies are done in accordance with the requirements as laid down in the Eskom HAZOP Guideline: 240-49230111.

All recommendations are included in the *Contractor*'s designs. This is submitted to the *Project Manager* for acceptance.

3.4.2 System Interface

The *Contractor* is responsible for all system interfaces which forms part of the works. The *Employer* will provide the relevant information defining the system interfaces. The *Contractor* caters for all the identified interfaces.

3.5 Use of *Contractor*'s design

All *Contractor* designs must be used only and once review & approval of the designs has occurred by the *Employer*. The approval must be submitted to the *Project Manager* in writing.

3.6 Design of Equipment

All designs of equipment by the *Contractor* must be used only and once review & approval of the designs has occurred. The review & approval must be submitted to the *Project Manager*.

- The *Contractor* must provide to the *Project Manager* and relevant Construction Management personnel the documentation for the warranties from manufacturers or suppliers of all equipment required in execution of the structures to be built within the ADF area.
- The *Employer* (Construction Health and Safety Agent) is obliged to ensure that proof to the effect that the designers comply with their obligations as stipulated in the Construction Regulations, section 6 is submitted during the application for a construction work permit.
- All the required documentation will be made available by relevant Construction Management personnel to the *Contractor* regarding the codification of equipment as well as the freight, storage, and delivery requirements within the Eskom sites prior to the procurement of any equipment required for the execution of the structures to be built within the ADF area.
- The *Contractor* is solely responsible for providing the protection of the equipment from damage or loss due to weather, fire, theft, unexplained disappearance or similar during the execution of the works

- The *Contractor* must bear the cost of the replacement of any equipment or part thereof damaged or requiring replacement and all such costs must be covered as per the required construction insurance taken out by *Contractor* for the construction of the works at the ADF area
- The liability of the use of such equipment in the execution of the works must remain that of the *Contractor* (i.e., this includes the design and transport, storage, maintenance, use of the equipment).

3.7 Equipment required to be included in the works

No specialised equipment is identified as being required, however if any is required, the designs must be provided by the *Contractor* and reviewed.

3.8 As-built drawings, operating manuals, and maintenance schedules

3.8.1 Language

All documentation, including reports, manuals, etc. is in the English language.

3.8.2 Manuals

The technical, training, operating and maintenance manuals are provided for each type of a functional unit. Technical manuals include all technical data as well as the technical data and leaflets of each individual component provided. Where generic manuals are provided, an addendum is provided indicating the applicable project specific components. Manuals are of a good quality and cover the following as a minimum:

- a) Technical descriptions of the equipment and component parts
- b) General arrangement drawings
- c) Installation instructions with drawings or pictures
- d) Operating and maintenance instructions for all components
- e) Detailed parts lists (accompanied by exploded view type drawings clearly detailing the part and uniquely identifying it)
- f) Spare part ordering instructions

Any special instructions pertaining to storage of spare parts, or their shelf life is included in the maintenance manual. All drawings requested for component location, dismantling and re-assembly for maintenance are included in the maintenance manual. All special tools required for operating and maintenance of the equipment are presented in a form of a schedule in the operating and maintenance manual, respectively. The content of the training manual is based on the content of the technical, operating and maintenance manuals.

3.8.3 Drawing Requirements

The *Contractor* supplies reproducible drawings according to the Vendor Document Submittal Schedule (VDSS). The *Contractor* develops the following minimum requirements for the drawings:

3.8.3.1 Drawing Numbering System

The *Employer* supplies the proposed *Project Manager* drawing numbering system to the *Project Manager*. The *Contractor* may assign his own drawing number as required to meet his document control system requirements.

- Civil & Structural drawings

3.8.3.2 Operating and Maintenance Manual

The *Contractor* provides operating and maintenance manuals, as well as an Operating Technical Specification for the new Plant. The *Contractor* provides four (4) hard copies and an electronic copy.

The procedures are provided by the original equipment manufacturer detailing descriptions of operating and the maintenance work. The procedure covers the requirements for maintenance of the equipment over the design life.

3.8.4 Data Books

The *Contractor* must compile Data Books progressively for all manufacturing and construction/erection inspections, operating manuals and test records and documents for every piece of plant required in producing the Works. The *Contractor* must submit data books to the *Supervisor* and *Project Manager* for their review for all Plant and Materials and work undertaken with the applicable requirements and specifications. Progressive Data book reviews (30%, 70%, 100%) will be incorporated as part of requirements including mechanism for retention (if applicable) for poor performance by *Contractor*.

4 Procurement

4.1 B-BBEE and Preferencing Scheme

The *Employer* requires the *Contractor* to maintain the B-BBEE Recognition Level with which the Contract was awarded or if B-BBEE non-compliant to achieve a B- BBEE Recognition Level of eight (8) (the "Required B-BBEE Recognition Level") within twelve (12) months from date of Contract Award in terms of Eskom's Directive "Implementation of Eskom's Black Economic Empowerment Strategy " and Standard "Application of the Broad Based Black Economic Empowerment Codes of Good Practice within Eskom (32-1034) ".

Eskom's policy is to maximise purchases from Black or Black Empowering Enterprises (BEE's) whether Black Woman-owned, small or Large Black or Black empowering suppliers. The purpose is to promote entrepreneurship in black communities and give black business access to the mainstream of business opportunity.

4.2 Supplier Development and Localisation (SD&L)

The *Contractor* complies with and fulfils the *Contractor's* obligations in respect of the Supplier Development and Localisation (SD&L) in accordance with and as provided for in the *Contractor* 's SD&L Compliance SD&L requirements.

4.2.1. 30% Subcontracting to the Designated Groups

The *Contractor* must sub-contract at least some of the works to Designated Group(s) as committed as part of the Pre- qualification criteria in terms of Regulation 4(1) (c) and amplified during negotiations.

The *Contractor* shall comply with the Assessment of Compliance with the Standard for Indirect Targeting for Enterprise Development through construction works contracts is 01 April 2021, as published in Government Notice No. 43726, which requires that a minimum of 30% will be subcontracted to the CIDB registered *Contractors*.

The *Contractor* must perform a needs analysis on all targeted enterprises and provide internal mentorship, which improves the targeted enterprises performance in at least two developmental areas, such developmental areas should be guided by the requirements of the CIDB Best Practice *Contractor* Recognition Scheme as well as the NCDP exit requirements for accreditation of *Contractor* s. The developmental areas are listed in the GN.

The *Contractor must* appoint an Enterprise Development Co-Ordinator who must:

- Develop a project specific enterprise development plan to improve the targeted enterprise's performance in the identified developmental areas which allocate resources and monitors progress in relation to improved performance; and
- Submits to the *Employer's* representative a monthly ED report which documents all mentoring activities that have taken place during that month and progress made in improving the targeted enterprise's performance in the development area, countersigned by the targeted enterprise.

If the *Contractor* fails to substantiate that any failure to achieve the CPG was due to reason beyond the *Contractor* 's control which may be acceptable to the Employer, the sanctions (financial penalties) provided for in the contract must apply.

4.2.2. Local Production and Content

The *Contractor* committed to compliance with the stipulated Local Content threshold for the applicable Designated Sector threshold as follows:

Commodity	Components	Local Content Threshold
Steel products and components for construction	Reinforcement steel, re-bar, etc.	100%
Piping	HDPE Piping	100%
Textiles, clothing, leather, and footwear - PPE	Reflector vests, jackets, safety boots, hard hats, etc.	100%
Bagged and Bulk Cement	Cem I, Cem II, Cem III, Cem IV, Cem IV, and masonry cement	100%

Eskom reserves the right to employ the services of the SABS or any other Quantity Surveying service provider to visit the premises of the manufacturers/fabricators to conduct audits on the compliance with the *stipulated local content threshold as per requirements*.

4.2.3. CIDB's *Contractor's* Skills Development Goals:

The Standard for Developing Skills through Infrastructure Contracts published by the Construction Industry Development Board on 03 July 2020 (Board Notice 363 of 2020, Government Gazette 43495) ("the CIDB Skills Standard") will apply to this contract. In terms of the classification system of engineering and construction works contracts the works is classified as Civil Engineering works (CE). As such for the purposes of the CIDB Skills Standard the Contract Skills Development Goal (CSDG) for this contract is 0.25% of the Accepted Contract Amount.

The *Contractor* shall spend 0.25% of the Contract Amount on Skills Development in accordance with the *Contractor's* Skills Development Goals. The *Contractor* also committed to comply with Client Skill development requirements.

The Skills Development beneficiaries would be recruited from within the municipality involved.

4.2.4. Reporting and Monitoring:

The *Contractor* keeps accurate records and provide the *Project Manager* with reports on the *Contractor's* actual delivery against the above stated Supplier Development and Localisation obligations.

The *Contractor must* submit the SDL&I Implementation Schedule, inclusive of CIDB Skills Development Goal, which must be completed by the suppliers and returned to SDL&I representative for acceptance within 28 days after contract award.

This SDL&I Implementation Schedule will be used as a reference document for monitoring, measuring, and reporting on the supplier's progress in delivering on their stated SDL&I commitments.

The *Contractor must*, on a quarterly basis, submit a report to Eskom in accordance with Data Collection Template on their compliance with the SDL&I obligations described above.

Eskom must review the SDL&I reports submitted by the *Contractor* within 30 (thirty) days of receipt of the reports and notify the *Contractor* in writing if their SDL&I obligations have been met or not.

Upon notification by Eskom that the *Contractor* has not met their SDL&I obligations, the *Contractor must* be required to implement corrective measures to meet those SDL&I obligations before the commencement and submission of the next SDL&I report.

The *Contractor's* failure to comply with his SD&L obligations constitutes substantial failure on the part of the *Contractor* to comply with his obligations under this contract.

The proforma documents shall be completed by the *Contractors* after award of the contract within the stipulated period. (i.e., Form A1 List of Recognised Skills Development Agencies, Form A2 Baseline Training Plan, Form A3 Project Interim Report, Form A4 Supervisor Agreement, Form A5 Project Completion Report).

The proforma documents shall be completed by the *Contractors* after award of the contract within the stipulated period. (i.e., Project Interim Report, Project Completion Report and Declaration).

4.3 Plant and Materials

4.3.1 Quality

4.3.1.1 MATERIAL QUALITY

Samples of materials to be used upon the Works must, when required, be submitted at the *Contractor* 's expense to the *Project Manager* for approval before use, and any material brought on to the Works which, in the opinion of the *Project Manager*, does not meet the standard of the sample so submitted or is considered by him in any way unsuitable for its designed purpose, must be removed immediately once instructions to that effect have been given.

4.3.1.2 QUALITY ASSURANCE

Workmanship must comply with the best and most modern practice and must be open for inspection by the representatives of the *Employer* (Eskom Holdings). The *Contractor* must comply with the intent of SABS ISO 9002 or must be working towards compliance in accordance with formal plans and programs. Quality control plans will:

- List the sequence of events of manufacture / fabrication, including inspections and tests.
- Identify the applicable procedure, drawing or specification for the performance of each event.
- Identify the acceptable standard for each event.
- Identify those events for which records are required by the Manufacturer,
- *Contractor* and *Employer* and provide the identification of the records.
- Provide for the notation of non conformance and concession data.
- Provide for acceptance signatures by the Manufacturer, *Contractor* and *Employer* for each event.

4.3.2 Plant & Materials provided “free issue” by the *Employer*

The *Employer* does reserve the opportunity to negotiate with the *Contractor* that different plant and materials be used of another origin for whatever purpose that may become apparent at the time.

4.3.3 *Contractor*'s procurement of Plant and Materials

- The *Contractor* must supply and use suitable and sufficient construction plant, tools and equipment and materials as may be required to carry out the works efficiently.
- The *Contractor* always provides protection for all plant and materials from damage or loss due to weather, fire, theft, unexplained disappearance or similar.
- The *Contractor* at all times protects from damage, due to the *Contractor*'s service to provide the works, all plant and materials and equipment and all items on the site that are the property of the *Employer* or Others.
- The *Contractor* provides or manages, as part of Works everything necessary for the receiving, inspection, safe keeping and storage, issuing, handling, management and administration of all plant and materials purchased by the *Contractor*.

- The *Contractor* must provide through the *Project Manager* and relevant Construction Management personnel the documentation for the warranties from suppliers of all relevant plant and material used in the structures built within the ADF area, as well as the vendor data of the suppliers.
- The *Contractor* will ensure to provide all guarantees and warranties of the plant & materials used in the Works to the *Project Manager* and *Employer* when construction is completed.

4.3.4 Spares and consumables

It will be the responsibility of the *Contractor* to arrange the supply of spares and consumables for the works.

4.4 Tests and inspections before delivery

It will be the responsibility of the *Contractor* to perform the required tests during construction and to coordinate documentation with the Supervisor. Test documentation generated during the commissioning phase will be filed as the work is completed. All tests and inspections are to comply with the quality management plans and requirements for the project as per Sections 2.5.

Once all *Contractor* construction activities are complete, the *Contractor* will hand over the Works to the Supervisor for testing and checkout. Completeness of the construction will be verified through a joint walk down between the Supervisor and *Contractor*. Any minor outstanding work items found during the construction walk down will be recorded as Defects, and dates will be established for resolution of these Defects.

Buildings with major omissions, errors, or problems found during the walk down will not be accepted for commissioning from construction. All construction documentation will be turned over to the Supervisor for review. This documentation will be reviewed for completeness and will be included in the final safety clearance with the *Project Manager*.

Once the Supervisor has accepted a part of the works from construction, the responsible *Project Manager* will direct all pre-operational tests required to ready the subsystem for initial operation.

Plant and Materials contained within the Works may undergo testing to verify that they are in good condition and ready to be put into service.

4.5 Marking Plant and Materials outside the Working Areas

All Plant and Material paid for by the *Employer* must be clearly labelled as being the *Employer's* property.

4.6 Contractor's Equipment (including temporary works).

There will not be any highly specialised equipment envisaged for the works.

5 Construction

5.1 Temporary works, Site services & construction constraints

5.1.1 Employer's Site entry and security control, permits, and Site regulations

The *Contractor* liaises with the ERI Safety Health and Environmental (SHE) Practitioner/Officers for Safety Induction prior work to commence. During Safety Induction, site access permits with a copy of the medical and a certified ID copy/passport (not older than three months) should be handed to the ERI SHE Practitioner/Officer for approval.

The *Contractor* employees will take the signed site access documents to security reception official to finalize their site access.

- The *Contractor* ensures that all its employees carry their site access forms with them all the time.
- The *Contractor* may be subjected to alcohol testing daily.
- The *Contractor* submits his application for vehicle permit to the *Project Manager*. The personnel and vehicles entering and leaving the site are subjected to routine searches.

For projects that are inside a power station, the Contractor will obtain 'Gate Removal Permits' from the ERI Project Manager before materials and equipment can be removed from site. The 'Gate Removal Permit' gives itemized list of materials and equipment to be removed from site.

The *Contractor* ensures that a tool list is available on the day of arrival and that all tools are captured on the tool list. The tool list will be handed over to the Reception Security official that will stamp the tool list. The tool list will be kept safe and will be used when tools need to be removed from site. This must also be communicated to any Sub-*Contractor* that will be working at the Power Stations.

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

- *Contractor* to provide the Traffic Management Plan (TMP) for his works.
- Flow of vehicles is accounted for normal operations. Working hours should be included in the enquiries document/ contracting strategy to avoid incurred costs.

- The layout plan must be finalised before the traffic plan is finalised. Operations must be engaged to ensure that the normal operation is not affected and to ensure that the plan is integrated with operations.
- Consider installation of proximity sensors on all vehicles. Plan on how to manage the movement of people and build into the SHE specification.
- Road infrastructure must be part of SHE specs and will form part of Traffic Management Plan.

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

Restrictions and hours of work may apply at the Power Station. The *Contractor* keeps records of his people on Site, including those of his Sub-*Contractor* s which the *Project Manager* or Supervisor have access to at any time. These records may be required when assessing compensation events.

5.1.4 Health and safety facilities on Site

The *Contractor* provides a First Aid service and SHE representative to his employees and Sub-*Contractor* s. In the case where these prove to be inadequate, like in the event of a serious injury, for projects inside a power station the power station might be utilized.

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

As per the following:

- Power Station Waste Management Procedure
- National Environmental Management Act (NEMA, Act No. 107 of 1998)
- National Environmental Management Waste Act (NEMWA, Act No. 59 of 2008)

The Contractor will be notified of protected fauna and flora.

5.1.6 Title to materials from demolition and excavation

As per Clause 73.2 the *Contractor* has no title to materials from excavation and demolition (e. g. copper)

5.1.7 Cooperating with and obtaining acceptance of others

Other *Contractor* s may be working in the same area as the work of this contract. In this regard, the *Contractor* co-ordinates his work with the *Project Manager* to maintain harmonious working conditions on Site.

During the progress of the works the *Contractor* provides access to others who also execute work in the same area, on an as and when required basis.

The *Contractor* makes his own assessment of the problems and difficulties which may be encountered for providing access to and interfacing with others (this includes access difficulties experienced during construction or commissioning phase).

5.1.8 Publicity and progress photographs

The taking of photographs at the Power Station including the Project works is restricted and subject to the approval by the *Project Manager*.

For the purpose of the Progress Reporting Requirements, the *Project Manager* may prohibit the taking of such photographs and/or require that all such photographs be taken by an official *Employer* photographer. In the latter event, the *Contractor* is required to make arrangements directly with the photographer for the

taking of the photographs required by the *Contractor* for the purpose of the Progress Reporting Requirements.

5.1.9 Contractor's Equipment

- a) The *Contractor* provides all Equipment that is required to complete the works.
- b) The *Contractor* must ensure that all his construction labour and equipment remain within the fenced off allocated construction area.
- c) The *Contractor* must ensure that any staff, labour, or equipment moving outside his allocated construction site does not obstruct the normal operation of the power station. Any additional access routes required must be coordinated with the *Project Manager*.
- d) The *Contractor* must keep 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.
- e) All Equipment used by the *Contractor* in providing the Works must comply with the General Machinery Regulation 4 of the Occupational Health and Safety Act (Act 85 of 1993).

5.1.10 Equipment provided by the Employer

No Equipment will be supplied by the *Employer*; however, the *Employer* does reserve the right to negotiate with the *Contractor* that different equipment be used of another origin for whatever purpose that may become apparent at the time.

The *Contractor* supplies all equipment including cranes, scaffolding and other earthmoving equipment for the construction of the works.

5.1.11 Site services and facilities

5.1.11.1 Site Yard

Site Yard for the *Contractor* must conform to the *Employer's* Safety Health and Environmental Specification 240-127760320 which will be provided. It is required, for the proper co-ordination and execution of the works that the *Contractor* has an office on site for the duration of the contract.

A site will be made available to the *Contractor* for his yard. The proposed site will be shown to the *Contractor* during the site meeting or clarification meeting. The yard will be used by the *Contractor* for the establishment of his offices, workshop, and stores.

The *Contractor's* yard is subject to periodic inspection by the *Project Manager*/delegated person.

The location of the nearest sewer manhole, power distribution point, portable water connection storm water channel and road access point is indicated by the *Employer*. The *Contractor* is responsible for connection to the closest point of supply. If the *Contractor* has to provide his own services, it will be mentioned to the *Contractor*.

5.1.11.2 Supply of Electricity

Electricity may be made available for construction purposes free of charge from power points which will be indicated by the *Project Manager*. The *Contractor* is responsible for the provision of the reticulation system from the point of supply. Both 220 (AC) Volt and 380 (AC) Volt are available on request. All points of supply requested by the *Contractor* are provided in terms of quantity and location at the discretion of the *Project Manager*. If not so, the *Contractor* will be notified that the *Employer* will provide electricity.

On secluded areas, where there is no supply point, it is the responsibility of the *Contractor* to provide the temporary power supply for their operations.

No guarantees of power supply quality are given, and power supply breaks of some duration may occur without warning. Planned outages are also a possibility. The *Contractor* makes arrangements at his own expense to improve continuity and quality of power where necessary for any reason and no claim of any nature relating to power failures is considered.

No connection is made to the permanent installation at the Power Station without the prior acceptance of the *Project Manager*.

The power supply is managed in accordance with the latest revision of the Eskom safety regulations i.e.:

- a) 32-846, Operating Regulations for High-Voltage Systems
- b) 36-681, Generation Plant Safety Regulations
- c) COC for the site installation is required prior to power being switched on.

5.1.11.3 Lighting

The *Contractor* at his own expense provides temporary local lighting in accordance with the requirements of the OHS Act as amended. The *Project Manager* provides no local lighting. All construction lighting is the responsibility of the *Contractor*.

5.1.11.4 Water

Water will be made available on request free of charge from water points on site. The *Contractor* supplies at his own cost all the necessary connections, fittings, piping work, temporary plumbing, and pumps necessary to lead water from the *Employer's* points of supply to the various points where it is required. The *Contractor* is responsible for maintaining this equipment and for removing it at Completion of the whole of the works.

The *Project Manager* does not guarantee continuity of supply and the *Contractor* makes his own provision for standby supplies to maintain continuity of work. Claims of any nature relating to discontinuity of water supply are not considered.

5.1.11.5 Roads

The *Contractor* provides temporary access points from the prescribed routes and roads to the points where the *Contractor* is required to perform work, having first obtained permission in writing from the *Project Manager*.

5.1.11.6 Setting-Out Beacons

The *Project Manager* provides permanent beacons marking the main setting out grid lines for the works, and permanent level benchmarks.

The *Contractor* takes reasonable steps to preserve beacons and benchmarks provided by the *Project Manager* who is not to be held responsible if any existing beacons are removed as long as other beacons exist.

5.1.12 Facilities provided by the *Contractor*

5.1.12.1 *Contractor's* Yard, Offices, Workshops and Stores

It is required, for the proper co-ordination and execution of the works that the *Contractor* has an office on Site for the duration of the contract.

The *Contractor* includes in his establishment rates for all further treatment of the yard areas that he considers necessary for his entire operation throughout his period of occupation and under all weather conditions. The *Contractor* also includes for all security fencing, security, and access arrangements. The yard will be always kept clean and tidy, this will include all workshops and storage areas under the control of the *Contractor*. Maintenance of the yard is the *Contractor's* responsibility and is for the *Project Managers* acceptance. If the Employer will provide a complete site yard, the Contractor will be advised.

Outfall drainage of all surface run-off drains is constructed by the *Contractor* to the acceptance of the *Project Manager* to minimise erosion and to effect control of contaminated water. The *Contractor's* plan for the layout of his yard area is accepted by the *Project Manager* prior to occupying the yard and the *Contractor* does not occupy any site area other than that allocated to him. The *Contractor's* plan states fully what measures are taken regarding removal and storage of topsoil, stabilisation of eroded areas and further loss of topsoil.

The *Contractor* complies with the environmental policy given in the Site Regulations. The *Contractor* provides, erects, and maintains for his own use adequate size office accommodation and stores together with such drainage, lighting, heating, and hot and cold-water services as may be required. Provision is also made for adequate parking and a turning area adjacent to all therefore said structures.

The *Contractor* dismantles and clears the yard of all such temporary structures and associated foundations and infrastructure at the direction of the *Project Manager* on Completion of the whole of the *works*. No such dismantling and clearance work is carried out without prior acceptance from the *Project Manager*. The *Contractor* must make provision for carrying out of all quality control testing required in terms of the works involved. This must include, but is not limited to, the following:

- Soil grading analysis from 0.075 mm up to 100 mm as per Technical Methods for Highways (TMH) 1 A1a) and A5.
- Soil testing for Atterberg limits as per TMH 1 A2-A4.
- Soil density testing (nuclear and sand replacement as per TMH 1 A10).
- Soil testing for moisture content.
- DCP testing.

The *Project Manager* will either provide a laboratory on site or may make use of approved external laboratories. Results of testing will only be accepted if carried out by an accredited laboratory.

5.1.12.2 Telecommunications

Neither a network point nor a telephone is available on site. Should the *Contractor* require one, he is to make his own arrangements with relevant authorities. Arrangements may also be made to use the telephones of the station if they are available. Should the *Contractor* wish to use radio communication equipment on site, he will make his own arrangements with the relevant authorities. In this case, he is requested to liaise with the head of security at the station to ensure that there is no interference with existing channels or equipment.

5.1.12.3 Sanitary Facilities and Refuse

The *Contractor* is to supply own sanitary facilities at his *Contractor's* yard. A refuse control system will be established by the *Contractor*. All waste and refuse will be collected and disposed of as directed by the *Project Manager*, at the Power Station refuse disposal site. If the Employer will provide this service, the Contractor will be advised accordingly.

5.1.12.4 Equipment/Appliances

Any electrical Equipment, or appliances, used by the *Contractor* conforms to the applicable OHS Act safety standards and is maintained in a safe and proper working condition. The *Project Manager* has the right to stop the *Contractor's* use of any electrical Equipment, or appliance, which, in the opinion of *Project Manager*, does not conform to the foregoing Inspection of equipment/appliance that will be done as required by OSH Act.

The *Employer* may assist the *Contractor* with the off-loading of equipment, plant, and material but the responsibility for off-loading remains with the *Contractor*.

Any special tools and equipment to be used on site for the execution of the *works* is the responsibility of the *Contractor*.

5.1.13 Existing premises, inspection of adjoining properties and checking work of others

The works are mostly Civil Earth works and no adjoining properties will be affected. Additional requirements are stipulated in 6.3.6.3 below.

5.1.14 Survey control and setting out of the works

The *Project Manager* designates the working area boundary limits and assigns for the *Contractor's* use access roads, parking areas, storage areas, existing facilities areas, and construction areas. The *Contractor* does not trespass in or on areas not designated for his work.

The *Contractor* is responsible for keeping *Contractor's* personnel out of areas not designated for *Contractor's* use, except, in the case of isolated work located within such areas for which the *Contractor* is authorized to do so.

The control points will be established by the *Contractor*. Land surveys will be done by the *Contractor* before and after clear and grub, before and after topsoil strip and after final excavation before construction commences.

The *Contractor* will ensure that application for excavation permit is done well in advance before any excavation work can start in an area. A copy of the excavation permit with the drawings will be handed to the *Employer* for record keeping.

In addition, the survey information is to be according to the National LO co-ordinate grid system and is to be provided in digital format (either YXZ format or preferably in Model Maker file system ver. 7 or above). The following survey information is additionally required to approve construction works executed. This list is intended to give an indication of some of the survey work required and is not intended to be an exhaustive list of all the surveys that will be required.

- Detailed bottom of excavation survey, before placement of any layer works, clearly showing toe and crest lines of the basin excavation and embankment walls (for all works).
- Survey of invert level subsoil and leakage detection collection collector and outlet pipes to verify falls and length of pipes installed.
- Detailed survey of final High-Density Polyethylene (HDPE) liner surface, clearly showing toe and crest lines of the facility.
- As-built surveys of the bottom and top of primary and secondary Compacted Clay Liners to verify liner thickness, as well as of the final surface of the ballast layer, will be required.
- Inverts levels of storm water drains.
- Any extensions to stockpile areas.

Final As-Built survey information must be given to the *Supervisor* in the same format as what the setting out was given in the drawings. Final completion will not be processed before this survey information has been evaluated and verified using a DTM package.

5.1.15 Excavations and associated water control

Controlling water from excavations is done as required by the Environmental legislation and only after a method statement to this regard has been accepted by the *Project Manager*.

The *Contractor* must ensure that adequate pumping capacity is provided for the continual pumping of water from excavations. Water may be contaminated and should not be discharged into the environment unless tested.

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

Further to the provisions of this sub-clause, the *Contractor* must arrange with the *Project Manager* or the *Employer* to point out any underground or overhead services which may be affected by construction activities prior commencing with the Works.

The *Employer* will provide, to the best of their knowledge, layout of all the known underground services that may be impacted during the construction of the works. This is to assist the *Contractor* in identifying the location of the services. It is the responsibility of the *Contractor* to do proper scans to identify and manage all the underground services. Where necessary the *Contractor* must excavate trenches by hand under direction of the *Project Manager* or *Employer* to establish the exact location of services. The *Contractor* must be solely responsible throughout the contract period for the safety and protection of services.

Any unintended damage of the services/infrastructure must be repaired timeously and as per relevant standards/procedures. Repair of known services damaged by the *Contractor* must be to his account.

Any deviation of services affected by construction, whether carried out by the *Contractor* or other authority will be paid for by the *Employer*.

5.1.17 Control of noise, dust, water, and waste

The *Contractor* maintains a high standard of cleanliness during the conduct of his activities at the Power Station. This includes areas allocated for storage of materials, site offices etc. to the satisfaction of the *Project Manager*. The *Contractor* keeps these areas clean and free from accumulation of waste materials and refuse regardless of the source.

The *Contractor* ensures during sweeping and dusting, that a minimum amount of dust is liberated into the atmosphere. Cleaning by vacuum cleaners is preferred and the use of compressed air for cleaning is prohibited.

The *Contractor* is responsible for the prompt removal of all waste to a designated disposal area. The disposal area will be on or in the vicinity of the Power Station and be indicated by the *Project Manager*.

For the purpose hereof, "waste" any matter, whether liquid or solid or any combination thereof, which is a by-product, emission, residue or remainder of any process or activity carried out in connection with the works and which is not reused on the Site in the ordinary course of carrying out the works within seven days of production.

The *Contractor* provides an adequate number of marked bins and containers at offices, in yards, at workshops and on the Site for the temporary storage of waste. These bins and containers are subject to approval by the *Project Manager*. The *Contractor* is required to segregate certain items of waste by type as designated by the *Project Manager*.

Bins and containers are emptied, and waste is removed to the designated area at least once a week. All the temporary storage areas for bins and containers are kept tidy and must not constitute a nuisance to others. The *Contractor* takes all required steps to avoid spillage of waste alongside the bins and containers during removal and disposal thereof.

All waste that cannot be contained in either a bin or container is placed on a temporary waste site which the *Project Manager* identifies. The waste is removed as soon as possible but, in any event, at least once a week. No burning of waste is allowed at the Power Station.

Hazardous waste is dealt with in accordance with the safety, health and/or environmental requirements of the *works* and the *Contractor* is solely responsible for the proper disposal thereof. Hazardous waste will be disposed of at an authorised landfill site. A waste manifest will be kept for record keeping and hand over at the end of the Project.

5.1.18 Sequences of construction or installation

The *Contractor* is responsible for the construction and installation of the equipment according to the *Contractor's construction* and installation plans.

The *Contractor* complies with the *Employer's Work Co-ordination Process*.

Without derogating from the provisions of the Conditions of Contract, the Work Co-ordination Process is used by the *Project Manager* to monitor and manage activities on the Power Station and to facilitate the integration and co-ordination of the various *works* by others.

If not included in the contract, the *Project Manager* will notify the *Contractor* of the requirements of the Work Co-ordination Process prior to the date of site establishment by the *Contractor*.

5.1.19 Giving notice of work to be covered up

The *Contractor* provides a notice of work to be covered up to the *Project Manager*.

5.1.20 Hook ups to existing works

The adjacent plant and equipment may not be modified without written permission from the *Project Manager*. The *Contractor* complies with Eskom Life Saving Rules and will report any non-conformance.

5.2 Completion, testing, commissioning, and correction of Defects

5.2.1 Work to be done by the Completion Date

On or before the Completion Date the *Contractor* must have done everything required to provide the Works. 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.

5.2.2 Use of the works before Completion has been certified

After the completion of each construction phase of works, the constructed phase will be opened for operation.

5.2.3 Materials facilities and samples for tests and inspections

Not applicable to this project.

5.2.4 Commissioning

This Works Information covers the Civil Works only.

5.2.5 Start-up procedures required to put the works into operation

The *Contractor* gives the *Project Manager* written notice that the works are ready for energisation. Such notice will suit the requirements of the *Employer* but will not, unless otherwise agreed, be less than 48 hours or more than fourteen (14) calendar days.

No alterations or adjustments will be made to the works after functional checks are done without the *Project Manager's* written permission.

At this stage the following must have been achieved:

- a) Installation and pre-commissioning completed.
- b) Testing report and the associated certificates received.
- c) Signed erection and safety clearance certificates.
- d) Final Draft of the Technical, Operating, Maintenance manuals delivered.
- e) QCP documentation received.

5.2.6 Take over procedures

The *Contractor* will prepare data books with the assistance of the *Employer* and will provide hand over procedures to the *Contractor*.

5.2.7 Performance tests after Completion

The *Contractor must* carry out necessary tests after completion to demonstrate that the performance of the Plant is in accordance with the *Employer's* Works Information requirements.

The *Contractor* will be required to provide a detailed method statement on how this verification will be achieved and any instrumentation/equipment required must be part of the system provided by the *Contractor*.

5.2.8 Training and technology transfer

The *Contractor* provides training on the equipment and systems included as part of the *works* to the various categories of the *Employer's* technical staff (operators, maintenance, and *Project Management* personnel) for the duration of the *works*.

Training provided by the *Contractor* is directly applicable to the actual equipment supplied for the *works*. Generalised training based on similar equipment is not acceptable. The local facilities for training provided by the *Employer* are a suitably sized air-conditioned room, as well as trainee and trainer desks, an overhead projector and flipchart or white board.

The *Contractor* submits to the *Project Manager* for acceptance a detailed training programme as well as a prospectus for each course. Course material is provided for the number of trainees as per the table above. The training schedule is incorporated in the Accepted Programme

5.2.8.1 Training of Maintenance Personnel

Maintenance is not expected to be part of the works.

5.2.9 Operational maintenance after Completion

It is not applicable to this *Employer's* Works Information.

Plant and Materials standards and workmanship

The standard specification for this project is SANS 1200 (1986) 'Standardised Specification for Civil Engineering Construction' as are applicable in their entirety and SANS 10409:2005. This document contains variations and additions to the standard specifications and therefore takes precedence where applicable. Variations and Additions contained in this document pertain to the following specifications:

Particular standards relating to items not In SANS 1200 91986) 'Standardised Specification for Engineering Construction' are outlined in the following specifications

1. PARTICULAR SPECIFICATION PAA: GEOMEMBRANE SHEETING
2. PARTICULAR SPECIFICATION PAB: NON-WOVEN PROTECTION GEOTEXTILES
3. PARTICULAR SPECIFICATION PAC: HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER
4. PARTICULAR SPECIFICATION PAD: GEOSYNTHETIC CLAY LINER (GCL)
5. PARTICULAR SPECIFICATION PAE: BENTONITE

5.3 Construction Investigation, survey, and Site clearance

5.3.1 PSA: Construction plant and tools

The *Contractor's* Plant and tools must be of modern design and construction, suitable for the duties required of them. They must be in sound working condition and must be sufficiently ample in capacity or number to enable the Works to be carried out efficiently and expeditiously.

If during the Contract, the *Project Manager* or the *Project Manager's* Representative considers that any item or items of constructional plant are in any way inefficient or inadequate to complete the Works within the Contract period, or do not meet the required safety standards, the *Project Manager* must have the right to call on the *Contractor* to either

- i. Put the constructional plant in order, or
- ii. Remove such constructional Plant and replace it with other efficient and /or safe Plant, or, and
- iii. Provide additional similar Plant or plant of greater capacity.

The *Employer* must have the right to stop all or part of the Works where constructional Plant not complying with required safety standards is being used until such time as the Plant has been made safe or replaced with approved Plant.

No additional payment will be made to the *Contractor* for expenses incurred in complying with any or all the above.

In addition, he must have available on the Site or readily available adequate standby Plant to ensure that operations designed to be executed continuously are not unduly disrupted because of breakdown of any Plant provided for such operations.

5.3.1.1 Survey and setting out

- i. Prior to any construction taking place the *Employer* Surveyor will supply *Contractor* with a Lidar Survey of the total area where the construction will take place and supply the relevant benchmark information to be used for the setting out of the works. This Digital Terrain Model (DTM) will form the basis for all original ground levels to be used for all cut and fill volume controls. The *Contractor* may carry his own checks regarding the DTM and the benchmarks and report any discrepancies to the

Project Manager. Once agreement has been reached the DTM and relevant benchmark information must be signed off as accepted by the *Contractor*.

- ii. Should the *Contractor* require additional benchmarks for the setting out of his works this must be discussed with the *Project Manager* and the *Employer* Surveyor. The *Contractor* must construct such benchmarks to industry standards which will be surveyed by the *Employer* surveyor and the relevant spatial data handed over to the *Contractor* for agreement and signoff.

DAM CONSTRUCTION

- iii. The *Contractor's* Surveyor will be responsible for the setting out of all works from the benchmarks supplied by the *Employer* Surveyor.
- iv. All earthwork volumes will be checked and approved by the *Employer* Surveyor before payments are made.
- v. The *Project Manager* will carry out random checks to ensure works are set out correctly
- vi. The following survey tasks will be required from the *Contractor* main surveyor for agreement with the *Project Manager*.
 - a. Ground levels must be recorded at 5m or 10m intervals on the centre line, upstream and downstream toe positions of all structures, embankments and fills after site clearance and again after:
 - removal of unsuitable material
 - Completion of excavations

The grids and lines for each survey operation must be co-incident in plan.

- I. Ground levels must be recorded at 10m intervals on the centre line left and right bank positions of all trenches, canals and drains after site clearance and prior to excavation and again on completion of the excavation to the required depths and grades.
- II. Ground levels must be recorded on a 15m grid over borrow areas immediately after site clearance. After removal of unsuitable materials and/or topsoil and/or fill material as required, a re-survey will be required on the ground and records levels as described above. The grids and lines before and after soil removal must be co-incident in plan. Where borrow areas are within the dam basin, the borrow areas must be re-surveyed on the same co-incident grid to form part of the as-built records.
- III. Upon completion of the works an as-built survey and with marked-up drawings are required showing as-constructed details and levels and positions of all embankments and structures. The survey must be in electronic format in an ASCII text file (-Y, -X, Z).

The *Employer* must inform the *Project Manager* on the completion of impoundment walls and trenches to design elevations and cross-sections. Thereafter, a check may be carried out by the *Project Manager* 's Representative to verify these elevations and cross-sections.

5.3.1.2 Watching, barricading, lighting, and traffic crossings

The *Contractor* must programme his Works in such a way that the area is always secure. The *Employer* reserves the right to suspend Works if, in his opinion, this requirement is not being complied with and, further, to make secure the area and recover any costs involved in labour and materials from monies due to the *Contractor*.

The *Contractor* must make provision for any temporary Works as may be required for the purpose of ensuring the safety of adjoining Works and property and for the protection of all persons or animals. He must be responsible for all damage, injuries and accidents that may occur through his omission of any necessary provision in this respect.

The *Contractor* must make full provision for all watching and lighting necessary for the protection of all persons, animals, vehicles, etc., from injury by reason of the Works. He must provide ample warning signs; guard rails, etc., around open trenches, stacks of material, excavated materials, debris, or the like, and must provide walkways over trenches wherever required for the convenience of the public.

The *Contractor* must provide and maintain all necessary temporary protection of finished and/or existing Works liable to be damaged during the progress of the Works by properly covering up, isolating, etc., Power Station: Ash Dump. The *Contractor* must be responsible for any damage which may occur and must make good at his own expense.

Every excavation which is accessible to the public, including the *Employer's* personnel, or which is adjacent to public roads or thoroughfares, or whereby the safety of persons may be endangered must be:

- i. In accordance with SHE Rules for *Contractors*
- ii. Provided with red warning lights, or other boundary indicators, which are clearly visible at night, or when visibility is poor.

The *Employer* reserves the right to stop any Works in progress which he deems to be unsafe and to expedite all necessary and appropriate action. All costs in this regard will be to the *Contractor's* account.

The *Contractor* must so arrange his Works that flow of the *Employer's* vehicular and pedestrian traffic can be always maintained. In this respect, it may be necessary that culverts, and pipes be constructed in sections.

All work must be arranged so that onsite operations and pedestrian traffic can be always maintained.

5.3.1.3 Pollution

The *Employer* will provide adequate containers with lids for the disposal of refuse. Containers must be provided at the Site for employees and if applicable at the Site office. The *Contractor* must ensure that his employees do not pollute any Works areas with refuse.

All domestic and general waste generated by the *Contractor* during the execution of the Works must be neatly maintained, in accordance with the requirements of the EMP and SHE Rules. All waste must be disposed of on a regular basis in the same way as the Power Station disposes of its waste. The *Contractor* is to familiarise himself with the preferred disposal Site and associated procedures for all his waste disposal requirements during construction.

In general, no on-Site disposal of domestic and general waste will be permitted.

Inert construction waste must be collected and dumped by the *Contractor* at locations approved by the *Project Manager* and/or *Employer*. The dumps must be covered by soil.

5.3.1.4 Safety

The *Contractor* must comply with the Occupational Health and Safety Act (Act 85 of 1993) and its Regulations. The Construction Regulations, 2003 (Government Gazette No 5207) must be always adhered to.

The *Contractor* must have no grounds for a claim against the *Employer* for extension of time and/or additional costs if the construction of the works or any part thereof is suspended by the *Project Manager* in terms of the Conditions of Contract for breach of the requirements of the above legislation.

All *Contractor's* Equipment, constructional plant, Temporary Works and Materials used by the *Contractor* and the Works carried out by the *Contractor's* personnel are subject to the safety regulations of the *Employer* (SHE Rules) and thereby also subject to the inspection and acceptance by their officials at all times.

The *Contractor* must prominently display a copy of this Act.

5.3.1.4.1 Health and safety plan

The health and safety plan required by the Act and supporting Regulations must include, but not be limited to, the following:

- Occupational health and safety policy
- Administrative requirements
- Risk identification and assessment including maintenance of all registers
- Training
- Incident and accident reporting
- Incident and accident investigation
- First aid
- Occupational health and safety representatives
- Occupational health and safety committees
- Permits
- Certificates of competence and compliance Permits
- Audits and inspections
-

5.3.1.4.2 Health and safety file

Every *Contractor* must ensure that a health and safety file, which must include all documentation required in terms of the provisions of the Act and the relevant Regulations, is kept on site and made available to the client, agent, or inspectors on request.

A Principal *Contractor* must hand over a consolidated health and safety file to the client upon completion of the construction work and must, in addition to the documentation referred to in the regulations, include a record of all drawings, designs, materials used and other similar information concerning the completed works.

A Principal *Contractor* must ensure that in addition to the documentation required in the health and safety file as determined in the regulations, a comprehensive and updated list of all sub- *Contractor* s on site accountable to the principal *Contractor*, the agreements between the parties and the type of work being done are included and available.

5.3.1.4.3 Safety officer

The *Contractor* must in accordance with the act and supporting regulations upon having considered the size of the project, the degree of dangers likely to be encountered or the accumulation of hazards or risks on the site, appoint a full-time construction safety officer with the necessary competencies and resources to assist him in the control of all safety related aspects on the site.

5.3.1.4.4 Health and safety training

The *Contractor* must provide employees with the necessary information and training or supervision that is necessary to enable them to perform their work safely and without risk to health and must ensure that every employee becomes familiar with work-related hazards and risks and the measures that must be taken to eliminate, control and minimize those hazards and risks.

5.3.1.4.5 Personal protective clothing and equipment (PPE)

All employees employed on the construction site and visitors must wear clothing and equipment as prescribed in the site hazard analysis. The *Contractor* must identify tasks requiring protective clothing and equipment and issue the necessary to employees on site.

Employees must maintain all PPE in a safe, clean condition. Personnel not wearing PPE where PPE is prescribed will be disciplined in accordance with the company's disciplinary code of conduct.

5.3.1.4.6 Method of construction

Acceptance of the Works does not signify acceptance of methods of construction and does not in any way relieve the *Contractor* of any of his responsibilities for the Works, and it must not be used as a basis for claiming compensation where the proposed methods of construction do not comply with the requirements of construction.

The *Project Manager* reserves the right to instruct the *Contractor* to supply, for approval prior to the start of the activity, a detailed method statement for any construction activity.

5.3.1.4.7 Site instruction book

A communication and site instruction book/diary must be made available onsite to record all requests and decisions made.

5.3.2 PSC: SITE CLEARANCE: South African National Standards (SANS) 1200c

5.3.2.1 PSC: Disposal of material

All material from the clear and grub exercise is to be placed in a neat stockpile(s), as directed by the *Project Manager*. The disposal area must be within a one-way distance of 2 000 m of the area from which it was excavated.

Vegetation and wood from the clearing operations must be disposed of either by stockpiling as firewood at designated locations, or by stockpiling and burning within the basin area if authorized in writing by the *Project Manager*. The *Contractor* must provide a waste management document for approval.

Any burning must take place within a cleared area, under strict supervision, after obtaining all necessary burning permits and the *Project Manager*'s approval, to ensure that no fires can spread to the surrounding areas.

Adequate firefighting equipment must be available during and for sufficient time after all burning operations to eliminate all fire hazards. The *Contractor* must be liable for any damage which occurs due to fires running out of control.

5.3.2.2 PSC: Conservation of topsoil

Where overburden or material resulting from clearance of the Site is acceptable for use as topsoil, it must be stockpiled adjacent to the Site from which it is stripped for later use on embankment slopes and elsewhere where topsoil is specified or required. Topsoil not required for the Works must be stockpiled in a designated topsoil stockpile for later use by others.

5.4 Building works

Major part of the works involves Civil and Earth works. There are no significant building works on these contracts.

All minor buildings must be done as per the relevant building standards or procedures.

5.5 Civil Project Management, PSD EARTHWORKS: SANS 1200D and Structural Works

During the construction of the works there are numerous standards and specifications to which the *Contractor* must adhere to, the documents listed below is not bound in this document but must be adhered to during the construction of the works:

- SANS 1123: uPVC Rainwater Components
- SANS 62: Steel Pipes
- SANS 190: Expanded Metal
- SANS 191: Cast steel Gate Valves
- SANS 533: Polyethylene Pipes
- SANS 664: Cast Iron Gate Valves for Waterworks
- SANS 665: Cast Iron Gate Valves
- SANS 676: Reinforced Concrete Pressure Pipes
- SANS 677: Concrete Non-Pressure Pipes
- SANS 719: Electric welded low carbon steel pipes for aqueous fluids (large bore)
- SANS 878: Ready-mixed Concrete
- SANS 966: uPVC Pipes
- SANS 986: Pre-cast Concrete Culverts
- SANS 1123: Pipe Flanges
- SANS 1200: Standardised Specifications

The most current revisions of following SANS 1200 Standard Specifications for Civil *Project Management* Construction must form part of this Contract (these specifications are available at the *Contractor* 's expense from the SA Bureau of Standards, 1 Dr Lategan Road, Groenkloof, Private bag X 191 Pretoria, 0001):

- SANS 1200 A: General
- SANS 1200 AB: Project Manager 's Office
- SANS 1200 AD: General (small dams)
- SANS 1200 AH: General (Structural)
- SANS 1200 C: Site clearance
- SANS 1200 D: Earthworks
- SANS 1200 DE: Small earth dams
- SANS 1200 DK: Gabions and pitching
- SANS 1200 G: Concrete (Structural)
- SANS 1200 GA: Concrete (Small works)
- SANS 1200 GB: Concrete (Ordinary Buildings)
- SANS 1200 GE: Pre-cast Concrete (Structural)
- SANS 1200 GF: Pre-stressed Concrete
- SANS 1200 H: Structural Steelwork
- SANS 1200 HA: Structural steelwork (sundry items)
- SANS 1200 HB: Cladding and Sheeting
- SANS 1200 HC: Corrosion Protection of Structural Steelwork
- SANS 1200 HE: Structural Aluminium work
- SANS 1200 L: Medium-Pressure Pipelines
- SANS 1200 LB: Bedding (Pipes)
- SANS 1200 LC: Cable Ducts
- SANS 1200 LD: Sewers
- SANS 1200 LE: Storm water Drainage
- SANS 1200 LF: Erf Connections (Water)
- SANS 1200 LG: Pipe Jacking

- SANS 1200 M: Roads (General)
- SANS 1200 ME: Sub-base
- SANS 1200 MF: Base
- SANS 1200 MFL: Base (Light Pavement Structures)
- SANS 1200 MG: Bituminous Surface Treatment
- SANS 1200 MH: Asphalt Base and Surfacing
- SANS 1200 MJ: Segmented Paving
- SANS 1200 MK: Kerbing and Channelling
- SANS 1294: Pre-cast Concrete Manhole Sections and Slabs
- SANS 1315: Polypropylene Pressure Pipes
- SANS 1476: Fabricated Flanged Steel Pipe work
- SANS 4427: Polyethylene (PE) pipes for water supply – Specifications
- SANS 10409 2005: Design, selection, and installation of geomembranes
- SANS 10221: 1998: The testing of Geotextiles
- SANS 1526: Thermoplastics polyolefin sheeting for the use as a geomembrane
- SANS 1700-5-1: Fasteners Part 5: General requirements and mechanical properties Section 1: Mechanical properties of fasteners made of carbon steel and alloy steel - Bolts, screws, and studs
- SANS 10085: The Design Erection, Use and Inspection of Access Scaffolding

5.5.1 PSD: Excavation of trenches, canals, and foundation bases

The *Contractor* must excavate whatever materials are encountered to the depths, cross-sections and grades shown on the drawings. Excavated material not required or unsuitable for backfill and / or for embankment construction must be transported to and disposed of at a suitable Site away from the Site of Works as directed by the *Project Manager*. The disposal area must be within a one-way distance of 2 000 m of the area from which it was excavated.

The unit of measurement for all excavation (other than for the purposes of borrowing to fill) must be the cubic metre of in-situ material excavated (measured Nett). It should be noted that when excavations are cut through embankments for the placing of drains, pipes, pipe encasements, puddle flanges etc., the payment for these excavations must be based on Nett dimensions with the measurable depth of excavation limited to that of the maximum vertical dimension of the drain, pipe, or encasement structure at each particular cross-section. Similarly, the measurable width must be the design width of each particular cross-section. All costs associated with the excavation greater than these dimensions i.e., battering back (but excluding backfilling with concrete or soil in over break as stipulated), must not be considered for payment.

Working space for formworks insertion and removal inclusive of additional excavation and backfill compacted to specification will only be paid for where instructed in writing by the *Project Manager*. The measurement must be the square metre of shuttered face.

The rates tendered must allow for the operation as described and haulage to within a one-way distance of 2 000 m of the Site.

The bases of all excavations are to be inspected and approved by the *Project Manager* before backfilling commences or blinding is cast as the case may be.

Where applicable, the standard specification for preparation of rock surfaces must apply to hard, non-erodible rock surfaces. "Slush" grouting with 1:3 cement / sand grout may be required on hard, highly fractured rock and must be measured per square metre of specified thickness under the relevant billed item where instructed by the *Project Manager*.

Soft, erodible rock surfaces must be prepared by removal of all loose particles and moistened immediately before being covered with fill material, or grout as instructed by the *Project Manager*.

NB: Excavations for pipe plinths and anchor blocks must be so carried out and so trimmed to the outline of the concrete Works shown on the drawings that the excavated surfaces will act as forms for the concrete Works. No shuttering will be considered or paid for below ground level.

5.5.2 Excavation of unsuitable material below compacted walls

Unsuitable material (sludge) must be removed to such depths, widths and lengths as the *Project Manager* may determine once the dams or ponds have been dewatered. The material removed must be transported and disposed of at a suitable site in accordance with the EMP guidelines or as directed by *Employer* away from the Site of Works or stockpiled for re-use as directed by the *Project Manager*.

The unit of measurement for unsuitable material removal must be the cubic metre of in-situ material removal (measured Nett). The rates must allow for the operation as described and haulage to within 2000 m of the Site.

5.5.3 Preparation of approved natural soil beneath compacted basin or slopes

Prior to commencement of construction of compacted embankments, the approved natural soil beneath the base areas must be prepared by ripping or other means to a depth of 300mm, water added, if necessary, mixed, and then compacted to the approval of the *Project Manager* by not less than eight passes of an approved six metric tonne roller (method) or to 95% Standard Proctor dry density as directed by the *Project Manager*.

It is imperative that this layer is compacted to such a degree to ensure that the indicated densities and moisture contents or such lesser densities and corresponding moisture contents as may be specified by the *Project Manager* can be achieved on subsequent layers.

The unit of measurement for ripping, watering, processing and compacting the approved founding layer is the design square metre.

5.5.4 Construction of final basin and slope layers

The final basin and slopes must be constructed or shaped by obtaining selected soil from excavations, approved borrow pits or stockpiles or commercial sources and prepared the same into a homogeneous mix in a manner and location approved by the *Project Manager* and then forming it to the dimensions and elevations given on the drawings.

Material forming the final basin and slopes must be compacted in layers as detailed in Clause 5.2.3.1 and of regular appearance with all cross-sections having the minimum sizes detailed on drawings and having side slopes not steeper than specified. The sides of the embankments must be compacted to hard durable faces. Any spoil resulting from this operation is to be removed and disposed of at no extra cost.

The unit of measurement for embankment construction must be the design cubic metre of placed material after compaction, trimming and forming to the specified dimensions. The *Contractor* will not be paid for embankments constructed in excess of the dimensions specified. The *Project Manager* will decide on acceptance or rejection of embankments which are oversized.

The *Contractor* is to allow in his rate for re-shaping the slopes and compacting the slopes to the final shape and size.

Material suitable for basin and slopes shaping construction should fit within the bounds defining G7 or G9 material as a minimum. The material must be verified from onsite investigations against these criteria before use.

Test of suitable material must form a smooth curve within the bounds of the grading envelope. The *Contractor* must carry out sufficient tests to satisfy himself about the consistency of material placed in the embankments. Check tests will be carried out by the *Project Manager* and the results made available to the *Contractor*. Material not conforming to the specifications should be blended to achieve requirements, or, failing this, the material must be spoiled. Any material containing organic material is unsuitable and must be stockpiled for later use as topsoil cover on the ash dump final surface.

5.5.5 Borrow pits (if applicable)

5.5.5.1 General

Borrow pit areas must be kept to a minimum. Opening of borrow pit areas must be limited to the areas required to provide material for construction. Areas not authorized by the *Project Manager* and surplus to requirements will not be considered for payment.

The *Contractor* must be responsible for ensuring that materials obtained from borrow pits conform to the material requirements specified by the *Project Manager*. These criteria include in brief terms, the material particle size distribution (i.e., grading envelope) minimum density and moisture content requirements.

To this end the *Contractor* will be required to excavate a reasonable number of trial pits at his own cost to prove suitability of each borrow area location.

The *Contractor*, unless otherwise directed, must obtain the required material by borrowing in these areas to such widths, lengths and depths as the *Project Manager* may direct, no payment for removal of borrow material to fill will be made. (Payment will only be made for the formation of basin and slopes or as selected fill where applicable).

Furthermore, in all instances (unless otherwise waived by the *Project Manager*), the *Contractor* will be required to bring to the Optimum Moisture Content (OMC) range, material in the borrow pits designated for construction use. Such material must have a uniform moisture content before leaving the borrow area(s).

No polluted water is to be used in any moisture conditioning requirement for materials used in the Works.

Payment for the opening of borrow areas not allocated by the *Project Manager*, will not be considered.

Borrow from borrow pits will normally be limited to material which can be loosened using mechanical rippers having a minimum fly wheel power of 130 kW and operating weight of 23 000 kg (e.g., a Caterpillar D7, Komatsu D85) in good condition and driven by a competent operator. All borrow areas are to be left in a safe and neat state as directed by the *Project Manager* at no extra cost.

Should stripping of unsuitable material overlying suitable material in a borrow pit be required, it must be to such depths as determined by the *Project Manager*. These unsuitable materials must be disposed of at a suitable Site near the borrow area or as directed by the *Project Manager*. The disposal area must be within a one-way distance of 2 000 m of the area from which it was removed.

The unit of measurement for unsuitable material removed must be the volume of in-situ material removed measured in cubic metres. The rates tendered must allow for the operation as described, including haulage to within 2 000 m of the borrow area, and, stockpiling or spreading and sloping as required by the *Project Manager*. The disposal area is to be left as described in Clause 5.2.2.3

5.5.5.2 Borrow pits restrictions

Fill material for all compacted basin and slopes must be free of all surface vegetation and approved by the *Project Manager*. This material will generally be obtained from the following sources:

- Borrow pit(s) within the confines of the *Employer's* property,
- Suitable spoil from trenches and excavations,

- Borrow areas outside of the *Employer's* boundaries and
- From commercial sources.

Under no circumstances must fill for compacted basin and slopes be obtained from the following areas:

- 2.0 m either side of the area of the toe drains,
- 2.0 m either side of the centre line of the drainage outlet trenches and
- 2.0 m downstream of the any pond or dams
- Within 30 m from the inside toe of the inner perimeter wall.

Should these restrictions not be adhered to, the *Contractor* must, at his own expense, restore the original ground level in the affected areas by compacting selected material to the specifications provided by the *Project Manager*.

Borrow pit areas must be neatly and safely finished off and unused material must be levelled off and compacted within the pits. Final sides of borrow pits must not be steeper than 1 vertical in 3 horizontals.

The costs of these Works are deemed to be included in the rates for excavation of unsuitable to waste and / or placing fill from borrow.

5.5.6 Compaction to a specified density

5.5.6.1 General

The standards of compaction required are shown on the drawings and densities obtained must be not less than the minimum specified Proctor density. The Proctor density described herein is the Standard Proctor – unless otherwise stated.

All compacted fill material is to be placed in horizontal layers and compacted in loose layers, with a depth not greater than 200mm, to a density not less than the minimum specified density. It should be further noted that a uniform moisture content (as per specification) is to be achieved throughout the loose layer prior to compaction. (Refer to materials preparation in Clause 5.2.3.1).

All compaction must be carried out in a direction parallel to the centre line of the earthworks, working on a predetermined pattern that must ensure that the whole area of the layer receives uniform compaction.

The moisture content must, unless otherwise specified, be in the range between two per cent (2%) below and two per cent (2%) above Standard Proctor Density optimum moisture content, (or any other range specified on the drawings or by the *Project Manager* from time to time) whichever is applicable.

Compacted layers with non-uniform moisture contents or moisture contents outside the specified range are deemed to have failed regardless of the densities achieved. The required moisture content must be distributed uniformly throughout each layer of material.

Suitable compaction equipment must be utilized to ensure efficiency of operations. Layer thicknesses are to be always maintained to specification. Preparation of each newly laid layer prior to placement of each additional layer should specifically involve:

- Scarification of the approved layer (newly laid compacted layer).
- Watering of the approved in-situ layer prior to bringing in the next loose layer.

5.5.6.2 Compaction control

The *Contractor* must provide an adequate Site laboratory, equipment, facilities, and experienced and competent personnel for carrying out the required compaction tests. Should the *Project Manager* at any time consider any of the above to be inadequate for this purpose, he must instruct the *Contractor* to cease further

Works on compaction or other laboratory related Works until such time as the *Contractor* has remedied the deficiency.

The onus must be on the *Contractor* to ensure the following:

- i. That the state of the material when placed is such that the compaction as specified in the drawings will be obtained.
- ii. That material selected for use in compacted embankments must be approved by the *Project Manager* based on the maximum dry density (Proctor or Mod American Association of State Highway and Transportation Officials (AASHTO), whichever is applicable) being equal to or greater than a minimum density to be specified by the *Project Manager* as well as being at the required moisture content, and, on the basis of the particle size distribution of the material falling within a specified envelope

Hence with the object of controlling the selection and compaction of all materials used in the various layers of fill, grading analysis and/or Standard Proctor density tests must be performed; whichever is applicable. Corresponding moisture content evaluations must also be done on each type of material to be used, this includes mixed or blended materials.

No polluted water is to be used in any moisture conditioning requirement for materials in the Works. In addition to the tests required for his own control the *Contractor* must allow for at least two density checks per 1000 square metre block of material compacted per layer, or, in the case of narrow widths (as determined by the *Project Manager*) at least 2 tests per 100m of narrow strip. The recognised method of determining the density is the sand replacement test. However, the Radio Isotope or other approved method may be used (if approved by the *Project Manager*) for density and moisture checks, provided suitable agreement is obtained between this method and the sand replacement method and provided the necessary calibration and specified tests to these instruments are undertaken at intervals to be specified by the *Project Manager*.

If an alternative method of density determination is accepted, the sand replacement method must be used as a control check on a frequency determined by the *Project Manager* on site. The moisture content of the sample must be determined by oven drying as specified for the Standard Proctor compaction methods.

To account for material variability, approved density tests are to be accepted based on the following

- i. Basin compacted to 95% Standard Proctor Density: If any one of the two density tests per 1000m² block (or narrow strip) is below 95% then the entire block will be re-ripped, re-watered and re-compacted.
- ii. The compaction control tests must be carried out as laid down in "Standard Methods of Road Construction Materials, TMH 1" published by the National Institute of Transport and Road Research of the CSIR. Standard Proctor density tests must be carried out in accordance with procedures set out in American Society for Testing and Materials (ASTM) D 698.
- iii. Field density and moisture content tests are to be carried out within 6 hours after the completion of each section of the layer, unless otherwise agreed by the *Project Manager*.

The *Project Manager* reserves the right to order additional in-situ density tests at any location on any strip. When the compaction of any section of any layer, for which a density and moisture content is specified, is completed, test results must be made available to the *Project Manager*.

No subsequent layer is to be placed until such time as the previous layer has been approved by the *Project Manager* in writing.

Accurate records of all compaction control tests must be maintained throughout the construction process, i.e., test data, chainage, and layer elevation. These records must be always available on Site for inspection by the Project Manager.

Where tests reveal that the density or moisture content of any layer, at any depth, is not to specification, the layer must be re-ripped, re-compact and re-water. If the specified density cannot be obtained by further compaction of the material such material must be removed and replaced by material capable of yielding the specified density.

5.5.6.3 Testing adjacent to adjoining structures (if applicable)

Where compacted material abuts up against adjoining structures, at least two density tests must be taken per layer of contact material adjacent to the structure.

Such testing may be increased to confirm the density of the material in close proximity to such structures to ensure water tightness of the join. The *Project Manager* reserves the right to order additional testing or independent confirmatory testing as the situation warrants.

5.5.7 Stripping and stockpiling of topsoil

Topsoil from excavations and borrow pits must be stripped to such depths and extent as indicated on the drawings or as directed by the *Project Manager* and stockpiled for later re-use in rehabilitating the embankment side slopes or as otherwise required by the *Project Manager* in accordance with the ESIA/EMP requirements.

5.5.8 Safety precautions in excavations and Contractor's liability

5.5.8.1 Safety precaution

It is the *Contractor's* responsibility to ensure safety of all excavations and must ensure that all reasonable measures are considered to ensure that shoring or by side sloping of the ground takes place. The *Project Manager* reserves the right to instruct the *Contractor* to strut banks and sides of excavations, etc. and / or side slope of such banks and sides of excavations etc. over any surface where the excavations are dangerous and / or to conform with any safety precaution in terms of relevant regulations. Such instructions must be considered final and binding.

All strutting must be of sufficient strength to ensure the safety of all persons in the excavations and must be suitably arranged to permit the construction of whatever is necessary, and the *Project Manager's* decision as to this must be binding upon the works. The works must be immediately rectified if any strut is deemed by the *Project Manager* to be unsafe or of such character as will impede or impair the construction of the Works. No under-cutting of excavations will be allowed.

5.5.8.2 Contractor's liability

The *Contractor* must be responsible for making good, or having made good, at his own expense any slips, falls, caving in of ground, damage to walls, structures or Works caused by reason of his acts or Works, or by causes within his control and must indemnify the *Project Manager* against any claims made in respect of loss of life, or injury or damage to persons, animals or things, caused by reason of his Works or through causes in his control.

The *Contractor's* rates will be held to cover all such liabilities and the *Project Manager* must have the right, if they must have suffered loss by reason of the above, to deduct the value of such loss from any monies due or that may become due to the *Contractor*.

5.5.9 De-watering

Suitable pumps, pumping equipment, well points must be operated and maintained and all other water devices necessary to properly de-water and maintain free from water all excavations and all groundwater until completion of the Works. No work must be executed in water without the written permission of the *Project Manager*.

The whole of the Works must be thoroughly drained and clear of water as long as may be required. Channels or sumps excavated outside the works for dewatering purposes, must be refilled and made good to a standard equivalent to the original conditions (and as directed by the *Project Manager*) when they are no longer required.

The *Project Manager* may order additional permanent works to be constructed to deal with springs or seepage liable to endanger the Works after completion of the Works.

5.5.10 Spoil disposal

Dumping areas (which may include used borrow pits) must be allocated for the disposal of all surplus material from clear Site operations, excavations, removal of unsuitable material, and for topsoil stripped from the Site etc. Such areas must be within a one-way distance of 2 000 m of the Sites of excavation.

These areas must be maintained in a neat condition and when completed, levelled off by grading to within 150 mm from level or a given surface as directed. The rates tendered must allow for all such levelling and trimming and for haulage within a one-way distance of 2 000 m from the Sites of removal.

Dumping area must be approved by the *Project Manager*.

5.5.11 Surfaces

5.5.11.1 Backfilling

Backfilling to foundations and trenches must be carried out by replacing selected excavated material in loose 150mm or 200mm layers or as specified on the drawings, each layer being thoroughly compacted, rammed and / or consolidated before the succeeding layer is placed or such other ways as may be directed by the *Project Manager*. In areas where specified compaction densities and moisture contents are required for backfill, then the identical testing and approval procedures as outlined in Clause PSD 6. will be enforced.

Heavy compaction equipment may not approach so close as to cause damage or permanent displacement of structures.

Any defects caused due to subsidence of the backfilling, must be repaired at the ground surface, by filling by banking to a height of about 100mm above the level of the adjacent ground surface to allow for any settlements and before completion of the Works.

Care must be taken to ensure that any structures being buried are not damaged by the compaction effort. Repairs for and damage arising from this must be for the *Contractor*'s account, and items for repair or replacement must be indicated and accepted by the *Project Manager* at his sole discretion.

5.5.11.2 Over excavation

Backfilling to over-excavation below the required levels or depths necessary to obtain a suitable bottom is to be carried out to the instructions and satisfaction of the *Project Manager* and entirely at the *Contractor*'s expense as follows:

- i. **Material not for structural Support** - Where the material excavated is not required for structural support, the over-excavation must be filled with selected material, free from stones in 150mm or 200mm layers or as specified on the drawings and compacted to a density not less than that of the surrounding undisturbed material at the designated moisture content.
- ii. **Material for Structural Support** - Where the material excavated was required for structural support, the over-excavation must be backfilled with 15 MPa/19mm concrete (or concrete of other strength and or aggregate sizing to be specified by the *Project Manager*) including all necessary work etc to prevent its inclusion with the structural concrete.

5.5.11.3 Surface to receive concrete

Before any concrete is cast all foundation, surfaces must be clean and generally prepared to receive it to the satisfaction of the *Project Manager*. The same applies to placing of all other materials in excavations.

In no case must concrete or other materials be placed in any excavation until the approval of the *Project Manager* has been obtained.

5.5.11.4 Surface to receive liner

The Geomembrane Installer will be required to thoroughly check the finished earthworks surface ahead of installing the Geomembrane and to remove particles remaining that could damage the Geomembrane. No protruding sharp objects will be allowed. Checking and picking of the final layer will be the responsibility of the *Contractor*.

The surface must be inspected in the presence of the *Project Manager* before the sheets are installed. If the *Project Manager* is satisfied with the finished earthworks, he will sign the Substrate Clearance certificate to allow the Geomembrane Installer to commence installation of the plastic Geomembrane. Any subsequent repairs required to finished earthworks must be the responsibility of the *Contractor*.

The surface may require rolling just prior to laying of the geomembrane due typically to erosion tunnels caused by rainstorms and damage due to picking. This rolling is to be done by the *Contractor*.

5.5.11.5 Surface to receive underdrains

The ground surface on which the horizontal section of the under drains are to be constructed including drain outlet trench bases are to be prepared to the cross-section, grades and elevations shown on the drawings.

Prior to the placing of geofabric and permeable material the blanket section is to be trimmed, wetted if required and nominally compacted to the satisfaction of the *Project Manager*. The rate for the preparation of the base area of the blanket section and trench bases must be the design square metre prepared.

5.5.12 Measurements and excavation classification

5.5.12.1 General

All excavation quantities throughout, in all classes of material, will be measured nett. Such excavation quantities do not include for cut to fill operations from borrow areas where material removed will be measured in placed and or compacted fill. Excavations must be measured per cubic metre, divided into the following classes:

- i. **Material Class "A"** - This classification must include all kinds of ground encountered except those defined in Class "B" hereinafter and must include made-up ground, paving, rubbish, gravel, sand, silt, hard oukrip and calcareous material, clay, soft rock, ground interspersed with small boulders of rock not exceeding 0.5 m³ (one half of a cubic metre), dumped waste rock, material in compacted embankments and all other materials which can, in the opinion of the *Project Manager*, be excavated

by hand or by machine without drilling and blasting, or without the use of power breaking tools such as an hydraulic hammer,

- ii. **Material Class "B"**- In the case of canal, trench and small excavation, this classification must mean granite, quartz, dolomite etc, or rock of similar hardness which in the opinion of the *Project Manager* or his representative, can only be removed by drilling and blasting. Solid boulders in excess of 0.5 m³ (one half of a cubic metre) will be classified in this category. This classification must apply whether or not blasting is authorized.

In the case of bulk excavation this classification mean granite, quartz, dolomite etc. or rock of similar hardness found in its original position which cannot be loosened by a bulldozer having a minimum fly wheel power of 130 kW and operating weight of 23 000 kg (e.g., a Caterpillar D7, Komatsu D85 or equivalent in good condition, fitted with an approved single tine ripper and driven by a competent operator). This classification must apply whether or not blasting is authorized.

One rate has been allowed in the Schedule of Rates for Class "B" material to cover all types and depths of excavation work. Spoiling of Class "B" material must be as for Class "A" material. The excavation rate for Class "B" must therefore include any extra required for spoiling the rock.

Note: If the *Contractor* considers that any material to be excavated is classified as Class "B" above, he must submit a written request to the *Project Manager* or his representative for his ruling. Failing such a request, the excavations must be deemed to be in Class "A". The decision of the *Project Manager* as to the classification of the material must be final and binding.

5.5.12.2 Over break

The backfill to an over-break zone will either be a specified class of concrete or selected and compacted earth filling. In the case of compacted earth filling, this will be done in 150mm loose layers compacted at OMC to the specified density.

For the purpose of these Works, concrete backfill will be 15MPa/19mm and earth backfill will be selected and approved material compacted to 95% Proctor density at OMC. The type of filling to be used will be determined by the *Project Manager*. All backfilling will be to the *Project Manager*'s approval.

The same must apply to sloping surfaces. All over-break zones must be kept to a minimum.

5.5.13 Unauthorised excavation

An unauthorised excavation must be avoided where possible unless authorised by the *Project Manager*. The *Contractor* must always be in possession of an excavation permit when excavating activities are taking place.

5.5.14 Haulage

The *Contractor* must at his own cost construct and maintain temporary haul roads as required along the routes designated by the *Project Manager*. If the *Contractor* chooses, for reasons of his own, to transport material by a different route, the measurement of distance for transport will be along the routes designated by the *Project Manager*.

In the case of borrow pits, the *Contractor* must be restricted to the routes designated by the *Project Manager*. Free haulage of material excavated from a borrow pit, excavation etc or cutting must be limited to two kilometres (2 000 m) measured from the edge of the borrow pit or cutting along the designated route. Haulage from designated sources or to designate stockpiles must also be included as free haul.

Overhaul is that portion of the total haulage beyond the free haul limit and is measured separately. For the purposes of this Contract, the free haul distance has been set at a one-way distance of two kilometres (2 000 m).

The unit of measurement for overhaul in the case of compacted fill or placed material must be the cubic metre. Kilometre being the product of distance measured in kilometres to the nearest tenth of a kilometre and the cubic metres of compacted or placed (whichever is applicable) material transported. However, in the case of cut to spoil, or stockpile the unit of measurement for overhaul must be the cubic metre. Kilometre being the product of the distance measured in kilometres to the nearest tenth of a kilometre and the cubic metre of undisturbed in-situ material prior to being transported.

5.6 PSDB-Pipe trenches: SANS 1200DB

5.6.1 General

The floor of the pipe trenches if any must be compacted to 95% Proctor density at optimum moisture content or any other specified density and moisture content that the *Project Manager* may authorise, to a minimum depth of 150mm.

5.6.1.1 Trench bottom

Unsuitable material must only be excavated once the *Project Manager* has given a written instruction to this effect. Backfilling material for over excavation must comply with the requirements of SANS 1200 LB and must be compacted to 95 % modified AASHTO.

5.6.1.2 Backfilling

Pipe joints must be left open for 300 mm to either side until the pipeline has successfully been tested and approved by the *Project Manager*.

5.6.1.3 Disposal of soft excavation material

Disposal of surplus material must take place at agreed sites within the free haul distance from the source of such excavation.

5.7 Gabions and stone pitching (if any)

5.7.1 Material

5.7.1.1 Geotextile

Filter fabric for groundwater drains must be a non-woven continuous filament, needle punched, spun bounded polyester geotextile having the following physical characteristics:

- | | |
|--|----------------------------|
| • Mass per unit surface | 150 g/m ² (min) |
| • Porosity under 0,5 kPa | 93% |
| • Porosity under 200 kPa | 82% |
| • Normal permeability under 2 kPa | 3×10^{-3} m/s |
| • Normal permeability under 200 kPa | 7×10^{-4} m/s |
| • Normal through flow under constant head of 400mm | 270 ℓ/m ² /s |

Alternatively - for woven filter fabrics the following characteristics must apply:

- | | |
|--|-------------------------|
| • Mass per unit area | 270 g/m ² |
| • Water percolation | 160 ℓ/m ² /s |
| • Composition polypropylene tape and polyethylene monofil. | |

The material must be placed as directed and must not be exposed to direct sunlight for prolonged period.

5.8 Small earthworks dams: SANS 1200 DE

5.8.1 Definitions

- i. **Defects:** Any aspect of materials and workmanship forming part of the Works that, in the opinion of the *Project Manager*, is due to the failure of the *Contractor* to comply with his obligations in terms of the agreement.
- ii. **Defects Liability Period:** one year at the completion date of the Works.

5.8.2 Class of excavations

The classes of material for excavation must be as defined in Project Specification Clause 6.12.1 (and 5.5.12.1 of this document). The *Contractor* must excavate whatever materials are encountered to the depths, cross-sections and grades shown on the drawings. Excavated material not required or unsuitable for backfill and / or for embankment construction must be transported to and disposed of at a suitable Site away from the Site of Works as directed by the *Project Manager*. The disposal area must be within a one-way distance of 2 000 m of the area from which it was excavated. The unit of measurement for all excavation must be the cubic metre of in-situ material excavated (measured nett). It should be noted that when excavations are cut through embankments for the placing of drains, pipes, pipe encasements, puddle flanges etc., the payment for these excavations must be based on nett dimensions with the measurable depth of excavation limited to that of the maximum vertical dimension of the drain, pipe, or encasement structure at each cross-section. Similarly, the measurable width must be the design width of each cross-section. All costs associated with excavations greater than these dimensions (i.e., including backfilling with concrete or soil as required) must not be considered for payment.

The rates tendered must allow for the operation as described and haulage to within a one-way distance of 2 000 m of the Site (Refer to Clause SANS 5.2.8.1). The disposal area is to be left as described in Clause SANS 5.2.2.5.

5.8.3 HDPE flexible drainage pipes

Flexible HDPE drainage pipes may be used in the sub-surface seepage collector drains. The pipes must have a smooth internal bore. 'Drainex' or similar equivalent may be used but must be approved by the *Project Manager*. Drainex is obtainable as "unslotted" and "slotted". The slotted piping is to be used as seepage collector piping within the sub-surface drains, and the unslotted to carry the seepage out of the impoundment and to safely discharge it into the solution trenches or other collection points.

All pipes are to be laid to the required grades and elevations as detailed on the drawings, or as directed by the *Project Manager*.

The unit of measurement for slotted and unslotted piping must be the linear metre of piping in place. The linear meter rate must include for all push-fit couplings and rubber ring seals that are required to all couplings. Typically, white push-fit couplings, complete with rubber "O" rings, must be used to connect all unslotted Drainex piping, in order that the seals can be easily seen in place. Yellow push-fit couplings, without "O" rings, must be used to connect all slotted Drainex piping. The linear meter rate must also include for all cutting to size of both types of piping. Specials in the form of uPVC bends, tees, laterals, and crosses will be measured separately and paid for on a unit basis.

The *Contractor* is to note the positions of the slots in relation to the underlying bedding in the collector drain trenches. To this end the *Contractor* is to carefully position the "top" of every slotted drainpipe (indicated by a yellow stripe) to ensure that the piping is installed according to manufacture specification. Furthermore, the

Contractor is to clearly mark, down the full length of each unslotted pipe, as soon as such piping arrives on Site, two bright coloured paint marks that are not easily removed to prevent unslotted piping being inadvertently placed in the collector drain.

Once the drain piping has been laid, the *Project Manager* or *Project Manager's* Representative is to inspect the laid piping, with the *Contractor's* appointed foreman, to ensure that it meets with design requirements and to ensure that no slotted/unslotted piping is in the wrong location. No piping, inclusive of specials, is to be covered over until the inspection has been carried out and approval given. To this end the *Contractor* is to timeously inform the *Project Manager* of the required inspection (at least twenty-four (24) hours' notice is required).

Furthermore, all installed and covered drain piping will be subject to water and drainpipe "pig" clearance tests, the costs of which are to be included in the unit rate for supply and installation of the piping. All piping will be tested for approval purposes. The tests are to be conducted jointly by the *Project Manager* and the *Contractor*.

The method and equipment required is to be timeously and jointly agreed between the *Project Manager* and the *Contractor*, the *Contractor* will be responsible for initialising such requirements. Piping that fails the tests will be removed and replaced. All costs in this regard will be to the *Contractor's* account.

5.8.4 Geofabric lining to drains

Where shown on the drawings or directed by the *Project Manager* subsurface pipe drainage systems must be lined with approved geofabric.

The type of geofabric to be used must be as indicated on the drawings or an approved equivalent. The *Project Manager* reserves the right to approve the make and grade of any alternative type of geofabric considered.

The geofabric must be always stored under cover and out of direct sunlight. Manufacturer's wrappings must not be removed until just prior to use. Any geofabric exposed for more than 10 (ten) days cannot be used and must be removed from the Works if already incorporated therein. Joining of the geofabric is to be undertaken with an approved nylon yarn as shown on the drawings or by double lines of stitching along a 150mm lap width made by means of a "sac-up" type of portable machine obtainable from "Industrial Sewing Machines" or any approved similar machine, using Lubes M20 nylon thread obtainable from "Natal Thread Co" or an approved equivalent. Prior to backfilling/covering, the placed geofabric and stitching are to be approved by the *Project Manager*.

The surface upon which the fabric is laid must be even and free of protruding or sharp-edged stones. Any damage caused to the fabric during installation or during placing of the permeable material may render it unsuitable for use. Should the damage be sufficiently localised, the *Project Manager* may direct that the fabric be patched. Patching must only be carried out after the *Project Manager's* permission has been given.

Where pipes come out of the geofabric-wrapped drain (i.e., pipes required for carrying water away from subsurface drains, but not forming a part thereof), the fabric must be tied around the pipes with suitable nylon or other approved yarn in a manner which is satisfactory to the *Project Manager*.

5.8.5 Filter and drain material classification

Filter and drain material utilised onsite must be approved by the *Project Manager*. Each drainage layer is classed as a structural entity. Stringent quality control checks on the cleanliness of the material, grading of the material, material thickness, and dimensional correctness, will be applied to ensure the integrity of each drainage layer.

The following quality control measures must be applied to all permeable materials.

Generally, one grading analysis is to be carried for every 50 m³ of material brought to Site. However, if materials are observed to be variable, then the *Project Manager* reserves the right to insist that one grading analysis per truck load be undertaken. The grading analyses are to be submitted to the *Project Manager* for approval which must be obtained prior to placement of the permeable material.

The preparation of filter media stockpile bases must be positioned and approved by the *Project Manager* prior to bringing filter material on to site. It is imperative that sufficient quantities are available as the Works proceeds.

It should be noted that independent ad hoc sampling and testing will also be instituted to access the validity of such materials.

Any material which fails to meet with the specification will be rejected and must be removed from Site. Stockpiles are to be formed on approved areas rendered free of vegetation and loose contaminant matter. Furthermore, to ensure an acceptable level of quality assurance and to minimise contamination, the number of stockpiles used, and their location is to be approved by the *Project Manager*.

Permeable material as used in the filter drains must comply with the following:

5.8.5.1 Crushed aggregate

The stone must be in accordance with SABS 1083 - 1994, with the grading requirements as follows:

—

19 mm graded crushed stone filter will be supplied to the Contractor

Hardness: When tested in accordance with test method No. B1 of SMTRCM the aggregate crushing value will be provided

—

Flakiness: The maximum flakiness index when testing in accordance with the test method NO. B3 of SMTRCM, will be provided

Above criteria must be confirmed through onsite testing.

5.8.6 Under drains

5.8.6.1 General

Under drains must be constructed as shown on the drawings or as directed by the *Project Manager*. Excavation for the under drains must be to the specified tolerances. Where applicable, the geofabric specified in Clause 5.8.7 of this document (Clause 9.7 of the Project Specification) must be carefully and neatly laid on the ground and must be wrapped around the filter material and pipe.

Piping forming the seepage collector system must be laid to straight grades and must be to the routes, levels and grades indicated on the drawings, or as agreed with the *Project Manager* on Site.

At all junctions within the under-drainage system or at any other section where required by the *Project Manager*, no permeable material must be placed until the junction and the laid piping has been inspected and approved by the *Project Manager*. The *Contractor* must undertake the necessary rodding and/or water testing as required by the *Project Manager*. All such costs must be included in the price for laying the pipes. The course materials must be placed as shown on the drawings. The finished thickness of each layer of course material must nowhere vary below the specified thickness.

Care should be exercised when placing the course materials so as not to damage the sub-surface drainage pipes or the geofabric.

The *Project Manager* must carry out tests from time to time to ensure that course materials to be used conform to the minimum requirements as set out in Clause 5.8.5.1 of this specification (clause 9.5.1 of the Projects specification).

Any material placed as course material not conforming to the minimum requirements as set out in Clause 5.8.5.1 above must, at the discretion of the *Project Manager*, be removed and replaced with suitable material at the *Contractor's* expense

5.8.7 Geotextile

As a minimum, filter fabric for groundwater drains must be a non-woven continuous filament, needle punched, spun-bonded polyester geotextile having the following physical characteristics:

• Mass per unit surface	150 g/m ² (min)
• Porosity under 0,5 kPa	93%
• Porosity under 200 kPa	82%
• Normal permeability under 2 kPa	3×10^{-3} m/s
• Normal permeability under 200 kPa	7×10^{-4} m/s
• Normal through flow under constant head of 400mm	270 l/m ² /s

Alternatively - for woven filter fabrics the following characteristics must apply:

• Mass per unit area	270 g/m ²
• Water percolation	160 l/m ² /s
• Composition polypropylene tape and polyethylene monofil.	

The material must be placed as directed and must not be exposed to direct sunlight for prolonged period.

5.9 DE PSG-Concrete: sans 1200GE

5.9.1 General

This specification sets out additions and changes to Standard Specification SANS 1200G.

5.9.2 Definitions

The following are defined as:

- i. PFA – Pulverised Fuel Ash
- ii. OPC – Ordinary Portland Cement

5.9.3 Materials

5.9.4 Approval of material

Aggregates must be supplied from approved sources which may not be changed without approval of the *Project Manager*.

Testing of water, if required, must be in accordance with BS 3148: 1980.

Concrete mix designs to be submitted for approval.

5.9.4.1 Cement

Cement used must be CEM 1 – 42.5 (formerly OPC). Blends of OPC with 30% PFA may be used. PFA must comply with the relevant requirements of SANS 50450 -1 & 2:2011.

Cement sacks must be closely stacked not exceeding 12 sacks in height, off the floor and not touching the walls of the storage facility. All cement must be stored to ensure that cement is used in the order in which it is received.

Cement must not be kept in storage for longer than three months without the *Project Manager's* permission.

5.9.4.2 Aggregates

“Plums” must not be used without the specific written permission of the *Project Manager* for each location of use.

5.9.5 Staff, plant, and formwork

5.9.5.1 General

The *Contractor* must provide a responsible person(s), approved by the *Project Manager*, with an adequate knowledge of concrete technology in as far as mixing, placing, and curing of concrete is concerned. This supervisor must be always on Site during concrete construction.

5.9.5.2 Formwork

20mm x 20mm rebates or fillets are to be provided at all corners of concrete work unless otherwise stated on the Drawings.

The *Contractor* must advise the *Project Manager* when he intends to strip any formwork.

5.9.5.3 Concrete strength

Strength concrete must be used in the Works. The grade of concrete and position on the works must be as shown on the drawings, and as described in the Schedule of Quantities or as directed by the *Project Manager* from time to time.

The minimum cementitious content and minimum cement/water ratio must be:

- i. 300kg/m³ and 1.5 for unreinforced concrete.
- ii. 340kg/m³ and 1.7 for reinforced concrete.
- iii. 400kg/m³ and 2.0 for pre-stressed concrete and for concrete of strength greater than or equal to Grade 40MPa.

Grout mix design will consist of 1-part cement to 4 parts fine aggregate.

The maximum aggregate size must be 19 mm unless otherwise shown on the drawings or authorised by the *Project Manager*.

Not less than two weeks before the start of any concrete work on the Site, mix design proportions must be submitted to the *Project Manager*, for his information and approval. This statement must provide the following information:

A method statement outlining the method to be adopted for adjusting the amount of water added, to compensate for variation in moisture content of the aggregate, and for each class of concrete:

- i. Mix proportions and types
- ii. Slump
- iii. Target strength.

The statement must be accompanied by evidence in the form of either a statement from an approved laboratory of the results of trial mixes, or an authoritative report previous use and experience, establishing that concrete made with the materials in the proportions proposed will have the properties specified.

5.9.5.4 Ready mix concrete

Test results obtained by a ready-mix production facility as part of its quality control system will not be acceptable for evaluation. All concrete must be sampled at the point of placing and test cubes made in accordance with the relevant methods.

5.9.5.5 Inspections and approval

No concrete may be poured without the prior approval of the *Project Manager*. No approval will be given unless there is sufficient time to complete the Works in normal daylight hours, unless special arrangements have been made with the *Project Manager* concerning working after normal hours and adequate lighting arrangements are in place before the start of the pour. Possible falls in temperature must be considered in planning this Works.

Concrete may not be placed before the *Project Manager's* approval has been given in writing and a minimum written notice of 24 hours prior to pouring is required for each part of the structure. All concrete works must be checked prior to it being inspected by the *Project Manager*.

5.9.5.6 Construction joints

The position and angle of all construction joints selected for each structure are to be submitted to and approved by the *Project Manager*.

All kickers are to be cast monolithically with the base element. All joints are to be scabbled to remove laitance to expose stone aggregate.

5.9.5.7 Curing

Curing compounds may not be used except with the prior written approval of the *Project Manager*. Should the *Contractor* wish to use a curing compound he must submit full details to the *Project Manager* at least 21 days before the first concrete is to be poured. Curing compounds, if approved, must be resin based and contain a fugitive dye, and must be applied immediately after formwork removal.

The method of curing and protection must be to the *Project Manager's* approval.

5.9.5.8 Concrete surfaces

Unless otherwise noted all exposed unformed surfaces are to have a wood-float finish.

5.9.5.9 Watertight concrete

All concrete structures in this contract are to be watertight.

5.9.5.10 Records

The *Contractor* must also keep a record of the mix proportions (including the water content) and slump test results for each pour and any other records considered necessary by the *Project Manager*. Such records must clearly indicate any changes made to the mix proportions or changes in slump during the pour.

Records must be always available for inspection by the Project Manager

5.9.6 Tolerances

All exposed concrete Works must be to degree of accuracy II. Buried concrete will be accepted to degree of accuracy III.

The top surface of the spillway fill must have a relative level accuracy of -5 mm to $+5 \text{ mm}$.

The permissible deviation of any bolt in a related group of bolts relative to any other bolt in the group must be $\pm 2,0 \text{ mm}$.

The permissible deviation of any bolt from its designated location in plan must be $\pm 4 \text{ mm}$.

The permissible deviation of the top of any bolt from its designated location in elevation must be $\pm 10 \text{ mm}$.

The permissible deviation of other cast-in items from their designated locations must be $\pm 10 \text{ mm}$, save that where the designated location is a concrete face, and the item is to be cast flush with the face it must be cast within 2 mm of the face.

5.9.7 Testing

Six concrete test cubes must be taken from each individual concreting operation, 3 for testing at seven (7) days and 3 for the prescribed twenty-eight (28) day tests. All cubes must be clearly marked. The *Contractor* must keep a cube identification logbook recording:

- i. The class and source of concrete
- ii. The member being cast and date of casting
- iii. The cube identification markings
- iv. The cube compressive test results

Copies of cube compressive test results and plant calibration records must be submitted to the *Project Manager* within twenty (24) hours of receipt and / or testing by the *Contractor*.

Should seven (7) day strengths be obtained at any stage, which indicate in the opinion of the *Project Manager*, that the specified twenty-eight (28) day characteristic strength will not be achieved, the *Project Manager* may stop concreting operations, or order adjustments to the mix, until the twenty-eight (28) day strengths of such concrete are available, without compensation for losses and delays.

The *Contractor* must be responsible for transporting and curing of cubes in accordance with the requirements of SABS (SANS) 863: 1994, to the satisfaction of the *Project Manager*.

Where more than three valid test results for a particular grade of concrete become available the average strength of all the available results for the grade must not be less than the required average strength given below. If the average strength is less than that given below the mix design must be adjusted to ensure compliance with the required average strength.

Table 6.1 Required Average Strength (Refer to Clause 14.3.3 of SANS 0100-2)

No. OF SETS (OF THREE TEST CUBES)	REQUIRED AVERAGE STRENGTH
4	Specified strength + 3.0 MPa
5	Specified strength + 4.5 MPa
6	Specified strength + 5.0 MPa
10	Specified strength + 6.0 MPa
20	Specified strength + 7.0 MPa
30 or more	Specified strength + 8.0 MPa

5.10 PSLB-Bedding (pipes)

Unless otherwise instructed by the *Project Manager*, all pipes must be laid and bedded as detailed on the drawings.

Selected granular and selected fill materials obtained from trench excavations may be used as bedding materials if proof can be provided to the *Project Manager* that the soil falls within the requirements of Materials, Compaction, and Testing requirements as shown on the drawings.

Prior to placing bedding material, all soil clods must be broken or discarded by means of sieving/screening so that no single soil clod used in the pipe bedding must have a nominal size in excess of 10 mm.

5.10.1 Selection

5.10.1.1 Suitable material available from trench excavation.

Prior to placing bedding materials, the *Contractor* will sieve/screen the bedding materials such that all soil clods must be broken down or discarded so that no single soil clod used in the pipe bedding must have a nominal size in excess of 10 mm.

5.10.1.2 Soil Crete

Where so specified or as instructed by the *Project Manager*, soilcrete will be used for pipe bedding and/or as a backfill material above pipe bedding.

Soilcrete must consist of an approved soil or gravel mixed with 5% cement of the type CEM II 32,5N or stronger, and only sufficient water to give it a consistency that will permit the soilcrete to be so placed, with the use of vibrators, as to properly fill all voids between the pipes and sides of excavations.

The aggregate used for soilcrete must preferably be a sandy material but may contain larger particles up to 38 mm and its plasticity index must not exceed 10. Harmful percentages of silt or clay must be avoided, and the aggregate must be obtained from an approved source.

The soilcrete must be mixed on Site by means of suitable concrete mixers. The water and cement contents must be carefully controlled during mixing. The material must be placed and then thoroughly compacted by means of concrete vibrators to fill all voids as described above.

5.10.1.3 Construction

5.10.1.3.1 General: Details of Bedding

No sharp-edged stones must be allowed to come into contact with the pipe, pipe couplings and fittings.

5.10.1.3.2 Tolerances: Moisture Content and Density

Unless specified to the contrary, the permissible deviation from OMC must comply with a degree of accuracy II.

5.10.1.4 Testing

5.10.1.4.1 Density

5.10.1.4.2

The nuclear gauge equipment and the sand replacement method are the approved methods to be used to determine the degree of compaction (density) attained. In the event that the Nuclear Density Gauge (NDG) is the method used, the sand replacement method will be used periodically as a check against the NDG calibration.

5.10.1.4.2.1 Equipment Calibration, Maintenance, and Operation

The calibration, maintenance, and operating procedures for all Nuclear Density Gauges must be submitted to the *Project Manager* prior to use on site, with all calibration certificates submitted to the *Project Manager* for approval.

Manufacturers' specifications for instrument calibration and maintenance will be followed. A record of calibration and maintenance activities will be maintained in field notebooks.

Each piece of equipment used in activities affecting data quality must be calibrated at a frequency specified by the manufacturer.

Each piece of equipment used in activities affecting data quality must be maintained. Following maintenance, instruments will be calibrated according to the manufacturer's specifications to ensure proper completion of the works.

5.10.1.5 Volume of bedding materials

The volume of bedding materials must be computed from the trench widths determined in accordance with the details shown on the drawings, or in the absence of such details, in the case of conventional excavations in accordance with Clause 5.2 of SANS 1200 DB.

The volume of bedding material must be measured net, i.e., the volume of the pipe is to be deducted, in accordance with the details shown on Drawing LB-4 of SANS 1200 LB

5.11 PSLE-Storm water drainage

5.11.1 Materials

5.11.1.1 Culvert units and pipes. A) Precast concrete pipes.

Prior to commencing manufacture, drawings of all concrete sections, fittings, reinforcing steel and joint details must be provided for *Project Manager's* review and acceptance. Manufacturing must not begin until the *Project Manager* has accepted the drawings.

Concrete pipe must not be delivered to the site of the work until concrete control cylinders representing the pipe have attained a compressive strength of at least 80 percent of the specified minimum 28-day strength.

- a) Joints: All joints must be silt-tight and leak resistant
- b) UPVC Pipes: uPVC pipes must comply with the applicable requirements of SANS 791.

5.11.2 Construction

5.11.2.1 Bedding and laying

Pipe grades between designated invert elevations must be uniform to provide unrestricted flow and to eliminate low spots that would retain water.

Pipe must be laid starting at the lowest elevation, with the groove ends facing upstream. Flared end sections must have groove end on outlet end section and tongue end on inlet end section. Longitudinal seams must be placed at the side of the trench.

When pipe laying is stopped for the day, the open end of the pipe must be closed with an end board or plug closely fitting the end of the pipe to prevent the entry of earth. The end board or plug must have several small holes near the centre to permit entry of water and prevent floatation

5.11.2.2 Tolerances

5.11.2.2.1 Invert levels

The permissible deviation of the level of the invert from the designated level must be ± 12.15 mm (measured on the main flow culvert at the inlet to the manhole or catchpit, as relevant).

5.12 PSME-Subbase

5.12.1 Materials

5.12.1.1 General

5.12.1.2

Layer work material must be obtained only from approved borrow areas or such other sources of supply as may be specified or approved for use from time to time. Only soil, gravel, aggregate or other approved material must be used for the construction of layer works.

5.12.1.3 Physical properties

5.12.1.3.1 Subbase material

The maximum dimension of coarse aggregate must not exceed the lesser quantity of two-thirds of the thickness of the compacted layer or 50 mm.

Grading of the above-mentioned materials must comply with requirements as indicated on SANS 1200 M Table 8 and density requirements will be as indicated on drawings. In addition, nuclear testing must be performed as per SANS 1200 M.

5.12.1.3.2 Subbase layer

Subbase layer material must, unless otherwise authorised, conform to the requirements given in Table 6.2 when finally placed.

Table 6.2 Requirements for Subbase

Criteria	Subbase
Parent Material	Natural gravel or natural gravel and boulders which

Criteria	Subbase
	may require crushing or crushed rock
Additional Fines	May contain approved natural fines not obtained from parent rock.
Strength	California Bearing Ratio (CBR) =25 at 95% of Mod. AASHTO max. Swell at 100% of Mod. AASHTO max. Density must not exceed 0.5%.
Durability	Mudrock only to be used if directed by the <i>Project Manager</i> .
Atterberg Limits	LL must not exceed 30 PI must not exceed 12. LS must not exceed 5%.
Grading	The maximum size of crushed material must be 2/3 of the layer thickness.
Compaction	The minimum dry density of the compacted layer must be 95% of modified AASHTO density.

5.13 PSMF-Base

5.13.1 Physical and chemical properties

5.13.1.1 Natural gravel (unstabilized)

The maximum dimension of the gravel must not exceed the lesser quantity of two-thirds of the thickness of the compacted layer or 53 mm.

Grading of the above-mentioned materials must comply with requirements as indicated on SANS 1200 M Table 8 and density requirements will be as indicated on drawings. In addition, nuclear testing must be performed as per SANS 1200 M.

5.13.1.2 Graded crushed stone

The maximum dimension of the crushed stone must not exceed the lesser quantity of two-thirds of the thickness of the compacted layer or 53 mm.

5.13.1.3 Tolerances

5.13.1.3.1 Dimensions, levels, etc.

The dimensions and levels must be as shown on the drawings.

5.13.1.3.2 Thickness

The average thickness of the base in any length of road, determined from measurements taken before and after construction of the base or from test holes, must be at least the specified thickness, and in no place must the actual thickness of the base be more than 10 mm less than the specified thickness.

5.13.1.3.3 Base layer

Base layer material must, unless otherwise authorised, conform to the requirements given in Table 14.1 when finally placed.

Table 6.3 Requirements for Base

CRITERIA	BASE –
Parent Material	Natural gravel or natural gravel and boulders which may require crushing, or crushed rock.
Additional Fines	May contain approved natural fines not obtained from parent rock.
Strength	CBR at 95% of Mod. AASHTO max. Density must be at least 45%. Swell at 100% of Mod. AASHTO max. Density must not exceed 0.5%.
Durability	Mudrock only to be used if directed by the <i>Project Manager</i> .
Atterberg Limits	LL must not exceed 30. PI must not exceed 10, except that if less than 30% of the sample passes the 2.00 mm sieve, the PI must not exceed 12. LS must not exceed 5%.
Grading	The maximum size of crushed material must be 53 mm before compaction. The maximum size of uncrushed material must be 63 mm. The percentage (by mass) passing the 2.00 mm sieve must be not less than 20% and not more than 70%. Grading modulus must be not less than 1.5 and not more than 2.5.
Compaction	The minimum dry density of the compacted layer must be 95% of modified AASHTO density.

5.14 Gravel wearing course

The gravel wearing course material must, unless otherwise authorized, conform to the requirements given in Table 6.4 when finally placed.

Table 6.4 Requirements for Gravel Wearing Course

PARAMETER	LIMIT	
	TYPE 1	TYPE 2
Maximum size, mm	37.5	37.5
Oversize Index (Io) (maximum), %	<5	0
Shrinkage product (Sp)	100 – 365 (Maximum of 240 preferable)	100 – 240
Grading coefficient (Gc)	16 – 34	16 – 34
CBR at > 95% modified AASHTO Compaction (soaked value) (minimum), %	≥ 15	≥ 15
Io = Oversize index (per cent retained on 37.5 mm sieve) Sp = Linear shrinkage x (per cent passing 26.5 mm – per cent 2.0 mm) x per cent passing 4.75 mm/100 Gc = (Per cent passing 26.5 mm – per cent passing 2.0 mm) x per cent passing 4.75 mm/100		

Note: All parameters in **Table 6.4** are defined in TRH 20.

5.15 Fencing

5.15.1 General

The fencing material must, unless otherwise authorised, conform to the requirements given in drawings or otherwise approved by the *Project Manager*.

5.15.2 Requirements for fencing:

1) Straining Posts:

3175x100diameter x 3mm Mild Steel Tubing with steel Cap and 230x230x3mm Base Plate, Fully Galvanized (SANS 121/ISO 1461)

2) Straining Posts (Corner Posts):

3425x100diameter x 3mm Mild Steel Tubing with steel Cap and 230x230x3mm Base Plate, Fully Galvanized (SANS 121/ISO 1461)

3) Stays:

3900x60 diameterx3mm Mild Steel Tubing with Cap and 230x230x3mm Base Plate, Fully Galvanized (SANS 121/ISO 1461)

4) Standards:

3175x60diameter x 3mm Mild Steel Tubing with steel Cap and 230x230x3mm Base Plate, Fully Galvanized (SANS 121/ISO 1461)

5) Droppers: Fully Galvanized

6) Cross Brace Support:

2400x60diameter x 3mm Mild Steel Tubing with steel Cap and 230x230x3mm Base Plate, Fully Galvanized (SANS 121/ISO 1461). Ends Pressed Flat To +-8mm

7) Vehicle Gate:

42 Diameter x 2mm Mild Steel Tubing Frame with 21.4mm diameter x 2mm Mild Steel Tube Bracing Complete with Hinges, Washers, Bolts and Locking Device. Fully Galvanized (SANS 121/ISO 1461) After Fabrication.

8) Barbed Wire:

3.2 x 2.5mm Oval High Tensile Grade Single Strand (SANS 675) Fully Galvanized.

9) Smooth Wire:

3mm Diameter High Tensile Grade Single Strand (SANS 675) Fully Galvanized.

10) Smooth Wire:

4mm Diameter High Tensile Grade Single Strand (SANS 675) Fully Galvanized. Lower Wire to be fixed to Concrete Using Hilt 6mm diameter eyes and Anchors.

11) Tying Wire:

2.5mm diameter Mild Steel (SANS 675). Fully Galvanized for Tying to Standards. 1.6mm diameter Mild Steel (SANS 675). Fully Galvanized for tying mesh to smooth wires.

12) Straining Wire:

4mm diameter Mild Steel (SANS 675). Fully Galvanized. (4 Strands doubled and twisted to take Strain).

13) Bolts for Stays:

12mm diameter Mild Steel, Including Nuts, and washers, fully galvanized.

14) Maximum Spacing of:

Straining Posts	36m c/c
Standards	12m c/c

15) All wires to be erected on the roadside of the fence unless otherwise instructed.

16) Minimum concrete strength of footings 20MPa at 28 days.

17) Welded Mesh:

50mmx50mmx2.5mm diameter welded mesh 2.3m wide.

18) Steel Peg:

12mm diameter Mild Steel Fully Galvanized.

19) Posts to be dipped in bitumen Solution before being concreted in (Lower 800mm)

5.16 Geomembrane: PAA

5.16.1 Scope

This Particular Specification covers the supply, installation and testing of geomembrane sheeting.

5.16.2 General

For the geomembrane specification and installation, refer to quality control assurance manual, ref: 301-00204/15

5.16.2.1 Non-woven protection geotextile: PAB

5.16.2.1.1 Scope

This Particular Specification covers the supply, installation and testing of geotextile sheeting.

5.16.2.1.2 Products

For the geotextile specification material must be as manufactured by the approved manufacturer with the following physical specifications or as approved by the *Project Manager*.

Table 6.5 Geotextile Properties

Material			Bidim A6	
Thickness	Under 2 KPa	mm	3.1	SANS 9863-1:13 / ISO 9863-1:05
Tensile Strength (200mm wide strip)	Weaker Direction	Typical kN/m	26.0	*SANS 1525:13 / ISO 10319:08
		MARV kN/m	22.2	
	Elongation	50-70%		
Static Puncture Strength	CBR	Typical kN/m	4.8	*SANS 12236:13 / ISO 12236:06
		MARV kN/m	4.3	
Puncture Resistance	Diameter of hole (max)	mm	13	SANS 13433:13 / ISO 13433:06
Trapezoidal Tear Strength	Weaker Direction	Typical N	800	ASTM D4533
		MARV N	650	
Grab Strength	Weaker Direction	Typical N	1550	ASTM D4632
		MARV N	1410	
	Elongation	50-80%		
UV Stability	70% strength retained after 1000		ASTM D4355	
Hydraulic Properties				
Normal Throughflow	@ 50mm head	ℓ/s/m ²	70	SANS 11058:13 / ISO 11058:10
In-plane Throughflow	Flow Rate (Per m width)	ℓ/hr	55	ISO 12958:10
Permeability	@ 50mm head	m/s x10 ⁻³	4.3	SANS 11058:13 / ISO 11058:10
Pore Size	O95 W	µm	130	SANS 12956:13 / ISO 12956:10
Roll Dimensions				
Width	Standard	m	2.65 & 5.3	
Length	Standard	m	75	

5.16.2.2 High density polyethylene (HDPE) geomembrane liner: PAC**5.16.2.2.1 Scope of supply**

Scope of supply must include furnishing and installation of high-density polyethylene (HDPE) geomembrane liner and associated quality control/quality assurance inspection and testing. All work must be done in strict accordance with the project drawings, these specifications and membrane lining fabricator's approved shop drawings.

Geomembrane panels will be supplied sufficient to cover all areas, including appurtenances, as required in the project, and shown on the drawings. The fabricator/installer of the liner must allow for shrinkage and wrinkling of the field panels.

Table 6.5 Geotextile Properties

Material			Bidim	
Thickness	Under 2 KPa	mm	3.1	SANS 9863-1:13 / ISO 9863-1:05
Tensile Strength (200mm wide strip)	Weaker Direction	Typical kN/m	26.0	*SANS 1525:13 / ISO 10319:08
		MARV kN/m	22.2	
	Elongation	50-70%		
Static Puncture Strength	CBR	Typical kN/m	4.8	*SANS 12236:13 / ISO 12236:06
		MARV kN/m	4.3	
Puncture Resistance	Diameter of hole (max)	mm	13	SANS 13433:13 / ISO 13433:06
Trapezoidal Tear Strength	Weaker Direction	Typical N	800	ASTM D4533
		MARV N	650	
Grab Strength	Weaker Direction	Typical N	1550	ASTM D4632
		MARV N	1410	
	Elongation	50-80%		
UV Stability	70% strength retained after 1000		ASTM D4355	
Hydraulic Properties				
Normal Throughflow	@ 50mm head	2	70	SANS 11058:13 / ISO 11058:10
In-plane Throughflow	Flow Rate (Per m width)		55	ISO 12958:10
Permeability	@ 50mm head	m/s x10 ⁻³	4.3	SANS 11058:13 / ISO 11058:10
Pore Size	O95 W	µm	130	SANS 12956:13 / ISO 12956:10
Roll Dimensions				
Width	Standard	m	2.65 & 5.3	
Length	Standard	m	75	

5.16.2.2 High density polyethylene (HDPE) geomembrane liner: PAC**5.16.2.2.1 Scope of supply**

Scope of supply must include furnishing and installation of high-density polyethylene (HDPE) geomembrane liner and associated quality control/quality assurance inspection and testing. All work must be done in strict accordance with the project drawings, these specifications and membrane lining fabricator's approved shop drawings.

Geomembrane panels will be supplied sufficient to cover all areas, including appurtenances, as required in the project, and shown on the drawings. The fabricator/installer of the liner must allow for shrinkage and wrinkling of the field panels.

5.16.2.2.2 Codes and standards

Work performed under these specifications must be done in accordance with the codes and standards indicated in these specifications. Unless otherwise specified, the applicable governing edition and addenda to be used for all references to codes or standards specified herein must be interpreted to be the jurisdictionally approved edition and addenda. If a code or standard is not jurisdictionally mandated, then the current edition and addenda in effect at the date of this document must apply. These references must govern the work.

Liner Installation work in accordance with **SANS 1526, SANS 10409**

5.16.2.2.3 Materials

The following materials must be used:

Component	Material
Geomembrane Liner	High density polyethylene (HDPE)

5.16.2.2.4 Products

All other liner specifications will be available in the drawings. The lining material must be as manufactured by the approved lining manufacturer with the following physical specifications as a minimum:

- a) Thickness: Nominal -5%. Lowest individual for 8 out of 10 values = -10%
Lowest individual for any of the 10 values = -15%
- b) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
 - a. Yield elongation is calculated using a gage length of 33 mm
 - b. Break elongation is calculated using a gage length of 50 mm
- c) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

5.16.2.2.5 Test requirements

The following testing must be conducted in accordance with the specified source. This testing is to be considered part of the defined scope of work, and all associated costs are the responsibility of the *Contractor* unless specifically identified as *Employer*-conducted. Tests identified as an option are to be priced separately. If identified as *Employer* -conducted, costs for the initial test will be the responsibility of the

Employer. However, the *Contractor* is responsible for all costs associated with correcting deficiencies and retesting in the event of a test failure:

Table 6.6 HDPE Test Requirements

Tests	In Accordance With	Conducted by
Specific gravity	ASTM 01505/792 Method B	<i>Contractor</i>
Carbon black content	ASTM 01603	<i>Contractor</i>
Melt index	ASTM 01238	<i>Contractor</i>
Carbon black dispersion	ASTM 05596	<i>Contractor</i>
Thickness – smooth	ASTM 05199	<i>Contractor</i>
Thickness – textured	ASTM 05994	<i>Contractor</i>
Tensile strength	ASTM 0638, Type IV	<i>Contractor</i>
Tear resistance	ASTM 01004	<i>Contractor</i>
Low temperature impact	ASTM 0746	<i>Contractor</i>
Stress crack resistance	ASTM 05397	<i>Contractor</i>
Puncture resistance	ASTM 04833	<i>Contractor</i>
Dimensional stability	ASTM 01204	<i>Contractor</i>
Continuous vacuum box extrusion welded seams	ASTM 04545/4437/5641	<i>Contractor</i>
Bond shear strength for seams and seam peel adhesion	ASTM 06392	<i>Contractor</i>
Air pressurized testing on all double fusion welded seams	ASTM 05820	<i>Contractor</i>
Ultrasonic testing on extrusion welded seams that do not permit vacuum box testing (short slopes, corners, or details)	ASTM 07006	<i>Contractor</i>
Spark testing on extrusion welded seams that do not permit vacuum box testing (short slopes, corners or details)	ASTM 06365	<i>Contractor</i>
Oven aging at 85° C	ASTM 05721	<i>Contractor</i>
Test method for rubber property effect of liquids	ASTM 0471	<i>Contractor</i>
Oxidation Induction Time- Standard	ASTM 03895	<i>Contractor</i>

5.16.2.3 Geosynthetic clay liner (GCL)

5.16.2.3.1 Scope

This Particular Specification covers the supply, installation and testing of clay liner sheeting.

5.16.2.3.2 Products

The lining material must be as manufactured by the approved manufacturer with the following physical specifications. Final specification will be provided to the Contractor

Table 6.7 GCL Properties

Material Property	Test Method	Test Frequency m ² (ft ²)	Bentomat (ST)	Bentomat (DN)
Bentonite Swell Index ¹	ASTM D 5890	1 per 50 tonnes	24 ml/2 g min	24 ml/2g min
Bentonite Fluid Loss ¹	ASTM D 5891	1 per 50 tonnes	18 ml max	18 ml max
Bentonite	ASTM D 5993	4,000	3.6 kg/m ² min	3.6 kg/m ² min

Material Property	Test Method	Test Frequency m ² (ft ²)	Bentomat (ST)	Bentomat (DN)
Mass/Area ²		(40,000)	(0.75 lb/ft ²)	(0.75 lb/ft ²)
GCL Grab Strength ³	ASTM D 6768	20,000 (200,000)	53 N/cm MARV (30 lbs/in MARV)	88 N/cm (MARV) (50 lbs/in MARV)
GCL Peel Strength ³	ASTM D 6496	4,000 (40,000)	6.1 N/cm min (3.5 lbs/in)	6.1 N/cm min (3.5 lbs/in)
GCL Index Flux ⁴	ASTM D 5887	Weekly	1x10 ⁻⁸ m ³ /m ² /sec max	1x10 ⁻⁸ m ³ /m ² /sec max
GCL Hydraulic Conductivity ⁴	ASTM D 5887	Weekly	5 x 10 ⁻⁹ cm/sec	5 x 10 ⁻⁹ cm/sec max
GCL Hydrated Internal Shear Strength ⁵	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) Typ 2 0 0 psf	500 psf (24 kPa) Typ 2 0 0 psf

5.17 Testing

Standard testing forms developed by the *Project Managers* Representative, or the *Contractor* must be used for the tests described in this section. When reference is made to an external test procedure, e.g., ASTM, the relevant test procedure documentation is an integral part of this manual. If these external test procedures reference or require other additional external procedures, they also are an integral part of this document.

The tests required are divided into two categories:

- Control tests
- Record tests

Control tests are used to determine that materials comply with the Earthwork, Concrete, Roads, Gabions & Pitching and Riprap Specifications prior to placement and to determine other parameters such as optimum moisture content and maximum dry density so that the requirements of the Specifications are achieved. The frequency of control tests can be reduced when material characteristics are relatively constant and consistent.

Record tests are performed, usually after placement of the materials, to determine that the in-place materials meet the requirements as set forth in the Specifications and/or are in accordance with the Design intent. Tests are performed by the methods indicated and at the frequencies shown in the Specifications. The tests will be performed at least the minimum number of times indicated. The *Project Manager* may increase the number of tests required.

5.17.1 Earthwork

Testing of all fill materials must be completed in accordance with the procedures and at the frequencies detailed in Specifications.

If the layer thickness for fill exceeds the test equipment working depth, compaction through the layer must be verified at the commencement of fill placement. This is done by excavating a pit. Thereafter, the compaction profile is established by testing the top of the layer. Periodic testing using pits may then be used to confirm continued acceptable compaction throughout the layer. Acceptance of riprap must be based on the visual observation of the placed riprap by the *Project Managers* Representative. If the *Project Managers* Representative deems it necessary, field measurements to determine the particle size distribution of the

riprap must be undertaken and other test work undertaken to determine its suitability and compliance with the requirements of the Specifications.

5.17.2 Pipework

The following tests are required prior to burial:

- Visual inspection of all non-welded joints connected by bolts.
- Visual inspection of all welds.

The following tests are required after backfill placement and compaction around the culverts.

- Visual inspection and testing, as required, of all culverts backfill. Periodically, the backfilled culvert must be exposed when specified by the *Project Managers* Representative to allow inspection of the completed backfill.
- Sections of the pipe must be tested for leaks as indicated in the Specifications.

All inspections and test results are to be recorded on the Work Activity Inspection Form.

5.17.3 Concrete

Inspections required are shown in the Specifications. Any testing deemed necessary will be performed at the discretion of the *Project Manager*. All concrete must be accepted by the *Project Managers* Representative on the Work Activity Inspection Form.

5.17.4 Field density tests

5.17.4.1 Sand replacement test

In general, the in-place density and unit weight of soil and rock are determined using the appropriate ASTM test method:

- ASTM D 5030:
 - Minimum test pit volume
 - Maximum particle size
- ASTM D 1556 or D 2167
 - Minimum test pit volume
 - Minimum particle size

The material being tested must be sufficiently cohesive to maintain stable sides during testing. It must not deform or slough while digging the hole or pouring the sand. In general, these test methods are limited to materials in an unsaturated condition and are not recommended for soft, friable, or seeping materials.

5.17.4.2 Failed tests

The *Project Managers* Representative will individually consider each record test which fails to meet the requirements of the Specifications and recommend an appropriate course of action. This may involve resampling, reworking, and retesting or some combination of these. In every case, all documentation associated with the original test and the recommended remedial work will be clearly cross referenced so that the entire sequence of activities can be completely reconstructed.

5.17.5 Equipment calibration, maintenance, and operation

Manufacturers' specifications for instrument calibration and maintenance will be followed. A record of calibration and maintenance activities will be maintained in field notebooks. The calibration, maintenance, and operating procedures for all instruments, equipment, and sampling tools are based on or are the actual manufacturer's instructions, specifications, and criteria for calibration, maintenance, and operation. Each piece of equipment used in activities affecting data quality must be calibrated at a frequency specified by the manufacturer.

Each piece of equipment used in activities affecting data quality must be maintained. Following maintenance, instruments will be calibrated according to the manufacturer's specifications to ensure proper completion of the maintenance procedure.

5.18 Inspection

5.18.1 Foundation preparation

The basin area of dam must be stripped, cleared, scarified, and compacted to form a Foundation. In general, the Foundation must be of material having density and strength parameters sufficient for the support of the proposed construction. In indicated Foundation areas, any unsuitable material must be removed until suitable material is reached unless approved otherwise by the *Project Manager*, any porous zones must be noted for later treatment with impervious material, and the location of any springs, seeps, and zones of must ow groundwater must be noted for remedial design. The *Project Managers* Representative must accept, on the Work Activity Inspection Form, prepared Foundation prior to the placement of overlying material.

Inspections required:

- Check for correct and complete stripping of topsoil, organic material, and unsuitable Materials.
- Check for preparation and compaction of Foundation surface.
- Check for location of porous zones.
- Check for location of encased pipes.
- Check for location of underdrains
- Check for compliance with the intent of the Design.

5.18.2 Fill material on dam

Fill Material on Specified Zones of the dam is to be used to backfill the wall areas as indicated on the Drawings or specified by the *Project Manager*. The materials are to be placed, worked, and compacted as required as per Specification. All fill must be accepted by the *Project Managers* Representative on the Work Activity Inspection Form.

Inspection required:

- Check for compliance with Specifications regarding moisture, spreading, layer Thickness, surface finish, and compaction.
- Check for compliance with the lines and grades shown on the Drawings.
- Check for compliance with the intent of the Design.
- Check for the presence of organic material.
- Check for control on maximum particle size and maximum fines content.

5.18.3 Concrete

All concrete must be accepted by the *Project Managers* Representative on the Work Activity Inspection Form.

The *Project Managers* Representative will perform three inspections:

- One prior to placement of concrete
- One during placement of the concrete
- Final inspection following curing

Inspections required:

- Check for compliance with the relevant Specifications regarding materials and methods.
- Check for compliance with the Drawings for line, grade, and method.
- Check for reinforcing size, spacing, and alignment.
- Check for form dimensions.
- Check for casting surface cleanliness.
- Check for vibration.
- Check for surface finish.
- Check for curing.

5.18.3 Measurements payments

5.18.3.1 Formwork

Fillets up to 20 mm * 20 mm will be deemed to be included in the rates for formwork.

Narrow formwork must only apply to items less than 300 mm wide.

Wood and steel float finishes will only be paid to the items listed in the schedule of quantities. All other floating or striking off must be deemed to be covered in the formwork and concrete placing rates.

5.18.3.2 Reinforcement

The rate submitted for each type of bar, mild or high yield, must apply for all sizes of bar.

5.18.3.3 Joints

Joints will only be paid for the items listed in the schedule of quantities. All other joints must be deemed to be covered in the concrete placing rates.

5.19 Reports

5.19.1 Daily reports

The *Project Managers* Representative will prepare a daily report summarizing work inspected, tests performed, and other relevant items. The daily report will indicate any failed inspections or tests, the actions taken to rectify these, and reports received or given about unacceptable or substandard procedures or materials.

5.19.2 Monthly progress report

The *Project Managers* Representative will prepare a monthly progress report. This report will:

- Summarize construction activities
- Summarize construction methods

- Summarize all CQA/QC activities
- Summarize all inspection and testing results
- Indicate problems encountered and resolutions
- Indicate potential difficulties
- Provide photographs

The *Project Managers* Representative may include such other items as Drawings, figures, and tables as are necessary to clearly present the work performed and planned.

5.19.3 As-built requirements

A record of all changes to Drawings due to unforeseen design omissions must be recorded on a standard As-built Record Sheet and updated timeously. This sheet will include item/s changed, date, brief description, a sketch that is clear and descriptive with dates and originator referenced to the item and information on correspondence between the Main *Contractor* and the *Project Manager* or Owner. Changes that take place and need to be updated on Drawings for As-built Drawings must be forwarded to the *Project Manager* as soon as practicable. They should also be reported in the daily and monthly progress reports.

The Construction Quality Assurance (CQA) must include photographic records of construction and video record of the method of which the 300 mm thick selected sand filter and protection layer is placed above the floor area of the 4-8-year ADF; reflect compliance with SANS10409 and be to at least the standard of the Department of Water and Sanitation draft guideline in SI units and South African Standard Specifications, recognising the Eskom project specifications.

This report will include:

5.19.4 Test Method and Testing Frequency

Test Methods – Earthwork

Type of Test Method

(ASTM)

Atterberg Limits D 4318

Particle Size Distribution D 422 a

Laboratory Compaction D 1557

Nuclear Method Field Density D 2922 b

Sand Cone Field Density D 1556

Notes:

C = Control Tests

R = Record Tests

5.19.5 Data Package

During the execution of the works, the *Contractor* shall complete a data package which shall include, but not be limited to or encompass only, the activities identified on the quality control plan but also all certificates called in for the specification. The package shall be handed to the Engineer for review and acceptance at the end of the project.

The *Contractor* shall refer to section 3.8.4 of this document for additional requirements on Data Books/Package.

The data package shall typically include the following:

- Index of contents
- Completed and signed quality plan
- Issued permits
- Method statements
- Identification of material
- Material test certificates
- Dimensional checks
- Inspection and test reports
- Re-work / repair details
- Variation orders
- Non-conformance reports and concessions granted
- Snag list
- Request for taking over certificates
- As-built drawing

5.20 Electrical & mechanical *Project Management* works

Electrical and Mechanical works are being covered through another contract/works. Interface between the *Contractor* s will be managed by the *Employer*.

5.21 Process control and IT works

The Process control and IT works, where required, will be covered through another contract/works. Interface between the *Contractor* s will be managed by the *Employer*.

5.22 Other Applicable Standards:

The *Contractor* (where applicable) must apply the latest versions of the following technical documents including Eskom Project Control Specifications

No	Document No	Description/Title
1		Technical Specification
2		Detailed Design Report
3		Quality Control Manual
4		Operations and Maintenance Manual
5		Existing Area Water Use Licence
6		Geotechnical Investigations Report
7		Environmental Authorization (EA) and Water Use License for the ADF
8		Environmental Impact Assessment
9		EMP
10		Department of Water and Sanitation, Technical Advisory Note: Construction Quality Assurance for Water Conservation and Pollution Control Barrier Systems
11		Construction Regulations (latest and applicable)
12		ISO 9001 Quality Management Systems
13	32-1034	Eskom Procurement Policy
14	240-53113685	Eskom Design Review Procedure
15	240-56355754	Field Instrumentation Installation
16	240-86973501	Project Management Drawing Standard – Common Requirements
17	240-53114026	Project Management Change Procedure

DAM CONSTRUCTION

No	Document No	Description/Title
18	240-66920003	Documentation Management Review and Handover Procedure
19	32-6	Eskom Document and Record Management Procedure
20	240-49230111	Hazard and Operability Analysis Guideline
21	240-4930030	Reliability Project Management Analysis Guideline
22	240-49230100	Safety Project Management Analysis Guideline
23	240-72273656	Power Generation Asset Criticality Classification Standard
24	200-6166	Backfill Specification
25	GGs 1427	Instrument Pipping
26	240-83561037	Reporting & Data Requirements Specification for <i>Contractors</i>
27	240-49230067	Life Data Analysis Guideline
28	240-49230046	Failure Mode and Effects Analysis Guideline
29	240-66920003	Project Handover Documentation Management Procedure
30	SANS 1200 series	Standardised Specification for Civil Project Management Construction
31	Act 36 of 1998	National Water Act (Act 336 of 1998) and Government Notice Regulation 704
32	Project Management Profession Act 46 of 2000	ECSA Code of Conduct (where applicable)
33	Regulatory and Legislative requirements	Legislative and Regulatory requirements, relevant and applicable
34	PPPFA Designated Sector	PPPFA Designated Sector Circular No. 01 of 2021/2022

6 List of drawings**6.1 Drawings issued by the *Employer***

The list of drawings will be issued by the *Employer* at or before the Contract Date and which apply to this contract.

