



**DEPARTMENT OF WATER AND SANITATION
REPUBLIC OF SOUTH AFRICA**

DUE AT 11:00 ON

(21 May 2019)

DWS01-0419 (WTE)

**THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF TEMPORARY
SUSPENSION STRUCTURE AND PIPE WORK FOR CANAL WATER SUPPLY**

SUBMIT BID DOCUMENTS TO:

POSTAL ADDRESS:
DIRECTOR-GENERAL:
WATER AND SANITATION
PRIVATE BAG X313
PRETORIA, 0001

OR

TO BE DEPOSITED IN:
THE BID BOX AT THE ENTRANCE
OF ZWAMADAKA BUILDING
157 FRANCIS BAARD STREET
PRETORIA, 0001

Compulsory Briefing Session

Date: 29 April 2019

Time: 13:00

Venue: Clanwilliam Dam Site Office

BIDDER: (Company Address OR Stamp)

COMPILED BY: CONSTRUCTION

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

THE SUPPLY, MANUFACTURE , DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPE WORK FOR CANAL WATER SUPPLY

CONTENTS

T1.	TENDERING PROCEDURES
T1.1	Part A: Invitation to bid
T1.2	Part B: Terms and conditions for bidding
T1.3	Conditions of tender
T2.	FORMS AND SCHEDULES TO BE COMPLETED BY TENDERER
T2.1	FORMS TO BE COMPLETED
	Declaration of Interest (SBD 4)
	Preference Points Claim in terms of the Preferential Procurement Regulation, 2017 (SBD 6.1) /SBD6.2
	Declaration of Bidders Past Supply Chain Management Practices (SBD 8)
	Certificate of Independent Bid Determination (SBD 9)
	Instructions to Bidders: Purchases
	Certificate of Attendance at Site Meeting
T2.2	DOCUMENTS TO BE SUBMITTED
(a)	Schedules to be submitted:
	▪ Schedule of plant and equipment
	▪ Schedule of similar work undertaken (Supply, manufacture, deliver of pipe work)
	▪ Schedule of proposed Sub-Contractors
	▪ Amendments proposed by tenderer
(b)	Verification documentation to be submitted to confirm B-BBEE Status level
	▪ B-BBEE Status Level Verification Certificate
(c)	Contractors Certificate of Registration with CIDB 3ME
(d)	Additional Documentation to be submitted
	▪ Tendered contract program (PS 8.2)
	▪ Method Statement (According to Pro Forma) (PS 9.1)
	▪ Pro Forma Quality Management System (PS 9.2)
	▪ Pro Forma Health and Safety Plan (PS 11.1)
C1.	CONTRACT DATA
C1.1	General conditions of contract
C1.2	Special conditions of contract
C1.2.1	General
C1.2.2	Amendment to the general conditions of contract for construction works. (3rd edition 2015)(GCC)
C1.3	Contract specific data
C2.	SCOPE OF WORK
C2.1	Standard specification
C2.2	Project specification
C2.3	Particular specifications
C2.4	Variations and additions to specifications

C3. PRICING SCHEDULE

- C3.1 Pricing instructions
- C3.2 Schedule of quantities

C4. DRAWINGS

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

**THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION
STRUCTURE AND PIPE WORK FOR CANAL WATER SUPPLY**

- T1. TENDERING PROCEDURES
 - T1.1 PART A: INVITATION TO BID
 - T1.2 PART B: TERMS AND CONDITIONS FOR BIDDING
 - T1.3 CONDITIONS OF TENDER

T1.1 PART A INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE (NAME OF DEPARTMENT/ PUBLIC ENTITY)

BID NUMBER: DWS01-0419 (WTE) CLOSING DATE: 21 MAY 2019 CLOSING TIME: 11:00

DESCRIPTION THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPE WORK FOR CANAL WATER SUPPLY

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT (STREET ADDRESS)

THE BID BOX AT THE ENTRANCE

OF ZWAMADAKA BUILDING

157 FRANCIS BAARD STREET, PRETORIA, 0001

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO

TECHNICAL ENQUIRIES MAY BE DIRECTED TO:

CONTACT PERSON Bid Office CONTACT PERSON I Arendse

TELEPHONE NUMBER 012 336 7596/7066/6544/7780/6562 TELEPHONE NUMBER 021 8720591

FACSIMILE NUMBER FACSIMILE NUMBER 021 8720594

E-MAIL ADDRESS bidenquirieswte@dws.gov.za E-MAIL ADDRESS Aarendsei@dws.gov.za

SUPPLIER INFORMATION

NAME OF BIDDER

POSTAL ADDRESS

STREET ADDRESS

TELEPHONE NUMBER CODE NUMBER

CELLPHONE NUMBER

FACSIMILE NUMBER CODE NUMBER

E-MAIL ADDRESS

VAT REGISTRATION NUMBER

SUPPLIER COMPLIANCE STATUS

TAX COMPLIANCE SYSTEM PIN:

OR CENTRAL SUPPLIER DATABASE No:

B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE TICK APPLICABLE BOX

B-BBEE STATUS LEVEL SWORN AFFIDAVIT

[TICK APPLICABLE BOX]

☐ Yes ☐ No

☐ Yes ☐ No

[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSES) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]

ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?

☐ Yes ☐ No

ARE YOU A FOREIGN BASED SUPPLIER FOR THE GOODS /SERVICES /WORKS OFFERED?

☐ Yes ☐ No

[IF YES, ANSWER PART B.3]

QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS

IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?

☐ YES ☐ NO

DOES THE ENTITY HAVE A BRANCH IN THE RSA?

☐ YES ☐ NO

DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?

☐ YES ☐ NO

DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA?

☐ YES ☐ NO

IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION?

☐ YES ☐ NO

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 BELOW.

T1.2 PART B

TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:	
1.1.	BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.
1.2.	ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED-(NOT TO BE RE-TYPED) OR IN THE MANNER PRESCRIBED IN THE BID DOCUMENT.
1.3.	THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.
1.4.	THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (SBD7).
2. TAX COMPLIANCE REQUIREMENTS	
2.1	BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.
2.2	BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS.
2.3	APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA .
2.4	BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.
2.5	IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.
2.6	WHERE NO TCS IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.
2.7	NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE, COMPANIES WITH DIRECTORS WHO ARE PERSONS IN THE SERVICE OF THE STATE, OR CLOSE CORPORATIONS WITH MEMBERS PERSONS IN THE SERVICE OF THE STATE."

NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.

SIGNATURE OF BIDDER:

.....

CAPACITY UNDER WHICH THIS BID IS SIGNED:

.....

(Proof of authority must be submitted e.g. company resolution)

DATE:

.....

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPEWORK FOR CANAL WATER SUPPLY

T1.3 CONDITIONS OF TENDER

CONTENTS

1. Issuing of documents
2. Queries with respect to this bid
3. Eligibility
4. Completion of Bids
5. Submission of Bids
6. Signature on Bids
7. Telegraphic Bids
8. The Department's right to decline any bid
9. Department is not liable for bidder's expenses
10. Evaluation Criteria
11. Rejection of bids
12. Results of Bids

T1.3 CONDITIONS OF TENDER

1. ISSUING OF DOCUMENTS

- (a) A complete sets of bid documents are issued to a prospective Bidder. These documents are available from the DWS website and e-Tender portal.
- (b) Bidders must satisfy themselves that the document is complete and conform to the index of this document. Should any figures or writing be indistinct or should any pages be missing from this document or should this document or the drawing(s) contain any obvious errors, the Bidders must immediately notify the Department in order to have any discrepancy rectified or clarified before submitting his bid. Such clarification will be valid only if made by the Department by means of formal amendment as described hereunder prior to the date of submission of bids. The Department may issue amendments to clarify or modify the Bid Documents. A copy of each amendment will be issued to each bidder and shall be acknowledged on the form issued with the amendments. No claim whatsoever will be entertained for faults in the bid price resulting from the above-mentioned discrepancies.
- (c) No alterations, omissions or additions shall be made to this document, but should it be deemed necessary to do so, the Bidder is at liberty to qualify his bid.
- (d) All Bidders shall be deemed to have waived, renounced and abandoned any conditions printed or written upon any stationery used by them for the purpose of or in connection with the submission of bids which are in conflict with the conditions laid down in this document.
- (e) Each page of the completed document that will be submitted should be initialised by the Bidder at the bottom of the page.

2. QUERIES WITH RESPECT TO THIS BID

Queries of a specific technical nature may be discussed personally or telephonically with I Arendse, Telephone 021 872 0591 or may be directed in writing to: **The Director: Construction Management Support, Department of Water and Sanitation, Private Bag X 323, Pretoria, 0001.**

3. ELIGIBILITY

An Entity is not eligible to submit a bid if:

- (a) the bidder does not comply with the legal requirements of the Department's Procurement as stated in paragraph 10.
- (b) the Entity submitting the bid is under restrictions or has principals who are under restriction to participate in the Department's procurement due to corrupt or fraudulent practices;
- (c) the Bidder does not have the legal capacity to enter into the contract;
- (d) the Entity submitting the bid is insolvent, in receivership, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of the foregoing;
- (e) the Bidder cannot demonstrate that he possesses the necessary professional and technical qualifications and competent, financial resources, equipment and other physical facilities, managerial capability, personnel, experience and reputation to perform the contract;
- (f) the Bidder cannot provide proof that he is in good standing with respect to duties, taxes, levies and contributions required in terms of legislation applicable to the work in the contract;
- (g) the Bidder has failed to perform on any previous contract and has been given a written notice to this effect;
- (h) the Bidder or a competent authorized representative of the Entity who submitted the tender has not attended the compulsory clarification meeting or site inspection if applicable;
- (i) the bid offer is not signed by a person authorized to sign on behalf of the Bidder;

- (j) more than one bid has been submitted by a Bidder. Each Bidder shall submit only one bid for the same project, either individually as a Bidder or as a partner in a joint venture. No Entity can be a subcontractor while submitting a bid individually or as a partner of a joint venture in the same bidding process. An Entity, if acting in the capacity of subcontractor in any bid, may participate in more than one bid, but only in that capacity. A Bidder who submits or participates in more than one bid will cause all the proposals in which the Bidder has participated to be disqualified.

4. COMPLETION OF BIDS

- (a) The bid must be signed on Part A Invitation to Bid form (SBD 1) with all blanks filled in Part A Invitation to Bid and Part B Terms and Conditions for Bidding.
- (b) All forms and schedules as per section T2.1 shall be completed in full. The documents as per section T2.2 shall be submitted.
- (c) **The Pricing Schedule in Section C3 of the bid document must be fully completed and priced out by the bidder. Failure to do so will deem your bid invalid.**
- (d) The bid documents shall not be separated in any way nor must any pages be detached from the original documents.
- (e) Each page of the completed document that will be submitted should be initialised by the Bidder at the bottom of the page.
- (f) Not make any alterations or additions to the bid documents, except to comply with instructions issued by the Department, or necessary to correct errors made by the Bidder. All signatories to the bid offer shall initial all such alterations. Erasures and the use of masking fluid are prohibited
- (g) Submit alternative bid offers only if a main bid offer, strictly in accordance with all the requirements of the bid documents, is also submitted. The alternative bid offer is to be submitted with the main bid offer together with a schedule that compares the requirements of the bid documents with the alternative requirements the Bidder proposes.

5. SUBMISSION OF BIDS

The Bid Document shall be completed, signed and submitted as follows:

- (a) The original Bid, together with a covering letter and supporting documents, shall be sealed in an envelope endorsed:

"ORIGINAL BID DWS01-0419 (WTE) FOR BID: THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPE WORK FOR CANAL WATER SUPPLY
and the name of the Bidder shall be clearly shown

- (b) Bids sealed and endorsed as above, will be received by: The Supply Chain Management office or may be deposit in the bid box at the entrance of the ZwaMadaka Building, 157 Francis Baard Street, Pretoria and not later than 11:00 on the date stipulated on the front cover of this document.

6. SIGNATURE ON BIDS

The successful bidder will be required to submit a "Letter from the manufacturer" confirming the supply arrangement within **14 days** after the approval of the bid. **Failure to do so will invalidate the Bid.**

If the bid is submitted by joint venture of more than one person and/or Companies and/or firms it shall be accompanied by the following:

- (a) The original or a notarial certified copy of the original document under which such joint venture was constituted which must define precisely inter alia the conditions under which the joint venture will function, its period of duration and the participation of the several constituent persons and/or companies and/or firms.
- (b) A certificate signed by or on behalf of each participating person and/or company and/or firm authorising the person who signed the bid to do so.

7. TELEGRAPHIC BIDS

No bid forwarded by telegram, telex, facsimile, e-mail or similar apparatus will be considered.

8. THE DEPARTMENTS RIGHT TO DECLINE ANY BID

The Department may accept or decline any variation, deviation, tender offer, or alternative tender offer, and may cancel the tender process and reject all tender offers at any time before the formation of a contract. The Department shall not accept or incur any liability to a tenderer for such cancellation and decline. The Department does not bind itself to accept the lowest or any bid.

9. DEPARTMENT NOT LIABLE FOR BIDDER'S EXPENSES

The Department will not be held liable for any expenses incurred in preparing and submitting bids, including the costs of any testing necessary to demonstrate that aspects of the offer satisfy requirements.

10. EVALUATION CRITERIA

Bids will be evaluated in accordance with the new Preferential Procurement Regulations, 2017, using 80/20 preference points system as prescribed in the Preferential Procurement Policy Framework Act (PPFA, Act 5 of 2000). The lowest acceptable bid will score 80 points for price and a maximum of 20 points will be awarded for attaining the Broad-Based Black Economic Empowerment (B-BBEE) Status Level of Contribution. Bids received will be evaluated on the five (5) phases namely **Pre-qualification, Local content, Administrative and mandatory requirements, Technical Evaluation and Specification Compliance and Price and Preference Points Claimed.**

Phase 1:

Prequalification criteria

Preferential procurement regulations, 2017, regulation 4

To give effect to the Preferential Procurement Regulations, 2017 pertaining to the Preferential Procurement Policy Framework Act (Act No 5 of 2000), the prequalification criteria in terms of regulation 4 will be applicable.

Only bidders who qualify as a B-BBEE Status level 1 and 2 will be considered for this bid.

• B-BBEE Status Level of contributor

Level 1	Level 2
X	X

Phase 2:

Evaluation of local production and content

- (a) The declaration made in the Declaration Certificate for Local Content (SBD 6.2) and **Annex C** (Local Content Declaration: Summary Schedule) will be used for this purpose. If the bid is for more than one product, the local content percentages for each product contained in Declaration C will be used
- (b) The Dti has the right to, as and when necessary, request for auditor's certificates confirming the authenticity the Declarations made in respect of local content

DECLARATION CERTIFICATE FOR LOCAL PRODUCTION AND CONTENT FOR DESIGNATED SECTORS

This Standard Bidding Document (SBD) must form part of all bids invited. It contains general information and serves as a declaration form for local content (local production and local content are used interchangeably).

Before completing this declaration, bidders must study the General Conditions, Definitions, Directives applicable in respect of Local Content as prescribed in the Preferential Procurement Regulations, 2017, the South African Bureau of Standards (SABS) approved technical specification number SATS 1286:2011 (Edition 1) and the Guidance on the Calculation of Local Content together with the Local Content Declaration Templates [Annex C (Local Content Declaration: Summary Schedule), D (Imported Content Declaration: Supporting Schedule to Annex C) and E (Local Content Declaration: Supporting Schedule to Annex C)].

1. General Conditions

1.1. Preferential Procurement Regulations, 2017 (Regulation 8) make provision for the promotion of local production and content.

1.2. Regulation 8.(2) prescribes that in the case of designated sectors, organs of state must advertise such tenders with the specific bidding condition that only locally produced or manufactured goods, with a stipulated minimum threshold for local production and content will be considered.

1.3. Where necessary, for tenders referred to in paragraph 1.2 above, a two stage bidding process may be followed, where the first stage involves a minimum threshold for local production and content and the second stage price and B-BBEE.

1.4. A person awarded a contract in relation to a designated sector, may not sub-contract in such a manner that the local production and content of the overall value of the contract is reduced to below the stipulated minimum threshold.

1.5. The local content (LC) expressed as a percentage of the bid price must be calculated in accordance with the SABS approved technical specification number SATS 1286: 2011 as follows:

$$LC = [1 - x / y] * 100$$

Where

x is the imported content in Rand

y is the bid price in Rand excluding value added tax (VAT)

Prices referred to in the determination of x must be converted to Rand (ZAR) by using the exchange rate published by South African Reserve Bank (SARB) at 12:00 on the date of advertisement of the bid as indicated in paragraph 4.1 below.

The SABS approved technical specification number SATS 1286:2011 is accessible on [http://www.thedti.gov.za/industrial development/ip.jsp](http://www.thedti.gov.za/industrialdevelopment/ip.jsp) at no cost.

- 1.6. A bid may be disqualified if this Declaration Certificate and the Annex C (Local Content Declaration: Summary Schedule) are not submitted as part of the bid documentation;

2. The stipulated minimum threshold(s) for local production and content (refer to Annex A of SATS 1286:2011) for this bid is/are as follows:

ITEM NO	DESCRIPTION OF GOODS	
A1	Installation on site	100%
A2	Delivery of all materials to site	100%
A3	Establishment and de-establishment	100%
A4	Health, Safety and Environment	100%
B1	12.7m Castelled beam	100%
B2	5.1m Castelled beam	100%
B3	3.4m Cross Beam	100%
B4	2.7m Column	100%
B5	3.6m Sling Beam	100%
B6	8.6m Beam	100%
B7	3.1m Beam	100%
B8	2.5m Column	100%
B9	0.6m Wide Saddle	100%
B10	3.6m Beam	100%
B11	3.6m Angle	100%
B12	4.9m Column	100%
B13	4.9m Column	100%
B14.1	Splice plates (Flange Splice, Inner – 14A)	100%
B14.2	Splice plates (Flange Splice, Outer – 14B)	100%
B14.3	Splice plates (Web Splice – 14C)	100%
B15	Dia 80 Pin (Material: EN 8)	100%
B16	Brackets as per drawing CWD 7079	100%
B17	Splice plate as per drawing CWD 7079	100%
B18	Keep Plate as per drawing CWD 7079	100%
B19	Brackets as per drawing CWD 7079	100%
B20	Brackets as per drawing CWD 7079	100%
B21	Brackets as per drawing CWD 7079	100%
B22	M20x80 Hexagon head screws with nut and 2 washers (Grade 10.9 HDG)	100%
B23	M20x60 Hexagon head screw with nut and 2 washers (Grade 10.9 HDG)	100%
B24	M20x60 Hexagon head screw with nut and 2 washers (Grade 8.8 HDG)	100%
B25	M16x50 Hexagon head screw with nut and 2 washers (Grade 8.8 HDG)	100%
B26	M20x70 Hexagon head screw with nut and 2 Hardened washers (Grade 8.8 HDG)	100%
B27	M8x30 Hexagon head screws (Grade 8.8 HDG)	100%
B28.1	M24 x460mm Long adhesive anchors with nut & two washers (Grade 8.8 HDG). Including adhesive as per drawing detail.	100%
B28.2	M24 Nuts (Grade 8.8 HDG)	100%
B29	M24 x 500mm long adhesive anchors with two nuts & two washers (Grade 8.8 HDG) Including adhesive as per drawing detail.	100%

ITEM NO	DESCRIPTION OF GOODS	
B30	M20 x275mm long adhesive anchors with nut & washers (Grade 8.8 HDG) Including adhesive as per drawing detail.	100%
B31	22x2950 Wire rope 6 x36 IWRC including thimble and 5 wire clips on each end	100%
B32	'D'-shackle (ø22mm Pin)	100%
B33	M32x 700-960 Turnbuckle / Rigging Screw	100%
B34	Adhesive foil pack	100%
B35	16mm Plate 1400 x 400mm (25x 22mm holes to be drilled on site to suit existing valve body).	100%
C1	Gusseted tee	100%
C2	Outlet pipe	100%
C3	Outlet pipe (Opp. Hand)	100%
C4	Support	100%
C5	RSV Valve: 200NB, PN10	70%
C6	M20x70 Hexagon bolt, nut and 2 washers	100%
C7	M20 x 220mm long adhesive anchor, two nuts and two washers (Incl Adhesive)	100%

3. Does any portion of the goods or services offered have any imported content?

(Tick applicable box)

YES		NO	
-----	--	----	--

- 3.1 If yes, the rate(s) of exchange to be used in this bid to calculate the local content as prescribed in paragraph 1.5 of the general conditions must be the rate(s) published by SARB for the specific currency at 12:00 on the date of advertisement of the bid.

The relevant rates of exchange information is accessible on www.reservebank.co.za

Indicate the rate(s) of exchange against the appropriate currency in the table below (refer to Annex A of SATS 1286:2011):

Currency	Rates of exchange
US Dollar	
Pound Sterling	
Euro	
Yen	
Other	

NB: Bidders must submit proof of the SARB rate (s) of exchange used.

4. Where, after the award of a bid, challenges are experienced in meeting the stipulated minimum threshold for local content the dti must be informed accordingly in order for the dti to verify and in consultation with the AO/AA provide directives in this regard.

LOCAL CONTENT DECLARATION

(REFER TO ANNEX B OF SATS 1286:2011)

LOCAL CONTENT DECLARATION BY CHIEF FINANCIAL OFFICER OR OTHER LEGALLY RESPONSIBLE PERSON NOMINATED IN WRITING BY THE CHIEF EXECUTIVE OR SENIOR MEMBER/PERSON WITH MANAGEMENT RESPONSIBILITY (CLOSE CORPORATION, PARTNERSHIP OR INDIVIDUAL)

IN RESPECT OF BID NO.

ISSUED BY: (Procurement Authority / Name of Institution):
.....

NB

- 1 The obligation to complete, duly sign and submit this declaration cannot be transferred to an external authorized representative, auditor or any other third party acting on behalf of the bidder.
- 2 Guidance on the Calculation of Local Content together with Local Content Declaration Templates (Annex C, D and E) is accessible on http://www.thdti.gov.za/industrial_development/ip.jsp. Bidders should first complete Declaration D. After completing Declaration D, bidders should complete Declaration E and then consolidate the information on Declaration C. **Declaration C should be submitted with the bid documentation at the closing date and time of the bid in order to substantiate the declaration made in paragraph (c) below.** Declarations D and E should be kept by the bidders for verification purposes for a period of at least 5 years. The successful bidder is required to continuously update Declarations C, D and E with the actual values for the duration of the contract.

I, the undersigned, (full names),
do hereby declare, in my capacity as

of (name of bidder
entity), the following:

- (a) The facts contained herein are within my own personal knowledge.
- (b) I have satisfied myself that:
 - (i) the goods/services/works to be delivered in terms of the above-specified bid comply with the minimum local content requirements as specified in the bid, and as measured in terms of SATS 1286:2011; and

- (c) The local content percentage (%) indicated below has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E which has been consolidated in Declaration C:

Bid price, excluding VAT (y)	R	
Imported content (x), as calculated in terms of SATS 1286:2011	R	
Stipulated minimum threshold for local content (paragraph 3 above)		
Local content %, as calculated in terms of SATS 1286:2011		

If the bid is for more than one product, the local content percentages for each product contained in Declaration C shall be used instead of the table above.

The local content percentages for each product has been calculated using the formula given in clause 3 of SATS 1286:2011, the rates of exchange indicated in paragraph 4.1 above and the information contained in Declaration D and E.

- (d) I accept that the Procurement Authority / Institution has the right to request that the local content be verified in terms of the requirements of SATS 1286:2011.
- (e) I understand that the awarding of the bid is dependent on the accuracy of the information furnished in this application. I also understand that the submission of incorrect data, or data that are not verifiable as described in SATS 1286:2011, may result in the Procurement Authority / Institution imposing any or all of the remedies as provided for in Regulation 14 of the Preferential Procurement Regulations, 2017 promulgated under the Preferential Policy Framework Act (PPFA), 2000 (Act No. 5 of 2000).

SIGNATURE: _____

DATE: _____

WITNESS No. 1 _____

DATE: _____

WITNESS No. 2 _____

DATE: _____

Phase 3:**Administrative Compliance:**

Bidders are required to comply with the following listed below:

No	Criteria	Yes	No
1	Companies must be registered with National Treasury's Central Supplier Database. Provide MAAA number on SBD1		
2	Tax compliant with SARS (to be verified through CSD and SARS). Attach a copy of Tax Clearance certificate and PIN.		
3	Active registration with Company Intellectual Property Commission (to be verified through CSD and CIPC). Attach copy of CIPC / CIPRO certificate.		
4	The Bid must be signed by a director of the company or a duly authorised person and proof of such authority must be submitted with the bid.		
5	Valid Sworn Affidavit or B-BBEE Status Level Verification Certificate of the main bidder – Failure to submit the required documentation will be interpreted to mean that the preference points for the B-BBEE status level of contribution are not claimed.		
6	Complete, sign, submit SBD 1, SBD 3.2, SBD 4, SBD 6.1, SBD 6.2, SBD 8, SBD 9, ANNEXURE C, D & E		

Mandatory requirements

Failure to submit any of the documents listed below will render your bid non-responsive and will be disqualified.

Yes - list the relevant documents required on the table below

No	Criteria	Yes	No
1	Attendance of compulsory briefing session		
2	Additional Documentation to be submitted <ul style="list-style-type: none">▪ Tendered contract program (PS 8.2)▪ Method Statement (According to Pro Forma) (PS 9.1)▪ Pro Forma Quality Management System (PS 9.2)▪ Pro Forma Health and Safety Plan (PS 11.1)		
3	Contractors Certificate of Registration with CIDB 3ME		
4	Valid letter of Good Standing with the Compensation Commissioner in terms of the Compensation for Occupational Injuries and Diseases Act No 130 of 1993		
5	Certified copy of UIF certificate or letter of good standing		

Phase 4:**Specification or Technical Compliance**

Compliance requirements:

- Indicate by marking the relevant column, if you mark on both column it will be considered as non-compliance. A bidder who fails to comply with the specifications requirements will be disqualified and not considered for further evaluation.

ITEM NO	DESCRIPTION OF GOODS	UNIT	QTY	COMPLY	NOT COMPLY
A1	Installation on site	Sum	1		
A2	Delivery of all materials to site	Sum	1		
A3	Establishment and de-establishment	Sum	1		
A4	Health, Safety and Environment	Sum	1		

ITEM NO	DESCRIPTION OF GOODS	UNIT	QTY	COMPLY	NOT COMPLY
B1	12.7m Castellated beam	No	2		
B2	5.1m Castellated beam	No	2		
B3	3.4m Cross Beam	No	5		
B4	2.7m Column	No	2		
B5	3.6m Sling Beam	No	4		
B6	8.6m Beam	No	1		
B7	3.1m Beam	No	1		
B8	2.5m Column	No	1		
B9	0.6m Wide Saddle	No	10		
B10	3.6m Beam	No	3		
B11	3.6m Angle	No	2		
B12	4.9m Column	No	1		
B13	4.9m Column	No	1		
B14.1	Splice plates (Flange Splice, Inner – 14A)	No	8		
B14.2	Splice plates (Flange Splice, Outer – 14B)	No	4		
B14.3	Splice plates (Web Splice – 14C)	No	4		
B15	Dia 80 Pin (Material: EN 8)	No	4		
B16	Brackets as per drawing CWD 7079	No	6		
B17	Splice plate as per drawing CWD 7079	No	2		
B18	Keep Plate as per drawing CWD 7079	No	8		
B19	Brackets as per drawing CWD 7079	No	2		
B20	Brackets as per drawing CWD 7079	No	2		
B21	Brackets as per drawing CWD 7079	No	4		
B22	M20x80 Hexagon head screws with nut and 2 washers (Grade 10.9 HDG)	No	80		
B23	M20x60 Hexagon head screw with nut and 2 washers (Grade 10.9 HDG)	No	56		
B24	M20x60 Hexagon head screw with nut and 2 washers (Grade 8.8 HDG)	No	64		
B25	M16x50Hexagon head screw with nut and 2 washers (Grade 8.8 HDG)	No	48		
B26	M20x70 Hexagon head screw with nut and 2 Hardened washers (Grade 8.8 HDG)	No	88		
B27	M8x30 Hexagon head screws (Grade 8.8 HDG)	No	16		
B28.1	M24 x460mm Long adhesive anchors with nut & two washers (Grade 8.8 HDG). Including adhesive as per drawing detail.	No	36		
B28.2	M24 Nuts (Grade 8.8 HDG)	No	20		
B29	M24 x 500mm long adhesive anchors with two nuts & two washers (Grade 8.8 HDG) Including adhesive as per drawing detail.	No	20		
B30	M20 x275mm long adhesive anchors with nut & washers (Grade 8.8 HDG) Including adhesive as per drawing detail.	No	6		
B31	22x2950 Wire rope 6 x36 IWRC including thimble and 5 wire clips on each end	No	8		
B32	'D'-shackle (22mm Pin)	No	8		
B33	M32x 700-960 Turnbuckle / Rigging Screw	No	8		
B34	Adhesive foil pack	No	20		

ITEM NO	DESCRIPTION OF GOODS	UNIT	QTY	COMPLY	NOT COMPLY
B35	16mm Plate 1400 x 400mm (25x 22mm holes to be drilled on site to suit existing valve body).	No	1		
C1.	Gusseted tee	No	2		
C2.	Outlet pipe	No	1		
C3.	Outlet pipe (Opp. Hand)	No	1		
C4.	Support	No	1		
C5.	RSV Valve: 200NB, PN10	No	2		
C6.	3mm Full Face Gasket to suit 200NB flange	No	8		
C7.	M20x70 Hexagon bolt, nut and 2 washers	No	64		
C8.	M20 x 220mm long adhesive anchor, two nuts and two washers (Incl Adhesive)	No	11		

Phase 5:

Evaluation of Price and Preference Points Claimed:

During this phase, bid proposals that passed the phase 4 will be further evaluated based on the 80/20 preference points system in accordance with the PPPFA Act, where 80 points will be attained in respect of price and 20 points will be awarded to a bidder for attaining the B-BBEE Status Level of Contribution.

Failure on the part of a bidder to submit proof of B-BBEE Status level of contributor together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.

Proof includes original and valid B-BBEE Status Level Verification Certificates or certified copies thereof together with their price quotations, to substantiate their B-BBEE rating claims.

Bidders who qualify as EMEs or QSEs are only required to submit a sworn affidavit signed by the company representative and attested by a Commissioner of oaths, confirming its annual total revenue and level of Black ownership.

B-BBEE certificate must be a certified copy and it must be valid on or before the closing date of the invitation in order for a bidder to qualify for the points to be claimed.

The original Sworn Affidavit endorsed or signed off by the commissioner of oath must be the original document not a copy and it must be valid on or before the closing date of the invitation in order for a bidder to qualify for the points to be claimed.

In bids where there is Consortia/Joint Ventures, a consolidated valid B-BBEE certificate must be submitted.

NB: A Copy of certified copy of B-BBEE status level contributor certificate will not be accepted.

NB: A Copy of a sworn affidavit will not be accepted.

11. BIDDERS ARE REQUESTED NOT TO MAKE A COPY OF THE DOCUMENT WHICH HAS ALREADY BEEN CERTIFIED FOR TENDERING PURPOSES!! REJECTION OF BID

Bids not complying with the above-mentioned requirements and specifications will be regarded as incomplete and will not be considered.

12. RESULTS OF BIDS

Results of non-acceptance of bids will be sent to individual unsuccessful bidders. Particulars of accepted bids are published weekly in the Government Tender Bulletin.

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

THE SUPPLY, MANUFACTURE , DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPEWORK FOR CANAL WATER SUPPLY

T2. FORMS AND SCHEDULES TO BE COMPLETED BY TENDERER

T2.1 FORMS TO BE COMPLETED

Declaration of Interest (SBD 4)

Preference Points Claim in terms of the Preferential Procurement Regulation, 2017
(SBD 6.1)/SBD6.2

Declaration of Bidders Past Supply Chain Management Practices (SBD 8)

Certificate of Independent Bid Determination (SBD 9)

Instructions to Bidders: Purchases

Certificate of Attendance at Site Meeting

T2.2 DOCUMENTS TO BE SUBMITTED

(a) Schedules to be submitted:

- Schedule of plant and equipment
- Schedule of similar work undertaken
- Schedule of proposed Sub-Contractors
- Amendments proposed by tenderer

(b) Verification documentation to be submitted to confirm B-BBEE Status level

- B-BBEE Status Level Verification Certificate

(c) Contractors Certificate of Registration with CIDB 3ME

(d) Additional Documentation to be submitted

- Tendered contract program (PS 8.2)
- Method Statement (According to Pro Forma) (PS 9.1)
- Pro Forma Quality Management System (PS 9.2)
- Pro Forma Health and Safety Plan (PS 11.1)

T2.2 (a) SCHEDULES TO BE SUBMITTED
SCHEDULE OF SIMILAR WORK UNDERTAKEN (Supply, manufacture, deliver of pipe work)

The following is a statement of work of similar nature recently successfully executed by myself / ourselves:

[illegible]

SIGNATURE: DATE:

(of person authorised to sign on behalf of the Tenderer)

VERIFICATION DOCUMENTATION

The Tenderer shall attach the following documentation in support of the pre-qualification specification of this bid:

original and valid B-BBEE Status Level Verification Certificate or an originally certified copy thereof, issued by accredited Verification Agency/s by SANAS or 11.2.3.2 Registered Auditor approved by Independent Regulatory Board of Auditor (IRBA), together with their bid to substantiate their B-BBEE rating claims.

A trust, consortium or joint venture (including unincorporated consortia and joint ventures) must submit a consolidated B-BBEE Status Level Verification certificate to substantiate their B-BBEE rating claims.

An EME is required to submit a sworn affidavit confirming their annual total revenue of R10 million or less and level of black ownership to substantiate their EME rating claims.

An EME that is regarded as a Specialized Enterprise is required to submit a sworn affidavit confirming their annual turnover/allocated budget/ gross receipt of R10 million or less and level of percentage of black beneficiaries to substantiate their EME rating claims.

A QSE is required to submit a sworn affidavit confirming their annual total revenue of between R10 million and R50 million and level of black ownership or a B-BBEE level verification certificate to substantiate their QSE rating claims.

NOTE: It is a requirement of this contract that the verification documentation of the names of proposed subcontractors for the work must be provided with the Tender.

SIGNATURE: DATE:
(of person authorised to sign on behalf of the Tenderer)

CONTRACTOR'S CERTIFICATE OF REGISTRATION WITH CIDB

Attached hereto is my / our Contractor's Certificate of Registration with CIDB. My failure to submit the certificate with my / our tender document will lead to the conclusion that I am / we are not registered with the CIDB and therefore not eligible to tender.

[Note: Only certificates for the specified category 3ME are acceptable. Applications, or acknowledgement of applications by CIDB, will only be acceptable if it is certain that the application will be successful and a certificate will be issued before award of the contract.]

SIGNATURE: DATE:
(of person authorised to sign on behalf of the Tenderer)

TENDERED CONTRACT PROGRAMME

The Tenderer shall attach a preliminary programme reflecting the proposed sequence and tempo of execution of the various activities comprising the work for this Contract. The programme shall be in accordance with the information supplied in the Contract, requirements of the Project Specifications and with all other aspects of his Tender.

[Notes:

- (1) The programme must be based on the completion time as specified in the Contract Data. No other completion time that may be indicated on this programme will be regarded as an alternative offer, unless it is listed in Form I hereafter and supported by a detailed statement to that effect, all as specified in the Tender Data]**

SIGNATURE: **DATE:**
(of person authorised to sign on behalf of the Tenderer)

CONTRACTOR'S HEALTH AND SAFETY DECLARATION

In terms of Clause 4(4) of the OHSA 1993 Construction Regulations 2003 (referred to as "the Regulations" hereafter), a Contractor may only be appointed to perform construction work if the Employer is satisfied that the Contractor has the necessary competencies and resources to carry out the work safely in accordance with the Occupational Health and Safety Act No 85 of 1993 and the OHSA 1993 Construction Regulations 2003.

To that effect a person duly authorised by the tenderer must complete and sign the declaration hereafter in detail.

Declaration by Tenderer

1. I the undersigned hereby declare and confirm that I am fully conversant with the Occupational Health and Safety Act No 85 of 1993 (as amended by the Occupational Health and Safety Amendment Act No 181 of 1993), and the OHSA 1993 Construction Regulations 2003.
2. I hereby declare that my company / enterprise has the competence and the necessary resources to safely carry out the construction work under this contract in compliance with the Construction Regulations and the Employer's Health and Safety Specifications.
3. I hereby undertake, if my tender is accepted, to provide a sufficiently documented Health and Safety Plan in accordance with Regulation 5(1) of the Construction Regulations, approved by the Employer or his representative, before I will be allowed to commence with construction work under the contract. I hereby agree that my company/enterprise will not have a claim for compensation for delay or extension of time because of my failure to obtain the necessary approval for the said safety plan.
4. I confirm that copies of my company's approved Health and Safety Plan, the Employer's Safety Specifications as well as the OHSA 1993 Construction Regulations 2003 will be provided on site and will at all times be available for inspection by the Contractor's personnel, the Employer's personnel, the Engineer, visitors, and officials and inspectors of the Department of Labour.
5. I hereby confirm that adequate provision has been made in my tendered rates and prices in the bill of quantities to cover the cost of all resources, actions, training and all health and safety measures envisaged in the OHSA 1993 Construction Regulations 2003, including the cost for specific items that may be scheduled in the bill of quantities.
6. I hereby confirm that I will be liable for any penalties that may be applied by the Employer in terms of the said Regulations for failure on my part to comply with the provisions of the Act and the Regulations as set out in Regulation 30 of the Regulations.
7. I agree that my failure to complete and execute this declaration to the satisfaction of the Employer will mean that I am unable to comply with the requirements of the OHSA 1993 Construction Regulations 2003, and accept that my tender will be prejudiced and may be rejected at the discretion of the Employer.
8. I am aware of the fact that, should I be awarded the contract, I must submit the notification required in terms of Regulation 3 of the OHSA 1993 Construction Regulations 2003 before I will be allowed to proceed with any work under the contract.

ADDITIONAL INFORMATION

The following documentation to be included after this page:

- Pro Forma Health and Safety Plan (PS 11.1)

SIGNATURE: DATE:
(of person authorised to sign on behalf of the Tenderer)

CONTRACTOR'S ENVIRONMENTAL DECLARATION

In terms of the National Environmental Management Act (107 of 1998) as well as Specific Environmental Management Acts such as the National Environmental Management : Waste Act (59 of 2008) a Contractor may only be appointed to perform construction work if the Employer is satisfied that the Contractor has the necessary competencies and resources to carry out the work in an environmentally acceptable manner.

To that effect a person duly authorised by the tenderer must complete and sign the declaration hereafter in detail

Declaration by Tenderer

1. I the undersigned hereby declare and confirm that I am fully conversant with the National Environmental Management Act (107 of 1998) as well as Specific Environmental Management Acts;
2. I hereby declare that my company / enterprise conforms to the information requirements stipulated in Regulation 33 of the of the NEMA EIA Regulations (Government Notice R.543);
3. I hereby undertake, if my tender is accepted, to provide a sufficiently documented Environmental Plan, tailored to meet the site specific needs of this project;
4. Ensure that conditions provided for in the Environmental Authorization issued by Western Cape Department of Environmental Affairs and Development Planning for the project are adhered to; and
5. Ensure that all reasonable measures are taken to prevent the realization of adverse environmental consequences

ADDITIONAL INFORMATION

The following documentation to be included after this page:

SIGNATURE:
(of person authorised to sign on behalf of the Tenderer)

DATE:

ADDITIONAL INFORMATION

The following documentation to be included after this page:

- Pro Forma Method Statement (PS 9.1)
- Pro Forma Quality Management System (PS 9.2)

SIGNATURE:
(of person authorised to sign on behalf of the Tenderer)

DATE:

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

THE SUPPLY, MANUFACTURE , DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPEWORK FOR CANAL WATER SUPPLY

C1. CONTRACT DATA

C1.1 GENERAL CONDITIONS OF CONTRACT

C1.2 SPECIAL CONDITIONS OF CONTRACT

C1.2.1 GENERAL

C1.2.2 ADMENDMENT TO THE GENERAL CONDITIONS OF CONTRACT FOR CONSTRUCTION WORKS. (3rd
Edition 2015)(GCC)

C1.3 CONTRACT SPECIFIC DATA

1.6.1 The names of all directors/trustees/shareholders/members, their individual identity numbers, tax reference numbers and, if applicable, employee/PERSAL numbers must be indicated in paragraph 3 below.

"State" means –

- (a) any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No. 1 of 1999);
- (b) any municipality or municipal entity;
- (c) provincial legislature;
- (d) national Assembly or the national Council of provinces; or
- (e) Parliament.

²⁹Shareholder" means a person who owns shares in the company and is actively involved in the management of the enterprise or business and exercises control over the enterprise.

2.7 Are you or any person connected with the bidder presently employed by the state?

☐ YES ☐ NO

2.7.1 If so, furnish the following particulars:

Name of person/director/trustee shareholder/member:

Name of state institution at which you or the person connected to the bidder is employed:

Position occupied in the state institution:

Any other particulars:

2.7.2

If you are presently employed by the state, did you obtain the appropriate authority to undertake remunerative work outside employment in the public sector?

☐ YES ☐ NO

2.7.2.1 If yes, did you attach proof of such authority to the bid document?

☐ YES ☐ NO

(Note: Failure to submit proof of such authority, where applicable, may result in the disqualification of the bid.)

2.7.2.2 If no, furnish reasons for non-submission of such proof:

2.8 Did you or your spouse, or any of the company's directors/trustees/shareholders/members or their spouses conduct business with the state in the previous twelve months?

☐ YES ☐ NO

2.8.1 If so, furnish particulars:

2.9 Do you, or any person connected with the bidder, have any relationship (family, friend, other) with a person employed by the state and who may be involved with the evaluation and or adjudication of this bid?

☐ YES ☐ NO

2.9.1 If so, furnish particulars

2.10 Are you, or any person connected with the bidder, aware of any relationship (family, friend, other) between any other bidder and any person employed by the state who may be involved with the evaluation and or adjudication of this bid?

☐ YES ☐ NO

2.10.1 If so, furnish particulars.

2.11 Do you or any of the directors/trustees/shareholders/members of the company have any interest in any other related companies whether or not they are bidding for this contract?

☐ YES ☐ NO

2.11.1 If so, furnish particulars:

3 Full details of directors/trustees/members/shareholders

[illegible]

4 DECLARATION

I, THE UNDERSIGNED (NAME) _____

CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 2 and 3 ABOVE IS CORRECT. I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

Signature

Date _____

Position

Name of bidder



DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

This Standard Bidding Document must form part of all bids invited.

It serves as a declaration to be used by institutions in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.

The bid of any bidder may be disregarded if that bidder, or any of its directors have-
abused the institution's supply chain management system;
committed fraud or any other improper conduct in relation to such system; or
failed to perform on any previous contract.

In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
4.1	Is the bidder or any of its directors listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector? (Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the audi alteram partem rule was applied). The Database of Restricted Suppliers now resides on the National Treasury's website(www.treasury.gov.za) and can be accessed by clicking on its link at the bottom of the home page.	<input type="checkbox"/>	<input type="checkbox"/>
4.1.1	If so, furnish particulars: 		
4.2	Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)? The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.	Yes <input type="checkbox"/>	No <input type="checkbox"/>

4.2.1	If so, furnish particulars:		
4.3	Was the bidder or any of its directors convicted by a court of law (including a court outside of the Republic of South Africa) for fraud or corruption during the past five years?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.3.1	If so, furnish particulars:		
4.4	Was any contract between the bidder and any organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.4.1	If so, furnish particulars:		

CERTIFICATION

SBD 8

I, THE UNDERSIGNED (FULL NAME) _____

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS TRUE AND CORRECT.

I ACCEPT THAT, IN ADDITION TO CANCELLATION OF A CONTRACT, ACTION MAY BE TAKEN AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

Signature

Date

Position

Name of Bidder

**PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL
PROCUREMENT REGULATIONS 2017**

This preference form must form part of all bids invited. It contains general information and serves as a claim form for preference points for Broad-Based Black Economic Empowerment (B-BBEE) Status Level of Contribution

NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF B-BBEE, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017.

1. GENERAL CONDITIONS

- 1.1 The following preference point systems are applicable to all bids:
- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
 - the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).
- 1.2
- a) The value of this bid is estimated to not exceed R50 000 000 (all applicable taxes included) and therefore the 80/20 preference point system shall be applicable; or
- 1.3 Points for this bid shall be awarded for:
- (a) Price; and
- (b) B-BBEE Status Level of Contributor.
- 1.4 The maximum points for this bid are allocated as follows:

PRICE	POINTS
B-BBEE STATUS LEVEL OF CONTRIBUTOR	80
Total points for Price and B-BBEE must not exceed	20
	100

- 1.5 Failure on the part of a bidder to submit proof of B-BBEE Status level of contributor together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.

- 1.6 The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the purchaser.

2. DEFINITIONS

- (a) **"B-BBEE"** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;
- (b) **"B-BBEE status level of contributor"** means the B-BBEE status of an entity in terms of a code of good practice on black economic empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;
- (c) **"bid"** means a written offer in a prescribed or stipulated form in response to an

invitation by an organ of state for the provision of goods or services, through price quotations, advertised competitive bidding processes or proposals;

(d) **“Broad-Based Black Economic Empowerment Act”** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);

(e) **“EME”** means an Exempted Micro Enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

(f) **“functionality”** means the ability of a tenderer to provide goods or services in accordance with specifications as set out in the tender documents.

(g) **“prices”** includes all applicable taxes less all unconditional discounts;

(h) **“proof of B-BBEE status level of contributor”** means:

- 1) B-BBEE Status level certificate issued by an authorized body or person;
- 2) A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;
- 3) Any other requirement prescribed in terms of the B-BBEE Act;

(i) **“QSE”** means a qualifying small business enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

(j) **“rand value”** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

3. POINTS AWARDED FOR PRICE

3.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 or 90 points is allocated for price on the following basis:
80/20 or 90/10

$$P_s = 80 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right) \quad \text{or} \quad P_s = 90 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$$

Where

P_s = Points scored for price of bid under consideration

P_t = Price of bid under consideration

P_{\min} = Price of lowest acceptable bid

4. POINTS AWARDED FOR B-BBEE STATUS LEVEL OF CONTRIBUTOR

4.1

In terms of Regulation 6 (2) and 7 (2) of the Preferential Procurement Regulations, preference points must be awarded to a bidder for attaining the B-BBEE status level of contribution in accordance with the table below:

B-BBEE Status Level of Contributor	Number of points (90/10 system)	Number of points (80/20 system)
1	10	20
2	9	18
3	6	14
4	5	12
5	4	8

5.1 Bidders who claim points in respect of B-BBEE Status Level of Contribution must complete the following:

6. B-BEE STATUS LEVEL OF CONTRIBUTOR CLAIMED IN TERMS OF PARAGRAPHS 1.4 AND 4.1

6.1 B-BEE Status Level of Contributor:(maximum of 10 or 20 points)

(Points claimed in respect of paragraph 7.1 must be in accordance with the table reflected in paragraph 4.1 and must be substantiated by relevant proof of B-BBEE status level of contributor.

7.1 Will any portion of the contract be sub-contracted?

YES		
	NO	

7.1.1 If yes, indicate:

- i) What percentage of the contract will be subcontracted..... %
- ii) The name of the sub-contractor.....
- iii) The B-BBEE status level of the sub-contractor.....
- iv) Whether the sub-contractor is an EME or QSE

YES		NO	
-----	--	----	--

v) Specify, by ticking the appropriate box, if subcontracting with an enterprise in terms of Preferential Procurement Regulations, 2017:

Designated Group: An EME or QSE which is at least 51% owned

Designated Group: An EME or QSE which is at last 51% owned by:		EME	QSE
Black people		✓	✓
Black people who are youth			
Black people who are women			
Black people with disabilities			
Black people living in rural or underdeveloped areas or townships			
Cooperative owned by black people			
Black people who are military veterans			
OR			
Any EME			
Any QSE			

8. DECLARATION WITH REGARD TO COMPANY/FIRM

8.1 Name of company/firm:.....

8.2 VAT registration number:.....

8.3 Company registration number:.....

8.4 TYPE OF COMPANY/ FIRM

Partnership/Joint Venture / Consortium
 One person business/sole propriety
 Close corporation
 Company
 (Pty) Limited
 [TICK APPLICABLE BOX]

8.5 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

.....

8.6 COMPANY CLASSIFICATION

Manufacturer
 Supplier
 Professional service provider
 Other service providers, e.g. transporter, etc.
 [TICK APPLICABLE BOX]

8.7 Total number of years the company/firm has been in business:.....

8.8 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBE status level of contributor indicated in paragraphs 1.4 and 6.1 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;
- iv) If the B-BBEE status level of contributor has been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have –
 - (a) disqualify the person from the bidding process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) recommend that the bidder or contractor, its shareholders and

directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and

- (e) forward the matter for criminal prosecution.

WITNESSES
1.
2.

..... SIGNATURE(S) OF BIDDERS(S)
DATE:
ADDRESS
.....
.....

DEPARTMENT OF WATER AND SANITATION
INSTRUCTIONS TO BIDDERS: PURCHASES

1. The standard bidding forms should not be retyped or redrafted but photocopies may be prepared and used. Additional offers may be made of any item but only on a photocopy of the page in question or on other forms obtainable from the Head of Procurement: Department of Water and Sanitation, Private Bag X313, Pretoria, 0001, Attention: Supply Chain Management Office. Additional offers made in any other manner may be disregarded.
2. Should standard bid forms not be filled in by means of mechanical devices, for example typewriters, ink, preferably black, must be used to fill in bids.
3. Bidders shall check the numbers of the pages and satisfy themselves that none are missing or duplicated. No liability shall be accepted in regard to claims arising from the fact that pages are missing or duplicated.
4. Where items are specified in detail, the specifications form an integral part of the bid document and bidders shall indicate in the space provided whether the items offered are to specification or not.
5. In respect of the paragraphs where the items offered are strictly to specification, bidders shall insert the words "as specified".
6. In cases where the items are not to specification, the deviations from the specifications shall be indicated.
7. The bid prices shall be given in the units shown.
8. With the exception of basic prices, where required, all prices shall be quoted in South African currency.
9. Delivery basis:
 - (a) Supplies which are held in stock or are in transit or on order from South African manufacturers at the date of bid, shall be offered on a basis of delivery into consignee's store or on his site within the free delivery area of the bidder's centre, or carriage paid consignee's station if the goods are required elsewhere.
 - (b) Notwithstanding the provisions of paragraph 9(a), bid prices for supplies in respect of which installation/erection/assembly is a requirement, shall include ALL costs on a basis of delivered on site as specified.
10. Unless specifically provided for in the bid document, no bids transmitted by telegram, telex, facsimile, e-mail or similar apparatus shall be considered.

ANNEXURE 7

11. Bids received after the closing date and time are late and will as a rule not be accepted for consideration.
12. Bids will be opened in public, that is, bidders or their representatives may be present. If requested by any bidder, the names of bidders and if practical the total amount of each bid and of any alternative bids, will be read aloud.
13. The period for which offers are to remain valid and binding is indicated in the bid documents and is calculated from the closing date on the understanding that offers are to remain in force and binding until the close of business on the last day of the period calculated and if this day falls on a Saturday, Sunday or public holiday, the bid is to remain valid and binding until the close of business on the following working day.
14. These conditions (ANNEXURE 7) form part of the bid and failure to comply therewith may invalidate a bid.
15. Bidders are requested to promote local content optimally. Bidders who use locally manufactured components, products, equipment and systems, must complete the Declaration Certificate for Local Production and Content Form (SBD 6.2), if attached.
16. After public opening of bids, information relating to the examination, clarification and evaluation of bids and recommendations concerning awards will not be disclosed to bidders or other persons not officially concerned with the process, until the successful bidder is notified of the award. The bid documentation of bidders is considered to be confidential and will under no circumstances be made available to other bidders or other persons.
17. If you are a supplier but not the actual manufacturer and will be sourcing the product(s) from another company, a letter from that company(ies)/supplier(s) confirming firm supply arrangement(s) in this regard, has to accompany your bid and failure to submit the document may invalidate your bid.
 - 17.1 The said company/supplier must confirm that it has familiarised itself with the item description, specifications and bid conditions and if the bid consist of more than one item it should be clearly indicated in respect of which item(s) the supportive letter has been issued.
18. The financial standing of bidders and their ability to manufacture or to supply goods or to render a service may be examined before their bids are considered for acceptance.
19. The Department may, where a bid relates to more than one item, accept such bid in respect of any specific item or items and also accept part of the specified quantity of any specific item or items.
20. The Department is not obliged to accept any bid. The evaluation of a bid will be done in accordance with the Preferential Procurement Policy Framework Act, 2000 (Act no. 5 of 2000) and its regulations.

ANNEXURE 7

21. After approval of the bid, both parties must sign a written contract. The Contract Form must be filled in duplicate by both the successful bidder and the purchaser. Both Contract Forms must be signed in the original so that the successful bidder and the purchaser would be in possession of originally signed contracts for their respective records.

- 21.1 Failure of the successful bidder to sign the Contract Form in ink may result in the invalidation of their bid.



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SBD 9

CERTIFICATE OF INDEPENDENT BID DETERMINATION

- 1 This Standard Bidding Document (SBD) must form part of all bids¹ invited.
- 2 Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).² Collusive bidding is a *per se* prohibition meaning that it cannot be justified under any grounds.
- 3 Treasury Regulation 16A9 prescribes that accounting officers and accounting authorities must take all reasonable steps to prevent abuse of the supply chain management system and authorizes accounting officers and accounting authorities to:
 - a) disregard the bid of any bidder if that bidder, or any of its directors have abused the institution's supply chain management system and or committed fraud or any other improper conduct in relation to such system.
 - b) cancel a contract awarded to a supplier of goods and services if the supplier committed any corrupt or fraudulent act during the bidding process or the execution of that contract.
- 4 This SBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.
- 5 In order to give effect to the above, the attached Certificate of Bid Determination (SBD 9) must be completed and submitted with the bid:

¹ Includes price quotations, advertised competitive bids, limited bids and proposals.

² Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

(Bid Number and Description)

in response to the invitation for the bid made by:

(Name of Institution)

do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of: _____ that:

(Name of Bidder)

- 1 I have read and I understand the contents of this Certificate;
- 2 I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
- 3 I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
- 4 Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign the bid, on behalf of the bidder;
- 5 For the purposes of this Certificate and the accompanying bid, I understand that the word "competitor" shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:
 - (a) has been requested to submit a bid in response to this bid invitation;
 - (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and
 - (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder

6 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium³ will not be construed as collusive bidding.

7 In particular, without limiting the generality of paragraphs 6 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:

- (a) prices;
- (b) geographical area where product or service will be rendered (market allocation)
- (c) methods, factors or formulas used to calculate prices;
- (d) the intention or decision to submit or not to submit, a bid;
- (e) the submission of a bid which does not meet the specifications and conditions of the bid; or
- (f) bidding with the intention not to win the bid.

8 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this bid invitation relates.

9 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

³ Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

10 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

Signature

Date

Position

Name of Bidder

C1.1 GENERAL CONDITIONS OF CONTRACT

The Contract shall be governed by the “General Conditions of Contract for Construction works, Third Edition, 2015, published by the South African Institution of Civil Engineering, Private Bag X200, Halfway House, 1685 and is obtainable from www.saice.org.za. It is supplemented with the Special Conditions of contract for the GCC and the Contract Data for GCC.

The only variations from these General Conditions of Contract shall be given in the Special conditions of Contract below. Whenever there is a conflict, the provisions in the Special Conditions of Contract shall prevail.

C1.2 SPECIAL CONDITIONS OF CONTRACT

C1.2.1 GENERAL

These Special Conditions of Contract (SCC) form an integral part of the Contract. The Special Conditions of Contract shall amplify, modify or supersede, as the case may be, to the extent specified below, and shall take precedence and shall govern.

C1.2.2 ADMENDMENT TO THE GENERAL CONDITIONS OF CONTRACT FOR CONSTRUCTION WORKS. (3rd Edition 2015)(GCC)

The clauses of the Special Conditions hereafter are numbered "SCC" followed in each case by the number of the applicable clause or sub clause in the General Conditions of Contract for Construction Works (3rd Edition 2015), and the applicable heading. A new special condition, that has no relation to the existing clauses, is introduced by a number that follows after the last clause number in the General Conditions, and an appropriate heading.

The pro forma annexures included in the General Conditions of Contract for Construction Works (3rd Edition 2015) are deleted for the purpose of this Contract and are replaced with the forms bound into this document

SCC 1(1) Definitions

The definitions contained in Clause 1(1) are hereby amended and/or supplemented as follows:

SCC 1.1.1 In the contract defined as: **"BID DWS01-0419 (WTE) : The supply, manufacture , deliver and installation of temporary suspension structure and pip work for canal water supply** the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires:

SCC1.1.1.15 "Employer" means the Minister of Water and Sanitation acting on behalf of the Government of the Republic of South African and shall include the Employer's duly authorised representative.

SCC1.1.1.16 "Employers Agent" means Contract Manager DWS: Construction South or any other person appointed from time to time by him and notified in writing to the Contractor. The Employers Agent will appoint an "Employers Representative" to act as Engineer for the purpose of the contract.

SCC 6.5 Day works: Delete in entirety

SCC 8.6.1 Change paragraph to read "Except if provided otherwise in the Contract Data, the Contract, without limiting his obligations in terms of the Contract, shall as part of the documentation required before commencing with the Works in accordance with Clause 5.3.1, at his own cost, effect and maintain the following insurances in the name of the Contractor."

SCC 8.6.1.1 Delete

SCC 8.6.1.1.1 Delete with sub-clauses

SCC 8.6.1.3 Change paragraph to read "Liability insurance that covers the Contractor against its respective liability for the death of, or injury to any person, or loss of, or damage to property arising from or in the course of the fulfilment of the Contract, from the Commencement Date to the issue of the Certificate of Completion for a limit of indemnity covering the risks of the Contractor for an amount not less than stated in the Contract Data."

SCC 8.6.6 Delete
SCC 8.6.7 Delete

C1.3 CONTRACT SPECIFIC DATA

The following contract specific data, referring to the General Conditions of Contract for Construction Works Third Edition (2015), are applicable to this Contract:

Compulsory Data

Clause	Description	Information
1.1.1.13	Defects and liability period: a) Suspension Structure b) Pipe Work for Canal Water Supply	a) 12 Months b) 6 Months
1.1.1.14	The time for practical Completion	45 Work Days from commencement date
1.1.1.15	The name of Employer	Minister of Water and Sanitation
1.2.1.2	The address of the Employer	Department of Water and Sanitation Private Bag X313 Pretoria 0001
1.1.1.16	The name of the Employers Agent.	Contract Manager DWS Construction South
1.2.1.2	The address of the Employers Agent.	Department of Water and Sanitation Construction South 4-6 Alkmaar Str. Paarl Tel: 021 8720604 Fax: 021 8720593
1.1.1.26	The Pricing Strategy	Re-measurable
3.2.3	Specific approval of the Employer required	5.7.3 Acceleration 5.12.3 Extension of Time 6.3.1 Variations 9.1 Termination of Contract 9.2 Termination by Employer 10 Claims and Disputes
5.1.1.1	Special non-working days	1. Statutory holidays as declared by National or Regional Government. 2. Three weeks annual Builders holiday December to January (dates to be confirmed) 3. The last Friday of every month.
5.8.1	The non-working days	Sundays
5.3.1	The documentation required before commencement with works execution:	Health and Safety plan (Clause 4.3) Initial programme (Clause 5.6) Insurance (Clause 8.6) Method Statements (as required by the applicable Specifications) Quality Assurance + Welder qualification
5.3.2	The time to submit the documentation required before commencement with Works execution	14 Calendar days
5.4.2	The access and possession of the Site	Shall not be exclusive to the Contractor but as set out in the Site Information
5.13.1	The penalty for failing to complete the Works	R 1/14 % of the contact value of outstanding work per day
5.14.1	Requirements for practical completion	Installed and commissioned works.

5.16.3	The latent defect period - period - Suspension Structure	1 years
6.2.1	Pipe Work for Canal Water Supply The security to be provided by the contractor	5 year Performance guarantee of 10% of Contract sum plus retention of 5% of the value of the Works.
6.10.1.5	The percentage advance on materials not yet built into the Permanent Works	0%
6.10.3	The limit of retention money	5% of the Contract Value
8.6.1.1.2	The value of Plant and materials supplied by the Employer to be included in the insurance sum	R 0.00
8.6.1.1.3	The amount to cover professional fees for repairing damage and loss to be included in the insurance sum	R 5 000 000.00
8.6.1.3	The limit of indemnity for liability insurance	R 5 000 000.00
10.5.3	The number of Adjudication Members to be appointed by the Contractor	1
10.7.1	The determination of disputes	By arbitration

PART 2: DATA PROVIDED BY THE CONTRACTOR

Clause	Description	Information
1.1.1.9	The name of the Contractor	
1.2.1.2	The address of the contractor	Physical address:
		Postal address:
		E-mail address:
6.8.2	The value of the certificates issued shall be adjusted in accordance with the Contract Price Adjustment Schedule with the following values:	Fixed X = 0.15 Labour A = Contractors Equipment B = Material C = Fuel D =
6.8.2	The definition and source of : "L" is the "labour Index", "P" is the "Plant Index"	The Consumer Price Index for the urban area nearest to the Site, as stated in the Contract Data, and as published in the Statistical News Release, P0141, Additional Tables : Table 14 "CPI- all items according to area" of Statistics South Africa and published by SAFCEC from time to time. Producer Price Index applicable to the appropriate Construction equipment as stated in the Contract Data and as published in the Statistical Release P0151, Table 4 of Statistics South Africa and published by SAFCEC from time to time.

<p>"M" is the "Materials Index"</p>	<p>Producer Price Index applicable to the appropriate materials as stated in the Contract Data and as published in the Statistical Release P0151, Table 3 or Table 4 of Statistics South Africa and published by SAFCEC from time to time.</p>
<p>"F" is the Fuel Index</p>	<p>Producer Price Index for Diesel at wholesale level for the coastal area as stated in the Contract Data and as published in the Statistical Release P0151, Table 4 of Statistics South Africa and published by SAFCEC from time to time.</p>
<p>6.8.3</p>	<p>Price adjustments for variations in the costs of special materials are allowed</p>



NATIONAL TREASURY
REPUBLIC OF SOUTH AFRICA

GOVERNMENT PROCUREMENT
GENERAL CONDITIONS OF CONTRACT

July 2010

GOVERNMENT PROCUREMENT GENERAL CONDITIONS OF CONTRACT July 2010

NOTES

The purpose of this document is to:

- (i) Draw special attention to certain general conditions applicable to government bids, contracts and orders; and
- (ii) To ensure that clients be familiar with regard to the rights and obligations of all parties involved in doing business with government.

In this document words in the singular also mean in the plural and vice versa and words in the masculine also mean in the feminine and neuter.

- o The General Conditions of Contract will form part of all bid Documents and may not be amended.
- o Special Conditions of Contract (SCC) relevant to a specific bid, should be compiled separately for every bid (if (applicable) and will supplement the General Conditions of Contract. Whenever there is a conflict, the provisions in the SCC shall prevail.

TABLE OF CLAUSES

1	Definitions
2	Application
3	General
4	Standards
5	Use of contract documents and information; inspection
6	Patent rights
7	Performance security
8	Inspections, tests and analysis
9	Packing
10	Delivery and documents
11	Insurance
12	Transportation
13	Incidental services
14	Spare parts
15	Warranty
16	Payment
17	Prices
18	Contract amendments
19	Assignment
20	Subcontracts
21	Delays in the supplier's performance
22	Penalties
23	Termination for default
24	Dumping and countervailing duties
25	Force Majeure
26	Termination for insolvency
27	Settlement of disputes
28	Limitation of liability
29	Governing language
30	Applicable law
31	Notices
32	Taxes and duties
33	National Industrial Participation Programme (NIPP)
34	Prohibition of restrictive practices

General Conditions of Contract

1 Definitions

1 The following terms shall be interpreted as indicated:

1.1 "Closing time" means the date and hour specified in the bidding documents for the receipt of bids.

1.2 "Contract" means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.3 "Contract price" means the price payable to the supplier under the contract for the full and proper performance of his contractual obligations.

1.4 "Corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution.

1.5 "Countervailing duties" are imposed in cases where an enterprise abroad is subsidized by its government and encouraged to market its products internationally.

1.6 "Country of origin" means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.

1.7 "Day" means calendar day.

1.8 "Delivery" means delivery in compliance of the conditions of the contract or order.

1.9 "Delivery ex stock" means immediate delivery directly from stock actually on hand.

1.10 "Delivery into consignees store or to his site" means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the supplies are so delivered and a valid receipt is obtained.

1.11 "Dumping" occurs when a private enterprise abroad market its goods on own initiative in the RSA at lower prices than that of the country of origin and which have the potential to harm the local industries in the RSA.

1.12 "Force majeure" means an event beyond the control of the supplier and not involving the supplier's fault or negligence and not foreseeable. Such events may include, but is not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

1.13 "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the bidder of the benefits of free and open competition.

	1.14	"GCC" means the General Conditions of Contract.
	1.15	"Goods" means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.
	1.16	"Imported content" means that portion of the bidding price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the supplies covered by the bid will be manufactured.
	1.17	"Local content" means that portion of the bidding price which is not included in the imported content provided that local manufacture does take place.
	1.18	"Manufacture" means the production of products in a factory using labour, materials, components and machinery and includes other related value-adding activities.
	1.19	"Order" means an official written order issued for the supply of goods or works or the rendering of a service.
	1.20	"Project site," where applicable, means the place indicated in bidding documents.
	1.21	"Purchaser" means the organization purchasing the goods.
	1.22	"Republic" means the Republic of South Africa.
	1.23	"SCC" means the Special Conditions of Contract.
	1.24	"Services" means those functional services ancillary to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance and other such obligations of the supplier covered under the contract.
	1.25	"Written" or "in writing" means handwritten in ink or any form of electronic or mechanical writing.
2	Application	
	2.1	These general conditions are applicable to all bids, contracts and orders including bids for functional and professional services, sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.
	2.2	Where applicable, special conditions of contract are also laid down to cover specific supplies, services or works.
	2.3	Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.
3	General	
	3.1	Unless otherwise indicated in the bidding documents, the purchaser shall not be liable for any expense incurred in the preparation and submission of a bid. Where applicable a non-refundable fee for documents may be charged.
	3.2	With certain exceptions, invitations to bid are only published in the Government Tender Bulletin. The Government Tender Bulletin may be obtained directly from the Government Printer, Private Bag X85, Pretoria 0001, or accessed electronically from www.treasury.gov.za

4	Standards	4.1	The goods supplied shall conform to the standards mentioned in the bidding documents and specifications.
5	Use of contract documents and information; inspection.	5.1	The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.
		5.2	The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause except for purposes of performing the contract.
		5.1	
		5.3	Any document, other than the contract itself mentioned in GCC clause
		5.1	shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so required by the purchaser.
		5.4	The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so required by the purchaser.
6	Patent rights	6.1	The supplier shall indemnify the purchaser against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the goods or any part thereof by the purchaser.
7	Performance security	7.1	Within thirty (30) days of receipt of the notification of contract award, the successful bidder shall furnish to the purchaser the performance security of the amount specified in SCC.
		7.2	The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.
		7.3	The performance security shall be denominated in the currency of the contract, or in a freely convertible currency acceptable to the purchaser and shall be in one of the following forms: <ul style="list-style-type: none"> (a) a bank guarantee or an irrevocable letter of credit issued by a reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or (b) a cashier's or certified cheque
		7.4	The performance security will be discharged by the purchaser and returned to the supplier not later than thirty (30) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified in SCC.

8 Inspections, tests and analyses

8.1 All pre-bidding testing will be for the account of the bidder.

8.2 If it is a bid condition that supplies to be produced or services to be rendered should at any stage during production or execution or on completion be subject to inspection, the premises of the bidder or contractor shall be open, at all reasonable hours, for inspection by a representative of the Department or an organization acting on behalf of the Department.

8.3 If there are no inspection requirements indicated in the bidding documents and no mention is made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.

8.4 If the inspections, tests and analyses referred to in clauses 8.2 and 8.3 show the supplies to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.

8.5 Where the supplies or services referred to in clauses 8.2 and 8.3 do not comply with the contract requirements, irrespective of whether such supplies or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.

8.6 Supplies and services which are referred to in clauses 8.2 and 8.3 and which do not comply with the contract requirements may be rejected.

8.7 Any contract supplies may on or after delivery be inspected, tested or analyzed and may be rejected if found not to comply with the requirements of the contract. Such rejected supplies shall be held at the cost and risk of the supplier who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with supplies which do comply with the requirements of the contract. Failing such removal the rejected supplies shall be returned at the suppliers cost and risk. Should the supplier fail to provide the substitute supplies forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected supplies, purchase such supplies as may be necessary at the expense of the supplier.

8.8 The provisions of clauses 8.4 to 8.7 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 23 of GCC.

9 Packing

9.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size and weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, specified in SCC, and in any subsequent instructions ordered by the purchaser.

- 10 Delivery and documents**
 - 10.1** Delivery of the goods shall be made by the supplier in accordance with the terms specified in the contract. The details of shipping and/or other documents to be furnished by the supplier are specified in SCC.
- 11 Insurance**
 - 11.1** The goods supplied under the contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified in the SCC.
 - 10.2** Documents to be submitted by the supplier are specified in SCC.
- 12 Transportation**
 - 12.1** Should a price other than an all-inclusive delivered price be required, this shall be specified in the SCC.
- 13 Incidental services**
 - 13.1** The supplier may be required to provide any or all of the following services, including additional services, if any, specified in SCC:
 - (a) performance or supervision of on-site assembly and/or commissioning of the supplied goods;
 - (b) furnishing of tools required for assembly and/or maintenance of the supplied goods;
 - (c) furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods;
 - (d) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and
 - (e) training of the purchaser's personnel, at the supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied goods.
 - 13.2** Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.
- 14 Spare parts**
 - 14.1** As specified in SCC, the supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the supplier:
 - (a) such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract; and
 - (b) in the event of termination of production of the spare parts:
 - (i) Advance notification to the purchaser of the pending termination, in sufficient time to permit the purchaser to procure needed requirements; and
 - (ii) following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

15 Warranty

15.1

The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.

15.2

This warranty shall remain valid for twelve (12) months after the goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for eighteen (18) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise in SCC.

15.3

The purchaser shall promptly notify the supplier in writing of any claims arising under this warranty.

15.4

Upon receipt of such notice, the supplier shall, within the period specified in SCC and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.

15.5

If the supplier, having been notified, fails to remedy the defect(s) within the period specified in SCC, the purchaser may proceed to take such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract.

16 Payment

16.1

The method and conditions of payment to be made to the supplier under this contract shall be specified in SCC.

16.2

The supplier shall furnish the purchaser with an invoice accompanied by a copy of the delivery note and upon fulfillment of other obligations stipulated in the contract.

16.3

Payments shall be made promptly by the purchaser, but in no case later than thirty (30) days after submission of an invoice or claim by the supplier.

16.4

Payment will be made in Rand unless otherwise stipulated in SCC.

17 Prices

17.1

Prices charged by the supplier for goods delivered and services performed under the contract shall not vary from the prices quoted by the supplier in his bid, with the exception of any price adjustments authorized in SCC or in the purchaser's request for bid validity extension, as the case may be.

18 Contract amendments

18.1

No variation in or modification of the terms of the contract shall be made except by written amendment signed by the parties concerned.

19 Assignment

19.1

The supplier shall not assign, in whole or in part, its obligations to perform under the contract, except with the purchaser's prior written consent.

20	Subcontracts	20.1	The supplier shall notify the purchaser in writing of all subcontracts awarded under this contracts if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the supplier from any liability or obligation under the contract.
21	Delays in the supplier's performance	21.1	Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.
		21.2	If at any time during performance of the contract, the supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the goods and performance of services, the supplier shall promptly notify the purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the supplier's notice, the purchaser shall evaluate the situation and may at his discretion extend the supplier's time for performance, with or without the imposition of penalties, in which case the extension shall be ratified by the parties by amendment of contract.
		21.3	No provision in a contract shall be deemed to prohibit the obtaining of supplies or services from a national department, provincial department, or a local authority.
		21.4	The right is reserved to procure outside of the contract small quantities or to have minor essential services executed if an emergency arises, the supplier's point of supply is not situated at or near the place where the supplies are required, or the supplier's services are not readily available.
		21.5	Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause
		21.2	without the application of penalties.
		21.6	Upon any delay beyond the delivery period in the case of a supplies contract, the purchaser shall, without canceling the contract, be entitled to purchase supplies of a similar quality and up to the same quantity in substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and without prejudice to his other rights, be entitled to claim damages from the supplier.
22	Penalties	22.1	Subject to GCC Clause 25, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, a sum calculated on the delivered price of the delayed goods or unperformed services using the current prime interest rate calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 23.

23 Termination for default

23.1

The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:

- (a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 21.2;
- (b) if the Supplier fails to perform any other obligation(s) under the contract; or
- (c) if the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

23.2

In the event the purchaser terminates the contract in whole or in part, the purchaser may procure, upon such terms and in such manner as it deems appropriate, goods, works or services similar to those undelivered, and the supplier shall be liable to the purchaser for any excess costs for such similar goods, works or services. However, the supplier shall continue performance of the contract to the extent not terminated.

23.3

Where the purchaser terminates the contract in whole or in part, the purchaser may decide to impose a restriction penalty on the supplier by prohibiting such supplier from doing business with the public sector for a period not exceeding 10 years.

23.4

If a purchaser intends imposing a restriction on a supplier or any person associated with the supplier, the supplier will be allowed a time period of not more than fourteen (14) days to provide reasons why the envisaged restriction should not be imposed. Should the supplier fail to respond within the stipulated fourteen (14) days the purchaser may regard the intended penalty as not objected against and may impose it on the supplier.

23.5

Any restriction imposed on any person by the Accounting Officer/ Authority will, at the discretion of the Accounting Officer/Authority, also be applicable to any other enterprise or any partner, manager, director or other person who wholly or partly exercises or exercised or may exercise control over the enterprise of the first-mentioned person, and with which enterprise or person the first-mentioned person, is or was in the opinion of the Accounting Officer/Authority actively associated.

23.6

These details will be loaded in the National Treasury's central database of suppliers or persons prohibited from doing business with the public sector.

23.7

If a court of law convicts a person of an offence as contemplated in sections 12 or 13 of the Prevention and Combating of Corrupt Activities Act, No. 12 of 2004, the court may also rule that such person's name be endorsed on the Register for Tender Defaulters. When a person's name has been endorsed on the Register, the person will be prohibited from doing business with the public sector for a period not less than five years and not more than 10 years. The National Treasury is empowered to determine the period of restriction and each case will be dealt with on its own merits. According to section 32 of the Act the Register must be open to the public. The Register can be perused on the National Treasury website.

24	Anti-dumping and countervailing duties and rights	24.1	When, after the date of bid, provisional payments are required, or anti-dumping or countervailing duties are imposed, or the amount of a provisional payment or anti-dumping or countervailing right is increased in respect of any dumped or subsidized import, the State is not liable for any amount so required or imposed, or for the amount of any such increase. When, after the said date, such a provisional payment is no longer required or any such anti-dumping or countervailing right is abolished, or where the amount of such provisional payment or any such right is reduced, any such favourable difference shall on demand be paid forthwith by the contractor to the State or the State may deduct such amounts from moneys (if any) which may otherwise be due to the contractor in regard to supplies or services which he delivered or rendered, or is to deliver or render in terms of the contract or any other contract or any other amount which may be due to him.
25	Force Majeure	25.1	Notwithstanding the provisions of GCC Clauses 22 and 23, the supplier shall not be liable for forfeiture of its performance security, damages, or termination for default if and to the extent that his delay in performance or other failure to perform his obligations under the contract is the result of an event of force majeure.
25.2	If a force majeure situation arises, the supplier shall promptly notify the purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the force majeure event.		
26	Termination for insolvency	26.1	The purchaser may at any time terminate the contract by giving written notice to the supplier if the supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the purchaser.
27	Settlement of Disputes	27.1	If any dispute or difference of any kind whatsoever arises between the purchaser and the supplier in connection with or arising out of the contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.
27.2	If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.		
27.3	Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.		
27.4	Mediation proceedings shall be conducted in accordance with the rules of procedure specified in the SCC.		

		27.5	Notwithstanding any reference to mediation and/or court proceedings herein,
		(a)	the parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and
		(b)	the purchaser shall pay the supplier any monies due the supplier.
28	Limitation of liability	28.1	Except in cases of criminal negligence or willful misconduct, and in the case of infringement pursuant to Clause 6;
		(a)	the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser; and
		(b)	the aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.
29	Governing language	29.1	The contract shall be written in English. All correspondence and other documents pertaining to the contract that is exchanged by the parties shall also be written in English.
30	Applicable law	30.1	The contract shall be interpreted in accordance with South African laws, unless otherwise specified in SCC.
31	Notices	31.1	Every written acceptance of a bid shall be posted to the supplier concerned by registered or certified mail and any other notice to him shall be posted by ordinary mail to the address furnished in his bid or to the address notified later by him in writing and such posting shall be deemed to be proper service of such notice
		31.2	The time mentioned in the contract documents for performing any act after such aforesaid notice has been given, shall be reckoned from the date of posting of such notice.
32	Taxes and duties	32.1	A foreign supplier shall be entirely responsible for all taxes, stamp duties, license fees, and other such levies imposed outside the purchaser's country.
		32.2	A local supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted goods to the purchaser.
		32.3	No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid the Department must be in possession of a tax clearance certificate, submitted by the bidder. This certificate must be an original issued by the South African Revenue Services.

33 National Industrial Participation (NIP) Programme	33.1 The NIP Programme administered by the Department of Trade and Industry shall be applicable to all contracts that are subject to the NIP obligation.
34 Prohibition of Restrictive practices	34.1 In terms of section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, an agreement between, or concerted practice by, firms, or a decision by an association of firms, is prohibited if it is between parties in a horizontal relationship and if a bidder (s) is/ are or a contractor(s) was/were involved in collusive bidding (or bid rigging).
	34.2 If a bidder(s) or contractor(s), based on reasonable grounds or evidence obtained by the purchaser, has/have engaged in the restrictive practice referred to above, the purchaser may refer the matter to the Competition Commission for investigation and possible imposition of administrative penalties as contemplated in the Competition Act No. 89 of 1998.
	34.3 Competition Commission of the restrictive practice referred to above, the purchaser may, in addition and without prejudice to any other remedy provided for, invalidate the bid(s) for such item(s) offered, and/or terminate the contract in whole or part, and/or restrict the bidder(s) or contractor(s) from conducting business with the public sector for a period not exceeding ten (10) years and/or claim damages from the bidder(s) or contractor(s) concerned.

Js General Conditions of Contract (revised July 2010)

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

**THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF THE TEMPORARY SUSPENSION
STRUCTURE AND PIPEWORK FOR CANAL WATER SUPPLY**

C2. SCOPE OF WORK

CONTENT

C2.1	STANDARD SPECIFICATION
C2.2	PROJECT SPECIFICATION
C2.3	PARTICULAR SPECIFICATIONS
C2.4	VARIATIONS AND ADDITIONS TO SPECIFICATIONS

C2.1 STANDARD SPECIFICATION

SS 1 APPLICABLE STANDARD SPECIFICATIONS

In the event of any discrepancy between a part or parts of the Standardised or Particular Specifications and the Project Specifications, the Project Specifications and Particular Specifications shall take precedence. In the event of a discrepancy between the Specifications, (including the Project Specifications) and the drawings and / or the Bill of Quantities, the discrepancy shall be resolved by the Engineer before the execution of the work under the relevant item.

The applicable standard specifications are mentioned in the Project Specification and Particular specification.

C2.2 PROJECT SPECIFICATION

CONTENT

PS 1.	DESCRIPTION OF THE PROJECT
PS 2.	SCOPE OF THE WORK
PS 2.1	General
PS 2.2	Temporary Suspension Structure
PS 2.3	Pipe Work for Canal Water Supply
PS 3.	THE SITE
PS 3.1	Location and access to site
PS 3.2	Weather
PS 3.3	General Site Conditions
PS 4.	FACILITIES PROVIDED BY MAIN CONTRACTOR to CONTRACTOR
PS 4.1	Contractors Yard
PS 4.2	Crane
PS 5.	FACILITIES PROVIDED BY CONTRACTOR FOR WORKS
PS 5.1	Electrical Power and Distribution
PS 5.2	Communications
PS 5.3	Accommodation and Site Facilities
PS 5.4	Sanitation and cleaning
PS 5.5	Access control and security
PS 6.	WORKING TIMES
PS 6.1	Work at Night
PS 6.2	Sunday Working
PS 6.3	Last Friday of Month
PS 7.	CLIMATIC CONDITIONS
PS 8.	PROGRAMMING REQUIREMENTS
PS 8.1	Tendered Contract Programme
PS 8.2	Contract Programme Maintenance and Progress Monitoring
PS 9.	MANUFACTURING AND INSTALATION MATTERS
PS 9.1	General Responsibilities
PS 9.2	Contractors Methods and Materials
PS 9.3	Quality Management
PS 9.4	Contractor Qualification
PS 9.5	Submission for Approval
PS 9.6	Bolting
PS 9.7	Material
PS 9.8	General Dimensional Tolerances
PS 9.9	General Welding
PS 9.10	General Manufacturing
PS 9.11	Flanges
PS 9.12	Standard Specification
PS 9.13	Drilling
PS 9.14	Cutting
PS 9.15	Corrosion Protection
PS 9.16	Handling and Transport
PS 9.17	Installation and Commissioning

PS 10. RECRUITMENT

PS 11. HEALTH AND SAFETY

PS 11.1 General

PS 11.2 Audits

PS 11.3 Works Health and Safety Committee

PS 11.4 Health and Safety Officers

PS 11.5 First Aid Provisions

PS 11.6 Accident Reporting

PS 11.7 Workman's Compensation Act

PS 12. ENVIRONMENTAL REQUIREMENTS

PS 12.1 General

PS 12.2 Temporary Services and Facilities

PS 12.3 Protection of Rivers, Streams and Watercourses

PS 12.4 Refuse and Waste Control

PS 12.5 Protection of Flora

PS 12.6 Protection of the Fauna

C2.2 PROJECT SPECIFICATION

PS 1. DESCRIPTION OF THE PROJECT

The raising of Clanwilliam dam, which will be the first phase of the Olifants-Doom river Water Resources Project (ODRWRP), will increase the yield of the dam by about 70 Mm³ per annum to augment the water supplies to the Olifants river irrigation scheme situated in the north-western part of the Western Cape Province, as well as to assist in the development of resource-poor farmers.

Clanwilliam Dam is located on the Olifants river, in the Western Cape, approximately 2 km south west of the town of Clanwilliam. The original dam was constructed in 1932-1935 (38m high from the base). The existing structure is a concrete gravity dam, consisting of a controlled ogee gravity spillway with 13 vertical crest gates. The length of the wall is 255 m. The total spillway length is 117,58 m, including the piers between the gates. The dam was raised in 1964 with vertical crest gates. Tensioned cables were supplied to ensure stability of the dam wall.

Currently water is released downstream via the Olifants river to Bulshoek weir from where the water is diverted into the diapidated irrigation canal situated on the left bank. Water is also released from the existing outlet works situated on the right bank into an irrigation canal situated on the right bank, to the pump station on the right bank supplying water to the town of Clanwilliam, and to the hydropower plant situated downstream on the right bank.

The feasibility investigation for raising the dam was completed at the end of 2007 and the Record of Decision (ROD) was issued on 12 May 2009 by the Department of Environmental Affairs. Approval by the Minister for raising the dam by 13 m was issued on 18 August 2010.

In order to comply with current dam safety standards, the Department of Water and Sanitation is also required to implement remedial measures with the raising in the height of the dam wall.

The raised dam wall will be approximately 370 m in length and 49 m in maximum height. At full supply level the reservoir will cover a surface area of approximately 2 022 ha and capacity of 344,3 million cubic metre. The works include addition of concrete on the downstream side, extending the apron, construction of a free standing intake tower, river outlet control house, a power generating house, short tunnel and coffer dam works on the upstream side, as well as various other pipe outlet structures on the downstream side. This work must be done without interfering with the day to day operation of the dam.

PS 2. SCOPE OF THE CONTRACT

PS 2.1 General

The Supply, manufacture, deliver and installation of the temporary suspension structure and pipe work for canal water supply

The detail of the work to be carried out under this contract includes, but is not limited to:

- a) Temporary suspension structure for existing outlet pipe work.
 - Manufacture according to drawings
 - Corrosion protect according to drawing specifications
 - Deliver to site
 - Erect
 - Commission
- b) Pipe work for the supply of temporary water to the canal.
 - Manufacture according to drawings
 - Corrosion protect according to specifications on drawings
 - Deliver to site
 - Install
 - Commission

All work shall be done in accordance with the specifications listed in the Project Specification and Drawings under Section C4: DRAWINGS.

PS 2.2 Temporary Suspension Structure

Water is supplied to the hydropower plant situated downstream on the right bank. In order for a portion of the construction work to be done without interfering with the day to day operation of the dam, a temporary support structure need to be erected to suspend the pipe work servicing the hydropower plant. 18 meters of the pipe work need to be suspended as per drawings under Section C4: DRAWINGS.

PS2.3 Pipe Work for Canal Water Supply

Water is released from the existing outlet works situated on the right bank into an irrigation canal situated on the right bank. The construction work will demolish part of the irrigation channel and a new release of water into the channel need to be established. The outlet works for the temporary supply of water to the channel detailed in the drawing under Section C4: DRAWINGS show that the release will be at the existing pressure release valves situated next to the hydropower plant and above the channel.

PS 3. THE SITE

PS 3.1 Location and access to site

The dam site is situated on the Olifants river, in the Western Cape, approximately 2 km South-West of Clanwilliam town in the Western Cape province. The site is immediately next to the N7 and accessed through a controlled gate.

PS 3.2 Weather

The Clanwilliam dam site is situated in the Western province in the winter rainfall region with hot summers and cold wet winters. Average summer maximum and minimum temperatures are in the order of 39°C and 11°C respectively. Corresponding winter temperatures are 31°C and 4°C.

Relevant detailed meteorological information were obtained for the site from Weather Station No 00846710 at Clanwilliam dam, situated at RL 103 m. Average monthly minimum and maximum temperatures obtained from that station are listed in Table 1. These records will be used for tender purposes and will be compared to information from a weather station to be installed at the dam site before construction commence. The prevailing wind direction(s) is South East and North West.

Table 1: Average Minimum and Maximum Temperatures (°C) Measured at Clanwilliam

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	41	40,5	39	37	32	27	26	29	33	35	40	41
Min	13,5	13	11	8	5	3	2	2,5	5	7	10	12

The Clanwilliam dam catchment has a mean annual precipitation (MAP) of 575 mm. The area has a winter rainfall pattern.

PS 3.3 General Site Conditions

The holes to be drilled to anchor the structures will be in reinforced concrete. It is advisable to manufacture a drill mask to insure that the structure is properly aligned.

PS 4. FACILITIES PROVIDED BY MAIN CONTRACTOR to CONTRACTOR

PS 4.1 Contractors Yard

A storage yard to the west of the N7 will be provided and can be used when working on site. If the Contractor requires more storage area or any other area it must be specified in his document and be negotiated with the Main Contractor.

The Main Contractor will supply only potable water to the sub-contractors yard.

PS 4.2 Crane

The main contractor will supply the contractor with a 30 ton rough terrain crane and an operator for the offloading and the erection of the temporary works. Proper planning and co-ordination between the contractor and the main contractor is of the importance to minimise delays. The main contractor reserves the right to allocate the crane when not in use by the contractor or when the crane usage is not properly planned with the main contractor ahead of time. No claims for additional cost shall be considered in the event of the crane time not being planned ahead of time with the main contractor.

PS 5. FACILITIES PROVIDED BY CONTRACTOR FOR WORKS

PS 5.1 Electrical Power and Distribution

The Contractor shall make his own arrangements to provide his own power supply. There is no ESKOM grid electrical power available on site.

Failure or interruption of the power supply shall not relieve the Contractor of any of his obligations under the Contract.

PS 5.2 Communications

The Contractor shall make his own arrangement with regards to his required communication requirements.

PS 5.3 Accommodation and Site Facilities

The Contractor shall make his own arrangements for accommodation for his staff. No accommodation is allowed on the site in terms of the Environmental EMP.

PS 5.4 Sanitation and cleaning

The Main Contractor shall provide at or within 200 m of each work place chemical toilet facilities. The Contractor shall maintain them in a clean and sanitary condition and shall take all necessary precautions to prevent pollution of the Site.

The Contractor shall ensure that there are adequate and sufficient refuse bins in and around the working area and that these shall be emptied frequently. All refuse bins shall be placed on a concrete base, which shall, from time to time, be sprayed with insecticide. All refuse collection, removal and disposal on site shall be the responsibility of the Contractor. All refuse shall be disposed of at a licensed landfill site only, and certificates of receipt shall be kept on record.

The Contractor shall clear away and remove all traces of refuse and restore the sites to their original condition.

PS 5.5 Access control and security

The Main Contractor will be responsible for access control and security for the site. The Contractor will abide by the access control measures. The Contractor is responsible for the safe guarding and protection of his own contractor's yard and his equipment and plant on site. The Main Contractor does not take any liability for the Contractor in terms of security what so ever.

PS 6. WORKING TIMES

PS 6.1 Work at Night

The Contractor could be requested to perform work at night. Responsible and qualified supervisory staff shall always be present and sufficient light must be available to conduct the work safely.

PS 6.2 Sunday Working

Sunday work shall not be permitted except for necessary maintenance, repairs and emergencies and shall only be undertaken with the prior written approval of the Engineer.

PS 6.3 Last Friday of Month

The last Friday of the month is regarded as the pay day of the Main Contractor and Engineer's personnel. This is a non-working weekend for Main Contractor and Engineer's personnel, and the Contractor will only be allowed to work with special permission on this day.

PS 7. CLIMATIC CONDITIONS

No standing time may be claimed for rain or high temperatures.

PS 8. PROGRAMMING REQUIREMENTS

PS 8.1 Tendered Contract Programme

An overall preliminary programme in the form of a Gant chart must be submitted with the tender. The following must be shown:

- a) The proposed sequence of the various activities.
- b) The dependencies that exist between the activities and whether these are time related or resource limited.
- c) Any shutdown periods proposed by the contractor.
- d) Any slack time built into various activities or sub-phases.
- e) The critical path of the work to be undertaken.

This programme shall be in sufficient detail so that it can form the basis of a more detailed construction programme to be prepared after the Contract has been awarded.

The target date for complete installation and commissioning of the Temporary Suspension Structure and Pipe Work for Canal Water Supply shall be in accordance with the civil construction programme. It is essential that the delivery specified by the successful Tenderer is realised otherwise penalties for delay may be enforced.

A Pro-Forma Method program with the minimum information required form part of the returnable documents under section T2.

PS 9. MANUFACTURING AND INSTALLATION MATTERS

PS 9.1 General Responsibilities

Contracts shall only be awarded to Tenderers who, in the Engineer's opinion, are capable of manufacturing to the required standard and who are equipped to do manufacturing in stainless steel. Workmanship shall be of the highest quality and welders shall be coded. The size of tools and equipment used shall be proportional to the task being carried out. A clean, dust free paint booth, away from grit blasting shall be used.

The Site and all services are under the control of the Main Dam Contractor and therefore the Employer expects the Contractor to liaise regularly with the Main Dam Contractor in order to ensure smooth execution and integration of activities with the Main Dam Contractor's activities.

Non-performance of the Main Dam Contractor shall not relieve the Contractor of any of his obligations under the Contract.

The Contractor shall ensure that qualified technical staff set out the anchor holes in the correct position. It is recommended to make use of a drill mask to drill the anchor holes.

PS 9.2 Contractors Methods and Materials

It is a requirement of this contract that final work procedures must be approved before commencement of work.

Method statements will full details concerning the methods, equipment and materials will be required for the following but not limited to:

- Erection of temporary suspension structure.
- Installation of pipe work for canal water supply.
- Welding plan
- Corrosion protection
- Manufacturing methods
- Quality Control Plan

The above method statements must be submitted with the tender to evaluate the ability of the Contractor to perform the work according to specification.

A Pro-Forma Method statement with the minimum information required form part of the returnable documents under section T2

PS 9.3 Quality Management

The Contractor's Quality Management System shall be in accordance with ISO 9000 and General Mechanical Specification DWS 1601.

The Contractor shall implement a comprehensive Quality Control programme and accept full responsibility for the quality of his workmanship and material used, irrespective of any quality surveillance that may be carried out by the Engineer, Main Contractor or his appointed representative.

In keeping with the principles contained in the above mentioned code of practice, the Contractor or any nominated and approved Sub-Contractor(s) shall -

- a) be responsible for compliance with all the clauses of this specification in every respect;
- b) carry out all inspections and tests called for in the specification in the presence of the Engineer or his appointed representative. The cost of these inspections and tests shall be included in the Tender price; and
- c) draft a quality control plan for manufacture and corrosion protection of all components indicating all the intended stages of testing during manufacture, cleaning, preparation and application as well as hold points for independent quality surveillance.

The quality control plans will not be compromised once in agreement and shall be adhered to at all times.

The Main Contractor shall be notified at least three days in advance, or as otherwise agreed, of impending inspections to be carried out as well as for witnessing the points in terms of the agreed Quality Control Plans.

All material, certification and records of the Contractor shall be subject to examination by the Main Contractor. This shall include the checking and testing of the equipment. If any deviation is found, additional testing and quality surveillance shall be carried out. If the additional testing confirms inaccurate quality control by the Contractor, all work shall be stopped and shall only proceed after remedial action has been implemented.

The cost for quality control shall be included in the Tender price. When surveillance results in rejection of the lot or when notice by the Contractor results in a fruitless trip, the cost borne by the Main Contractor shall be debited against the Contractor's account.

If additional inspections, tests and analyses requested by the Main Contractor prove that the corrosion protection of the equipment is in accordance with the Specification, the costs of the inspections and/or tests including transport will be defrayed by the Main Contractor. However, should the additional investigations prove that the manufacture and/or corrosion protection of the equipment does not conform to the Specification, the cost shall be defrayed by the Contractor.

The Main Contractor shall have the right, without prejudice to any other legal remedy, to deduct such costs from payments due to the Contractor under the Contract.

Where equipment or services fail to meet the Contract requirements but are nevertheless accepted at an agreed revised price, the costs with regard to inspections, test and analyses shall be for the Contractor's account unless otherwise directed by the Main Contractor.

Welding shall only be subjected to radiographic and ultrasonic tests if dye penetrant and magnetic particle tests fail or if otherwise mentioned.

Pipes do not need to be subjected to hydrostatic testing.

Accurate and detailed quality control records shall be kept by the Contractor for all stages of the work.

A Pro-Forma **quality control plan** with the minimum information required form part of the returnable documents under section T2

PS 9.4 Contractor Qualifications

The Contractor and Sub-Contractor(s) shall satisfy the Project and Corrosion Engineers that they have the management, facilities and equipment, skilled staff, a quality control procedure and required test methods and standards to carry out quality control during manufacture and corrosion protection. The above mentioned Contractors shall be subject to a Quality Audit.

PS 9.5 Submission for Approval

The Contractor shall submit the following to the Main Contractor, including data sheets where applicable, for approval:

- a) Shop drawings
- b) A programme
- c) A quality control plan
- d) Method statements
- e) Health and Safety plan

All material, certification and records of the Contractor shall be subject to examination by the Main Contractor. This shall include the checking and testing of the equipment. If any deviation is found, additional testing and quality surveillance shall be carried out. If the additional testing confirms inaccurate quality control by the Contractor, all work shall be stopped and shall only proceed after remedial action has been implemented.

PS 9.6 Bolting

Bolting shall be in accordance with General Mechanical Specification DWS 1601.

PS 9.7 Material

All materials shall be in accordance with General Mechanical Specification DWS 1601.

The Manufacturer's material test data certification and the Contractor's quality records shall be subject to examination by the Engineer or his representative.

All mild steel items to be in accordance with SANS 50025/ en 10025 grade S353JR. The materials for manufacture shall be as per attached drawings.

All material and equipment, where not specified, shall comply with relevant SANS or BS Specifications.

All material and equipment shall be new and of first grade quality.

All surfaces on fasteners shall be smooth and without jagged edges.

All material to be supplied with Material Test Certificates.

PS 9.8 General Dimensional Tolerances

All dimensions and tolerances indicated on the drawings shall be strictly adhered to.

PS 9.9 General Welding

The following general welding for the Pipe Work for Canal Water and the Temporary Suspension Structure shall apply:

- Perform necessary weld preparation.
- All welds shall be continuously full penetration welds.
- Remove weld spatter.
- Welders shall be certified in accordance with ASME IX for the relevant scope of welds specified.

The flanges at the Pipe work for Canal water shall be welded on pipes in accordance with B.S 806 Type 6.

Welding shall be in accordance with General Mechanical Specification DWS 1601. The Contractor shall satisfy the Engineer that his welders are coded in accordance with the welding procedures for all applicable welds.

PS 9.10 General Manufacturing

The following general manufacturing of the pipe work for the canal water supply shall apply:

- Pipe manufacturing and tolerances shall be in accordance with SANS 719.
- Fabrication to be in accordance with particular specification CWD44 – pipes and specials.
- Manufacturing shall be in accordance with General Mechanical Specification DWS 1601.

The manufacturing of the temporary suspension structure shall be in accordance with General Mechanical Specification DWS 1601.

PS 9.11 Flanges

The flanges for the Pipe work for Canal water supply is as follows:

- All flanges shall be flat faced with a grammophone finish.
- All flange size & drilling shall be in accordance with SANS 1123 table 1000/3.
- All flanges shall be manufactured according to SANS 1123.
- Flange thickness as shown on drawing 169393/12 ME [CWD 7076].

PS 9.12 Standard Specification

When reference is made to a code, specification or standard, the reference shall be taken to mean the latest edition to the code, specification or standard, including addenda, supplements and modifications and revisions thereto, unless otherwise specified.

The materials, design and workmanship shall be in accordance with the appropriate Specification current at the time of manufacture unless otherwise specified.

PS 9.13 Drilling

All bolt holes shall be drilled, not punched. Templates shall be used where applicable.

PS 9.14 Cutting

Edges of all plates and members shall be square, clean and free from burrs and true to dimensions. If flame/plasma cutting is employed, edges shall be dressed smooth and true.

PS 9.15 Corrosion Protection

The corrosion protection for the Pipe Work for Canal Water Supply is as per drawing 169393-0.

The corrosion protection for the Temporary Suspension Structure is as per drawings 169394-0, 169395-0, 169396-0, 169397-0.

PS 9.16 Handling and Transport

The Contractor shall, as part of this Contract, be responsible for the supervision of all loading and unloading procedures, all in accordance with General Mechanical Specification DWS 1601.

The Department shall provide a 30 Ton rough terrain hydraulic crane with operator free of charge for the offloading of material on site. The Contractor or his representative shall supervise the off-loading of his equipment at Site. Any damage incurred during loading onto trucks, during transit or off loading and handling on Site shall be repaired to the Contractor's account.

The Contractor shall communicate and arrange any requirements regarding off-loading, storage on site and the exact date of delivery at least 2 weeks in advance with the Main Contractor. The contractor remains responsible for the offloading of his own materials. Equipment arriving at Site on a Friday shall be off-loaded the following Monday unless previous arrangements have been made.

All the necessary balks of timber and sawdust bags to protect and support the equipment (both at his Works and on Site), shall be provided by the Contractor.

PS 9.17 Installation and Commissioning

The installation and setting to work shall be in accordance with General Mechanical Specification DWS 1601.

Before installation commences, the Contractor shall ascertain that the as-built dimension of the civil structure is in accordance with the wall sluice requirements. Any discrepancies shall be communicated to the Engineer in writing.

Installation of all the equipment supplied under this Contract shall be carried out by the Contractor.

If needed the Contractor shall provide certified scaffolding as per Construction regulations.

The Contractor shall ensure that all columns, castellated beams and pipes are properly aligned.

The Department shall provide a 30 ton rough terrain hydraulic crane free of charge for maximum of one (1) week for installation of the temporary suspension structure and the pipe work for canal water supply, provided arrangements are made two weeks in advance with the Main Contractor. The Contractor shall be responsible for any additional cost if the installation takes more than one (1) week.

The Final Certificate and the full retention moneys will be released on completion of the guarantee period.

Grouting shall be done by the main contractor.

PS 10. RECRUITMENT

The Labour Desk will be established by the Employer. The Labour Desk will be responsible for the recruitment of local labour. The Contractor shall advise the labour desk in writing of the numbers of each category of temporary workers, which is required, and the period for which they are required.

The Contractor shall pay his employees and shall ensure that his Sub-contractors pay their employees rates of remuneration not less than prescribed by legislation and applicable to the area of the works and shall observe conditions of employment which are no less favourable than those which are customary in the area in which the Works are to be constructed for those trades and occupations involved in the fulfilment by the Sub-Contractor of his obligations under the Contract. The Sub-Contractor shall also practice and ensure that his Sub-contractors practice a policy of equal remuneration, conditions of employment and benefits for people of equal skills and productivity.

PS 11. HEALTH AND SAFETY

PS 11.1 General

For this contract the Contractor will be the mandatory of the Employer (Client), as defined in the Act (OHSA 1993), which means that the Contractor, as employer in his own right in respect of the contract, will be responsible for all the duties and obligations of an employer as set out in the Act (OHSA 1993) and the Construction Regulations 2003. Furthermore, the Contractor shall comply with any additional current statutory requirements of any relevant Government Departments regarding health and safety and specifically environmental health issues.

Nothing specified in this document shall relieve the Contractor of any obligations or responsibilities with regard to health and safety responsibilities.

Where safety precautions are not being observed, the Employer may order the Contractor to comply with minimum safety requirements at the Contractor's expense, and compliance with such an order will not absolve the Contractor from any of his responsibilities and obligations under the Contract.

Before commencement of work under the contract the Contractor shall:

1. Enter into an agreement with the Employer (Client) to confirm his status as mandatory (employer) for the contract under consideration.
2. Submit a Health and Safety Plan to the Employer within 28 days after the Commencement Date. The Contractor shall immediately implement the policy and any amendments, and keep it in operation for the full duration of the Contract.
3. Submit a risk assessment of the contract works as part of the Health and Safety Plan and which is to include;
 - (i) Identification of the risks and hazards;
 - (ii) Analysis and evaluation of the risks and hazards identified;
 - (iii) A documented plan of safe work procedures;
 - (iv) A monitoring plan; and
 - (v) A review plan.

The Contractor is required to keep health and safety records (which shall include audit reports) on site in an orderly filing system which shall be handed over to the Employer on completion of construction.

Failure by the Contractor to comply with safety requirements will entitle the Employer to reduce payment of the relevant Bill of Quantity items and/or order a temporary halt of work within the affected areas until the specified requirements are met, without any extension of time being granted and without any additional payment

Refer to CWD01 HS Health and Safety Specification in the Particular Specification Document.

A Pro-Forma **Health and Safety plan** with the minimum information required form part of the returnable documents under section T2

PS 11.2 Health and Safety Officers

The Contractor shall appoint a full time permanent Health and Safety Officer on the commencement of the works. On the commencement of shift working he shall appoint at least one deputy with the same duties. The Health and Safety Officer and his deputy (or deputies) shall be employed exclusively on health and safety matters, and at least one of them shall always be available on Site so that Health and Safety matters receive 24 hour coverage for the full duration of the Contract. The Health and Safety Officer, or his deputy shall carry out regular and random checks of all parts of the Site where work is taking place.

PS 11.3 First Aid Provisions

The Contractor shall provide a first aid station. The Contractor shall institute and operate a basic first aid training programme to ensure that at least each foreman or work crew leader is trained in first aid and possesses a valid certificate to that effect issued by the Red Cross Society of South Africa, or equivalent. There shall be a person certified in first aid in each work crew.

PS 11.4 Accident Reporting

The Contractor, through the Health and Safety Officer or his deputy, shall keep the Resident Engineer advised at the time, or as soon thereafter as is practical but not later than 12 hours, of any occurrence during the course of work, whether on or off the Site, if the said occurrence affected or may have affected the health or safety of any person employed on the Site or of any member of the public. The Contractor shall submit to the Employer at the end of each month reports and statistics in spreadsheet format approved by the Employer on all accidents involving any person employed on or visiting the works.

PS 11.5 Workman's Compensation Act

By accepting the Contract, the Contractor warrants that all his and his Sub-Contractor's workmen are covered in terms of the Compensation for Occupational Injuries and Diseases Act (Act no 130 of 1993) which covers shall remain in force whilst any workman is present on the Site.

PS 12. ENVIRONMENTAL REQUIREMENTS

The Contractor shall take full responsibility for protecting the natural environment and eliminating or minimising the negative impacts of construction on the environment during construction.

PS 12.1 General

The main project, Raising of Clanwilliam dam, has been environmentally authorised under a Record of Decision (ROD). The ROD requires that all activities conducted by the Main Dam Contractor and Contractors/Sub-contractors are within the framework of the Environmental Management Plan (EMP) and Rehabilitation Specifications (RS) of the Site. This document is available from the Employer.

The Contractor and his staff must be familiar with the EMP & RS and execute the project in such a way that it complies with the requirements of the EMP and RS. The Environmental Control Officer (ECO) will regularly inspect the Contractor's site. In the event that the Contractor does not comply with the requirements the deviation must be rectified as recommend by the ECO at the Contractor's cost.

The Contractor shall construct and/or implement all the necessary environmental protection measures in each area before any production work will be allowed to proceed. The IEM may suspend the Works at any time should the Contractor, fail to implement, operate or maintain any of the environmental protection measures adequately. The costs of such suspension shall be to the Contractor's account

PS 12.3 Protection of Rivers, Streams and Watercourses

All rivers, streams and watercourses shall be protected from direct or indirect spills of pollutants such as garbage, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and waste water or organic material resulting from the Contractor's activities. In the event of a spill prompt action shall be taken to clear polluted or affected areas.

The Contractor shall not work within streams, watercourses and wetlands without the written approval or as required for the execution of the work.

PS 12.4 Refuse and Waste Control

The management of solid waste on site shall be strictly controlled and monitored. The Contractor shall adhere to and implement the following:

- Labelled recycling bins shall be used and waste separated where possible. In addition, a recycled-material collection schedule shall be established and the bins shall be collected regularly;
- Eating areas for the construction staff shall be designated and supplied with waste bins to control litter;
- No on-site burying or dumping or unauthorised burning of any waste materials, vegetation, litter or refuse shall occur;

Solid waste shall be disposed of off site, at an approved landfill site. The Contractor shall supply the Employer with a certificate of disposal; and waste shall be separated into domestic waste, building/construction rubble, scrap metal, oil and grease and hazardous waste and dealt with in the following manner:

- a) Domestic waste
 - Suitable refuse bins, all with lids, shall be provided by the Contractor for his own buildings. Refuse shall be collected and removed from all facilities on the Site at least twice per week. Domestic waste shall be transported to the approved refuse disposal site off site in covered containers or covered trucks.
- b) Organic waste
 - Refuse from food preparation and eating areas shall be collected and removed daily. Organic Waste shall be disposed of as per Domestic Waste.
- c) Building/Construction waste
 - Inert building/construction rubble shall be disposed of by burying in the dam basin in borrow pits, at a site and in such a way as approved by the Employer.
- d) Scrap metal
 - Scrap metal shall be disposed of offsite.
- e) Used oil and grease
 - Used oil and/or grease shall be removed from site and sold to an approved used oil recycling company.
- f) Hazardous waste
 - All hazardous waste shall be disposed of in an approved hazardous waste disposal site and a disposal certificate supplied to the Employer.

PS 12.5 Protection of Flora

The removal, damage and disturbance of indigenous flora is prohibited. The Contractor shall request permission before removal of any vegetation on the designated work area and undertake to demarcate and protect flora outside the designated work area.

PS 12.6 Protection of the Fauna

The Contractor shall protect fauna living within the Site and shall ensure that hunting, snaring, poisoning, shooting, nest raiding or egg-collecting and disturbance does not occur. The Contractor is to ensure that his employees are instructed not to feed wild animals and no domestic pets or livestock are permitted on site.

The use of pesticides is prohibited unless approved by the Employer.

C2.3 PARTICULAR SPECIFICATIONS

CWD 01SC	General
CWD 01HS	Health and Safety
CWD 44	Pipes and Specials
DWS 1601	General Mechanical Specification
DWS 9900 C1	Corrosion Protection – Pipes and Specials

C2.4 VARIATIONS AND ADDITIONS TO SPECIFICATIONS

The variations and addition to clauses in Section C2.1, C2.2 and C2.3 are lettered and numbered using the alphabetic identification of the applicable standardised specifications or the numeric identification of the applicable particular specifications. The number of the clauses is prefixed with the letter PS.

For example, variations and addition clauses are numbered as follows:

- For SABS 1200 A specification the clauses are lettered PSA.
- For specification CWD 23 the clauses are lettered PS23.

PS PROJECT DESCRIPTION

Add

PS 13 Information to be submitted by Contractor

The following information shall be submitted by the contractor at tender stage:

- (a) Tendered contract program (PS 8.2)
- (b) Preliminary Method statements (PS 9.1)
- (c) Pro Forma Quality Management System (PS 9.2)
- (d) Pro Forma Health and Safety Plan (PS 11.1)

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

THE SUPPLY, MANUFACTURE, DELIVER AND INSTALLATION OF TEMPORARY SUSPENSION STRUCTURE AND PIPEWORK FOR CANAL WATER SUPPLY

C3: PRICING DATA

CONTENTS

- C3.1 PRICING INSTRUCTIONS
- C3.2 BILL OF QUANTITIES

C3.1 PRICING INSTRUCTIONS

1. GENERAL

The Schedule of Quantities forms part of the Contract Documents and must be read and priced in conjunction with all the other documents comprising the Contract Documents which include the Conditions of Tender, Conditions of Contract, the Specifications (including the Project Specification) and the Drawings.

2. DESCRIPTION OF ITEMS IN THE SCHEDULE

The Schedule of Quantities has been drawn up generally in accordance with the payment items as per Particular Specifications.

The short descriptions of the items in the Schedule of Quantities are for identification purposes only and the measurement and payment clause of the Standardised Specifications and each Particular Specification, read together with the relevant clauses of the Project Specification and directives on the drawings, set out what ancillary or associated work and activities are included in the rates for the operations specified.

3. QUANTITIES REFLECTED IN THE SCHEDULE

The quantities given in the Schedule of Quantities are estimates only, and subject to re-measuring during the execution of the work. Where quantities or sums are indicated as "Provisional", the Employer reserves the right to adjust the quantity or sum upwards or downwards as necessary, or the item can be omitted altogether. The Contractor shall obtain the Engineer's detailed instructions for all work before ordering any materials or executing work or making arrangements for it.

The Works as finally completed in accordance with the Contract shall be measured and paid for as specified in the Schedule of Quantities and in accordance with the General and Special Conditions of Contract, the Specifications and Project Specifications and the Drawings. Unless otherwise stated, items are measured net in accordance with the Drawings, and no allowance has been made for waste.

The validity of the contract will in no way be affected by differences between the quantities in the Schedule of Quantities and the quantities finally certified for payment.

4. PRICING OF THE SCHEDULE

The prices and rates to be inserted in the Schedule of Quantities shall be the full inclusive prices to be paid by the Employer for the work described under the several items, and shall include full compensation for all costs and expenses that may be required in and for the completion and maintenance during the defects liability period of all the work described and as shown on the drawings as well as all overheads, profits, incidentals and the cost of all general risks, liabilities and obligations set forth or implied in the documents on which the Tender is based.

Each item shall be priced and extended to the "Total" column by the Tenderer. If the Contractor omits to price any items in the Schedule of Quantities, then these items will be Considered to have a nil rate or price.

All items for which terminology such as "inclusive" or "not applicable" have been added by the Tenderer will be regarded as having a nil rate which shall be valid irrespective of any change in quantities during the execution of the Contract.

All rates and amounts quoted in the Schedule of Quantities shall be in Rand and shall include all levies and taxes (other than VAT). VAT will be added in the summary of the Schedule of Quantities.

5. CORRECTION OF ENTRIES

Incorrect entries shall not be erased or obliterated with correction fluid but must be crossed out neatly. The correct figures must be entered above or adjacent to the deleted entry, and the alteration must be initialised by the Tenderer.

6. MONTHLY PAYMENTS

Unless otherwise specified in the Specifications and Project Specifications, progress payments in Interim Certificates, referred to in Clause 6.10 of the General Conditions of Contract 2015 (Third edition), in respect of "sum" items in the Schedule of Quantities shall be by means of interim progress instalments assessed by the Employers Agent and based on the measure in which the work actually carried out relates to the extent of the work to be done by the Contractor.

7. UNITS OF MEASUREMENT

The units of measurement described in the Schedule of Quantities are metric units for which the standard international abbreviations are used. Non-standard abbreviations which may appear in the Schedule of Quantities are as follows:

No.	=	number
Sum	=	Lump sum

8. ARITHMETICAL ERRORS

As per SANS 294:2004:

F.3.9 Arithmetical errors

F.3.9.1 Check responsive tender offers for arithmetical errors, correcting them in the following manner:

- a) Where there is a discrepancy between the amounts in figures and in words, the amount in words shall govern.
- b) If a bill of quantities (or schedule of quantities or schedule of rates) applies and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
- c) Where there is an error in the total of the prices, either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if a bill of quantities applies) to achieve the tendered total of the prices.

F.3.9.2 Consider the rejection of a tender offer if the tenderer does not correct or accept the correction of his arithmetical errors in the manner described in F.3.9.1.

C3.2 BILL OF QUANTITIES

Item No	Pay Ref	Short Description	Unit	Qty	Rate	Amount
Section A: General						
A1		Installation on site	Sum	1		
A2		Delivery of all materials to site	Sum	1		
A3		Establishment and de-establishment	Sum	1		
A4		Health, Safety and Environment	Sum	1		
Total Carried forward to Summary						

Item No	Pay Ref	Short Description	Unit	Qty	Rate	Amount
Section B: Temporary Suspension Structure (Drawing 169394/13 ME to 169397/13 ME CWD 7076 to 9)						
B1		12.7m Castellated beam	No	2		
B2		5.1m Castellated beam	No	2		
B3		3.4m Cross Beam	No	5		
B4		2.7m Column	No	2		
B5		3.6 Sling Beam	No	4		
B6		8.6m Beam	No	1		
B7		3.1m Beam	No	1		
B8		2.5m Column	No	1		
B9		0.6m Wide Saddle	No	10		
B10		3.6m Beam	No	3		
B11		3.6m Angle	No	2		
B12		4.9m Column	No	1		
B13		4.9m Column	No	1		
B14.1		Splice plates (Flange Splice, Inner – 14A)	No	8		
B14.2		Splice plates (Flange Splice, Outer – 14B)	No	4		
B14.3		Splice plates (Web Splice – 14C)	No	4		
B15		Dia 80 Pin (Material: EN 8)	No	4		
B16		Brackets as per drawing CWD 7079	No	6		
B17		Splice plate as per drawing CWD 7079	No	2		
B18		Keep Plate as per drawing CWD 7079	No	8		
B19		Brackets as per drawing CWD 7079	No	2		
B20		Brackets as per drawing CWD 7079	No	2		
B21		Brackets as per drawing CWD 7079	No	4		
B22		M20x80 Hexagon head screws with nut and 2 washers (Grade 10.9 HDG)	No	80		
B23		M20x60 Hexagon head screw with nut and 2 washers (Grade 10.9 HDG)	No	56		
Carried Forward						

Brought Forward					
B24	M20x60 Hexagon head screw with nut and 2 washers (Grade 8.8 HDG)	No	64		
B25	M16x50Hexagon head screw with nut and 2 washers (Grade 8.8 HDG)	No	48		
B26	M20x70 Hexagon head screw with nut and 2 Hardened washers (Grade 8.8 HDG)	No	88		
B27	M8x30 Hexagon head screws (Grade 8.8 HDG)	No	16		
B28.1	M24 x460mm Long adhesive anchors with nut & two washers (Grade 8.8 HDG). Including adhesive as per drawing detail.	No	36		
B28.2	M24 Nuts (Grade 8.8 HDG)	No	12		
B29	M24 x 500mm long adhesive anchors with two nuts & two washers (Grade 8.8 HDG) Including adhesive as per drawing detail.	No	20		
B30	M20 x275mm long adhesive anchors with nut & washers (Grade 8.8 HDG) Including adhesive as per drawing detail.	No	6		
B31	22x2950 Wire rope 6 x36 IWRC including thimble and 5 wire clips on each end	No	8		
B32	'D'-shackle (ø22mm Pin)	No	8		
B33	M32x 700-960 Turnbuckle / Rigging Screw	No	8		
B34	Adhesive foil pack	No	20		
B35	16mm Plate 1400 x 400mm (25x 22mm holes to be drilled on site to suit existing valve body).	No	1		
Total Carried forward to Summary					

Item No	Pay Ref	Short Description	Unit	Qty	Rate	Amount
Section C: Pipe Work for Canal Water Supply (Drawing no 169393/13 ME [CWD 7075])						
C1.		Gusseted tee	No	2		
C2.		Outlet pipe	No	1		
C3.		Outlet pipe (Opp. Hand)	No	1		
C4.		Support	No	1		
C5.		RSV Valve: 200NB, PN10	No	2		
C6.		3mm Full Face Gasket to suit 200NB flange	No	8		
C7.		M20x70 Hexagon bolt, nut and 2 washers	No	64		
C8.		M20 x 220mm long adhesive anchor, two nuts and two washers (Incl. Adhesive)	No	11		
Total Carried forward to Summary						

Summary of Bill of Quantities		
Section	Description	Amount
A	General	
B	Temporary Suspension Structure	
C	Pipe Work for Canal Water Supply	
Sub Total		
15 % VAT		
Total		

DEPARTMENT OF WATER AND SANITATION

DWS01-0419 (WTE)

THE SUPPLY, MANUFACTURE DELIVER AND INSTALLATION OF THE TEMPORARY SUSPENSION
STRUCTURE AND PIPEWORK FOR CANAL WATER SUPPLY

C4. DRAWINGS

CONTENTS

C4.1 TENDER DRAWINGS

C4.1 TENDER DRAWINGS

The drawings issued to the tenders as part of the tender documents must be regarded as provisional and preliminary for the tenderer's benefit to generally assess the scope of work.

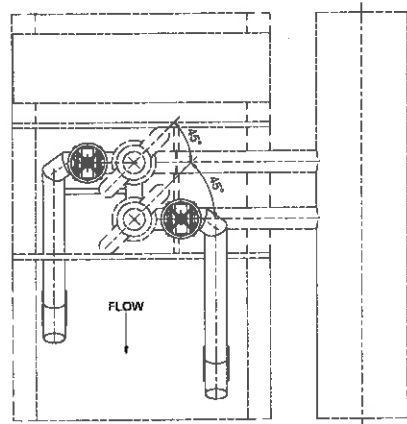
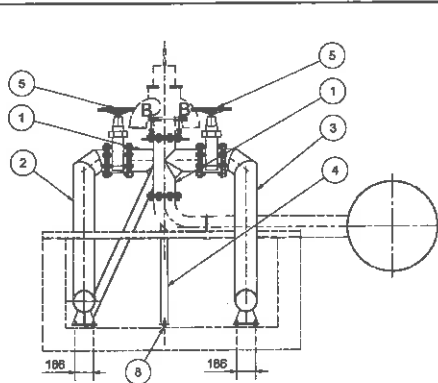
The work shall be carried out in accordance with the latest available revision of the drawings approved for construction (AFC)

At commencement of the contract, the Engineer shall deliver to the Contractor copies of the AFC drawings and any instructions required for the commencement of the works. From time to time thereafter during progress of the works, the Engineer may issue further drawings for construction purposes as may be necessary for adequate construction, completion and defects correction of the works.

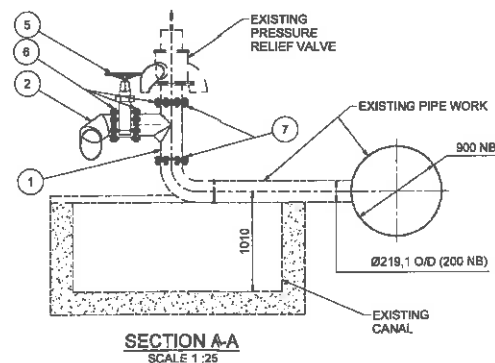
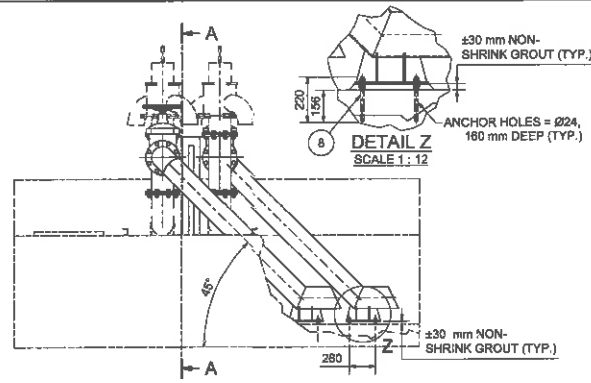
All drawings and specifications and copies thereof remain the property of the Employer, and the Contractor shall return all drawings and copies thereof to the Employer at the completion of the contract.

LIST OF DRAWINGS

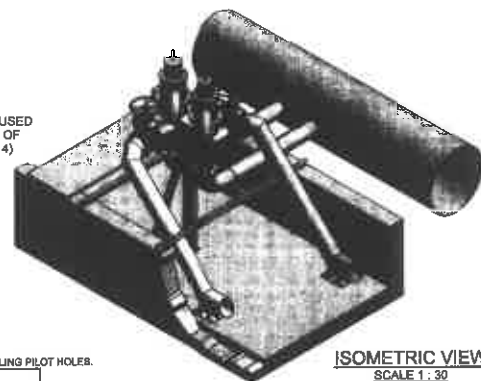
DRAWING NR	TITLE
169393/13 ME [CWD7075]	Outlet Works: Temporary Canal Water Supply – Assembly & Details
169394/13 ME [CWD7076]	Right Bank Outlet Works: Temporary Suspension for Existing Outlet Pipework – Assembly [1/4]
169395/13 ME [CWD7077]	Right Bank Outlet Works: Temporary Suspension for Existing Outlet Pipework – Detail [2/4]
169395/13 ME [CWD7078]	Right Bank Outlet Works: Temporary Suspension for Existing Outlet Pipework – Detail [3/4]
169396/13 ME [CWD7079]	Right Bank Outlet Works: Temporary Suspension for Existing Outlet Pipework – Detail [4/4]



PLAN VIEW
SCALE 1:25

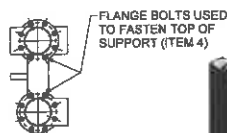


SECTION A-A
SCALE 1:25



ISOMETRIC VIEW
SCALE 1:30

SECTION B-B
SCALE 1:20



NOTE:
ALL EXISTING STRUCTURES ARE SHOWN IN
DOUBLE DASH CHAIN LINES:

GENERAL WELDING NOTES:
- PERFORM NECESSARY WELD PREPARATION.
- IDENTICAL WELDS SYMBOLISED ONCE ONLY.
- ALL WELDS SHALL BE CONTINUOUS FULL
PENETRATION WELDS. REMOVE WELD SPATTER.
- WELDERS SHALL BE CERTIFIED IN ACCORDANCE
WITH ASME IX FOR THE RELEVANT SCOPE OF
WELDS SPECIFIED.

FLANGES TO BE WELDED ON PIPES IN ACCORDANCE
WITH B.S. 600 TYPE 6.

GENERAL MANUFACTURING NOTES:
- PIPE MANUFACTURING AND TOLERANCES
SHALL BE IN ACCORDANCE WITH SANS 719.
- FABRICATION TO BE IN ACCORDANCE WITH PARTI-
CULAR SPECIFICATION CWD44 - PIPES AND SPECIALS.
- ROUND ALL EDGES TO 2 mm RADIUS.

GENERAL DIMENSIONAL TOLERANCES (U.O.S.)
DIMENSIONS UP TO 120: ± 0.3 mm
DIMENSIONS ABOVE 120 TO 400: ± 0.5 mm
DIMENSIONS ABOVE 400 TO 1000: ± 0.8 mm
DIMENSIONS ABOVE 1000: ± 2 mm
FLATNESS TOLERANCE: 3 mm/m WIDE

MATERIAL:
ALL MILD STEEL ITEMS TO BE IN ACCORDANCE WITH
SANS 60025 / EN 10025 GRADE S355JR OR SANS 1431
GRADE 350WA.
SURFACE FINISH (REMOVAL OF MATERIAL):
X = SURFACE ROUGHNESS IN MICROMETRES

ALL DIMENSIONS IN MILLIMETRES

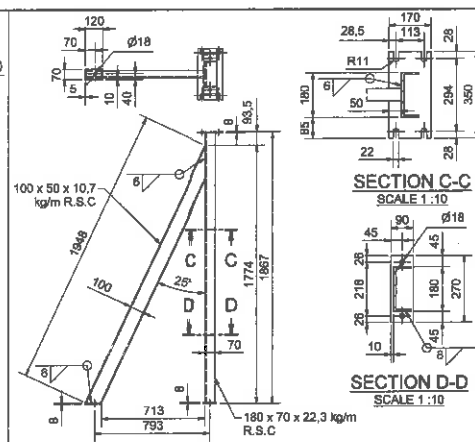
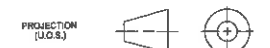
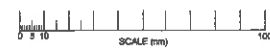
INSTALLATION NOTE:
- ALIGN ALL ITEMS BEFORE FINAL TIGHTENING AND
PLACING OF GROUT.
- USE ITEM BASEPLATES AS A TEMPLATE FOR DRILLING PILOT HOLES.

FLANGES:
- ALL FLANGES SHALL BE FLAT FACED WITH A
GRAMOPHONE FINISH.
- ALL FLANGE SIZE & DRILLING SHALL BE IN
ACCORDANCE WITH SANS 1123 TABLE 1000/3.
- FLANGE THICKNESS AS SHOWN ON DRAWING.

CORROSION PROTECTION & GENERAL WELDING NOTES:
- IN ACCORDANCE WITH DWA STANDARD
SPECIFICATION DWS 8900.
- PERFORM NECESSARY WELD PREPS.
- IDENTICAL WELDS SYMBOLISED ONCE ONLY.
- ALL WELDS SHALL BE CONTINUOUS FULL
PENETRATION WELDS. REMOVE WELD SPATTER.
- WELDERS SHALL BE CERTIFIED IN ACCORDANCE WITH
ASME IX FOR RELEVANT SCOPE OF WELD SPECIFIED.
- HOT DIP GALVANIZING (HDG) SHALL BE IN ACCORDANCE
WITH SANS 121 (HEAVY DUTY > 105 µm). NO CUTTING,
DRILLING OR WELDING IS PERMITTED AFTER HDG.
ANY MODIFICATIONS TO BE PREPARED WITH ZINC/Pb.

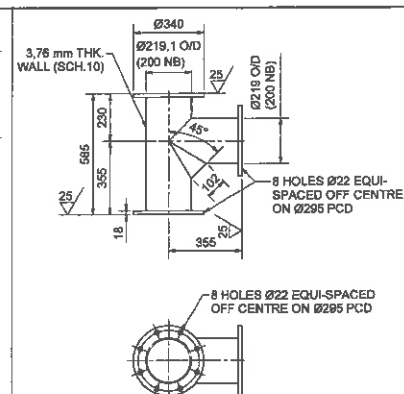
DO NOT SCALE DRAWING

REMOVE SHARP EDGES

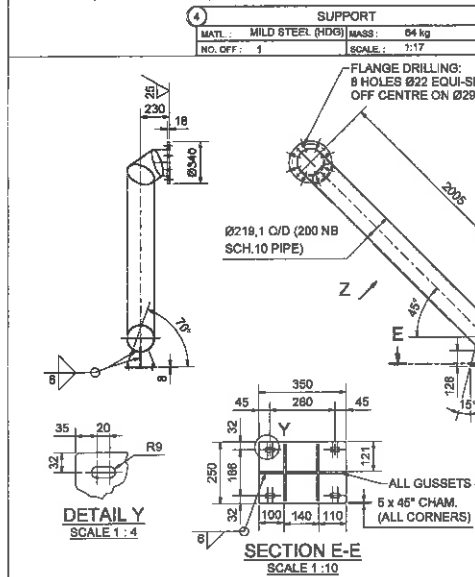


SECTION C-C
SCALE 1:10

SECTION D-D
SCALE 1:10



VIEW ON ARROW 'Z'
SCALE 1:20



DETAIL Y
SCALE 1:4

SECTION E-E
SCALE 1:10

8	M20 x 220 mm LONG ADHESIVE ANCHOR, TWO NUTS AND TWO WASHERS.	11	GRADE 8.8 (HDG) STD.	HILTI OR EQUIVALENT
7	HEXAGON BOLT - M20 x 70 - 8.8, NUT AND 2 WASHERS	64	MILD STEEL STD.	HOT DIP GALVANIZED
6	GASKET: 3 mm THK FULL FACE TYPE TO SUIT 200 NB FLANGE	8	RUBBER STD.	
5	RSV VALVE: 200 NB, PN10 (EN 558-1 SERIES 14 (230 mm FACE TO FACE)). (SEE NOTES WITH REGARDS TO FLANGES)	2	GREY CAST IRON - (STD.) STD.	COATED TO DWS 8900
4	SUPPORT	1	MILD STEEL CWD 7075	HOT DIP GALVANIZED
3	OUTLET PIPE (OPP. HAND)	1	MILD STEEL CWD 7075	HOT DIP GALVANIZED
2	OUTLET PIPE (AS DRAWN)	1	MILD STEEL CWD 7075	HOT DIP GALVANIZED
1	GUSSETED TEE	2	MILD STEEL CWD 7075	HOT DIP GALVANIZED

ITEM DESCRIPTION QTY MATERIAL DETAIL DRG. REMARKS

GUSSETED TEE
SCALE 1:12

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

OUTLET PIPE (AS DRAWN)
SCALE 1:20

OUTLET PIPE (OPP. HAND)
SCALE 1:20

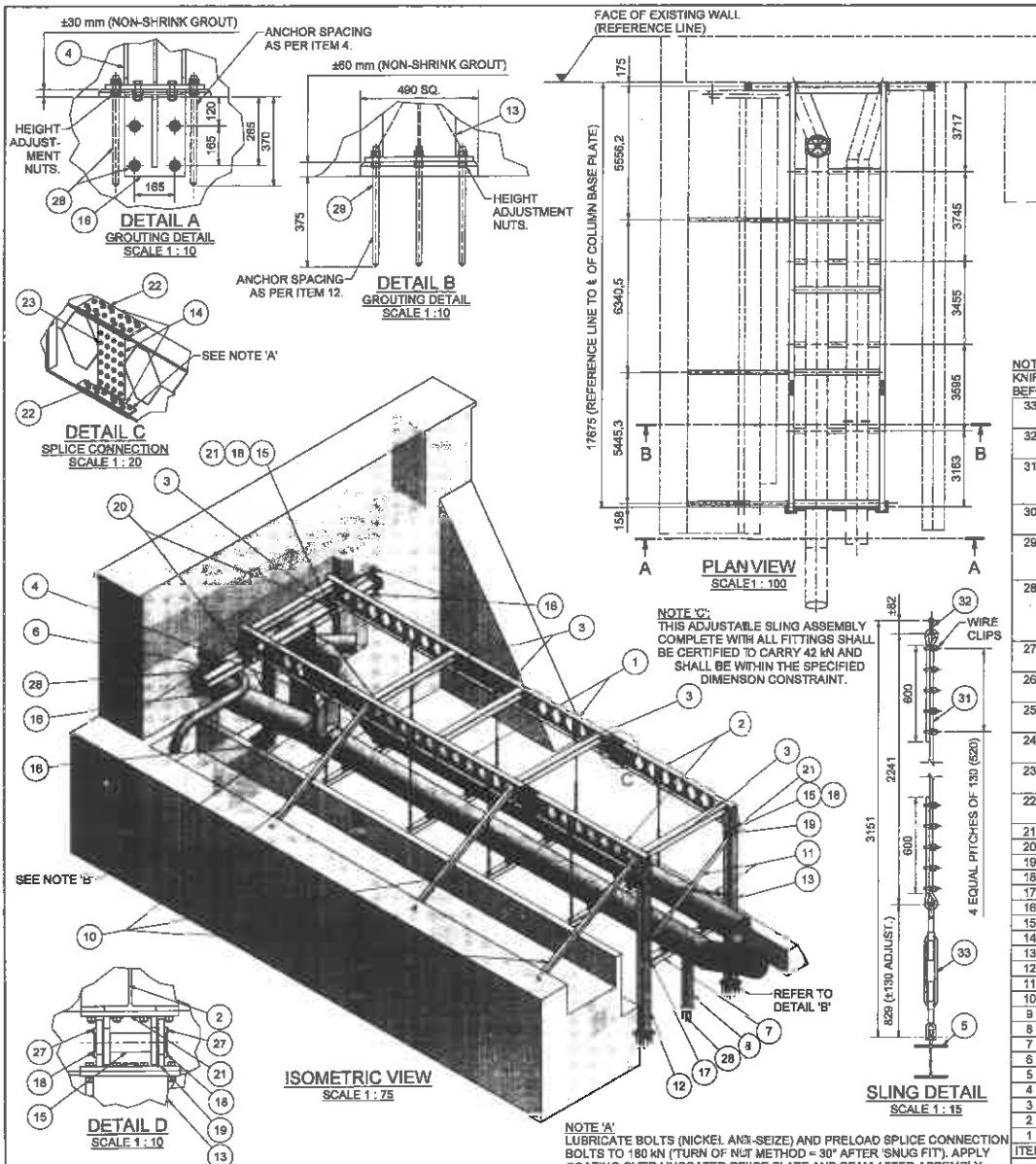
REVISION NO. DATE DESCRIPTION FOR 0 10/15 ISSUED FOR CONSTRUCTION		DEPARTMENT OF WATER AND SANITATION REPUBLIC OF SOUTH AFRICA GEORGINA BUILDING 108 BOCKHART STREET PORT COCA (P.O. BOX 1800)	
CHECKED: [Signature] DATE: 9/15/15		DRAWN: J.J. THOMSON DATE: 9/15/15	
CONFIRMED: [Signature] DATE: 9/15/15		DATE: 9/15/15	
PROJECT: 169393/13 ME		SHEET: 1 OF 1	

OLIFANTS-DOORN RIVER WATER RESOURCE PROJECT

RAISING OF CLANWILLIAM DAM
OUTLET WORKS

TEMPORARY CANAL WATER SUPPLY
-ASSEMBLY & DETAILS-

PROJECT: WESTERN CAPE	DISTRICT: CLANWILLIAM	REVISION: CWD 7075	DIET: PIP	OTHER: CWD 7075
LOCALITY: E100-02	THEORY: CLANWILLIAM	SHEET: 1 OF 1	REEL NO.: 169393/13 ME	REVISION: 0
CONTRACT NO.: E100-02	DATE: 9/15/15			



GENERAL DIMENSIONAL TOLERANCES (U.O.S.)

DIMENSIONS UP TO 125: ± 0.5 mm

DIMENSIONS ABOVE 125 TO 400: ± 0.5 mm

DIMENSIONS ABOVE 400 TO 1000: ± 0.8 mm

DIMENSIONS ABOVE 1000: ± 2 mm

FLATNESS TOLERANCE: 3 mm/m WIDE

CORROSION PROTECTION:

- BLAST CLEAN ITEMS TO SA 2, APPLY ONE COAT WATER BASED SELF ETCHING PRIMER (80 µm DFT) AND ONE OVERCOAT WHITE ALKYLID (80 µm DFT).

- BOLTS, NUTS, WASHERS & ANCHORS: HOT DIP GALVANIZED (HDG) TO SANS 121.

- APPLY NICKEL ANTI-SEIZE COMPOUND TO THREADS.

ALL DIMENSIONS IN MILLIMETRES

GENERAL WELDING NOTES:

- PERFORM NECESSARY WELD PREPARATION.

- IDENTICAL WELDS SYMBOLISED ONCE ONLY.

- ALL WELDS SHALL BE CONTINUOUS FULL PENETRATION WELDS. REMOVE WELD SPATTER.

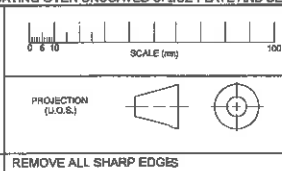
- WELDERS SHALL BE CERTIFIED IN ACCORDANCE WITH ASME IX FOR THE RELEVANT SCOPE OF WELDS SPECIFIED.

MATERIAL:

- MILD STEEL TO BE IN ACCORDANCE WITH SANS 5002/EN 10025 GRADE S355JR.

- REFER TO INSTALLATION DATA IN THE DESIGN REPORT

DO NOT SCALE DRAWING



REVISION	DATE	DESCRIPTION	FOR	DRAWN
1	01/15	ISSUED FOR CONSTRUCTION		

DEPARTMENT OF WATER AND SANITATION
REPUBLIC OF SOUTH AFRICA

WELD OFFICE
WELD. ELEC. ENG.
PRIVATE BAG 200
PRETORIA 0001

DESIGNING BUILDING
186 SCHOMBURG STREET
PRETORIA
0001

DATE: 24/01/2015
DATE: 24/01/2015
DATE: 24/01/2015

DATE: 24/01/2015
DATE: 24/01/2015
DATE: 24/01/2015

OLIFANTS-DOORN RIVER WATER RESOURCE PROJECT

RAISING OF CLANWILLIAM DAM

RIGHT BANK OUTLET WORKS

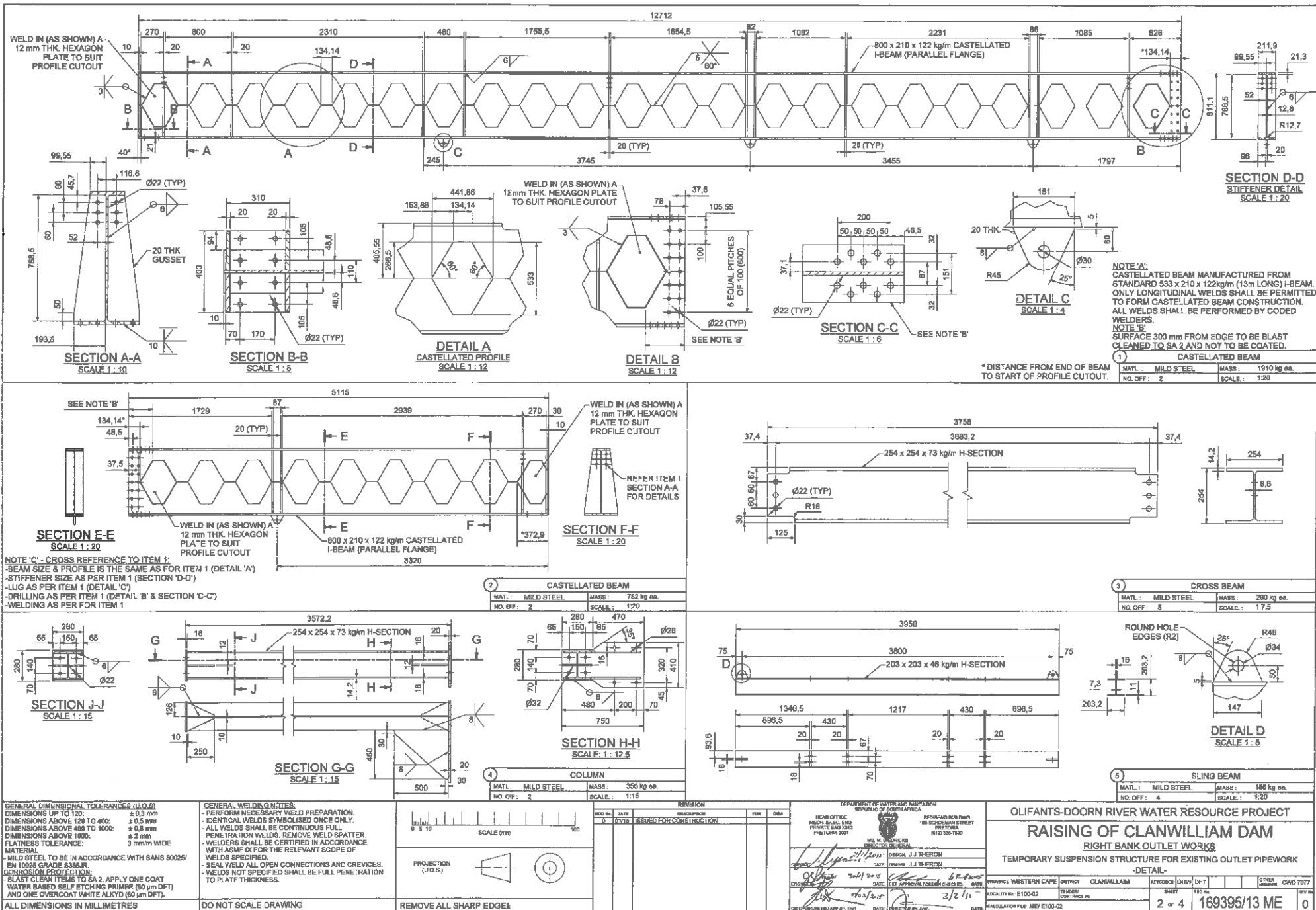
TEMPORARY SUSPENSION STRUCTURE FOR EXISTING OUTLET PIPEWORK

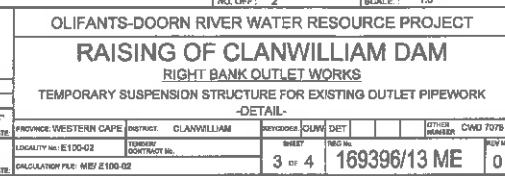
ASSEMBLY

PROVINCE: WESTERN CAPE | DISTRICT: CLANWILLIAM | MUNICIPALITY: OLIVIERBOS | COUNCIL: OLIVIERBOS

PROJECT NO: 169394/13 ME

1 of 4





PARTICULAR SPECIFICATION CWD01 HS

HEALTH AND SAFETY

TABLE OF CONTENTS

Description	Page
1. SCOPE	3
2. APPLICATIONS AND INTERPRETATION.....	3
3. DEFINITIONS	3
4. TENDERS	4
5. NOTIFICATION OF COMMENCEMENT OF CONSTRUCTION WORK	4
6. LEGAL DOCUMENTATION / APPOINTMENTS	5
7. RISK ASSESSMENT	5
8. APPOINTMENT OF EMPLOYEES AND SUBCONTRACTORS.....	7
9. APPOINTMENT OF SAFETY PERSONNEL.....	7
10. RECORDS AND REGISTERS	8
11. CONTRACTOR'S RESPONSIBILITIES.....	9
12. TRAINING	11
13. GENERAL REQUIREMENTS.....	11
14. MEASUREMENT AND PAYMENT	12
ANNEXURE 1: SAFETY ON THE SITE OF WORKS	13

1. SCOPE

This specification covers the health and safety requirements to be met by the Contractor to ensure a continued safe and healthy environment for all workers, employees and subcontractors under his control and for all other persons entering the site of works.

This specification shall be read with the Occupational Health and Safety Act (Act No 85 and amendment Act No 181) 1993, and the corresponding Construction Regulations 2003, and all other safety codes and specifications referred to in the said Construction Regulations.

This safety specification and the Contractor's own Safety Plan as well as the Construction Regulations 2003, shall be displayed on site or made available for inspection by all workers, employees, inspectors and any other persons entering the site of works.

Monitoring of compliance on site shall be to the requirements of the Occupational Health and Safety Act and Regulations as well as the contents of the Health and Safety Plan(s) (H&S Plan(s)) of the Principal Contractor and Contractors.

2. APPLICATIONS AND INTERPRETATION

This document is to be read in conjunction with the following:

- Occupational Health and Safety Act (Act 85 of 1993);
- All regulations published in terms of the Occupational Health and Safety Act;
- Construction Regulations (2003);
- SABS (SANS) codes referred to by the Occupational Health and Safety Act;
- Contract documents; and
- Basic Conditions of Employment Act (Act 75 of 1997).

3. DEFINITIONS

For the purpose of this contract the following shall apply:

- (a) **"Employer"** where used in the contract documents and in this specification, means the Employer as defined in the General Conditions of Contract and it shall have the exact same meaning as **"client"** as defined in the Construction Regulations 2003. **"Employer"** and **"client"** are therefore interchangeable and shall be read in the context of the relevant document.

- (b) **"Contractor"**, wherever used in the contract documents and in this specification, shall have the same meaning as **"Contractor"** as defined in the General Conditions of Contract.

In this specification the terms **"principal contractor"** and **"contractor"** are replaced with **"Contractor"** and **"subcontractor"** respectively.

- (c) **"Mandatory"**, wherever used in the contract, includes an agent, a contractor or a subcontractor for work, but without derogating from his status in his own right as an employer or user.

For the purpose of this contract the **"Contractor"** will, in terms of the agreement contemplated in section 37(2) of the Occupational Health and Safety Act (OHSA) 1993, be the mandatory, responsible to comply with all provisions of OHSA 1993 and the Construction Regulations (CR) 2003.

- (d) **"Engineer"** where used in this specification, means the engineer as defined in the General Conditions of Contract (GCC). In terms of the Construction Regulations the Engineer may act as agent on behalf of the Employer (the client as defined in the Construction Regulations).
- (e) **Health and Safety Plan** means a document plan, which addresses hazards, identified and includes safe work procedures to mitigate, reduce or control the hazards identified.
- (f) **Health and Safety Specification** means a documented specification of all health and safety requirements pertaining to the associated works on a construction site, so as to ensure the health and safety of persons.
- (g) **Risk Assessment** means a program to determine any risk associated with any hazard at a construction site, in order to identify the steps to be taken to remove, reduce or control such hazard.

Also refer to definitions given in the **Occupational Health and Safety Act (Act 85 of 1993)** and the **Construction Regulations (2003)**.

4. TENDERS

The Contractor shall submit the following with his tender:

- (a) A documented Health and Safety Plan as stipulated in Regulation 5 of the Construction Regulations. The safety Plan must be based on the Construction Regulation 2003 and will be subject to approval by the Employer;
- (b) A declaration to the effect that he has the competence and necessary resources to carry out the work safely in compliance with the Construction Regulations 2003;
- (c) A declaration to the effect that he made provision in his tender for the cost of the health and safety measure envisaged in the Construction Regulations.
- (d) Failure to submit the foregoing with his tender, will lead to the conclusion that the Contractor will not be able to carry out the work under the contract safely in accordance with the Construction Regulations.

5. NOTIFICATION OF COMMENCEMENT OF CONSTRUCTION WORK

After award of the contract, but before commencement of construction work, the Contractor shall, in terms of Regulation 3 of the Construction Regulations (2003), notify the Provincial director of the Department of Labour in writing if the following work is involved:

- (a) Construction work that will exceed 30 days of 300 person-days;
- (b) Working at a height greater than 3,0 m above ground or landings.

The notification must be done in the form of the pro forma included as Annexure A in the Construction Regulations (2003)

A copy of the notification form must be kept on site, available for inspection by inspectors, Employer, Engineer, employees and persons on site.

6. LEGAL DOCUMENTATION / APPOINTMENTS

The following documents must be provided in the Health and Safety Plan:

- Health and Safety Policy;
- Letter of good standing with the Compensation Commissioner, Federated Employers of similar insurer; and
- Health and Safety Organogram (or table, outlining the Health and Safety Team, as well as the appointment(s) they have under the Act and Regulations (reference to specific section/regulation applicable to appointment).

Example of Safety Organogram:

Tom Smith Section 16(2) Construction supervisor CR 6(1)
Dick King Construction vehicle competent person CR 21(1)(j) Excavation competent person CR 11(1)
Harry Hackett H & S Rep – Section 17(1)

- The competency of each member of Health and Safety Team must be provided and should include knowledge, training, experience & qualifications specific to the work or task being performed.

Signed copies of legal appointments must be provided in the Health and Safety Plan.

The following information must be provided in the Health and Safety Plan:

- Indicate the estimated number of employees to be working on site.
- Indicate the expected number of contractors to be appointed by the Principal Contractor.

7. RISK ASSESSMENT

Before commencement of any construction work during the construction period, the Contractor shall have a risk assessment performed and recorded in writing by a competent person. (Refer Regulation 7 of the Construction Regulations 2003).

The risk assessment shall identify and evaluate the risks and hazards that may be expected during the execution of the work under the contract, and it shall include a documented plan of safe work procedures to mitigate, reduce or control the risks and hazards identified.

The risk assessment shall be available on site for inspection by inspectors, Employer, Engineer, sub-contractors, employees, trade unions and health and safety committee members, and must be monitored and reviewed periodically by the Contractor. Risk assessments of all required activities shall form an integral part of the Health and Safety plan.

All risk assessments shall be conducted in terms of an acceptable methodology, prior to commencement of work, according to the provisions of Regulation 7 of the Construction Regulations (2003) and should cover at least the following:

- Movement of construction vehicles;
- All work near overhead power lines and underground cables;
- Locating underground cables/ existing services;
- Hand excavation of trenches;
- Mechanical excavation of trenches;
- All work carried out inside trenches, including compacting, pipe laying, backfilling etc.;
- Temporary stockpiling and removal of excavated material;
- Transporting material;
- Cutting into existing sewage line;
- All work carried out from scaffolding;
- Exposure to raw sewerage;
- All work carried out on live electrical installations;
- Welding in confined spaces;
- Working at heights;
- Roof work;
- Cladding;
- Formwork / Support work;
- Demolition work;
- Working with hand tools;
- Working with portable electrical tools;
- Asphaltting; AND
- All health hazards that can be present during any of the above activities and should include individual dusts, gases, fumes, vapours, noise, extreme temperatures, illumination, vibration and ergonomic hazards due to any of the above activities.

The above list is by no means exhaustive and should not be limited to these activities but must cover all activities that forms part of the said construction work. Each activity must be split down to individual tasks and all associated hazards identified and listed in the risk assessment. This ensures that critical tasks and subsequent critical hazards are not missed.

The risk assessment to be included in the Health and Safety Plan must clearly indicate:

- The methodology used to do the risk assessments;
- Frequency, likelihood and consequence;
- Breakdown of processes and activities covered; and
- High risks anticipated.

All risk assessments are to be conducted by a competent person as appointed under paragraph 6 of this document. The plan must include a declaration in this regard or the risk assessment must contain the signature(s) of these appointed persons.

8. APPOINTMENT OF EMPLOYEES AND SUBCONTRACTORS

Health and Safety plan

The Contractor shall appoint his employees and any sub-contractors to be employed on the contract, in writing, and he shall provide them with a copy of his documented Health and Safety Plan, or relevant sections thereof. The Contractor shall ensure that all subcontractors and employees are committed to the implementation of his Safety Plan. To this end the Employer, or the Engineer or Agent on his behalf, will, in terms of Regulations 4(1)(d) and 5(3)(c), carry out audits on a regular basis to ensure that the Contractor as well as any sub-contractors in his employ, do implement the Contractor's Safety Plan as well as the Employer's Safety Specifications in accordance with the Construction Regulations.

Health and safety induction training

The Contractor shall ensure that all employees under his control, including sub-contractors and their employees, undergo a health and safety induction training course by a competent person before commencement of construction work. No visitor or other person shall be allowed or permitted to enter the site of the works unless such person has undergone health and safety training pertaining to hazards prevalent on site. The Employer or the Engineer on his behalf will carry out audits from time to time to ensure compliance by the Contractor.

The Contractor shall ensure that every employee on site shall at all times be in possession of proof of the health and safety induction training issued by a competent person prior to commencement of construction work.

9. APPOINTMENT OF SAFETY PERSONNEL

Construction Supervisor

The Contractor shall appoint a full-time **Construction Supervisor** with the duty of supervising the performance of the construction work. (*Refer Regulation 6(1)*). He may also have to appoint one or more competent employees to assist the construction supervisor where justified by the scope and complexity of the works.

Constructions Safety Officer

Taking into consideration the size of the project and the hazards or dangers that can be expected, the Contractor shall appoint in writing a full-time or part-time **Construction Safety Officer** if so decided by the Inspector of the Department of Labour. The Safety Officer shall have the necessary competence and resources to perform his duties diligently. (*Refer Regulation 6(2)*). Provision will be made in the schedule of quantities to cover the cost of a dedicated construction safety officer appointed after award of the contract if so ordered by the Engineer.

Health and safety representatives

In terms of **Section 17 and 18 of the Act (OHSA 1993)** the Contractor, being the employer in terms of the Act for the execution of the contract, shall appoint a **health and safety representative** whenever he has more than 20 employees in his employment on the site of the works. The health and safety representative must be selected from employees who are employed in a full-time capacity at a specific workplace.

The number of health and safety representatives for a workplace shall be at least one for every 100 employees.

The function of the health and safety representative(s) will be to review the effectiveness of health and safety measures, to identify potential hazards and major incidents, to examine causes of incidents (in collaboration with his employer, the Contractor), to investigate complaints by employees relating to health and safety at work, to make representations to the employer (Contractor) or inspector on general matters affecting the health and safety of employees, to inspect the workplace, plant, machinery etc. on a regular base, to participate in consultations with inspectors and to attend meetings on the health and safety committee.

Health and safety committee

In terms of **Sections 17 and 18 of the Act (OHSa 1993)** the Contractor (as employer), shall establish one or more **health and safety committee(s)** where there are two or more health and safety representatives at a workplace. The persons selected by the Contractor to serve on the committee shall be designated in writing.

The function of the health and safety committee shall be to hold meetings at regular intervals, but at least once every three months, to review the health and safety measures on the contract, to discuss incidents related to health and safety with the Contractor and the inspector, and to make recommendations regarding health and safety to the Contractor and to keep record of recommendations and reports made by the committee.

Competent persons

In accordance with the Construction Regulations the Contractor has to appoint in writing **competent persons** responsible for supervising construction work.

A competent person may be appointed for more than one part of the construction work with the understanding that the person must be suitably qualified and able to supervise at the same time the construction work on all the work situations for which he has been appointed.

The appointment of competent persons to supervise parts of the construction work does not relieve the Contractor from any of his responsibilities to comply with **all** requirements of the Construction regulations.

10. RECORDS AND REGISTERS

In accordance with the Construction Regulations (2003) the Contractor is bound to keep records and registers related to health and safety on site for periodic inspection by inspectors, the Engineer, the Employer, trade union officials and sub-contractors and employees. The following records and registers must be kept on site and shall be available for inspection at all times.

- (a) A copy of the OHSa 1993 Construction Regulation 2003;
- (b) A copy of the Client's Health and Safety Specification;
- (c) A copy of the Contractor's Health and Safety Plan (Regulation 4);
- (d) A copy of the Notification of Construction Work (Regulation 3);
- (e) A health and safety file in terms of Regulation 5(7) with inputs by the Construction Safety Officer (Regulation 6(7));
- (f) A copy of the risk assessment described in Regulation 7;
- (g) A full protection plan and the corresponding records of evaluation and training of employees working from elevated positions as described in Regulation 8;
- (h) A register for recording of findings by the competent person appointed to inspect construction vehicles and mobile plant (Regulation 21(1)(i)).

11. CONTRACTOR'S RESPONSIBILITIES

For this contract the Contractor will be the mandatory of the Employer (Client), as defined in the Act (OHSA 1993), which means that the Contractor, as employer in his own right in respect of the contract, will be responsible for all the duties and obligations of an employer as set out in the Act (OHSA 1993) and the Construction Regulations (2003).

Before commencement of work under the contract, the Contractor shall enter into an agreement with the Employer (Client) to confirm his status as mandatory (employer) for the contract under consideration.

The Contractor's duties and responsibilities are clearly set out in the Construction Regulations (2003), and are not repeated in detail but some important aspects are highlighted hereafter, without relieving the Contractor of any of his duties and responsibilities in terms of the Construction Regulations. Safety reminders in the form of a checklist of some of the more important aspects of safety as related to personnel on site, must be displayed at a prominent position at the site (see Annexure 1: Safety on the site of Works).

(a) Contractor's position in relation to the Employer (Client) (Regulation 4)

Section 4 of the Regulations by implication requires that the Contractor shall at all times liaise closely with the Employer, or the Engineer on behalf of the Employer, to ensure that all requirements of the Act and the Regulations are met and complied with.

(b) The Principal Contractor and Contractor (Regulation 5)

The Contractor for the contract under consideration is the equivalent of "Principal Contractor" as defined in Regulation 2(b) of the Construction Regulations, and he shall comply with all the provisions of Regulation 5.

Any subcontractors employed by the Contractor must be appointed in writing, setting out the terms of the appointment in respect of health and safety. An independent subcontractor shall however provide and demonstrate to the Contractor a suitable, acceptable and sufficiently documented health and safety plan before commencement of the subcontract. In the absence of such a health and safety plan the subcontractor shall undertake in writing that he will comply with the Contractor's safety plan, the health and safety specifications of the Employer and the Construction Regulations 2003.

(c) Supervision of construction work (Regulation 6)

The Contractor shall appoint the safety and other personnel and employees as required in terms of Regulation 6 and as set out in paragraph 7 above. Appointment of those personnel and employees does not relieve the Contractor from any of the obligations under Regulation 6.

(d) Risk assessment (Regulation 7)

The Contractor shall have the risk assessment made as set out in paragraph 7 above before commencement of the work, and it must be available on site for inspection at all times. The Contractor shall consult with the health and safety committee or health and safety representative(s) etc. on a regular basis to ensure that all employees, including subcontractors under his control, are informed and trained by a competent person regarding health hazards and related work procedures.

No subcontractor, employee or visitor shall be allowed to enter the site of works without prior health and safety induction training, all as specified in Regulation 7.

(e) Fall protection (Regulation 8)

Fall protection, if applicable to this contract shall comply in all respects with Regulation 8 of the Construction Regulations.

(f) Scaffolding (Regulation 14)

The Contractor shall ensure that all the provisions of Regulation 14 of the Construction Regulations are complied with. (Note: Reference in the Regulations to "Section 44 of the Act" should read "Section 43 of the Act")

(g) Construction vehicles and mobile plant (Regulation 21)

The Contractor shall ensure that all construction vehicles and plant are in good working condition and safe for use, and that they are used in accordance with their design and intended use. Workers or operators who have received appropriate training, all in accordance with all the requirements of Regulation 21, shall only operate the vehicles and plant.

All vehicles and plant must be inspected on a daily basis, prior to use, by a competent person and the findings must be recorded in a register to be kept on site.

(h) Water environments (Regulation 24)

Where construction work is done over or in close proximity to water, the provisions of Regulation 24 shall apply.

(i) Housekeeping on Construction sites (Regulation 25)

Housekeeping on all construction sites shall be in accordance with the provisions of the environment Regulations for workplaces (Government Notice R2281 of 16 October 1987) and all the provisions of Regulation 25 of the Construction Regulations.

(j) Stacking and storage on construction sites (Regulation 26)

The provisions for the stacking of articles contained in the General Safety Regulations (Government Notice R1031 of 30 May 1986) as well as all the provisions of Regulation 26 of the Construction Regulations shall apply.

(k) Fire precautions on construction sites (Regulation 27)

The provisions of the environment Regulations for Workplaces (Government Notice R2281 of 16 October 1987) shall apply.

In addition the necessary precautions shall be taken to prevent the incidence of fires, to provide adequate and sufficient fire protection equipment, sirens, escape routes etc. all in accordance with Regulation 27 of the Construction Regulations.

(l) Construction welfare facilities (Regulation 28)

The Contractor shall comply with the constructions site provisions as in the Facilities Regulations (Government Notice R1593 of 12 August 1988) and the provisions of Regulation 28 of the Construction Regulations.

(m) *Non-compliance with the Construction Regulations (2003)*

The foregoing is a summary of parts of the Construction Regulations applicable to all construction projects.

The Contractor, as employer for the execution of the contract, shall ensure that all provisions of the Construction Regulations applicable to the contract under consideration are complied with to the letter.

Should the Contractor fail to comply with the provisions of the Regulation 3 to 28 as listed in Regulation 30, he will be guilty of an offence and will be liable, upon conviction, to the fines of imprisonment as set out in Regulation 30.

THE CONTRACTOR IS ADVISED IN HIS OWN INTEREST TO MAKE A CAREFUL STUDY OF THE ACT AND THE CONSTRUCTION REGULATIONS, AS IGNORANCE OF THE ACT AND THE REGULATIONS WILL NOT BE ACCEPTED IN ANY PROCEEDINGS RELATED TO NON-CONFORMANCE TO THE ACT AND THE REGULATIONS.

12. TRAINING

Each Health and Safety Plan shall indicate the following regarding training:

- Name and contents of the following training courses which have to be conducted:
 - Induction Training;
 - Training regarding hazards identified and any corrective measures in place;
 - Training regarding all applicable regulations; and
 - Specific training regarding applicable competencies.
- Attendance registers must be kept as proof of training provided.
- Method of informing visitors and other persons entering the site of hazards prevalent site.
- Method providing personal protective equipment to visitors and non-employees.
- An example of ID training card for each employee (if used).
- Methodology to be used in the issuing and communicating of written instructions/safe work procedures.

13. GENERAL REQUIREMENTS

Personal Protective Equipment

The procedures for issuing and control over PPE shall be indicated in the Health and Safety Plan, as well as the enforcement for the wearing thereof.

Hired Plant

The responsibility for the safe condition and use of all hired plant shall be that of the contractor.

Transport of Employees

Transport of employees shall be carried out in terms of the National Road Ordinances. The Health and Safety Plan shall detail the arrangements and methods of the transportation of workers.

Signs

The Principal Contractor shall indicate in his Health and Safety Plan the arrangements regarding the posting of danger signs.

Certificates of fitness

The Principal Contractor shall include in his H&S Plan copies of all employees that require medical fitness certificates under the following regulations where applicable:

- Construction Regulations (2003) Regulation 21 – Construction vehicles and Mobile plant operators.

Site Visitors Register

A site visitor's register is to keep on site and steps are to be taken to ensure that all visitors sign the visitor's register before entering the site. A sign should also be provided directing all visitors to report to the site officer.

14. MEASUREMENT AND PAYMENT

(a) Principles

It is a condition of this contract that Contractors, who submit tenders for this contract, shall make provision in their tenders for the cost of all health and safety measures during the construction process. Special reference is made to the following:

i. Safety personnel

All safety personnel and competent persons referred to in clauses 9 will normally be members of the Contractor's personnel, and no additional payment will be made for the appointment of such safety personnel.

However provision will be made in the schedule of quantities for payment under the contract for a Construction supervisor in terms of Clause 7.1 and for a dedicated Construction Safety Officer in terms of Clause 7.2 on the instruction of the Inspector of the Department of Labour.

ii. Records and Registers

Provision will be made in the schedule of quantities for payment to the Contractor for the keeping of health and safety-related records and registers as described in Clause 8.

(b) Scheduled items

Payment will be done under:

CWD01SC 5.4.1 Health and Safety and Environment

Unit : Sum

The sum shall cover all the Contractor's time-related costs related to complying with Health and Safety standards and the Environmental Requirements including the appointment of dedicated Construction Supervisor and Health and Safety Officer and up keeping of records and registers.

Payments for these items do not absolve the Contractor from his responsibilities and liabilities in terms of Regulation 30 of the Construction Regulations 2003

ANNEXURE 1: SAFETY ON THE SITE OF WORKS

The basic day-to-day requirements for safety on the site of works are listed below. Compliance with these aspects does not relieve the Contractor of any of his obligations and responsibilities detailed in Regulations 4 to 28 referred to paragraph 9 of the Safety Specification.

1. Fall protection

- (a) All unprotected openings in floors, slabs, hatchways and stairways must be adequately guarded, fenced or barricaded or similar means must be used to safeguard any person from falling through such openings;
- (b) Notices must be placed conspicuously at all openings where the possibility exists that a person might fall through such openings;
- (c) Where roof work is being performed on a construction site, the contractor shall ensure that:
 - (1) No employees are permitted to work on roofs during inclement weather conditions of if weather conditions are a hazard to the health and safety of the employees;
 - (2) Prominent warning notices are to be placed where all covers to openings are not of sufficient strength to withstand any imposed loads and where fragile material exists; and
 - (3) There is suitable and sufficient guard-rails or barriers and toe-boards or other similar means of protection to prevent, so far as is reasonably practicable, the all of any person, material or equipment.

2. Cranes

The Contractor shall ensure that where tower cranes are use, that:

- (a) The tower crane operators are competent to carry out the work safely; and
- (b) The tower crane operators are physically and psychologically fit to work in such an environment by being in possession of a medical certificate of fitness.

3. Construction vehicles and mobile plant

- (a) The contractor shall ensure that all construction vehicles and mobile plant; are operated by workers who:
 - (1) Have received appropriate training and been certified competent and been authorized to operate such machinery; and
 - (2) Are physically and psychologically fit to operate such construction vehicles and mobile plant by being in possession of a medical certificate of fitness.
- (b) The Contractor shall furthermore ensure that:
 - (1) No person rides or be required or allowed to ride on any construction vehicle or mobile plant otherwise than in a safe place provided thereon for that purpose;
 - (2) Vehicles used to transport employees have seats firmly secured and adequate for the number of employees to be carried; and
 - (3) When workers are working on or adjacent to public roads, reflective indicators are provided and worn by the workers.

4. Use and temporary storage of flammable liquids on construction sites

- (a) The Contractor shall ensure that:
 - Where flammable liquids are being used, applied or stored at the workplace concerned, it is done in a manner that would not cause fire of explosive hazards, and that the workplace is effectively ventilated. Where the workplace cannot effectively be ventilated:

- (a) Every employee involved must be provided with a respirator, mask or breathing apparatus of a type approved by the chief inspector, and
 - (ii) Steps must be taken to ensure that every such employee, while using or applying flammable liquids, uses the apparatus supplied to him or her.
- (b) No person smokes in any place in which flammable liquid is used or stored, and the contractor shall affix a suitable and conspicuous notice at all entrances to any such areas prohibiting smoking;
- (c) An adequate amount of efficient fire-fighting equipment is installed in suitable locations around the flammable liquids store with the recognized symbolic signs.

5. Fire precautions on construction sites

The contractor shall ensure that smoking is prohibited and notices in this regard are prominently displayed in all places containing combustible or flammable materials.

6. Construction welfare facilities

- (a) The contractor shall, depending on the number of workers and the duration of the work, provide at or within reasonable access of every construction site, the following clean and maintained facilities:
 - (1) At least one shower facility for every 15 workers;
 - (2) At least one sanitary facility for every 30 workers;
 - (3) Chancing facilities for each sex; and
 - (4) Sheltered eating areas.
- (b) The Contractor shall also ensure that:
 - (1) No horseplay between employees or aggressive or threatening behaviour by anybody is allowed on site;
 - (2) Workers shall wear appropriate protective clothing for particular tasks, including protective eyewear, gloves, boots, ear protection, masks, etc. Workers shall not be allowed to wear loose clothes of footwear.
 - (3) Workers executing tasks in manholes for sewer and storm water systems shall be made aware of the existence of hazardous gases in closed areas, and shall be issued with masks as necessary. Only specialists shall be allowed to work in gas-filled chambers.
 - (4) Blasting must be done by specialists in accordance with the Explosive Act;
 - (5) Workers shall not be allowed to make open fires on any part of the site, unless in designated areas approved by the health and safety manager;
 - (6) No vehicle or equipment shall be operated on site if it produces noise above 90 decibels, measured at a distance of 10m from the unit;
 - (7) Adequate signage shall be used on site to indicate:
 - Non-smoking areas on the site;
 - Safety exits / emergency exits from buildings under construction;
 - Stairs (temporary and permanent works);
 - Toilets;
 - Fire fighting equipment;
 - Fire assembly points;
 - Fire escapes;
 - Overhead works;
 - Areas where members of the public are not allowed; and
 - First aid facilities.
 - (8) Visitors to the site shall only be allowed to enter the site by pre-determined procedures, including safety induction training. Records of visitors shall be kept in the health and safety files.

PARTICULAR SPECIFICATION CWD01 SC

GENERAL

INDEX TO PARTICULAR SPECIFICATION CWD01 SC

CWD01SC 1 SCOPE

CWD01SC 2 INTERPRETATIONS

- CWD01SC 2.1 Application
- CWD01SC 2.2 No Limitation by Description
- CWD01SC 2.3 Approval

CWD01SC 3 MATERIALS

CWD01SC 4 TESTING

- CWD01SC 4.1 Principles
- CWD01SC 4.2 Quality Management

CWD01SC 5 MEASUREMENT AND PAYMENT

CWD01SC 5.1 Measurement

- CWD01SC 5.1.1 Method of Measurement, All Sections of the Schedule

CWD01SC 5.2 Payment

- CWD01SC 5.2.1 Fixed-charge and Value-related Items
- CWD01SC 5.2.2 Time-related Items
- CWD01SC 5.2.3 Withholding of Certification for Payment for Time-related Items by the Engineer

CWD01SC 5.3 Scheduled Fixed-charge and Value-related Items

- CWD01SC 5.3.1 Establishment of Facilities for Contractor on Site
- CWD01SC 5.3.2 Removal of Site Establishment
- CWD01SC 5.3.3 Temporary de-establishment
- CWD01SC 5.3.4 Re-establishment after temporary de-establishment

CWD01SC 5.4 Scheduled Time-related Items

- CWD01SC 5.4.1 Health and Safety
- CWD01SC 5.4.2 Supervision for Duration of Construction

PARTICULAR SPECIFICATION CWD01 SC

GENERAL

CWD01SC 1

SCOPE

This specification covers general requirements applicable to all the activities required to complete the Works and includes the requirements for the Contractor's Establishment on Site.

CWD01SC 2

INTERPRETATIONS

CWD01SC 2.1

Application

Each standard referred to in a Standardised or Particular Specification shall be deemed to be the latest edition, including all amendments issued by the relevant body, published three calendar months or more before the closing date for receipt of tenders.

CWD01SC 2.2

No Limitation by Description

Nothing appearing in the Specification, Drawings or Schedule shall limit the obligations and liabilities of the Contractor, the Engineer or the Employer under the Conditions of Contract.

CWD01SC 2.3

Approval

No approval of any material or plant and its operation, or of any construction procedure to be used, will imply any relaxation of the requirements governing the quality of the materials or of the finished work, or relieve the Contractor of his responsibilities under the Contract.

CWD01SC 3

MATERIALS

The Contractor, when using materials that are specified to comply with a standard specification shall, if so ordered, furnish the Engineer with certificates showing that the materials do so comply. Where so specified, materials shall bear the official mark of the appropriate standards authority. Samples ordered or specified shall be delivered to the Engineer's office on the Site. Unless otherwise specified, all proprietary materials shall be used and placed in strict accordance with the published instructions of the relevant manufacturer.

CWD01SC 4

TESTING

CWD01SC 4.1

Principles

The Contractor shall carry out sufficient controls, tests and checks to the approval of the Engineer (refer also **Clause CWD01SC 4.2** to ensure that the materials used and the workmanship (i.e. the quality of construction, adherence to tolerances and, when applicable, the strength and other properties attained) comply consistently with the specified requirements and the results of those tests and checks shall immediately be made available to the Engineer unless otherwise approved. The Engineer may as part of his quality monitoring take such samples, conduct such tests and carry out such checks as he deems necessary at any point or at any depth or on any layer or lift or on any item as applicable, and the results of the Engineer's checks shall be made available to the Contractor. The Contractor shall provide all assistance and facilities as may be required by the Engineer to take samples, conduct tests and carry out checks.

CWD01SC 4.2

Quality Management

The Contractor's quality control or management shall be carried out in accordance with ISO 9000 Series of Codes of Practice for Quality Systems. Prior to the commencement of any activity the Contractor shall submit to the Engineer for his approval details of the quality control procedures he intends to follow for that particular activity.

CWD01SC 5

MEASUREMENT AND PAYMENT

CWD01SC 5.1 Measurement

CWD01SC 5.1.1 Method of Measurement. All Sections of the Schedule Measurement shall be the net actual quantity if each item of the Permanent Works and the method of measurement shall be in accordance with the Bill of Quantities or other applicable schedules.

CWD01SC 5.2 Payment

CWD01SC 5.2.1 Fixed-charge and Value-related Items
The sum tendered for each fixed-charge and value-related item will be paid in a single payment in terms of the first progress certificate issued after the Contractor's obligations in respect of that item have, in the opinion of the Engineer, been discharged.

CWD01SC 5.2.2 Time-related Items
Payment for time-related items will be effected as follows only after payment for the relevant fixed-charge item has been made. Payment of incremental amounts (calculated by the division of the remainder of the tendered sum by the number of months required to complete the Site activities for which the relevant sum was tendered) will be authorised in each of the subsequent progress certificates until the sum tendered has been paid.

CWD01SC 5.2.3 Withholding of Certification for Payment for Time-related Items by the Engineer
a. Should the Contractor fail to continue to provide all or part of the services or to meet all or part of the obligations and liabilities required of him in a particular period in respect of any time-related item, certification for payment of all or part of the relevant incremental amount for that item may be withheld until the required service has been provided or the obligation or liability has been discharged.
b. Should the Contractor fail to continue entirely to provide all or part of the continuing services or to meet all or part of the continuing obligations and liabilities required of him in respect of a time-related item, the amount or part of the amount for the item will be omitted from the certificates and the total amount of the Contract reduced accordingly.

CWD01SC 5.3 Scheduled Fixed-charge and Value-related Items

CWD01SC 5.3.1 Establishment of Facilities for Contractor on Site
The sums shall cover the cost of providing, establishing and commissioning on the Site these facilities adequately equipped to allow the work to commence and to proceed to completion as required in terms of the Contract.
Unit: Sum

CWD01SC 5.3.2 Removal of Site Establishment
The sum shall cover the cost of the demolition on and the removal from the surface of the Site of all items established to complete works and shall provide for the making good and the restoring of the Site to the satisfaction of the Engineer.
Unit: Sum

CWD01SC 5.3.3 Temporary de-establishment
The sum shall cover the cost of discontinue work on instruction due to the phased availability of work place, including removal of equipment and personnel if necessary.
Unit: Sum

CWD01SC 5.3.4 Re-establishment after temporary de-establishment
The sum shall cover the cost of re-establishment after temporary de-establishment, including return of equipment and personnel. sum shall cover the cost of the demolition on and the removal from the surface of the Site of all items established to complete works and shall provide for the making good and the restoring of the Site to the satisfaction of the Engineer.
Unit: Sum

CWD01SC 5.4 Scheduled Time-related Items

CWD01SC 5.4.1 Health and Safety and Environment
The sum shall cover all the Contractor's time-related costs related to complying with Health and Safety standards and the Environmental Requirements including the appointment of dedicated Construction Supervisor and Health and Safety Officer and up keeping of records and registers.
Unit : Sum

Payments for these items do not absolve the Contractor from his responsibilities and liabilities in terms of Regulation 30 of the Construction Regulations 2003

CWDD01SC 5.4.2 Supervision for Duration of Construction

Unit : Sum

The sum shall cover the costs of on-site supervision and such local administration as the Contractor considers necessary for the proper completion of the Works, and shall cover the cost of the salaries, wages and allowances paid to the Site Agent, general foreman, section foremen (where applicable), site surveyors, timekeepers, assistants and other Site supervisory staff, and of transport incurred in connection with such staff

PARTICULAR SPECIFICATION CWD 44
PIPES AND SPECIALS

INDEX TO PARTICULAR SPECIFICATION CWD 44

	<u>Page</u>
CWD 44.1 SCOPE	3
CWD 44.1.1 SERVICES REQUIRED.....	3
CWD 44.1.2 DEVIATIONS.....	3
CWD 44.1.3 CONDITIONS OF CONTRACT	3
CWD 44.1.4 GUARANTEE	3
CWD 44.1.5 DESCRIPTION OF PIPE OUTLET SYSTEM	3
CWD 44.1.6 VALVES, HEADS AND FLOWS	4
CWD 44.1.7 TENDER INFORMATION.....	4
CWD 44.2 INTERPRETATIONS	4
CWD 44.2.1 STANDARD SPECIFICATIONS FOR STEEL PIPES AND SPECIALS	4
CWD 44.2.2 DEFINITIONS AND ABBREVIATIONS.....	5
CWD 44.3 MATERIALS	6
CWD 44.3.1 PIPES AND SPECIALS.....	6
CWD 44.3.2 FLANGES.....	6
CWD 44.3.3 COLLARS.....	6
CWD 44.3.4 GASKETS	7
CWD 44.3.5 RUBBER.....	7
CWD 44.3.6 BOLTS AND NUTS.....	7
CWD 44.4 PLANT	7
CWD 44.5 FABRICATION AND CONSTRUCTION.....	7
CWD 44.5.1 GENERAL	7
CWD 44.5.1.1 Supporting Specifications	7
CWD 44.5.1.2 Welding of Pipes & Specials	7
CWD 44.5.1.3 Qualification of Welders.....	7
CWD 44.5.1.4 Non-destructive Tests and Adjudication.....	7
CWD 44.5.2 SPECIFIC REQUIREMENTS FOR PIPES AND SPECIALS	7
CWD 44.5.2.1 Dimensional requirements.....	7
CWD 44.5.2.2 <i>Specials</i>	8
CWD 44.5.2.3 Flanges and Gaskets.....	8
CWD 44.5.2.4 Flexible Couplings and Flange Adaptors.....	9
CWD 44.5.3 CORROSION PROTECTION	9
CWD 44.5.3.1 Toxicity of Lining Material	9
CWD 44.5.3.2 Proprietary Items.....	9
CWD 44.5.3.3 Coating Systems for Outlet Pipes, Specials and Bell Mouths.....	9
CWD 44.5.3.4 QUALITY ASSURANCE, INSPECTIONS AND TESTS.....	13
CWD 44.5.3.5 Visual Inspection.....	13
CWD 44.5.3.6 Testing of Pipes and Specials.....	13
CWD 44.5.3.7 Hydrostatic Field Testing	14
CWD 44.5.3.8 Repair of Injurious Defects	14
CWD 44.5.4 MARKING.....	14
CWD 44.5.5 STORAGE, HANDLING AND TRANSPORT	15
CWD 44.5.6 INSTALLATION	15

CWD 44/2

CWD 44.6 TOLERANCES 15

CWD 44.7 TESTS ON COMPLETION 15

CWD 44.8 MEASUREMENT AND PAYMENT 15

CWD 44.8.1 BASIC PRINCIPLES 15

CWD 44.8.2 SCHEDULED ITEMS 16

CWD 44.8.2.1 Documentation..... 16

CWD 44.8.2.2 Procurement / manufacture, hydraulic pressure testing and supply of pipes and specials..... 16

..... 16

CWD 44.8.2.3 Corrosion Protection 16

CWD 44.8.2.4 Transport and delivery to Site 16

CWD 44.8.2.5 Installation and testing of pipes and specials (to be priced by Main Contractor) 16

CWD 44.8.2.6 Tests on Completion (to be priced by Main Contractor)..... 16

ANNEXURE A 17

PARTICULAR SPECIFICATIONS CWD 44

PIPES AND SPECIALS

CWD 44.1 SCOPE

CWD 44.1.1 Services Required

This Specification covers the manufacture and supply, delivery, installation and testing of electric fusion welded stainless steel grade 304L, 316L, 2205 and 3CR12 pipes and specials and low carbon steel pipes and associated specials for the conveyance of water at ambient temperatures and at medium to high pressures.

In particular, this Specification shall cover:

- (a) Manufacture of pipes, pipe ancillaries, pipe specials and delivery to Site, including the supply of all materials;
- (b) Installation, testing and Tests on Completion of pipes, pipe ancillaries and pipe specials;
- (c) Workshop corrosion protection of specials and straight pipes, complete with (where applicable) welded in-situ ancillaries (nozzles, sliding support reinforcement, anchorages, etc.)
- (d) Site corrosion protection of circumferential field welds;
- (e) Remedial corrosion protection where necessary to remedy damage to shop painting of pipes, ancillaries and specials and to valves and appurtenant equipment supplied by others occurring after handover of such equipment by the Contractor;
- (f) Site painting to stipulated final colour of pipe work, including Site painting of valves and appurtenant equipment supplied by others;
- (g) Maintenance of pipes and pipe specials during the Defects Notification Period;
- (h) Supply of all fasteners and washers for complete installation of the entire pipe system. All fasteners and gaskets for mounting of the valves (CWD45 - Valves) to the pipe work shall be supplied by the Valve Supplier.

CWD 44.1.2 Deviations

Equipment shall be manufactured and corrosion protected in accordance with the requirements specified in this Specification. No deviation from the Specification will be allowed without the written approval of the Engineer.

CWD 44.1.3 Conditions of Contract

The conditions governing this Tender are as set out in the "Conditions of Contract for Mechanical & Electrical Works (General)".

Contracts will only be awarded to Tenderers who, in the Engineer's opinion, are capable of manufacturing to the required standard. Only Tenderers who can demonstrate that they are bona fide manufacturers of the equipment as specified in this Specification, with their own manufacturing and service workshop, may tender. An established local service and spare parts network for the equipment offered shall be available. Workmanship shall conform to accepted industrial standards and welders shall be coded. The size of tools and equipment used shall be proportional to the task being carried out.

CWD 44.1.4 Guarantee

The period of guarantee as stipulated in "Conditions of Contract for Mechanical & Electrical Works (General)", shall read 12 (twelve) months from the date of issue of the Commissioning Certificate by the Engineer to the Contractor or on completion of full flow testing, whichever is the latest and shall terminate with the issue of the Final Certificate by the Department.

CWD 44.1.5 Description of Pipe Outlet System

The Outlet Works at the Clanwilliam Dam include the following prime elements as shown on the Drawings:

- | | |
|------------------------------------|----------------------|
| Drawings showing pipe work layout: | Parts List |
| | CWD 7000 |
| | Assembly Drawings |
| | CWD 7001 to CWD 7007 |
| | Detail Drawings |
| | CWD 7008 to CWD 7079 |
- Refer to Drawing CWD 7001 for the General Assembly and Layout of the dam's Outlet Works.

- The outlet works structure of approximately 39 m overall height equipped with two vertical DN 1800 pipe stacks, equipped with 7 staggered and screened horizontal intakes. The intakes consist of stainless steel 316L bell mouths, isolated at their downstream ends by DN 1800 butterfly valves (level selector valves). For maintenance purposes, the bell mouths will be isolated by a single emergency gate designed to seal against the sealing faces of the bell mouths and operated by an overhead crane on top of the outlet works structure.
- 6 off 90° DN 1800 x DN 1800 branch sweep tees and 1 off 30° Y-Piece connect the staggered horizontal intakes to twin DN 1800 vertical pipe stacks, both extending horizontally through the dam wall on top of one another and bifurcating to respective crossover chambers, one leading to the isolating valve chamber that connects to a future Hydro-electric Power Plant and the other continues to the sleeve valve controlled river outlet chamber.
- Twin DN 1000 outlet pipes bifurcating from the river outlet pipes on the left bank and connecting to the right bank crossover chamber and pipe outlet chamber.
- Two operational and one spare set of stainless steel / uPVC fine screens, manually cleaned on the emergency gate control room operating floor level (RL 124,750 masl).
- Sleeve valve river outlets fed from the twin DN 1800 main outlet and twin DN 1000 branch pipes reducing to DN 1000 and DN 600 respectively. The discharge of water shall be through two DN 1000 hooded fixed cone sleeve valves and two subsidiary DN 600 hooded fixed cone sleeve valves for river compensation flow. The DN 1000 fixed cone sleeve valves shall be isolated via DN 1800 butterfly valves installed upstream of the reducers serving these valves. Similarly, the DN 600 fixed cone sleeve valves shall be isolated via DN 1000 butterfly valves.
- An electrically operated overhead crane intended to operate the emergency gate and to allow the level selector valves to be raised to emergency gate control room operating floor level for major maintenance off-site and for handling of all mechanical equipment in the outlet works.
- 2 off pipe outlet chambers containing a 3-off DN 1800 butterfly valve cross over system.
- 1 off pipe outlet chamber containing a 5-off DN 1000 butterfly valve cross over system.
- Pipe work from the pipe outlet chambers extending towards the flow meter chambers.
- Small diameter valves in bypasses, drains, back fill pipes, permanent water supply pipes to the operator's houses, etc.

CWD 44.1.6 Valves, heads and flows

Refer to CWD 45 - Valves for supply of valves, applicable water heads and flow velocities.

CWD 44.1.7 Tender Information

Sufficient information shall be supplied with the Tender giving enough information to make a proper assessment of the equipment offered. Information supplied shall include (but not necessarily be limited to):

- Pipe manufacturing process proposed, within the scope of the detailed Specifications;
- Material supplier proposed, within the ambit of the detailed Specifications;
- Slip coupling and flange adaptor supplier proposed.

CWD 44.2 INTERPRETATIONS

CWD 44.2.1 Standard specifications for steel pipes and specials

This Particular Specification CWD 44 shall where applicable, have preference over all other sections of this Tender Document or any Standard Specifications referred to. Technical drawings referred to in this Particular Specification shall have preference. Otherwise this Particular Specification shall rule.

This Particular Specification shall be read in conjunction with General Mechanical Specification DWS 1601 and the following Departmental Standard Specifications (which are available on request):

STANDARD SPECIFICATION DWS 2020:	QUALITY CONTROL SPECIFICATION (October 2001 edition)
STANDARD SPECIFICATION DWS 9900:	CORROSION PROTECTION SPECIFICATION (October 2002 edition)
STANDARD SPECIFICATION DWS 1110:	CONSTRUCTION OF PIPELINES (Latest edition)

This Specification is supported by the following standards of which the latest publication shall apply (unless otherwise specified):

(a) American Water Works Association

AWWA: C207 : Steel pipe flanges "100mm through 3600mm",
AWWA MANUAL M11: Steel Pipe - A Guide for Design and Installation

(b) South African Bureau of Standards

SANS 121: Hot-dip galvanised coatings on fabricated iron and steel articles
SANS 564: Rubber insertion sheeting
SANS 719: Electric welded low carbon steel pipes for aqueous fluids (ordinary duties)
SANS 1123: Steel Pipe Flanges (2011 Edition 3.2)
SANS 1431: Weldable structural steels
SANS 1476: Fabricated flanged steel pipe works
SANS 1700: Fasteners
SANS 10044: Welding

(c) British Standards Institution

BS 534: Steel pipes and specials for water and sewage
BS 2494: Materials for elastomeric joint rings for pipe work and pipelines
BS 2633: Class I arc welding of ferritic steel pipe work for carrying fluids
BS 4677: Arc welding of austenitic stainless steel pipework for carrying fluids

(d) American Petroleum Institute

API 5L: Specification for line pipe
API 1104: Standard for welding pipelines and related facilities

(e) American Society of Mechanical Engineers

ASME IX: Boiler and Pressure Vessel Code

CWD 44.2.2 Definitions and Abbreviations

For the purposes of this Particular Specification, the following definitions shall apply:

Contractor: The Party to whom the Tender comprising this Particular Specification is awarded.

Employer: Chief Directorate Infrastructure Development of the Department of Water and Sanitation.

Engineer: Chief Directorate Engineering Services of the Department of Water and Sanitation. For the purposes of this Particular Specification, the Engineer will be represented by the Mechanical & Electrical Engineering Directorate. Enquiries shall be directed to the compiler as listed in Annexure A.

Main Contractor: The Directorate Construction of the Department of Water and Sanitation. The Main Contractor shall be responsible for the raising of Clanwilliam Dam.

Specification: This Particular Specification together with any references therein to other documents.

Except as indicated below, the definitions given in SANS 10044 and SANS 719 shall apply:

Pipe means a straight cylinder of uniform diameter and of standard or non-standard length and having square-cut (plain or prepared) ends.

Specials means any pipe other than a pipe as defined above. Included are all types of specials such as bends, tees, crosses, angle branches, reducers, tapers, couplings and flanged pipes.

Exact Length as defined in SANS 719 shall be the standard pipe length stated in Clause CWD 44.5.2.1.

ABS	:	Acrylnitrile-butadiene-styrene
Al	:	Aluminium
BSPT	:	British Standard pipe thread
CI	†	Cast iron - grade 220

CS	:	Cast steel
DCA	:	Die cast aluminium
DFT	:	Dry film thickness
DN	:	Nominal diameter
FA	:	"VIKING JOHNSON" type flange adaptor or equal
FBE	:	Fusion-bonded Epoxy
FBP	:	Fusion-bonded Polyester
FBPE	:	Fusion-bonded Polyethylene
FTE	:	Flanged two ends
FOE	:	Flanged one end
FW	:	Field weld
GRP	:	Glass fibre reinforced Polyester
HDG	:	Hot-dip galvanized
HDPE	:	High Density Polyethylene
MS	:	Mild steel (grade 300WA, S355) or any carbon steel
NB	:	Nominal bore/diameter
PBE	:	Plain both ends
PC	:	Polycarbonate
PE	:	Plain end
PVC	:	Polyvinylchloride
RFA	:	Restrained flange adaptor
SC	:	"ARPOL", "STRAUB" or equal type slip coupling
SG	:	Spheroidal graphite cast iron – grade 420
SS	:	Stainless steel – grades 304, 304L, 316, 316L and 2205
UV	:	Ultra Violet
WP(B)	:	Weld Preparation (Butt)
3Cr12	:	Corrosion resistant steel
µm	:	Micrometer

CWD 44.3 MATERIALS**CWD 44.3.1 Pipes and Specials**

Unless otherwise indicated on the Drawings or supplementary schedules:

- All pipes and specials of 600 kPa rating and smaller than nominal diameter 600 mm, as well as all sizes of bell mouths (including the section of pipe between the bell mouth and the selector butterfly valve), shall be manufactured of stainless steel 316 L and in accordance with SANS 719.
- Pipes and specials of 600 kPa rating and nominal diameter of 600 mm and larger (excluding bell mouths) shall be manufactured of stainless steel 304 L and in accordance with SANS 719, irrespective of being in concrete or not.
- Pipes and specials of 1 000 kPa rating and nominal diameter of 600 mm and larger and embedded in soil, shall be manufactured to SANS 719 from mild steel as specified and approved by the Engineer.

CWD 44.3.2 Flanges

All flanges up to and including a size of 200 mm NB shall be manufactured from stainless steel Grade 304L or equivalent, cut from plate.

All flanges of size larger than 200 mm NB shall be manufactured from mild steel to SANS 1431 Grade 300 WA, S355 or equivalent, preferably by forging or cut from plate, or (less preferably) by welded ring segments according to AWWA C207.

The Contractor shall refer to CWD45 - Valves to confirm that drilling of flanges shall match that of the appropriate valve supplied under CWD45.

CWD 44.3.3 Collars

All collars shall be manufactured from mild steel to SANS 1431 Grade 300 WA or S355.

CWD 44.3.4 Gaskets

Gaskets shall be manufactured from insertion rubber or other similar approved material which complies with the requirements of SANS 564.

All gaskets shall be 3 mm thick and purpose made to the dimensions of the matching flanges.

CWD 44.3.5 Rubber

Rubber for joining rings in flexible couplings shall be manufactured from first grade EPDM.

CWD 44.3.6 Bolts and Nuts

Unless otherwise stated on the Drawings, bolts, nuts, studs and washers shall comply with SANS 1700 and shall be hot-dip galvanised in accordance with SANS 121.

CWD 44.4 PLANT

The Contractor shall utilise such plant and equipment as is necessary to safely and efficiently carry out the installation, testing and commissioning of the items covered by this Particular Specification.

CWD 44.5 FABRICATION AND CONSTRUCTION**CWD 44.5.1 General****CWD 44.5.1.1 Supporting Specifications**

Pipes and specials shall be manufactured, tested and inspected in accordance with the latest issues of the following Standards and Codes of Practice except where amended in subsequent clauses in this Particular Specification.

CWD 44.5.1.2 Welding of Pipes & Specials

SANS 1476, SANS 719, BS 2633 and BS 534 shall also be deemed to apply to the manufacture of pipes and specials from submerged arc spirally - or longitudinally welded "cans", rolled from low carbon steel plate or 3CR12, 304L, 316L and 2205 stainless steel plate of designated Specification and then joined by submerged arc circumferential welding or MIG flux core welding to form suitable pipe lengths.

The following additional requirements shall apply with regards to welding of pipes and specials:

- (a) All butt-welds and branch fillet welds on specials shall where practical, have an internal weld. The weld bead of this internal weld shall not extend above the prolongation of the original inside surface of the pipe by more than 1,0 mm. Internal reinforcement in the form of backing rings at weld seams shall not be permitted.
- (b) The radiographic technique, adjudication of radiographs and repair of defects shall be in accordance with API 1104.

Refer to Drawing CWD 7008 for details of the site welded joints for DN 1800 and DN 1000 pipes.

CWD 44.5.1.3 Qualification of Welders

All manual or semi-automatic welds and repair welds shall only be undertaken by welders qualified under tests laid down in the latest issue of the ASME "Boiler and Pressure Vessel Code", Section IX.

CWD 44.5.1.4 Non-destructive Tests and Adjudication

The following standard Specifications shall apply:

- Radiographic Inspection : API 1104
- Ultrasonic Inspection : API 5L

CWD 44.5.2 Specific Requirements for Pipes and Specials**CWD 44.5.2.1 Dimensional requirements**

All dimensions and tolerances shall be in accordance with the Drawings. Where not indicated, tolerances shall be in accordance with SANS 719 Clause 5.1.

The tolerance on the pipe outside diameter for pipe outside diameters above 1250 mm up to and including 1820 mm shall be ± 8 mm (excluding pipe ends).

The ovality tolerance on the pipe inside diameter of pipe ends above 1250 mm up to and including 1820 mm shall be $\pm 1,6$ mm all around the circumference over 150 mm distance from pipe ends.

Pipe ends to be joined by Site welding require appropriate spider-jacks and pipe chain clamps to ensure the acceptable ovality tolerance mentioned above is achieved and to accommodate the combined tolerance of two adjacent connecting pipes.

CWD 44.5.2.2 Specials

Specials shall generally be manufactured from pipe conforming to this Particular Specification (i.e. pipe that has been successfully subjected to a hydraulic pressure test as specified in Clause CWD 44.5.3.6). Where detailed Drawings of the specials are provided, the specials are to comply in all respects with the Drawings. Where constructional details are not indicated on the Drawings, these issues shall be communicated in writing by the Contractor to the Engineer before any work is carried out.

(a) Weld Bead

The internal weld bead for fusion welding and the height of the upset metal and flash on the inner surface of electric welding shall not exceed 1,0 mm.

Unless it is stated elsewhere in the Specification or on the Drawings that the pipes and specials are to be joined by butt-welding, the external weld reinforcement or upset metal and flash shall be ground flush with the body for a length of 200 mm back from the ends.

(b) Bends

Bends shall have their "centre plane" marked with two small punch marks close to both ends of the bends to facilitate correct positioning of the bends during laying.

(c) Branches and Nozzles for Bypasses, Drains, Air Valves, Pressure Gauges, etc.

Centre lines of nozzles and branches shall be at right angles to the barrel of the pipe, unless indicated otherwise on the Drawings.

(d) Reducer Pieces

Reducer pieces shall be manufactured from the same type and quality steel plate as would the relevant straight pipe for the same duty. Reducer pieces shall not have more than two longitudinal weld seams and further as detailed on the Drawings.

CWD 44.5.2.3 Flanges and Gaskets

All flanges shall be supplied complete with bolts, nuts, washers and full face gaskets, except where a gasket and bolting material is specifically designated to be supplied under CWD 45 - Valves.

All bolts and nuts shall be in accordance with DWS 1601 – General Mechanical. All bolt sizes shall conform to the requirements of CWD 45 - Valves. Bolted joints shall have a washer underneath both the bolt head and nut.

Flanges shall be drilled "off-centre" and in accordance with Table 2 below and the Drawings. Flange thickness shall be in accordance with the Drawings. Flange faces shall be in accordance with Table 1 below. Where not indicated, flanges shall be designed to have a uniform thickness, adequate in terms of an appropriate design code, to withstand the design working pressure within specified stress levels, and subject to the approval of the Engineer. The flange face shall have a circular or gramophone finish with a maximum surface roughness of 25 µm after the application of the coating.

The following shall apply, unless otherwise stated on the Drawings:

TABLE 1
SCHEDULE OF FLANGE TYPES ACCORDING TO SIZE AND PRESSURE RATING

PIPE DIAMETER NB (mm)	PRESSURE RATING ≤ 1600 kPa	PRESSURE RATING ≥ 2500 kPa
0 ≤ Ø ≤ 400	Full face gasket (i.e. flat faced flange)	Full face gasket (i.e. flat faced flange)
400 < Ø ≤ 2 500	Full face gasket (i.e. flat faced flange)	Raised face
Ø > 2 500	O-ring	O-ring

Details of the proposed "O" ring groove design shall accommodate corrosion protection requirements and shall be furnished at Tender stage for consideration.

TABLE 2
SCHEDULE OF FLANGE DIMENSIONS & DRILLING ACCORDING TO PRESSURE RATING

PRESSURE RATING (kPa)	PIPE NB (mm)	FLANGE BODY DIMENSIONS (EXCL. THICKNESS) (SANS 1123, Ed. 3.1)	DRILLING TABLE (SANS 1123, Ed. 3.1)
1 000	1600 & 1800	1 000/1B	1 000/1B
1 000	< 1600	1 000/3	1 000/3
1 600	ALL	1 600/3	1 600/3
2 500	ALL	2 500/3	2 500/3
4 000	≤ 500	BS 4505 Table 40/3	BS 4505 Table 40/3
4 000	> 500	NWS 1676 Table 40/3	NWS 1676 Table 40/3

(a) Joints rated below 4 000 kPa

The flange body dimensions (excluding thickness) for sizes smaller than 1 600 mm NB shall be as for steel plate flanges for welding as detailed in SANS 1123 Table 1000/3. The minimum flange rating shall be SANS 1123 Table 1000/3 for all working pressures up to 1 000 kPa. The minimum pressure rating for the drilling of flanges shall be according to SANS 1123 Table 1000/3.

The flange body dimensions (excluding thickness) for size 1 600 mm NB to 2 000 mm NB shall be as for integral iron flanges as detailed in SANS 1123 Table 1 000/1B.

CWD 44.5.2.4 Flexible Couplings and Flange Adaptors

Flexible couplings shall be of the Straub, Arpol or similar type at the joints indicated on the Drawings. All couplings shall permit a repeated movement to cater for thermal expansion and contraction of the pipes and shall further allow for the angular deflections, all in accordance with the supplier's Specification for each specific size. During installation, all tolerances with regard to permitted gaps, misalignment, angular deflection, differences in pipe O/D, axial movement, lateral displacement, etc. shall be complied with.

The casing of the coupling shall be manufactured from stainless steel 304 L or 316 L and the rubber seal from EPDM rubber. The locking bolts and bars of the coupling shall be stainless steel.

Flange adaptor type couplings shall be of the Viking Johnson type or equal and shall accommodate angular deflections as specified by the supplier.

CWD 44.5.3 Corrosion Protection

Corrosion protection of equipment supplied under this Particular Specification shall conform to DWS 9900 – CORROSION PROTECTION. Colour coding shall be in accordance with Annexure C3. All corrosion protection products shall be submitted to the Engineer for approval before application.

CWD 44.5.3.1 Toxicity of Lining Material

Materials used for the lining of valves and pipes shall be non-toxic and shall not impart any odour, taste, or colour to the water. Certification shall be submitted to the Corrosion Engineer for his approval.

CWD 44.5.3.2 Proprietary Items

Components that are supplied painted or protected e.g. gearboxes, actuators etc. **shall only be accepted** provided that they meet the corrosion protection requirements of this Particular Specification. Other coating systems may only be used if full details of the coating system was submitted at Tender stage and approved by the Corrosion Engineer.

CWD 44.5.3.3 Coating Systems for Outlet Pipes, Specials and Bell Mouths

The following tables are abbreviated guidelines and the systems are not listed in order of preference.

See Notes under Clause CWD 44.5.3(i).

Refer to the Standard Specification DWS 9900 – CORROSION PROTECTION for the updated corrosion systems. The following tables provide an indication of the corrosion protection systems required:

(a) Encased in Concrete

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Encased in concrete	SS 304 or SS 316 (See note 6)	Lining	1. Two pack Epoxy	250
			2. FBE	175
		Coating	1. Two pack Epoxy plus sealant of Polyurethane or Polysulphide – See note 2 of Clause CWD 44.5.3.3(i)	150
			2. FBE plus sealant of Polyurethane or Polysulphide – See note 2 of Clause CWD 44.5.3.3(i)	100
			3. Pickle and passivate – See note 4 of Clause CWD 44.5.3.3(i)	
Buried in soil - chamber to coupling	All materials	Coating	Two pack Epoxy plus Tape wrapping system	150 Min. 3 mm double tape wrap

NOTE: Interfaces of different environments shall be protected as per table above; option: Coating 1 or 2.

(b) In Chamber Walls

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
In chamber walls	SS 304 or SS 316	Lining	1. Two pack Epoxy	250
			2. FBE	175
		Coating	1. Two pack Epoxy plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide – See note 2 of Clause CWD 44.5.3.3(i)	150
			2. FBE plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide – See note 2 of Clause CWD 44.5.3.3(i)	25
Buried in soil - chamber to coupling	All materials	Coating	Two pack Epoxy plus Tape wrapping system	150 Min. 3 mm double tape wrap

(c) Scour, Ventilation- and Drainage Pipes

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
In concrete	SS 304	Lining and Coating	Two pack Epoxy	150
In atmosphere	SS 304 / 316 uPVC		Pickle & passivation	

(d) In Water

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
In water & severe corrosion conditions	SS 304 See note 6 of Clause CWD 44.5.3.3(i)	Lining	1. Two pack Epoxy	250
		Coating	2. FBE	150
			1. Two pack Epoxy	250
			2. FBE	150

(e) Couplings and Adapters

MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
MS	Lining and Coating	1. Two Pack Epoxy 2. FBE	400 300
SS 304	Lining and coating	Pickle and passivate - See note 4 of Clause CWD 44.5.3.3(i)	
SS 304 buried	Lining and coating	1. Two pack Epoxy 2. FBE	150 125

(f) Fasteners

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
Fasteners and washers - Dry	MS	HDG plus threads coated with Molybdenum Disulphide lubricant or wax	45
	SS 304	Threads coated with Molybdenum Disulphide lubricant or Nickel Anti-seize compound	Uniform cover
Fasteners and washers - Wet/Submerged	SS 316	1. Pickle and passivate - See note 4 of Clause CWD 44.5.3.3(i) plus threads coated with Molybdenum Disulphide lubricant or Nickel Anti-seize compound	Uniform cover
		2. FBE coated (thread surfaces excluded) plus threads coated with Molybdenum Disulphide lubricant or Nickel Anti-seize compound.	
Fasteners for flanges	MS	HDG plus complete fastener system coated with an approved spray type lubricant (Molybdenum disulphide). Bolt heads and nuts to be covered with plastic bolt caps.	45
Tie rods for flanges (only threaded at ends)	MS	HDG complete fastener system, rod only threaded at ends plus FBE coated shank and coated with an approved spray type lubricant (Molybdenum disulphide) on threads prior to assembly. After drying of the spray type lubricant, stud to be covered by Carbomastic 150®.	45 30
Fasteners and washers -buried in soil	MS	HDG plus threads coated with Molybdenum Disulphide lubricant and wax plus Bitumen or Tape wrapping, covered with sealed plastic sheeting.	45
	SS 304	Threads coated with Molybdenum Disulphide lubricant or Nickel Anti-seize compound plus Bitumen or Tape wrapping, covered with sealed plastic sheeting.	Uniform cover
Fasteners for flange adaptors - Drilled and tapped	MS	HDG plus wet assembly with Epoxy or threads coated with Molybdenum Disulphide lubricant	45
	SS 304	Pickle and passivate - See note 4 of Clause CWD 44.5.3.3(i) plus wet assembly with Epoxy	Uniform cover
Fasteners for flange adaptors -	SS 304	Pickle and passivate - See note 4 of Clause CWD 44.5.3.3(i)	

(g) Coating at Joints

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
Plain ended pipes where couplings or flange adaptors are to be fitted	MS	Same as lining material for 300 mm from end	400
		Two pack Epoxy for cement mortar lining with 100 mm overlap inside and outside	400
Flanges of bitumen wrapped pipes	MS	Same as lining material on top and back of flange with an overlap of 100 mm from the flange	400
Flange faces	MS	Two pack Epoxy for cement mortar lining with 100 mm overlap inside and outside	400
Coupling or flanged joints buried in soil or in wet chambers	MS SS 304 SS 316	Coating system plus Petrolatum wrapping system - refer Section 13 of DWS 9900.	60 - 90
Welded joints buried in soil and encased in concrete	MS SS 304 SS 316	As specified for lining and coating	

(h) Stainless Steel Items

SURFACES	COATING	MINIMUM DFT (µm)
Stainless steel components (Dissimilar materials in submerged conditions)	Two pack Epoxy or FBE to a smooth, glossy and uniform finish	125
3Cr12 steel components (All submerged conditions)	Two pack Epoxy or FBE	400
Stainless steel components (Dry or compatible metal conditions)	Pickle and passivate – See note 4 of Clause CWD 44.5.3.3(i)	250
3Cr12 steel components (Dry conditions only)	Pickle and passivate – See note 4 of Clause CWD 44.5.3.3(i)	

(i) Notes

The following items shall be approved by the Corrosion Engineer:

- Hot-dip galvanizing
 - Only for pipes up to 200 mm diameter maximum and flow less than 2 m/s.
 - Pipes shall not be embedded in concrete.
 - Water analysis shall be provided.
 - Pipes over 200 mm diameter to be coated with a duplex system
- Sealant
 - Interfaces of different environments shall be sealed with a Polyurethane or Polysulphide flexible sealant to be applied in accordance with the manufacturer's data sheets.
- Un-coated stainless steel
 - Only to be used if no galvanic reaction and anaerobic conditions are found.
- Pickle and passivate
 - If not in contact with less noble material.
 - If exposed to anaerobic conditions seal-coat all crevices with solvent free Epoxy.
 - Shall be done by the dipping process.
- Galvanic cells
 - Where a galvanic cell is situated within a water path <150 mm and concrete cover <75 mm, both the MS, 3Cr12 or SS shall be coated.
- Anaerobic conditions
 - SS grade 316L shall be used under anaerobic and aggressive water conditions.

- | | | | |
|-----|--------------------------------------|---|--|
| 7. | Polyurethane for coding | • | Re-coatable or pure Aliphatic Polyurethane where required colour for colour coding.
Only UV resistant Polyurethane shall be used. |
| 8. | Primers | • | Primers shall only be used in special cases i.e. over-coating of galvanized surfaces. |
| 9. | 3CR12 | • | In view of superior corrosion resistance, coated 3CR12 material is preferred |
| 10. | Mild steel | • | Mild steel may only be used where the pipe lining can be refurbished in situ |
| 11. | Items subjected to high temperatures | • | Items to be manufactured out of stainless steel or coated with heat resistant paint. |
| 12. | Epoxy primer | • | Epoxy primer may not be required if appropriate two pack Epoxy / Re-coatable or pure Aliphatic Polyurethane is being used. |

CWD 44.5.3.4 QUALITY ASSURANCE, INSPECTIONS AND TESTS

Quality assurance and inspections shall be in accordance with this Particular Specification, DWS 1601: GENERAL MECHANICAL SPECIFICATION (Revision 0), STANDARD SPECIFICATION DWS 2020: QUALITY CONTROL SPECIFICATION (October 2001 edition) and as further described hereunder. The Contractor shall compile the Data Book consisting of QCP's (for manufacturing and corrosion protection), material certificates, test certificates, welder qualifications and welding procedures.

CWD 44.5.3.5 Visual Inspection

All finished pipes and specials shall be visually examined and shall be free of injurious defects as defined in API 5L Section 9.10 (44th Edition, October 2007). In addition, fillet welds and welds on specials shall be inspected by the application of a penetrant-dye, in accordance with API 1104, on the inside and outside over 100 % of any specific weld bead to determine if any cracks are present.

This procedure shall also apply to all pipe to pipe flange welds.

CWD 44.5.3.6 Testing of Pipes and Specials

In addition to the requirements of SANS 719, the following requirements shall apply to the testing and inspection of pipes and specials:

- (a) Hydraulic pressure tests (pressure resistance and leakage test) shall be carried out on all pipes and specials in order to test the integrity of the material used and of welds. These tests shall take place prior to corrosion protection and concrete encasement. The hydraulic test pressure applicable to all pipes and specials shall be equivalent to 1.5 times the relevant pressure rating, e.g. 900 kPa for 600 kPa rated pipes. This is in accordance with the formula in SANS 719 Sub-clause 5.2.4 using the pressure bearing wall thickness (i.e. 6.4 mm for 10 mm wall thickness on 1800 NB pipes and 3.6 mm for 8 mm wall thickness on 1000 NB pipes obtained from the Barlow Formula). This test pressure shall be maintained for 30 minutes after which visual inspection of all welded seams shall be performed while maintaining the test pressure. The duration of the hydraulic pressure tests may be reduced by the Engineer.
- (b) The pressure shall be applied gradually by approved means and maintained without variation sufficiently long for the duration of the inspection. Should leaks appear from any part or any defects of any nature be discovered, the pipe shall be emptied and the defects repaired. The pipe shall then be retested. Should a pipe, after repair, fail to pass the second hydraulic test, the Engineer may order its rejection.
- (c) Where possible, specials shall be hydraulically pressure tested in the same way as specified for pipes. Specials and pipe sections that can not be practically hydraulically pressure tested, shall be subjected to 100 % radiographic testing of all the welds not subjected to the hydraulic pressure test of the original pipe.
- (d) Specials manufactured completely or partially from plate that has not been subjected to a hydraulic pressure test as described above, shall be hydraulically pressure tested as specified for pipes.
- (e) Specials manufactured completely or partially from plate that has not been subjected to a hydraulic pressure test as described above and that can for practical reasons not be subjected to a hydraulic pressure test, shall be subjected to a 100 % radiographic test on all welds. Such items shall however be kept to the minimum.

- (f) Circumferential and longitudinal butt welds (only in the event of no hydraulic pressure test being conducted): 100 % of the length of all circumferential butt welds shall be subjected to 100 % radiographic test, provided when consistently acceptable results are obtained, the number of welds to be so tested may be reduced by the Engineer.
- (g) Site welds: All site welds shall be subjected to hydraulic pressure testing to 900kPa for a duration as specified in Clause CWD 44.5.3.6 a). Where hydraulic pressure testing is not possible (or at bends that do not cater for hydraulic testing) 100 % radiographic tests shall be performed, provided when consistently acceptable results are obtained, the number of welds to be so tested may be reduced by the Engineer.
- (h) The test pressure over any length or section of pipe work being tested, taking possible difference in elevation into account, shall be such that the test pressure at any point along that section does not exceed 900 kPa. Any such conditions shall only be carried out with the written approval of the Engineer.
- (i) The integrity of welds on items hydraulically tested in the workshop shall not be questioned during radiographic testing of site welds.

Note that the maximum static pressure in the lowest pipe work due to head of the dam (NOC) is approximately 425 kPa.

All hydraulic pressure tests on pipes and specials shall be conducted in the Manufacturer's Workshop and before the application of any corrosion protection.

Periodic factory inspection, verification and witnessing of tests and inspection of test records may be carried out by the Engineer or an independent Inspectorate appointed by the Engineer.

Tests and inspections shall be carried out at the Manufacturer's Works at the expense of the Contractor (pipe manufacturer) who shall provide all necessary testing facilities, labour instruments, equipment and samples that might be required, free of charge. The Engineer or his representatives shall be afforded every facility during the course of manufacture and testing to enable witnessing and inspections to be carried out effectively.

All test samples shall be selected by the Engineer or his representatives and all instruments used for testing purposes shall be approved by the Engineer or his representatives. If in the opinion of the Engineer or his representatives any instrument should require calibration, such instruments shall be calibrated at the expense of the Contractor by such body as may be approved by the Engineer.

No mechanical re-working or straining of pipes and specials shall be allowed after testing and inspection.

CWD 44.5.3.7 Hydrostatic Field Testing

After complete installation, the Main Contractor shall be responsible to carry out a hydraulic pressure test to ensure that all joints and connections are leak free. This test and allowable leakage shall comply with AWWA M11 Chapter 12, over a test period of minimum two hours after the test pressure has been maintained for a minimum of 24 hours and to a test pressure (i.e. 1.25 x working pressure) of 750 kPa for all 600 kPa rated pipes.

CWD 44.5.3.8 Repair of Injurious Defects

Injurious defects found by non-destructive testing of welds, visual examination, hydrostatic testing or determined by any other means to exceed the limitations in API 5L Section 9.10 (44th Edition, October 2007) and API 1104 Section 9 (20th Edition, November 2005) shall be repaired in accordance with API 1104 Section 10 (20th Edition, November 2005) but subject always to the requirements of this Particular Specification.

The total length of all repairs shall be subjected to hydraulic pressure testing to 900 kPa. Where hydraulic pressure testing is not possible, radiographic tests shall be performed on the total length of all repairs.

CWD 44.5.4

Marking

All pipes and specials shall be clearly marked by welding alongside a longitudinal or spiral weld on one end of the pipe (at least 300mm away from the end) with the following data: Item number and specific range designation number. These numbers must in return reference to the documentation that consists of the following information:

- (a) Grade and thickness of material;
- (b) Item number of the pipe or special;
- (c) Nominal diameter (mm); and
- (d) Work pressure (kPa).
- (e) Hydraulic test pressure (kPa)

The applicable drilling table shall be stamped or welded on the periphery of all flanges.

The minimum height of welded-on lettering shall be 30 mm. Hard stamping shall be legible after coating.

CWD 44.5.5 Storage, handling and transport

After testing, final inspection and approval the pipes and specials shall be securely packed to prevent any damage in transit. In order to protect the internal coating system the ends of the pipes and specials shall be securely blanked off by sturdy blanks.

The ends of all pipes and specials shall be protected against denting. Pipes shall be transported and stacked in a manner such as to prevent deformation of the pipe body in excess of 2 percent of diameter. Dents causing a protrusion in excess of 3 mm into the interior of the pipe shall result in the pipe being rejected.

Otherwise General Mechanical Specification DWS 1601 –shall apply.

CWD 44.5.6

Installation

The Main Contractor shall be responsible for the complete installation of all the equipment supplied under this Particular Specification. Installation shall be done in accordance with DWS 1110: CONSTRUCTION OF PIPELINES and AWWA Manual M11.

Installation and alignment of bell mouth sections in particular shall be in accordance with the tolerances stated on the Drawing Reg. No. CWD XXXX to ensure accurate installation of the sealing frames around the bell mouths for proper functioning of the emergency gate.

Alignment and reforming of pipe ends at joints for site welding purposes shall be achieved using suitable pipe chain clamps. The *EZPCC/10-72 SS 'E-Z Fit' Pipe Chain Clamp* or equal is recommended. Pipe ends shall be reformed from the inside using suitable spider jacks. Stainless steel contact points and chain shall be used on the pipe clamps and spiders to reduce possible contamination on the stainless steel pipes.

Installation procedures shall include transport from the point of storage at Site to the location of installation of each item, alignment of all pipes and specials according to the Drawings, connecting of flanges and couplings, site welding, field testing and making good of corrosion protection, etc.

Distance pieces (closer pipes) shall be installed in positions reserved for valves. These distance pieces shall be cut to length when installing the valves.

CWD 44.6

TOLERANCES

The Contractor shall refer to the tolerances specified in Clause CWD 44.5.2 and the relevant Drawings.

CWD 44.7

TESTS ON COMPLETION

Tests on Completion of the Works and pipelines shall be carried out in accordance with Clause CWD 44.5.3.7. These tests shall take place as shown in the Main Contractor's Construction Programme. The Main Contractor shall submit to the Engineer for approval a method statement for this procedure and shall be responsible to provide for all the requirements and to carry out the approved procedure.

CWD 44.8

MEASUREMENT AND PAYMENT

CWD 44.8.1

Basic Principles

Notwithstanding the breakdown as indicated in the Bill of Quantities, all the work and requirements of any nature as specified in this Particular Specification shall be covered by the Contractor in the pricing as reflected in the Bill of Quantities. No additional cost for any work or requirement in this Specification shall be allowed.

Items are provided for:

- Supply of all pre-manufacture documentation for approval;
- Procurement / manufacture of pipes and specials as indicated in the Bill of Quantities;
- Corrosion protection of pipes and specials as indicated in the Bill of Quantities;
- Delivery of all equipment supplied to Main Contractor's Site store as indicated in the Bill of Quantities;
- Installation and testing of pipes and specials *(to be priced by Main Contractor)*;
- Tests on completion *(to be priced by Main Contractor)*;
- Preparation of Operating and Maintenance Manuals and Drawings for the operation of the pipe system, all in accordance with General Mechanical Specification DWS 1601.

CWD 44/16

CWD 44.8.2 Scheduled Items

CWD 44.8.2.1 Documentation

Separate items are provided in the Bill of Quantities for documentation with regard to the manufacture and supply of the pipes and specials as indicated on the Drawings. Unit : Sum

The rates tendered against the items in the Bill of Quantities shall include full compensation for material schedules and certificates; quality control documentation; programmes of work (manufacture and on-site); and any other work as specified.

CWD 44.8.2.2 Procurement / manufacture, hydraulic pressure testing and supply of pipes and specials.

Separate items are provided for the manufacture and supply of the pipes and specials. Unit : Sum

The rates tendered against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the manufacture, procurement, inspection, testing (also including hydraulic pressure testing), trial erection and dismantling of the specified pipes, specials, bolts, nuts, washers and gaskets and any other work as specified. Payment shall be made per unit. Payment shall only be effected after full compliance of the items with the Specification has been certified by the Engineer.

CWD 44.8.2.3 Corrosion Protection

Separate items are provided for the corrosion protection of the pipes and specials. Unit : Sum

The rates tendered against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the preparation for corrosion protection, procurement, application, inspection, testing of corrosion protection of the specified pipes, specials, bolts, nuts, washers and gaskets and any other work as specified. Payment will be made per unit. Payment will only be effected after full compliance of the items with the Specification has been certified by the Engineer.

CWD 44.8.2.4 Transport and delivery to Site

Separate items are provided for the delivery of the pipes and specials to Site. Unit : Sum

The rates tendered against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the loading, transport, offloading and all other processes involved with the delivery into storage on Site of the specified pipes, specials, bolts, nuts, washers and gaskets and any other work as specified. Payment shall be made per unit. Payment shall only be effected after full compliance of the items with the Specification has been certified by the Engineer.

CWD 44.8.2.5 Installation and testing of pipes and specials (to be priced by Main Contractor)

Separate items are provided for the installation of the pipes and specials. Unit : Sum

The rates tendered against the items in the Bill of Quantities shall include for full compensation of all costs incurred in the taking from the Contractor's Site store, handling, assembly, erection, aligning, welding, inspection, testing, making good corrosion protection of the specified pipes, specials, bolts, nuts, washers and gaskets and any other work as specified. Payment shall only be effected after full compliance of the items with the Specifications has been certified by the Engineer.

CWD 44.8.2.6 Tests on Completion (to be priced by Main Contractor)

Separate items are provided for performing Test on Completion. Unit : Sum

Payment will be made for the complete outlet pipe work system, including valves successfully tested before. The rate tendered shall include for full compensation for all Tests on Completion including labour, supervision, materials, tools, instruments, etc., necessary for the testing of the system, remedial work and any other work as specified. All costs incurred in pressure testing and completion testing the system during both pressure testing and flow testing, shall be included in the tendered rate.

ANNEXURE A

“The Engineer”

Director: Mechanical & Electrical Engineering

Department of Water and Sanitation

Room 329A

Sedibeng Building

185 Schoeman Street

PRETORIA

Private Bag X313

PRETORIA

0001

COMPILED BY:

J.J. Theron

Sub-directorate: Mechanical Design

Tel: (012) 336-8777;

Fax: (012) 336-8330

Email: theronj@dwa.gov.za

MAY 2014



water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WATER AND SANITATION

PRIVATE BAG X 313

PRETORIA

0001

REPUBLIC OF SOUTH AFRICA

STANDARD SPECIFICATION

DWS 1601

GENERAL MECHANICAL SPECIFICATION

DIRECTORATE: MECHANICAL & ELECTRICAL ENGINEERING

SUB-DIRECTORATE: MECHANICAL DESIGN

FIRST EDITION: November 2015

INDEX TO GENERAL MECHANICAL SPECIFICATION DWS 1601

	PAGE
1 SCOPE.....	5
1.1 MODIFICATIONS.....	5
1.2 CONTRACTS.....	5
1.3 SUBCONTRACTORS	5
1.4 CONTINGENCIES	5
2 INTERPRETATIONS	6
2.1 DEFINITIONS.....	6
2.2 ABBREVIATIONS	6
2.3 COMPLIANCE WITH STANDARDS	6
3 MATERIALS	7
3.1 INTRODUCTION.....	7
3.2 GENERAL.....	7
3.3 STEEL.....	7
3.4 STAINLESS STEEL	7
3.5 MISCELLANEOUS MATERIALS	8
3.5.1 CAST IRON.....	8
3.5.2 STEEL CASTINGS.....	9
3.5.3 FORGINGS.....	9
3.5.4 FABRICS AND WOOD, ETC.....	9
3.5.5 BRONZE.....	9
3.5.6 BRIGHT PARTS.....	9
3.5.7 ALUMINIUM AND ALUMINIUM ALLOYS	9
3.5.8 ASBESTOS.....	9
3.6 ADHESIVES.....	10
4 DESIGN.....	11
4.1 GENERAL.....	11
4.2 OPERATING CONDITIONS AND CLIMATE	11
4.2.1 WATER QUALITY	11
4.2.2 CLIMATE.....	11
4.2.3 WATER RETENTION AREAS.....	12
4.3 VIBRATION AND DESIGN LOADS	12
4.4 PERMISSIBLE STRESSES	13
4.4.1 GENERAL.....	13
4.4.2 GATES, STOPLOGS, VALVES	13
4.4.3 LININGS	13



4.5	TOLERANCES	14
4.6	CONTRACTOR'S DRAWINGS	15
4.6.1	GENERAL	15
4.6.2	TENDER DRAWINGS	15
4.6.3	MANUFACTURING DRAWINGS	15
4.6.4	SITE CONSTRUCTION AND INSTALLATION DRAWINGS	15
4.6.5	DRAWINGS FOR RECORD PURPOSES	15
4.6.6	CONTRACTED DESIGN DRAWINGS	16
4.7	CONTRACTOR'S SUBMISSIONS	16
5	MANUFACTURE	17
5.1	GENERAL	17
5.2	LAMELLAR TEARING	17
5.3	STRUCTURAL STEELWORK FABRICATION	17
5.4	SURFACE DEFECTS IN FABRICATED STEELWORK	18
5.5	WELDING	18
5.6	BOLTING	19
5.7	HYDROGEN EMBRITTLEMENT IN FASTENERS	20
5.8	BEARINGS	20
5.8.1	SELF-LUBRICATING BEARINGS	21
5.8.2	OTHER BEARINGS	21
5.9	LUBRICATION	21
5.10	ACCESS LADDERS, PLATFORMS AND HANDRAILS	22
5.10.1	GENERAL	22
5.10.2	CAT LADDERS	22
5.10.3	PLATFORMS, WALKWAYS AND HANDRAILING	22
5.10.4	COVER PLATES AND KERBINGS	22
5.11	NAMEPLATES, RATING PLATES AND LABELS	23
5.11.1	GENERAL	23
5.11.2	MARKING	23
6	ELECTRICAL REQUIREMENTS	24
7	CORROSION PROTECTION	25
7.1	PERMANENT INSTALLATIONS	25
7.2	CORROSION PREVENTION	25
7.3	PRE-PREPARATION	25
7.3.1	RESPONSIBILITY	25
7.3.2	GENERAL REQUIREMENTS	25
7.3.3	CASTINGS	26
7.3.4	HOT-DIP GALVANIZED ITEMS	26

7.3.5	CORROSION RESISTANT STEELS.....	26
7.4	PRIMARY CLEANING.....	27
8	SAFETY	28
9	SPARE PARTS	29
10	SPECIAL TOOLS AND TEST EQUIPMENT	30
11	OPERATING & MAINTENANCE MANUALS.....	31
12	PACKING AND TRANSPORTATION	32
12.1	OFF-LOADING AT SITE.....	33
12.2	STACKING AND STORAGE	33
12.3	ATTACHMENTS FOR TRANSPORT AND ERECTION.....	33
13	INSTALLATION AND SETTING TO WORK.....	34
13.1	GENERAL.....	34
13.2	FOUNDATIONS, FOUNDATION BOLTS AND FITTINGS.....	34
13.3	ACCURACY OF WORK: MECHANICAL EQUIPMENT.....	34
13.4	GROUTING.....	34
13.5	BUILDING IN.....	35
13.6	DRILLING THE STRUCTURE FOR FIXINGS.....	35
13.7	INSTRUMENT INSTALLATION.....	35
13.8	PROTECTION ON SITE.....	35
13.9	SETTING TO WORK.....	35
13.10	PERIOD OF INSTRUCTION.....	35
13.11	PERIODIC VISITS.....	36
14	QUALITY CONTROL AND TESTING.....	37
14.1	GENERAL.....	37
14.2	CONTRACTOR QUALIFICATION.....	37
14.3	INSPECTION AT MANUFACTURER'S PREMISES.....	37
14.4	INSPECTION BY THE ENGINEER.....	38
14.5	INDEPENDENT SURVEILLANCE.....	38
14.5.1	MATERIAL TESTS.....	38
14.5.2	TYPE TESTS.....	38
14.5.3	ROUTINE TESTS.....	38
14.5.4	TESTS AT SITE.....	39
14.5.5	DESTRUCTIVE TESTING.....	39
14.5.6	NON-DESTRUCTIVE TESTING DURING MANUFACTURE.....	39
14.5.7	NON-DESTRUCTIVE TESTING ON SITE.....	39
14.6	QUALITY CONTROL RECORDS.....	40
14.6.1	COATING AND MATERIAL RECORDS.....	40
14.6.2	DATA SHEETS, SPECIFICATIONS AND CODES OF PRACTICE.....	40



14.6.3	QUALITY CONTROL RECORDS	40
14.6.4	PROVISION FOR TESTING	40
14.7	SUBSTANDARD QUALITY CONTROL	40
14.8	ACCESS FOR SURVEILLANCE	41
14.9	SUBMISSION FOR APPROVAL	41
14.9.1	FOR MANUFACTURE	41
14.9.2	FOR CORROSION PROTECTION	41
14.9.3	MANUFACTURE AND CORROSION PROTECTION PROGRAMMES	41
14.10	COST OF QUALITY CONTROL	42
14.11	NON-COMPLIANCE WITH THE SPECIFICATION	42
14.12	OPERATION OF EQUIPMENT PRIOR TO TAKING OVER	42
14.13	DEFECTS NOTIFICATION PERIOD	42
ANNEXURE A	43

1 SCOPE

This Specification deals with the general requirements for mechanical equipment and installations and shall be read in conjunction with any Particular- or Project Specification referring to it. Any particular requirements stated in such documents shall take precedence over this DWS 1601: General Mechanical Specification.

This Document shall also be read in conjunction with all Departmental Standard Specifications (DWS-Documents). In cases where contradiction take place, this shall be clarified with the Engineer in writing.

1.1 MODIFICATIONS

Any modifications or deviations from the Specification shall be indicated on the form "Proposed Alterations to Specification". The Contractor shall make no changes or modifications to any part of the design or the equipment offered under this Contract without the written approval of the Engineer. The Department shall not accept any additional cost for any part of this Contract if this procedure has not been followed.

1.2 CONTRACTS

Contracts shall only be awarded to Tenderers who are properly equipped and capable of manufacturing to the specified standard. Only Tenderers who can prove that they are bona fide manufacturers of the equipment as described, with their own local manufacturing and service workshop, may tender. Tenderers shall have a twenty four hour back-up maintenance and spare parts service available. Workmanship shall be of the best quality and welders shall be coded for the work being performed. The size of tools and equipment used shall be proportional to the task being carried out.

1.3 SUBCONTRACTORS

The Contractor to whom this contract is awarded shall be responsible to communicate all specifications of the tender to all his subcontractors. Failure to do so shall not be considered as motivation for any concession by the Department or for any additional cost to be approved.

Where the Contractor proposes to supply material not of his own manufacture or otherwise to Subcontract part of the Works, the Subcontractor indicated on the form "Schedule of Proposed Subcontractors" by the Contractor when tendering, shall not be changed without the prior approval in writing of the Engineer. Purchase orders placed on suppliers of other equipment shall be made available to the Engineer upon request.

1.4 CONTINGENCIES

The Engineer may make any variation of the form, quality or quantity of the Contract that in his opinion be necessary, up to an amount not exceeding 50 % of the Contract value. No such variation shall be made by the Contractor without an order in writing by the Engineer (see Clause 1.1).

2 INTERPRETATIONS

2.1 DEFINITIONS

In this Section the word or words:-

Department shall be the Department: Water and Sanitation of the Republic of South Africa,

Design includes, as applicable, the submission of design documentation for approval by the Engineer,

Supply includes, as applicable, the purchase of materials or goods, manufacture and fabrication, any specified corrosion protection measures and any off-site inspection or testing,

Installation includes, as applicable, all handling and transport from storage and if necessary, all erection and setting to work, and

Tests on Completion include, as applicable, the dry and wet tests as specified.

2.2 ABBREVIATIONS

SASSDA:	Southern Africa Stainless Steel Development Association
QCP:	Quality Control Plan
DWS:	Department: Water and Sanitation
BDE:	Design Basis Earthquake
OHS Act:	Occupational Health and Safety Act

2.3 COMPLIANCE WITH STANDARDS

When reference is made to a code, specification or standard, the reference shall be taken to mean the latest edition of the code, specification or standard, including addenda, supplements and modifications and revisions thereto, unless otherwise specified.

The materials, design and workmanship shall be in accordance with the appropriate Specification current at the time of manufacture unless otherwise specified.

Should the Contractor desire for any reason to deviate from the Standards specified or the aforesaid equal or better Standard, he shall submit for the Engineer's written approval a statement of the exact nature of the deviation, fully supported by copies of the equivalent Standard (in English) and complete Specification of the alternative materials proposed. It shall be the responsibility of the Contractor to demonstrate that any alternative Standards proposed are equal or superior to those specified.

3 MATERIALS

3.1 INTRODUCTION

This Section of the Specification sets out the general standards of materials to be supplied by the Contractor and mention of any specific material or equipment does not necessarily imply that such material or equipment is to be included in the Works.

All component parts of the equipment shall, unless otherwise specified, comply with the provisions of this Specification and be subject to the approval of the Engineer.

The names of the manufacturers of materials and equipment proposed for incorporation in the Works, together with performance reports, capacities, certified test reports and other significant information pertaining to such manufacturers, shall be furnished when requested by the Engineer, who shall have power to reject any parts which, in his opinion, are unsatisfactory or not in compliance with the Specification and such parts shall be replaced by the Contractor without additional payment.

3.2 GENERAL

All materials incorporated in the Works shall be the most suitable for the duty concerned and shall be new and of first class commercial quality, free from imperfection and selected for long life and minimum maintenance.

All parts subject to submergence or subject to relative movement, shall be of corrosion-resistant metals or other materials as appropriate. All parts in direct contact with various chemicals shall be completely resistant to corrosion and abrasion by those chemicals. All parts shall maintain their properties with minimum deterioration due to passage of time, exposure to light or any other cause.

Particular attention shall be paid to the prevention of corrosion due to the close proximity of dissimilar metals. Where it is necessary to use dissimilar metals in contact, these shall be selected so that the bimetallic corrosion potential is minimised or preferably eliminated by the use of standard isolating procedures, to the approval of the Engineer.

All materials, supplies or articles used in the equipment shall be new products of recognised reputable manufacturers with established dealerships and/or agencies in the Republic of South Africa and subject to the approval of the Engineer. Products shall be approved only when the Engineer has been notified and has satisfied himself as to their strength, reliability, durability and suitability for the application intended.

To assist the Engineer in this matter, the Contractor shall furnish performance data, references to completed works and any other relevant information together with samples of materials for approval. Materials, equipment and other articles incorporated in the Works without the approval of the Engineer may be subsequently rejected by the Engineer.

3.3 STEEL

Mild steel for welded, riveted and bolted construction shall comply with SANS 50025 / EN 10025. Mild steel for load-bearing components shall not be inferior to Grade S355JR.

The Contractor shall provide the Engineer with copies of mill rolling sheets for all sections incorporated in the Works, together with test certificates certifying that the steel has been tested and found to comply with the appropriate Standards. The Engineer reserves the right to test samples of steel independently and the results of these tests shall take precedence over the tests carried out by the rolling mill. Marking by the steel maker and the mills shall comply with BS 4360.

3.4 STAINLESS STEEL

Unless otherwise specified, stainless steel shall have resistance to atmospheric corrosion not less than that provided by BS 970, Grade 304L.

Particular attention shall be paid to the prevention of seizure by fretting where two corrosion resistant metals are in contact, by the selection of materials of suitable relative hardness and surface finish and the application of lubricants.

Stainless steel shall be pickled and passivated after fabrication and welding. Re-passivation may be ordered, post-installation, at no additional cost should there be evidence of ferrous re-contamination.

3CR12 type materials shall be supplied in No 1 finish from the material supplier's store.



3.5 MISCELLANEOUS MATERIALS

3.5.1 CAST IRON

Cast iron shall be of the nodular or spheroidal graphite type to SANS 936/937 grade SG42 or to such other grade as is approved by the Engineer.

Cast iron shall not be used for components subject to impact stresses unless otherwise approved by the Engineer.

Before proceeding with foundry work for any castings which will be subject to hydraulic pressure and for all other important components, the Contractor shall submit to the Engineer for his approval Drawings of such castings, showing the proposed locations for taking specimens for tensile, impact, fatigue, bending and any other appropriate tests. Castings shall be clearly marked by the manufacturer.

The Contractor shall give the Engineer not less than 14 days' notice in writing of the date when such castings will be cleaned to enable the Engineer to inspect the castings immediately after they have been cleaned. Whether or not the Engineer attends such inspection, no repair work shall be undertaken without the Engineer's prior approval.

Castings shall be true to the Drawings and any castings in which any dimension is so much reduced as to impair the strength of the casting by more than 10 % or to increase the stresses above specified limits, may be rejected by the Engineer.

The structure of the castings shall be homogeneous and free from excessive non-metallic inclusions and other injurious defects. Excessive segregation of impurities or alloys at critical points in a casting shall be sufficient cause for its rejection.

The Contractor shall perform all tests listed in SANS 936/937 together with the following additional tests on specimens from each batch:

- Each tensile test shall include determination of the 0,2 % proof stress value; and
- Three impact tests shall be performed on samples from each batch of castings at normal ambient temperatures and 3 further tests at an ambient temperature of -30°C. The average impact value of each set of tests shall be such as will be suitable for the operational temperatures of each item made from the batch, as agreed with the Engineer.

The Contractor shall non-destructively test all castings using radiographic, magnetic particle, penetrant and ultrasonic flaw detection methods as appropriate, similar to those specified in BS 4080 and as agreed with the Engineer.

Subject to the approval of the Engineer, minor defects shall be chipped or grooved out by a carbon arc air process to sound clear metal and repaired by welding. Castings with defects which do not otherwise affect the performance of the castings but which necessitate the removal of metal resulting in a reduction in the stress-bearing cross-section of a component by more than 20 % may be rejected by the Engineer.

Welding shall only be carried out by properly qualified welders and all such repairs shall, unless otherwise agreed by the Engineer, be subject to stress relief.

Before carrying out any repairs the Contractor shall submit to the Engineer for his approval a complete statement of procedure for such repairs together with, where appropriate, stress calculations and no repair work shall commence until the Engineer's written approval of such statement and calculations has been received.

In addition to tests carried out under additional tests on specimens from each batch, and if so instructed by the Engineer, radiographic and/or ultrasonic testing and/or other approved non-destructive testing shall be carried out on the areas around all defects in any casting after removal of metal to ensure that each defect has been properly removed.

Certified copies of the results of any test required shall be furnished to the Engineer.

3.5.2 STEEL CASTINGS

The steel used for castings shall be of the quality appropriate to each particular item as approved by the Engineer and shall comply with the relevant British Standards included in BS 3100. Castings shall be heat treated as agreed in writing by the Engineer.

The Contractor shall perform all the tests listed in BS 3100, together with the following additional tests on specimens from each batch:

- a) Brinell hardness tests together with copies of test certificates; and
- b) The impact tests specified in Clause 3.5.1. of this General Mechanical Specification.

3.5.3 FORGINGS

Steel for forging shall be of the quality appropriate to each particular item, shall comply with BS 29 or BS 970, as appropriate and shall be subject to the approval of the Engineer.

All forging shall be heat-treated for the relief of residual stresses before the start of machining and the Contractor shall submit details of his proposed method to the Engineer for his approval in writing before starting the treatment.

The forging shall be inspected by the Contractor using radiographic methods similar to those set out in BS 4080 for steel castings and also using the ultrasonic, magnetic particle and penetrant flaw detection testing techniques set out in BS 4124.

The Engineer shall be informed in writing of all flaws found by the inspection and the Contractor shall not use in the Works any forging containing flaws unless remedial action is agreed with the Engineer and carried out by the Contractor to the satisfaction of the Engineer.

3.5.4 FABRICS AND WOOD, ETC.

Fabrics, cork, paper and similar materials that are not subsequently to be protected by impregnation shall be treated with an approved fungicide. Sleaving and fabrics treated with linseed oil varnish shall not be used.

The use of organic materials shall be avoided as far as possible, but where these have to be used they shall be treated to make them fire resistant and non-flame propagating.

The use of wood shall be avoided as far as possible. If used, woodwork shall be thoroughly seasoned teak or other approved hardwood that is resistant to fungal decay and free from shakes and warp, sap and wane, knots, faults and other blemishes. All woodwork shall be treated to protect it against damage by fire, moisture, fungus, bacteria or chemical attack, unless it is naturally resistant to those causes of deterioration. All joints in woodwork shall be dovetailed or tongued and pinned. Metal fittings shall be of non-ferrous material. Adhesives shall be specially selected to ensure the use of types that are impervious to moisture. Synthetic resin cement only shall be used for joining wood. Casein cement shall not be used.

3.5.5 BRONZE

Where bronze is specified or used it shall be zinc free.

3.5.6 BRIGHT PARTS

Bright parts and bearing surfaces shall be thoroughly polished and protected from corrosion by the application of rust preventive lacquer or high melting-point grease, as approved by the Engineer, before the parts are packed. A sufficient quantity of the correct solvent for removal of the protective compounds shall be supplied and packed with each particular part.

3.5.7 ALUMINIUM AND ALUMINIUM ALLOYS

Aluminium and aluminium alloys used in mechanical parts shall be to the approval of the Engineer.

3.5.8 ASBESTOS

Asbestos and materials containing asbestos shall not be used.

3.6 ADHESIVES

All adhesives shall be specially selected to ensure use of types that are impervious to moisture and are resistant to mould growth and other forms of attack or deterioration.



4 DESIGN

4.1 GENERAL

The Contractor shall design the relevant parts of the Works to the Engineer's satisfaction and in accordance with the Specification, subject to such modifications as may be agreed under the terms of the Contract. The design shall be in accordance with the best modern practice and shall be such as will facilitate operation, inspection, cleaning, repainting, lubrication, maintenance and repair to ensure the highest reliability of operation under all service conditions.

The Contractor's design calculations shall be submitted to the Engineer with the appropriate Drawings for approval. The calculations for principle stresses of the main components of the equipment shall be submitted with the Tender. Failure to do so may disqualify the Tenderer. Approval by the Engineer of the Contractor's design and/or Drawings shall not relieve the Contractor of any of his obligations or liabilities under the Contract. Generally, the design shall be such as to provide the maximum reliability under all conditions of service, coupled with safety and convenience of operation and maintenance under all conditions at the Site. The design, dimensions and materials of all parts shall be suitable for the specified service and be such that the stresses to which they may be subjected shall not render them liable to buckling, breaking or excessive wear.

A copy of the hydraulic model test report (where appropriate) shall be made available. The arrangements and details shall be simple and robust.

All moving parts shall work silently and be readily accessible for removal, maintenance and repair. All parts shall be designed, proportioned and supported so as to withstand, without undue deflection or deformation, the forces that may be applied to them. Special measures shall be taken to prevent malfunction due to corrosion, to minimise risk of fire and to prevent ingress of dust, dirt, moisture and vermin. The designs shall be in accordance with the applicable requirements of the Occupational Health and Safety Act, Act 85 of 1993.

All equipment shall be designed to suppress corrosion in an exposed environment. Easy access for corrosion protection and maintenance shall be provided. The use of back to back angles, partially open box sections or inaccessible stiffeners shall be avoided. Corrosion protection of areas that are unavoidably inaccessible shall be specified by the Engineer.

4.2 OPERATING CONDITIONS AND CLIMATE

4.2.1 WATER QUALITY

4.2.1.1 SUSPENDED SOLIDS

Flow is drawn off into the service intakes from the reservoir which acts as a silt trap, and hence is not expected to contain coarse solids in suspension, although a degree of turbidity is likely after heavy flood run-off into the reservoir and down the river.

4.2.1.2 pH

Refer to the Project Specification.

The equipment shall be suitable for operating under all conditions having regard to any corrosive properties of the water and taking into account the effect of any bacterial action which may arise and special consideration shall be given to the corrosion protection of all permanently immersed parts where maintenance painting is not possible after Tests on Completion.

4.2.1.3 WATER TEMPERATURE

Refer to the Project Specification.

4.2.2 CLIMATE

The equipment shall be suitable for operating satisfactorily under the climatic conditions as given in the Scope of Works. The Contractor shall ascertain such additional information he considers necessary for the design of the equipment.

The equipment shall be designed and manufactured with due attention to its installation and satisfactory operation, inspection and maintenance under conditions prevailing at the Site at ambient temperatures giving rise to steelwork temperatures between -5°C and 50°C.

The general provisions shall include but not be limited to:

- a) Provision for facilitating transport to and erection at the Site, inspection, maintenance, cleaning, and repairs;
- b) Provision for ensuring the safety of the Works at all times as well as the safety of personnel concerned with manufacture, testing, installation, Tests on Completion, operation and maintenance;
- c) Availability of the equipment through reliable operation throughout the full range of seasonal climatic conditions at the Site; and
- d) Remain operational for a period of at least 30 years.

4.2.3

WATER-RETENTION AREAS

Pockets, recesses and crevices in which water and dirt may collect shall be avoided. Water retention areas shall be properly drained by holes as large as possible i.e. typically 150 mm diameter but minimum 50 mm diameter.

Surfaces of corrodible metals, such as the insides of tanks or hollow sections that cannot be protected by any method (e.g. painting or dipping), shall be avoided, or where not possible, be fully sealed against ingress of air and moisture.

4.3

VIBRATION AND DESIGN LOADS

Special care shall be taken to ensure that all items of the equipment are free of harmful vibration. Special care shall also be taken to ensure that resonance of any part does not occur as a result of harmonics which, although not apparent when the item in question is tested by itself, nevertheless give rise to objectionable vibrations when it is installed in its final position.

The Contractor shall, without additional payment, take whatever steps may be necessary after erection to remedy any vibration which the Engineer considers harmful. All fastenings on the equipment which may, notwithstanding the above provisions, be at risk of vibration under certain combinations of loadings and operating conditions shall be designed, by means of lock washers or by other approved means, not to work loose due to vibration or other cause. Design loads and load cases shall include those set out in DIN 19704/5: Hydraulic Steel Structures: except that:-

- a) Impact by ships and friction by ships shall not be considered;
- b) Seismic conditions shall be considered, with the simultaneous application to all parts of the Works of a seismic event having a vertical acceleration of 0,06 g and a horizontal acceleration of 0,08 g (hereinafter referred to as the "Design Basis Earthquake" or DBE) applied in the most adverse combination and direction;
- c) In respect of the design of gates (and associated hoist and hoist gantry) the provisions of Clause 4.3.b) **Error! Reference source not found.** above shall be applied under the following conditions:
 - (i) Gates closed and subject to the specified maximum water levels; and
 - (ii) Gates partially open in still water or in air at any vertical position.
- d) In respect of the design of hoists and cranes the provisions of Clause 4.3.b) above shall be applied under the following conditions:
 - (i) Fully loaded at any vertical position.
- e) The criteria for approval of the response of mechanical equipment to the DBE shall be that all components of the equipment in question shall, after the seismic event, remain broadly operational without the need for other than minor adjustment. In particular, permanently submerged components (such as gate guides) shall not be distorted to such an extent so as to prejudice correct operation of the gates after the most adverse combination of gate position and vertical and/or horizontal seismically induced forces.

4.4 PERMISSIBLE STRESSES

4.4.1 GENERAL

The equipment shall be designed such that no part of the Works under any loading condition shall impose any stress greater than those set out below on or in any concrete work:

- a) For compressive bearing stress: 7,0 MPa; For shearing stress: 1,7 MPa; and
- b) No tensile stress shall be allowed in concrete.

Under the most severe operating and/or erection conditions, stresses in castings and forgings expressed as percentages of yield point (tensile, shear or compression as the case may be) or proof stress (0,1% or 0,2% for tensile, shear or compression as the case may be) shall not exceed the figures set out in the table below. Grey cast iron is measured against the ultimate tensile strength of the material.

Table 1 : Maximum stress percentages

Material	Tension	Compression	Shear
Grey cast iron (% tensile strength)	10 %	20 %	6 %
Nodular cast iron	33 %	50 %	33 %
Carbon or low alloy cast steel	33 %	50 %	33 %
High alloy cast steel	33 %	50 %	33 %
Carbon and high alloy forgings	50 %	50 %	50 %

The value of tensile strength to which the tabulated percentages shall be applied shall be the tensile strength (as defined in BS 18) of the proposed grade of metal as guaranteed by the supplier of the metal on the basis of tests carried out in accordance with BS 18.

4.4.2 GATES, STOPLOGS, VALVES

All structural steel parts shall be manufactured from steel conforming to SANS 50025 / EN 10025, or equivalent standard. The grade classification shall be decided on the basis of notch ductility and corrosion requirements. Permissible stresses for this steel shall be determined according to SANS 10162-1. These stresses shall be multiplied by the following coefficients to allow for indeterminate factors:

- Valves: 0,85
- Sliding gates/stoplogs: 0,90
- Gates (jet flow, if applicable): 0,85

When calculating the stresses including transient and earthquake forces, the primary stresses shall not exceed 80 % of the yield stress of the material used and where secondary stresses are included the stress shall not exceed 85 % of the yield stress of the material used.

4.4.3 LININGS

The permissible working stresses for all steel linings and transitions shall not exceed that given in BS 5500. Where the proposed steel is BS 1501-223 - 490A a basic permissible working stress of 223 MPa shall be used. If steels other than the above are proposed the permissible working stresses shall be as obtained from BS 5500, but in this case special consideration shall be given to the other requirements of BS 5500 regarding welding details, pre-heating, stress relieving, weld joint factor, handling, etc. 100 % Radiographic inspection shall be done for of the longitudinal welds and where possible, of the circumferential welds including the joint between the circumferential welds and the adjacent longitudinal welds. In addition all in-situ (field) welds shall be 100 % radio graphically or ultrasonically inspected. The joint factor to be used in design shall then be taken as 1,0 and the design shall be based on this factor.

4.5 TOLERANCES

Unless otherwise specified, tolerances of equipment shall, in accordance with ISO 2768-1, be as follows:

Table 2 : Tolerances for linear dimensions									
Permissible deviations									
	0.5 - 3	3 - 6	6 - 30	30 - 120	120 - 400	400 - 1000	1000- 2000	2000- 4000	
f Fine	± 0.05	± 0.05	± 0.1	± 0.15	± 0.2	± 0.3	± 0.5		
m Medium	± 0.1	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	
c Coarse	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3	± 4	
v Very coarse		± 0.5	± 1	± 1.5	± 2.5	± 4	± 6	± 8	

Table 3 : Tolerances for broken edges (External radii and chamfer heights)				
		Permissible deviations		
		0.5 - 3	3 - 6	30 - 120
f Fine		± 0.2	± 0.5	± 1
m Medium		± 0.2	± 0.5	± 1
c Coarse		± 0.4	± 1	± 2
v Very coarse		± 0.4	± 1	± 2

Table 4 : Tolerances for angular dimensions						
		Permissible deviations for ranges of lengths in mm of shorter side of the angle concerned				
f Fine	± 1°	± 0.5°	± 0.333°	± 0.166°	± 0.083°	
m Medium	± 1°	± 0.5°	± 0.333°	± 0.166°	± 0.083°	
c Coarse	± 1.5°	± 1°	± 0.5°	± 0.25°	± 0.166°	
v Very coarse	± 3°	± 2°	± 1°	± 0.5°	± 0.333°	

Tolerances of flatness: 3mm per m wide

Tolerance of squareness: ± 2mm across diagonals

4.6 CONTRACTOR'S DRAWINGS

4.6.1 GENERAL

Drawings that do not conform to the requirements as set out below, shall be returned to the Contractor and payment shall not be made until these requirements are met. Drawings provided by the Contractor shall be size A-1 produced in hard copy and electronically in PDF format.

Dimensions on all Drawings shall be metric. All legends shall be in English. A blank space 90 mm by 60 mm shall be provided as an extension of the title block for the Engineer's approval stamp. Provision shall be made for details of revisions to be recorded in a dedicated "revisions" block which shall form part of the title block. Prints of Drawings (including those provided for record keeping) shall be in the form of black lines and text on a white background.

4.6.2 TENDER DRAWINGS

Unless detailed manufacturing drawings are included in this Tender, Tender Drawings provided are simply configuration guidelines to enable the Contractor to determine the equipment required to be designed and detailed.

Drawings submitted by the Contractor with his Tender shall give sufficient information to enable the Engineer to make a proper assessment of the equipment offered. This shall include sufficient detail, dimensions and general arrangement of the equipment. All the important parts shall be shown in detail, i.e. equipment body, sealing arrangements, bearing arrangements, guides, wheels, etc.

Tender drawings shall include details of parts to be built into and loads to be transferred onto the civil engineering works, routes and sizes of cabling, cable ducts or trunking, hydraulic pipework, description of erection methods, operating and control units, position indicators and details of connections to any other equipment. The approximate mass of the assemblies shall be stated on the drawings.

4.6.3 MANUFACTURING DRAWINGS

After receipt of the Letter of Acceptance but before manufacture commences, one set of working Drawings containing general arrangements and assemblies for the equipment, material schedules, standard parts, realistic mass of assemblies, etc., shall be provided for approval in principle by the Engineer.

Drawings shall provide all the information required by the manufacturer to ensure full compliance with the Drawings and Departmental Specifications.

Drawings shall be in standard sizes, but not exceeding the A-1 size (preferred size is A-1). The drawings shall be clear, black line on white paper and unfolded. Drawings shall be prepared to acceptable industry standards complying with SANS 10111. An example of the Drawings shall be submitted for approval before draughting commences.

Approval by the Engineer of any Drawing shall only signify approval of the general design and shall not relieve the Contractor of any responsibility for his designs, installations or for correct fitment on Site. The Department shall not be liable for any errors by the Contractor.

The Engineer retains the right to suspend manufacture until approved working Drawings are in his possession.

4.6.4 SITE CONSTRUCTION AND INSTALLATION DRAWINGS

Where appropriate, Drawings to enable Site preparations to be completed shall be provided before the arrival of equipment, giving all details necessary for the programming of civil and/or diving works, including foundation details and anchor bolts. These Drawings shall be provided not later than three weeks after approval of the layout Drawings has been given in principle.

4.6.5 DRAWINGS FOR RECORD PURPOSES

A complete set of "As built" drawings shall be provided in black on 80g/m² paper. The drawings shall be complete in all respects, drawn generally in accordance with SANS 10111 and shall contain general arrangements, assemblies, parts lists (including part numbers) and complete component details.

Drawings shall be to scale and in standard sizes, but not exceeding the A-1 size (preferred size is A-1). The drawings shall be clear, black line on white paper and unfolded. They shall be suitable for digital scanning



purposes. A draft drawing shall be submitted to the Engineer for approval of the printing standard before the complete set is supplied. In addition, drawings shall also be provided in PDF electronic format on compact disc.

The standardised reduced Departmental title block (see Drawing No. BF 1819 included in Annexure A of this document) as prescribed by the Engineer shall be used on all drawings. This title block shall be positioned directly above the Contractor's title block, as close as possible to the bottom right hand corner, on each drawing. On each drawing shall be printed in bold letters the name of the scheme and dam. The Department will issue key information required to complete the reduced Departmental title block (drawing number, codes, etc.) which shall be included on all documentation and drawings.

Drawings that do not conform to the above requirements shall be returned to the Contractor. See also of Particular Conditions of Contract for General Mechanical and Electrical Works.

Drawings for record purposes shall show all of the equipment as installed and shall include all general arrangement and detail drawings, diagrams and schedules produced. Information shown shall include tolerances, clearances, loadings, finishes, materials and ratings.

4.6.6

CONTRACTED DESIGN DRAWINGS

This shall include drawings produced by the Contractor or Professional Service Provider upon receipt of an applicable order from the Department, and which shall become the property of the Department. Such drawings may or may not form part of any manufacture or supply obligations by the Contractor for the associated equipment.

Contracted design drawings shall be accompanied by all associated design calculations, corrosion protection requirements and any other important information that form part of the design of the equipment. These drawings shall contain all details required for complete manufacture, supply, corrosion protection, installation and testing of such equipment.

Contracted design drawings shall comply in all respects to Standard Specification DWS 1602: Standards for Preparation of Mechanical & Electrical Engineering Drawings. The standard Departmental title block, as described in DWS 1602, will be available in electronic format of Autodesk Inventor drawing (.idw) from the Department.

4.7

CONTRACTOR'S SUBMISSIONS

Within 28 days of the Commencement Date and before manufacture is started, the Contractor shall submit for the Engineer's approval all the submissions required by the Specification.

The Contractor shall continue to make submissions at a reasonable rate so that all designs and Drawings are completed within a further 56 days. Manufacture shall not commence until the Engineer's approval has been given in writing.

The Contractor shall carefully check each of his submissions and those of his Subcontractors and before forwarding those to the Engineer for approval, shall sign each submission to certify that it has been checked by him. The Engineer will not examine any submission which has not been so certified. The Engineer shall, within 14 days of receipt, signify his approval in principle or refusal thereof.

Documents for approval by the Engineer:-

- a) Drawings to be submitted in the manner prescribed in Clause 4.6.
- b) Submissions such as calculations, manuals (including draft Operating and Maintenance Manuals), programmes, quality plans, progress reports, packing lists, samples and test reports as required by the Specification.
- c) Any other drawings as the Engineer may require.

These drawings/submissions, having been corrected or amended as necessary to the Engineer's approval, shall become the drawings/submissions to be used for the execution of the Works and no drawings/submissions other than these drawings/submissions shall be used for such purpose without specific instructions, in writing, from the Engineer. Copies of all approved drawings/submissions shall be provided for the Engineer's, or his representative's use during the course of the Works. Approval by the Engineer of any drawing/submission shall not relieve the Contractor of any of his responsibilities under the Contract. Copies of all other drawings for all equipment being provided under the Contract shall also be provided to enable the Engineer to have a full understanding of the equipment, but these shall not form part of the approved drawings.

5 MANUFACTURE

5.1 GENERAL

Workmanship and general finish shall be of first class commercial quality and in accordance with best workshop practice.

The fabrication, machining and finish (including corrosion protection finishes) of all parts shall be such that when the work is assembled both in the workshop and at the Site, the appropriate tolerances and clearances shall be obtained. The clearances used shall be sufficiently small to avoid vibration but all moving parts shall operate freely and shall be such that the risk of undue wear or jamming under load or on account of debris, temperature effects, encrustation or other causes is minimised. Finished faces shall be free of any wind or twist.

All similar items of equipment and their component parts shall be completely interchangeable. Spare parts shall be manufactured from the same type of materials as the originals and shall fit all similar items of the equipment. Machinery fits on renewable parts shall be accurate and to specified tolerances so that replacements made to manufacturer's Drawings may be readily installed.

All equipment shall operate without harmful vibration and with minimum of noise. All revolving parts shall be statically and dynamically balanced so that when running at all operating speeds and any load up to a maximum, there shall be no vibration due to lack of balance.

All parts that can be worn or damaged by dust shall be totally enclosed in a dust-proof housing.

Manufacturers of stainless steel items shall comply with the "Stainless Steel Good Housekeeping Rules" as issued by SASSDA from time to time.

All extrusions, rolled steel and castings shall be clean and free of score marks, pits, protrusions, blisters, porosity, blowholes, cracks or any other flaws that may be detrimental.

Laminations, scabs or occluded scale shall be ground out. If such grinding penetrates deeper than 7 % of the metal thickness, the area shall be repaired by welding or the metal shall be rejected at the discretion of the Engineer.

Where required, lugs shall be fitted by the manufacturer to the requirements of the Corrosion Subcontractor and the approval of the Engineer.

After removal of lugs, the damaged coating area shall be repaired in accordance with the Specification.

Lugs, not intended to be removed, shall be manufactured of equal or more noble grade than the base material in accordance with the Specification. Where possible, stainless steel shall be used.

5.2 LAMELLAR TEARING

The Contractor shall design, detail and fabricate all junctions in steelwork in such a way as to prevent failure by lamellar tearing.

5.3 STRUCTURAL STEELWORK FABRICATION

Fabrication of structural steelwork shall be generally in accordance with SANS 10162-1 unless otherwise specified.

The Contractor shall ensure that all surfaces requiring corrosion protection are either:

- a) Accessible, to the satisfaction of the Engineer, for maintenance of the protection by reasonable methods when in position in the Works; and
- b) Enclosed in hermetically sealed voids, where it is structurally safe to seal such voids, and as agreed in writing by the Engineer, which shall be proved to be sealed by air pressure testing if required by the Engineer.

All permanently exposed edges and corners of members of fabricated steelwork shall be formed or dressed to a rounded profile with a minimum radius of approximately 2 mm to ensure an even coating of the protection to such parts of the fabrication.

All cutting, chamfering and other shaping of metals necessary for site connections shall be done in the workshop. Adequate provision for temporary bolted site connections or clamps shall be provided to hold assemblies rigid and in proper alignment during site welding. After welding, all temporary connections and clamps shall be removed and all bolt holes shall be plugged, welded over and ground down flush with the adjacent metal on both faces, all to the satisfaction of the Engineer.



Bending and pressing of plates may be by either the hot or cold process. In no case shall the internal radius of bends in cold-bent plates be less than twice the thickness of the metal. The procedures used, including temperature control in the case of hot-forming, shall be to the approval of the Engineer. Where necessary, allowance shall be made in the design for possible modification of material properties.

Edges of all plates and members shall be square, clean, free from burrs and true to dimensions. If flame cutting is employed, edges shall be dressed smooth and true.

5.4

SURFACE DEFECTS IN FABRICATED STEELWORK

All fabricated steelwork shall be free of surface defects in the steel, burrs, sharp or rough edges, crevices, cracks or discontinuities in welded joints and depressions, hollows or moisture retaining features in locations where rain, spray or condensed moisture left in contact with the structure may promote corrosion of the steel. The dressing of the steel to remove burrs and rough edges from holes or cut lines shall be carried out as soon as possible after their presence has been detected, consistent with the need to clean and give initial protection to exposed steel elsewhere on the plate, section or fabrication concerned.

Surface defects shall be ground out. The extent and depth of laminations shall be determined before any rectification is carried out. Provided the size and extent of any surface defect or lamination is not such as to warrant rejection of the steel plate or member on structural or other grounds, the area affected by the remedial work shall be cleaned and protected to the same standard as the rest of the plate or member.

Where necessary (e.g. to meet dimensional tolerances) the steel surface at such defective areas may be built up by welding, including any preheating that might be required and ground flush with the surrounding steel surface before being cleaned and protected. This welding is to be stress-relieved by an approved post-weld heat treatment as approved by the Engineer.

5.5

WELDING

All welding shall comply with the general requirements of AWS D1 (except as amended by the Merrison Interim Design Rules should the Contractor wish to submit designs of gates or other parts of the Works involving box girder construction). Double U or J welds shall be adopted where control of distortion is important.

All welding, whether in the workshop or at Site, shall be approved metal-arc processes and shall be in accordance with BS 5135 subject to the provisions of this Clause. Full details of welding procedures and detail Drawings of welds and weld preparations shall be submitted to the Engineer for his approval and the Contractor shall carry out, without additional payment, such welding procedure tests as the Engineer may order to prove the sufficiency of his proposed procedures.

No welding shall commence until all welding procedures have been approved by the Engineer in writing and no alteration shall be made to any previously approved procedure without prior approval of the Engineer.

All welders shall be qualified in accordance with BS 5400 or in accordance with such appropriate sections of BS 4871 or BS 4872 as the Engineer may approve to. The Engineer shall have the authority to order that any welder whose work he deems to be questionable shall be re-tested in his presence. No separate payment shall be made for such tests. Welders shall be required to be re-qualified for the welding procedures in respect of which they have approved qualifications should they have failed to be employed on work involving these procedures for a period of six months or longer.

All welds shall be identified to enable each weld to be traced to the welder by whom it was made. The form and location of all identification marks shall be proposed by the Contractor and shall be subject to the approval of the Engineer.

The preparation of joint faces shall be by machining except as otherwise approved by the Engineer. Where errors in joint preparation lead to larger gaps between fusion faces than permissible, these shall not be bridged over but the faces shall be made up with weld metal and re-machined as necessary to the correct profile before welding proper commences.

Where deviation from true profile of fusion faces occurs due to mill tolerances in rolled sections, fitting up and welding shall be in accordance with a procedure to be agreed between the Contractor and the Engineer. To this end the Contractor's statement of welding procedures shall contain proposals for dealing with such deviations.

Pre-heating shall be carried out as recommended in BS 5135 or other appropriate British Standard.

The full throat thickness shall be ensured at the ends of butt welds by the use of extension pieces or by other approved means. If extension pieces are used they shall be clamped to the work and not welded. To ensure full penetration in butt welds, the use of backing material shall not be permitted except as approved by the Engineer.

All welds shall be continuous and even, with no contact gaps, and crevices left between members or unfilled re-entrant corners that would harbour moisture or dirt and prevent the satisfactory application and retention of the corrosion protective system. Weld undercuts and cavities as well as pits in metal surfaces shall not be permitted. Removal of slag from welds that will be subject to tensile stresses shall be carried out by grinding or blast cleaning. Peening shall be carried out only where approved by the Engineer.

The finish of the welded joint shall be free from irregularities, grooves and depressions. Undercutting at the welded joint shall not be permitted. Where welds are ground smooth, grinding shall where possible be in the direction of the principle stress.

The Engineer shall be notified of all defects before any repair work is commenced and the repair technique shall be subject to the approval of the Engineer. Where ordered by the Engineer, repairs shall be subject to radiographic and/or ultrasonic testing.

All welds between plates 25 mm or greater in thickness, whether carried out in the workshop or at the Site, shall be stress-relieved by an approved post-weld heat treatment unless otherwise agreed in writing by the Engineer.

All fabrications which are subsequently to be machined in any way shall be stress relieved prior to machining.

Shop and Field Fabrication Method Statements / QCP's shall be provided detailing welding distortion mitigation or elimination strategies before manufacture commences. The Engineer reserves the right to stop any work should this issue not receive the necessary attention.

All undercuts, cavities and pits shall be ground out, re-welded and ground to a smooth contour.

All welds shall be continuous and shall have a smooth contour.

Staggered welds, where specified, shall only be permitted with prior approval of the Engineer up on submission of appropriate remedial corrosion protection procedures.

Welding processes used shall limit heat input to a minimum to restrict the heat affected zone.

5.6

BOLTING

All bolts, nuts, studs and washers shall be in accordance with SANS 1700.

Bolts and studs shall be of such standard length that a minimum of two to four complete threads shall show through the nut when in the fully tightened condition.

Stainless steel bolts, nuts and washers shall be according to SANS 1700 and from a grade of stainless steel approved by the Engineer. Threads shall be rolled and of a high quality surface finish. Nickel anti-seize compound shall in all cases be applied to stainless steel fasteners.

Where bolts and nuts are required to be removed and re-assembled on a regular basis, these shall be of stainless steel.

Bolts and nuts for pressure parts shall be the best quality bright steel, machined on the shank and under the head and nut.

High strength friction grip bolts, nuts, load indicator washers and washers shall comply with BS 4395 and BS 4604 and shall be hot dip galvanised. High strength friction grip bolts shall be tightened in accordance with the manufacturer's recommendations and the tension shall be re-checked not less than 3 hours after first tightening and then the bolts shall be re-tightened to the initial load all to the approval of the Engineer.

Fitted bolts shall be a light driving fit in the reamed holes they occupy, shall have the screwed portion of a diameter such that it shall not be damaged in driving and shall be marked in a conspicuous position to ensure correct assembly at Site. Unless otherwise specified, the tolerance on the specified diameter of dowels shall be -0,05 mm to -0,20 mm for use in holes for fitted bolts.

Service bolts shall have the same nominal diameter as the specified permanent bolts. Where it is important that there shall be no movement prior to final connection, sufficient dowels, close tolerance bolts or high strength friction grip bolts shall be used to locate the work. All service bolts shall be replaced by the specified permanent bolts.

Washers, locking devices and anti-vibration arrangements shall be provided where necessary and shall be subject to the approval of the Engineer.

Where bolts pass through tapered structural members, matching taper washers shall be fitted where necessary and be orientated correctly to ensure that no bending stress is caused in the bolt.

Where there is a risk of corrosion, bolts and studs shall be designed so that the maximum stress in the bolt and nut does not exceed half of the yield stress of the material under all conditions. The shear value of high strength friction grip bolts shall be reduced in proportion to the reduced tensile stress compared with the normal design stress. Mating surfaces shall be adequately protected against corrosion whilst awaiting assembly of the faces and bolting, all to the approval of the Engineer.

No tapped holes in mild steel shall be allowed. Where tapped holes are unavoidable, this shall be done into stainless steel.

Washers of the same grade as the bolt and nut shall be installed under both the bolt head and nut of all bolted joints.

All bolt holes shall be drilled, not punched. Templates shall be used where applicable.

Large washers of at least twice the thickness of a standard washer shall be used on all fasteners going through slotted holes.

5.7 HYDROGEN EMBRITTLEMENT IN FASTENERS

Metal coatings and other treatments applied to fasteners shall be carried out in a manner that shall not cause hydrogen embrittlement of the parent material.

5.8 BEARINGS

The material from which all parts of bearings, including housing, spigots and bedplates are to be made shall be in accordance with the bearing manufacturer's recommendations and as approved by the Engineer.

The surface finish, dimensions and tolerances of all parts of bearings, including the shafts and housing, shall be similarly agreed.

Each bearing shall be designed to safely transmit axial and radial loads likely to be applied to it under all conditions, both during operation and at rest. The L10 design life of rolling bearings shall not be less than 10 000 hours based on the most severe dynamic and static load condition, whichever is the more severe, for the particular bearing. Bearings subject to daily movement due to thermal effects shall be designed to operate for not less than 50 years. In addition to the above, bearings shall be designed and manufactured from materials suitable for carrying static loads for not less than 50 years with very infrequent operation.

Each bearing shall be so installed in such a manner that it can be removed for maintenance or replacement without damage to either the bearing or the adjacent parts of the equipment.

All bearings, including self-lubricating bearings, shall be sealed against the ingress of deleterious contaminants and shall be provided where necessary with means of lubrication to the centre of the bearing so that any foreign matter is expelled through the end seals.

Each bearing shall be lubricated as specified, the lubrication stations being situated in weather-proof and accessible positions.

Except in the case of roller bearings which shall be installed generally in accordance with the bearing manufacturer's recommendations, the backing plates, outer sleeves (or housing) and the inner sleeves (where provided) of bearings shall be fixed to their respective adjacent structural members by such positive mechanical means as keying or similar, so that the movement in the bearing shall take place only between the bearing surfaces.

Where the housing of any bearing is welded to steelwork, the housing shall be machined to the required tolerances to receive the bearing after completion of fabrication and heat treatment.

Where bearing housings are bolted in steelwork, the design of the connection shall be such that distortion of the bearing housing does not occur when it is tightened down.

All bearings except self-lubricating bearings, which when in use will be subject to small displacements or small angular rotations only, shall be run-in before incorporation in the equipment. Each self-lubricating bearing shall either be run-in or prepared and precoated so that the lubricant is evenly distributed over the whole bearing surface. All other bearings shall be run-in before the start of or during the site tests. The Contractor shall not start running-in any bearing or group of bearings until he has received the approval of the Engineer of the intended duration and method of such running-in.



5.8.1 SELF-LUBRICATING BEARINGS

These bearings may be of the plain type or, where the alignment of the bearing is subject to change under varying loads due to structural deformations of the equipment, shall be of the self-aligning type.

Self-aligning bearings shall have an inner spherical section manufactured from aluminium nickel bronze and a split outer housing of stainless steel all to the approval of the Engineer.

The spherical surface shall be for taking misalignment and the bearing shall run on the cylindrical inner surface. The split housing shall be locked against rotation.

The spherical and cylindrical surfaces shall be inlaid with and covered with solid lubricant.

The lubricant shall have non-deteriorating characteristics and shall be capable of withstanding the effects of longterm exposure to atmospheric pollution and submerged environments at the Site. The Contractor shall satisfy himself as to the atmospheric and submerged environments at the Site.

The lubricant shall be epoxy based and shall be free of graphite and all other constituents that may lead to fretting corrosion, electrolytic corrosion or chemical action of any part of the bearing.

The lubricant shall be contained in recesses machined in the inner diameter and spherical surface of the bronze ball section. The recesses shall cover an area of not less than 30 % of the projected area of the bearing surfaces. The lubricant shall be compressed into the recessing by a pressure of at least twice the designed unit loading.

The lubricant shall be compatible with greases used during assembly and subsequently injected during operation for the exclusion of moisture and dirt.

The surfaces on which bearings rotate and or slide shall have a hardness exceeding that of the bearing material by 100 points on the Brinell Hardness scale or as otherwise required by the bearing manufacturer and as agreed by the Engineer.

5.8.2 OTHER BEARINGS

Where large pedestal type roller bearings are used to support slow moving parts the bearings shall be, where practicable, heavy duty self-aligning split roller bearings. Bearings shall have cast steel or fabricated steel housings or plumber blocks. Cast iron housings or -plumber blocks shall not be used.

All high-speed shafts shall be provided with ball- or roller bearings and they shall be mounted in dustproof housings and lubricated by grease gun.

Other bearings shall be of the adjustable cap type where practicable and shall be fitted with grease lubricators.

All cylindrical journal bearings shall be bushed with zinc-free bronze or white metal and shall be accurately bedded and grooved.

The underside of the base of each bearing housing shall be machined and shall bear against a machined surface.

5.9 LUBRICATION

Lubrication shall be provided to all moving parts using either oil or grease. A separate oil cup or grease nipple shall be used to lubricate each point. Grease lubrication shall be provided with stainless steel button head type (1/8" BSP) grease nipples. A red circle of 60 mm diameter shall be painted around all grease nipples and oil filler caps or plugs for easy identification. Where necessary for accessibility, the nipples shall be placed at the end of a short extension pipe.

Where possible such nipples shall be grouped together and each group shall be mounted on a plate situated at a convenient point for the use of a grease gun. A grease gun with connections to suit the nipples shall be provided with each unit of equipment as part of the contract.

Before putting the equipment to work, all grease points and gearboxes, etc. shall be charged as required with the appropriate lubricant.

Attention is drawn to the climatic conditions in Clause 4.2 and all oils and greases shall be suitable for these conditions.

5.10 ACCESS LADDERS, PLATFORMS AND HANDRAILS

All access ladders, platforms, handrails, covers, etc. shall be in accordance with the Occupational Health and Safety Act, Act 85 of 1993 and the Drawings. Unless otherwise specified, the requirements of the following clauses shall apply.

5.10.1 GENERAL

All ladders, platforms, cover plates, kerbings and appurtenant parts located at operating deck level or above shall be fabricated from materials as stated on the relevant drawings.

All ladders, platforms, cover plates, kerbings and appurtenant parts located at the outside of civil structures and within two metres of the maximum water level, shall be manufactured from stainless steel 304L or better.

All safety cages around ladders shall, where practical, extend above the top end of the ladder for a distance of 900 ± 100 mm.

5.10.2 CAT LADDERS

Where not shown or dimensioned on the Drawings, cat ladders shall be manufactured as follows:

The sides of the cat ladders shall consist of flat bar sections, the size depending on the length but in any case shall not be less than 70 mm x 12 mm, and the inside width shall not be less than 380 mm. The rungs shall consist of round bars, not less than 20 mm diameter at 250 mm centres and holed through the side stringers, welded all around on both sides of the flats and ground flush on the outside. If it is not possible for any reason to adopt the rung centres stated above, the pitch adopted shall be not less than 230 mm and not more than 255 mm. The length of each ladder shall not exceed 7 m and shall be suitably supported over its whole length.

The cat ladders shall be vertical and provided with safety hoops of 700 mm diameter. The bottom safety hoops on each ladder shall be 2,50 m from the floor or landing level. The side stringers of all ladders shall be extended nominally one metre above the first rung to provide a handhold. Entries to the tops of cat ladders shall be suitably guarded by an entry bar.

5.10.3 PLATFORMS, WALKWAYS AND HANDRAILING

Platforms and walkways shall be provided where applicable. All landing covers shall be of the egg-crate grating type. Unless higher loadings are specified, platforms and walkways shall be designed in accordance with SANS 10162, Southern African Steel Construction Handbook (Red Book) 12.2.8 and 12.5.5 for a uniform live load of not less than 3,0 kPa. In addition, they shall be designed for an alternative concentrated load of not less than 3,0 kN, applied to a square of 0,1 m sides at any location on the floor. Where maintenance of equipment can take place on platforms, they shall be designed for the loading imposed by the particular equipment. Bar sections shall not be less than 39 mm x 3 mm and the platforms shall be designed accordingly. Kick plates or angles shall be fixed around all platforms and walkways and shall extend 100 mm above the top of the flooring.

Handrails shall be provided along the exposed edges of all platforms and walkways and elsewhere as shown on the Drawings. All hand railing shall be three tiered tubular but the standards may be tubular or solid forged. Angle iron shall not be used.

Unless otherwise stated on the Drawings, the height to the top handrail from the finished platform or floor level shall be 1,10 m, the height to the top of the middle handrail shall be 550 mm and the height to the top of the bottom handrail shall be 225 mm. All handrails shall be equivalent in size and stiffness to BS 1775 Grade 13, 33,7 mm OD heavy-duty tube or equivalent standard.

5.10.4 COVER PLATES AND KERBINGS

All covers shall be designed in accordance with SANS 10162 for a uniform live load of not less than 3,0 kPa unless otherwise specified. In addition, they shall be designed for an alternative concentrated load of not less than 3,0 kN, applied to a square of 0,1 m sides at any location on the floor. Where maintenance of equipment can take place on platforms, they shall be designed for the loading imposed by the particular equipment. All raised tread non-slip type plate covers shall be of "Durbat" pattern and shall not be less than 8 mm thick on the plain plate and shall be reinforced if and where necessary.

The covers and supports shall also be designed to take account of any special loadings that may be imposed during erection or maintenance. The kerbings shall consist of formed stainless steel angles suitably anchored and the landings for the covers shall not be less than 40 mm wide. Removable supports shall be provided where necessary.

5.11 NAMEPLATES, RATING PLATES AND LABELS

5.11.1 GENERAL

Where appropriate each item of the equipment shall have permanently attached to it in a conspicuous position a nameplate upon which shall be engraved or stamped the Manufacturer's name, Type and Serial No. of equipment, Contract No., Order No., Date of Manufacture, Mass, Material and all necessary information relating to the supply and replacement of parts and details of the loading and duty at which the item of equipment has been designed to operate. A nameplate denoting the equipment or function identification number shall also be attached. Such nameplates shall be of stainless steel.

Labels shall be provided for every panel to describe the duty of or otherwise identify every instrument, relay or item of control equipment mounted externally and internally.

Outdoor fitted panel labels shall be of non-plastic, durable, weather resistant material with letters and numbers engraved and filled with black paint.

Indoor fitted panel labels shall be finished white and engraved letters and numbers filled with black paint, unless otherwise specified. Laminated material such as "Trilolite" or rear engraved and filled plastic may be used. Embossed materials and techniques shall not be accepted.

Labels shall also be provided in conformity with the above requirements or by other approved means wherever necessary to designate panels or panel sections, to provide warnings or reminders of dangerous or potentially dangerous circumstances and wherever called for elsewhere in this Specification.

Danger labels, e.g. "DANGER-400V AC" shall be coloured red with white lettering.

Caution labels e.g. "CAUTION: ISOLATE BEFORE REMOVING COVER" shall be yellow with black lettering.

Where withdrawable equipment is provided, both fixed and moving portions shall be suitably identified.

Labels shall be of uniform design and the display of manufacturers' standard nameplates on panel external surfaces shall be subject to the approval of the Engineer.

Details of proposed inscriptions shall be submitted to the Engineer for approval before any labels are manufactured.

All nameplates and labels shall be fixed using non-corrosive fasteners (e.g. screws with nuts and washers or power nails) to the approval of the Engineer. Mounting by adhesive only shall not be acceptable.

5.11.2 MARKING

All items shall be permanently and indelibly marked to identify each individual item as specified by the Engineer.

6 ELECTRICAL REQUIREMENTS

All electrical installations shall be done in accordance with SANS 10142 and as further required by Sub-Directorate Electrical Design.

7 CORROSION PROTECTION

Departmental Standard Specification DWS 9900 shall apply in all cases.

7.1 PERMANENT INSTALLATIONS

Permanent installations in concrete shall be manufactured from stainless steel as specified in Clause 3.4.

7.2 CORROSION PREVENTION

The Contractor shall ensure that the following steps are taken to minimise corrosion:

- a) If dissimilar metals are used: Coat all surfaces of the whole assembly including the more noble member of the galvanic series.
- b) If the noble member of the assembly cannot be entirely covered:
 - (i) Keep the anode/cathode ratio as large as possible in the particular component.
 - (ii) Use electrical insulators between two metals. Insulation shall be complete; a bolt requires a sleeve as well as washers of an insulating material.
- c) Joints and crevices between metals shall be sealed.
- d) Where fastening is unavoidable, the fasteners shall be more noble (cathodic) than the base material. Fasteners shall be coated where possible and / or adequately electrically insulated between fasteners and the base material.

7.3 PRE-PREPARATION

7.3.1 RESPONSIBILITY

The Manufacturer or Refurbisher shall be responsible for all the pre-preparation of equipment prior to surface preparation. Pre-preparation shall be carried out to the approval of the Engineer and the Corrosion Protection Subcontractor.

Pre-preparation shall be carried out by competent personnel, under the supervision of an experienced supervisor.

7.3.2 GENERAL REQUIREMENTS

Protrusions shall be removed by grinding and dressing to a smooth contour.

Sharp edges, burrs and rough faces caused by gulliotining, flame cutting, drilling, machining or punching shall be removed by grinding. All sharp edges shall be radiused to a minimum of 2 mm.

Welds shall be free from slag, slag inclusions, cracks, surface cavities and under-cuts. Irregular projections shall be ground to a smooth contour. Areas adjacent to welds shall be free from weld spatter. Such spatter shall be removed by grinding or scraping.

7.3.3 CASTINGS

Castings with defects exceeding the restrictions given in the table below shall be rejected.

In the case of blowholes occurring opposite each other, the combined depth shall be taken into account.

Blowholes and cavities not exceeding 2 mm in depth shall be smoothed out by grinding.

Castings shall, after inspection by the Engineer, be ground smooth.

Small and repaired blowholes shall be ground level and smooth.

Table 5 : Acceptance criteria for the repair of blowholes and cavities

Surface	Depth of blowholes	Diameter of blowholes	Repair
Internal	Maximum 20 % of material thickness	40 % maximum of material thickness	Welding only
External	Maximum 10 % of material thickness	20 % maximum of material thickness	Solvent free Epoxy or welding
External	10 to 20 % maximum of material thickness	40 % maximum of material thickness	Welding only

7.3.4 HOT-DIP GALVANIZED ITEMS

The design and manufacture of all items to be hot-dip galvanized shall conform to SANS 121.

Vent holes shall be drilled by the Manufacturer, in accordance with the above Code of Practice, to the approval of the Engineer and Galvanizer.

The silicon and phosphorus contents of materials to be hot dip galvanized shall comply with the standard below. If no material certificates are available, samples of the materials shall be analysed for their silicon and phosphorus contents.

The following materials shall be used:

- For aesthetic appearance:
Aluminium-killed steel or Silicon-killed steel with a silicon content not exceeding 0.04% and a phosphorus content not exceeding 0.02%.
- For general corrosion protection:
Aluminium killed steel or Silicon killed steel with a silicon content not exceeding 0.25% and a phosphorus content not exceeding 0.02%.

NOTE: Material certificates to verify the above requirements shall be provided by the Contractor.

7.3.5 CORROSION RESISTANT STEELS

Fabrication shall take place in dedicated areas separated from carbon steel.

All equipment used in the forming and manipulation of stainless steel items during fabrication shall be clean and free of materials that may contaminate the metal with carbon steel.

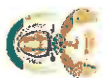
The manufacture of items from corrosion resistant steels shall be in accordance with the SASSDA's Information Series and the guidelines of the material supplier.

Discoloration caused by welding or cutting shall be mechanically cleaned by buffing followed by pickling and passivation in accordance with the SASSDA's Information Series and the guidelines of the material supplier.

Organic contamination shall be removed by degreasing.

Iron contamination shall be removed by pickling and passivation, by the dipping process, after degreasing.

All surfaces shall be tested for free iron contamination by the water or the ferroxyl test method.



7.4 PRIMARY CLEANING

The Manufacturer or Refurbisher shall remove excessive oil, grease or other surface contaminants with a water soluble solvent degreaser followed by rinsing with clean soft water before the items are despatched to the Corrosion Protection Subcontractor.

8 SAFETY

All equipment shall comply with the OHS Act (No 85 of 1993).

All shafts, couplings, collars, projecting key heads, gear wheels, chain drives and other moving machinery shall be guarded to give complete protection to all persons. All set screws on revolving shafts shall be countersunk or suitably protected. The guards shall be of approved design and shall be fitted where necessary with inspection doors. All guards shall be arranged so that they can be removed without disturbing the parts of the equipment they protect. The guards shall comply with the requirements of BS 1649 or equivalent standard.

Any permanent fencing or other safeguards required to be erected around electrical equipment shall be completed as far as practicable before connection is made to the electricity supply, but where this is not practicable, the Engineer may permit the use of temporary fencing or other safeguards.

If work in the vicinity of electrical equipment has to be carried out after connection has been made to the electricity supply, the Contractor shall comply with any "Permit to Work" system approved by the Engineer.

All equipment shall be designed and arranged to minimise the risk of fire and any damage that might be caused in the event of fire.

No protruding items of a permanent nature shall be allowed on the deck or any other moving or working area.

9 SPARE PARTS

The Contractor shall supply such spare parts for the operation of the equipment for a minimum period of 5 years or as the Engineer shall direct, at rates entered in the Spare Parts Price List or Bill of Quantities.

In the case of parts which are required to be regularly replaced during the lifetime of the equipment, the Department requires that certain minimum facilities be available in the Republic of South Africa for the supply of these parts. Tenderers shall state in their covering letter what facilities will be provided for the supply of these parts. The information shall include the name and address of depots where the parts will be held.

The Department requires certain minimum facilities to be available in the Republic of South Africa for the repair of any breakdowns which may occur in any portion of the equipment to be supplied under the Contract. Tenderers shall state in their covering letter (and applicable technical schedule if so required) details of the facilities and service they could provide. In the light of the above, the Department expects adequate services to be forthcoming throughout the life of the equipment supplied.

All spare parts shall be new, unused and strictly interchangeable with the parts for which they are intended to be replacements. All such spare parts shall be treated and packed for long storage under the climatic conditions prevailing at the Site.

Each spare part shall be clearly marked or labelled on the outside of its packing with its description and purpose, and when more than one spare is packed in a single case or other container, a general description of its contents shall be shown on the outside of such case or container in a waterproof transparent envelope and a detailed list enclosed.

All cases, containers and other packages shall be marked and numbered in an approved manner for purposes of identification.

All spare parts shall be inspected by the Engineer prior to packing.

10 SPECIAL TOOLS AND TEST EQUIPMENT

The Contractor shall supply all special tools and test equipment for the Engineer's approval to enable any erection, dismantling, reassembly or testing to be carried out on all parts of the equipment, whether of an electrical, mechanical or other nature during the life of the Works.

The tools and test equipment shall not be used for erection and, except that the Engineer may call upon the Contractor to demonstrate their use and effectiveness, they shall be handed over to the Employer in a completely new and unused condition. Should the Contractor require any such tools and test equipment at the Site during erection, he shall provide his own.

The tools for each different type of equipment shall be contained in suitable boxes clearly marked or labelled with their description. Each tool shall be identified and a list of tools stamped on a stainless steel plate shall be affixed to the inside of the box lid. Boxing shall be deemed to be included in the rates entered for the tools. Each set of tools shall be supplied with the equipment with which it is associated.

The test equipment shall include only special purpose items essential for the testing or repair.

11 OPERATING & MAINTENANCE MANUALS

- a) The Contractor shall, together with his quality control documentation submitted for approval by the Engineer, also submit a draft version of the Operating and Maintenance Instruction Manual, showing the intended binder, contents and layout.
- b) The Contractor shall provide four complete hard copies and three complete electronic version copies on CD or DVD or other medium agreed upon of the Operating and Maintenance Instruction Manual in the English language as approved by the Engineer.
- c) The manuals shall be securely bound in A4 size hard backed plastic waterproof four-ring binders with clear pockets on the spine and front cover for insertion of title slips giving Contract Number, Project Name and equipment supplied.
- d) The manual shall contain sections separated by plastic dividers clearly and visibly marked to match the index and shall be set out as follows:
 - (i) Title page;
 - (ii) Contents;
 - (iii) Tender Specification, completed tender forms, covering letters and final inspection certificate;
 - (iv) General description with hydraulic test certificate and final acceptance certificate relating to tests carried out;
 - (v) Pre-tests on Completion checks;
 - (vi) Operating instructions;
 - (vii) Operating limitations or constraints (if any);
 - (viii) Routine maintenance and lubrication schedules;
 - (ix) List of special maintenance tests provided or required;
 - (x) Planned maintenance and repair procedures;
 - (xi) Fault diagnosis;
 - (xii) Spare parts lists: supplier's/agent's details shall be provided; and
 - (xiii) Drawings: They shall include general arrangement, assembly drawings, parts and material lists and flow discharge curves, where applicable, in A3-size. Any supplier's original brochures and instrumental literature shall also be incorporated in the manual. Such literature shall be edited so as to clearly indicate the sections specifically applicable to the materials or equipment actually incorporated into the Works.
- e) Drawings larger than A3-size, index and other title pages shall be contained in separate pockets.
- f) Where it is not possible to include all items of a particular section of the equipment in one binder, several binders as necessary shall be provided and all binders for that section of the equipment shall bear the same volume number, but with the sections contained therein clearly defined on the front cover and spine.
- g) A collection of manufacturer's descriptive leaflets, instruction sheets, charts, lists, pamphlets and the like shall not be acceptable in place of the Instruction Manual, though they shall be provided as complementary thereto.
- h) As soon as he is able to do so, and in any case not later than the time at which any item of the equipment is delivered to the Site, the Contractor shall submit for the Engineer's approval, a set of instructions appropriate to the erecting, Tests on Completion, testing, operation and running maintenance of that item. These instructions shall form part of the final Operating and Maintenance Instruction Manual.

12 PACKING AND TRANSPORTATION

Before any of the equipment is despatched from a Manufacturer's Works, it shall be properly prepared and packed and the Contractor shall give the Engineer at least 14 days notice that these preparations are to commence.

Prior to despatch all parts shall be adequately protected by painting or by other means for the whole period of transit, storage and erection, against corrosion and incidental damage, including the effects of vermin, sunlight, rain, temperature, wind blown sand and humid atmospheres. The Contractor shall be responsible for the equipment being so packed and/or protected as to ensure that it reaches the Site intact and undamaged. The equipment shall be packed to withstand rough handling in transit and all packages shall be suitable for storage including possible delays in transit.

The Contractor shall be deemed to have included in the pricing schedule or the Bill of Quantities for all materials and packing cases necessary for the safe packing and transport of the equipment. All transporting arrangements shall be to the satisfaction of the Engineer.

No one package or bundle shall contain items intended for incorporation in more than one section of the Works. Cases containing small items shall not weigh more than 500 kg gross.

Bolts in strong hessian bags and other small components shall be labelled and crated. The bags and crates shall be tagged using metallic tags and shall indicate the following information:

- Contract number;
- Project name;
- Part numbers;
- Description;
- Sizes; and
- Quantities.

Each bag or crate shall have the delivery address listed on a separate metallic tag.

Every crate or package shall have a general description of its contents shown on a packing list in a waterproof transparent envelope attached to the outside of the crate or package. The Delivery Certificate Form ME 2, included in the Specification, shall be used for this purpose. A duplicate copy of the packing list shall be issued to the Engineer. The Department shall not accept any responsibility for items not listed on the Consignment Notes.

Items shall be clearly marked for identification against the packing list.

All crates, packages, steel fabrications and machinery shall be clearly marked with a waterproof material to show the weight, the position to which slings may be attached and shall have an indelible identification mark relating them to the packing lists. In addition, all packages shall be clearly painted with a distinctive site identification colour and sign, so that the final location of each item can be easily identified at the Site in order to avoid delay, double handling or loss. These special identification marks shall be in addition to the normal shipping and transport marks.

Machined flanges of pipes, valves and fittings shall be protected by wooden discs attached by means of service bolts (which shall not be used on the Works) or by other approved means.

Coated items shall not be handled within the drying time recommended by the coating manufacturer, relevant to the ambient temperature. Wherever possible lifting of painted items shall be from approved lifting attachments. All coated items shall only be lifted by means of broad band slings that shall not damage the coating. Slings shall not be less than 50 mm wide or as approved by the Engineer.

During transport, non-packaged items shall be held securely in position on sufficient padded blocks as are necessary to give adequate and safe support and, inter-alia, to militate against the possibility of brunnelling of bearings en route to Site. Stainless steel items shall be packed in a way that prevents contamination.

The use of ropes, wire ropes or chains without suitable padding is expressly forbidden.

All the necessary balks of timber or sawdust bags to support the components on soil, concrete or other hard surface and to separate them from each other in transit and at Site shall be provided by the Contractor free of charge.

When loading onto vehicles, precautions shall be taken to support and chock the components to prevent movement. Components shall be firmly lashed or chained with padded lashing, supported on sawdust bags. The area of padded surfaces shall be adequate to prevent damage to the coating.



Items may be inspected on arrival at the Contractor's end delivery point and any repairs necessary shall be to the cost of the Contractor. Any damage that occurs during the handling and storage of equipment and components at the Manufacturer's/Contractor's Works, including transportation to Site, shall be repaired by the Manufacturer/Contractor at his own cost, in accordance with the Specification and to the approval of the Engineer. Damage to corrosion protection shall only be carried out by a specialist corrosion protection applicator.

12.1 OFF-LOADING AT SITE

The Engineer shall be notified within **21 days of the delivery date** and of any requirements regarding off-loading and storage at Site.

The supplier shall be responsible for the transportation and supervision during off-loading of the equipment and other small components at the delivery Site. Unless otherwise specified, the Department will provide at no extra cost cranes on Site for off-loading purposes, provided that this is arranged by the Contractor with the Resident Engineer at Site at least two weeks in advance.

Under no circumstances shall coated equipment be allowed to rest directly on the ground.

The final delivery inspection and acceptance of equipment supplied shall be undertaken by the Engineer on Site after off-loading has been completed.

The Engineer has the right to reject any damaged equipment, components and materials that have been delivered and off-loaded at Site.

12.2 STACKING AND STORAGE

The Contractor shall provide all the necessary barks of timber and sawdust bags used to support the equipment and components on soil, concrete or other hard surface and to separate them from each other, both at his Works and on Site.

Grass or other vegetation shall not be allowed to grow in the storage area within three metres of the components.

Stacking of equipment on top of each other shall not be allowed if this leads to any deformation of equipment.

12.3 ATTACHMENTS FOR TRANSPORT AND ERECTION

The Contractor shall submit for the Engineer's approval proposals for such properly designed supports, lifting attachments or handling points as the Contractor considers necessary or desirable for assistance in handling fabricated sections for cleaning, applying protection, assembly, transportation, storage, erection and subsequent maintenance. All such lifting attachments or handling points shall be such as to avoid overstressing or deforming the steel members of fabrications. Lifting attachments shall be designed for not less than the applicable mass reaction plus 50 % allowance for impact.

Temporary supports, lifting attachments or handling points shall be removed or filled as required, and by approved methods to the satisfaction of the Engineer, and the surfaces of the permanent steelwork in these localities shall be dressed, cleaned and painted as specified elsewhere. Where tapped holes are provided for lifting devices (such as eyebolts) the tapped holes shall be plugged with stainless steel socket head screws (the thread of which shall be covered with anti-seize compound).

Supports, lifting attachments or handling points may be left at site, if so approved by the Engineer, provided that in his opinion:

- a) There is no deleterious long term effect on the structural integrity or operational use of the completed fabrication.
- b) The steelwork protective system is continuous over or around the lifting attachments or handling points and there is no undue risk of breaks or cracks occurring in the protection at such areas.
- c) There is no significant effect on the visual appearance of the fabrication.

Attachments to the steel fabrication to assist in the future inspection and maintenance of the steelwork and associated equipment may be required. Such attachments (e.g. supports for ladders, scaffolding cradles and ropes) may be combined with the Contractor's temporary handling and lifting requirements during fabrication and erection and agreement on additional attachments shall be subject to the approval by the Engineer before fabrication of the steelwork commences.

13 INSTALLATION AND SETTING TO WORK

13.1 GENERAL

The Contractor shall utilise such equipment as is necessary to safely and efficiently carry out the installation / erection, testing and commissioning of the Works.

The Contractor's Representative and workers referred to in the Conditions of Contract shall include approved specialist skilled working erectors and sufficient skilled, semi-skilled and unskilled labour to ensure completion of the Works in the time required. The Contractor shall not remove any supervisory staff or skilled labour from the Site without the Engineer's prior approval.

The Contractor's erection staff shall arrive at the Site on dates to be agreed by the Engineer. Before they proceed to the Site, the Contractor shall satisfy himself that sufficient items have arrived on Site so that no delay will be incurred on this account.

The Contractor shall be responsible for setting up and erecting the equipment to the line and level required and shall ensure that, where items are to be built in, they are kept in position whilst being built in.

Where a specialist Subcontractor is in attendance during the building in of first-stage built in parts, the sums and rates entered in the Bill of Quantities shall be deemed to include for all Site visits made for this purpose.

13.2 FOUNDATIONS, FOUNDATION BOLTS AND FITTINGS

Foundations, where required, shall be provided by the Contractor for the erection of the equipment and shall comply with any requirements of specialist Subcontractors and with any Drawings supplied by them and approved by the Engineer. Where necessary, the Contractor shall prepare floors and plinths to accept foundation bolts or mounting plates to the approval of the Engineer.

The Contractor shall supply all holding down-, alignment- and levelling bolts complete with anchorages, nuts, washers and packing required to attach the items of equipment to their foundations, and all bed-plates, frames and other structural parts necessary to spread the loads transmitted by the equipment to concrete foundations without exceeding the design stresses.

All bed plates and machinery shall be connected to concrete by means of grout arranged so as to transmit all vertical and horizontal loads into the foundations by means of direct compressive stress.

The bed plates and machinery shall be provided with means of adjustment for line and level to maintain the items of the equipment in correct alignment during and after grouting. Packers used for adjustment shall be of non-corrosive material to the approval of the Engineer. Grout only shall not be acceptable for load bearing.

Holding down bolts that are to be tightened after grouting shall be provided with bond breakers where they pass through grout.

Unless otherwise specified, holding down bolts, nuts and washers shall be of stainless steel and provided with isolating washers and sleeves where appropriate to prevent galvanic corrosion.

13.3 ACCURACY OF WORK: MECHANICAL EQUIPMENT

The Contractor responsible for installation of the mechanical equipment shall be responsible for alignment of any equipment according to the designer's / manufacturer's specification.

The Contractor responsible for installation of the mechanical equipment shall also be responsible for supporting the equipment prior to final installation in order achieve the required accuracy of installation.

Conformance to these tolerances shall be verified by the Engineer and no installation work shall continue before written approval from the Engineer has been received.

13.4 GROUTING

Concrete for embedding second stage built-in parts shall be supplied, mixed and placed in accordance with specified requirements as approved by the Engineer.

Grout for the connection between bed plates and machinery and concrete shall be non-shrink epoxy grout and shall be mixed and placed in accordance with the approved Drawings & product specification instruction.



Non-shrink grout shall:-

- a) Have a compressive strength not less than 4 times the maximum stress to be transmitted;
- b) Be subject only to compressive stress;
- c) Be such that air voids are eliminated between bed plates and machinery and concrete;
- d) Be completely resistant to lubricants, hydraulic fluids and diesel fuel;
- e) Have a bond strength to concrete exceeding the tensile strength of the concrete; and
- f) Have a bond strength to steel not less than (e) above.

Cavity and contact grouting behind all applicable equipment shall be done, following precise alignment to line, plane and level. When grouting is complete, the Contractor shall fill all grout holes with screwed and welded steel plugs to give a flush surface on the outer surface.

13.5

BUILDING IN

The provision of trenches, backfilling and reinstating holes through walls and floors, chases or ducts in walls and floors, making good and final decorative finishes shall be undertaken by the Contractor. For this purpose the Contractor shall make all necessary arrangements with his specialist workmen who shall mark out all such work and shall provide all necessary information concerning preformed holes, chases, ducts, etc. The Contractor shall be responsible for the accuracy of all building in operations.

13.6

DRILLING THE STRUCTURE FOR FIXINGS

The drilling of holes for fixing devices shall be carried out by specialist workmen. Holes shall be made with a rotary drill, or a rotary/percussion type drill such that no damage or spalling is caused to the concrete and/or brickwork being drilled. Explosion or impact devices, such as single shot cartridge tools, shall not be used.

No structural steel, reinforcement or timber work shall be drilled without the prior approval of the Engineer.

Any damage to surfaces caused by the Contractor or his specialist during erection shall be made good by the Contractor without additional payment and to the satisfaction of the Engineer.

13.7

INSTRUMENT INSTALLATION

All instruments shall be installed in accordance with the recommendations or instructions of the instrument manufacturer, for the particular application. Each mounting position shall be chosen to give correct operation of the equipment, faithful reproduction of the quantity to be measured, ease of operation, reading, maintenance and servicing, and freedom from any condition that could have adverse effects.

13.8

PROTECTION ON SITE

Factory finished parts shall be adequately protected during installation against damage to finished surfaces and fitted components. It may be necessary for structural finishing operations to be carried out in the vicinity of installed items of the equipment before it is taken over and the Contractor shall take this into consideration in complying with the requirements of this clause.

13.9

SETTING TO WORK

After the equipment has been erected and the tests specified have been carried out, the Contractor shall set the equipment to work and when the Contractor is satisfied that the equipment is working correctly and in accordance with the Specification, he shall inform the Engineer that he is ready for the Tests on Completion.

13.10

PERIOD OF INSTRUCTION

The Contractor shall allow for a "Period of Instruction" of 2 weeks duration during which time the Contractor shall provide for 40 hours each week such skilled operators as are necessary to instruct the Employer's own operators to operate and maintain the equipment. Verbal instructions relating to operating procedures additional to any instructions given in the instruction manuals shall be confirmed in writing.



13.11 PERIODIC VISITS

The installation shall be visited during the sixth and twelfth months after the commencement of the Defects Notification Period in the company of the Engineer by a competent engineer and/or other specialist representative of the Contractor who shall inspect all the equipment provided under the Contract and service, adjust and recalibrate as necessary all items requiring attention.

14 QUALITY CONTROL AND TESTING

14.1 GENERAL

The Contractor's Quality Management System shall be in accordance with ISO 9000 and DWS 2020: Quality control.

The Contractor shall implement a comprehensive Quality Control programme and accept full responsibility for the quality of his workmanship and material used, irrespective of any quality surveillance that may be carried out by the Engineer or his appointed representative.

In keeping with the principles contained in the above mentioned code of practice, the Contractor or Subcontractor(s) shall -

- Be responsible for compliance with all the clauses of this Specification in every respect;
- Carry out all inspections and tests called for in the Specification in the presence of the Engineer or his appointed representative. The cost of these inspections and tests shall be included in the Tender Price; and
- Submit a quality control plan for approval by the Engineer for manufacture and comply with the specified quality plan for corrosion protection of all components indicating all the intended stages of testing during manufacture, cleaning, preparation and application as well as hold points for independent quality surveillance.

The quality control plans shall not be compromised once in agreement and shall be adhered to at all times.

The Contractor shall operate approved quality assurance and -control programmes on the Supplier's and Manufacturer's premises and on Site in order to verify that all equipment complies with this Specification. Prior to the commencement of any work, the Contractor shall prepare and submit to the Engineer for approval, quality plans describing the procedures, standards of acceptance, hold point inspections, routine and type tests to be carried out for each component both during manufacture and on Site.

Although it shall remain the responsibility of the Contractor to ensure that the Works conform to the Specification, the Engineer shall be entitled to inspect, examine and test the materials, workmanship and performance of every item of the equipment. The Engineer will notify the Contractor which tests or inspections, detailed in the quality plan, he will attend.

The Contractor shall give the Engineer not less than 14 days notice in writing of the date and the place of impending inspections or when cleaning and first coat application are to be carried out as well as for witnessing the points in terms of the agreed Quality Control Plans and he shall give the Engineer full facilities for witnessing such tests.

Approval by the Engineer of materials, workmanship etc. during manufacture or at Site shall not relieve the Contractor of his obligations to comply with all the requirements of the Contract.

All instruments and appliances necessary for the complete inspection and testing shall be provided by the Contractor. Calibration certificates for instruments shall be produced for the Engineer's approval and, if required by the Engineer, instruments shall be re-calibrated before commencement of the tests and again immediately after the tests.

14.2 CONTRACTOR QUALIFICATION

The Contractor and Subcontractor(s) shall satisfy the Engineer that they have the management, facilities and equipment, skilled staff, a quality control procedure and required test methods and standards to carry out quality control during manufacture and corrosion protection.

All Contractors and Subcontractors shall be subject to a Quality Audit.

14.3 INSPECTION AT MANUFACTURER'S PREMISES

All the equipment shall be subject to inspection and testing by the Engineer at the Manufacturer's premises before despatch. No material shall be delivered to the Site without inspection having been carried out or waived by the Engineer in writing.



14.4 INSPECTION BY THE ENGINEER

Inspection of equipment shall be carried out by the Engineer, his appointed representative or a nominated and approved inspection authority at the Manufacturer's- and Corrosion Applicator's Works.

14.5 INDEPENDENT SURVEILLANCE

The Engineer may employ an independent, technically qualified organisation to carry out quality surveillance of the work on his behalf.

The inspection authority has the right to inspect any item covered in the Contract at any stage of execution of the Contract.

Where imported supplies are to be inspected before shipment, the Contractor shall notify his suppliers abroad of the conditions applicable to inspections and also request them to notify the Employer's Representative abroad when consignments are ready so that arrangements for inspection may be made.

14.5.1 MATERIAL TESTS

The Manufacturer's material test data certification and the Contractor's quality records shall be subject to examination by the Engineer or his representative. Reasonable samples of the cleaning and coating materials to be used may be removed for testing.

Rejection of the samples shall place a hold on the use of materials of the same batch number and any components that have already been cleaned/coated with rejected material shall be reworked.

14.5.2 TYPE TESTS

Where the Contractor offers equipment selected from the standard range of products from a specialist manufacturer, type tests in accordance with a recognised international standard are required on one unit of each type to prove satisfactory design and quality of manufacture.

The Engineer may waive the requirement for type tests if he is satisfied that tests have previously been performed on identical equipment. The Contractor shall submit the data and results with his Quality Plan in sufficient time to allow for repeat tests without delaying the Works should the Engineer not approve the evidence submitted.

14.5.3 ROUTINE TESTS

The Contractor shall carry out routine tests in accordance with the requirements of recognised applicable standards on all items of equipment during manufacture to demonstrate satisfactory materials, workmanship and assembly.

Detailed proposals for routine tests shall be included in the Contractor's Quality Plan, and shall include where applicable:

- Material tests
- Non-destructive tests
- Dimensional and finish checks
- Pressure tests
- Assembly checks
- Paintwork tests
- Electrical tests
- Functional tests
- Load tests
- Performance tests

After assembly each unit shall be carefully checked to ensure that it is in accordance with the approved dimensions.



The Engineer may require applicable sections or all the work to be assembled in position as is necessary so that he can adequately test and check that all parts are to the correct dimensions, square and that all moving parts work easily.

Welds shall be physically examined and non-destructively tested by radiographic, ultrasonic, magnetic particle, dye penetrant or hydraulic pressure test methods as appropriate and / or specified.

14.5.4 TESTS AT SITE

The Contractor shall repeat such routine tests as are necessary to confirm that the equipment has not been damaged in transit, has been satisfactorily erected, and is ready for Tests on Completion.

For the purpose of carrying out tests on the equipment at the Site (including Tests on Completion), all labour, materials, power, apparatus and ancillary equipment as may be required for the tests shall be provided by the Contractor and shall be deemed to be included in the tendered rate.

The Engineer shall not be obliged to witness dry tests or Tests on Completion unless Operating and Maintenance Manuals have been presented and approved as being in a sufficiently advanced state of completion as is appropriate for the type of testing that it is proposed to be carried out. The Engineer may order that tests, which had to be aborted because of major malfunctions of the equipment, be repeated in their entirety once the malfunctions have been corrected.

14.5.5 DESTRUCTIVE TESTING

The Engineer or his representative may carry out reasonable destructive tests to ascertain compliance with the Specification. Areas thus damaged shall be repaired by the Contractor to the satisfaction of the Engineer at no additional cost.

14.5.6 NON-DESTRUCTIVE TESTING DURING MANUFACTURE

All welds on equipment shall be physically checked for compliance with the Specification and for throat thickness in the case of fillet welds. If judged to be satisfactory from a physical external examination, they shall then be non-destructively tested by means of radiographic, ultrasonic, magnetic particle or dye penetrant methods, as appropriate. If post weld heat treatment is required, non-destructive tests shall be done after completion of heat treatment. Prior approval for the use of ultrasonic (or other) methods in place of radiographic methods shall be obtained from the Engineer by way of the approval of welding procedure submissions.

Radiographic examination shall be in accordance with BS 2600: Parts 1 or 2, or BS 2910 as appropriate. Normally X-ray techniques shall be used with ultra-fine-grain-high-contrast direct-type film.

The standards of acceptance shall be as defined in BS 5500 Table 5.7: Acceptance Levels. Unacceptable defects shall be rejected or repaired as directed by the Engineer.

If welds or portions of a weld or welds are deemed to be of an unacceptable standard of quality, total repair or re-welding shall be carried out as directed by the Engineer. No repair shall be carried out after the radiographic examination without the prior approval of the Engineer.

If the re-radiographing of a repaired weld reveals unacceptable defects then the whole weld shall be cut out, rewelded and re-tested.

All repairs shall, if practicable, be carried out by the same process as was used for the original weld. An alternative process for repair may only be used with the full knowledge and approval of the Engineer.

Where a defective part has been cut out, the Engineer shall be entitled to make an examination before re-welding is commenced.

Repaired sections of welds shall be re-subjected to radiographic examination and radiographs shall be identified as being carried out after the repair.

The Contractor shall supply all apparatus, materials and labour required for his own non-destructive examinations and for non-destructive examinations ordered by the Engineer.

14.5.7 NON-DESTRUCTIVE TESTING ON SITE

In addition to the requirements of Clause 14.5.5, should any site welding be necessary, ultrasonic examination of in-situ welds may be ordered for welds where radiographic examination is not practicable. Prior approval for the use of ultrasonic (or other) methods in place of radiographic methods shall be obtained from the Engineer by way of the approval of welding procedure submissions.

Ultrasonic examination shall be in accordance with BS 3923 : Parts 1 or 2 as appropriate. Adjacent parent metal shall be ultrasonically examined to locate any imperfections that might prevent effective examination of the weld.

14.6 QUALITY CONTROL RECORDS

14.6.1 COATING AND MATERIAL RECORDS

Quality control, material and coating records for all stages of the work, i.e. batch numbers of materials used, environmental conditions and all test data, shall be recorded on the approved Quality Control Plan for Manufacture and the approved Quality Control Plan for Corrosion Protection.

Certificates for all materials used shall be provided by the Contractor.

14.6.2 DATA SHEETS, SPECIFICATIONS AND CODES OF PRACTICE

The Contractor shall have available the latest issues of the following:

- a) A copy of the relevant particular or technical Specification.
- b) Relevant Standard Specifications and Codes of Practice.
- c) Manufacturer's data sheets for materials to be used.

The above mentioned shall be available to all the Contractor's Quality Control and Production personnel.

14.6.3 QUALITY CONTROL RECORDS

Accurate and detailed quality control records shall be kept by the Contractor for all stages of the work.

Data of corrosion protection shall be recorded on the Employer Record sheets (see Departmental Specification DWS 9900) for corrosion protection:

- a) Quality Control Plan
- b) Coating Application Records
- c) Surface Profile and Dry Film Thickness readings

All the quality control records shall be available for inspection by the Engineer or his representative.

Incomplete, inaccurate or inadequate records shall be regarded as non-compliance with the Specification.

The collection of documents for each item of the equipment supplied shall be collated and bound in a logical manner and retained by the Contractor as proof of quality achieved. These documents shall be available on demand for quality control and part payment releases. The bound quality control records shall be handed over to the Engineer on completion of the work.

The records shall be bound in the Operation and Maintenance manuals where such manuals are supplied.

14.6.4 PROVISION FOR TESTING

The Contractor shall at no additional cost provide all material, samples, labour and the necessary calibrated instruments that may be required for the purpose of inspection, testing and analyses, unless otherwise specified.

14.7 STANDARD QUALITY CONTROL

All material, certification and records of the Contractor shall be subject to examination by the Engineer.

This shall include the checking and testing of the equipment. If any deviation is found, additional testing and quality surveillance shall be carried out.

If the additional testing confirms inaccurate quality control by the Contractor, all work shall be stopped and shall only proceed after remedial action has been implemented to the satisfaction of the Engineer.



14.8 ACCESS FOR SURVEILLANCE

For the purpose of carrying out quality surveillance, the Engineer or his representative shall be granted access to any part of the Contractor's or his Subcontractor's premises relevant to the work being carried out, at any reasonable time.

The Contractor shall provide, at his own cost, any equipment or labour necessary to gain access to surfaces which are coated, to be coated or are in the process of being coated.

14.9 SUBMISSION FOR APPROVAL

The Contractor shall submit the following to the Engineer, including data sheets where applicable, for approval prior to the commencement of any work:

14.9.1 FOR MANUFACTURE:

- a) Drawings
- b) A programme
- c) A quality control plan
- d) A draft Operation and Maintenance Manual

14.9.2 FOR CORROSION PROTECTION:

- a) A programme
- b) The Quality Control Plan for Corrosion Protection duly completed
- c) Blast material data sheets
- d) Coating products data sheets
- e) Pickling and passivation products data sheets

14.9.3 MANUFACTURE AND CORROSION PROTECTION PROGRAMMES

The manufacture and corrosion protection programmes shall state the time and place when the following will be conducted:

- a) Inspection of material;
- b) Hydrostatic testing of uncoated castings, pipes and fittings;
- c) Manufacture of components;
- d) Fetting or dressing;
- e) Degreasing;
- f) Water soluble salts test;
- g) Blast cleaning and application of the first coat;
- h) Application of intermediate and final coats; and
- i) Final hydrostatic testing
- j) The commencement of Site repairs.

14.10 COST OF QUALITY CONTROL

The cost for quality control shall be included in the Tendered rates.

When surveillance results in rejection of the lot or when notice by the Contractor results in a fruitless trip, the cost borne by the Employer/Engineer shall be debited against the Contractor's account.

If additional inspections, tests and analyses requested by the Employer/Engineer prove that the corrosion protection of the equipment is in accordance with the Specification, the costs of the inspections and/or tests including transport will be defrayed by the Employer. However, should the additional investigations prove that the manufacture and/or corrosion protection of the equipment does not conform to the Specification, the cost shall be defrayed by the Contractor.

The Engineer shall have the right, without prejudice to any other legal remedy, to deduct such costs from payments due to the Contractor under the Contract.

Where equipment or services fail to meet the Contract requirements but are nevertheless accepted at an agreed revised rate, the costs with regard to inspections, tests and analyses shall be for the Contractor's account unless otherwise directed by the Employer.

14.11 NON-COMPLIANCE WITH THE SPECIFICATION

Equipment, materials and services that do not conform to the requirements of this Specification shall be rejected.

Such rejected equipment shall be held at the cost and risk of the Contractor who shall, when called upon, and at his own cost, repair the defects or corrosion protection according to the Contract.

Failing satisfactory repair of rejected equipment, the equipment shall be returned to the Contractor at his cost and risk without any opportunity to substitute the rejected equipment. Alternative equipment may be purchased at the Contractor's expense or an approved Contractor may be employed to do the repair to the corrosion protection.

Should the Contractor fail to comply with the provisions of the Painting and Corrosion Protection Specification, the Certificate of Commissioning shall not be issued.

14.12 OPERATION OF EQUIPMENT PRIOR TO TAKING OVER

The Contractor shall be responsible for all operations necessary for the adjustment and testing of the equipment until it has been taken over.

During the full duration of the tests to be carried out, the Contractor shall be wholly responsible for the preservation, care and remedying of any defects of the equipment and he shall provide all labour, supervision, apparatus, materials, stores, instruments, etc. necessary for these operations.

The Contractor shall permit and facilitate the Engineer's observation of the erection, installation, and testing of all the equipment.


The Contractor shall ensure that specialist personnel from Subcontractors are at hand over the entire planned duration of the tests, and shall have made contingency plans to remain present in the event that the tests over-run their expected duration.

14.13 DEFECTS NOTIFICATION PERIOD

The Defects Notification Period shall commence on the date of issue of the Certificate of Commissioning by the Engineer to the Contractor or on completion of full flow testing, whichever is the latest and shall run for a period of 365 calendar days.



ANNEXURE A

DEPARTMENT OF WATER & SANITATION REPUBLIC OF SOUTH AFRICA HEAD OFFICE M&E ENGINEERING PRIVATE BAG X313 PRETORIA 0001  SEDIBENG BUILDING 185 SCHODMAN STREET PRETORIA (012) 336-7500 M.A. DIEDRICKS DIRECTOR GENERAL			
SCHEME			
PROVINCE:	DISTRICT:		
KEY CODES:			
CALCULATIONS FILE:	TENDER NO.		
LOCALITY NO.	CONTRACT NO.		
SHEET OF	DEPARTMENT OF WATER & SANITATION DRAWING REG. NO.		REV. NO.

DIRECTORATE MECHANICAL & ELECTRICAL ENGINEERING			
DESIGNED BY <i>B. van der Merwe</i>	CHECKED BY <i>B. van der Merwe</i>	DATE 13/11/14	PROJECT NO.
PROJECT NO.	LOCALITY NO.	CONTRACT NO.	REVISION NO.
TYPE DRAWING DRAWING NO. 1819 REVISION NO. 1 REVISION NO. 2			



STANDARD SPECIFICATION

DWS 9900

SECTION C1

CORROSION PROTECTION OF STEEL PIPES AND SPECIALS FOR PIPELINES

This document shall be read in conjunction with:

DWS 2020: Quality Assurance and Procedures

Annexures

Requirements to be specified

Departmental colour code



INDEX

PAGE

1.	SCOPE	10
2.	INTERPRETATIONS	10
2.1	PROJECT SPECIFICATION	10
2.2	APPLICATION	10
2.3	DEFINITIONS	10
3.	APPROVAL PROCEDURE	11
3.1	APPROVALS BEFORE AWARD OF CONTRACT	11
3.2	APPLICATION APPROVALS	11
4.	GENERAL REQUIREMENTS.....	11
4.1	QUALITY ASSURANCE AND PROCEDURES	11
4.1.1	QUALITY PLAN	11
4.2	QUALIFIED STAFF	11
4.2.1	APPLICATION	11
4.2.2	REPAIR WORK AT SITE	11
4.3	COMPATIBILITY OF MATERIALS	12
4.3.1	DESIGN PRECAUTIONS	12
4.3.1.1	ACCESSIBILITY	12
4.3.1.2	WATER RETENTION AREAS	12
4.3.1.3	PERMANENT INSTALLATIONS	12
4.3.2	CORROSION PREVENTION	12
4.4	EQUIPMENT	13
4.4.1	MEASURING EQUIPMENT	13
4.4.2	SPRAY EQUIPMENT	13
4.4.3	MIXER	13
4.5	INSTALLATION REQUIREMENTS	13
4.5.1	SUPPORTS	13
4.5.2	ANCHORS IN CONCRETE	13
4.5.3	SEALING	13
4.5.4	ARMOURING	14
4.6	HANDLING AND TRANSPORT	14
4.6.1	PHYSICAL PROTECTION	14
4.6.2	END COVERS	14
4.6.3	LIFTING	14
4.6.4	MARKING OF PIPES, CRATES AND BAGS	14
4.6.5	TRANSPORT	15
4.6.6	OFF-LOADING AT SITE	15
4.6.7	STACKING AND STORAGE	15
4.6.8	DAMAGE	16
4.6.9	REJECTION	16
4.7	SPARE PIPES	16
4.8	MEASUREMENT AND PAYMENT	16
5	RECOMMENDED COATING SYSTEMS.....	17
5.1	TOXICITY OF LINING MATERIAL	17
5.2	PROPRIETARY ITEMS	17
5.3	COATING SYSTEMS FOR PIPES AND SPECIALS	17
5.3.1	ENCASED IN CONCRETE	17
5.3.2	ABOVE GROUND	18
5.3.3	BURIED IN SOIL	18
5.3.4	IN CHAMBER WALLS	19
5.3.5	IN WATER	19
5.4	COUPLINGS AND FLANGE ADAPTORS	20
5.5	JOINTS	20



5.6	SPARE PIPES	20
5.7	STAINLESS STEEL COMPONENTS	21
5.8	FASTENERS AND ANCHORS	21
5.8.1	FASTENERS	21
5.8.2	ANCHORS	22
5.9	ABBREVIATIONS AND NOTES	22
6	MANUFACTURE AND PRE-PREPARATION	24
6.1	RESPONSIBILITY	24
6.1.1	PRE-PREPARATION	24
6.1.2	PERSONNEL	24
6.1.3	MARKING	24
6.2	FABRICATION REQUIREMENTS	24
6.2.1	SURFACE DEFECTS	24
6.2.2	UNDERCUTS, CAVITIES AND PITS	24
6.2.3	WELDS	24
6.2.4	LIFTING LUGS	24
6.2.4.1	LUGS TO BE REMOVED	24
6.2.4.2	PERMANENT LUGS	25
6.3	REFURBISHMENT	25
6.3.1	INSPECTION PROCEDURE	25
6.3.2	PREPARATION METHODS	25
6.4	PRE-PREPARATION	25
6.4.1	GENERAL REQUIREMENTS	25
6.4.1.1	PROTRUSIONS	25
6.4.1.2	SHARP EDGES	25
6.4.1.3	WELDS	25
6.4.2	MATERIALS	25
6.4.2.1	CASTINGS	25
6.4.2.2	HOT-DIP GALVANIZED ITEMS	26
6.4.2.3	CORROSION RESISTANT STEELS	26
6.5	PRIMARY CLEANING	27
7	SURFACE PREPARATION	28
7.1	STANDARDS	28
7.2	RESPONSIBILITY	28
7.2.1	SURFACE PREPARATION	28
7.2.2	PERSONNEL	28
7.2.3	EQUIPMENT	28
7.2.4	WORKING CONDITIONS	29
7.2.5	HEALTH AND SAFETY	29
7.3	PROCEDURE	29
7.3.1	APPROVAL OF WORKS AND PROGRAMME	29
7.3.2	INITIAL INSPECTION	29
7.3.3	DEGREASING	29
7.3.4	ROUGH-BLAST	29
7.3.5	WATER SOLUBLE SALTS	30
7.3.6	FINAL-BLAST	30
7.3.6.1	FINAL-BLAST	30
7.3.6.1.1	Humidity and Temperature	30
7.3.6.1.2	Blasting-material	30
7.3.6.1.3	Cleanliness	30
7.3.6.1.4	Profile	30
7.3.6.1.5	Residual Dust and Debris	30
7.3.6.1.6	Contamination	30
7.3.6.2	FLASH-BLAST	30
7.3.6.3	SWEEP-BLASTING	31



	PAGE
7.4 REQUIREMENTS.....	31
7.4.1 SURFACE CONDITIONS.....	31
7.4.2 ABRASIVE MATERIAL.....	31
7.4.2.1 MATERIAL.....	31
7.4.2.2 CERTIFICATION.....	31
7.4.2.3 SHAPE AND SIZE.....	31
7.4.2.4 HARDNESS.....	32
7.4.2.5 PH.....	32
7.4.2.6 WATER SOLUBLE SALTS.....	32
7.4.2.7 MOISTURE CONTENT.....	32
7.4.2.8 RE-CYCLING.....	32
7.4.3 AIR SUPPLY.....	32
7.5 SURFACE PREPARATION OF OTHER MATERIALS.....	32
7.5.1 GALVANIZED SURFACES TO BE COATED.....	32
7.5.1.1 PASSIVATION.....	32
7.5.1.2 DEGREASING.....	32
7.5.1.3 PROFILE.....	32
7.5.1.3.1 Sweep-blasting.....	32
7.5.1.3.2 Mechanical.....	33
7.5.1.4 DUST AND DEBRIS.....	33
7.5.1.5 PRIMER.....	33
7.5.2 ALUMINIUM SURFACES TO BE COATED.....	33
7.5.2.1 DEGREASING.....	33
7.5.2.2 PROFILE.....	33
7.5.2.3 DUST AND DEBRIS.....	33
7.5.2.4 PRIMER.....	33
7.5.3 CORROSION RESISTANT AND STAINLESS STEEL.....	33
7.5.3.1 UN-COATED SURFACES.....	33
7.5.3.2 SURFACES TO BE COATED.....	34
7.5.3.2.1 Degreasing.....	34
7.5.3.2.2 Profile.....	34
7.5.3.2.3 Dust and debris.....	34
7.5.4 SYNTHETIC MATERIALS TO BE COATED.....	34
7.5.4.1 DEGREASING.....	34
7.5.4.2 PROFILE.....	34
7.5.4.3 DUST AND DEBRIS.....	34
7.5.5 COATED SURFACES.....	34
7.5.5.1 PRIMED SURFACES TO BE OVER-COATED.....	34
7.5.5.1.1 Degreasing.....	34
7.5.5.1.2 Profile.....	34
7.5.5.1.3 Dust and Debris.....	34
7.5.5.2 COATED SURFACES TO BE REPAIRED.....	35
7.5.5.2.1 Preparation of Bare Areas.....	35
7.5.5.2.2 Soluble Salts.....	35
7.5.5.2.3 Feathering of Coated Surfaces.....	35
7.5.5.2.4 Dust and Debris.....	35
7.5.5.3 COATED SURFACES TO BE OVER-COATED.....	35
7.5.5.3.1 Degreasing.....	35
7.5.5.3.2 Profile.....	35
7.5.5.3.3 Dust and Debris.....	35
7.5.5.3.4 Solvent-wiping.....	35
7.6 TEST METHODS.....	35
7.6.1 FREE OF OIL AND GREASE.....	35
7.6.1.1 WETTING WITH WATER.....	35
7.6.1.2 SOLVENT-WIPING.....	36
7.6.2 WATER SOLUBLE SALT CONTAMINANTS.....	36
7.6.3 STANDARD OF MECHANICAL SURFACE PREPARATION.....	36
7.6.4 BLAST PROFILE.....	36
7.6.5 RESIDUAL DUST AND DEBRIS.....	36
7.6.6 BLASTING MATERIAL.....	36
7.6.6.1 METALLIC ABRASIVE.....	36
7.6.6.2 NON-METALLIC ABRASIVE.....	36



8	EPOXY COATING SYSTEM	37
8.1	STANDARDS	37
8.2	MATERIAL	37
8.3	SPECIAL COATING AREAS	38
8.4	APPLICATION	38
8.4.1	ACCEPTABILITY OF ITEMS TO BE COATED	38
8.4.2	SURFACE PREPARATION	38
8.4.3	COATING THICKNESSES	38
8.4.4	MANUFACTURER'S INSTRUCTIONS	39
8.4.5	COATING APPLICATION	39
8.4.5.1	ENVIRONMENTAL CONDITIONS	39
8.4.5.1.1	Dusty Conditions	39
8.4.5.1.2	Surface Temperature	39
8.4.5.1.3	Relative Humidity And Time Of Application	39
8.4.5.1.4	Ambient Temperature	39
8.4.5.2	MIXING	39
8.4.5.3	APPLICATION REQUIREMENTS	40
8.4.5.3.1	Equipment	40
8.4.5.3.2	Compatibility of Coats	40
8.4.5.3.3	Surface Restoration	40
8.4.5.3.4	Supports	40
8.4.5.4	METHOD OF APPLICATION	40
8.4.5.4.1	Application	40
8.4.5.4.2	First Coat	40
8.4.5.4.3	Cleanliness	40
8.4.5.4.4	Stripe Coat and Crevices	41
8.4.5.4.5	Second and subsequent Coats	41
8.4.5.4.6	Coat Colours	41
8.4.5.4.7	Over-coating Times	41
8.4.5.5	PIPE ENDS	41
8.4.5.6	IN-SITU APPLIED EPOXY LINING	41
8.4.5.7	PROTECTION WITH TAPE WRAP	41
8.4.5.8	OVER-COATING WITH POLYURETHANE	42
8.4.5.8.1	Wet, Submerged or High Humidity Conditions	42
8.4.5.8.2	Dry or UV Conditions	42
8.4.5.9	QUALITY OF COATING	42
8.4.5.9.1	Finish	42
8.4.5.9.2	Dry Film Thickness (DFT)	42
8.4.5.9.3	Electrical Insulation Defects	42
8.4.5.9.4	Finishing Coat Colours	42
8.4.5.9.5	Solvent Entrapment	43
8.5	TESTING	43
8.5.1	CONTRACTOR'S AND ENGINEER'S INSPECTIONS	43
8.5.2	VISUAL INSPECTION	43
8.5.3	HOLIDAY INSPECTION (ELECTRICAL INSULATION DEFECTS INSPECTION)	43
8.5.4	DRY FILM THICKNESS (DFT)	43
8.5.4.1	AUTOMATED SHOP APPLIED LINING AND COATING	44
8.5.4.2	HAND AND IN-SITU APPLIED LININGS AND COATING	44
8.5.5	DEGREE OF CURE OF TWO-COMPONENT MATERIALS	44
8.6	DAMAGED COATINGS	44
8.7	REPAIR METHODS FOR MINOR DEFECTS	45
8.8	REPAIR METHODS FOR MAJOR DEFECTS	45
9	FUSION-BONDED EPOXY COATING	46
	SYSTEM (HEAVY DUTY)	46
9.1	STANDARDS	46
9.2	MATERIAL	46
9.3	APPLICATION	46
9.3.1	SURFACE PREPARATION	46
9.3.2	COATING THICKNESSES	46
9.3.3	COATING APPLICATION	46



	PAGE
9.3.4	46
9.3.4.1	46
9.3.4.2	47
9.3.4.3	47
9.3.4.4	47
9.4	47
9.4.1	47
9.4.2	47
9.4.3	47
9.4.4	47
9.4.5	48
9.5	48
9.6	48
9.7	49
10	50
10.1	50
10.2	50
10.3	50
10.4	51
10.4.1	51
10.4.1.1	51
10.4.1.2	51
10.4.2	51
10.4.2.1	51
10.4.2.2	51
10.4.2.3	52
10.4.2.4	52
10.5	52
10.5.1	52
10.5.1.1	52
10.5.1.2	52
10.5.2	52
10.5.2.1	52
10.5.2.2	52
10.5.2.3	52
10.5.2.4	52
10.6	53
10.6.1	53
10.6.2	53
10.7	53
10.7.1	53
10.7.1.1	53
10.7.1.2	53
10.7.1.3	53
10.7.1.4	53
10.7.1.5	54
10.7.2	54
10.7.3	54
10.7.3.1	54
10.7.3.2	55
11	56
11.1	56
11.2	56
11.2.1	56
11.2.2	56
11.2.3	56
11.3	56
11.3.1	56
11.3.2	56
11.3.3	56



PAGE

11.3.4	COATING.....	57
11.3.4.1	COATING PROCEDURE.....	57
11.3.4.2	RE-INFORCED COATING.....	57
11.3.4.3	ARMOURED COATING.....	57
11.3.4.4	PIPE ENDS.....	57
11.3.4.5	REFLECTIVE FINISH.....	57
11.3.5	BITUMEN COATING OF PIPES WITH LININGS OTHER THAN BITUMEN.....	57
11.3.5.1	APPLICATION OF COATING.....	58
11.3.6	LINING AND COATING OF SPECIALS.....	58
11.3.7	REFLECTIVE FINISH.....	58
11.4	TOLERANCES.....	58
11.5	SPARE PIPES.....	58
11.6	TESTING.....	59
11.6.1	VISUAL INSPECTION.....	58
11.6.2	NON-DESTRUCTIVE TESTS.....	59
11.6.2.1	HOLIDAY TESTING.....	59
11.6.2.2	THICKNESS TESTING.....	59
11.6.3	DESTRUCTIVE TESTS.....	59
11.6.3.1	PEEL TEST ON LINING.....	59
11.6.3.2	CONDITION OF BITUMEN.....	59
11.6.4	TEST SAMPLES.....	60
11.6.4.1	Visual.....	60
11.6.4.2	NON-DESTRUCTIVE TESTING.....	60
11.6.4.3	DESTRUCTIVE TESTING.....	60
11.7	REPAIR METHODS.....	60
11.7.1	DAMAGE TO SUBSTRATE.....	60
11.7.2	PARTIALLY DAMAGED.....	60
11.7.3	ELECTRICAL INSULATION DEFECTS.....	60
11.7.4	TOP COAT.....	60

12 TAPE WRAPPING SYSTEM.....61

12.1	STANDARDS.....	61
12.2	MATERIAL.....	61
12.3	APPLICATION.....	61
12.3.1	GENERAL.....	61
12.3.2	SURFACE PREPARATION.....	61
12.3.3	PRIMING.....	61
12.3.4	NORMAL WRAPPING.....	61
12.3.5	ARMOURING.....	62
12.3.6	WRAPPING OF SPECIALS.....	62
12.3.7	ARMOUR WRAPPING OF COATED PIPES.....	62
12.4	TOLERANCES.....	62
12.4.1	PRESSURE SENSITIVE TAPE WRAPPING.....	62
12.4.2	BUTYL RUBBER LAMINATES.....	62
12.5	TESTING.....	63
12.5.1	VISUAL INSPECTION.....	63
12.5.2	NON-DESTRUCTIVE TESTING.....	63
12.5.3	DESTRUCTIVE TESTING.....	63
12.5.4	REPAIRS.....	63
12.6	REPAIR METHODS.....	64
12.6.1	SMALL DAMAGED AREAS.....	64
12.6.2	LARGE DAMAGED AREAS.....	64
12.6.3	DAMAGE ON DOUBLE WRAP.....	64
12.6.4	OUTER WRAP DAMAGE.....	64

13 PETROLATUM WRAPPING SYSTEM.....65

13.1	STANDARDS.....	65
13.2	SURFACE PREPARATION.....	65
13.3	PRIMING.....	65
13.4	APPLICATION OF MASTIC AND TAPE.....	65
13.5	TOP COAT.....	65
13.5.1	BURIED CONDITIONS.....	65
13.5.2	HIGH HUMIDITY CONDITIONS.....	66



14	POLYOLEFIN-BITUMEN WRAPPING SYSTEM.....	67
14.1	STANDARDS	67
14.2	MATERIAL	67
14.3	APPLICATION	67
14.3.1	SURFACE PREPARATION	67
14.3.2	APPLICATION	67
14.4	TOLERANCES	67
14.5	TESTING	67
14.5.1	VISUAL INSPECTION	68
14.5.2	ELECTRICAL INSULATION DEFECT (HOLIDAY) TESTING	68
14.5.3	ADHESION	68
14.6	REPAIRS	68
14.6.1	SMALL REPAIRS (LESS THAN 10 MM)	68
14.6.2	LARGE REPAIRS	68
15	POLYETHYLENE (MEDIUM DUTY) COATING SYSTEM.....	69
15.1	STANDARDS	69
15.2	MATERIAL	69
15.3	APPLICATION	69
15.3.1	SURFACE PREPARATION	69
15.3.2	APPLICATION	69
15.3.3	TREATMENT	69
15.4	TOLERANCES	70
15.4.1	COATING THICKNESS	70
15.5	TESTING	70
15.5.1	VISUAL INSPECTION	70
15.5.2	THICKNESS	70
15.5.3	ELECTRICAL INSULATION DEFECTS	70
15.6	TEST REQUIREMENTS	70
15.6.1	TYPE TEST	70
15.6.1.1	GENERAL	70
15.6.1.2	POLYETHYLENE COMPOUND	70
15.6.1.3	PRODUCTION TESTS	71
15.7	REPAIR METHODS	71
15.7.1	GENERAL	71
15.7.2	REPAIR LIMITS	71
15.7.3	REPAIR TEST METHODS	71
16	ELASTOPLASTIC POLYURETHANE	72
	COATING SYSTEM	72
16.1	STANDARDS	72
16.2	MATERIAL	72
16.2.1	PRIMER	72
16.2.2	COATING	72
16.2.3	ADHESIVE	73
16.3	APPLICATION	73
16.3.1	SURFACE PREPARATION	73
16.3.2	APPLICATION	73
16.4	TOLERANCES	74
16.5	TESTING	74
16.5.1	VISUAL INSPECTION	74
16.5.2	DRY FILM THICKNESS	74
16.5.3	ELECTRICAL INSULATION DEFECTS (HOLIDAY) INSPECTION	74
16.6	REPAIR METHODS	74
16.6.1	REPAIRS BEFORE FULL CURE	74
16.6.2	REPAIRS AFTER FULL CURE	74



17	CEMENT MORTAR LINING SYSTEM.....	75
17.1	STANDARDS	75
17.2	MATERIAL	75
17.2.1	CEMENT	75
17.2.2	AGGREGATES	75
17.2.3	WATER	76
17.2.4	CONCRETE AND MORTAR	76
17.2.5	WELDED STEEL FABRIC	76
17.3	APPLICATION	76
17.3.1	LINING	76
17.3.1.1	THICKNESS	76
17.3.1.2	SURFACE PREPARATION	77
17.3.1.3	SHOP APPLIED LININGS – CENTRIFUGAL SPUN	77
17.3.1.4	IN-SITU APPLIED LININGS	78
17.3.1.5	LINING OF SPECIALS	78
17.3.1.6	FINISH	78
17.3.1.7	CURING	79
17.3.1.8	PIPE ENDS	79
17.3.2	COATING	80
17.3.2.1	THICKNESS	80
17.3.2.2	COVER TO REINFORCEMENT	80
17.3.2.3	SURFACES PREPARATION	80
17.3.2.4	APPLICATION	80
17.3.2.5	PIPE ENDS	81
17.3.2.6	REPAIR OF DEFECTS	81
17.4	TOLERANCES	81
17.5	TESTING	82
17.5.1	LINING	82
17.5.1.1	VISUAL INSPECTION	82
17.5.1.2	DESTRUCTIVE TESTING	82
17.5.1.3	CONTRACTOR'S AND ENGINEERS INSPECTIONS	83
17.5.2	COATING	83
17.5.2.1	VISUAL INSPECTION	83
17.5.2.2	DESTRUCTIVE TESTING	83
17.5.2.3	CONTRACTOR'S AND ENGINEER'S INSPECTIONS	83
17.6	REPAIR METHODS	84
17.6.1	REPAIR OF DEFECTS	84
	REQUIREMENTS TO BE SPECIFIED	85
	DEPARTMENTAL COLOUR CODE	86



1. SCOPE

This specification covers the corrosion protection of steel pipes and specials to be used for the conveyance of potable water at ambient temperature, which may be buried or subjected to environments with variable corrosive tendencies.

2. INTERPRETATIONS

2.1 PROJECT SPECIFICATION

Steel pipes and specials shall be manufactured and corrosion protected in accordance with the requirements specified in the Project Specification. No deviation from specification will be allowed without the written consent of the Project Engineer. In the case of there being conflict between specifications, the Project Specification will take preference.

2.2 APPLICATION

This specification contains clauses that are generally applicable to the corrosion protection of steel pipes and specials.

2.3 DEFINITIONS

LINING

Refers to the internal coating of pipes and specials.

COATING

Refers to the external coating of pipes and specials.

DIS-BONDED AREA

An area of lining or coating that initially did adhere to the steel substrate after application, but which subsequently became loose from the substrate as a result of mechanical, chemical or other action.

UN-BONDED AREA

An area of lining or coating which at no stage adhered to the steel substrate.



3. APPROVAL PROCEDURE

3.1 APPROVALS BEFORE AWARD OF CONTRACT

- (a) The Corrosion Protection System specified in the Project Specification, shall be agreed upon between the Corrosion and Project Engineers.
- (b) Approval by the Corrosion Engineer of the corrosion protection system, procedures and specific materials offered in the Tender. Manufacturer's data sheets or legible copies thereof shall be submitted for each product.
- (c) Acceptance of the Departmental Quality Control Plan for Corrosion Protection - refer to DWS 2020 QCC1.

3.2 APPLICATION APPROVALS

- (a) Qualification of personnel
- (b) Quality of equipment
- (c) Pre-preparation
- (d) Surface preparation
- (e) Application
- (f) Final acceptance

4. GENERAL REQUIREMENTS

4.1 QUALITY ASSURANCE AND PROCEDURES

Quality procedures as specified in DWS 2020 shall be adhered to.

The production and application shall be in accordance with SABS ISO 9000, Quality System.

The Contractor shall ensure that he is fully conversant with the requirements of this specification and the relevant coating systems.

4.1.1 QUALITY PLAN

A detailed quality plan shall be submitted for approval and completion by the Corrosion Engineer before manufacture/coating is initiated -- refer to DWS 2020 QCC1 section 1.

4.2 QUALIFIED STAFF

4.2.1 APPLICATION

A high standard of workmanship is required. Only experienced personnel shall be used to carry out corrosion protection work.

All work shall be carried out under the constant supervision of a qualified supervisor.

4.2.2 REPAIR WORK AT SITE

All repair work shall be done by competent personnel of the approved applicator under the supervision of a qualified supervisor.



4.3 COMPATIBILITY OF MATERIALS

The Contractor shall ensure that metals or alloys are compatible or are adequately protected if, in the galvanic series, there is a 0,3 volt difference in the galvanic potential.

4.3.1 DESIGN PRECAUTIONS

All equipment shall be designed to suppress corrosion in an exposed environment.

4.3.1.1 ACCESSIBILITY

Easy access for protection and maintenance shall be provided. The use of back to back angles, partially open box sections or inaccessible stiffeners shall be avoided.

Corrosion protection of areas that are unavoidably inaccessible shall be specifically specified or approved by the Corrosion Engineer.

4.3.1.2 WATER RETENTION AREAS

Pockets, recesses and crevices in which water and dirt may collect shall be avoided. Water retention areas shall be properly drained by holes as large as possible i.e. 150 mm diameter – minimum 50 mm diameter.

Surfaces of corrodible metals, such as the insides of tanks or hollow sections that cannot be protected by any method (e.g. painting or dipping), shall be avoided, or where not possible, be fully sealed against ingress of air and moisture.

4.3.1.3 PERMANENT INSTALLATIONS

Permanent installations in concrete shall be manufactured from stainless steel as specified in Section 5.

4.3.2 CORROSION PREVENTION

The Contractor shall ensure that the following steps are taken to minimise corrosion:

- (a) If dissimilar metals are used:

Coat all surfaces of the whole assembly including the more noble member of the galvanic series.
- (b) If the noble member of the assembly cannot be entirely covered:
 - (i) Keep the anode/cathode ratio as large as possible in the particular component.
 - (ii) Use electrical insulators between two metals. Insulation must be complete, a bolt requires a sleeve as well as washers of an insulating material.
- (c) Joints and crevices between metals shall be sealed.
- (d) Where fastening is unavoidable, the fasteners shall be more noble (cathodic) than the base material. Fasteners shall be coated where possible and/or adequately electrically insulated between fasteners and the base material.



4.4 EQUIPMENT

4.4.1 MEASURING EQUIPMENT

The Contractor shall have the following measuring equipment at his shop or site at all times:

Ambient temperature gauge
Blast profile gauge
Dew point instrument
Dry film thickness gauge
Electric insulation defect detector
Surface temperature gauge
Relative humidity instrument
Wet film comb

All test equipment shall have current calibration certification.

All instruments shall be calibrated daily, except where otherwise specified by manufacturers, to achieve the required accuracy.

Dry film thickness gauges shall be calibrated on a flat surface, provided that the surface profile is in accordance with the specification.

4.4.2 SPRAY EQUIPMENT

Spray equipment shall be suitable for the production of high quality work, capable of properly atomising the coating material and equipped with suitable pressure regulators and gauges. Air caps, needles and nozzles shall be of the type recommended by the coating manufacturer.

All spray equipment shall be fitted with suitable oil and moisture traps.

4.4.3 MIXER

A low speed mixer, which does not introduce air into the coating material being mixed, shall be utilised.

4.5 INSTALLATION REQUIREMENTS

4.5.1 SUPPORTS

When pipes are installed or mounted on concrete supports, rubber insertion shall be used to insulate the pipe from the support. The thickness of the rubber insertion shall not be less than 10 mm and protrude not less than 20 mm all round.

4.5.2 ANCHORS IN CONCRETE

All permanent anchors in concrete shall be stainless steel to ASTM A240 grade 316.

Special care shall be taken to ensure that anchors be installed to the correct level and depth. Anchors shall not be cut after installation without prior inspection and approval of the Engineer.

To avoid a galvanic reaction (stainless steel/galvanizing) under wet conditions, the nut and washer shall be FBE coated. Where necessary caps shall be specified by the Corrosion Engineer.



4.5.3 SEALING

Pipes that enter or exit concrete shall be sealed on their circumference with a continuous polyurethane or polysulphide flexible sealer, in a 25 mm square recess, approved by the Corrosion Engineer.

4.5.4 ARMOURING

Armoured or special protection shall be applied to surfaces at all road and rail crossings, through sleeves and culverts, and as requested by the Engineer.

4.6 HANDLING AND TRANSPORT

4.6.1 PHYSICAL PROTECTION

Adequate provision shall be made for the protection of the pipe coating, between the completion of manufacture and installation.

The coated items shall not be handled within the drying time recommended by the coating manufacturer, relevant to the ambient temperature.

4.6.2 END COVERS

After inspection, testing and final acceptance, all ends (including branch ends), shall be sealed as follows:

All plain ends shall be sealed with plastic or other approved sheeting secured to the pipe circumference with double flat steel binding strips and all flanged ends shall be closed off with sturdy timber flanges.

All plastic covers and timber flanges to be clearly marked:

“NOT TO BE REMOVED BEFORE INSTALLATION”

Plastic covers and timber flanges shall remain in place during, handling, transport, storage and laying.

4.6.3 LIFTING

All coated items shall only be lifted by means of broad band slings that will not damage the coating. Slings shall not be less than 500 mm wide for pipes up to 500 mm nominal bore, 1 000 mm wide for larger pipes and 50 mm wide for other items, or as approved by the Engineer.

4.6.4 MARKING OF PIPES, CRATES AND BAGS

(a) Each pipe and special shall be legibly, indelibly and durably marked, (in such a manner that the coating is not damaged), with the following information:

- Contract number,
- Scheme name,
- Serial number of the pipe or special,
- Nominal diameter,
- Grade and thickness of steel,
- Hydrostatic test pressure,
- Item number.



(b) The bags and crates shall be tagged using metallic tags and shall indicate the following information:

- Contract number,
- Scheme name,
- Part numbers,
- Description,
- Sizes,
- Quantities.

Each bag or crate shall have the delivery address listed on a separate metallic tag.

4.6.5

TRANSPORT

Coated items shall be handled with due regard to the relatively soft nature of organic coatings and appropriate precautions shall be taken.

The Contractor is responsible for the safe delivery of all the items and small parts to site without damage. All items shall be securely packed to prevent damage while in transit.

If transported by a third party, the Contractor is responsible for ensuring protection of items as specified.

Precaution shall be taken to support and chock the pipes on padded cradles and/or saw-dust filled bags to prevent movement when loading onto vehicles.

Where stacked pipes are transported, the packing shall be of a thickness and positioned to ensure that pipes do not touch when they flex.

Items shall be firmly lashed or chained with padded lashing. The area of padded surfaces shall be adequate to prevent damage to coatings.

Bolts in strong hessian bags and other small components shall be labelled and crated. The bags and crates shall be tagged using metallic tags and shall be marked in accordance with paragraph 4.6.4 (b).

Each bag or crate shall have the delivery address listed on a separate metallic tag.

The Site Engineer shall be notified of the delivery date and of any requirements regarding off-loading and storage at site.

4.6.6

OFF-LOADING AT SITE

The pipe supplier shall be responsible for the transportation and supervision during off-loading of the pipes and other small components at the delivery site.

Under no circumstances shall coated pipes be allowed to rest directly on the ground.

The final delivery inspection and acceptance of equipment supplied shall be undertaken on site after off-loading has been completed.

4.6.7

STACKING AND STORAGE

The Contractor shall provide all the necessary balks of timber and saw-dust filled bags used to support the items on soil, concrete or other hard surface and to separate them from each other both at his works, on site and when stringing along the trench.

Pipes shall be stacked to a safe height not exceeding two pipes high on cradles and on level ground.



Grass or other vegetation shall not be allowed to grow in the storage area within three metres of the equipment.

4.6.8 DAMAGE

Any damage that occurs during the handling and storage of items at the Manufacturer/Contractor's works, including transportation to site, shall be repaired by the Manufacturer/Contractor at his own cost, in accordance with the specification and to the approval of the Engineer.

4.6.9 REJECTION

The Engineer has the right to reject any damaged items and materials which have been delivered and off-loaded at site.

4.7 SPARE PIPES

Corrosion protection of spare pipes for the following pipelines:

- Bitumen lined/coated.
- Tape wrapped.
- Cement mortar lined/coated.

shall be as specified in paragraph 5.6.

Top coat

Re-coatable Polyurethane to a DFT of 30 – 50 µm, colour white or silver, for storage and above ground installation

And before burying in soil

Single armoured tape wrapping to be applied in accordance with paragraph 12.3.5.

4.8 MEASUREMENT AND PAYMENT

The lining and coating of straight pipes shall be measured per linear metre of pipe lined and coated.

The lining and coating of specials, whether lined by hand or otherwise, shall be measured per unit of completed specials, except where such specials are lined and coated in a single in-situ operation by mechanical means. In this case the lining and coating of the same shall be included, measured per linear metre of completed pipeline.

Payment for factory applied linings and coatings shall be included in the payment for pipes delivered to site.

Payment for in situ applied linings and coatings shall be for completed linings and coatings at the rates scheduled.



5. RECOMMENDED COATING SYSTEMS

5.1 TOXICITY OF LINING MATERIAL

Materials used for the lining of pipes shall be non-toxic and shall not impart any odour, taste, or colour to the water. Certification shall be submitted to the Corrosion Engineer for his approval.

5.2 PROPRIETARY ITEMS

Components that are supplied painted or protected e.g. gearboxes, actuators etc. **shall only be accepted** provided that they meet the corrosion protection requirements of this specification. If this specification cannot be adhered to the Contractor **shall submit full details of the equivalent coating systems** at tendering stage for approval by the Corrosion Engineer.

5.3 COATING SYSTEMS FOR PIPES AND SPECIALS

Selection of all corrosion protection systems shall be cleared with the Corrosion Engineer before finalisation of the Project Specification.

The following tables are abbreviated guidelines and the systems are not listed in order of preference.

See **NOTES** under paragraph 5.9.

5.3.1 ENCASED IN CONCRETE

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Encased in concrete	3CR12 (See note 9) MS (See note 10)	Lining	1. Two pack Epoxy	400
			2. FBE	300
			3. Elastoplastic Polyurethane	2 mm
	3CR12	Coating	1. Two pack Epoxy	250
			2. FBE	200
			1. Two pack Epoxy	300
	MS	Coating	2. FBE	250
			1. Two pack Epoxy	250
			2. FBE	175
	SS 304 or SS 316 See note 6	Lining	3. Elastoplastic Polyurethane	1 mm
			1. Two pack Epoxy plus sealant of Polyurethane or Polysulphide – See note 2	150
			2. FBE plus sealant of Polyurethane or Polysulphide - See note 2	100
		Coating	3. Pickle and passivate – See note 4	
Petrolatum wrapping system – refer Section 12				
Buried in soil – chamber to coupling	All materials	Coating		



5.3.2

ABOVE GROUND

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Above ground For wet conditions see paragraph 5.3.5	MS	Lining	1. Two pack Epoxy	400
			2. FBE	300
			3. Elastoplastic Polyurethane	1-3 mm
			4. HDG – See note 1	105
		Coating	1. Two pack Epoxy plus top coat of Re-coatable Polyurethane	250
			2. Multi-purpose Epoxy plus top coat of Re-coatable Polyurethane if required	250 40
			3. FBE plus top coat of Re-coatable Polyurethane	200 40
			4. HDG – See note 1 If required: Epoxy primer for galvanised surfaces plus top coat of Re-coatable Polyurethane	105 40-80 40

5.3.3

BURIED IN SOIL

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
Buried in soil	MS	Lining	1. Two pack Epoxy	400
			2. FBE	300
			3. Bitumen – refer paragraph 11.4	2.5 mm
			4. Cement mortar – refer paragraph 15.3	
		Coating Depth < 4 m	5. Elastoplastic Polyurethane	1-3 mm
			1. Reinforced bitumen – refer paragraph 11.3.4	
			2. FBPE	2-3 mm
			3. Tape wrapping – refer paragraph 12.3.4	
			4. Two pack Epoxy plus tape wrapping – refer paragraph 12.3.5	300
			5. FBE plus tape wrapping – refer paragraph 12.3.5	200
		Coating Depth > 4 m and proximity of other services	1. Reinforced bitumen – armour wrapping - refer paragraph 11.3.4	
			2. FBPE	2-3 mm
			3. Armoured tape wrapping – refer paragraph 12.3.4	See paragraph 12.3.5
			4. Two pack Epoxy plus tape wrapping – refer paragraph 12.3.5	400
			5. FBE plus tape wrapping – refer paragraph 14.4	300



5.3.4

IN CHAMBER WALLS

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
In chamber walls	3CR12 MS	Lining	1. Two pack Epoxy	400
			2. FBE	300
			3. Cement mortar – refer paragraph 17.3	
			4. Elastoplastic Polyurethane	1-3 mm
			5. HDG plus Epoxy primer plus Two pack Epoxy	105 40-80 300
			6. HDG plus FBE	105 250
			1. Two pack Epoxy plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	400 25
			2. FBE plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	300 25
			3. HDG plus Epoxy primer plus Two pack Epoxy plus top coat of pure Aliphatic Polyurethane	105 40-80 300 25
			4. HDG plus FBE plus top coat of pure Aliphatic Polyurethane	105 275 25
	SS 304 or SS 316	Lining	1. Two pack Epoxy	250
			2. FBE	175
			3. Elastoplastic Polyurethane	1 mm
			1. Two pack Epoxy plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide – See note 2	150 25
			2. FBE plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	100 25
			1. Two pack Epoxy plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	100 25
			2. FBE plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	100 25
			1. Two pack Epoxy plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	100 25
			2. FBE plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	100 25
			1. Two pack Epoxy plus top coat of pure Aliphatic Polyurethane plus sealant of Polyurethane or Polysulphide - See note 2	100 25
Buried in soil – chamber to coupling	All materials	Coating	Petrolatum wrapping system – refer Section 12	

5.3.5

IN WATER

ENVIRONMENT	MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
In water and severe corrosion conditions	3CR12 MS	Lining	1. Two pack Epoxy	400
			2. FBE	300
			3. Elastoplastic Polyurethane	1-3 mm
			1. Two pack Epoxy plus pure Aliphatic Polyurethane	400 25
			2. FBE	300
			3. Elastoplastic Polyurethane	1-3 mm
			4. FBPE	2-3 mm
			1. Two pack Epoxy	250
			2. FBE	150
			3. Elastoplastic Polyurethane	1 mm
	SS 304 See note 6	Coating	1. Two pack Epoxy	250
			2. FBE	150
			3. Elastoplastic Polyurethane	1 mm
			1. Two pack Epoxy	250
			2. FBE	150
			3. Elastoplastic Polyurethane	1 mm
			1. Two pack Epoxy	250
			2. FBE	150
			3. Elastoplastic Polyurethane	1 mm
			1. Two pack Epoxy	250



5.4 COUPLINGS AND FLANGE ADAPTORS (SEE PARAGRAPH 5.6)

MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
MS	Lining and Coating	1. Two pack Epoxy	400
		2. FBE	300
		3. HDG plus Epoxy primer plus Two pack Epoxy	105 40-80 250
		4. HDG plus FBE	105 250
SS 304	Lining and coating	Pickle and passivate – See note 4	
SS 304 buried	Lining and coating	1. Two pack Epoxy	150
		2. FBE	125

5.5 JOINTS

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
Plain Ended Pipes where couplings/flange adaptors are to be fitted	MS	Same as lining material for 300 mm from end	400
		Two pack Epoxy for cement mortar lining with 100 mm overlap inside and outside	400
Flanges of Bitumen wrapped pipes	MS	Same as lining material on top and back of flange with an overlap of 100 mm from the flange	400
		Two pack Epoxy for cement mortar lining with 100 mm overlap inside and outside	400
Flange faces	MS	Two pack Epoxy or FBE	60 - 90
Coupling or Flanged Joints Buried in Soil or in Wet Chambers	MS SS 304 SS316	Coating system plus Petrolatum wrapping system - refer Section 13	
Welded Joints Buried in Soil and encased in concrete	MS SS 304 SS316	As specified for lining and coating	

5.6 SPARE PIPES

MATERIAL	SURFACE	SYSTEM	MINIMUM DFT (µm)
MS	Lining	1. Two pack Epoxy	400
		2. FBE	300
		1. Two pack Epoxy plus top coat of Re-coatable Polyurethane Wrap before burying in soil	400 40
		2. FBE plus top coat of Re-coatable Polyurethane Wrap before burying in soil	300 40



5.7 STAINLESS STEEL ITEMS

SURFACES	COATING	MINIMUM DFT (µm)
Stainless steel components (Dissimilar materials in submerged conditions)	Two pack Epoxy or FBE to a smooth, glossy and uniform finish	125
3CR12 steel components (All submerged conditions)	Two pack Epoxy or FBE	400 250
Stainless steel components (Dry or compatible metal conditions)	Pickle and passivate – See note 4	
3CR12 steel components (Dry conditions only)	Pickle and passivate – See note 4	

5.8 FASTENERS AND ANCHORS

5.8.1 FASTENERS

ENVIRONMENT	MATERIAL	SYSTEM	MINIMUM DFT (µm)
Fasteners and washers - Dry	MS	HDG plus threads coated with Molybdenum Disulphide lubricant or wax	45
	SS 304	Threads coated with Molybdenum Disulphide lubricant or Nickel Anti- seize compound	Uniform cover
Fasteners and washers - Wet/Submerged	SS 316	1. Pickle and passivate - See note 4 plus threads coated with Molybdenum Disulphide lubricant or Nickel Anti-seize compound	Uniform cover
		2. Fusion bonded Epoxy coated (thread surfaces excluded) plus threads coated with Molybdenum Disulphide lubricant or Nickel Anti-seize compound	50
Fasteners and washers - Buried in soil	MS	1. HDG plus threads coated with Molybdenum Disulphide lubricant or wax plus Bitumen or Tape wrapping	45
	SS 304	1. Threads coated with Molybdenum Disulphide lubricant or Nickel Anti- seize compound plus Bitumen or Tape wrapping	Uniform cover
Fasteners for flange adaptors – Drilled and tapped	MS	HDG plus wet assembly with Epoxy or threads coated with Molybdenum Disulphide lubricant	45
	SS 304	Pickle and passivate - See note 4 plus wet assembly with Epoxy	Uniform cover
Fasteners for flange adaptors - welded	SS 304	Pickle and passivate - See note 4	



5.8.2 ANCHORS

ENVIRONMENT	MATERIAL	SYSTEM	
Anchors in concrete - Dry See paragraph 4.5.1	SS 316	Threads coated with Molybdenum Disulphide Lubricant or Nickel Anti-seize compound	Uniform cover
Anchors in concrete - Wet See paragraph 4.5.1	SS 316	Threads coated with Molybdenum Disulphide Lubricant or Nickel Anti-seize compound plus nut and washer FBE coated	Uniform cover 50

5.9 ABBREVIATIONS AND NOTES

ABBREVIATIONS

DFT :	Dry film thickness
FBE :	Fusion-bonded Epoxy
FBPE :	Fusion-bonded Polyethylene
HDG :	Hot-dip galvanized
MS :	Mild steel – grade 300WA
SS :	Stainless steel – grades 304L
UV :	Ultra Violet
3Cr12 :	Corrosion resistant steel
µm :	Micrometer

NOTES

The following items shall be approved by the Corrosion Engineer

- Hot-dip galvanizing
 - Only for pipes up to 200 mm diameter maximum and flow less than 2 m/s.
 - Pipes shall not be embedded in concrete.
 - Water analysis shall be provided.
 - Pipes over 200 mm diameter to be coated with a duplex system
- Sealant
 - Interfaces of different environments shall be sealed with a Polyurethane or Polysulphide flexible sealant to be applied in accordance with the manufacturers data sheets.
- Un-coated stainless steel
 - Only to be used if no galvanic reaction and anaerobic conditions are found.
- Pickle and passivate
 - If not in contact with less noble material.
 - If exposed to anaerobic conditions seal-coat all crevices with Elastoplastic Epoxy.
 - Shall be done by the dipping process.
- Galvanic cells
 - Where a galvanic cell is situated within a water path <150 mm and concrete cover <75 mm, both the MS, 3Cr12 or SS shall be coated.



DWS 9900: STANDARD SPECIFICATION: CORROSION PROTECTION
C1: CORROSION PROTECTION OF STEEL PIPES AND SPECIALS FOR PIPELINES



- | | |
|-----------------------------------|--|
| 6. Anaerobic conditions | <ul style="list-style-type: none">- SS grade 316L shall be used under anaerobic and aggressive water conditions. |
| 7. Polyurethane for colour coding | <ul style="list-style-type: none">- Re-coatable or pure Aliphatic Polyurethane where required for colour coding. Only UV resistant Polyurethane shall be used. |
| 8. Primers | <ul style="list-style-type: none">- Primers shall only be used in special cases i.e. over-coating of galvanized surfaces. |
| 9. 3CR12 | <ul style="list-style-type: none">- In view of superior corrosion resistance, coated 3CR12 material is preferred |
| 10. Mild steel | <ul style="list-style-type: none">- Mild steel may only be used where the pipe lining can be refurbished in situ |
| 11. Epoxy primer | <ul style="list-style-type: none">- Epoxy primer may not be required if appropriate two pack Epoxy/ Re-coatable or pure Aliphatic Polyurethane is being used. |



6 MANUFACTURE AND PRE-PREPARATION

6.1 RESPONSIBILITY

6.1.1 PRE-PREPARATION

The Manufacturer or Refurbisher shall be responsible for all the pre-preparation of equipment prior to surface preparation. Pre-preparation shall be carried out to the approval of the Corrosion Engineer and the Corrosion Protection Contractor.

6.1.2 PERSONNEL

Pre-preparation shall be carried out by competent personnel, under the supervision of an experienced supervisor.

6.1.3 MARKING

All items shall be permanently and indelibly marked to identify each individual item as specified by the Engineer.

6.2 FABRICATION REQUIREMENTS

6.2.1 SURFACE DEFECTS

All extrusions, rolled steel and castings shall be clean and free of score marks, pits, protrusions, blisters, porosity, blowholes, cracks or any other flaws which may be detrimental.

Laminations, scabs or occluded scale shall be ground out. If such grinding penetrates deeper than 7% of the metal thickness, the area shall be repaired by welding or the metal shall be rejected at the discretion of the Engineer.

6.2.2 UNDERCUTS, CAVITIES AND PITS

Weld undercuts and cavities as well as pits in metal surfaces are not permitted.

All undercuts, cavities and pits shall be ground out, re-welded and ground to a smooth contour.

6.2.3 WELDS

All welds shall be continuous and shall have a smooth contour.

Staggered welds, where specified, shall only be permitted with prior approval of the Corrosion Engineer on submission of appropriate remedial corrosion protection procedures.

Welding processes used shall limit heat input to a minimum to restrict the heat affected zone.

6.2.4 LIFTING LUGS

Where required, lugs shall be fitted by the manufacturer to the requirements of the Corrosion Contractor and the approval of the Engineer.

6.2.4.1 LUGS TO BE REMOVED

After removal the damaged coating area shall be repaired in accordance with the original Specification.



6.2.4.2 PERMANENT LUGS

Lugs, not intended to be removed, shall be manufactured of equal or more noble grade than the base material in accordance with the Specification.

6.3 REFURBISHMENT

6.3.1 INSPECTION PROCEDURE

Corrosion damage must be exposed by manual, mechanical or abrasive blast-cleaning for inspection. The refurbishment procedures shall then be specified by the Engineer.

6.3.2 PREPARATION METHODS

- (a) Smooth out all shallow pits with a pencil grinder.
- (b) Weld up and grind to a smooth finish where:
 - More than 25% of the material has been lost by pitting corrosion.
 - Material loss detrimentally affects the strength of the item.
- (c) Replace damaged section.

6.4 PRE-PREPARATION

6.4.1 GENERAL REQUIREMENTS

6.4.1.1 PROTRUSIONS

Protrusions shall be removed by grinding and dressing to a smooth contour.

6.4.1.2 SHARP EDGES

Burrs and rough faces caused by guillotining, flame cutting, drilling, machining or punching shall be removed by grinding.

All sharp edges shall be radiused to a minimum of 2 mm.

6.4.1.3 WELDS

Welds shall be free from slag, slag inclusions, cracks, surface cavities and under-cuts.

Irregular projections shall be ground to a smooth contour.

Areas adjacent to welds shall be free from weld spatter. Such spatter shall be removed by grinding or scraping.

6.4.2 MATERIALS

6.4.2.1 CASTINGS

Castings with defects exceeding the restrictions given in the table below shall be rejected.

In the case of blowholes occurring opposite each other, the combined depth shall be taken into account.

Blowholes and cavities not exceeding 2 mm depth shall be smoothed out by grinding.



Acceptance criteria for the repair of blowholes and cavities.

SURFACE	DEPTH OF BLOWHOLES	DIAMETER OF BLOWHOLES	REPAIR
Internal	Maximum 20% of material thickness	40% maximum of material thickness	Welding only
External	Maximum 10% of material thickness	20% maximum of material thickness	Solvent free Epoxy or welding
External	10 to 20% maximum of material thickness	40% maximum of material thickness	Welding only

Castings shall, after inspection by the Engineer, be ground smooth.

Small and repaired blowholes shall be ground level and smooth.

6.4.2.2 HOT-DIP GALVANIZED ITEMS

The design and manufacture of all items to be hot-dip galvanized shall conform to SABS Code of Practice 0214.

Vent holes shall be drilled by the manufacturer, in accordance with the above Code of Practice, to the approval of the Engineer and Galvanizer.

The Silicon and Phosphorus contents of materials to be galvanized shall comply with the standard below. If no material certificates are available, samples of the materials shall be analysed for their Silicon and Phosphorus contents.

The following materials shall be used:

- (a) For aesthetic appearance
 - Aluminium-killed steel or
 - Silicon-killed steel with a Silicon content not exceeding 0,04% and a Phosphorus content not exceeding 0,02%.

NOTE: Material certification shall be supplied.

- b) For general corrosion protection
 - Aluminium killed steel or
 - Silicon killed steel with a Silicon content not exceeding 0,25% and a Phosphorus content not exceeding 0,02%.

6.4.2.3 CORROSION RESISTANT STEELS

Fabrication shall take place in dedicated areas separated from carbon steel.

All equipment used in the forming and manipulation of stainless steel items during fabrication shall be clean and free of materials that may contaminate the metal with carbon steel.

The manufacture of items from corrosion resistant steels shall be in accordance with the SASSDA's Information Series and the guidelines of the material supplier.

Discoloration caused by welding or cutting shall be mechanically cleaned by buffing followed by pickling and passivation in accordance with the SASSDA's Information Series and the guidelines of the material supplier.

Organic contamination shall be removed by degreasing.

Iron contamination shall be removed by pickling and passivation, by the dipping process, after degreasing.



All surfaces shall be tested for free iron contamination by the water or the ferroxyl test method.

6.5 PRIMARY CLEANING

The Manufacturer or Refurbisher shall remove excessive oil, grease or other surface contaminants with a water soluble solvent degreaser followed by rinsing with clean soft water before the items are despatched to the Corrosion Protection Contractor.



7 SURFACE PREPARATION

7.1 STANDARDS

SABS	1344	Medium duty solvent detergent.
SABS	064	The preparation of surfaces for coating.
SABS ISO	8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after overall removal of previous coatings.
SABS ISO	8504-2	Preparation of steel substrates before application of paints and related products -- Surface preparation methods – Part 2: Abrasive blast cleaning.
SABS Method	770	Cleanliness of blast-cleaned steel surfaces for painting (freedom of soluble salts).
SABS Method	772	Profile of blast-cleaned steel surfaces for painting (profile gauge).
SABS Method	769	Cleanliness of blast-cleaned steel surfaces for painting (freedom from dust and debris).
ISO	11125	Preparation of steel substrates before application of paints – Metallic blast-cleaning abrasives.
ISO	11127	Preparation of steel substrates before application of paints – Non-metallic blast-cleaning abrasives.

7.2 RESPONSIBILITY

7.2.1 SURFACE PREPARATION

The corrosion protection Contractor shall be responsible for preparation of all surfaces to be coated.

On completion of the Contract, all plant, equipment, temporary structures and materials shall be removed from the site.

7.2.2 PERSONNEL

The Contractor carrying out the surface preparation shall have competent personnel with the necessary technical knowledge of the processes involved.

All work shall be carried out under the supervision of an experienced supervisor.

7.2.3 EQUIPMENT

Plant and equipment shall, to achieve the specified surface preparation, comply with the following:

- Equipment and air supply free of oil and moisture.
- Compressors shall have a capacity and pressure output to achieve the required nozzle pressures.
- Worn nozzles shall be replaced.

If the correct surface preparation is not achieved due to inadequate plant and equipment, the Engineer may order the Contractor to obtain such plant and equipment as may be necessary to achieve the specified results.

All plant, equipment and temporary structures shall at all times be maintained in good and safe working order.



7.2.4 WORKING CONDITIONS

Surface preparation shall not take place when conditions are likely to affect the corrosion protection processes adversely.

The Contractor shall provide screens, covers, trestles or any other equipment necessary to avoid contamination of surfaces and to minimise time delays caused by inclement weather.

7.2.5 HEALTH AND SAFETY

The Contractor shall at all times enforce health and safety measures necessary to comply with the Occupational Health and Safety Act No. 85 of 1993 and the manufacturer's requirements.

7.3 PROCEDURE

7.3.1 APPROVAL OF WORKS AND PROGRAMME

The Contractor's programme, plant and equipment and works shall be approved by the Corrosion Engineer prior to commencement of surface preparation.

7.3.2 INITIAL INSPECTION

Before accepting items from the Fabricator, the corrosion protection Contractor shall check the initial condition of the surface for:

- (a) Visible surface defects
- (b) Corrosion or contamination
- (c) Any required metal dressing
- (d) Elimination of burrs and radiusing of edges
- (e) Removing of weld spatter and weld imperfections such as blowholes
- (f) Suitable lifting lugs

7.3.3 DEGREASING

All surfaces to be coated shall be tested for oil and grease contamination by the water break free test.

Oil and grease contamination shall be removed by:

- Steam-cleaning.
- An emulsifiable or aqueous detergent applied in accordance with SABS 1344.
- An alkaline cleaning solution.

Allow to react, then rinse off with clean, potable water to remove all residues prior to surface preparation, all in accordance with clauses 3.3 and 3.4 of SABS 064.

The surfaces shall be tested after degreasing and show no oil, grease and chemical contamination after degreasing.

Care shall be taken to avoid entrapment of cleaning agents in recesses or other retention areas.

7.3.4 ROUGH-BLAST

All rust, millscale, old coating or marking paint shall be removed by rough-blasting.

The Engineer shall be advised when blast-cleaning of the appropriate section will be completed so that an inspection can be carried out to determine if repairs are required.

Blast-cleaning shall be done in accordance with the code of practice SABS 064 to achieve a cleanliness of Sa 2. (SABS ISO 8501-1)



7.3.5 WATER SOLUBLE SALTS

The surfaces to be coated shall be tested for water soluble salts after blast-cleaning. The maximum level of salts allowable on the surfaces shall not exceed the values given in paragraph 7.4.1.

Should these values be exceeded, the surfaces shall be cleaned by:

- (a) A liquid soluble salt remover approved by the Corrosion Engineer or
- (b) Washing with a high pressure jet of clean potable water or
- (c) Water injected blast-cleaning or
- (d) Flash blast-cleaning until the soluble salts are within the specified limits.

7.3.6 FINAL-BLAST

7.3.6.1 FINAL-BLAST

Humidity and Temperature

All blast-cleaned surfaces shall be coated within:

Four (4) hours when humidity is below 70% or

Two (2) hours when humidity is between 70% and 85%.

Final-blasting shall not be carried out if the steel temperature is less than 3°C above dew point.

7.3.6.1.2 Blasting-material

Final blast-cleaning shall be carried out using clean, uncontaminated blast-medium in accordance with paragraph 7.4.2.

7.3.6.1.3 Cleanliness

All surfaces for "wet/submerged conditions" and for "dry conditions" shall be blast-cleaned to Sa 3 and Sa 2½ respectively.

7.3.6.1.4 Profile

The required surface profile specified in paragraph 7.4.1 shall be achieved by final-blasting in accordance with SABS 064 and SABS ISO 8504-2.

7.3.6.1.5 Residual Dust and Debris

Prior to coating, dust and debris shall be removed by vacuum-cleaning in accordance with SABS 769. Dust and debris may only be removed by blowing with clean uncontaminated compressed air, with prior approval of the Corrosion Engineer.

7.3.6.1.6 Contamination

After final-blasting un-coated steel shall not be touched with bare hands. All applicators shall wear white gloves and shoe covers where applicable.

7.3.6.2 FLASH-BLAST

Flash blast-cleaning shall be carried out to reinstate the surfaces specified in paragraph 7.4.1, in accordance with paragraph 7.3.6.1.



7.3.6.3 SWEEP-BLASTING

Sweep blast-cleaning is used to create a fine, even profile on soft materials and to remove portions of a coating.

The parameters for sweep blast-cleaning are as follows:

Equipment and air supply	Free of oil and moisture
Nozzle pressure	Not greater than 300 kPa
Nozzle angle to the surface being cleaned	30 to 60°
Sweeping distance	450 to 600 mm
Abrasive – ultra fine non-metallic grit	Minimum 0,2 mm – maximum 0,8 mm
Grit	Only new grit shall be used

7.4 REQUIREMENTS

7.4.1 SURFACE CONDITIONS

Prepared surfaces shall be in accordance with the table below.

PROPERTY	FOR DRY CONDITIONS	FOR WET/SUBMERGED CONDITIONS	TAPE WRAPPING
Cleanliness to ISO 8501-1 (min) (SIS 055900)	Sa 2½	Sa 3	St 2
Residual dust and debris (SABS Method 769)	0,5%	0,3%	0,5%
Oil, grease and perspiration	Nil	Nil	Nil
Surface Profile Coats up to 200 µm (min)	30 µm	30 µm	-
Coats up to 200 µm (max)	50 µm	50 µm	-
Surface Profile Coats up to 300 µm (min)	50 µm	50 µm	-
Coats up to 300 µm (max)	80 µm	80 µm	-
Surface Profile Coats up to 500 µm (min)	60 µm	60 µm	-
Coats up to 500 µm (max)	100 µm	100 µm	-
Water soluble salts: Maximum at any point	500 mg/m ²	100 mg/m ²	500 mg/m ²
Average of any 250 cm.	100 mg/m ²	100 mg/m ²	100 mg/m ²

Note: Surface profile shall be about ↓ of the coating thickness.

7.4.2 ABRASIVE MATERIAL

7.4.2.1 MATERIAL

The blast-cleaning abrasive shall be composed of clean, sound hard particles free from foreign substances such as dirt, oil, grease, toxic substances, organic matter, water soluble salts and foreign metals.

7.4.2.2 CERTIFICATION

The abrasive material supplier shall certify that all products supplied conform to all the requirements specified.

7.4.2.3 SHAPE AND SIZE

The individual abrasive particles shall be angular in shape and within the following sizes:

Non-metallic material	0,2 to 0,8 mm or 0,4 to 1,4 mm
Metallic material	0,3 to 0,9 mm



7.4.2.4 HARDNESS

The minimum hardness of abrasive material shall be as follows:

For non-metallic material – 6 on the Moh's scale
For metallic material – 390 HV

7.4.2.5 PH

The pH of the prepared slurry mixture shall not be below 6.2.

7.4.2.6 WATER SOLUBLE SALTS

The conductivity of slurry shall be less than 25 mS/m in accordance with ISO 11127.

7.4.2.7 MOISTURE CONTENT

The moisture content for abrasive material shall not exceed 0.2 percent.

7.4.2.8 RE-CYCLING

Re-cycled blasting-material shall only be used if:

- (a) Blasting-materials were only used on degreased surfaces
- (b) Dust and debris is removed from the blasting-material
- (c) Particles are kept angular and within specified sizes

7.4.3 AIR SUPPLY

The air pressure at the nozzle shall be a minimum of 600 to 700 kPa.

Air supply equipment shall be fitted with efficient oil and water traps to avoid contamination of the surface.

7.5 SURFACE PREPARATION OF OTHER MATERIALS

7.5.1 GALVANIZED SURFACES TO BE COATED

7.5.1.1 PASSIVATION

Surfaces to be coated shall not be passivated.

7.5.1.2 DEGREASING

Galvanized steel surfaces shall be degreased prior to coating, using either a water soluble solvent degreaser in accordance with SABS 1344 and the manufacturer's instructions, or a mild acid-detergent degreasing solution to be approved by the Corrosion Engineer.

7.5.1.3 PROFILE

7.5.1.3.1 Sweep-blasting

Large areas shall be prepared by sweep-blasting with non-metallic abrasive in accordance with paragraph 7.3.6.3. Cracking, flaking, or any form of delamination of the zinc coating due to excessive blast-cleaning shall not be permitted. Removal of zinc by blast-cleaning shall not exceed 10 µm.



7.5.1.3.2 Mechanical

Surfaces that can not be sweep-blasted shall be abraded manually or mechanically with abrasive paper grade 220 or by using non-metallic abrasive pads.

7.5.1.4 Dust And Debris

Finally, all dust and debris shall be removed by vacuum-cleaning.

7.5.1.5 PRIMER

Primer for galvanised surfaces shall be applied immediately after surface preparation, not exceeding the time limits specified in paragraph 7.3.6.1.1.

7.5.2 ALUMINIUM SURFACES TO BE COATED

Aluminium surfaces to be coated shall be treated as follows:

7.5.2.1 DEGREASING

Surfaces shall be degreased in accordance with paragraph 7.3.3.

7.5.2.2 PROFILE

Sweep-blast with non-metallic abrasive in accordance with paragraph 7.3.6.3.

7.5.2.3 DUST AND DEBRIS

All dust and debris shall be removed by vacuum-cleaning.

7.5.2.4 PRIMER

Primer for aluminium surfaces shall be applied immediately after surface cleaning, not exceeding the time limits specified in paragraph 7.3.6.1.1.

7.5.3 CORROSION RESISTANT AND STAINLESS STEEL

Components fabricated from stainless steel shall not be contaminated with iron or mild steel.

7.5.3.1 UN-COATED SURFACES

Stainless steel surfaces shall not be contaminated with carbon steel, scratched or stressed.

The following areas shall be pickled and passivated:

- (a) All un-coated areas.
- (b) Ground and sheared edges.
- (c) Heat affected zones caused by welding or cutting.

It is recommended that, if possible, pickling and passivation be done by the dipping process.

Proprietary pickling and passivation chemicals (as supplied by approved suppliers) shall only be used in accordance with the manufacturer's recommendations. Care shall be taken not to exceed the maximum contact time recommended.



After pickling and passivation, surfaces shall be very thoroughly washed with clean potable water to remove all traces of acid. Surfaces shall be allowed to dry, then polished where necessary, using polishing compounds recommended by the stainless steel manufacturer.

7.5.3.2 SURFACES TO BE COATED

7.5.3.2.1 Degreasing

Surfaces shall be degreased in accordance with paragraph 7.3.3.

7.5.3.2.2 Profile

Corrosion resistant steel surfaces shall be blast-cleaned with stainless steel grit or non-metallic abrasive to create a profile in accordance with table 7.4.1. The use of steel shot and steel or cast iron grit is strictly prohibited.

Where blasting is impractical, the surface shall be roughened manually with abrasive paper grade 220, disc grinders or flapper wheel abrasive pads. In all instances, clean, uncontaminated equipment must be used.

Surface profile shall be in the range of 30 to 50 µm.

7.5.3.2.3 Dust and Debris

Dust and debris shall be removed by vacuum-cleaning.

7.5.4 SYNTHETIC MATERIALS TO BE COATED

7.5.4.1 DEGREASING

Surfaces shall be degreased in accordance with paragraph 7.3.3.

7.5.4.2 PROFILE

Abrade the surface with abrasive paper grade 220 to achieve a uniform matt finish.

7.5.4.3 DUST AND DEBRIS

Dust and debris shall be removed by vacuum-cleaning.

7.5.5 COATED SURFACES

7.5.5.1 PRIMED SURFACES TO BE OVER-COATED

7.5.5.1.1 Degreasing

Surfaces shall be degreased in accordance with paragraph 7.3.3.

7.5.5.1.2 Profile

Primers to be over coated outside the over-coating period shall be abraded with abrasive paper grade 220 to a uniform matt finish.

All un-coated areas and all areas with micro rust shall be re-blasted to the original surface finish as specified.

7.5.5.1.3 Dust and Debris

Dust and debris shall be removed by vacuum-cleaning.



7.5.5.2 COATED SURFACES TO BE REPAIRED

Spot repairs shall be carried out in accordance with the original specification or as specified by the Corrosion Engineer. Repairs shall overlap the undamaged area by a minimum of 25 mm. Repairs shall be built up to the original undamaged coating thickness.

7.5.5.2.1 Preparation of Bare Areas.

Bare areas shall be prepared by spot-blasting to Sa 3 in accordance with paragraph 7.3.6. If spot-blasting is not possible, clean with abrasive paper grade 220 to a bright metal surface.

7.5.5.2.2 Soluble Salts

The surfaces shall be tested for water soluble salts in accordance with paragraph 7.3.5.

7.5.5.2.3 Feathering of Coated Surfaces

The surrounding paint, which must be intact, shall be feathered for a minimum distance of 25 mm beyond the damaged areas.

7.5.5.2.4 Dust and Debris

Dust and debris shall be removed by vacuum-cleaning.

7.5.5.3 COATED SURFACES TO BE OVER COATED

7.5.5.3.1 Degreasing

Surfaces shall be cleared of all contamination and degreased in accordance with paragraph 7.3.3.

7.5.5.3.2 Profile

Coated surfaces to be over-coated outside the over-coating period shall be abraded with abrasive paper grade 220 to a uniform matt finish.

7.5.5.3.3 Dust and Debris

Dust and debris shall be removed by vacuum-cleaning.

7.5.5.3.4 Solvent-wiping

The surfaces to be coated shall be wiped with the solvent specified by the coating manufacturer and approved by the Corrosion Engineer.

Further coats shall then be applied as specified in the Project Specification.

7.6 TEST METHODS

Tests, instruments, methods and criteria shall be as specified below or in the Project Specification.

7.6.1 FREE OF OIL AND GREASE

7.6.1.1 WETTING WITH WATER

All surfaces cleaned of oil and grease shall be tested using the "water-break-free" method. The surface shall be wetted with water and the entire surface shall be covered by an unbroken film.



DWS 9900: STANDARD SPECIFICATION: CORROSION PROTECTION
C1: CORROSION PROTECTION OF STEEL PIPES AND SPECIALS FOR PIPELINES



7.6.1.2 SOLVENT-WIPING

Where water soluble lubricants may be present the surface shall be further tested by wiping with a clean cotton wool swab soaked in solvent. No stain shall be evident on the swab after solvent-wiping.

7.6.2 WATER SOLUBLE SALT CONTAMINANTS

Substrate surfaces shall be tested for the presence of water soluble salt contaminants in accordance with SABS Method 770 or by means of the Weber Reilly Test.

7.6.3 STANDARD OF MECHANICAL SURFACE PREPARATION

Mechanical surface preparation shall be visually compared to the standard shown in SABS ISO 8501-1.

7.6.4 BLAST PROFILE

The blast profile of the substrate surfaces shall be determined in accordance with SABS Method 772.

7.6.5 RESIDUAL DUST AND DEBRIS

Substrate surfaces shall be tested for the presence of residual dust and debris in accordance with SABS Method 769.

7.6.6 BLASTING-MATERIAL

All blasting-materials shall be approved by the Corrosion Engineer.

7.6.6.1 METALLIC ABRASIVE

Abrasive shall be tested in accordance with ISO 11125 for particle size, hardness, density, foreign matter and moisture.

7.6.6.2 NON-METALLIC ABRASIVE

Abrasive shall be tested in accordance with ISO 11127 for particle size, hardness, density, moisture and water soluble contaminants.



8 EPOXY COATING SYSTEM

8.1 STANDARDS

Equipment, materials and operational methods shall comply with the relevant SABS, ISO, BS, DIN or equivalent American Standard.

The Contractor shall ensure that he is in possession of the latest editions of all the relevant National Specifications, Codes of Practice or Standards referred to in this specification.

Reference is made to the latest issues of the following Standard Specifications:

SABS	1091	National colour standards for paint.
SABS	1217	The production of painted and powder coated steel pipes.
SABS Method	769	Cleanliness of blast-cleaned steel surfaces for painting (dust and debris).
SABS Method	772	Profile of blast-cleaned steel surfaces for painting.
SABS ISO	2808	Determination of film thickness.
SABS ISO	8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
BSS	5493	Protective coating of iron and steel structures against corrosion.
SABS ISO	9000	Model for quality assurance in production and installation.

8.2 MATERIAL

- (a) The Contractor shall have the latest editions of all the relevant National Specifications and Codes of Practice and the manufacturer's data sheets of materials to be used available.
- (b) Two pack Epoxies shall be in accordance with SABS 1217. Preference will be given to Contractor's utilising solvent free Epoxies in confined spaces.
Two pack Epoxies offered shall be either polyamide or polyamine cured.
- (c) Multi-purpose Epoxy shall be of the high build, modified aluminium Epoxy mastic type, containing at least 90% solids.
- (d) Materials and procedures shall comply with the relevant SABS Specifications and Codes of Practice.
- (e) All materials in a coating system shall be purchased from the same manufacturer unless approved by the Corrosion Engineer.
- (f) Details of coating materials to be supplied and approved – refer to paragraph 3.1.
The Contractor shall only proceed with the purchase of coating materials upon receipt of written approval from the Corrosion Engineer.
- (g) Materials offered and subsequently approved shall not be changed without written approval of the Corrosion Engineer.

Coating material selection shall also be approved by the material manufacturer/supplier. The Contractor shall receive a written assurance from the material suppliers that the materials comply with the specified requirements.



(h) All coating materials shall be delivered in the manufacturer's original containers, clearly marked with the following:

- Manufacturer's name
- Product Brand and Reference Number
- Batch Number which may incorporate the date of manufacture
- Abbreviated instructions for storage and use of material, which shall include mixing ratios of the components of multi-component materials, minimum and maximum temperature of application and the method of application
- The SABS mark where applicable

(i) All coating materials shall be kept in an approved dry and enclosed store. The temperature shall not drop below 0°C nor exceed 40°C.

(j) Usage of materials shall be on a first in, first out basis and no materials shall be used that have exceeded the shelf life recommended by the manufacturer.

8.3 SPECIAL COATING AREAS

(a) Areas that are inaccessible after assembly shall be prepared and fully coated with the specified system to the specified requirements before assembly. The coating shall be fully cured before assembly.

(b) Mating surfaces of joints shall be coated with primer (where specified) or first coat only. The coating shall be uniform in thickness and shall not interfere with the mechanical tolerances. After assembly the outside surface of the joints shall be fully coated.

(c) Steel edges to be welded after coating shall not be coated for a distance of 50 mm from the welding edge. The unlined strip of grit blasted surface shall be temporarily protected with a coat of (red or a different colour to the lining/coating) weldable primer between coating application and installation.

(d) Friction grip areas shall be left un-coated unless otherwise specified.

8.4 APPLICATION

8.4.1 ACCEPTABILITY OF ITEMS TO BE COATED

Shall conform to sub-clause 4.1.1 of SABS 1217, with the proviso that pipes shall read items to be coated.

8.4.2 SURFACE PREPARATION

The Contractor shall satisfy himself that the condition of each item to be coated is such that it is fit for coating or lining, or both, as relevant. Immediately after surface preparation each item or special shall be examined, including the inside surface, where possible, for compliance with the relevant requirements of this sub-clause.

Pre- and surface preparation shall conform to Sections 6 and 7 respectively.

For pipes and specials intended for butt welding the prepared surfaces shall extend to the pipe ends.

8.4.3 COATING THICKNESSES

Coating thicknesses shall conform to Section 5 or as specified in the Project Specification.



8.4.4 MANUFACTURER'S INSTRUCTIONS

Recommendations supplied by the manufacturer in the form of the latest edition of printed data sheets, or given in writing on the manufacturer's letterhead, shall be followed.

The following details shall be made available to the applicator:

- (a) Brand and type of epoxy resin
- (b) Mixing and thinning instructions
- (c) Recommended type and quantity of solvent required for thinning during application
- (d) Pot life of mixed product
- (e) Minimum and maximum recommended dry film thickness per coat
- (f) Recommended time intervals between coats
- (g) Recommended minimum and maximum steel surface temperatures during application
- (h) Time for complete drying and curing on steel surfaces
- (i) All relevant information the Supplier wishes to submit on his product
- (k) Recommended method of coating application

Verbal information by the manufacturer's representative will not be accepted unless confirmed in writing by the Company.

8.4.5 COATING APPLICATION

8.4.5.1 ENVIRONMENTAL CONDITIONS

8.4.5.1.1 Dusty Conditions

Coatings shall not be applied in dusty or contaminated conditions.

8.4.5.1.2 Surface Temperature

Coatings shall not be applied if the surface temperature of the steelwork is less than 3°C above dew point or outside the range 5-40°C, unless otherwise specified by the coating manufacturer.

8.4.5.1.3 Relative Humidity and Time of Application

The first coat shall be applied as soon as possible after blast cleaning, but not exceeding four (4) hours if the relative humidity (RH) is below 70% or two (2) hours if the RH is between 70% and 85%. Refer to paragraph 7.3.6.1.

8.4.5.1.4 Ambient Temperature

Coatings shall not be applied when the ambient temperature is less than the minimum or greater than the maximum specified by the manufacturer of the coating material.

8.4.5.2 MIXING

The Contractor shall ensure that all paints are mixed in accordance with the requirements of Specification BS 5493.

All coating components, particularly two- or multi-component materials, shall be thoroughly mixed until a homogeneous mixture is achieved.

In the case of two-pack materials, each component containing pigments shall be thoroughly mixed. The two components shall then be mixed together in the proportions supplied by the Manufacturer until the mixture is completely homogeneous. For two pack materials, the use of part of the contents (split packs) is strictly forbidden unless the components can be accurately measured to within 0,5% of material by volume. Splitting of packs will only be accepted if



DWS 9900: STANDARD SPECIFICATION: CORROSION PROTECTION C1: CORROSION PROTECTION OF STEEL PIPES AND SPECIALS FOR PIPELINES



measurement of components is done by the use of a laboratory volume beaker (0-1000 ml) and mixed in the precise volume specified by the manufacturer.

In the case of solvent based Epoxy materials, it is recommended that the mixed material be allowed to stand for an induction period, as recommended by the manufacturer, before use.

During application, coating materials shall be agitated regularly to keep the solids in suspension. The preparation time, induction time and pot life of these materials shall be closely adhered to.

8.4.5.3 APPLICATION REQUIREMENTS

8.4.5.3.1 Equipment

Application equipment shall be maintained in a clean condition and in good working order.

The use of equipment not maintained in good condition may lead to rejection of the coating.

8.4.5.3.2 Compatibility of Coats

All primer, intermediate and finishing coats shall be mutually compatible.

8.4.5.3.3 Surface Restoration

Should immediate lining/coating not be possible, or should any atmospheric oxidation take place between the completion of blast cleaning and commencement of lining/coating, such oxidation shall be removed by flash blasting to restore the specified surface finish. Removal of dust and debris shall be in accordance with paragraph 7.3.6.1.5.

8.4.5.3.4 Supports

During coating application, the items shall be so supported to prevent damage to the wet coatings until the coatings have hardened adequately. Items shall remain supported during curing, storing and handling.

8.4.5.4 METHOD OF APPLICATION

8.4.5.4.1 Application

Epoxy coatings shall be applied by any appropriate method recommended by the manufacturer thereof, and approved by the Corrosion Engineer.

8.4.5.4.2 First Coat

The first coat shall be applied to a minimum dry film thickness of 40 µm above the peaks of the blast profile.

8.4.5.4.3 Cleanliness

During application and curing of the layers, the items shall be protected against contamination by dust or other foreign matter and shall be kept dry and shaded from direct sunlight.

All coats shall be clean and free from dust, oil, moisture and perspiration before over-coating.

Operators handling blast-cleaned or partially painted surfaces shall wear clean gloves to avoid contamination of the surface.



8.4.5.4.4 Stripe Coat and Crevices

All metal edges, up stands, welds, bolts and nuts shall be adequately coated. Additional stripe coatings shall be applied after initial priming, if ordered by the Engineer.

Special attention shall be given to crevices and edges to ensure complete coverage and uniform paint thickness.

8.4.5.4.5 Second and Subsequent Coats

The second and subsequent layers shall then be applied within the recommended over-coating periods.

8.4.5.4.6 Coat Colours

The colour of each subsequent coat shall be different to that of the previous coat except where two finishing coats of the same colour are necessary to achieve colour uniformity.

8.4.5.4.7 Over-coating Times

Over-coating times shall be not less than the minimum nor greater than the maximum specified by the manufacturer relevant to the ambient temperature.

Strict adherence to over-coating times is particularly important for coatings which are subsequently immersed.

8.4.5.5 PIPE ENDS

(a) Extension of Lining

For flanged pipes or specials and pipes or specials intended for joining with flexible couplings or for site welding by means of double sleeve weld-on couplings, the lining shall extend to the ends of pipes and specials including edges and shall overlap by at least 300 mm on the outside of the pipe. Coatings shall overlap epoxy surfaces on the outside by at least 25 mm.

(b) Butt Weld Edges

For pipes and specials intended for site butt welding, lining and coating shall extend up to a distance of 80 mm from the pipe ends.

The unlined circumferential strip of grit blasted surface shall be temporarily protected between the works and the site with a coat of (red or a different colour to the lining/coating) weldable primer.

8.4.5.6 IN-SITU APPLIED EPOXY LINING

In-situ application shall only be used to make good defects. No welding whatsoever shall be performed on any pipe or special on which the lining or coating has been completed, without the approval in writing of the Engineer. The temporary protected surfaces shall be blast cleaned before coating with the specified system. The approval shall only be considered by the Corrosion Engineer after submission by the Contractor of acceptable proposals for making good un-coated and damaged areas.

8.4.5.7 PROTECTION WITH TAPE WRAP

Pipes to be tape wrapped (when buried in soil) shall be wrapped in accordance with paragraph 12.3.4



8.4.5.8 OVER-COATING WITH POLYURETHANE

8.4.5.8.1 Wet, Submerged or High Humidity Conditions

Pure Aliphatic Polyurethane

- (a) The area to be over-coated shall be abraded with abrasive paper grade 220 to a uniform matt finish.
- (b) The surface shall be vacuum-cleaned to remove dust and debris – refer paragraph 7.3.6.1.5.
- (c) Contaminants shall be removed and surfaces prepared by wiping with an organic solvent.
- (d) Over-coat with a 25 to 35 µm layer of pure Aliphatic Polyurethane in accordance with the Departmental colour code.

8.4.5.8.2 Dry or UV Conditions

Re-coatable Polyurethane

- (a) The area to be over-coated shall be abraded with abrasive paper grade 220 to a uniform matt finish.
- (b) The surface shall be vacuum-cleaned to remove dust and debris – refer paragraph 7.3.6.1.5.
- (c) Over-coat with a 40 µm minimum layer of Re-coatable Polyurethane in accordance with the Departmental colour code.

8.4.5.9 QUALITY OF COATING

8.4.5.9.1 Finish

The fully cured coating shall have a uniform, smooth, gloss finish with proper adhesion.

8.4.5.9.2 Dry Film Thickness (DFT)

The Epoxy coating shall be evenly applied to the minimum final film thickness as specified in section 5 and shall be tested in accordance with paragraph 8.5.4.

8.4.5.9.3 Electrical Insulation Defects

All coated surfaces intended for water immersion or where likely to be frequently wetted under normal service conditions shall show no electrical insulation defects when tested in accordance with paragraph 8.5.3.

8.4.5.9.4 Finishing Coat Colours

The finishing coat colours shall be as specified in the Project Specification in accordance with the Departmental Colour Code.

Colours shall be in accordance with SABS 1091 as follows:

Valves and outlet pipes for raw water	Brilliant green to SABS 1091 code - H10
Valves and outlet pipes for chlorinated filtered water	Arctic blue to SABS 1091 code – F28
Handwheels	Golden yellow to SABS 1091 code – B49

Where not specified, the selection of final colours shall be approved by the Engineer.



8.4.5.9.5 Solvent Entrapment

Coatings showing evidence of entrapped solvents after full cure will be rejected. No inter-coat de-lamination shall be allowed.

The Contractor shall be held responsible for blistering of coatings, when shown to be caused by solvent retention.

8.5 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.

8.5.1 CONTRACTOR'S AND ENGINEER'S INSPECTIONS

Paragraphs 1.4 and 3.1 of DWS 2020 shall apply.

8.5.2 VISUAL INSPECTION

All surfaces shall be inspected visually and shall be free from tears, runs, sags, wrinkles, blisters, change in colour or gloss, orange peel, dirt, visible pinholes, dust or fluff occlusions or any other visible defects.

8.5.3 HOLIDAY INSPECTION (ELECTRICAL INSULATION DEFECTS INSPECTION)

100% of the lining and coating of all pipes shall be tested and there shall be no electrical insulation defects on any area inspected.

Except for coating containing conductive pigment (Zn, Al), low-voltage wet sponge electrical insulation defects inspection shall be carried out in accordance with SABS 1217 for coatings and linings of thickness not exceeding 500 µm.

For films exceeding 500 µm thickness, the high voltage, sparking electrical insulation defects detector is used in accordance with SABS 1217.

Inspection procedure shall ensure that sufficient moisture is present at all times i.e. only measure the bottom section of pipes.

8.5.4 DRY FILM THICKNESS (DFT)

(a) Measurements shall be taken in accordance with SABS ISO 2808, unless the frequency of readings is specified in the Project Specification.

(b) 100% of all coating thicknesses measured shall comply with the minimum requirements of the Project Specification.

(c) In the case of coats applied after the erection of steel work on Site, the frequency at which measurements of the DFT are taken shall be at the discretion of the Engineer's Inspector or the Engineers Representatives, and may be dictated by accessibility.

(d) DFT in excess of the prescribed maxima shall not necessarily constitute reason for rejection if the paint film is demonstrated to be sound in all respects.

(e) Owing to delayed solvent release, solvent-borne coatings shrink over a period of time resulting in a lower film thickness and therefore it is important that DFT measurements be taken within seven days.

DFT measurements taken at times beyond seven days after application, shall not constitute a valid claim against the original satisfactory and documented execution of the work.



- (f) The method used to measure DFT, and the significance of the readings for each particular project, shall be agreed upon by all parties prior to commencement of the work.

8.5.4.1 AUTOMATED SHOP APPLIED LINING AND COATING

The film thickness on the first pipe and thereafter on at least one pipe selected at random from every day's production, but not less than one pipe out of every ten pipes, shall be measured non-destructively by an approved eddy current instrument. At least four readings at equally spaced intervals around the circumference, approximately 300 mm from each end of the pipe, shall be taken. The first reading shall be over the weld bead. When practicable an additional four readings at equally spaced intervals around the circumference in the centre of the pipe shall be taken. The thickness shall not be less than the minimum specified over 100% of the area including weld beads. The Inspectorate may at their discretion supplement the above test by checking wet film thickness on any or all pipes during application of the epoxy resin.

8.5.4.2 HAND AND IN-SITU APPLIED LINING AND COATING

All the applied lining and coating thicknesses shall be tested by means of an approved eddy current or magnetic instrument. At least four readings shall be taken at equally spaced intervals around the pipe circumference at any test point. The first reading shall be over the weld bead. The thickness shall not be less than the minimum specified over 100% of the area including weld beads.

8.5.5 DEGREE OF CURE OF TWO-COMPONENT MATERIALS

The degree of cure of a two-component material will vary with time, temperature and ventilation and shall be assessed by solvent wiping in accordance with the method given in SABS 1217 (methyl ethyl ketone resistance test)

8.6 DAMAGED COATINGS

- (a) All repairs and procedures shall be approved by the Corrosion Engineer and subject to inspection procedures as set out in paragraph 8.5.1.

Where the damage is extensive the remedial procedures shall be agreed with the Corrosion Engineer in writing

- (b) All repairs shall comply with the requirements of the repair-product manufacturer's data sheet. The Engineer may at his discretion request that repaired coating areas undergo adhesion tests.
- (c) Any damage occurring during transit from the Contractor's premises to the site, shall be the responsibility of the Contractor. The Contractor responsible for installation of equipment at site shall repair and damage occurring on site during handling, assembly, storage, transport and erection.
- (d) The repaired area shall be tested in accordance with sub-clauses 8.4 and 8.12 of SABS 1217 for compliance with the relevant requirements for thickness and electrical insulation defects respectively.
- (e) Any item showing electrical insulation defects exceeding an average of five per square metre (a cluster of pinholes within a radius of 25 mm being regarded as a single defective area), or flaking or other signs of loss of adhesion, shall not be repaired. The item shall be blast cleaned and re-coated in accordance with the relevant requirements of the specification



8.7 REPAIR METHODS FOR MINOR DEFECTS

The repair of areas showing electrical insulation defects or low film thickness shall, if approved by the Corrosion Engineer, be carried out as follows:

- (a) Degrease in accordance with paragraph 7.3.3.
- (b) Thoroughly abrade the damaged area, including an adjacent surrounding area of at least 25 mm wide, with a medium grade 220 abrasive paper.
- (c) Vacuum-clean the surface to remove dust and debris in accordance with SABS method 769 and paragraph 7.4.1.
- (d) Wipe the abraded paint surface with methyl ethyl ketone and allow to dry
- (e) Apply as many coats of repair material as necessary to achieve the specified thickness and finish.

NOTE: 1. When solvent borne materials are used, curing time between coats, as specified by the coating material manufacturer, shall be adhered to.

- 2. Apply a final top coat over the repaired area to achieve a pleasing, uniform finish of the item.

8.8 REPAIR METHODS FOR MAJOR DEFECTS

The repair of areas showing damage down to the steel surface shall, if approved by the Corrosion Engineer, be carried out as follows:

- (a) Degrease in accordance with paragraph 7.3.3.
- (b) Blast-clean all damaged areas to Sa 3 (SABS ISO 8501-1).
- (c) Feather the surrounding paint for a distance of 25 mm beyond the damaged areas with a medium grade 220 abrasive paper.
- (d) Vacuum-clean the surface to remove dust and debris in accordance with SABS method 769 and paragraph 7.4.1.
- (e) Wipe only the abraded paint surface with methyl ethyl ketone and allow to dry.
- (f) Apply as many coats of repair material as necessary to achieve the specified thickness and finish.

NOTE: 1. When solvent borne materials are used, curing time between coats, as specified by the coating material manufacturer, shall be adhered to.

- 2. Apply a final top coat over the repaired area to achieve a pleasing, uniform finish of the item.



9 FUSION BONDED EPOXY COATING SYSTEM (HEAVY DUTY)

9.1 STANDARDS

Equipment, materials and operational methods shall comply with the relevant SABS, ISO, BS, DIN or equivalent American Standard.

The Contractor shall ensure that he is in possession of the latest editions of all the relevant National Specifications, Codes of Practice or Standards referred to in this specification.

Reference is made to the latest issues of the following Standard Specifications:

SABS 1217	The production of painted and powder coated steel pipes.
SABS Method 769	Cleanliness of blast-cleaned steel surfaces for painting (dust and debris).
SABS Method 772	Profile of blast-cleaned steel surfaces for painting.
SABS ISO 2808	Determination of film thickness.
SABS ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.

BSS 5493 Protective coating of iron and steel structures against corrosion.
SABS ISO 9000 Model for quality assurance in production and installation.

9.2 MATERIAL

Shall conform to SABS 1217, Type 2, powder coating.

9.3 APPLICATION

9.3.1 SURFACE PREPARATION

Pre- and surface preparation shall conform to Sections 6 and 7 respectively.

9.3.2 COATING THICKNESSES

Coating thicknesses shall conform to Section 5 or as specified in the Project Specification.

9.3.3 COATING APPLICATION

Items shall be heated to a temperature of 200°C (only applicable to heavy items) and coated with Fusion-bonded Epoxy by means of an electrostatic powder gun.

The normal procedures pertaining to powder application shall apply.

On completion of the coating, items shall be cured for 60 minutes at 200°C (mean temperature).

9.3.4 QUALITY OF COATING

9.3.4.1 Finish

The fully cured coating shall have a uniform, smooth, gloss finish with proper adhesion.



9.3.4.2 Film Thickness

The Epoxy coating shall be evenly applied to the minimum final film thickness as specified in section 5 and shall be tested in accordance with paragraph 9.4.4.

9.3.4.3 Electrical Insulation Defects

All coated surfaces intended for water immersion or where likely to be frequently wetted under normal service conditions shall show no electrical insulation defects when tested in accordance with paragraph 9.4.3.

9.3.4.4 Finishing Coat Colours

The finishing coat colours shall be as specified in the Project Specification in accordance with the Departmental Colour Code.

Colours shall be in accordance with SABS 1091.

Where not specified, the selection of final colours shall be approved by the Engineer.

9.4 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance and SABS 1217.

9.4.1 CONTRACTOR'S AND ENGINEER'S INSPECTIONS

Paragraphs 1.4 and 3.1 of DWS 2020 shall apply.

9.4.2 VISUAL INSPECTION

All surfaces shall be inspected visually and shall be free from tears, runs, sags, wrinkles, blisters, change in colour or gloss, orange peel, dirt, visible pinholes, dust or fluff occlusions or any other visible defects.

9.4.3 HOLIDAY INSPECTION (ELECTRICAL INSULATION DEFECTS INSPECTION)

100% of all coated surfaces shall be tested and there shall be no electrical insulation defects on any area inspected.

Inspection procedure shall ensure that sufficient moisture is present at all times.

For films exceeding 500 µm thickness, a high voltage, electrical insulation defects detector shall be used in accordance with SABS 1217.

9.4.4 FILM THICKNESS

- (a) Measurements shall be taken in accordance with SABS ISO 2808.
- (b) 100% of all coating thicknesses measured shall comply with the minimum requirements of the Project Specification.
- (c) Film thickness in excess of the prescribed maxima shall not necessarily constitute reason for rejection if the coating is demonstrated to be sound in all respects.
- (d) The method used to measure film thickness, and the significance of the readings for each particular project, shall be agreed upon by all parties prior to commencement of the work.



9.4.5 DEGREE OF CURE OF FUSION-BONDED MATERIALS

The degree of cure of fusion-bonded material shall be assessed by solvent wiping in accordance with the method given in SABS 1217 (methyl ethyl ketone resistance test)

9.5 DAMAGED COATINGS

- (a) All repairs and procedures shall be approved by the Corrosion Engineer and subject to inspection procedures as set out in paragraph 8.5.1.

Where the damage is extensive the remedial procedures shall be agreed in writing with the Corrosion Engineer.

- (b) All repairs shall comply with the requirements of the repair-product manufacturer's data sheet. The Engineer may at his discretion request that repaired coating areas undergo adhesion tests.
- (c) Any damage occurring during transit from the Contractor's premises to site, shall be the responsibility of the Contractor. The Contractor responsible for installation of equipment on site shall repair any damage occurring on site during handling, assembly, storage, transport and erection.
- (d) The repaired area shall be tested in accordance with sub-clauses 8.4 and 8.12 of SABS 1217 for compliance with the relevant requirements for thickness and electrical insulation defects respectively.
- (e) Any item showing electrical insulation defects exceeding an average of five per square metre (a cluster of pinholes within a radius of 25 mm being regarded as a single defective area), or flaking or other signs of loss of adhesion, shall not be repaired. The item shall be blast cleaned and re-coated in accordance with the relevant requirements of the specification

9.6 REPAIR METHODS FOR MINOR DEFECTS

The repair of areas showing electrical insulation defects or low film thickness shall, if approved by the Corrosion Engineer, be carried out as follows:

- (a) Degrease in accordance with paragraph 7.3.3.
- (b) Thoroughly abrade the damaged area, including an adjacent surrounding area of at least 25 mm wide, with a medium grade 220 abrasive paper.
- (c) Vacuum-clean the surface to remove dust and debris in accordance with paragraph 7.4.1.
- (d) Wipe the abraded paint surface with methyl ethyl ketone and allow to dry
- (e) Apply as many coats of the following repair material as necessary to achieve the specified thickness and finish.
- (i) Solvent free Epoxy or
- (ii) Fusion-bonded Epoxy powder repair kit.

NOTE: 1. Apply a final top coat over the repaired area to achieve a pleasing, uniform finish of the item.



9.7 REPAIR METHODS FOR MAJOR DEFECTS

The total un-coated areas for renovation by the applicator shall not exceed 0,5 percent of the total surface area of a component. Each un-coated area for renovation shall not exceed 2 500 mm². If damaged areas are larger, the items containing such areas shall be re-coated.

The repair of areas showing damage down to the steel surface shall, if approved by the Corrosion Engineer, be carried out as follows:

- (a) Degrease in accordance with paragraph 7.3.3.
- (b) Blast-clean all damaged areas to Sa 3 (SABS ISO 8501-1).
- (c) Feather the surrounding paint for a distance of 25 mm beyond the damaged areas with a medium grade 220 abrasive paper.
- (d) Vacuum-clean the surface to remove dust and debris in accordance with SABS method 769 and paragraph 7.4.1.
- (e) Wipe only the abraded paint surface with methyl ethyl ketone and allow to dry.
- (f) Apply as many coats of the following repair material as necessary to achieve the specified thickness and finish.
 - (i) Solvent free Epoxy or
 - (ii) Fusion-bonded Epoxy powder repair kit.

NOTE: 1. Apply a final top coat over the repaired area to achieve a pleasing, uniform finish of the item.



10 GALVANIZING

10.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

SABS ISO	14713	Protection against corrosion of iron and steel in structures - guidelines.
SABS EN	10240	Internal/external protective coatings for steel tubes.
SABS ISO	1461	Hot-dip galvanized coatings on fabricated iron and steel articles.
SABS Method	772	Profile of blast-cleaned steel surfaces for painting.
SABS ISO	2063	Metallic and other inorganic coatings – Thermal spraying.
SABS ISO	2808	Determination of film thickness.
SABS ISO	8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS	0374-1	The suitability of hot-dip galvanized steel piping for the transportation of water.
SABS ISO	1344	Medium duty solvent detergent.
ISO	752	Zinc ingots.
EN	1179	Zinc and zinc alloys – primary zinc
SABS ISO	9000	Model for quality assurance in production and installation.

10.2 MATERIAL

- (a) The impurities in the molten zinc, as defined in ISO 752 and EN 1179, shall not exceed a total of 1,5%.
- (b) Steel to be hot-dip galvanized shall be:
- (i) For aesthetic appearance
- Aluminium-killed steel or
 - Silicon-killed steel with a Silicon content not exceeding 0,04% and a Phosphorus content not exceeding 0,02%.

NOTE: Material certification shall be supplied.

- (ii) For general corrosion protection
- Aluminium killed steel or
 - Silicon killed steel with a Silicon content not exceeding 0,25% and a Phosphorus content not exceeding 0,02%.
- (c) The condition of articles to be hot-dip galvanized shall comply with "Annexure C" of SABS ISO 1461.
- (d) The condition of tubes to be hot-dip galvanized on a continuous line shall comply with "Annexure A" of SABS EN 10240.

10.3 APPLICATION

- (a) Shall only be done by members of the Hot Dip Galvanizers Association of Southern Africa (HDGASA) in accordance with SABS ISO 9000.
- (b) Shall be in accordance with SABS ISO 1461 and SABS EN 10240 for tubes.



10.4 TOLERANCES

10.4.1 STEEL SPECIALS

Shall be in accordance with clause 6 of SABS ISO 1461.

10.4.1.1 SURFACE

The surfaces shall be free from nodules, blisters, roughness and sharp points. Un-coated areas, flux residues, lumps and zinc ash shall not be permitted.

Notwithstanding Clause 6.1 of SABS ISO 1461, in the case of handrails etc. a high quality surface finish is required and a bright smooth surface shall be achieved. Only materials specified under paragraph 10.2 (b) (i) shall be utilised. Double dipping shall not be allowed.

10.4.1.2 THICKNESS

The thickness of hot-dip galvanizing shall comply with the requirements of the table below.

Minimum coating thicknesses on items that are not centrifuged.

ARTICLES AND ITS THICKNESS	HEAVY DUTY COATING		LIGHT DUTY COATING	
	Coating thickness µm (min)		Local coating thickness µm (min)	Mean coating thickness µm (min)
≥ 6 mm ≤ Steel	105		70	85
3,0 mm ≤ Steel	80		55	70
1,5 mm ≤ Steel	65		45	55
Steel < 1,5 mm	55		35	45
Castings ≥ 6,0 mm	105		70	80
Castings < 6,0 mm	-		60	70

Heavy duty coatings are required except in the following cases:

- (a) Where a high surface finish is required.
- (b) Where otherwise specified in the Project Specification.

10.4.2 STEEL TUBES

Shall be in accordance with clause 7 of SABS EN 10240.

10.4.2.1 SURFACE

The surface of the coating shall be continuous, smooth and free from flux residues.

10.4.2.2 THICKNESS

The thickness shall comply with the requirements of the coating quality A1, in accordance with clause 8, Table 1 of SABS EN 10240, as specified below.

Minimum local coating thickness requirements for coating quality A1

Requirements	Coating quality A1
Minimum local coating thickness on the inside surface except at the weld bead	55 µm
Minimum local coating thickness on the inside surface at the weld bead	28 µm
Minimum local coating thickness on the outside surface	55 µm



10.4.2.3 ADHESION

The coating shall show no evidence of flaking or cracking when tested in accordance with clause 11.4 of SABS EN 10240.

10.4.2.4 COATING QUALITIES

- (a) Coating qualities shall be A1 for water installations – see sub-clause 8.2 of SABS EN 10240.
- (b) The surface of the coating on the inside shall be as smooth as can be achieved by steam blowing.

10.5 TESTING

10.5.1 STEEL ITEMS

To be read in conjunction with paragraph 4.1, Quality Assurance.

10.5.1.1 VISUAL EXAMINATION

Where a superior aesthetic appearance of hot-dip galvanizing is requested, a bright mirror surface finish shall be achieved by the galvanizer.

10.5.1.2 THICKNESS

Thicknesses shall be in accordance with paragraph 10.4.1.2 and shall be tested in accordance with sub-clause 6.2 of SABS ISO 1461.

10.5.2 STEEL TUBES

To be read in conjunction with paragraph 4.1, Quality Assurance.

10.5.2.1 VISUAL EXAMINATION

Where a superior aesthetic appearance of hot-dip galvanizing is requested, a bright mirror surface finish shall be achieved by the galvanizer.

10.5.2.2 THICKNESS

Shall be tested in accordance with sub-clause 11.3 of SABS EN 10240.

10.5.2.3 ADHESION

Shall be tested in accordance with sub-clause 11.4 of SABS EN 10240.

10.5.2.4 CHEMICAL ANALYSIS

Shall be tested in accordance with sub-clause 11.5 of SABS EN 10240.



10.6 REPAIR METHODS

10.6.1 STEEL ITEMS

The total un-coated areas for renovation by the galvanizer shall not exceed 0,5% of the total surface area of a component. Each un-coated area for renovation shall not exceed 400 mm². If un-coated areas are larger, the item containing such areas shall be re-galvanized.

The repair method shall be approved by the Corrosion Engineer before repairs are initiated.

Repairs shall be by zinc thermal spray in accordance with SABS ISO 2063 or three component zinc solvent free Epoxy repair system. The repair shall include removal of any scale, cleaning and any necessary pre-treatment to ensure adhesion – refer surface preparation Section 7.

The coating thickness on the renovated areas shall be a minimum of 30 µm more than the local coating thickness specified in paragraph 10.4.1.2 for the relevant hot-dip galvanized coating unless otherwise specified by the Corrosion Engineer. The coating on the renovated areas shall be capable of giving sacrificial protection to the steel to which it is applied.

10.6.2 STEEL TUBES

- Repairs shall not be allowed on internal surfaces of tubes. Tubes shall be re-galvanized.
- Repairs on external surfaces shall be in accordance with paragraph 10.6.1.

10.7 DUPLEX SYSTEM (HOT-DIP GALVANIZING + ORGANIC COATING)

10.7.1 SURFACE PREPARATION

10.7.1.1 SURFACE PASSIVATION

Items to be over-coated shall not be passivated.

10.7.1.2 CONTAMINANTS AND PHYSICAL FACTORS

The following contaminants shall be removed:

- (a) Galvanizing residues and passivation products.
- (b) Oil and grease.
- (c) Perspiration and oil contamination from contact with hands.
- (d) Dust and chemical contamination.

10.7.1.3 DEGREASING

Galvanized steel surfaces shall be degreased prior to coating, using either a water soluble solvent degreaser in accordance with SABS 1344 and the manufacturer's instructions, or a mild acid-detergent degreasing solution to be approved by the Corrosion Engineer.

10.7.1.4 SWEEP BLAST-CLEANING

Large areas shall be prepared by sweep-blasting with non-metallic abrasive in accordance with paragraph 7.3.6.3. Cracking, flaking, or any form of de-lamination of the zinc coating due to excessive blast-cleaning shall not be permitted. Removal of zinc by blast-cleaning shall not exceed 10 µm.



10.7.1.5 MECHANICAL CLEANING

Surfaces that can not be sweep-blasted shall be abraded manually or mechanically with abrasive paper grade 220 or non-metallic abrasive pads.

10.7.2. APPLICATION

Coatings shall be applied immediately after surface preparation in accordance with paragraph 8.4.5. All coating materials shall be applied strictly in accordance with the manufacturer's instructions.

In the case of nuts, bolts and other fasteners, care shall be taken to ensure that all edges are over-coated to the minimum specified thickness.

Only coatings approved by the Corrosion Engineer for application on hot-dip galvanized surfaces shall be used.

For additional protection under high humidity conditions and for colour coding Epoxy and Polyurethane coatings shall be applied to thicknesses specified in paragraph 5.

Epoxy primer may not be required if appropriate two pack Epoxy/ Re-coatable or pure Aliphatic Polyurethane is being used.

10.7.3. REPAIRS OF DUPLEX SYSTEM

To repair coatings damaged during transportation, handling or erection, the following procedures shall be followed:

10.7.3.1 DAMAGE DOWN TO BARE STEEL

- (a) Degrease in accordance with paragraph 7.3.3.
- (b) Thoroughly abrade the damaged area, including an adjacent surrounding area of at least 25 mm wide, with grade 80 abrasive paper.
- (c) Vacuum-clean the surface to remove dust and debris in accordance with SABS method 769 and paragraph 7.4.1.
- (d) Where originally over-coated with two component Epoxies, wipe the surface with methyl ethyl ketone and allow to dry.
- (e) Apply sufficient coats of three component zinc solvent free Epoxy to a dry film thickness of 30 µm more than the original thickness of the zinc.
- (f) When dry, apply the same system as originally applied so as to cover the damaged area extending for 25 mm over the surrounding area.

- NOTE:**
- 1. When solvent borne materials are used, curing time between coats, as specified by the coating material manufacturer, shall be adhered to.
 - 2. Apply a final top coat over the repaired area to achieve a pleasing, uniform finish of the item.



10.7.3.2 DAMAGE DOWN TO ZINC SURFACE

- (a) Prepare the surface as described in paragraph 10.7.3.1 - (a), (b) (c) and (d).
- (b) Apply coating as described in paragraph 10.7.3.1 – (e) and (f).

- NOTE:**
- 1. When solvent borne materials are used, curing time between coats, as specified by the coating material manufacturer, shall be adhered to.
 - 2. Apply a final top coat over the repaired area to achieve a pleasing, uniform finish of the item.



11. BITUMEN COATING SYSTEMS

11.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

SABS 1130	Glass fibre reinforcing material for pipe wrapping.
SABS 1136	Cold-applied bitumen primer for steel pipeline protection.
SABS 1137	Hot-applied bitumen for steel pipeline protection.
SABS 1178	The production of lined and coated steel pipes using bitumen or coal tar enamel.
SABS ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS ISO 9000	Model for quality assurance in production and installation.

11.2 MATERIAL

11.2.1 HOT APPLIED BITUMEN AND PRIMER

Shall conform to SABS 1137 & 1178. In all cases where bitumen or primer is to be stored in open tanks at elevated temperatures, or the storage temperature of the bitumen in enclosed tanks exceeds 180°C, the supplier shall be consulted and certificates obtained from him indicating recommended maximum temperatures and temperature/time relationships for storage. These certificates shall be made available to the Engineer or the Inspectorate on request.

NOTE: Bitumen that has been heated to a temperature in excess of 230°C shall be discarded.

11.2.2 COLD APPLIED BITUMEN PRIMER

Shall conform to SABS 1136

11.2.3 GLASS FIBRE TISSUE AND WOVEN WRAP

Shall conform to SABS 1130.

11.3 APPLICATION

11.3.1 ACCEPTABILITY OF PIPES

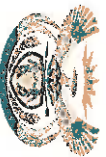
Shall conform to sub-clause 3.3.1 of SABS 1178.

11.3.2 SURFACE PREPARATION

Surfaces shall be prepared in accordance with Section 7 and shall conform to sub-clause 3.3.2 of SABS 1178 with preparation grade Sa 2½ of ISO 8501-1 and surface profile amplitude 75 micrometers (µm)

11.3.3 LINING

- (a) Primers shall be applied in accordance with clause 3.5 of SABS 1178. The lining shall then be applied in accordance with clause 3.6 of SABS 1178, except that the maximum lining thickness shall be 5 mm.



- (b) Where pipe ends are intended for jointing by butt welding, the lining shall be cut back 100 mm from each end of the pipe. The primer shall however extend over the full length of the pipe.

11.3.4 COATING

11.3.4.1 COATING PROCEDURE

The coating procedure shall conform to sub-clauses 3.5.2, 3.7.2 and 3.7.3 of SABS 1178 and as specified here.

11.3.4.2 RE-INFORCED COATING

The re-inforced wrapping shall be of glass fibre tissue and shall have a fifty (50) percent overlap from one end of the pipe to the other. On completion of the first wrap a further coat of hot bitumen of temperature not exceeding 230°C shall be applied, whilst a second wrap shall be applied in the same manner as the first, but in the reverse direction. On no account shall the bitumen layer between two wraps be less than 1 mm thick.

The minimum cover of bitumen over the second glass fibre tissue wrap shall not be less than 1 mm. The nominal thickness of the completed coating shall be 5,5 mm. The coating surface shall be free of surface craters, crazing, laminations, and pinholes and shall have an acceptable smooth surface.

11.3.4.3 ARMoured COATING

Armoured coated pipes shall, where specified in the Schedule of Quantities and in the documents, be "armoured" against mechanical damage as follows:

Immediately after completion of the second glass fibre tissue (to SABS 1130, Type 1) wrap, a further coat of hot bitumen, not exceeding 230°C, shall be applied with bitumen impregnated woven glass fibre reinforcement, (to SABS 1130, Type 2 or Type 3) as in the above paragraphs (a) and (b).

It shall be helically wound around the pipe as a single wrap from end to end, applied under tension with a minimum overlap of 35 mm.

On no account shall the minimum thickness of the bitumen layer between the outer wrap and the second tissue wrap be less than 1,5 mm.

The minimum cover of bitumen over the woven glass fibre outer wrap shall not be less than 1,0 mm.

The nominal thickness of "armoured" coatings shall be 7 mm.

11.3.4.4 PIPE ENDS

Treatment of pipe ends shall conform to sub-clause 3.7.11 of SABS 1178.

Where pipe ends are intended for jointing by slip couplings, the coating shall be cut back 250 mm from the end of the pipe.

11.3.4.5 REFLECTIVE FINISH

Reflective finishes shall conform to paragraph 11.3.7 and sub-clause 3.7.10 of SABS 1178.

11.3.5 BITUMEN COATING OF PIPES WITH LININGS OTHER THAN BITUMEN

Bitumen and glass fibre reinforcement shall comply with paragraphs 11.2.1 and 11.2.3 respectively. Cold applied bitumen primer shall conform to SABS 1136.



11.3.5.1 APPLICATION OF COATING

- (a) Within four (4) hours of having been grit blasted, and provided the pipes and specials are kept dry and free of dust, cold applied bitumen primer shall be applied by brush, spray, roller or mechanical equipment. The pipe or special shall be supported on skids or in any other suitable manner to avoid damage to and contamination of the primed surface. Primer shall be applied in a uniform manner and at the coverage rate specified or as recommended by the manufacturer, but at a rate of not less than 0,8 litres per square metre of pipe surface. Particular care is required to ensure complete penetration and coverage of welds and sharp edges. All defects in priming shall be immediately touched up by brush, care being taken to overlap the joint with the correctly primed area. Care shall be taken not to contaminate the inside of the pipes or specials with the primer.

All equipment used for priming shall be maintained in a clean condition. Primer shall be stored in sealed containers and before material is drawn from containers, the contents shall be agitated or stirred to ensure uniformity. After sufficient material for application is withdrawn, containers shall be sealed immediately to prevent contamination or loss of solvent. Material shall not be kept in open containers overnight, nor shall it be exposed to the sun. Primer which has become fouled with foreign substances shall be discarded. Primer shall be maintained at the correct consistency by mechanical agitation during application. Thinners may be used as recommended by the manufacturer, provided the thinners are uniformly mixed with the primer before use.

- (b) As soon as the primer is dry to the touch, but not later than three (3) days after application of the primer and provided primed surfaces are kept clean, dry, free from dust and shaded from sunlight, the primed pipes shall be transferred to a lathe-like coating machine. Coating shall further proceed strictly in accordance with paragraph 11.3.4.

Reflective finishes shall only be applied and the specified inspections and non-destructive tests shall only be carried out after the lining, if applicable, has been completed and fully cured.

11.3.6 LINING AND COATING OF SPECIALS

In the case of specials, where length and/or shape preclude the application of lining and coating by the mechanical processes as described for pipes, the lining and coating shall be applied by hand. The lining and coating shall not be inferior to that applied by machine. The standards of pre-cleaning of specials and linings and coatings applied to specials shall comply with all the requirements of this specification.

11.3.7 REFLECTIVE FINISH

Bitumen coated pipes shall be given a temporary reflective finish of white wash to minimise heat absorption in transit and prior to laying and back filling on site.

11.4 TOLERANCES

The minimum acceptable lining thickness shall be 2,5 mm and the maximum acceptable thickness 5 mm.

The nominal coating thickness shall be 5,5 mm with a tolerance of -0,5 mm and +0,5 mm.

The nominal thickness of "armoured" coatings shall be 7,0 mm with a tolerance of -0,5 mm and +0,5 mm.

11.5 SPARE PIPES

Spare pipes shall be lined and coated in accordance with paragraph 4.7.



11.6 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.

11.6.1 VISUAL INSPECTION

- (a) Linings shall have a smooth glossy finish and shall be free from ripples, runs, pinholes, craters, bubbles, laminations and visible impurities.
- (b) Coatings shall be free of surface craters, crazing lamination, dis-bonding, un-bonded areas, pinholes and shall have an acceptable smooth surface. No hollow sounds shall be detected when the coating is tapped. The glass fibre reinforcement of the fibre pattern thereof shall not be discernible on the bitumen surface.

11.6.2 NON-DESTRUCTIVE TESTS

11.6.2.1 HOLIDAY TESTING

Shall conform to sub-clause 7.2.2 of SABS 1178.

11.6.2.2 THICKNESS TESTING

On each pipe in the sample, taken in accordance with paragraph 11.6.4.2 (b), the thickness of lining and coating shall be measured by means of a suitable magnetic or eddy current instrument. The instrument must be designed for non-destructive measurement of the thickness of non-metallic films on a magnetic base and be suitable for use on curve surfaces. Set zero and calibrate the instrument on steel similar to that used in the manufacture of the pipe, using a suitable shim of which the thickness is approximately equivalent to the thickness of the coating/lining under test. Take readings as specified in sub-clause 7.2.1 (a) and (b) of SABS 1178.

11.6.3 DESTRUCTIVE TESTS

11.6.3.1 PEEL TEST ON LINING

Shall conform to sub-clause 7.3.2 of SABS 1178. Three tests shall be carried out, one of which shall be over the longitudinal or spiral weld seam, the test areas being approximately 120° apart. The lining shall not be accepted as having passed the test if the average of the three peel length readings is greater than 3 mm.

11.6.3.2 CONDITION OF BITUMEN

Shall conform to sub-clause 7.3.3 (a) and (b) of SABS 1178, to the following standards:

- (a) Fraas breaking point : no failure to +10°C
- (b) Softening point : 100 - 125°C
- (c) Penetration : 1.0 - 2.2 mm
- (d) Resistance to cracking : no cracking down to -10°C

In the event of the condition of bitumen test results not satisfying all these requirements, a series of three (3) other tests shall be carried out by the Contractor, and witnessed by the Inspectorate. The average of the three (3) results for each test shall be determined. If the average does not comply with the requirements, then the day's production, from which lining and coating samples were obtained, shall be rejected.



11.6.4 TEST SAMPLES

11.6.4.1 VISUAL

All pipes to be inspected.

11.6.4.2 NON-DESTRUCTIVE TESTING

(a) Holiday testing

All pipes to be inspected.

(b) Thickness

On the first pipe and thereafter on at least 10 percent of the number of pipes and specials in each day's production.

11.6.4.3 DESTRUCTIVE TESTING

Sufficient lining and coating material shall be removed from the ends of at least one pipe selected at random from that day's production for the purpose of carrying out the tests. The peel test shall be carried out the next day on the same pipe.

11.7 REPAIR METHODS

11.7.1 DAMAGE TO SUBSTRATE

Areas dis-bonded or damaged through to the substrate shall be repaired as follows:

- (i) The problem areas shall be stripped back to the substrate and the edges feathered back for 100 mm minimum to achieve S12 of ISO 8501.
 - (ii) The repair shall be effected by firstly applying a coat of primer
 - (iii) (a) Using liquid bitumen and cut pieces of glass fibre tissue or a blanket, rebuild the coating to the original specification. Gas heated repair irons shall be used to blend in the various layers or
 - (b) Apply a layer of the "torch on" bitumen tape with 50 mm overlap by heating the side of the tape with a gas torch until the compound is glossy and just molten. Then smooth firmly onto the surface to eliminate air pockets and voids.
- Overlaps and seams shall be smoothed and sealed by tooling with a heated bullnose trowel

11.7.2 PARTIALLY DAMAGED

Areas partially de-laminated or damaged through the thickness shall be repaired as follows:

The de-laminated or damaged areas shall be stripped back to the lamination or bottom of the damage and using liquid bitumen and cut pieces of glass fibre tissue, the coating shall be rebuilt to the original specification. Gas heated repair irons shall be used to blend in the various layers.

11.7.3 ELECTRICAL INSULATION DEFECTS

Electrical insulation defects (holidays) shall be repaired by hot ironing.

11.7.4 TOP COAT

Completed repairs shall be protected as per paragraph 11.3.7.



12 TAPE WRAPPING SYSTEM

12.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

SABS 1117	Plastic wrappings for the protection of steel pipelines.
SABS 0129	Plastics tape wrapping of steel pipelines.
SABS ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS ISO 9000	Model for quality assurance in production and installation.

12.2 MATERIAL

Polyethylene pressure-sensitive or polyethylene laminated to an elastomeric layer of butyl rubber tapes shall conform to SABS 1117, types A, B or C.

12.3 APPLICATION

12.3.1 GENERAL

Steel pipes, fittings and specials, protected by means of tapes, shall be wrapped in accordance with SABS 0129 as amended and extended by this Specification. All pipes shall be wrapped outside the trench in accordance with acceptable factory applications. Tape wrapping may be carried out in an "over the trench" operation for pipe diameters up to 450 mm.

If in the opinion of the Engineer adverse weather conditions are such as to interfere with the successful application of an efficient corrosion protective wrapping, he shall order a stoppage of work. It shall be regarded that the Contractor has accepted this risk and made provision for it in his tender.

The production and application of the tapes shall be controlled by SABS ISO 9000, Quality System.

12.3.2 SURFACE PREPARATION

Shall conform to clause 3.2 of SABS 0129.

12.3.3 PRIMING

Immediately after cleaning but not later than 4 hours after cleaning, provided the pipe surfaces are kept dry and free from dust, a primer shall be applied according to sub-clause 4.2.1 of SABS 0129.

12.3.4 NORMAL WRAPPING

Tape wrapping shall be applied with sufficient pre-tensioning immediately after priming, in accordance with sub-clause 4.2.2 of SABS 0129, and shall ensure a smooth wrap free from wrinkles, blisters, frayed or torn edges, cracks or other defects even at temperatures up to 65°C.

For normal wrapping, tape shall be applied in two layers with a minimum overlap of 50 mm on both the inner and outer wraps.

Tape joints and repairs shall be done in accordance with sub-clause 4.2.3 of SABS 0129.



Hand wrapping shall only be allowed for short lengths that are inaccessible to a wrapping machine, specials, joints, small diameter pipes and small repairs – refer paragraph 12.6.

12.3.5 ARMOURING

Where armour wrapping is specified, two layers of tape wrapping shall first be applied, with sufficient pre-tensioning immediately after priming, in accordance with sub-clause 4.2.2 of SABS 0129, and shall ensure a smooth wrap free from wrinkles, blisters, frayed or torn edges, cracks or other defects even at temperatures up to 65°C.

The first layer of wrap shall overlap by half the tape width plus 25 mm and the second wrap shall overlap by not less than 50 mm.

The above-mentioned layers of tape shall be armoured by the application of a third layer of pressure-sensitive polyethylene tape with a carrier thickness of 750 micrometers and a minimum overlap of 50%.

Armoured wrappings shall generally be applied at the following positions:

- (a) all road crossings through sleeves and culverts;
- (b) all railway crossings through sleeves or culverts; and
- (c) wherever the Engineer may consider that special conditions warrant such measures.

12.3.6 WRAPPING OF SPECIALS

In the case of specials or pipe lengths where length and/or shape preclude the application of a protective wrapping system by any means, the protection shall be carried out either by bitumen-fibre glass or epoxy coating in accordance with paragraphs 11.3 or 8.4.5 respectively. In the case of access, scour, air valve and farmers off-take tees the special shall be deemed to incorporate at least two (2) diameter lengths either side of the main tee barrel.

12.3.7 ARMOUR WRAPPING OF COATED PIPES

Where armour wrapping of coated pipes is specified, a single layer of pressure-sensitive polyethylene tape with a carrier thickness of 750 micrometers and a minimum overlap of 50% shall be applied.

12.4 TOLERANCES

12.4.1 PRESSURE SENSITIVE TAPE WRAPPING

The minimum thickness of the inner low-density polyethylene tape carrier component shall be 300 µm and the maximum thickness of the outer high-density tape carrier shall be 1000 µm. Total minimum polyethylene thickness of 1450 µm.

The adhesive part of the inner layer shall be a minimum thickness of 1.5 times the polyethylene tape carrier thickness. For the outer layer the adhesive layer shall be at least equal to the thickness of the polyethylene tape carrier thickness.

12.4.2 BUTYL RUBBER LAMINATES

The minimum thickness of the completed wrapping shall be 750 µm. The inner layer shall be a butyl rubber laminate of 450 µm minimum thickness of which the butyl rubber film shall not be less than 200 µm thick and the polyethylene film shall not be less than 200 µm thick.

The outer layer shall be high density pressure tape of 300 µm minimum thickness.



12.5 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.

12.5.1 VISUAL INSPECTION

The wrapping shall have a smooth appearance, free from wrinkles, blisters, bridging across weld beads, frayed edges, cracks, dis-bonding and any signs of physical damage.

12.5.2 NON-DESTRUCTIVE TESTING

(a) Electrical Insulation Defect (Holiday) Testing

The entire wrapping of the pipeline shall be tested with an approved holiday detector equipped with a rolling ring detector around the pipe by the Contractor to the Engineer's satisfaction. The ring shall be in close contact with the surface of the wrapping along the pipe circumference. The test shall be carried out immediately prior to lowering the pipe into the trench. The wrapping on specials or short pipe lengths shall be tested with an approved holiday detector fitted with a copper bristle brush detector of suitable form. The wrapping shall exhibit no holidays when tested with an effective voltage of 12 kV at a nominal pulse frequency of not less than 30 Hz.

The Engineer may instruct any length of pipe or any number of specials to be re-tested using a holiday detector with a copper bristle brush detector.

(b) Coating Insulation Test

The Engineer shall carry out a conductance test on the wrapping over any section of pipeline between valves when the pipeline has been wrapped and installed in the trench with padding and back filling completed. The test shall be conducted with the valves temporarily removed from the line, at the Contractor's expense, to ensure complete isolation of the pipeline section under test or between gaps left for tie-ins.

The length of the section of pipeline under test shall be carefully measured and the conductance over the section tested shall not exceed 180 micro-Siemens per square metre of pipe surface under all conditions of test. If the results of the test for the section of pipeline tested are not satisfactory, two sections immediately adjacent to the testing section will be tested. If the results on one or both of these sections tested are not satisfactory, all sections of wrapped pipeline shall be tested.

12.5.3 DESTRUCTIVE TESTING

The Engineer may from time to time collect samples of 10 metres of each type of tape and one litre of primer for testing, for compliance with the specification, by any independent laboratory appointed by the Engineer. The supply of samples shall be for the Contractor's account. The Engineer reserves the right to reject the whole batch of materials from which unsatisfactory samples were obtained.

12.5.4 REPAIRS

The Contractor shall be required to locate areas of faulty protection on all sections on which unsatisfactory results are obtained and to affect the necessary repairs. The cost of this work and all additional materials provided or supplied, including the reinstatement of the trench and the retest shall be for the Contractor's account.



12.6 REPAIR METHODS

Where damage to the wrapping on a pipeline has occurred and where there are creases, wrinkles and folds in the wrapping, proceed as follows:

12.6.1 SMALL DAMAGED AREAS

If the width of the tape being used exceeds by at least 100 mm the length of the section affected, cut the area of damaged wrapping away to bare metal leaving no raised edges or protrusions.

Clean and prime the exposed area in accordance with paragraphs 12.3.2 and 12.3.3 and apply a patch of tape, ensuring an overlap of not less than 50 mm on all sides onto the surrounding wrap.

Apply by hand-wrapping with a 55% overlap, a further layer of tape commencing two turns before and continuing for two turns beyond the patch.

12.6.2 LARGE DAMAGED AREAS

Where the extent of damaged or faulty wrapping is such that the tape cannot span the affected area and provide a 50 mm overlap on all sides it must be completely remove from the pipe over the affected section. The area must be cleaned and primed in accordance with paragraphs 12.3.2 and 12.3.3. The pipe must be re-wrapped with a 55% overlap, commencing two turns before and finishing two turns beyond the bared section.

12.6.3 DAMAGE ON DOUBLE WRAP

Where damage or a defect has occurred in a section that has been double wrapped and in the case of small holidays, the outer wrap shall be removed for a distance equal to three (3) times the width of the inner wrap tape on each side of the damaged area.

The appropriate procedure given in paragraphs 12.6.1 or 12.6.2 shall be used to effect the repair of the inner wrap.

The outer wrap shall be re-instated in accordance with paragraph 12.3.5.

12.6.4 OUTER WRAP DAMAGE

Where damage extends through an outer wrap/rockshield (see Section 6 of SABS 0129), this should be carefully removed for a distance equal to three (3) times the width of the inner wrap tape on each side of the damaged area without damaging the inner wrapping.

The repair shall be carried out by the appropriate method given in paragraphs 12.6.1 or 12.6.2 and the outer wrap/rockshield re-instated in accordance with paragraph 12.3.5.



13 PETROLATUM WRAPPING SYSTEM

Profiling mastic and mastic blankets are used for corrosion protection of couplings and flanges in chambers with high humidity and buried in soil.

13.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

SABS ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS 0129	Plastics tape wrapping of steel pipelines.
SABS ISO 9000	Model for quality assurance in production and installation.

13.2 SURFACE PREPARATION

Mechanically clean and wire brush the joint to remove all loose rust, scale, old coating and foreign matter to St 2 (ISO 8501-1).

Areas subjected to chemical attack, salt spray, fungus or bacteria shall be neutralised, rinsed with clean potable water and mechanically cleaned as specified above.

13.3 PRIMING

Brush priming solution well over the entire joint area, leaving a thin film (at a nominal coverage rate of 0,8 m²/litre). Apply a liberal amount around the bolt threads, narrow cavities and crevices.

Paste shall be used where excessive surface corrosion has occurred and under high humidity or submerged conditions.

13.4 APPLICATION OF MASTIC AND TAPE

- (a) Use profiling mastic and/or strips to fill all voids, crevices and sharp or irregular contours.
- (b) Apply mastic tape circumferentially over the area to be coated with a 25 mm overlap on either side of the mastic with a 75 mm end overlap.
- (c) Pre-formed petrolatum mastic blanket system (10 mm thick), supported by a coated tape backing, is available to provide a quick and easy method to apply this system.
- (d) Eliminate all air pockets, wrinkles and creases.

13.5 TOP COAT

13.5.1 BURIED CONDITIONS

Two complete turns of the polyethylene sheeting shall be applied circumferentially. The ends are secured to the pipe barrels with 48 mm wide bands of PVC adhesive tape, which is also applied to the outside diameter of the bolted joint.



DWS 9900: STANDARD SPECIFICATION: CORROSION PROTECTION
C1: CORROSION PROTECTION OF STEEL PIPES AND SPECIALS FOR PIPELINES



13.5.2 HIGH HUMIDITY CONDITIONS

Overcoat with a synthetic coating mixed with a cementitious filler to give a tough, flexible coating. The base coat may be over-coated with water based Acrylics or Epoxies.

NOTE: Detail of application shall be in accordance with the manufacturer's data sheets and approved by the Corrosion Engineer.



14 POLYOLEFIN-BITUMEN WRAPPING SYSTEM

This system shall be used for corrosion protection of galvanised pipes up to 200 mm diameter.

The system comprises an inner layer and outer coating whereby the inner layer is made up of a self-adhesive rubber bitumen compound reinforced with a fully impregnated heat set polyester mat. The outer layer is a tough medium density cross-linked Polyolefin heat shrinkable sleeve.

14.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

SABS ISO 1461	Hot-dip galvanized coatings on fabricated iron and steel articles.
SABS ISO 8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS 1117	Plastic wrappings for the protection of steel pipelines.
SABS 0129	Plastics tape wrapping of steel pipelines.
SABS ISO 9000	Model for quality assurance in production and installation.

14.2 MATERIAL

Tapes shall conform to SABS 1117, type C.

14.3 APPLICATION

14.3.1 SURFACE PREPARATION

Surfaces, hot-dip galvanised in accordance with SABS ISO 1461, shall be degreased as per Sections 6 and 7.

14.3.2 APPLICATION

- (a) Apply an adhesive bitumen layer at 130°C.
- (b) Allow the compound to cure for thirty (30) minutes and cool to room temperature.
- (c) Fit the oversized sleeve onto the pipe protruding 75 mm beyond the pipe ends.
- (d) Shrink the sleeve with a yellow LPG or propane flame.
- (e) Trim the sleeve edges.

14.4 TOLERANCES

Prime coat	20 µm DFT
Inner layer	900 µm nominal
Outer layer	600 µm nominal
Overall thickness	1,5 mm nominal
Colour	Black

14.5 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.



14.5.1 VISUAL INSPECTION

The wrapping shall have a smooth appearance, free from wrinkles, blisters, bridging across weld beads, frayed edges, cracks, dis-bonding and any signs of physical damage.

14.5.2 ELECTRICAL INSULATION DEFECT (HOLIDAY) TESTING

The entire wrapping of the pipeline shall be tested with an approved holiday detector equipped with a rolling ring detector around the pipe by the Contractor to the Engineer's satisfaction. The ring shall be in close contact with the surface of the wrapping along the pipe circumference. The test shall be carried out immediately prior to lowering the pipe into the trench. The wrapping on specials or short pipe lengths shall be tested with an approved holiday detector fitted with a copper bristle brush detector of suitable form. The wrapping shall exhibit no holidays when tested with an effective voltage of 12 kV at a nominal pulse frequency of not less than 30 Hz.

The Engineer may instruct any length of pipe or any number of specials to be re-tested using a holiday detector with a copper bristle brush detector.

14.5.3 ADHESION

Shall be tested in accordance with SABS 1117 (Type C).

14.6 REPAIRS

14.6.1 SMALL REPAIRS (LESS THAN 10 MM)

- (a) Remove any contaminants from the damaged area.
- (b) Cut away any protrusions.
- (c) Use a weld stick and seal the damaged area by gently heating the point of the weld stick until it begins to flow. Press the weld stick firmly over the damaged area.

14.6.2 LARGE REPAIRS

- (a) Remove any contaminants from the damaged area.
- (b) Cut away any protrusions.
- (c) Using a 100 mm wide bitumen tape and beginning 100 mm from the affected area, spirally wrap the tape utilising a 55 percent overlap. Continue to apply the tape until the repair is 100 mm beyond the affected area.
- (d) Alternatively, if the pipe has not yet been installed, a section of sleeve may be placed over the defect and shrunk to at least 100 mm beyond each side of the defect.



15 POLYETHYLENE (MEDIUM DENSITY) COATING SYSTEM

15.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

AS	4321	Fusion bonded medium-density polyethylene – coating and lining for pipes and fittings.
AS	3894	Method 3: Determination of dry film thickness.
ASTM	D1693	Environmental stress cracking.
SABS ISO	1183	Plastics – Methods for determining the density and relative density of non-cellular plastics.
SABS ISO	8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS method	1264	Cathodic dis-bonding test for pipeline coatings.
SABS ISO	2808	Paints and varnishes – Determination of film thickness.
SABS ISO	3270	Paints and varnishes and their raw materials – Temperatures and humidities for conditioning and testing.
SABS	1217	The production of painted and powder coated steel pipes.
SABS Method	767	Cleanliness of blast-cleaned steel surfaces for painting (pictorial standards).
SABS Method	769	Cleanliness of blast-cleaned steel surfaces for painting (dust and debris).
SABS Method	772	Profile of blast-cleaned steel surfaces for painting
SABS ISO	9000	Model for quality assurance in production and installation.

15.2 MATERIAL

Shall conform to AS 4321

15.3 APPLICATION

15.3.1 SURFACE PREPARATION

All surfaces to be coated shall be abrasive blast-cleaned in accordance with Section 7.

15.3.2 APPLICATION

The pipes and specials shall be heated in such a way as not to produce any deleterious contaminants on the surface to be coated.

The polyethylene compound shall be applied to obtain a smooth finished surface.

The coating shall not be post-heated by use of a torch or other flame treatment being applied directly to the coating.

15.3.3 TREATMENT

- (a) Where the coating is terminated externally it shall be set back a nominal distance of 100 mm from the closest assembly weld point and sealed with a primer.
- (b) Where the coating in the joint region terminates internally and the pipe is cement mortar lined, the mortar shall overlap by a minimum of 25 mm.
- (c) The end coating be tapered over a distance not less than the coating thickness.



15.4 TOLERANCES

15.4.1 COATING THICKNESS

When determined with a magnetic thickness gauge in accordance with method 5 of SABS ISO 2808, the minimum coating thickness of the fusion bonded polyethylene applied to pipes and specials shall be as tabled below.

Coating And Lining Thickness

Pipe OD in mm	Minimum coating thickness in mm		
	Coating	Lining	Area at coupling
OD ≤ 273	1.6	1.0	0.8
273 < OD ≤ 508	1.8	1.0	0.8
508 < OD ≤ 762	2.0	1.0	1.0
762 < OD	2.3	1.0	1.0

15.5 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.

15.5.1 VISUAL INSPECTION

The coating shall be smooth, glossy free from pinholes, excessive orange peel, bubbling or excessive runs or sags.

15.5.2 THICKNESS

When tested using a thickness gauge complying with AS 3894 Method 3, the minimum coating thickness of the FBPE shall be as specified in the above-mentioned table. On any pipe the minimum thickness may be up to 0,2 mm less than that specified in the table provided that the area of coating or lining with reduced thickness does not cover more than five (5) percent of the total pipe coating or lining area. Pipes with reduced thickness shall comprise not more than five (5) percent of the pipe coating order.

15.5.3 ELECTRICAL INSULATION DEFECTS

The total coated and lined surfaces of every pipe and fitting. Shall be tested in accordance with Appendix L of AS 4321. All holidays detected shall be repaired in accordance with clause 8 of AS 4321.

15.6 TEST REQUIREMENTS

15.6.1 TYPE TEST

15.6.1.1 GENERAL

Type tests shall be carried out at intervals of no greater than three (3) years and at any change in formulation or source of polyethylene compounds and at any change in application process.

15.6.1.2 POLYETHYLENE COMPOUND

The polyethylene compound to be used for coating, lining and repairs shall be type tested for thermal stability, water absorption, penetration resistance, tensile stress at yield , environmental stress-cracking resistance, density and impact resistance as specified in clauses 6.1.2.2 to 6.1.2.8 of AS 4321.

Test samples may be prepared in the laboratory or in the coating plant.



If the same formulation and source of polyethylene is used for both the coating and lining, then tests on the coating shall also qualify the lining. The impact resistance test is not required for the lining.

15.6.1.3 PRODUCTION TESTS

The coating and lining shall comply with the production test requirements specified in clauses 6.3.2 to 6.3.4 of AS 4321.

15.7 REPAIR METHODS

15.7.1 GENERAL

Where a holiday is located it shall be repaired to produce a continuous coating and lining. Damaged areas that pass the continuity test need not be repaired provided the coating or lining thickness remains greater than or equal to 1.0 mm.

The bare steel surface shall be prepared in such a way to produce a rust-free, clean, abraded surface. The adjacent FBPE coating or lining shall be tapered as specified in clause 5.4 of AS 4321.

All lining repairs shall be in accordance with clause 7.2 of AS 4321.

Where practicable the following coating repair methods shall be used:

- (a) Fusion-bonded repairs as specified in clause 7.2 of AS 4321.
- (b) Heat shrink sleeve repair.
- (c) Hot gas welding repair (for the joint region shown in Figure 1 of AS 4321).

NOTES:

- 1. The repair methods outlined apply to repairs at the application plant only.
- 2. The Corrosion Engineer may specify a particular repair method (see Appendix A of AS 4321).

15.7.2 REPAIR LIMITS

The number of coating repairs (this includes repairs to the joint region, see Figure 1 of AS 4321) shall not exceed three per pipe or fitting. An allowance is made for up to six repairs per pipe or fitting provided that the number of pipes or fittings with this larger number of repairs does not exceed five (5) percent of a pipe coating order. The number of lining repairs shall not exceed three per pipe or fitting.

The area of any single coating repair shall not exceed 0.1 m², and the length of such repair shall not exceed 2 m in the longitudinal direction. The area of any single lining repair shall not exceed 5 000 mm².

15.7.3 REPAIR TEST METHODS

All repairs shall comply with the continuity test requirements of clause 6.3.3 of AS 4321.



16 ELASTOPLASTIC POLYURETHANE COATING SYSTEM

Two component solvent free elastoplastic polyurethane.

16.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

Manufacturer's data sheets/recommendation

SABS	1217	The production of painted and powder coated steel pipes.
SABS Method	767	Cleanliness of blast-cleaned steel surfaces for painting (pictorial standards).
SABS Method	769	Cleanliness of blast-cleaned steel surfaces for painting (dust and debris).
SABS Method	772	Profile of blast-cleaned steel surfaces for painting.
SABS Method	776	Adhesion of coatings (direct pull-off method).
SABS ISO	2808	Determination of film thickness.
SABS ISO	8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS ISO	9000	Model for quality assurance in production and installation.

16.2 MATERIAL

16.2.1 PRIMER

The primer, supplied by the manufacturer of the coating material, shall be compatible with the coating material applied at the manufacturer's specified thickness within the specified over coating time.

16.2.2 COATING

The coating material shall be a solvent free two-component polyurethane hybrid based on a polyester type polyol and aromatic isocyanate. The cured coating shall comply with the following requirements:

- (a) Tensile strength at 3 mm thickness - ASTM D 638 - not less than 15 MPa.
- (b) Adhesion to primed steel - SABS Method 776 - not less than 10 MPa.
- (c) Impact resistance (direct) - ASTM G 14 - not less than 9 Joules.
- (d) Dielectric Strength - not less than 10 kV/mm.
- (e) Elongation at break - not less than 25 %.
- (f) Compressibility - not less than 25 MPa.
- (g) Surface hardness of 5 mm thick sample - not less than 60 nor greater than 80 Shore 'D'.
- (h) Water Vapour Permeability - not greater than 0,5 g/24 h/m²/mm².
- (i) Cathodic dis-bonding - when tested in accordance with ASTM GB Method A, for 60 days, the dis-bonded area shall not exceed 500 mm².



16.2.3 ADHESIVE

Adhesive shall be a two component polyurethane adhesive designed to maximise adhesion between used polyurethane and freshly mixed polyurethane.

16.3 APPLICATION

16.3.1 SURFACE PREPARATION

- (a) Contaminants shall be removed by an appropriate method such as with an organic solvent emulsion cleaner or a suitable detergent.
- (b) All sharp edges shall be rounded off to a 2 mm radius. The prepared surfaces shall extend to the ends of the pipes and specials and around the edges for a width of at least 150 mm on the outside of the pipe.

For pipes and specials intended for butt welding the prepared surfaces shall extend to the pipe ends.

- (c) The surface shall be blast-cleaned with a suitable abrasive to achieve a surface cleanliness of Sa 3 for lining and Sa 2½ for coating to ISO 8501-1, with an average surface profile of 50-100 micrometers (µm), in accordance with SABS method 772.

- (d) Water soluble salts present in the steel after blast cleaning shall not exceed the values in paragraph 7.4.1. Should these values be exceeded, the steel shall be cleaned by washing with clean potable water or by water shrouded or water injected blast cleaning until the soluble salts are within the limits specified above. The steel shall then be allowed to dry, after which it shall be flash blast cleaned to achieve the required degree of cleanliness.

- (e) The surface shall be vacuum-cleaned or be blown clean with uncontaminated dry compressed air to remove dust and debris, in accordance with SABS method 769, to not greater than 0,3 percent.

- (f) The clean pipe surfaces shall be coated within four (4) hours if the relative humidity is below 70 percent or within two (2) hours if the relative humidity is in the range of 70% to 85%.

No blast cleaning or coating application shall take place when:

- (i) The ambient temperature is outside the range of 15 - 40°C or otherwise specified by the manufacturer;
- (ii) The relative humidity is above 85 percent,
- (iii) The surface temperature is less than 3°C above dew point.

16.3.2 APPLICATION

- (a) Apply the primer specified in paragraph 16.2.1 to the manufacturer's specified thickness.
- (b) Apply the solvent free polyurethane by means of an airless spray fitted with metering pumps. The Contractor shall demonstrate that the machine is delivering components in the correct mixing ratio.



16.4 TOLERANCES

- (a) For mildly corrosive/abrasive conditions
The dry film thickness shall be 1.0 mm minimum.
- (b) For corrosive/abrasive conditions
The dry film thickness shall be 3.0 mm minimum.

16.5 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.

16.5.1 VISUAL INSPECTION

The coating shall be smooth, glossy, free from pin holes, excessive orange peel effect, bubbling or excessive runs or sags.

16.5.2 DRY FILM THICKNESS

Shall be inspected in accordance with SABS ISO 2808

16.5.3 ELECTRICAL INSULATION DEFECTS (HOLIDAY) INSPECTION

The coating shall be free from electrical insulation defects when tested with a high voltage holiday detector set at 5 kV and 15 kV for 1 mm and 3 mm dry film thickness respectively.

16.6 REPAIR METHODS

Since polyurethane systems are chemically cured, very thorough abrasion of damaged or defective coating is required to ensure an adequate physical bond.

16.6.1 REPAIRS BEFORE FULL CURE [WITHIN SIXTEEN (16) HOURS OF APPLICATION OF LAST COAT]

- (a) The area to be over-coated shall be abraded with abrasive paper grade 220 to a uniform matt finish.
- (b) The surface shall be vacuum-cleaned or be blown clean with uncontaminated dry compressed air to remove dust and debris.
- (c) Apply brush grade polyurethane in as many coats as are required to achieve the specified thickness free of electrical insulation defects.

16.6.2 REPAIRS AFTER FULL CURE [AFTER SIXTEEN (16) HOURS OF APPLICATION OF LAST COAT]

- (a) The area to be over-coated shall be abraded with abrasive paper grade 220 to a uniform matt finish.
- (b) The surface shall be vacuum-cleaned or be blown clean with uncontaminated dry compressed air to remove dust and debris.
- (c) Apply the coating manufacturer's adhesive primer only to the abraded surface.
- (d) Between thirty (30) minutes and four (4) hours apply brush grade polyurethane in as many coats as are required to achieve the specified thickness free of electrical insulation defects.



17 CEMENT MORTAR LINING SYSTEM

17.1 STANDARDS

Reference is made to the latest issues of the following Standard Specifications:

SABS ENV	197-1	Cement: Composition, specification and conformity criteria.
SABS	1024	Welded steel fabric for concrete reinforcement.
SABS	1083	Aggregates from natural sources.
SABS	1200	Standardised specifications for civil engineering construction.
SABS	0100	Structural use of concrete.
SABS Method	551	Sodium and potassium contents of Portland cement.
SABS Method	769	Cleanliness of blast-cleaned steel surfaces for painting (dust and debris).
SABS Method	830	Chloride content of aggregates.
SABS Method	863	Compressive strength of concrete (including making and curing of the test cubes).
SABS Method	1245	Potential reactivity of aggregates with alkalis (accelerated mortar prism method)
SABS ISO	8501-1	Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of un-coated steel substrates and of steel substrates after removal of previous coatings.
SABS ISO	9000	Model for quality assurance in production and installation.
AWWA	C602	Cement-mortar lining of water pipelines - 4 inches (100 mm) and larger - in place.
BS	3148	Methods of test for water for making concrete (including notes on the suitability of the water).
SIS	05 59 00	Pictorial surface preparation standards for painting steel surfaces. (Swedish.)

17.2 MATERIAL

17.2.1 CEMENT

Cement shall be of type I with a class strength of 42,5 and shall be identified by CEM I : 42,5. The cement shall conform to SABS ENV 197-1.

The alkali content of the cement, when expressed as sodium oxide (Na_2O) equivalent, shall not be greater than 0,6 percent by mass of cement determined in accordance with SABS Method 551 or any other reduced value as determined by the Engineer, where:

$$\% \text{Na}_2\text{O equivalent} = \% \text{Na}_2\text{O} + (0,658 \times \% \text{K}_2\text{O})$$

Cement shall be from the same source and shall be fresh. Cement shall be used strictly in the order of delivery. All cement in storage for longer than eight weeks and all cement in unsealed pockets shall be removed from storage and discarded.

Cement shall be stored in weather-proof bulk silos, or if in pockets, shall be stored in weather-proof sheds provided with damp proof floors at least 300 mm above ground level, stacked on pallets and covered with a waterproof membrane.

17.2.2 AGGREGATES

Both, the coarse aggregate (stone) and fine aggregate (sand) used in the manufacture of concrete or mortar shall conform to SABS 1083.



The aggregates shall be evaluated for potential alkali reactivity using SABS Method 1245.

The chloride content of the sand determined by SABS Method 830 shall not exceed 0,01 percent per mass.

Coarse aggregate shall be suitable for concrete subject to surface abrasion, and of the largest possible size that would allow placement of concrete without difficulty.

Within eight (8) weeks of award of contract, the Contractor shall submit to the Engineer the results of tests carried out on aggregates from the Contractor's proposed source by an independent and competent body. The Engineer reserves the right to take further samples of aggregates at any time from the Contractor's source or from his stockpiles and have same tested for compliance with the specification.

17.2.3

WATER

Water used for concrete, mortar or cement slurry shall be clean i.e. free from oil, acid, alkalis, vegetable and mineral matter.

The water shall generally conform to the recommendations in the appendix to BS 3148.

17.2.4

CONCRETE AND MORTAR

Concrete and mortar ingredients shall be batched by mass and shall be well mixed in mechanical mixers of good condition for a duration of not less than two (2) minutes.

There shall be no re-tempering of the mix after discharge from the mixer. Only fresh concrete and mortar shall be used and all concrete, mortar or cement slurries in a mixed state for longer than thirty (30) minutes shall be discarded.

No additives shall be used, except where approved by the Engineer in writing.

The minimum cement content per cubic metre of concrete shall be 400 kg.

Mortar shall be a mixture of one (1) part cement to two (2) parts fine aggregate, for linings of up to 15 mm thickness and one (1) part cement to three (3) parts fine aggregate for thicker linings. Mortar shall not be used for coatings.

Total water content shall be the minimum required to produce suitable consistency and shall not exceed fifty (50) percent by mass of cement content, allowance being made for the moisture content of aggregates.

150 mm cubes of concrete or mortar made and cured in accordance with SABS Method 863 shall have a minimum compressive strength of 30 MPa after twenty eight (28) days.

17.2.5

WELDED STEEL FABRIC

Welded steel fabric shall conform to SABS 1024, except that wire diameter and mesh sizes shall conform to this Specification.

17.3

APPLICATION

17.3.1

LINING

17.3.1.1

THICKNESS

The thickness of linings on pipes shall generally be as tabled below, except where specified to the contrary in the Schedule of Quantities or on the drawings.



Pipe OD in mm	Thickness of lining in mm		
	Nominal	Maximum	Minimum
273,0 to 609,6	10	13	8
above 609,6 to 1 016	14	16	12
above 1 016,0 to 1 220	16	20	14
above 1 220,0 to 1 620	20	24	16

The thickness of lining on specials shall generally comply with the above, provided the minimum cover of mortar over reinforcement mesh shall not be less than 10 mm.

17.3.1.2 SURFACE PREPARATION

After bare pipes and specials have been tested and inspected for compliance with the applicable specification and after application of coating, if applicable, surface shall be prepared as follows:

- (a) Weld spatter, loose rust and loose mill scale shall be removed by chipping and/or scraping.
- (b) Deposits of grease, oil, bitumen or other contaminants shall be removed by scraping and wiping with rag soaked in white spirit or similar toxic free solvent.
- (c) Other contaminants shall be removed by manual -, mechanical - or abrasive blast cleaning. The standard of cleaning shall not be less than grade St 2 or grade Sa 1 of ISO 8501-1, as appropriate.
- (d) Residual dust and debris on the pipe surface shall be 0,5 percent maximum when tested in accordance with SABS Method 769.

17.3.1.3 SHOP APPLIED LININGS - CENTRIFUGAL SPUN

Within twenty four hours of having been grit blasted and provided the pipe surfaces are kept dry, free of dust, oil and other deleterious contaminants and provided ambient temperatures are above 20°C the pipe shall be transported to a suitable spinning machine. The coating, if applicable, shall be suitably protected against mechanical damage during the handling and spinning operation. Before being placed in the spinning machine, the pipe shall be suitably braced with external stiffening rings, which shall not be removed until the appropriate one of the following periods has elapsed from the time of placing of the lining:

- (a) Seventy two (72) hours when water curing is used; and
- (b) Thirty six (36) hours when steam curing is used.

End gauge rings shall be securely attached to the pipe ends to control the lining thickness, to act as stop end to prevent mortar leakage and to stiffen and hold the pipe ends round.

Each pipe shall be rotated in a spinning machine with its axis horizontal during and for a suitable period after the placing of the lining. The speed of rotation shall be such as to produce a uniform distribution of the cement mortar over the interior surfaces of the pipe.

Sufficient mortar to line completely one pipe to the appropriate nominal thickness specified in paragraph 17.3.1.1 shall be mixed in one batch, and it shall be of such consistency as to minimise segregation during spinning. The mortar shall be placed in the pipe immediately after mixing and before initial set has taken place, and in a manner providing uniform longitudinal distribution of the batch from end to end of the pipe.

As soon as the mortar lining has achieved a uniform thickness over the whole interior surface of the pipe, the speed of rotation shall be increased to a speed that will compact the mortar and is not less than 1 peripheral speed of 17 metres per second. The required speed shall be maintained for such a period as will give the maximum density of mortar and smoothness of



surface, and sufficient bonding to permit removal of the pipe from the machine without injury to the lining.

The ends of the lining shall be finished uniform and square or slightly bevelled as required in paragraph 17.3.1.8.

All water and laitance expelled during spinning shall be removed in such a manner that the surface of the lining is smooth, level and true.

After the lapse of a suitable period after spinning (as determined by experiment), the spun lining shall be given a steel trowelled or smoothing bar finish. A second trowelling may be necessary to remove all laitance and produce a smooth and hard finished surface. The Colebrook-White (k) friction value shall be not more than 0,13 mm.

17.3.1.4 IN-SITU APPLIED LININGS

(a) Standard

Shall be carried out generally in accordance with the provisions of the latest issue of AWWA C602 for "Cement-Mortar Lining of Water Pipeline - 4 in (100 mm) and larger - In Place", subject to the modifications, amendments and amplifications in this Specification.

(b) Curing

The contents of clauses 4.7.2, 4.7.3, 8.7.2 and 8.7.3 of AWWA C602 shall be deleted and shall be replaced by: "Curing by Contractor. The Contractor shall be responsible for careful curing of the mortar lining until the pipeline has been handed over to the Department."

(c) Length of uninterrupted lining

Tenderers shall state in tenders the maximum length of lining which they are prepared to undertake between any two consecutive points of access and under what circumstances they would require this length modified. This factor will be taken into account when assessing the comparative economic merits of tenders.

(d) Methods of lining

For pipe sizes up to 500 mm nominal bore, the "Tate system" of lining is permissible. The "Perkins system" of lining by means of a suitable machine that travels through the pipe and distributes mortar by high velocity centrifugal spraying, followed by a trowelling device, shall be permissible for all pipe sizes.

Tenderers shall submit full details of the system to be employed with special reference to methods of pre-cleaning of surfaces and delivery of mortar to the spraying head.

17.3.1.5 LINING OF SPECIALS

Bends, tees and other specials that cannot be lined by machine shall be manually lined. In case where the nominal diameter exceeds 600 mm the lining shall be reinforced by steel mesh tacked to the inside of the pipe in such a way that it is not in contact with the pipe except where welded. The steel mesh shall be of 2,5 mm diameter steel wire at 100 mm by 50 mm, or equivalent spacing. The minimum cover over the mesh shall be 10 mm.

17.3.1.6 FINISH

The lining shall be well finished with a smooth surface free from excessive laitance and surface irregularities. Projections exceeding a height of 1,5 mm shall be removed by trowelling before the concrete has set, or by grinding after the lining has cured.



The thickness of the lallance, if any, shall not exceed ten (10) percent of the thickness of the lining, or 1,25 mm, whichever is less.

The effective surface roughness of the lining when measured in terms of the Colebrook-White "K" friction coefficient for lining surface effective roughness shall be guaranteed by the suppliers and shall not be more than 0,13 mm when actually measured in the field after completion of the pipeline. No rougher surface will be acceptable.

17.3.1.7 CURING

(a) Water curing

Immediately after the placing of the concrete, the pipe shall be so sealed as to prevent loss of contained water, and the concrete shall be kept continuously moist for a period of at least seven (7) days or, in the case of an in-situ applied lining, until the pipe has been handed over to the Purchaser. During this period steps shall be taken, when necessary, to prevent the temperature of the steel shell falling below 2°C.

(b) Steam curing

Pipes that have shop applied linings, and that have not been coated with bitumen or coal tar may be steam cured.

Immediately after application of the concrete lining, the ends of the pipe shall be completely sealed. After the lined pipe has been standing for not less than two (2) hours, steam shall be injected into it so as to raise the temperature at a rate not exceeding 28°C per hour until the temperature of the lining is within the range 55-70°C.

Steaming shall continue for a further six (6) hours, the temperature of the lining being maintained within the range specified. Steaming shall be discontinued and the pipes shall remain sealed for a further two (2) days from the time that the temperature of the pipe has fallen to ambient. During this period precautions shall be taken to prevent the temperature of the steel falling below 2°C.

During the curing cycle, excluding the two (2) day holding period, the temperature of at least one pipe out of that day's production, shall be recorded by a suitable automatic recording instrument. If the temperature record reveals that the requirements set out above have not been achieved, then the pipes shall be subjected to the full period of water curing as specified in paragraph 17.3.1.7(a).

(c) General

Concrete lined pipes shall not be moved or transported for a period of twenty one (21) days after the date of lining.

17.3.1.8 PIPE ENDS

Where lining takes place before welding, i.e. not in-situ but on site or in the shop, the following shall apply:

(a) For flanged pipes and specials and pipes intended for jointing by couplings, concrete lining shall be ended flush with pipe ends with a 6 mm bullnosing of edges by means of a nosing tool.

(b) For pipes to be butt welded, the lining shall terminate 100 mm from the internal end of each pipe and the end of the lining shall be bevelled to form an angle of approximately 85 degrees between the clear end of the pipe barrel and the lining end.



The unlined circumferential strip of grit blasted surface shall be temporarily protected between the works and the site with a coat of (red or a different colour to the lining/coating) weldable primer.

17.3.2 COATING

17.3.2.1 THICKNESS

The thickness of coatings on pipes and specials shall generally be as tabled below, except where specified to the contrary elsewhere in these documents.

Pipe OD in mm	Thickness of coating in mm		
	Nominal	Maximum	Minimum
273,0	to 609,6	16	18
Above 609,6	to 1 016	20	22
Above 1 016,0	to 1 220	25	25
Above 1 220,0	to 1 620	30	30

17.3.2.2 COVER TO REINFORCEMENT

Nominal coating thickness in mm	Minimum cover to reinforcement in mm
16	10
20	14
25	18
30	20

17.3.2.3 SURFACE PREPARATION

Paragraph 17.3.1.2 shall apply.

17.3.2.4 APPLICATION

(a) Stiffening rings

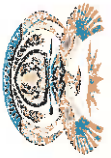
End gauge rings shall be securely attached to the pipe ends to control the coating thickness, to act as stop end to prevent mortar spillage at pipe ends and to stiffen and hold pipe ends round.

(b) Reinforcement

The coating shall be bonded to the pipe surface and shall be reinforced by 2,5 mm diameter round steel wire wound spirally around the total length of the pipe and tack-welded to the pipe surface. The pitch between windings shall not exceed 40 mm. Alternatively, the reinforcement shall consist of 2,5 mm thick, 100 mm by 100 mm steel mesh wrapped around the pipe and tack-welded to the surface. Except where welded, the reinforcement shall not be in contact with the pipe surface.

(c) Cement slurry

Within twenty four (24) hours of having been grit blasted and provided the pipe surfaces are kept dry, free from dust, oil and other deleterious contaminants and provided ambient temperatures are above 2°C on a rising thermometer, the pipe surfaces and reinforcement shall be coated with a slurry consisting of approximately ten (10) litres of water to twenty (20) kilograms of cement. No more of the pipe surface shall be coated at any time than what can be covered with cement mortar immediately without the cement slurry drying out.



(d) Concrete application

Immediately after application of the cement slurry and while the cement slurry is still wet, concrete shall be applied by impact, or under vibration, or by hand plastering where mechanical means of application are not possible.

(e) Finish

The finished coating shall be firm and dense, shall adhere rigidly to the outside of the pipe and the thickness of laitance shall not exceed 1,25 mm. The coating shall furthermore be free from pinholes, craters, cracks, laminations and other imperfections.

(f) Curing

Upon completion of the coating operation and until the coating has set sufficiently to allow the pipe to be handled and transported to the curing site without damage to the coating, the coated pipe shall be fully protected from wind, rain, direct sunlight and against loss of moisture from the coating.

(i) Water curing: As soon as the coating has set sufficiently for the pipe to be handled, the coating shall be kept continuously moist by continuous water spraying for a period of at least 7 days. During this period steps shall be taken to prevent the temperature of the steel shell from dropping below 2°C.

(ii) Steam curing: paragraph 17.3.1.7(b) shall apply, except that steam curing shall continue for 6 hours before end stiffeners and gauging rings are removed. Steam curing shall thereafter continue for a further twelve (12) hours or alternatively, after six (6) hours of steam curing, the coatings may be water cured by continuous water spraying for at least five (5) days.

17.3.2.5 PIPE ENDS

For pipes and specials intended for jointing by flexible couplings, the coating shall be terminated 250 mm from pipe ends with a 6 mm radius bull-nosed outer edge.

For pipes to be butt welded, the coating shall terminate 100 mm from pipe ends and the ends of coatings shall be bevelled to form an angle of approximately 85 degrees between the clear end of the pipe barrel and the end face of the coating.

The unlined circumferential strip of grit blasted surface shall be temporarily protected between the works and the site with a coat of (red or a different colour to the lining/coating) weldable primer.

17.3.2.6 REPAIR OF DEFECTS

Paragraph 17.6.1 shall apply.

17.4 TOLERANCES

The thickness of linings and coatings shall be as given by paragraphs 17.3.1.1 and 17.3.2.1 respectively.



17.5 TESTING

To be read in conjunction with paragraph 4.1, Quality Assurance.

17.5.1 LINING

17.5.1.1 Visual Inspection

(a) Shop applied lining

The cured lining in every pipe and special shall be inspected visually for defects before the pipe leaves the factory, but not sooner than twenty one (21) days after application of the lining.

The lining shall have a smooth, steel floated appearance and shall have no projections exceeding a height of 1,5 mm above immediate lining surface.

Slight surface crazing and hair cracks shall be permissible. All cracks into which a suitable metal depth gauge with a probe of 1,5 mm diameter can be inserted to a depth of half the minimum specified thickness of the lining shall be considered a defect and shall be repaired as described in paragraph 17.6.1 of this specification.

(b) In-situ Lining

Visual inspection of the finished lining shall include the provision of a camera mounted on a suitable trolley which shall be so arranged as to make exposures at intervals of approximately twenty (20) metres throughout the lined pipe.

Accurate records including exposure serial numbers and the relative pipe chainages shall be kept by the Contractor. All records and exposures shall become the property of the Employer.

The Contractor shall supply all equipment, facilities and chemicals required for the processing of films. A full description of the equipment and method proposed shall be submitted with tenders.

Exposures of any completed section of lining shall be processed and be made available immediately after processing. The Engineer may order repeat exposures at any point in the line due to the lack of good definition, lighting, focus or because a defect in the lining is suspected. Repeat exposures shall be to the account of the Contractor. Repeat exposures to clarify suspected defects however, shall, if the suspected defects prove acceptable or non-existent, be to the account of the Department.

17.5.1.2 DESTRUCTIVE TESTING

(a) Thickness of lining and cover to reinforcement

On the first pipe lined and thereafter on one pipe selected at random out of every day's production and after completion of curing, chisel down to bare steel base a representative section of area at least 0,25 square metres of the lining. The area shall contain the weld bead.

Measure distance between steel base and surface of concrete, top of weld bead and surface, and reinforcement mesh to surface of concrete, with a suitable dial gauge or micrometer to an accuracy of 0,1 mm. Take not less than five (5) readings for each pipe and record all readings, the mean of readings, the maximum and the minimum readings.



Repair lining as described in paragraph 17.6.1. Should thickness not fall within the specified ranges, a further two pipes out of the day's production shall be tested. If thickness of any of the two pipes or specials tested shall fail the requirements, the lining of all pipes and specials in that day's production may be rejected.

(b) Water absorption

On first pipe and thereafter on one pipe selected at random out of every day's production, chisel out approximately 0.2 cubic metres of cured lining in as large chunks as possible. Dry sample in oven at 100°C to constant mass. Allow to cool to room temperature and determine dry mass to the nearest gram. Immerse sample in clean water for twenty four (24) hours. Withdraw sample, remove excess surface water and determine saturated mass to the nearest gram.

$$\text{Water absorption \%} = \frac{\text{Saturated mass} - \text{Oven dry mass}}{\text{Oven dry mass}} \times 100$$

(c) Water absorption shall not exceed 6 percent.
Concrete strength

Prepare, cure and test in accordance with SABS method 863, three 150 mm cubes daily of mortar sampled out of a single batch of mortar selected at random from batches mixed for every day's production. Standard of acceptance shall be in accordance with clause 5.8 of SABS 0100, Part II.

17.5.1.3 CONTRACTOR'S AND ENGINEER'S INSPECTIONS

Paragraphs 1.4 and 3.1 of DWS 2020 shall apply.

17.5.2 COATING

17.5.2.1 VISUAL INSPECTION

The cured coating in every pipe and special shall be inspected visually for defects before leaving the factory, but not sooner than twenty one (21) days after application.

The finished coating shall be firm and dense, shall adhere rigidly to the outside of the pipe and the thickness of laitance shall not exceed 1,25 mm.

The coating shall be free from pinholes, craters, cracks, and laminations, although slight surface crazing and hair cracks shall be permissible.

All cracks into which a suitable depth gauge with a probe of 1,5 mm diameter can be inserted to a depth of half the minimum specified thickness, shall be considered a defect and repaired as described in paragraph 17.6.1.

17.5.2.2 DESTRUCTIVE TESTING

Paragraph 17.5.1.2 shall apply, except that lining shall be read as coating.

17.5.2.3 CONTRACTOR'S AND ENGINEER'S INSPECTIONS

Paragraphs 1.4 and 3.1 of DWS 2020 shall apply.



17.6 REPAIR METHODS

17.6.1 REPAIR OF DEFECTS

All defective concrete shall be removed and the surrounding area of concrete chipped back to a position where the concrete is firmly bonded to the steel.

The edges of the firm surrounding concrete shall be bevelled to form an angle of 85 degrees with the portion of pipe barrel under repair.

The pipe surface shall be cleared from all signs of concrete and dust.

The pipe surface and surrounding concrete shall then be given one coat of cement/water grout and the fresh mortar applied by hand while the grout coat is still wet. The mortar shall be of the same mix and consistency as the lining.

The repair area shall be built up to the full thickness of the lining, care being taken to ensure complete filling of the bevelled edges with the mortar.

The repaired areas shall be covered by damp hessian, which shall be kept continuously wet for seven (7) days after completion of repair.



ANNEXURE C1

REQUIREMENTS TO BE SPECIFIED

A: INFORMATION TO BE SUPPLIED IN TENDER SPECIFICATION

ITEM	INSTRUCTION	PARAGRAPH
Corrosion protection system	Agreement and approval	3.1a
	Dry film thickness	8.5.4
Finishing coat colours	Departmental colour code	8.4.5.9.4 9.3.4.4
Repair kit	Required or not	9.1.6
Medium duty hot-dip galvanized coating	Medium duty	10.4.1.2
Maximum length of un-interrupted lining	Information	17.3.1.4.(c)
Method of lining	Information	17.3.1.4.(d)

B: INFORMATION TO BE SUPPLIED BEFORE ORDER IS PLACED

ITEM	INSTRUCTION	PARAGRAPH
Approval of specific corrosion systems	Approval	3.1 (b) 3.1 (c)
Proprietary items	Corrosion protection	5.2
Lifting lugs	Design	6.2.4
Blasting-material with data sheets	Blasting-material	7.4.2
Method of application	Epoxy	8.4.5.4.1
Coating for duplex system	Application of duplex system	10.7.2

C: INFORMATION TO BE SUPPLIED AFTER ORDER IS PLACED

ITEM	INSTRUCTION	PARAGRAPH
Quality plan	Approval	4.1.1
Suitability of design	Hot-dip galvanizing	6.4.2.2
Programme	Approval	7.3.1
Results and tests on aggregates	Results	17.2.2



ANNEXURE C1

DEPARTMENTAL COLOUR CODE

MECHANICAL AND GENERAL

ITEMS	COLOUR	SABS 1091 CODE
Structural steel, Gates	Light grey	G29
Hydraulic power pack	Strong blue	F11
Hydraulic oil	Salmon pink	A40
Hazardous objects/areas (restricted headroom, crane hook etc)	Golden yellow with black chevron	B49*
Handwheels and levers	Golden yellow	B49
Handrails:	Black	
- vertical	Golden yellow	G49
- horizontal	Un-coated	
Handrails on dam walls	Un-coated	
- Aluminium	Un-coated	
- Stainless steel	Light grey	G29
- Galvanized		
Floors:	Emerald green	E14
- safe and walking areas	Golden yellow	B49*
- restricted areas	Un-coated	
- open flooring (gratings) – MS galvanized 3CR12	Un-coated	
Stainless steel	Un-coated	
Fire protection equipment	Signal red	A11*
Control panels	Eau de nil	H43

PUMP STATION

ITEMS	COLOUR	SABS 1091 CODE
Electric motors	Light beige	C57
Pumps/control valves: for raw water	Apple green	H29
for chem-treated water	Middle blue	F07
Fan and coupling guards	Signal red	A11*
Base plates	Black	
Overhead travelling cranes	Golden yellow	B49
Isolating valves: for raw water	Brilliant green	H10
for chem-treated water	Arctic blue	F28

ELECTRICAL

ITEMS	COLOUR	SABS 1091 CODE
Low voltage panels: indoor	Light orange	B26*
outdoor	Light orange	B26
Medium voltage panels: indoor	Admiral grey	G12
outdoor	Admiral grey	G12
Panel accessories (gland plates, back plates, interior)	White	
UPS equipment	Light orange	B26
Transformers	Light stone	C37
LV distribution kiosks, mini subs	Light stone	C37
Standby electrical equipment (Permanently powered)	Signal red	A11*
General outdoor	Light grey green	H40
All equipment – interior	White	



WATER TREATMENT PLANT

ITEMS	COLOUR	SABS 1091 CODE
Equipment	Same colour of respective pipe work	
Handwheels (remote valves)	Same colour of respective pipe work	
PIPE WORK		
Raw water	Brilliant green	H10
Chemical treated raw water	Verdigris green	E22
Clarified raw water	Eau de nil	H43
Filtered water	Pale blue	E39
Chlorinated filtered water	Arctic blue	F28
Backwash water	Cornflower blue	F29
Air saturated water	Turquoise blue	E18
Wash water recovery	Middle buff	B33

SEWAGE PIPE WORK

ITEMS	COLOUR	SABS 1091 CODE
Raw sewage	Dark earth	B11
Settled sewage effluent	Brilliant green	H10
Biologically treated sewage effluent	Verdigris green	E22
Final/chlorinated effluent	Eau de nil	H43
Digested sewage sludge	Middle brown	B07
Raw sewage sludge	Dark brown	B03
Humus sludge	Golden brown	B13
Return activated sludge	Golden brown	B13
Waste activated sludge	Middle brown	B15
Supernatants/underflows returning to head of works	Middle buff	B33

DOSING/CONTROL PIPE WORK

ITEMS	COLOUR	SABS 1091 CODE
Poly-electrolite	Pinotage	A08
Alum/Ferric chloride	Jacaranda	F18
Chlorine solution	Primrose	C67
Chlorine gas	Lemon	C54
Chlorine liquid	Light orange	B26
Lime slurry	Biscuit	B64
Lime hydrated	Biscuit	B64
Lime saturated water	Biscuit	B64
Air/compressed air	White	
Steam	Pastel grey	G54

NOTE: Colours marked thus * are restricted for specified equipment only.