



NEC3 Term Service Contract (TSC3)

Between **ESKOM HOLDINGS SOC Ltd**
(Reg No. 2002/015527/30)

and
(Reg No. _____)

for **Welding, machining and associated services at
Drakensberg Pumped Storage Scheme for a period
of 5 years**

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ENQUIRY No. E1544GXPOU

PART C1: AGREEMENTS & CONTRACT DATA

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C1.1 Form of Offer & Acceptance

Offer

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract for the procurement of:

Welding, machining and associated services at Drakensberg Pumped Storage Scheme for a period of 5 years

The tenderer, identified in the Offer signature block, has examined the documents listed in the Tender Data and addenda thereto and by submitting this Offer has accepted the Conditions of Tender.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the *Contractor* under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the *conditions of contract* identified in the Contract Data.

Options A	The offered total of the Prices exclusive of VAT is	R [•]
	Sub total	R [•]
	Value Added Tax @ 15% is	R [•]
	The offered total of the amount due inclusive of VAT is ¹	R [•]
	(in words) [•]	

This Offer may be accepted by the Employer by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the *Contractor* in the *conditions of contract* identified in the Contract Data.

Signature(s)

Name(s)

Capacity

**For the
tenderer:**

(Insert name and address of organisation)

Name &
signature of
witness

Date

Tenderer's CIDB registration number:

¹ This total is required by the *Employer* for budgeting purposes only. Actual amounts due will be assessed in terms of the *conditions of contract*.

Acceptance

By signing this part of this Form of Offer and Acceptance, the Employer identified below accepts the tenderer's Offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the *conditions of contract* identified in the Contract Data. Acceptance of the tenderer's Offer shall form an agreement between the Employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1	Agreements and Contract Data, (which includes this Form of Offer and Acceptance)
Part C2	Pricing Data
Part C3	Scope of Work: Service Information

and drawings and documents (or parts thereof), which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Returnable Schedules as well as any changes to the terms of the Offer agreed by the tenderer and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Form of Offer and Acceptance. No amendments to or deviations from said documents are valid unless contained in this Schedule.

The tenderer shall within two weeks of receiving a completed copy of this agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the *conditions of contract* identified in the Contract Data at, or just after, the date this agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date when the tenderer receives one fully completed and signed original copy of this document, including the Schedule of Deviations (if any).

Signature(s)

Name(s)

Capacity

**for the
Employer**

(Insert name and address of organisation)

Name &
signature of
witness

Date

Note: If a tenderer wishes to submit alternative tenders, use another copy of this Form of Offer and Acceptance.

Schedule of Deviations to be completed by the *Employer* prior to contract award

Note:

1. This part of the Offer & Acceptance would not be required if the contract has been developed by negotiation between the Parties and is not the result of a process of competitive tendering.
2. The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.
3. A tenderer's covering letter must not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid be the subject of agreement reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here and the final draft of the contract documents shall be revised to incorporate the effect of it.

No.	Subject	Details
1	[•]	[•]
2	[•]	[•]
3	[•]	[•]
4	[•]	[•]
5	[•]	[•]
6	[•]	[•]
7	[•]	[•]

By the duly authorised representatives signing this Schedule of Deviations below, the Employer and the tenderer agree to and accept this Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules, as well as any confirmation, clarification or changes to the terms of the Offer agreed by the tenderer and the Employer during this process of Offer and Acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Form shall have any meaning or effect in the contract between the parties arising from this Agreement.

	For the tenderer:	For the Employer
Signature	_____	_____
Name	_____	_____
Capacity	_____	_____
On behalf of	(Insert name and address of organisation) _____	(Insert name and address of organisation) _____
Name & signature of witness	_____	_____
Date	_____	_____

C1.2 TSC3 Contract Data

Part one - Data provided by the *Employer*

Completion of this data in full, according to the Options chosen, is essential to create a complete contract.

Clause	Statement	Data
1	General	
	The <i>conditions of contract</i> are the core clauses and the clauses for main Option:	
		A: Priced contract with price list
	dispute resolution Option	W1: Dispute resolution procedure
	and secondary Options	
		X1: Price adjustment for inflation
		X2: Changes in the law
		X17: Low service damages
		X18: Limitation of liability
		X19: Task Order
		Z: Additional conditions of contract
	of the NEC3 Term Service Contract April 2013 ² (TSC3)	
10.1	The <i>Employer</i> is (name):	Eskom Holdings SOC Ltd (reg no: 2002/015527/30), a state owned company incorporated in terms of the company laws of the Republic of South Africa
	Address	Registered office at Megawatt Park, Maxwell Drive, Sandton, Johannesburg
	Represented by:	TBC
	Email:	TBC
10.1	The <i>Service Manager</i> is (name):	TBC
	Address	
	Tel	
	Fax	
	e-mail	
11.2(2)	The Affected Property is	Drakensberg Pumped Storage Scheme

² Available from Engineering Contract Strategies Tel 011 803 3008 Fax 086 539 1902 www.ecs.co.za

11.2(13)	The <i>service</i> is	Welding, machining and associated services
11.2(14)	The following matters will be included in the Risk Register	<ul style="list-style-type: none"> • Delays and disruptions impacting the delivery of services • SHE injuries resulting from unsafe act • Usage of improper tools and equipment • Non-compliance with regulations, legislation and plant regulations applicable to the service as defined in the Service Information • Labour and community unrests • Poor workmanship
11.2(15)	The Service Information is in	Part 3: Scope of Work and all documents and drawings to which it makes reference.
12.2	The <i>law of the contract</i> is the law of	the Republic of South Africa
13.1	The <i>language of this contract</i> is	English
13.3	The <i>period for reply</i> is	<ul style="list-style-type: none"> • Immediately for health and safety related matters • 3 calendar days
2	The Contractor's main responsibilities	Data required by this section of the core clauses is also provided by the Contractor in Part 2 and terms in italics used in this section are identified elsewhere in this Contract Data
21.1	The Contractor submits a first plan for acceptance within	2 weeks
3	Time	
30.1	The <i>starting date</i> is.	TBC
30.1	The <i>service period</i> is	Five (5) years
4	Testing and defects	There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data
5	Payment	
50.1	The <i>assessment interval</i> is	between the 25th and 27th day of each successive month or after completion of Task Order.
51.1	The <i>currency of this contract</i> is the	South African Rand
51.2	The period within which payments are made is	30 days on receipt of valid tax invoice
51.4	The <i>interest rate</i> is	the publicly quoted prime rate of interest (calculated on a 365 day year) charged by from time to time by the Standard Bank of South Africa Limited (as certified, in the event of any dispute, by any manager of such bank, whose appointment it shall not be necessary to prove) for amounts due in Rands and

		(ii) the LIBOR rate applicable at the time for amounts due in other currencies. LIBOR is the 6 month London Interbank Offered Rate quoted under the caption "Money Rates" in The Wall Street Journal for the applicable currency or if no rate is quoted for the currency in question then the rate for United States Dollars, and if no such rate appears in The Wall Street Journal then the rate as quoted by the Reuters Monitor Money Rates Service (or such service as may replace the Reuters Monitor Money Rates Service) on the due date for the payment in question, adjusted <i>mutatis mutandis</i> every 6 months thereafter (and as certified, in the event of any dispute, by any manager employed in the foreign exchange department of The Standard Bank of South Africa Limited, whose appointment it shall not be necessary to prove.
6	Compensation events	There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data
7	Use of Equipment Plant and Materials	There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data
8	Risks and insurance	
80.1	These are additional <i>Employer's</i> risks	None
9	Termination	There is no reference to Contract Data in this section of the core clauses and terms in italics used in this section are identified elsewhere in this Contract Data.
10	Data for main Option clause	
A	Priced contract with price list	
20.5	The <i>Contractor</i> prepares forecasts of the final total of the Prices for the whole of the <i>service</i> at intervals no longer than	12 weeks.
11	Data for Option W1	
W1.1	The <i>Adjudicator</i>	the person selected from the ICE-SA Division (or its successor body) of the South African Institution of Civil Engineering Panel of Adjudicators by the Party intending to refer a dispute to him. (see www.ice-sa.org.za). If the Parties do not agree on an Adjudicator the Adjudicator will be appointed by the Arbitration Foundation of Southern Africa (AFSA).
W1.2(3)	The <i>Adjudicator nominating body</i> is:	the Chairman of ICE-SA a joint Division of the South African Institution of Civil Engineering

		and the Institution of Civil Engineers (London) (see www.ice-sa.org.za) or its successor body.
W1.4(2)	The <i>tribunal</i> is:	arbitration
W1.4(5)	The <i>arbitration procedure</i> is	the latest edition of Rules for the Conduct of Arbitrations published by The Association of Arbitrators (Southern Africa) or its successor body.
	The place where arbitration is to be held is	Johannesburg, South Africa
	The person or organisation who will choose an arbitrator	
	- if the Parties cannot agree a choice or	the Chairman for the time being or his nominee
	- if the arbitration procedure does not state who selects an arbitrator, is	of the Association of Arbitrators (Southern Africa) or its successor body.

12 Data for secondary Option clauses

X1	Price adjustment for inflation																									
X1.1	The <i>base date</i> for indices is	One month prior to enquiry closing.																								
	The proportions used to calculate the Price Adjustment Factor are:	<table> <tr> <th>proportion</th><th>linked to index for</th><th>Index prepared by</th></tr> <tr> <td>0.</td><td>[•]</td><td>[•]</td></tr> <tr> <td>0.</td><td>[•]</td><td>[•]</td></tr> <tr> <td>0.</td><td>[•]</td><td>[•]</td></tr> <tr> <td>0.</td><td>[•]</td><td>[•]</td></tr> <tr> <td>0.</td><td>[•]</td><td>[•]</td></tr> <tr> <td>0.15</td><td colspan="2">non-adjustable</td></tr> <tr> <td>1.00</td><td></td><td></td></tr> </table>	proportion	linked to index for	Index prepared by	0.	[•]	[•]	0.	[•]	[•]	0.	[•]	[•]	0.	[•]	[•]	0.	[•]	[•]	0.15	non-adjustable		1.00		
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0.15	non-adjustable																									
1.00																										
X2	Changes in the law	There is no reference to Contract Data in this Option and terms in italics are identified elsewhere in this Contract Data.																								

X17	Low service damages										
X17.1	The <i>service level table</i> is in										
	<table> <tr> <th>Low Service Damage Description</th><th>Value Of Low Service Damages</th><th>Limit Of Low Service Damage</th></tr> <tr> <td>Submission Delays: Delays in submission of documents as detailed in this agreement</td><td>1% of Task Order value per day until corrected</td><td>Capped at 10% of Task Order value</td></tr> <tr> <td>Service delays: Not finishing as per accepted programme</td><td> <ul style="list-style-type: none"> 2% of Task Order value per </td><td>Capped at 10% of Task Order value</td></tr> </table>	Low Service Damage Description	Value Of Low Service Damages	Limit Of Low Service Damage	Submission Delays: Delays in submission of documents as detailed in this agreement	1% of Task Order value per day until corrected	Capped at 10% of Task Order value	Service delays: Not finishing as per accepted programme	<ul style="list-style-type: none"> 2% of Task Order value per 	Capped at 10% of Task Order value	
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Service delays: Not finishing as per accepted programme	<ul style="list-style-type: none"> 2% of Task Order value per 	Capped at 10% of Task Order value									

		day until finished	
	Poor workmanship: Rework due to poor workmanship	<ul style="list-style-type: none">2% of Task Order value per day until corrected	Capped at 10% of Task Order value

X18	Limitation of liability		
X18.1	The <i>Contractor's</i> liability to the <i>Employer</i> for indirect or consequential loss is limited to	R0.0 (zero Rand)	
X18.2	For any one event, the <i>Contractor's</i> liability to the <i>Employer</i> for loss of or damage to the <i>Employer's</i> property is limited to	the amount of the deductibles relevant to the event	
X18.3	The <i>Contractor's</i> liability for Defects due to his design of an item of Equipment is limited to	The greater of <ul style="list-style-type: none">the total of the Prices at the Contract Date andthe amounts excluded and unrecoverable from the <i>Employer's</i> insurance (other than the resulting physical damage to the <i>Employer's</i> property which is not excluded) plus the applicable deductibles	
X18.4	The <i>Contractor's</i> total liability to the <i>Employer</i> , for all matters arising under or in connection with this contract, other than the excluded matters, is limited to	the total of the Prices other than for the additional excluded matters. The <i>Contractor's</i> total liability for the additional excluded matters is not limited. The additional excluded matters are amounts for which the <i>Contractor</i> is liable under this contract for <ul style="list-style-type: none">Defects due to his design, plan and specification,Defects due to manufacture and fabrication outside the Affected Property,loss of or damage to property (other than the <i>Employer's</i> property, Plant and Materials),death of or injury to a person andinfringement of an intellectual property right.	
X18.5	The <i>end of liability date</i> is	3 years after the end of the <i>service period</i>.	

X19	Task Order		
X19.5	The <i>Contractor</i> submits a Task Order programme to the <i>Service Manager</i> within	Two (2) weeks of receiving the Task Order	

Z	The <i>additional conditions of contract</i> are		
		Z1 to Z14 always apply.	

Z1 Cession delegation and assignment

- Z1.1 The *Contractor* does not cede, delegate or assign any of its rights or obligations to any person without the written consent of the *Employer*.
- Z1.2 Notwithstanding the above, the *Employer* may on written notice to the *Contractor* cede and delegate its rights and obligations under this contract to any of its subsidiaries or any of its present divisions or operations which may be converted into separate legal entities as a result of the restructuring of the Electricity Supply Industry.

Z2 Joint ventures

- Z2.1 If the *Contractor* constitutes a joint venture, consortium or other unincorporated grouping of two or more persons or organisations then these persons or organisations are deemed to be jointly and severally liable to the *Employer* for the performance of this contract.
- Z2.2 Unless already notified to the *Employer*, the persons or organisations notify the *Service Manager* within two weeks of the Contract Date of the key person who has the authority to bind the *Contractor* on their behalf.
- Z2.3 The *Contractor* does not alter the composition of the joint venture, consortium or other unincorporated grouping of two or more persons without the consent of the *Employer* having been given to the *Contractor* in writing.

Z3 Change of Broad Based Black Economic Empowerment (B-BBEE) status

- Z3.1 Where a change in the *Contractor's* legal status, ownership or any other change to his business composition or business dealings results in a change to the *Contractor's* B-BBEE status, the *Contractor* notifies the *Employer* within seven days of the change.
- Z3.2 The *Contractor* is required to submit an updated verification certificate and necessary supporting documentation confirming the change in his B-BBEE status to the *Service Manager* within thirty days of the notification or as otherwise instructed by the *Service Manager*.
- Z3.3 Where, as a result, the *Contractor's* B-BBEE status has decreased since the Contract Date the *Employer* may either re-negotiate this contract or alternatively, terminate the *Contractor's* obligation to Provide the Service.
- Z3.4 Failure by the *Contractor* to notify the *Employer* of a change in its B-BBEE status may constitute a reason for termination. If the *Employer* terminates in terms of this clause, the procedures on termination are P1, P2 and P4 as stated in clause 92, and the amount due is A1 and A3 as stated in clause 93.

Z4 Confidentiality

- Z4.1 The *Contractor* does not disclose or make any information arising from or in connection with this contract available to Others. This undertaking does not, however, apply to information which at the time of disclosure or thereafter, without default on the part of the *Contractor*, enters the public domain or to information which was already in the possession of the *Contractor* at the time of disclosure (evidenced by written records in existence at that time). Should the *Contractor* disclose information to Others in terms of clause 25.1, the *Contractor* ensures that the provisions of this clause are complied with by the recipient.
- Z4.2 If the *Contractor* is uncertain about whether any such information is confidential, it is to be regarded as such until notified otherwise by the *Service Manager*.

- Z4.3 In the event that the *Contractor* is, at any time, required by law to disclose any such information which is required to be kept confidential, the *Contractor*, to the extent permitted by law prior to disclosure, notifies the *Employer* so that an appropriate protection order and/or any other action can be taken if possible, prior to any disclosure. In the event that such protective order is not, or cannot, be obtained, then the *Contractor* may disclose that portion of the information which it is required to be disclosed by law and uses reasonable efforts to obtain assurances that confidential treatment will be afforded to the information so disclosed.
- Z4.4 The taking of images (whether photographs, video footage or otherwise) of the Affected Property or any portion thereof, in the course of Providing the Service and after the end of the *service period*, requires the prior written consent of the *Service Manager*. All rights in and to all such images vests exclusively in the *Employer*.
- Z4.5 The *Contractor* ensures that all his subcontractors abide by the undertakings in this clause.

Z5 Waiver and estoppel: Add to core clause 12.3:

- Z5.1 Any extension, concession, waiver or relaxation of any action stated in this contract by the Parties, the *Service Manager* or the *Adjudicator* does not constitute a waiver of rights, and does not give rise to an estoppel unless the Parties agree otherwise and confirm such agreement in writing.

Z6 Health, safety and the environment: Add to core clause 27.4

- Z6.1 The *Contractor* undertakes to take all reasonable precautions to maintain the health and safety of persons in and about the execution of the *service*. Without limitation the *Contractor*:
- accepts that the *Employer* may appoint him as the "Principal Contractor" (as defined and provided for under the Construction Regulations 2014 (promulgated under the Occupational Health & Safety Act 85 of 1993) ("the Construction Regulations") for the Affected Property;
 - warrants that the total of the Prices as at the Contract Date includes a sufficient amount for proper compliance with the Construction Regulations, all applicable health & safety laws and regulations and the health and safety rules, guidelines and procedures provided for in this contract and generally for the proper maintenance of health & safety in and about the execution of the *service*; and
 - undertakes, in and about the execution of the *service*, to comply with the Construction Regulations and with all applicable health & safety laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the *Contractor's* direction and control, likewise observe and comply with the foregoing.
- Z6.2 The *Contractor*, in and about the execution of the *service*, complies with all applicable environmental laws and regulations and rules, guidelines and procedures otherwise provided for under this contract and ensures that his Subcontractors, employees and others under the *Contractor's* direction and control, likewise observe and comply with the foregoing.

Z7 Provision of a Tax Invoice and interest. Add to core clause 51

- Z7.1 Within one week of receiving a payment certificate from the *Service Manager* in terms of core clause 51.1, the *Contractor* provides the *Employer* with a tax invoice in accordance with the *Employer's* procedures stated in the Service Information, showing the amount due for payment equal to that stated in the payment certificate.
- Z7.2 If the *Contractor* does not provide a tax invoice in the form and by the time required by this contract, the time by when the *Employer* is to make a payment is extended by a period equal in time to the delayed submission of the correct tax invoice. Interest due by the *Employer* in terms of core clause 51.2 is then calculated from the delayed date by when payment is to be made.

- Z7.3 The *Contractor* (if registered in South Africa in terms of the companies Act) is required to comply with the requirements of the Value Added Tax Act, no 89 of 1991 (as amended) and to include the *Employer's* VAT number 4740101508 on each invoice he submits for payment.

Z8 Notifying compensation events

- Z8.1 Delete the last paragraph of core clause 61.3 and replace with:

If the *Contractor* does not notify a compensation event within eight weeks of becoming aware of the event, he is not entitled to a change in the Prices.

Z9 Employer's limitation of liability

- Z9.1 The *Employer's* liability to the *Contractor* for the *Contractor's* indirect or consequential loss is limited to R0.00 (zero Rand)
- Z9.2 The *Contractor's* entitlement under the indemnity in 82.1 is provided for in 60.1(12) and the *Employer's* liability under the indemnity is limited to compensation as provided for in core clause 63 and X19.11 if Option X19 Task Order applies to this contract.

Z10 Termination: Add to core clause 91.1, at the second main bullet point, fourth sub-bullet point, after the words "against it":

- Z10.1 or had a business rescue order granted against it.

Z11 Ethics

For the purposes of this Z-clause, the following definitions apply:

Affected Party	means, as the context requires, any party, irrespective of whether it is the <i>Contractor</i> or a third party, such party's employees, agents, or Subcontractors or Subcontractor's employees, or any one or more of all of these parties' relatives or friends,
Coercive Action	means to harm or threaten to harm, directly or indirectly, an Affected Party or the property of an Affected Party, or to otherwise influence or attempt to influence an Affected Party to act unlawfully or illegally,
Collusive Action	means where two or more parties co-operate to achieve an unlawful or illegal purpose, including to influence an Affected Party to act unlawfully or illegally,
Committing Party	means, as the context requires, the <i>Contractor</i> , or any member thereof in the case of a joint venture, or its employees, agents, or Subcontractors or the Subcontractor's employees,
Corrupt Action	means the offering, giving, taking, or soliciting, directly or indirectly, of a good or service to unlawfully or illegally influence the actions of an Affected Party,
Fraudulent Action	means any unlawfully or illegally intentional act or omission that misleads, or attempts to mislead, an Affected Party, in order to obtain a financial or other benefit or to avoid an obligation or incurring an obligation,
Obstructive Action	means a Committing Party unlawfully or illegally destroying, falsifying, altering or concealing information or making false statements to materially impede an investigation into allegations of Prohibited Action, and
Prohibited Action	means any one or more of a Coercive Action, Collusive Action, Corrupt Action, Fraudulent Action or Obstructive Action.

- Z11.1 A Committing Party may not take any Prohibited Action during the course of the procurement of this contract or in execution thereof.
- Z11.2 The *Employer* may terminate the *Contractor's* obligation to Provide the Services if a Committing Party has taken such Prohibited Action and the *Contractor* did not take timely and appropriate action to prevent or remedy the situation, without limiting any other rights or remedies the *Employer* has. It is not required that the Committing Party had to have been found guilty, in court or in any other similar process, of such Prohibited Action before the *Employer* can terminate the *Contractor's* obligation to Provide the Services for this reason.
- Z11.3 If the *Employer* terminates the *Contractor's* obligation to Provide the Services for this reason, the amounts due on termination are those intended in core clauses 92.1 and 92.2.
- Z11.4 A Committing Party co-operates fully with any investigation pursuant to alleged Prohibited Action. Where the *Employer* does not have a contractual bond with the Committing Party, the *Contractor* ensures that the Committing Party co-operates fully with an investigation.

Z12 Insurance

Z 12 .1 Replace core clause 83 with the following:

Insurance cover 83

- 83.1 When requested by a Party, the other Party provides certificates from his insurer or broker stating that the insurances required by this contract are in force.
- 83.2 The *Contractor* provides the insurances stated in the Insurance Table A from the *starting date* until the earlier of Completion and the date of the termination certificate.

INSURANCE TABLE A

Insurance against	Minimum amount of cover or minimum limit of indemnity
Loss of or damage caused by the <i>Contractor</i> to the <i>Employer's</i> property	The replacement cost where not covered by the <i>Employer's</i> insurance. The <i>Employer's</i> policy deductible as at Contract Date, where covered by the <i>Employer's</i> insurance.
Loss of or damage to Plant and Materials	The replacement cost where not covered by the <i>Employer's</i> insurance. The <i>Employer's</i> policy deductible as at Contract Date, where covered by the <i>Employer's</i> insurance.
Loss of or damage to Equipment	The replacement cost where not covered by the <i>Employer's</i> insurance. The <i>Employer's</i> policy deductible as at Contract Date, where covered by the <i>Employer's</i> insurance.
The <i>Contractor's</i> liability for loss of or damage to property (except the <i>Employer's</i> property, Plant and Materials and Equipment) and liability for bodily injury to or death of a	<u>Loss of or damage to property</u> The replacement cost <u>Bodily injury to or death of a person</u>

person (not an employee of the <i>Contractor</i>) arising from or in connection with the <i>Contractor's</i> Providing the Service	The amount required by the applicable law.
Liability for death of or bodily injury to employees of the <i>Contractor</i> arising out of and in the course of their employment in connection with this contract	The amount required by the applicable law

Z 12.2 Replace core clause 86 with the following:

**Insurance
by the
Employer**

86

86.1 The *Employer* provides the insurances stated in the Insurance Table B

INSURANCE TABLE B

Insurance against or name of policy	Minimum amount of cover or minimum limit of indemnity
Assets All Risk	Per the insurance policy document
Contract Works insurance	Per the insurance policy document
Environmental Liability	Per the insurance policy document
General and Public Liability	Per the insurance policy document
Transportation (Marine)	Per the insurance policy document
Motor Fleet and Mobile Plant	Per the insurance policy document
Terrorism	Per the insurance policy document
Cyber Liability	Per the insurance policy document
Nuclear Material Damage and Business Interruption	Per the insurance policy document
Nuclear Material Damage Terrorism	Per the insurance policy document

Z13 Nuclear Liability

Z13.1 The *Employer* is the operator of the Koeberg Nuclear Power Station (KNPS), a nuclear installation, as designated by the National Nuclear Regulator of the Republic of South Africa, and is the holder of a nuclear licence in respect of the KNPS.

Z13.2 The *Employer* is solely responsible for and indemnifies the *Contractor* or any other person against any and all liabilities which the *Contractor* or any person may incur arising out of or resulting from nuclear damage, as defined in Act 47 of 1999, save to the extent that any liabilities are incurred due to the unlawful intent of the *Contractor* or any other person or the presence of the *Contractor* or that person or any property of the *Contractor* or such person at or in the KNPS or on the KNPS site, without the permission of the *Employer* or of a person acting on behalf of the *Employer*.

- Z13.3 Subject to clause Z13.4 below, the *Employer* waives all rights of recourse, arising from the aforesaid, save to the extent that any claims arise or liability is incurred due or attributable to the unlawful intent of the *Contractor* or any other person, or the presence of the *Contractor* or that person or any property of the *Contractor* or such person at or in the KNPS or on the KNPS site, without the permission of the *Employer* or of a person acting on behalf of the *Employer*.
- Z13.4 The *Employer* does not waive its rights provided for in section 30 (7) of Act 47 of 1999, or any replacement section dealing with the same subject matter.
- Z13.5 The protection afforded by the provisions hereof shall be in effect until the KNPS is decommissioned.

Z14 Asbestos

For the purposes of this Z-clause, the following definitions apply:

AAIA	means approved asbestos inspection authority.
ACM	means asbestos containing materials.
AL	means action level, i.e. a level of 50% of the OEL, i.e. 0.1 regulated asbestos fibres per ml of air measured over a 4 hour period. The value at which proactive actions is required in order to control asbestos exposure to prevent exceeding the OEL.
Ambient Air	means breathable air in area of work with specific reference to breathing zone, which is defined to be a virtual area within a radius of approximately 30cm from the nose inlet.
Compliance Monitoring	means compliance sampling used to assess whether or not the personal exposure of workers to regulated asbestos fibres is in compliance with the Standard's requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles.
OEL	means occupational exposure limit.
Parallel Measurements	means measurements performed in parallel, yet separately, to existing measurements to verify validity of results.
Safe Levels	means airborne asbestos exposure levels conforming to the Standard's requirements for safe processing, handling, storing, disposal and phase-out of asbestos and asbestos containing material, equipment and articles.
Standard	means the <i>Employer's</i> Asbestos Standard 32-303: Requirements for Safe Processing, Handling, Storing, Disposal and Phase-out of Asbestos and Asbestos Containing Material, Equipment and Articles.
SANAS	means the South African National Accreditation System.
TWA	means the average exposure, within a given workplace, to airborne asbestos fibres, normalised to the baseline of a 4 hour continuous period, also applicable to short term exposures, i.e. 10-minute TWA.

- Z14.1 The *Employer* ensures that the Ambient Air in the area where the *Contractor* will Provide the Services conforms to the acceptable prescribed South African standard for asbestos, as per the regulations published in GNR 155 of 10 February 2002, under the Occupational Health and Safety Act, 1993 (Act 85 of 1993) ("Asbestos Regulations"). The OEL for asbestos is 0.2 regulated asbestos fibres per millilitre of air as a 4-hour TWA, averaged over any continuous period of four hours, and the short term exposure limit of 0.6 regulated asbestos fibres per millilitre of air as a 10-

minute TWA, averaged over any 10 minutes, measured in accordance with HSG248 and monitored according to HSG173 and OESSM.

- Z14.2 Upon written request by the *Contractor*, the *Employer* certifies that these conditions prevail. All measurements and reporting are effected by an independent, competent, and certified occupational hygiene inspection body, i.e. a SANAS accredited and Department of Employment and Labour approved AAIA. The *Contractor* may perform Parallel Measurements and related control measures at the *Contractor's* expense. For the purposes of compliance the results generated from Parallel Measurements are evaluated only against South African statutory limits as detailed in clause Z14.1. Control measures conform to the requirements stipulated in the AAIA-approved asbestos work plan.
- Z14.3 The *Employer* manages asbestos and ACM according to the Standard.
- Z14.4 In the event that any asbestos is identified while Providing the Services, a risk assessment is conducted and if so required, with reference to possible exposure to an airborne concentration of above the AL for asbestos, immediate control measures are implemented and relevant air monitoring conducted in order to declare the area safe.
- Z14.5 The *Contractor's* personnel are entitled to stop working and leave the contaminated area forthwith until such time that the area of concern is declared safe by either Compliance Monitoring or an AAIA approved control measure intervention, for example, per the emergency asbestos work plan, if applicable.
- Z14.6 The *Contractor* continues to Provide the Services, without additional control measures presented, on presentation of Safe Levels. The contractually agreed dates to Provide the Services, including the Completion Date, are adjusted accordingly. The contractually agreed dates are extended by the notification periods required by regulations 3 and 21 of the Asbestos Regulations, 2001.
- Z14.7 Any removal and disposal of asbestos, asbestos containing materials and waste, is done by a registered asbestos contractor, instructed by the *Employer* at the *Employer's* expense, and conducted in line with South African legislation.

C1.2 Contract Data

Part two - Data provided by the Contractor

[Instructions to the contract compiler: (delete this notes before issue to tenderers with an enquiry)

Whenever a cell is shaded in the left hand column it denotes this data is optional and would be required in relation to the option selected. In the event that the option is not required select and delete the whole row.]

Notes to a tendering contractor:

1. Please read both the both the NEC3 Term Service Contract April 2013 and the relevant parts of its Guidance Notes (TSC3-GN)³ in order to understand the implications of this Data which the tenderer is required to complete.
2. The number of the clause which requires the data is shown in the left hand column for each statement however other clauses may also use the same data.
3. Where a form field like this [] appears, data is required to be inserted relevant to the option selected. Click on the form field **once** and type in the data. Otherwise complete by hand and in ink.

Completion of the data in full, according to Options chosen, is essential to create a complete contract.

Clause	Statement	Data
10.1	The <i>Contractor</i> is (Name): Address Tel No. Fax No.	
11.2(8)	The <i>direct fee percentage</i> is The <i>subcontracted fee percentage</i> is	% %
11.2(14)	The following matters will be included in the Risk Register	
11.2(15)	The Service Information for the <i>Contractor's</i> plan is in:	
21.1	The plan identified in the Contract Data is contained in:	
24.1	The key people are: 1 Name: Job: Responsibilities: Qualifications: Experience: 2 Name: Job	

³ Available from Engineering Contract Strategies Tel 011 803 3008 Fax 086 5391902 or www.ecs.co.za

Responsibilities:

Qualifications:

Experience:

CV's (and further key person's data including
CVs) are in .

A	Priced contract with price list
11.2(12)	The <i>price list</i> is in
11.2(19)	The tendered total of the Prices is R

PART 2: PRICING DATA
TSC3 Option A

Document reference	Title	No of pages
C2.1	Pricing assumptions: Option A	2
C2.2	The <i>price list</i>	1

C2.1 Pricing assumptions: Option A

How work is priced and assessed for payment

Clause 11 in NEC3 Term Service Contract (TSC3) core clauses and Option A states:

Identified and defined terms	11	
	11.2	(12) The Price List is the <i>price list</i> unless later changed in accordance with this contract.
		(17) The Price for Services Provided to Date is the total of <ul style="list-style-type: none">the Price for each lump sum item in the Price List which the <i>Contractor</i> has completed andwhere a quantity is stated for an item in the Price List, an amount calculated by multiplying the quantity which the <i>Contractor</i> has completed by the rate.
		(19) The Prices are the amounts stated in the Price column of the Price List. Where a quantity is stated for an item in the Price List, the Price is calculated by multiplying the quantity by the rate.

This confirms that Option A is a priced contract where the Prices are derived from a list of items of service which can be priced as lump sums or as expected quantities of service multiplied by a rate or a mix of both.

Function of the Price List

Clause 54.1 in Option A states: "Information in the Price List is not Service Information". This confirms that instructions to do work or how it is to be done are not included in the Price List but in the Service Information. This is further confirmed by Clause 20.1 which states, "The *Contractor* Provides the Service in accordance with the Service Information". Hence the *Contractor* does **not** Provide the Service in accordance with the Price List. The Price List is only a pricing document.

Link to the *Contractor's* plan

Clause 21.4 states "The *Contractor* provides information which shows how each item description on the Price List relates to the operations on each plan which he submits for acceptance". Hence when compiling the *price list*, the tendering contractor needs to develop his first clause 21.2 plan in such a way that operations shown on it can be priced in the *price list* and result in a satisfactory cash flow in terms of clause 11.2(17).

Preparing the *price list*

Before preparing the *price list*, both the *Employer* and tendering contractors should read the TSC3 Guidance Notes pages 14 and 15. In an Option A contract, either Party may have entered items into the *price list* either as a process of offer and acceptance (tendering) or by negotiation depending on the nature of the service to be provided. Alternatively the *Employer*, in his Instructions to Tenderers or in a Tender Schedule, may have listed some items that he requires the *Contractor* to include in the *price list* to be prepared and priced by him.

It is assumed that in preparing or finalising the *price list* the *Contractor*:

- Has taken account of the guidance given in the TSC3 Guidance Notes relevant to Option A;
- Understands the function of the Price List and how work is priced and paid for;
- Is aware of the need to link operations shown in his plan to items shown in the Price List;
- Has listed and priced items in the *price list* which are inclusive of everything necessary and incidental to Providing the Service in accordance with the Service Information, as it was at the time of tender, as well as correct any Defects not caused by an *Employer's* risk;
- Has priced work he decides not to show as a separate item within the Prices or rates of other listed items in order to fulfil the obligation to complete the service for the tendered total of the Prices.
- Understands there is no adjustment to items priced as lump sums if the amount, or quantity, of work within that item later turns out to be different to that which the *Contractor* estimated at time of tender. The only basis for a change to the (lump sum) Prices is as a result of a compensation event.

Format of the *price list*

(From the example given in an Appendix within the TSC3 Guidance Notes)

Entries in the first four columns in the *price list* in section C2.2 are made either by the *Employer* or the tendering contractor.

If the *Contractor* is to be paid an amount for the item which is not adjusted if the quantity of work in the item changes, the tendering contractor enters the amount in the Price column only, the Unit, Expected Quantity and Rate columns being left blank.

If the *Contractor* is to be paid an amount for an item of work which is the rate for the work multiplied by the quantity completed, the tendering contractor enters the rate which is then multiplied by the Expected Quantity to produce the Price, which is also entered.

If the *Contractor* is to be paid a Price for an item proportional to the length of time for which a service is provided, a unit of time is stated in the Unit column and the expected length of time (as a quantity of the stated units of time) is stated in the Expected Quantity column.

C2.2 the *price list*

Refer *price list* attached

PART 3: SCOPE OF WORK

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C3.2	<i>Contractor's Service Information</i>	
	Total number of pages	16

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1. Description of the service

1.1. Executive overview

Provision of welding, machining and associated services at Drakensberg Pumped Storage Scheme for a period of 5 years on an as and when required basis.

The service involves on-site and off-site (*Contractor's* facility) welding and machining as detailed in the Welding, Machining and Associated Services technical specification (Doc. No. 31A/11111-P3-A Revision 2).

1.2. Employer's requirements for the service

The *Contractor* provides labour including supervision, tools (including special tools), equipment (including special equipment), consumables, quality control and associated services, such as general machining and heat treatment necessary to carry out the *service* according to the applicable codes, standards and Employer's requirements.

The *service* required are detailed in the Technical Specification (Doc. No. 31A/11111-P3-A Revision 2).

1.3. Interpretation and terminology

The following abbreviations are used in this Service Information:

Abbreviation	Meaning given to the abbreviation
NDT	Non-Destructive Testing
PT	Penetrant Testing
MPI	Magnetic Particle Inspection
UT	Ultrasonic Testing
GV	Guide Vanes
PWHT	Post Weld Heat Treatment
WPQR	Welding Procedure Qualification Record
HT	Heat Treatment
QCP	Quality Control Plan
WPS	Welding Procedure Specification

2. Management strategy and start up.

2.1. Management meetings

Meetings shall be held to mutually promote and to pro-actively and jointly manage the administration of the contract with the objective of minimising the adverse effects of risks and surprises for both Parties.

During execution the *Contractor* holds a toolbox talk each morning before commencing with the *services* to discuss the previous day's work and to ensure that everyone understands what is required of them.

When required, the *Contractor* must have a representative at each daily morning meeting during planning and execution phases.

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

Meetings	Approximate time & interval	Location	Attendance by:
Kick-off	Once-off	MS Teams/Drakensberg	<i>Employer, Contractor, Service Manager</i> and others as deemed necessary
Risk Reduction	Adhoc	MS Teams /Drakensberg	<i>Employer, Contractor, Service Manager</i> and others as deemed necessary

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

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

Attendees shall have the necessary delegated authority to make decisions in respect of matters discussed at each meeting.

2.2. Contractor's management, supervision and key people

The *Contractor* shall supply the *Employer* with the organogram indicating the hierarchy of dedicated and appointed project personnel with their lines of authority / communication. The Organogram shall include contact details and emergency response (24-hour) information.

The *Contractor* employs in and about the Provision of the Services only such persons that are careful, competent and efficient in their several trades and callings, to achieve safety excellence and highest quality standard.

The *Employer* reserves the right to object to and require the *Contractor* to remove from the *services*, forthwith, any person employed by the *Contractor* in or about the Provision of the Services who, in the opinion of the *Service Manager* is incompetent, misconduct's himself or negligent in the proper performance of his duties and such person is not again employed for the *services* without the written permission of the *Service Manager*.

Contractor's key people to provide their CVs and qualifications before the start of a Task Order. The *Contractor's Service Manager* is trained on the NEC TSC3 prior the *starting date*.

2.3. Documentation control

2.3.1. General

Each instruction, certificate, submission, proposal, record, acceptance, notification and reply is communicated in a form which can be read, copied and recorded and in the language of the Contract, within the period for reply or any other period agreed between the parties prior to its due date. Any such communiqué must bear the signature of the author; emails therefore do not conform except when used as a transmittal medium.

2.3.2. Minimum requirements

All documents shall be in simple and clear English; and always reference to applicable TSC clause under (or as a result of) which it is communicated.

2.3.3. Use of standard forms

The *Service Manager* and the *Contractor* will use the standard TSC

2.3.4. Communication

All Communication is addressed to the *Service Manager* as applicable to the TSC. All communication makes reference to:

- The Contract Number that is issued by the *Employer* (normally a 46000.....)
- The Contract title;
- Any previous reference relating to the specific communiqué;
- The specific TSC clause under which the communication is issued;
- Whether a reply is required and
- A unique letter reference number.

The unique reference number to be used for written correspondence between the *Service Manager* and *Contractor* and vice versa is as follows:

- From the *Service Manager* to the *Contractor*: 46000..... E/C 0xxx; and from the *Contractor* to the *Service Manager* 46000 C/E 0xxx referring to the Contract number and the next sequential letter (channel) number

2.4. Invoicing and payment

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

- a) The *Services Manager* to be copied in on all electronic invoices emailed.
- b) Failure to submit the invoice to the correct address could result in delays in payment.
- c) The *Contractor's* Tax Invoices comply with the requirements as stated in clause Z7 of the Contract Data
- d) Invoices are submitted electronically to:
 - Local Eskom Invoices - invoiceseskomlocal@eskom.co.za
 - Foreign Eskom Invoices - invoiceseskomforeign@eskom.co.za
- e) Details required when submitting invoices and additional data:
 - The subject line on your email should only contain your vendor number
 - Each invoice in PDF should be named with your invoice number only
 - All electronic invoices are be sent in PDF format only

- Attach the proof of delivery to your invoice
 - Where applicable, supporting documents are to be attached to the scanned PDF invoice as one attachment
 - A copy of the signed assessment certificate
 - Any other appropriate documents, e.g.
 - For shipping invoices, please ensure the following documents are attached
 - Invoice (this should only reflect the shipping cost)
 - Commercial invoice
 - Delivery note
 - Your shipping costs calculation relevant to that invoice – not a generic calculation (The amount of the shipping costs calculation balances on the amount on the invoice.)
 - Forwarding agent's invoice
 - The customs document
 - Please do not attach unnecessary documents as this will make the file too large
- f) Other requirements:
- For foreign invoices, suppliers are still required to physically deliver hard copies of original documents to the respective *Service Manager* even though the invoices have been submitted electronically
 - Ensure compliance with the tax requirements for submitting invoices electronically
 - Each PDF should contain one credit note, one debit note or one credit note only. More than one invoice can be submitted per email
- g) Include the following information on the Invoice:

The *Contractor* shall address the tax invoice to

Eskom Holdings SOC Limited
P O Box 1091
Johannesburg
2000

and include on each invoice the following information

- Name and address of the *Contractor* and the *Service Manager*;
- The contract number and title;
- *Contractor's* VAT registration number;
- The *Employer's* VAT registration number 4740101508;
- Total amount invoiced excluding VAT, the VAT and the invoiced amount including VAT;
- *Contractor's* company registration number if applicable
- *Contractor's* banking details
- Name and address of recipient
- Tax invoice number and date of issue,
- Description of goods/service provided,
- Quantity or volume of goods/services
- Period time for which the Tax Invoice is being rendered,
- Relevant Task Order Number (commencing with a 45 prefix),
- Relevant line item number,
- Statement whether value added tax is included or excluded

CPA

CPA is applied as per Secondary Option X1 in Contract Data. If there is CPA on your invoice, it is recommended that you issue a separate invoice for CPA so that if there are any issues on the CPA, the rest of the invoice can be paid whilst CPA issues are resolved. CPA calculation sheets to accompany invoice.

Payment Queries

For all queries and follow-ups on invoice payments, kindly contact the Finance Shared Services Contact Centre

- Tel: 011 800 5060
- Email: fss@eskom.co.za

Eskom information

- Eskom Tax clearance and BBBEE certificate is available at: https://www.eskom.co.za/Tenders/BBBEECertificate/Pages/Eskom_BBBEE_Certificate.aspx
- Eskom VAT Number is **4740101508**

Avoid Payment Delays

- Failure to submit a PDF invoice with accompanying assessment electronically to Invoiceseskomlocal@eskom.co.za could result in payment delays.
- *Contractor* to ensure the *Service Manager* has an updated valid certified copy of BBBEE certificate or sworn affidavit, tax certificate and Letter of Good standing during contract period. Failure to do so, could result in Eskom Vendor Management Dept blocking vendor details on Eskom vendor management system which affects payment processing of invoices.
- It is important that the value stated on the invoice must be the same as the value stated on the task order. If the invoice value is different from the task order value, payment of the invoice will be delayed. It is strongly recommended that if there are any discrepancies on the invoice, it will be rectified with the *Service Manager* before it is submitted for payment.
- Ensure remittance email address and name on invoice are correct and that Eskom has received the same information to update its records. If different in Eskom's system, it will delay processing of invoice.

2.5. Contract change management

Each change/compensation event (whether positive or negative) is submitted, using the standard NEC TSC3 Forms.

2.6. Records of Defined Cost to be kept by the *Contractor*

Clear records of hours worked or time sheets in respect of all time charges shall be kept by the *Contractor* and shall indicate the resource utilised, location, duration, and times, associated expenses incurred, and a summary of the *services* rendered which shall be cross-referenced to deliverables rendered. The *Service Manager* shall review all time sheets.

Records to be kept and separated in the following categories:

- SHE related
- Labour costs
- Transport
- Accommodation
- Living out
- Materials
- Plant and equipment

The *Contractor* maintains records of all documentation and shall be provided to the *Service Manager* in electronic format and hard copy

2.7. Insurance provided by the *Employer*

As per Clause Z12. Queries regarding insurance claims and/or procedures can be addressed with the *Service Manager*.

2.8. Things provided at the end of the service period for the *Employer's* use

2.8.1. Equipment

None

2.8.2. Information and other things

At the end of the service period or earlier termination of this contract, the *Contractor* shall make available to the *Employer* all records as detailed in the Technical Specification (Doc. No. 31A/11111-P3-A Revision 2) and information relating to the service carried out under this contract at no extra cost to the *Employer* excluding the *Contractors* intellectual property.

2.9. Management of work done by Task Order

All work will be done in terms of Task Orders. Consultation by the *Service Manager* about the contents of a Task Order will be via email or MS Teams meeting.

The *Service Manager* issues a Task Order (commencing with a 45 prefix) to the *Contractor* which clearly specifies the Task to be performed, additional specification; procedures; any other constraints the *Contractor* complies with in providing the *service*. This Task Order authorises work to be done by the *Contractor*. No works are to be executed without a Task Order.

Within one (1) week of receiving the Task Order, the *Contractor* submits the following to the *Service Manager* for acceptance:

- Task Order programme showing all the information required by Clause X19.6 of NEC3 TSC. In addition the programme shows details as per Technical Specification (Doc. No. 31A/11111-P3-A Revision 2).
- The Task Order programme must be submitted in MS Projects.
- CV's for key personnel showing level of experience and qualifications

The *Contractor* performs the service in accordance with the Task Order issued and completes it within the time period specified in the Task Order.

Task Order template below as Annexure A.

3. Health and safety, the environment and quality assurance

3.1. Health and safety risk management

- The *Contractor* shall comply with the health and safety requirements contained in SHE specification provided for this service.
- The *Contractor* adheres to Technical Specification (Doc. No. 31A/11111-P3-A Revision 2).

3.2. Environmental constraints and management

The *Contractor's* rates tendered shall cover all costs that will be incurred to comply with all requirements of the environmental requirements. Special attention is drawn inter alia to the following aspects:

- The *Contractor's* attention is drawn to the fact that the Affected Property is situated in a highly sensitive environmental area and that any incident that may result in an environmental impact must be brought to the attention of the *Service Manager* as soon as it is possible. The site is managed in accordance with an ISO 14001 certified management system, and the *Contractor* is expected to manage all processes in line with environmentally sound principles.
- The *Contractor*, in and about the execution of the service, complies with all applicable national, provincial and Municipal environmental legislation and by laws.
- Comply with all environmental legislation of South Africa, including but not limited to:
 - National Environmental Management Act 107 of 1998
 - National Environmental Management Waste Act 59 of 2008
 - National Water Act 36 of 1998
 - Eskom Waste Standard latest revision
 - Waste Management: Norms and standards: Act 59 of 2008 latest revision
- The *Contractor* shall comply to all National and Local legislation requirements as well as Eskom procedures and policy. Eskom's goal is to ensure zero harm to the environment, and to ensure that any possible impact is mitigated or managed. The Duty of Care and implementation of best practice is critical during operations, and full communication on environmental issues is required at all times.
- **Site/laydown demarcation:** The *Contractor* shall demarcate his camp site, be restricted to that specific area and take full responsibility to restore the area to its original condition before the contract commenced.
- **Waste management:** The *Contractor* shall dispose of all waste off-site at a licensed waste disposal facility and submit proof to Eskom. The method statement on waste management will need to include the identification of possible waste streams, temporary storage and disposal options for each waste type, and contingency plans in the case of any environmental incident. A Safety Data Sheet must be supplied for all chemical or hazardous / potentially hazardous material brought onto site."
- **Sanitation:** The *Contractor* shall provide an appropriate enclosed temporary sanitation facility
- **Dust control:** The *Contractor* shall be responsible to apply effective dust control measures.
- **Fire prevention:** It shall be the responsibility of the *Contractor* to prevent fires at all times during the contract.
- 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. Nothing specified herein shall relieve the *Contractor* of any obligations or responsibilities in this regard.
- The *Contractor* shall implement an Environmental Policy and plan, in line with relevant various compliance obligations, statutory regulations, including all national, provincial and municipal legislation/regulations.
- Method statements which include environmental protection shall be submitted to the *Service Manager* within 14 days after the.
- The *Contractor* shall conduct his activities so as to cause the least possible disturbance and adverse impact to the existing amenities, whether natural or man-made, in accordance with all the currently

applicable statutory requirements. Special care shall be taken by the *Contractor* to prevent irreversible damage to the environment.

- The *Contractor* shall take adequate steps to educate all members of his workforce as well as his *Supervisory* staff on the relevant environmental laws and regulations. The *Contractor* shall supplement these steps by prominently displayed notices and signs in strategic locations to remind personnel of environmental concerns.

Method Statements

The *Contractor* shall submit, before 14 calendar days of commencement of any activity, a Method Statement containing details of all site layouts and environmental protection measures proposed to the *Service Manager* for review and acceptance.

These shall include but not limited to:

- Site establishment layout;
- Pollution prevention measures;
- Waste including water management plan;
- Incident and emergency management

In addition, the *Contractor* shall provide detailed method statements on how he intends to carry out the works; this shall apply to all, and any part of the works as provided in the *conditions of contract*.

Temporary Services and Facilities

- All fuel storage tanks shall be bunded to 110 % of the total storage capacity. Fuel dispensing areas and workshop areas shall be provided with concrete hard standing draining to oil separators. This will also apply to other areas with pollution potential.
- Cleaning, maintenance and repairs of vehicles shall be done off site.

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, silt and wastewater 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 river flood lines, streams, water courses and wetlands without the written acceptance of the *Service Manager* as required for the execution of the work.

Refuse and Waste Control

- The management of solid waste on site shall be strictly controlled and monitored. Only licenced waste disposal landfill sites shall be used.
- The quantities of waste generated on Site shall be minimised; 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.
- No on-site burying or dumping or unauthorised burning of any waste materials, vegetation, litter, or refuse shall occur.
- Bins provided must have lids and will be sufficient to store the solid waste produced on a daily basis.
- The bins should be emptied at least once a day;
- Waste from bins may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof and which the *Service Manager* has accepted;
- All solid waste shall be disposed of off site, at a licenced landfill site. The *Contractor* shall supply the *Service Manager* 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:

Protection of Flora

- The removal, damage and disturbance of indigenous flora are prohibited.

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.
- The use of pesticides is prohibited unless accepted by the *Service Manager*.
- No domestic pets or livestock are permitted on Site.

Dust

- A dust control programme shall be implemented by the *Contractor* to maintain a safe and healthy working environment/.
- The *Contractor* shall act appropriately to minimise the generation of dust resulting from his works operations and activities.
- The *Contractor* shall prepare and submit a Dust Control Method Statement to the *Service Manager* within 14 days after the *starting date*.

3.3. Quality assurance requirements

The *Contractor* complies with the quality requirements and Technical Specification (Doc. No. 31A/11111-P3-A Revision 2) for this *service*.

4. Procurement

4.1. People

4.1.1. Minimum requirements of people employed

This shall be noted in the compulsory organogram and updated.

- *Contractor* provides valid work permits for all foreign employees.
- Staff to have good verbal and written skills in English
- The *Contractor's* ensures that only qualified people will be allowed to work on Affected Property. The *Service Manager* is entitled to verify the qualifications of the key people.
- Only personnel with a clear criminal result will be granted access to site.
- The *Contractor* shall comply with the South African Labour Relations Act and ensure that their staff is compensation with a fair and reasonable wage.

4.1.2. BBBEE and preferencing scheme

Contractor to ensure the *Service Manager* has an updated valid certified copy of BBBEE certificate or sworn affidavit during contract period. Failure to do so, could result in Eskom Vendor Management Department blocking vendor details on Eskom vendor management system which affects payment processing of invoices.

4.1.3. Supplier Development, Localization, and Industrialization (SDL&I)

The *Contractor* shall comply with the SDL&I requirements for this service.

4.2. Subcontracting

4.2.1. Subcontract documentation, and assessment of subcontract tenders

It is compulsory for the *Contractor* to use NEC system when subcontracting.

4.2.2. Limitations on subcontracting

Supervision may not be subcontracted.

4.2.3. Attendance on subcontractors

It is the sole responsibility of the *Contractor*.

4.3. Plant and Materials

4.3.1. Specifications

As detailed in the Technical Specification (Doc. No. 31A/11111-P3-A Revision 2)

4.3.2. Correction of defects

The *Contractor* provides a report detailing the nature of the defective Plant and Materials, the report should also give recommendations as to whether the defect can be fixed or not. The *Employer* is entitled to witness the defective Plant and Materials.

No replacement of defective Plant and Materials must be done without an instruction by the *Service Manager*.

4.3.3. Contractor's procurement of Plant and Materials

It shall remain the sole responsibility of the *Contractor* to procure Plant and Material of a reasonable and acceptable quality.

For any deliveries prior to installation *Service Manager* to be notified three (3) days in advance.

Delivery times for Mondays to Thursdays 08h00 to 15h30, for Fridays from 08h00 to 11h00. No deliveries on weekends and public holidays. Driver to produce Identity document on arrival.

5. Working on the Affected Property

5.1. Employer's site entry and security control, permits, and site regulations

Peaking Stations are National Key Points. All persons intending to perform work and/or attend meetings during this contract period comply with the following:

- The *Contractor* adheres to all Life Saving Rules and emergency procedures.
- The *Employer* does not permit any passengers to be transported at the back of any truck, light domestic vehicle or enclosed light commercial vehicle.
- Each person shall sign the site entrance register and this information shall also be collated by the *Contractor* for use during the scheduled meetings

- Parking is allowed in the demarcated areas only and should it be required to drive on site, then the following must be adhered to:
 - Speed limit
 - Obey all road signs
 - Damage to *Employer's* plant/property will be for the *Contractor's* account.
- All *Contractor* personnel are in possession of clearance certificate obtained from South African Police Service (SAPS) Criminal Record Centre (CRC) or an accredited supplier linked to the SAPS Automated Fingerprint Identification System (AFIS), along with a copy of their identity document or passport. Verification records are submitted as part of the safety file together with ID copies as well as valid work permits for foreigners. Only personnel with a cleared criminal record will go through safety induction.
- Original Identity document (ID) or passport is presented to Security on arrival
- No weapons may be taken on site
- No drugs allowed on site
- No explosives allowed on site
- No firearms and ammunition allowed on site
- No photographs may be taken whilst on site
- All persons entering the *Employer's* premises undergo a breathalyser test (including random testing). Any persons testing positive is not allowed entry. The *Employer* has a zero tolerance towards alcohol.
- Tool registers are verified on arrival by security personnel
- Only reverse parking is allowed on site
- *Contractor* shall be subject to searches, including vehicles, tools, equipment, objects, or materials, or anything else deemed appropriate for searching, at any time when entering or exiting the *Employer's* premises.
- Removal of equipment or materials from site without proper authorisation is strictly prohibited.
- The *Contractor* communicates any resignations or suspensions to the *Service Manager* and ensures that replacement personnel have undergone criminal background checks and work permit verifications prior to reporting to the *Employer's* premises.
- *Contractor* is required to comply with the access control standard and security instructions to maintain a secure working environment at the *Employer's* premises.
- No recruitment on site or at the main access gates or any of the *Employer's* premises is allowed.
- All activities on plant must be preceded by a task risk assessment – Risk assessment as per the *Employer's* standard, to be current at all times (Live Document).

Asset registers of all tools and equipment incorporated or consumed in providing the service shall be maintained by the *Contractor* and shall be audited and inspected by *Employer* from time to time.

5.2. People restrictions, hours of work, conduct and records

The *Contractor* keeps records of his people working on the Affected Property, including those of his subcontractor. The *Service Manager* shall have access to them at any time.

Working times will be agreed upon between the *Contractor* and the *Service Manager*.

5.3. Cooperating with and obtaining acceptance of Others

The *Contractor* will be working with other *Contractor's* in the same area. Others might also from time to time require limited access to the same area in order to execute maintenance activities and the *Contractor* is to be accommodating in such instances.

The *Contractor* co-operates with and does not delay, impede or otherwise impair the work of Others

5.4. Records of *Contractor's* Equipment

- The *Contractor* declares all equipment and tools to security personnel on arrival.
- When removing items from site, the items declared are verified by security personnel.

5.5. Site services and facilities

5.5.1. Provided by the *Employer*

Ablution facilities

- The *Contractor* is allowed to make use of the *Employer's* ablution facilities.

Electricity Supply

- All points of supply are provided in terms of availability and location.
- The *Employer* indicates which supply points may be used.
- 220V electrical supply is generally available in the power station complex, the *Contractor* provides correct matching plugs
- 380V supply is also available, the *Contractor* ensures provides correct matching plugs.
- The *Contractor* verifies and provides extension lead requirements.
- No warranty is offered or given by the *Employer* that the existing available electrical supply will necessarily be adequate for the *Contractors* purposes nor that such supply is in any way guaranteed.
- The distribution of electricity shall be carried out by the *Contractor* strictly in accordance with the applicable laws and regulations.

The *Contractor* provides everything else necessary for Providing the Service

5.5.2. Provided by the *Contractor*

- *Contractor* provides and ensure safe transportation services for all his employees, and it must comply with 240-62946386
- *Contractor* provides own groceries (Coffee, sugar, milk, tea etc.)
- *Contractor* provides own office facility including computers, printers etc if deemed necessary
- The *Contractor* provides accommodation and meals for his employees.

The *Contractor* on completion dismantles and clears from site all such temporary structures and services at the direction of the *Service Manager*. No such dismantling and clearance work is carried out without prior instruction from the *Service Manager*.

5.6. Control of noise, dust, water and waste

The *Contractor* will keep noise and dust levels to a minimum. At no time shall his/her work result in nuisance, interference or danger to the staff or any other person working at the site. The *Employer* will make water and waste disposal available to the *Contractor*. The *Contractor* provides workers with PPE to protect against noise and dust.

5.7. Tests and inspections

5.7.1. Description of tests and inspections

As detailed in the Technical Specification (Doc. No. 31A/11111-P3-A Revision 2)

5.7.2. Materials facilities and samples for tests and inspections

The *Contractor* provides everything necessary for the tests and inspections

6. List of drawings

6.1. Drawings issued by the *Employer*

As detailed in the Technical Specification (Doc. No. 31A/11111-P3-A Revision 2)

To the <i>Contractor</i>	[●]	Tel:	[●]
Address	[●]	Fax:	[●]
Attention	[name] [●]	Date:	[●]
E mail	[●]	Ref:	[●]

Contract title	[•]	Number:	[•]
Contract action	Clause X19.2 Task Order		

Task Order No.	[•]	service	[•]
PO Number:.....			
Detailed description of the work in the Task:	[•]		
Starting date for the Task	[•]		
Task Completion Date	[•]		
Delay damages (if any)	[•]		
A priced list of items of work in the Task in which items are taken from the Price List is attached			
Total of Prices for items of work taken from the Price List per the attached priced list is:		R.	_____
Total of Prices for items of work not in the Price List (details attached) is:		R.	_____
Total of the Prices for this Task Order		R.	_____

Signature (<i>Service Manager</i>)	Name
Distribution:	

Price List (including durations)

The *Contractor* to supply an estimate of total duration required and estimated duration (and quantity) of each skills required to perform the following activities:

#	Activity Description	Activity Reference (Refer to Technical Specification – 31A/11111-P3-A)	Estimated Total Duration	Estimated Duration of Skill Requirements						
				Safety Officer	Quality Controller	Welders	Fitters (Boiler-maker)	Semi-Skilled Labourers	PWHT	Other (Please specify)
1	Guide Vane Bush Casing (Middle and Bottom) Repairs	Section 3.2.1.1							N/A	
2	Guide Vane Link Pin (Eccentric & Straight) and Governor Servomotor Link Pin Locking Plate Welding	Section 3.2.1.5							N/A	
3	Turbine Runner Blade Repairs	Section 3.2.1.9 (Pricing for 18 localised areas of 100mm diameter and maximum 5mm depth)								
4	Shaft Seal Sleeve Replacement	Section 3.2.1.11								
5	Shaft Seal Upper-, Middle- & Lower- Case Housing O-ring Groove Refurbishment	Section 3.2.1.13 (Pricing for one 10mm defect in length and maximum depth of 4mm)								

C2.2 Price List

Part 1

Item no.	Description	Unit	Estimated Quantity	Rate ZAR	Estimated Total Price ZAR
1	Preliminary & General (Fixed items)				
1.1	Site Establishment (offices, storage shed)	Sum			
1.2	Compliance with Employers Safety requirements, Compile Health & Safety File	Sum			
1.3	Site De-establishment (offices, storage shed)	Sum			
1.4	Detailed Report on all findings as per the scope	Sum			
1.5	Data book	Sum			
2.	Preliminary & General (Time related)				
2.1	LDV, bakkie, other Light motor vehicle	km	5000		
2.2	Microbus	km	15000		
2.3	Travelling to site - Airfreight	trip	10		
2.4	Travelling to site - Hired car - Class B	daily	100		
2.5	Travelling to site - Hired car - Microbus	daily	100		
2.6	Accommodation per person per night	daily	800		
2.7	Site Offices	daily	800		
2.8	Storage container/s	daily	800		

2.9	Tools and Equipment (e.g. rental of lathe etc) NB: Contractor to provide list of items and price per item provided	daily	100		
3	Consumables				
3.1	All welding consumables NB: Contractor to provide list of items and price per item provided	Each			
4	Labour				
4.1	Safety Officer	Hours	5000		
4.1.1	Safety Officer (Saturday)	Hours	1000		
4.1.2	Safety Officer (Sunday and Public Holidays)	Hours	1000		
4.2	Qualified Quality Controller - Level 2 SAIW Inspector Qualification	Hours	5000		
4.2.1	Qualified Quality Controller (Saturday – Overtime)	Hours	1000		
4.2.2	Qualified Quality Controller (Sunday and Public Holidays)	Hours	1000		
4.3	All welders as per the WPS requirements – rate per hour per 1 welder	Hours	50000		
4.3.1	Welder (Saturday)	Hours	1000		
4.3.2	Welder (Sunday and Public Holidays)	Hours	1000		
4.4	All PWHT services	Hours	10000		
4.5	Fitter (Qualified Boilermaker - Boilermaker Trade Test)	Hours	5000		

4.5.1	Fitter (Saturday)	Hours	1000		
4.5.2	Fitter (Sunday and Public Holidays)	Hours	1000		
4.6	Semi-Skilled Labourers - Matric or N3 Mechanical Engineering Certificate	Hours	5000		
4.6.1	Semi-Skilled Labourers (Saturday)	Hours	1000		
4.6.2	Semi-Skilled Labourers (Sunday and Public Holidays)	Hours	1000		
4.7	IWE/IWT	Hours	5000		
4.8	Welding Supervisor (IWS/IWP)	Hours	5000		
4.8.1	Welding Supervisor (Saturday)	Hours	1000		
4.8.2	Welding Supervisor (Sunday and Public Holidays)	Hours	1000		
4.9	Other (Contractor to specify) NB: Contractor to provide rates for Saturdays, Sundays/Public holidays for each skill added to the list)	Hours	5000		
4.10	Other (Contractor to specify)	Hours	5000		
4.11	Other (Contractor to specify)	Hours	5000		
4.12	Other (Contractor to specify)	Hours	5000		

 Eskom	Specification	Peaking
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Title: Technical Specification for
Drakensberg Pumped Storage
Scheme

**Welding, Machining and
Associated Services**

Unique Identifier:

31A/11111-P3-A

Alternative Reference
Number:

**27281458, 27281459,
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2

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Controlled Disclosure

1. BACKGROUND

The Drakensberg Pumped Storage Scheme Turbine Refurbishment outages necessitate specialized welding and associated services to support the refurbishment and maintenance of turbine components to ensure plant availability, reliability as well as production performance.

The Power Station consists of four units each with separate turbine plants. The turbine plant generally consists of a main shaft rotating by means of water flowing through a runner of the turbine, which turns the rotor of the generator and generate electricity to the national grid of South Africa. The flow rate of the water is controlled with guide vanes in conjunction with a governor system. The governor system consists of various components to allow the guide vane servomotors, operating ring and guide vanes to move.

This Technical Specification outlines the detailed requirements for welding and associated services including, but not limited to equipment, setups, consumables, material supply, machining, heat treatment, personnel qualifications, applicable design codes, quality control measures, documentation, testing and inspection and acceptance criteria.

2. DESCRIPTION OF THE *WORKS*

2.1 *Employer's objectives*

The *Employer's* objective is to establish a welding-, machining- and associated services contract with a suitably experienced *Contractor* to execute Drakensberg (DRP) turbine refurbishment outages in accordance with this Technical Specification. The outages, which are subject to possible date changes, are currently scheduled for August 2025 (DRP Unit 3), October 2025 (DRP Unit 4), March 2027 (DRP Unit 2) and April 2027 (DRP U1). Turbine plant refurbishment is limited to 60 days (double shifts).

2.2 *Brief description of the works*

The *works* include provision of manpower, consumables, tools, equipment, quality control and associated services, such as general machining and heat treatment, by the *Contractor* during the planned turbine refurbishment outages, to perform the specified welding according to the applicable codes, standards and *Employer's* requirements.

3. WORK TO BE PERFORMED BY THE *CONTRACTOR*

3.1 *Specifications*

The *Contractor* adheres to the following in providing the *works*:

- a) The *Employer's* safety rules
- b) The *Employer's* codes of practice
- c) All the documents stated in this document.

3.2 *Scope of work*

The *works* to be performed by the *Contractor* include the following:

3.2.1 *Turbine Components' Welding and Machining Works*

Various components within the turbine plant require welding, machining and potential heat treatment during the turbine refurbishment outages.

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3.2.1.1 Guide Vane Bush Casing (Middle and Bottom) Repairs

The weld repairs of the pump-turbine guide vane bush casings are part of the *Employer's* programme of overhauling the pump-turbines at Drakensberg Pumped Storage Scheme. The *works* of this activity is described as the in-situ guide vane bush casing repairs by means of corrosion resistant overlay welding and machining on 20 pump turbine guide vane middle bush casings and 20 guide vane bottom bush casings, as per the table below.

a) Scope of Work	
i.	<p>The welding <i>Contractor</i> performs all necessary welding and associated welding services, excluding line-boring of the internal bore diameters, which will be done by the <i>Employer's</i> appointed line-boring service provider.</p> <p>The guide vane bush casing repairs will consist of the following high-level activities:</p> <ul style="list-style-type: none"> • Machining, prior to welding of the butter layer, consisting of bore material excavation by means of line-boring performed by the <i>Employer's</i> line-boring service provider. • NDT, consisting of 100% surface crack inspections, performed by the <i>Employer's</i> NDT service provider. • Welding of the butter layer, performed by the welding <i>Contractor</i>. • Machining, if necessary, after welding of the butter layer and prior to welding of the stainless-steel overlay, consisting of bore material excavation by means of line-boring performed by the <i>Employer's</i> line-boring service provider. • NDT, consisting of 100% surface crack inspections, performed by the <i>Employer's</i> NDT service provider. • Welding of the stainless-steel overlay, performed by the welding <i>Contractor</i>. • Final machining, performed by the <i>Employer's</i> line-boring service provider. • NDT, consisting of 100% surface crack inspections and 15% volumetric inspections, performed by the <i>Employer's</i> NDT service provider. <p>The welding <i>Contractor</i> provides oversight and quality control for the complete repair, including during line-boring, to ensure dimensional compliance in terms of the welding procedures as well as the final required dimensions, as per the following:</p> <ul style="list-style-type: none"> • The middle bush casing has an inner diameter specification of Ø380.000mm to Ø380.057mm. • The bottom bush casing has an inner diameter specification of Ø370.000mm to Ø370.057mm.
ii.	The existing casings are made from JIS SM41A carbon steel and are integral parts of the turbine head cover and bottom stay ring.
iii.	Should the line-boring service provider require tack welds to temporary secure line-boring equipment and tools to the existing plant, the welding <i>Contractor</i> shall perform these welds according to a Welding Procedure Specification.
iv.	The <i>Employer's</i> line-boring service provider uses the healthy, non-corroded and un-worn parts of the middle- or bottom bush casing inner diameters as datums to align the boring bar radially.
v.	<p>The <i>Employer's</i> line-boring service provider machines back the corroded areas by not more than 5mm to 7mm in radius (from the existing Ø380mm to no more than Ø394mm) to achieve a healthy part of the base metal. The final material to be machined away will be determined during the execution of the <i>works</i>.</p> <ul style="list-style-type: none"> • The height on the middle bush casing to be machined away is 57mm as illustrated in Figure 1. • The height on the bottom bush casing to be machined away is 60mm as illustrated in Figure 2.
vi.	The welding <i>Contractor</i> uses a bore welder to deposit a butter layer of 309L stainless-steel and then a set of final layers of 316L stainless steel ensuring that the 316L layer is thick enough for final machining to the original bore size. The welding <i>Contractor</i> shall utilise a previously proven and qualified corrosion resistant overlay welding procedure specification, subject to the <i>Employer's</i> acceptance.

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vii.	The <i>Employer's</i> line-boring service provider line bores the welded area to the original bore sizes concentric. The acceptance criteria for any eccentricity is 0.050 mm or less.
viii.	After final machining, the inner diameters of the casings are within the tolerance specifications as listed below: <ul style="list-style-type: none"> Guide vane middle bush casing inner diameter specification = Ø380.000mm to Ø380.057mm. Guide vane bottom bush casing inner diameter specification = Ø370.000mm to Ø370.057mm.
ix.	The welding <i>Contractor</i> takes note that the maximum taper over the length of the bush casing is 0.050 mm.
x.	The welding <i>Contractor</i> takes note that the surface finish of the machined internal diameter is 0.8 µm R _a or better.
xi.	The <i>Employer's</i> line-boring service provider removes all burrs and sharp edges from the casings after final machining and polishes the edges to obtain a smooth profile. Refer to Figure 11.1.2, as per Addendum A.
xii.	The weld repairs on the casings are tested for cracks by Non-Destructive examination. The welding <i>Contractor</i> shall request, from the <i>Employer's</i> Outage Management, 100% Dye Penetrant Testing (PT) and 15% Ultrasonic Testing to be performed by the <i>Employer's</i> NDT Service Provider.
xiii.	The work to be completed in less than ten calendar days.

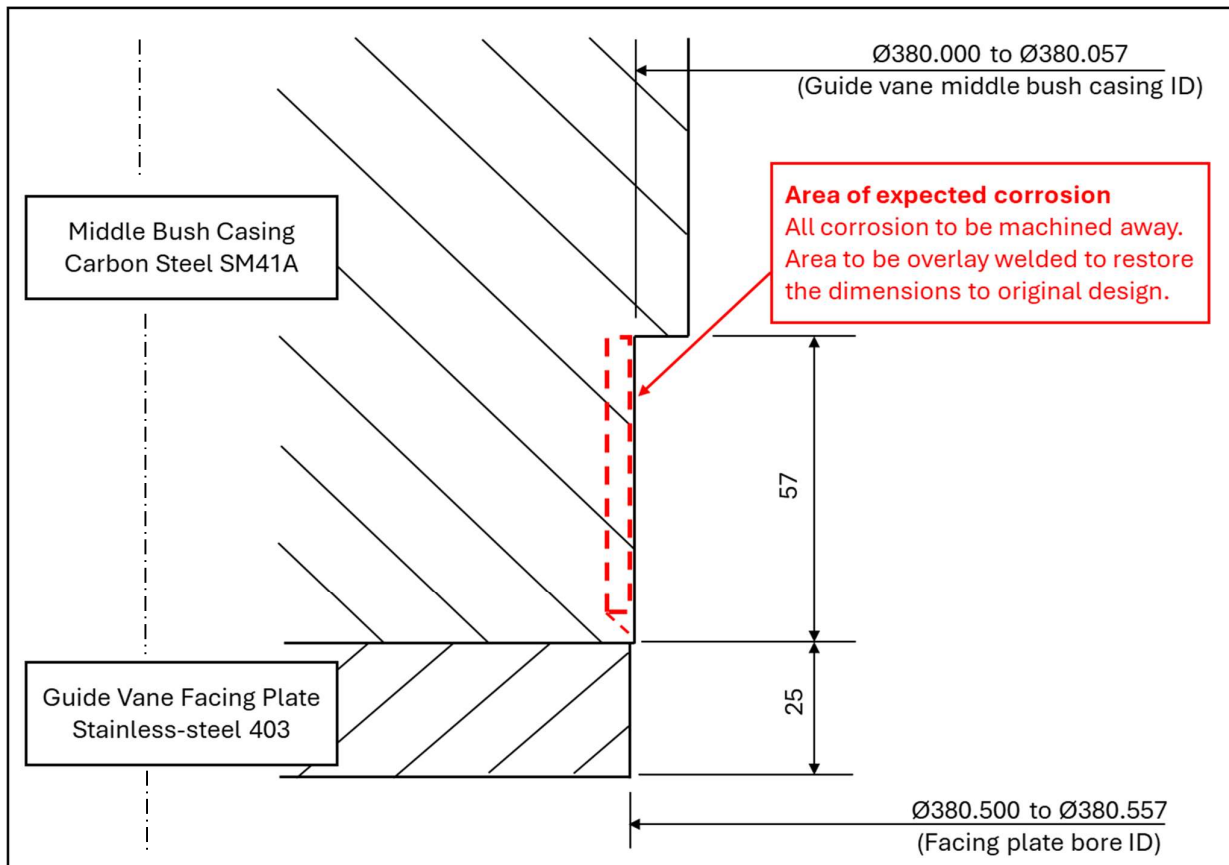


Figure 1: Guide vane middle bush casing repair illustration

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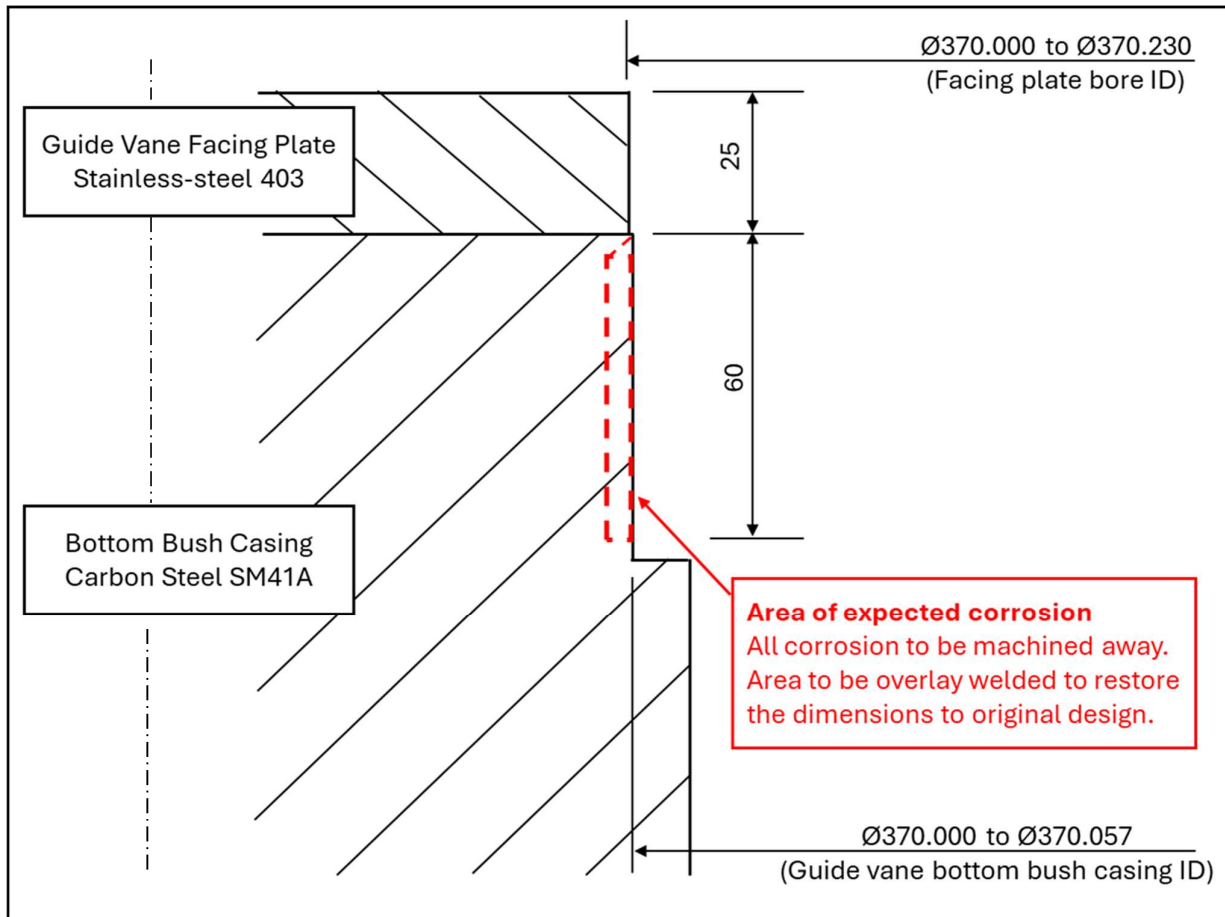


Figure 2: Guide vane bottom bush casing repair illustration

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3.2.1.2 Spiral Casing Liner, Stay Vanes and Mandoor Repairs

Spiral casing and stay vane inspections will be conducted by the *Employer* and all identified areas of concern will be handed over to the *Contractor* for repair welding. General information to be utilised as input for the repair procedure is given as per the table below.

Item	Code	Dimensions [mm]	Material Specification	Drawing	Plant Parameters / Additional Information
¹ Spiral casing liner (shell plates)	ASME Code Sec VIII Div 1 / ASME IX	Ø: 2250 to 1184 t: 35-65	SM50B (JIS)	0.48/526 REV 4	Temperature: Ambient Pressure: 72 Bar ⁴ Weld Position: Various ⁴ In-situ welding ⁴ Weld Type: Weld build-up ⁴ Weld Process: SMAW ⁴ Machining: Grinding; Blending; Polishing ⁷ NDT Request: PT/MPI/UT
² Stay vanes		t (Avg.): 30			Temperature: Ambient Pressure: 72 Bar ⁵ Weld Position: Vertical ⁵ In-situ welding ⁵ Weld Type: Weld build-up ⁵ Weld Process: SMAW ⁵ Machining: Grinding; Blending; Polishing ⁷ NDT Request: PT/MPI/UT
³ Spiral casing mandoor sealing faces and O-ring groove		t: 120 Sealing face width: 275 Oval Door: Ø1120x1420L O-ring: Ø6 (cross-sectional)		0.48/1753 0.48/1754	Temperature: Ambient Pressure: 72 Bar ⁶ Weld Position: Vertical ⁶ In-situ welding ⁶ Weld Type: Weld build-up ⁶ Weld Process: SMAW ⁶ Machining: Specialised machining of O-ring groove ⁷ NDT Request: PT/MPI/UT
1	The spiral casing is a reducing steel lined spiral passage, that is completely coated internally and embedded in concrete, and responsible for directing the water from a penstock onto the runner.				
2	Stay vanes are profiled, fixed and completely coated and its function is to guide the incoming water from the spiral casing through the guide vanes onto the turbine runner.				
3	Access to the spiral casing is obtained through a vertical orientated oval flanged access door that is coated internally. Sealing is ensured by a 6 mm O-ring installed into an O-ring groove between the two sealing faces (spiral casing flange face and door flange face).				
4	With regards to the spiral casing liner, defects can be averaged to 5 mm deep and can be localised or spread. The repairs will consist of wall thickness restoration by means of in-situ weld build-ups of all identified areas. The Contractor to take note that actual defect depths will only be known upon inspection. Welding positions will vary according to where the defects are identified and the preferred welding process to be implemented by the Contractor shall be manual SMAW. The weld build-ups shall be ground/polished to suit the surrounding areas.				
5	With regards to the stay vanes, defects typically consist of localised pit-like craters that can reach depths of up to 10 mm deep, refer to Figure 11.3.2 as per Addendum A. The welding required by the Contractor shall be in-situ weld build-ups by means of manual SMAW in the vertical position, due to the stay vanes being fixed and profiled. The weld build-ups shall be ground/polished to suit the surrounding areas.				

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6	The spiral casing mandoor defects, if any, typically includes localised damage of the general surface areas or deterioration of the 6 mm O-ring groove, situated on the spiral casing flange. The repairs will consist of weld build-ups in the vertical in-situ position. The preferred process to be utilised by the <i>Contractor</i> shall be manual SMAW. Specialised machining shall be required by the <i>Contractor</i> to machine the O-ring groove dimensions (groove radius, depth, width, corner radius, surface finish) according to the static axial application, if found to be necessary, refer to Figure 11.3.1 as per Appendix A. The O-ring groove dimensions shall be confirmed by the <i>Contractor</i> , once access is obtained, and agreed with the <i>Employer</i> prior to welding/machining. A surface finish of 0.8µm Ra or better for sealing surfaces and 1.6 µm Ra or better for vertical lead-ins shall be achieved.
7	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, consisting of 100% PT or MPI and 15% UT for weld build-ups, depending on the build-up depths.

Table 1: Spiral casing, stay vanes and mandoor information

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3.2.1.3 Draft Tube Liner and Mandoor Repairs

The *Employer* will conduct draft tube inspections, and all identified defects will be handed over to the *Contractor* for repair welding. Refer to the table below for summarised information required to determine the repair procedure.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters / Additional Information
¹ Draft tube liner	ASME Code Sec VIII Div 1 / ASME IX	t:	22 to 28	BS4360 Grade 43A	0.48/426 SHT 1/2	Temperature: Ambient Pressure: 10 Bar ³ Weld Position: Various ³ In-situ welding ³ Weld Type: Weld build-ups ³ Weld Process: SMAW ³ Machining: Grinding; Blending; Polishing ⁵ NDT Request: PT/MPI/UT
		Ø:	2700 to 1988			
		r (oval):	994 to 2250			
² Draft tube mandoor sealing faces		t:	50		0.48/429	Temperature: Ambient Pressure: 10 Bar ⁴ Weld Position: Vertical ⁴ In-situ welding ⁴ Weld Type: Weld build-ups ⁴ Weld Process: SMAW ⁴ Machining: Grinding; Blending; Polishing ⁵ NDT Request: PT/MPI/UT
		Seal face width:	115			
		Door:	870x1140			
1	The draft tube is a steel lined, coated and altering tube at the discharge of the turbine runner that is embedded in concrete. The draft tube varies from circular in shape with a vertical orientation to an oval shape with a horizontal orientation which then alters to a slight upward angle as it approaches up to the lower dam.					
2	Access to the draft tube is obtained through a vertical orientated rectangular flanged access door. Sealing is ensured by a 6 mm gasket installed between the two sealing faces (draft tube flange face and door flange face). Refer to Figure 11.4.2 as per Addendum A.					
3	Typical draft tube liner defects can be either localised or spread over a wider area with an averaged depth of 5 mm, as per Figure 11.4.1 in Addendum A. General maintenance consists of cleaning these concerned areas and coating with corrosion protection epoxy. The repairs will consist of in-situ wall thickness restoration by means of weld build-ups of all identified areas. The <i>Contractor</i> to take note that actual defect depths will only be known upon inspection and depending on where the defects are found, the welding positions will vary. The preferred welding process to be utilised by the <i>Contractor</i> shall be manual SMAW. The weld build-ups shall be ground/polished to suit the surrounding areas.					
4	The draft tube mandoor defects, if any, typically include localised damage of the general surface areas or deterioration of the sealing surface. Weld build-ups will be required, in-situ, for restoration. Welding positions will most likely be in the vertical orientation. The preferred welding process to be utilised by the <i>Contractor</i> shall be manual SMAW. The weld build-ups shall be ground/polished to suit the surrounding areas and all sealing surfaces shall have a surface finish of 0.8µm Ra or better.					
5	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, consisting of 100% PT or MPI and 15% UT for weld build-ups, depending on the build-up depths.					

Table 2: Draft tube and mandoor information

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3.2.1.4 Turbine Head Cover Surface Repairs and O-ring Groove, O-ring Lead-In and O-ring Sealing Surface Repairs

The turbine head cover is removed from the stay ring during the turbine refurbishment outage, exposing the interfacing and normally non-accessible areas. The *Employer* will conduct inspections to identify all defects within this area on the head cover as well as stay rings, including O-ring grooves and sealing surfaces between the two components, that shall be repair welded by the *Contractor*, if necessary. The table below summarizes necessary information that will serve as input to the repair procedure.

Item	Code	Dimensions [mm]		Material Spec	Drawing	Plant Parameters / Additional Information
¹ Turbine Head Cover	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2	t:	Various > 20	JIS SM50B JIS SM41A JIS SS41	0.48/526 0.48/561 SHT1&2	³ Weld position: Overhead and vertical ³ On-site welding ³ Weld Type: Weld build-ups ³ Machining: Grinding; Polishing ³ Weld process: SMAW ⁵ NDT Request: PT/MPI/UT
² Stay Ring	or ASME IX	t:	53 - 75	JIS SM41A JIS SS41 JIS SM50B	0.48/562 SHT 1&2	⁴ Weld position: Flat and vertical ⁴ On-site welding ⁴ Weld Type: Weld build-ups ⁴ Machining: Grinding; Polishing ⁴ Weld process: SMAW ⁵ NDT Request: PT/MPI/UT
1	The head cover, top part that is lifted from normal sitting position and supported during the turbine refurbishment outages, comprises of different materials, typically plates, of similar material grouping and is situated around the main shaft. Overall outer diameter is approximately 6650 mm.					
2	The stay ring, bottom fixed component, consists of similar materials and has one important round O-ring groove, for a 12mm O-ring, with an approximate diameter of 5860 mm. The O-ring are replaced during this opportunity and the groove, lead-in surfaces as well as sealing surfaces shall be repaired by the <i>Contractor</i> , where and if necessary.					
3	With regards to the turbine head cover, the sealing surfaces, on top of the O-rings, typically corrode and based on findings shall be repair welded by the <i>Contractor</i> only at the areas where required. The corroded or damaged areas shall be excavated, and weld build-ups shall be performed by the <i>Contractor</i> . The weld build-ups shall be ground/polished to suit the surrounding areas to achieve a surface finish of 0.8µm Ra or better. The <i>Contractor</i> shall weld by means of manual SMAW. The top cover is lifted and supported in an elevated position; hence the sealing surfaces will be in the overhead position, while other areas to be repaired might be in the vertical position. Distortion shall be controlled as best as possible and monitored by the <i>Contractor</i> .					
4	With regards to the stay ring, any damage or corrosion identified, to be repaired by the <i>Contractor</i> , on the O-ring grooves, lead-in surfaces and sealing surfaces shall be repaired in-situ, most likely in the flat and possibly in the vertical positions. Damaged areas shall be excavated, and weld build-ups shall be performed by the <i>Contractor</i> to repair the identified areas. Should an O-ring groove be repaired, specialised machining for the round O-ring groove shall be required to achieve a surface finish of 0.8µm Ra or better for sealing surfaces and 1.6 µm Ra or better for vertical lead-ins. Refer to Figure 11.5.1 as per Addendum A as an example of previous damage. All other build-ups shall be ground/polished to suit the surrounding areas. Manual SMAW shall be utilised by the <i>Contractor</i> . Like for the top cover, distortion shall be controlled and monitored by the <i>Contractor</i> .					
5	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, consisting of 100% PT or MPI and 15% UT for weld build-ups depending on where the build-up is performed as well as the depth.					

Figure 3: Turbine head cover surface repairs and O-ring groove information

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3.2.1.5 Guide Vane Link Pin (Eccentric & Straight) and Governor Servomotor Link Pin Locking Plate Welding

The *Contractor* shall weld the locking plates for the guide vane (GV) link eccentric and straight pins as well as the governor servomotor link pins during the assembly phase of the turbine refurbishment outage. Input data for the relevant repair procedure is summarized in the table below.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters
¹ GV link eccentric pin locking plates (20 in total)	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	Locking plate t:	28	JIS G3101 SS41 plate	0.48/720	³ Weld position: Flat ³ In-situ welding ³ Weld type: Fillet stitch weld ³ Weld process: SMAW ³ Machining: Fillet welds to be left as welded ⁴ NDT Request: PT or MPI
¹ GV link straight pin locking plates (20 in total)		GV link arm t:	55			
² Governor servomotor link pin locking plates (4 in total)		Locking plate t:	50			
		Servo link bar t:	111			
1	The linkage between the GV arm lever, link arm and operating ring is secured by eccentric and straight pins. The position of these pins is essential and therefore are secured by means of circular/disk plates that fits over the pins and are welded onto the top link arm plates. There are 20 guide vanes each with 1 eccentric pin and 1 straight pin, thus 20 eccentric pin locking plates and 20 straight pin locking plates in total.					
2	The linkage between the servomotor rod link arm, connecting link bars and operating ring, is ensured by eccentric pins. The eccentric pin positions are locked by means of fixed welded circular locking plates. There are 2 servomotors link bars each with 2 eccentric pins, thus a total of 4 locking plates.					
3	The Contractor shall weld in-situ during the assembly phase of the turbine refurbishment outage, with manual SMAW, a 10 mm (leg length) fillet stitch weld consisting of 80 mm lengths at a pitch/spacing of 200 mm around the circular locking plates in the flat position. There are 44 locking plates in total to be stitch welded. No machining or polishing will be required as the fillet welds shall be left as-welded condition. Refer to Figure 11.6.1 for a presentation of the circular locking plates.					
4	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, and shall consist of 100% PT or MPI for all fillet welds.					

Table 3: GV link (eccentric & straight) pin and governor servomotor link pin locking plates information

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3.2.1.6 Operating Ring Vertical and Horizontal Wearing Plate Journal Repair and Welding of Wear Plate Locking Plates

Operating ring journal repairs shall be implemented by the *Contractor*. Inspections will be carried out by the *Employer*, during the disassembly phase and upon gaining of access, to identify all defects and concerning areas, which will be handed over to the *Contractor*. The following table provides information to be used as input for determining the repair procedure.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters
¹ Operating ring vertical and horizontal journals	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	t:	>50	Operating ring: JIS G3106 SM41A	0.48/718	³ Weld position: Vertical; Flat ³ On-site welding ³ Weld type: Weld build-up ³ Machining: Grinding; Blending; Polishing. JIG as per Addendum A ³ Weld process: SMAW ⁵ NDT Request: PT
² Wear plate locking plates		t:	>15	Similar material group as JIS G3106 SM41A	N/A	⁴ Weld position: Vertical ⁴ On-site welding ⁴ Weld type: Fillet weld ⁴ Machining: Fillet welds to be left as welded ⁴ Weld process: SMAW ⁵ NDT Request: PT
1	Wear plates, that are installed/bolted onto the vertical journals on the inner diameter of the operating ring, as well as the horizontal journals on the top cover ensure adequate movement and protection of all underlying surfaces of the operating ring whilst being driven by the governor servomotors to position the guide vanes.					
2	Locking plates are installed on either side of the wear plates to prevent unwanted looseness and possible damage that might be caused should a wear plate move. It must be noted that some units do not have locking plates and therefore each unit will be assessed during the disassembly phase to confirm if and what type of welding intervention will be required. Locking plates are simple rectangular steel plates/blocks. Refer to Figure 11.7.2 and 11.7.3 as per Addendum A.					
3	With regards to the operating ring vertical and horizontal journals, the <i>Contractor</i> shall perform weld build-up repairs, on site, of all defects by means of SMAW, in both the vertical and flat positions. Typical defects, as previously experienced, included indents, galling, localised damage and general wear that required weld build-ups. The <i>Contractor</i> to take note that actual defect depths will only be known upon inspection. The weld build-ups shall be ground/polished to suit the surrounding areas to a surface finish of 0.8µm Ra or better. A jig shall be manufactured by the <i>Contractor</i> to assist with grinding of the vertical journal back to its desired radius after weld buildup repairs, refer to Figure 11.7.1 as per Addendum A.					
4	With regards to the wear plate locking plates, the <i>Contractor</i> shall perform on-site vertical fillet welds, with a maximum leg length of 8 mm, on each locking plate, only if found to be necessary, on both ends of the wear plates by means of SMAW. Vertical up welding will not be allowed, except if separately qualified by a test piece. The vertical fillet welds will be left as-welded and not be blended or polished.					
5	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, and shall consist of 100% PT for all fillet welds and weld build-ups, for this particular case based on the application.					

Table 4: Operating ring journal and wear plates locking information

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3.2.1.7 Guide Vanes Blade Repairs

Guide Vane Blade inspections will be conducted by the *Employer*, after the removal of each Guide Vane during the disassembly phase, to identify all defects that can typically include cracks, erosion, cavitation, local impact damage due to particles, top and bottom facing area pick-up damage, etc. The defective areas will be handed over to the *Contractor* for repair welding. The table below summarises information required to determine the repair procedure.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters / Additional Information
¹ Guide vane blades	ASME Code Sec VIII Div 1 / ASME IX	t (min):	90	JIS G5121 SCS1	0.48/719	² Weld position: Mostly flat depending on moveability ² On-site welding ³ Weld type: Weld build-ups ³ Machining: Lathe; Grinding; Blending; Polishing ⁴ Weld process: GTAW ⁵ NDT Request: PT & UT
1	Guide vanes are critical components, within the governor system, that direct and control the flow of water into the turbine runner. There are a total of 20 guide vanes. The guide vane blades are manufactured from corrosion resistant cast steels.					
2	The guide vanes are removed during the turbine refurbishment outages for machining purposes that will occur on-site, therefore it can be moved, orientated and positioned to a certain extent to accommodate the desired welding positions. Welding shall be done on-site.					
3	Guide vane blade face typical localised defects can be 5-10 mm deep, while spread cavitation are typically less than 3mm as illustrated per Figure 11.8.1 in Addendum A. Guide vane top and bottom interface weld repairs, as per Figure 11.8.4 per Addendum A, shall be performed by the <i>Contractor</i> , only if found to be necessary by the <i>Employer</i> . The <i>Contractor</i> shall confirm the correct blade height, subject to the <i>Employer's</i> acceptance, prior to welding, to ensure accurate machining by the <i>Employer's</i> lathe operating on-site service provider on the <i>Employer's</i> lathe following the weld build-up. The <i>Contractor</i> to take note that actual defect depths and spread will only be known upon inspection. The weld build-ups shall be ground/polished to suit the adjacent areas. The guide vane journals as well as collars shall be repair welded, if found necessary, by the <i>Contractor</i> by means of circumferential weld runs or build ups that will require machining, which will be done by the <i>Employer's</i> lathe operating service provider on the <i>Employer's</i> lathe onsite. The <i>Contractor</i> shall provide oversight and ensure quality control and accurate final dimensions and surface finishes during all lathe machining, done by the <i>Employer's</i> lathe operating service provider, required on-site on the guide vanes following weld repairs. Refer to Figures 11.8.2 and 11.8.3 as per Addendum A for a general overview of the guide vanes and Figure 11.8.5 for typical collar damage.					
4	Due to the function of the guide vanes the weld will be treated as a critical weld and the Contractor shall perform weld build-up repairs by means of GTAW.					
5	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, consisting of 100% PT and 15% UT for weld build-ups, depending on the build-up depths.					

Table 5: Guide vane blades information

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3.2.1.8 Guide Vanes Facing Plate Repairs

The *Contractor* shall repair weld all defects identified by the *Employer* on the Guide Vane top and bottom Facing Plates. Information regarding the Facing Plates, to be utilised as input to determine the appropriate repair procedure, are summarized as per the following table below.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters / Additional Information
¹ Guide vane top and bottom facing plates	ASME Code Sec VIII Div 1 / ASME IX	t:	25	SUS403	0.48/562 SHT 1&2	² Weld position: Flat and overhead ² In-situ & on-site welding ³ Weld type: Weld build-ups ³ Machining: Grinding; Blending; Polishing ⁴ Weld process: GTAW (& PWHT) ⁵ NDT Request: PT & UT
1	Guide vanes are situated between a top and bottom facing plate. The clearance between the guide vanes and facing plates are crucial for operation purposes. The facing plates must be defect free, level and flush with adjacent healthy surfaces to ensure and maintain current clearances between the guide vane top and bottom interfaces, with no high spots that could result in material pick-up.					
2	The top facing plate will be lifted with the top cover therefore, welding shall be done by the Contractor in the overhead position, while the bottom facing plate will remain in-situ (flat).					
3	Repairs shall be done by the Contractor in the form of weld build-ups of all localised pick-up damage, surface craters as well as dispersed areas where material/pick-up was previously polished away, by means of a flapper disc. Typical defects depths can range between 0.3 to 5 mm deep. The Contractor to take note that actual defect depths will only be known upon inspection. Refer to Figure 11.9.1 as per Addendum A for an example of bottom facing plate damage. The weld build-ups shall be ground/polished to suit the surrounding areas and achieve a surface finish of 0.8µm or better. Straight edges to be used to ensure the repaired areas are flush with the surrounding areas.					
4	The facing plates are critical components in the sense that it can have adverse effects on the functioning of the guide vanes, should any high spots, weld or material failure or distortion occur. The welding process to be implemented by the Contractor shall be GTAW with the possibility of PWHT.					
5	The Contractor shall request NDT, from the Employer's Outage Management, consisting of 100% PT and 15% UT for weld build-ups, depending of the build-up depths.					

Table 6: Guide vane facing plates information

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3.2.1.9 Turbine Runner Blade Repairs

Turbine runner defects, identified by the *Employer*, shall be repair welded by the *Contractor*. The table below summarizes necessary information that will serve as input to the repair procedure.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters / Additional Information
¹ Turbine runner	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	t:	100-120	Stainless Steel Casting: 13Cr-3.8Ni	0.48/1132 0.48/407	² Weld position: Various ² In-situ on-site welding ³ Weld Type: Weld build-ups ³ Machining: Grinding; Blending; Polishing ⁴ Weld process: GTAW & PWHT ⁵ NDT Request: PT & UT
1	The vertical turbine runner extracts energy from the water flow and causes the connecting shaft to rotate the Generator, which generates electricity. The runner consists of 6 blades in total.					
2	Runner orientation is vertical, but blades are curved, thus depending on where the defects are noted the welding position will be determined. In-situ weld repairs, due to the runner being fixed to the shaft, shall be performed by the Contractor.					
3	Typical localised defects can be up to 10 mm deep in extreme cases, while dispersed defects such as cavitation can be over a slightly larger area but generally do not reach depths of more than 5mm. The repairs shall consist of weld build-ups and shall be ground/polished to suit the surrounding areas to ensure the profile of the runner blades are maintained. Refer to Figure 11.10.1 and 11.10.2 for reference of typical runner blade damage. Typically, there are 3 areas per blade where cavitation damage is noted, thus a total of 18 areas that will most likely require repairs. An assessment to be done by the <i>Contractor</i> whether distortion might affect turbine labyrinth clearances prior to welding.					
4	The runner is a stainless-steel casting and PWHT will be required. GTAW will be performed for any runner repairs by the Contractor.					
5	The Contractor shall request NDT, from the Employer's Outage Management, consisting of 100% PT and 15% UT for weld build-ups.					

Table 7: Turbine runner information

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3.2.1.10 Guide Vane Head Repairs

Guide vane head repairs shall be implemented by the *Contractor*. Inspections will be carried out by the *Employer*, during the disassembly phase and upon gaining of access, to identify all defects and areas of concerns, especially on the bottom flange contact surface, that requires repair welding by the *Contractor*. Information, to determine the most appropriate repair procedure, is given as per the following table.

Item	Code	Dimensions [mm]		Material Specification	Drawing	Plant Parameters / Additional Information
¹ Guide vane heads	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	t:	40	JIS G5101 SC46	0.48/720 0.48/6276	² Weld position: Flat ³ Offsite Repair – Due to machining required. ³ Weld type: Weld build-ups ³ Machining: Grinding; Blending/Polishing; Lathe machining; Possibility of line- boring. ⁴ Weld process: GTAW ⁵ NDT Request: PT & UT
1	Guide vane heads form a critical part of the guide vanes' driving mechanism. The guide vane heads are fixed to the guide vanes and transfers the driving forces from the servomotors, operating ring and link arms to the guide vanes to ensure the required opening or closing movements during operation. There are a total of 20 guide vane heads.					
2	The guide vane heads will be removed during the turbine refurbishment outage and repairs shall take place off site at the Contractor's facility; therefore, placement will allow for welding in the flat or desired position.					
3	Repairs shall be done by the Contractor in the form of weld build-ups and machining of the bottom flange interfacing faces. Typically, corrosion damage and wear to the bottom flanges are present as per Figure 11.11.3 within Addendum A, these areas shall be locally excavated and repaired by means of a weld build-up and ground/machined to the required finish and thickness. The Contractor to take note that these components are prone to distortion and previously a few bores had to be line bored to size. Refer to Figure 11.11.1 as per Addendum A for an example check sheet used during previous outages as well as a schematic illustration of the distortion that occurred as per Figure 11.11.2. The bores as well as the bottom flanges' parallelism shall be measured and inspected as part of the final acceptance. Due to the machining requirements, the repairs shall be implemented offsite at the Contractor's facilities. A surface finish of 0.8µm or better shall be achieved. The quantity, if any, of guide vane heads to be sent off site shall be confirmed upon completion of the Employer's inspections during the turbine refurbishment outage upon gaining of access. All other identified defects, by the Employer, on the guide vane head body, such as cracks, craters or unacceptable indications shall be build-up weld repaired and blended accordingly by the Contractor.					
4	The welding process to be implemented by the Contractor shall be GTAW.					
5	The Contractor shall request NDT, from the Employer's Outage Management, consisting of 100% PT and 15% UT for weld build-ups. Offsite NDT interventions throughout the repair shall be clearly communicated to prevent delays and to ensure the availability of the Employer's NDT service provider.					

Table 8: Guide vane head information

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3.2.1.11 Shaft Seal Sleeve Replacement

The unit 3 shaft seal sleeve is due for replacement during the turbine refurbishment outage. The *Contractor* shall remove the current shaft seal sleeve, without damaging of the shaft, and install a spare sleeve, by means of welding, that will be supplied by the *Employer*. Relevant information to determine the most appropriate repair procedure, is summarised within the table below.

Item	Code	Dimensions [mm]		Material Spec	Drawing	Plant Parameters / Additional Information
¹ Shaft seal sleeve	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	t:	15	JIS G4304 SUS410	0.48/5904	² Removal: Drilling & grinding
		Ø (ID):	1070(+0.165; -0)			³ Weld position: Vertical
		Ø (OD):	1100(+0; -0.105)			³ Weld type: Butt Weld
		L:	375 - 385			³ In-situ on-site welding
						⁴ Weld process: GTAW & PWHT
						⁴ NDT Request: PT & UT
						⁵ Installation: Viton O-ring
						⁵ Machining: Grinding; Polish
1	In a hydro power station shaft seals are critical components for preventing water leakage between the rotating turbine shaft and the stationary top cover. The shaft seal sleeve is a wearing part, consisting of two half segments, refer to Figure 11.12.1 as per Addendum A, and is replaced on a regular basis.					
2	The removal procedure, to be implemented by the Contractor, of the old shaft seal sleeve halves, refer to Figure 11.12.2 as per Addendum A, consists of the following: <ul style="list-style-type: none">Using a 4 mm drill bit, remove the stop pins from the sleeve flush bolts.Remove the flush bolts with a punch in the direction of rotation (anticlockwise) from the access/ bolt head side.Grind out the welds on the sleeve halves (under no circumstances grind deeper than 13 mm).Using a nub nose chisel, break the remaining weld and remove the sleeve halves.The Contractor to take note that each shaft sleeve half weighs approximately 75kg.					
3	The Contractor shall perform in-situ welding of the two shaft seal segments around the main machine shaft. The two weld grooves, 180 degrees apart on either side of the shaft, require vertical welding. The weld type shall be a partial joint penetration butt weld, to ensure the sleeve is not welded onto the main shaft. Vertical down welding shall not be allowed, except if qualified by a specific test piece. Vertical up welding, as proven by the WPQR, shall be utilised by the Contractor.					
4	The welding process to be implemented by the Contractor shall be GTAW. The parent material, vertical welding and critical function of the shaft seal sleeve deem the welding as critical. Proper pre-heating and PWHT are required due to the large heat dissipation of the shaft, causing the welded area not to retain heat long enough to form a proper weld without cracks. The Contractor shall request NDT, from the Employer's Outage Management, consisting of 100% PT and 15% UT.					

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5	<p>The installation & in-situ welding procedure, to be implemented by the <i>Contractor</i>, of the new shaft seal sleeve segment halves consists of the following:</p> <ul style="list-style-type: none"> • Thoroughly clean the shaft surface to remove all unwanted particles or build-up by means of manual abrasive scouring pads. No power tools will be used, and the <i>Contractor</i> ensures the scouring pad is compatible with the stainless-steel shaft to prevent contamination. • Before positioning the sleeve for final fitment apply white paint on the shaft where the sleeve fits around the shaft, excluding the area near the weld joint. • Fit the bottom Viton O-ring, supplied by the <i>Employer</i>, around the shaft and glue in place with Loctite O-ring adhesive (426). • Clean the inner surface of the sleeve with acetone, set and clamp the sleeve halves onto the shaft using two pull lifts and slings. • Ensure all contact surfaces between the sleeve and shaft are closed using a dead blow hammer to strike the sleeve halves at centre and work around to the joint surfaces. Make use of feeler gauges to ensure the gap is closed around the shaft. • Check the root gap of the two weld joints as per requirement in the welding procedure. Measure the outside diameter of the sleeve at three equally spaced heights. • Confirm if the diameters are within tolerance, ($\varnothing 1100 +0-0.105$ mm) and the sleeve is fitted correctly, (i.e., concentric with the shaft). • Fit the two middle bolts to hold the sleeve halves in place on each sleeve half. • Perform welding of the joints. • Using a template with the curvature of the designed sleeve diameter, grind the welds smooth and ensure profile conforms to the template. The template can be a simple cardboard cut-out with the outer radius of the shaft sleeve to confirm the curvature. • Before final polishing, perform 100% PT and 15% UT per weld to ensure no unacceptable defects exist. • In the event of defects, follow corrective action procedure, (grind, re-weld, test and polish). • Drill and tap M16 holes under the bolt holes of the sleeve, see Eskom drawing 18.48/5904. • Countersink holes using a centring guide bush. • Set the flush bolts by applying thread locking adhesive to the thread. • Tighten the flush bolts until the bolt head shears off. • Drill and fit the 6 mm retaining pin, (do not drill through the sleeve into the shaft) • Using the curvature template, grind the bolt heads and welds flush and smooth to a required surface finish of Ra 0.8 μm or better. • Polish the complete surface of the sleeve with a fine grade (#500) oil stone. • Perform a final PT inspection of the welds. • In the event of defects, follow corrective action procedure, (grind re-weld test and polish) • Measure and record the diameter of the shaft seal sleeve. • Measurements are taken at three equally spaced heights and three diametric positions (120 degrees apart), including the welded areas. • Fit the top Viton O-ring around the shaft and glue in place with Loctite 426 O-ring glue.
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Table 9: Shaft seal sleeve information

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3.2.1.12 Shaft Seal Base Plate Repairs

The *Contractor* shall weld repair all identified defects, by the *Employer*, on the shaft seal base plates. The most appropriate procedure for the required repairs shall be implemented by the *Contractor* based on the following summarised information as per the table below.

Item	Code	Dimensions [mm]		Material Spec	Drawing	Plant Parameters / Additional Information
¹ Shaft seal base plate	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	t: Ø (ID): Ø (OD):	30 1100 1500	JIS G3101 SS41	18.48/4683	² Weld position: Flat ² Offsite weld repair – due to setup, but to be assessed by the Contractor ³ Weld type: Fillet welds, butt welds and weld build-ups ³ Machining: Grinding/Blending ⁴ Weld process: GTAW ⁵ NDT Request: PT & UT
1	The shaft seal base plate consists of 4 flanged segments that are bolted onto each other around the main shaft. Air exhaust pipes are fixed onto 2 of the segments. The shaft seal contains water during GEN MODE and PUMP MODE, while during SCO MODE air is pumped in the area above the turbine to displace water to a level below the runner, which allows the turbine to operate in air. Any shaft seal base plate defects, cracks or damage can cause air leaks, resulting in short blowdown air requirement intervals.					
2	The shaft seal base plate shall be removed and disassembled by the Employer and repairs can take place off site at the Contractor's facility if necessary. Therefore, the components can be positioned as required by the Contractor's welding procedure during welding.					
3	Typical defects include cracks or damage on the connecting fillet and butt weld joints between the base plate, air release piping, fittings and flanges. The Contractor shall rip the defective welds and repair weld accordingly. Fillet and butt welds on piping, should repairs be required, shall be left as-welded and not be machined or polished. Other possible repairs will consist of weld build-ups for all general base plate defects as well as defects related to the flange faces between the base plate segments to ensure sufficient flange face contact. Weld build-ups shall be ground, blended and polished according to the surrounding areas. Refer to Figure 11.13.1 and 11.13.2 as per Addendum A.					
4	The welding process to be implemented by the Contractor shall be GTAW.					
5	NDT will be requested by the Contractor, from the Employer's Outage Management, and shall consist of 100% PT for all fillet welds, while 100% PT as well as 15% UT will be required for weld build-ups and butt welds. Offsite NDT interventions throughout the repair shall be clearly communicated to prevent delays and to ensure the availability of the Employer's NDT service provider.					

Table 10: Shaft seal base plate information

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3.2.1.13 Shaft Seal Upper-, Middle- & Lower-Case Housing O-ring Groove Refurbishment

The *Employer* will conduct inspections on the shaft seal upper case housings in general to identify all concerning defects and to verify whether the O-ring grooves require weld refurbishment. All identified defects, including the O-ring grooves, will be handed over to the *Contractor* for repair welding. Refer to the table below for summarised information required to determine the repair procedure.

Item	Code	Dimensions [mm]		Material Spec	Drawing	Plant Parameters / Additional Information
¹ Shaft seal upper-, middle- & lower-case housings	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2 or ASME IX	t: Ø O-ring: O-ring groove depth:	20 – 35 4 4	JIS G5121 SCS1	18.48/4683	² Weld position: Flat ² Offsite weld repair – due to machining and PWHT required ³ Weld type: Weld build-up ³ Machining: O-ring groove machining, blending and fettling ⁴ Weld process: GTAW & PWHT ⁵ NDT Request: PT & UT
1	The shaft seal consists of a three-layer water cooled multi segmented carbon seal that runs on the shaft sleeve. The 3 upper case housings are installed on top of each other and the base plate, each with a 4 mm O-ring seal, static axial application, arrangement in between, thus 3 O-ring grooves in total.					
2	The shaft seal upper case housings shall be removed and disassembled by the Employer and repairs shall take place off site at the Contractor's facility, and therefore can be positioned as required by the Contractor's welding procedure during welding.					
3	Typical defects include damage to the O-ring grooves in the form of material breakage that effects the sealing of the O-rings. The Contractor shall excavate the identified areas on the O-ring grooves and perform the required weld build-ups. Other possible localised defects on the 3 upper case housings shall also be repair welded by the Contractor by means of weld build-up if necessary. The specialised machining required for the 4 mm O-ring groove shall be done, by the Contractor, after the weld build-up is performed. The O-ring groove dimensions (depth, width, corner radius and surface finish) according to the static axial application shall be confirmed and agreed upon once access is obtained. The O-ring groove shall have a surface finish of 0.8µm Ra or better for sealing surfaces and 1.6 µm Ra or better for vertical lead-ins. All other weld build-ups shall be blended according to the surrounding areas. Refer to Figures 11.14.1 to 11.14.3 as per Addendum A for an overview of previous damage.					
4	The welding process to be implemented by the Contractor shall be GTAW. The Contractor shall control possible distortion. The parent material will require heat treatment consisting of pre-heat, interpass temperature and PWHT.					
5	NDT shall be requested by the <i>Contractor</i> , from the <i>Employer's</i> Outage Management, and shall consist of 100% PT as well as 15% UT, depending on weld build-up depths. Offsite NDT interventions throughout the repair shall be clearly communicated to prevent delays and to ensure the availability of the <i>Employer's</i> NDT service provider.					

Table 11: Shaft seal upper case housings and O-ring groove information

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3.2.1.14 Turbine Embedded Pipework and Bottom Facing Plate Blanking

Turbine embedded pipework was previously found to be leaking, at an area that is impossible to repair due to the pipes being embedded in concrete, therefore these pipes were decommissioned and completely blanked off at the draining holes in the GV bottom facing plate. The supply and welding of new blanks shall be done by the *Contractor*. Furthermore, the draining holes in the bottom facing plates shall be drilled concentric so that blanks of the same material can be supplied, installed and welded, by the *Contractor*, to form a uniform surface and concealing the embedded pipework blanks. Refer to the table below for summarised information required to determine the repair procedure.

Item	Code	Dimensions [mm]		Material Spec	Drawing	Plant Parameters / Additional Information
¹ Embedded Pipework Blanks	Unknown: Refer to Section 3.2.2.2 BS EN 15614-1 Level 2	Ø (pipe)	100	JIS STPG38 SCH80	0.48/562 SHT1&2	³ Weld position: Flat ³ In-situ welding ³ Weld type: Seal/Butt weld ³ Machining: Weld prep ³ Weld process: SMAW ³ Supply: JIS STPG38 Blanks ⁵ NDT Request: PT
² Bottom Facing Plate Holes	or ASME IX	t (face plate):	25	SUS403	0.48/809	⁴ Weld position: Flat ⁴ In-situ welding ⁴ Weld type: Seal/Butt weld ⁴ Machining: Drilling; Grinding; Polishing ⁴ Weld process: GTAW (& PWHT) ⁴ Supply: SUS403 Blanks/Plugs ⁵ NDT Request: PT
1	The existing embedded pipework blanks are in a poor condition and will therefore be removed by the <i>Employer</i> . New blanks of adequate sizes, to be measured and supplied by the <i>Contractor</i> . There are 10 vertical pipes of 100 NB each that will each require a blank.					
2	The guide vane bottom facing plates have 10 opening holes that are aligned with the top ends of the embedded pipework where the blanks are installed. The holes were originally 80 NB each.					
3	With regards to the embedded pipework, the pipes are vertically orientated, thus the <i>Contractor</i> shall perform in-situ welding of the blanks in the flat position. The access at the area where welding will occur is very limited and only allows for a seal/butt weld (Take note: The enlarging of the bottom facing plate openings as per number 4 below, also forms part of the <i>Contractor's works</i> , can be done prior to welding of the pipe blanks to aid with access). The <i>Employer</i> will remove the current blanks and upon completion, the <i>Contractor</i> shall assess, measure each pipe end and supply blanks of the correct sizes and same material. The <i>Contractor</i> can consider using the <i>Employer's</i> on-site lathes for machining of the blanks. The <i>Contractor</i> shall perform all weld preparations on the pipe ends and blanks. Upon completion of welding, no further machining will be required, and the seal/butt weld shall be left as-welded. The preferred welding process is manual SMAW, due to the access limitation. Refer to Figure 11.15.1 as per Addendum A for embedded pipework blanks and openings in the bottom facing plate.					
4	With regards to the guide vane bottom facing plate holes; The ridges/edges of these opening holes are in a poor condition that is not favourable for welding due to previous grinding. The openings are not concentric with diameter sizes ranging between 80 – 110 mm. The <i>Contractor</i> shall drill/machine the openings larger to concentric holes ranging between 100-130 mm, depending on the condition of each hole. The <i>Contractor</i> shall machine, supply and weld tight fit plugs from the same material and thickness as the bottom facing plate. All welding preparation work on holes and plugs shall be done by the <i>Contractor</i> . A partial penetrating butt weld shall be performed by the <i>Contractor</i> by means of GTAW with the possibility of PWHT. The butt weld shall be ground and blended smooth according to the surrounding areas to a surface finish of 0.8µm Ra or better. The <i>Contractor</i> shall control distortion.					
5	The <i>Contractor</i> shall request NDT, from the <i>Employer's</i> Outage Management, consisting of 100% PT for the embedded pipework blank welds, while the bottom facing plate plugs' butt welds will include 100% PT and 15% UT.					

Table 12: Embedded pipework and GV bottom facing plate plugging information

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3.2.2 Welding Requirements

3.2.2.1 General Welding Requirements

The following requirements are applicable for all welding:

- The *Contractor* responsible for the welding shall be ISO 3834-2 certified (current) and approved, in terms of the relevant Product/Construction Standards, Welding Processes and required Parent Material Groups, by the *Employer* to perform Level 1 plant welding related work (maintenance, refurbishment and fabrication).
- All welding shall be performed in accordance with 240-106628253 Standard for Welding Requirements on Eskom Plant, including all referenced standards therein.
- The *Contractor* can subcontract other companies to carry out certain services, such as Heat Treatment (HT) and machining, given that these companies are adequately qualified. The *Contractor* will remain responsible for the final product.
- The *Contractor* shall provide all necessary tools, equipment, resources, consumables and relevant services to complete the *works*.
- The *Contractor* shall carry out site-based and off-site work as required. The *Contractor* shall clearly indicate which components and sections of the *works* will be performed off-site at the facilities of the *Contractor* or subcontractor.
- The *Contractor* must be able to qualify Welding Procedure Specifications as well as Welders, if necessary, to complete the welding requirements within the outage duration.
- All welding documentation will be subject to acceptance by the *Employer*.
- The *Contractor* shall perform Positive Material Identification (PMI) of all base materials prior to welding as well as verify the relevant thicknesses.
- The *Contractor* can consider utilising the *Employer's* on-site lathe where applicable, to a certain extent, depending on availability.
- For each refurbishment item, as per Section 3.2.1, the following shall be implemented and required by the *Contractor*:
 - All repairs shall be assessed to determine whether the *Employer's* stipulated welding process, consisting either of GTAW or SMAW, is appropriate.
 - All repairs or welds shall be assessed in terms of application, dimensions, weld position, parent material and the requirement for heat treatment to determine the most appropriate repair procedure.
 - The *Contractor* shall ensure that the correct cutting, profiling and brushing tools, in terms of material, are utilised for the various parent materials to prevent unwanted weld contamination and adverse effects.
 - Proper cleaning and degreasing of the identified areas shall be implemented prior to welding.
 - The necessary weld preparations and machining of the parent materials shall be implemented, including excavation of defects, removal of weld metal as well as heat affected zones (HAZ) of previous welds.
 - All welding shall be done according to a qualified Welding Procedure Specification (WPS) and by a qualified welder, subject to the *Employer's* acceptance.
 - The *Contractor* shall perform specialised machining, profiling, blending and polishing of the weld repair to match the surrounding area to achieve a surface finish of 0.8µm Ra or better for all sealing surfaces only.
 - The *Contractor* shall control and monitor for distortion during welding.
 - The necessary heat treatment, as and when required, according to the parent material and qualified welding procedure shall be thoroughly implemented.
 - General cleaning, including removal of slag where necessary, upon completion of welding shall be implemented.

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- The *Contractor* shall perform and document the necessary inspections, consisting of visual and dimensional inspections, throughout the welding process.
- The *Contractor* shall request the necessary Non-Destructive Testing (NDT) throughout the welding, repair and machining process, as and when required, from the *Employer's* Outage Management department.
- The implementation of proper stainless-steel pickling and passivation, where necessary.
- The *Contractor* takes note that all drawings will be made available upon request and after signing of a non-disclosure agreement (NDA).

3.2.2.2 Codes & Standards and Specifications Requirements

Welding Procedure Qualification as well as Welder (or welding operator) Qualification shall be in accordance with the appropriate welding standard incorporated into the design and construction code. The relevant design and construction code for each item to be repair welded are indicated for each item as per Section 3.2.1.

Numerous components, as specified per Section 3.2.1, to be repair welded have unconfirmed design and construction codes, for which the *Employer* requires a conservative approach. Therefore, the *Employer* prefers that Welding Procedure Qualification shall be performed in accordance with BS EN 15614-1 Level 2, and Welder Qualification shall be conducted in accordance with ISO 9606-1. Alternatively, ASME IX is also acceptable. Overlay Welding Procedure Qualification shall be according to BS EN 15614-7 and will be specific to corrosion resistant overlay welding.

Any possible exceptions to this must be motivated, by the *Contractor*, for approval by the *Employer* through a concession. Combining and mixing of different family code specifications on a single weld are not allowed.

The latest revision of all relevant codes, standards and specifications shall be implemented to ensure compliance.

3.2.2.3 Non-Destructive Testing (NDT) & Acceptance Criteria

All welding NDT is performed according to the requirements of the *Employer* as detailed in the Standard for Non-Destructive Testing (NDT) on Eskom Plant, 240-8353994. The *Employer's* NDT service provider is responsible for this function; therefore, the requirement of NDT services will not be part of this *works*.

The *Contractor*, for the *works* as per this welding technical specification, is responsible for the inspection of welding set-ups, welding preparations and NDT inspection requests, to the *Employer's* Outage Department, for completed weldments. The *Contractor* will only liaise with the *Employer's* NDT service provider to ensure the correct areas are inspected and that the correct information is captured on the NDT reports. Furthermore, the *Contractor* must notify the *Employer's* Outage Department 1 day in advance for NDT requests. The *Contractor* is allowed to perform in-house NDT, however it shall be subject to the *Employer's* approval, depending on the criticality and application, and the in-house NDT shall be clearly indicated on the QCP's. All critical and final NDT inspections shall be done by the *Employer's* service provider.

The *Contractor* takes note of the following information:

- NDT will be done, by the *Employer's* NDT service provider, on all welds performed by the *Contractor*.
- The relevant design/construction code, application, weld type, material, process, position and geometry will determine the type of NDT that will be done. Fillet Welds will be limited to Surface

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Inspection only, consisting of 100% Liquid Penetrant Testing (PT) or Magnetic Particle Inspection (MPI), depending on the material. Butt Welds, Weld Build-Ups and Corrosion Resistant Overlay Welding will consist of 100% Surface Inspection (either PT or MPI) as well as Volumetric Inspection, to a certain percentage, consisting of Ultrasonic Testing (UT). For welds where PWHT (Post Weld Heat Treatment) was implemented, Hardness Testing will be required.

- NDT will still be indicated in the *Contractor's* Quality Control Plan (QCP).
- NDT acceptance criteria will be as per the following:
 - BS EN ISO 5817 Welding Quality Levels for Imperfections – Quality Level B

3.2.2.4 Heat Treatment Requirements

Heat Treatment (HT) includes Pre-Heat, Interpass, Post Weld Heat Treatment (PWHT) and Post Welding Bake-Out, where applicable, and shall be clearly indicated in the Quality Control Plan (QCP).

The *Contractor* shall implement HT in accordance with an applicable qualified WPS, subject to the *Employer's* review and acceptance, prior to commencement of the *works*.

The *Contractor* provides valid calibration certificates, subject to the *Employer's* acceptance, for all relevant HT, especially PWHT, equipment and must be included in the final databook.

Pre-Heating requirements, to be adhered to by the *Contractor*, includes the following:

- Gas preheating is allowed provided there is a low risk for spot heating and resistance heating pad set ups are not practical, subject to the *Employer's* acceptance.
- Resistance heating is allowed and must be done in accordance with an approved HT procedure subject to the *Employer's* acceptance.
- Whatever method of preheating is used, care must be taken to ensure that the temperatures recorded are representatives of those at the inner surface before welding commences, especially for thick-walled components.
- Constant monitoring of the process is required to ensure that the correct temperatures as set out in the WPS are being achieved by means of using a calibrated contact thermometer (e.g. thermo crayons such as tempilstick, digital thermometer) prior to welding.

Interpass Temperature requirements, to be complied with by the *Contractor*, includes the following:

- Interpass temperature, as per the qualified WPS, is monitored between welding passes and is the temperature immediately before each weld pass is performed.
- Welding will only continue once the correct temperature is obtained.

PWHT requirements, to be adhered to by the *Contractor*, includes the following:

- The temperature ranges, for the applicable material, must be according to the applicable design/construction code, material specification, or according to the agreed code for cases where the design/construction code is unknown.
- The welds and areas to be heat treated must be free from any products such as grease, lubricants and coatings that can adversely affect the HT process.
- The areas to be heat treated and surroundings must be protected against oxidation and mechanical damage.
- Where applicable open ends are closed off to prevent the cooling associated with draughts.
- The *Contractor* ensures that insulation is securely fastened using the appropriate strapping technique suitable for the intended temperature range and that no gaps from insulation to component and insulation to heating pads are present.

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- The type of Thermocouples and the relevant attachment method must be provided by the *Contractor* and must be in accordance with the requirements of the thermocouples, heating band and insulation. Additional thermocouples must be fitted at each controlling point as back up for use in the event of primary thermocouple failing. A detailed sketch must be provided by the *Contractor*.
- The heating pads must be securely strapped to the component for the duration of the heating cycle.
- Time at soaking temperature is measured from the time when the last thermocouple reading reaches the min temperature of the specified range.
- The *Contractor* must ensure constant supervision, and that HT equipment is attended to by suitably qualified technicians and operators, provided by the Heat Treatment service provider.
- The equipment must be of a proper make suitable for HT and it shall bear proper electrical power input/output.
- Upon completion of the PWHT cycle, the *Contractor* shall:
 - Examine the component for distortion, discolouring, damage and arching.
 - Clean/polish the thermocouple attachment areas and conduct surface crack inspections (PT).
 - Ensure review and signature of the PWHT chart by the *Contractor's* IWE/IWT.
- Repair welding after PWHT shall not be permitted.
- The *Contractor* shall provide a PWHT method statement, specific to each relevant weld and subject to the *Employer's* acceptance prior to commencement of the work, as per the following minimum requirements:
 - Compiled strictly in accordance with the applicable qualified WPS and signed the *Contractor's* IWE/IWT.
 - Include the number and position of thermocouples and their relation to the heater, the component and the PWHT recorder as well as the function of each i.e. controlling, monitoring or half-peak, with the actual reference points for the thermocouples recorded in terms of distance (mm from 0 reference point).
 - Include the method of heat treatment e.g. furnace, inductive or resistance.
 - Include the position and dimensions of the heating, soaking and insulation band.
 - Include the method of heating control to obtain uniform heating without creating localized hotspots.
 - Include the minimum and maximum heating and cooling rates in °C per hour, as per the qualified WPS.
 - Include the minimum and maximum soak temperature in °C per hour, as per the qualified WPS.
 - Include the method for stabilizing all temperature measurements before reaching soaking temperature.
 - Include the insulation type and characteristics.
 - Include cooling conditions, i.e. still air, forced cooling, etc., and the prevention of harmful thermal gradients that must be avoided at all times in all situations.

3.2.2.5 Welding Filler Materials

Filler materials shall be supplied by the *Contractor* and selected based on the parent materials as well as the application and shall comply to the relevant standards as required per Section 7 of the *works*.

The *Contractor* shall ensure proper identifying, drying, storing and handling of electrodes and filler wires related to the manufacturer's recommendations as well as relevant standards.

The *Contractor* shall provide type 3.1 Material Certificates for quality assurance and traceability purposes, in accordance with EN 10204, for all filler materials (electrodes, wires & rods) that will be

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utilised during weld repairs as specified within each of the Qualified Welding Procedures, subject to the *Employer's* review and acceptance prior to any welding.

3.2.2.6 Supply of Materials

All materials supplied by the *Contractor* shall be accompanied by a 3.1 Material Certificate for quality assurance and traceability purposes, in accordance with EN 10204. Material verification, for supplied materials, shall be part of the QCP. The Heat number, referenced by the material certificate, shall be visible on the material during witnessing by the *Employer*.

3.2.2.7 Welders, Welding Operators and Labour

In addition to the personnel and qualification requirements, as per 240-106628253 Standard for Welding Requirements on Eskom Plant, the following skilled resources are required to perform welding related work to complete and fulfil the requirements of the *works*:

- Qualified Quality Controller – Level 2 SAIW Inspector Qualification
- Qualified Boilermakers – Boilermaker Trade Test
- Semi-Skilled Labourers – Matric or N3 Mechanical Engineering Certificate

The *Employer* reserves the right to conduct periodic audits of the *Contractor* to ensure compliance with these requirements. The *Contractor* is required to provide proof of qualifications to the *Employer* for all the required personnel working on the *Employer's* plant.

3.2.2.8 Pickling and Passivation of Stainless Steel

The *Contractor* shall perform pickling and passivation of all stainless-steel surfaces that were exposed to heat due to welding, grinding or heat treatment. Typical formulations based on hydrofluoric (HF), and nitric (HNO₃) acids remove scale, contaminants as well as the underlying chromium depleted layer and restore the corrosion resistance. The formulation is to be accepted by the *Employer* that can typically range, but is not limited to, between 15-20% HNO₃ and 1-1.5% HF based on volume. It is recommended that the *Contractor* make use of either gel or pastes and the necessary safety precautions are followed during handling and application.

3.2.2.9 Equipment Requirements

The *Contractor* supplies all equipment, tools and gear required to complete the *works* with the desired surface finishes, sizes and tolerances. The *Contractor's* equipment must be in a reliable, maintained and calibrated condition to deliver the *works* and quality requirements, including, but not limited to, hot boxes, temperature measuring equipment, recording equipment, welding machines, power sources, power tools, PMI equipment, measuring equipment and machining equipment as well as safety equipment and protective clothing.

3.2.2.10 Welding Concessions

The *Contractor* shall motivate, by means of an official concession request, for any allowable exceptions or deviations to this technical specification document that might arise during the outage. Concessions due to poor planning or undeclared technical deviations, as per the Technical Evaluation Strategy (31A/11111-P3-C) will not be considered.

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4. WORK TO BE PERFORMED BY THE *EMPLOYER* FOR THE *WORKS*

4.1 Inspection

The *Employer* has the right to perform various inspection, witness and hold points of the *works* at any time during the execution of the *works*, including dimensional inspections

4.2 Documentation Review and Acceptance

The *Employer* reviews all required documentation, submitted by the *Contractor*, for acceptance to ensure compliance prior to implementation of the *works*.

4.3 Material

The *Employer* provides certain material/spares required as specifically stated per Section 3.2.1 for each welding item. This excludes the supply of blanks for the embedded pipework and blanks/plugs for the bottom facing plate.

4.4 NDT

The *Employer's* appointed NDT service provider will be responsible for all NDT inspections.

5. *EMPLOYER'S* PHILOSOPHY

5.1 Engineering philosophy

Fully operational capability of the Pump/Turbine unit, improved reliability and maintainability of the Turbine system at Drakensberg PSS.

5.2 Maintenance philosophy

Welding repairs of critical components executed by an experienced and certified *Contractor* that provides the required quality and quality control will ensure that proper maintenance can be executed during the Turbine Refurbishment outages.

6. DRAWINGS

The following drawings are supplied to the *Contractor* as part of the *works*.

Drawing Number*	Title
0.48/407	Pump Turbine Runner Outline Details
0.48/561 SHT 1	Pump Turbine Top Cover Plan
0.48/561 SHT 2	Pump Turbine Top Cover Elevation
18.48/U1/5894	Pump Turbine Guide Vane Top Bush
18.48/U1/5898	Pump Turbine Guide Vane Middle Bush
18.48/U1/5899	Pump Turbine Guide Vane Bottom Bush
0.48/526	Pump Turbine Spiral Case and Stay Ring Details
0.48/1753	Pump Turbine Spiral Casing Penstock Section Manhole Cover Details
0.48/1754	Pump Turbine Spiral Casing Penstock Section Details

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0.48/426 SHT 1&2	Pump Turbine Draft Tube Liner Details
0.48/429	Pump Turbine Draft Tube Liner Upper Mandoor Cover Details
0.48/561 SHT 1&2	Top Cover Elevation
0.48/720	Pump Turbine Guide Vane Operating Mechanism Sub Assembly
0.48/718	Pump Turbine Guide Operating Ring Details
0.48/719	Pump Turbine Guide Vane Details
0.48/562 SHT 1&2	Pump Turbine Bottom Ring Plan Details
0.48/1132	Main Shaft and Runner Sub-Assembly
0.48/407	Pump Turbine Outline of Runner
0.48/U1/6276 SHT 2	Guide Vane Head Shear Pin Cam Lever Details
0.48/U2/6276 SHT 2	Guide Vane Head Shear Pin Cam Lever Details
0.48/U3/6276 SHT 2	Guide Vane Head Shear Pin Cam Lever Details
0.48/U4/6276 SHT 2	Guide Vane Head Shear Pin Cam Lever Details
18.48/U2/6357	Shaft Sleeve Section & Details
18.48/U1/4683	Sealing Water System Shaft Sealing Box Sub-Assembly
18.48/U2/4683	Sealing Water System Shaft Sealing Box Sub-Assembly
18.48/U3/4683	Sealing Water System Shaft Sealing Box Sub-Assembly
18.48/U4/4683	Sealing Water System Shaft Sealing Box Sub-Assembly
0.48/809 SHT 1, 2, 3 & 4	Schematic Diagram of Water and Air Piping Unit 1, 2, 3 & 4

**Refer to the latest revision of these drawings. Drawings will be made available to the Supplier by the Employer, subject to the signing of an NDA.*

7. SPECIFICATIONS

The *Contractor* adheres to the following in providing the required welding and associated services:

Reference Number	Title	Date or revision	Tick if Contractor to obtain
ISO 3834-1	Quality requirements for fusion welding of metallic materials – Criteria for the selection of the appropriate level of quality requirements	2021	✓
ISO 3834-2	Quality requirements for fusion welding of metallic materials – Comprehensive quality requirements	2021	✓
240-106628253	Standard for Welding Requirements on Eskom Plant.	2	*
BS EN 1011	Welding – Recommendations for welding of metallic materials. Part 1: General guidance for arc welding	2009	✓

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	Part 2: Arc welding of ferritic steels Part 3: Arc welding of stainless steels		
BS EN ISO 15609	Specification and qualification of welding procedures for metallic materials – Welding procedure specification	2019	✓
BS EN 15614-1	Specification and qualifications of welding procedure for metallic materials – Welding procedure test – Arc and gas welding of steels and arc welding of nickel and nickel alloys	2017	✓
BS EN 15614-7	Specification and qualifications of welding procedure for metallic materials – Welding procedure test – Overlay welding	2016	✓
ISO 9606-1	Qualification testing of welders — Fusion welding - Steels	2012	✓
BS EN 13480	Metallic industrial piping	2024	✓
ASME VIII Div 1	BPVC Section VIII – Rules for Construction of Pressure Vessels Division 1	2025	✓
ASME IX	BPVC Section IX – Welding, Brazing, and Fusing Qualifications	2025	✓
240-83539994	Standard for Non-Destructive Testing (NDT) on Eskom Plant	3	*
BS EN ISO 5817	Welding – Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality Levels for Imperfections	2023	✓
EN 10204	Metallic products – Types of inspections	2004	✓
SABS 10238	Welding and Thermal Cutting Processes - Health and Safety	2011	✓
OHSA No. 85 of 1993	Occupational Health and Safety Act. ()	1993	✓
NEMA Act. 107 of 1998	National Environmental Management Act	1988	✓

*Available on request as these standards or procedures are *Employer* specific documents.

✓ Standards and codes, and the latest revisions thereof, to be obtained by the *Contractor* from the relevant standard organisation.

8. CONSTRAINTS ON HOW THE *CONTRACTOR* PROVIDES THE *WORKS*

8.1 Identification

The *Contractor* and his employees carry identification while on site.

8.2 Visual and Dimensional Inspections

The *Contractor* is responsible to perform visual and dimensional inspections prior to, during and upon completion (final inspection) of the *works*, for each of the items as per Section 3.2.1, and submit a detailed report, subject to the *Employer's* approval, for record purposes.

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8.3 Loading and Offloading

The *Contractor* is responsible for loading and offloading of tools, equipment as well as all the *Employer's* components that are sent offsite as part of the *works* such as welding-, machining- or heat treatment related services.

8.4 Quality management

The *Contractor* is responsible for Quality Control to ensure the performed welding and associated services meet the requirements of the *Employer*. Quality, inspection, testing and documentation requirements include the following:

- No work will be done without a quality control plan (QCP) that is accepted by the *Employer*. A QCP will therefore be submitted to the *Employer* for each item as per Section 3.2.1, no later than 2 weeks prior to each of the Turbine Refurbishment Outage start dates.
- Each QCP shall contain a space, separate from the individual intervention points, where the names of the nominated quality representative from each party will print their names and sign next to it; this is to aid signature identification.
- Intervention points will be signed as work progresses and no back-dating will be allowed.
- The *Contractor* will notify the *Employer* of interventions at least 24 hours in advance for on-site interventions and 72 hours for off-site interventions.
- QCP's will make provision for referencing of the relevant documents.
- The following minimum intervention points must be included in each of the weld repair QCP's for the *Employer's* quality control representative:
 - Approval of QCP (H)
 - As-Found Inspection (W)
 - PMI (Positive Material Identification) (H)
 - NDT Procedures and Operators (H)
 - Weld Maps (R)
 - WPS/WPQR (H)
 - Welder Qualifications (H)
 - Welding Consumable Material Certificate (H)
 - Material Verification (H) (for supplied material where applicable)
 - Machining (W) (only if applicable to repair)
 - Weld as per WPS (S)
 - PWHT (H) (only if applicable to repair)
 - Final Machining (W) (only if applicable to repair)
 - NDT (H)
 - Final Inspection (H)
 - Final Databook Acceptance (H)

8.5 Safety management

- The *Contractor* must understand and implement the basics in terms of Health and Safety according to SABS 10238 Welding and Thermal Cutting Processes.
- The *Contractor* complies with the Occupational Health and Safety Act. (OHSA No. 85 of 1993)
- The *Contractor* takes every precaution to ensure safety and to protect the *works*.
- The *Contractor* is responsible for the safety and security of his personnel, materials and equipment.
- The *Contractor* adheres to the safety regulations pertaining to the *Employer's* Power Station (Drakensberg Pumped Storage Scheme).
- The *Contractor* provides all the required safety and personal protective equipment to his staff for the duration of the contract.

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8.6 Environmental management

- The *Employer's* Power Station (Drakensberg Pumped Storage Scheme) is situated in an environmentally sensitive area.
- The *Contractor* acquaints himself with all statutory and local environment regulations and adheres to these without exception.
- The *Contractor* complies with the Hazardous Chemical Regulations when using any hazardous chemicals, as well as complying with the requirements of the National Environmental Management Act of 1988.

8.7 Security

General access to the *Employer's* Power Station (Drakensberg Pumped Storage Scheme) is controlled and it is mandatory that the *Contractor* adhere to all security regulations in force during the period of the contract.

8.8 Other construction activities

The *Contractor* notes that there may be other work taking place during the period when he/she is providing the *works* at the *Employer's* Site and liaises with the other *Contractors* and site personnel in this regard.

8.9 Title to site materials

The *Contractor* has no title to plant and/or materials resulting from him/her supplying the *works*.

8.10 Documentation

- All documents supplied by the *Contractor* shall be of good quality and subject to the *Employer's* acceptance.
- The *Contractor* notes that metric sizes, as specified by the International Standards Organization and agreed to by the South African Metrication Boards, are used. International System of Units (SI units) are used on drawings, pamphlets, calculations and documents.
- The *Contractor* shall provide a consolidated databook that will consist of all the documents, as required for each of the items as per Section 3.2.1, including, as a minimum and not limited to, the following:
 - QCP
 - Requirements stipulated as per Section 8.4.
 - Visual and Dimensional Inspection Reports
 - The *Contractor* shall perform as-found inspections prior to commencement of the *works*, that will be utilised to validate the correct WPS, as well as inspections upon completion for final acceptance purposes. These inspections will be indicated on the QCP and will consist of visual and dimensional inspections with findings documented, by the *Contractor*, in the form of an inspection report.
 - NDT Procedures and Operator Qualifications
 - The *Employer* will provide the relevant information, as received from the *Employer's* NDT service provider to the *Contractor* for databook consolidation purposes as well as references within the QCP and relevant reports.
 - Method Statements
 - A method statement must be provided by the *Contractor*, only if specifically requested by the *Employer* for a given weld, otherwise a thorough and detailed QCP, subject the *Employer's* review, is acceptable.
 - Welding Procedure Specification (WPS) & Welding Procedure Qualification Record (WPQR/PQR)

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- The *Contractor* will provide, as per Section 3.2.2.2, a qualified WPS supported by a valid WPQR/PQR approved (signed) by the *Contractor's* registered IWE or IWT as well as the independent AIA or notified body (examiner) who witnessed the welding and testing of the test pieces, for each of the listed items as per Section 3.2.1.
- Welder Qualifications
 - The *Contractor* will provide, as per Section 3.2.2.2, valid Welder Qualifications (Welder Approval Certificates) approved by the *Contractor's* IWE/IWT as well as the Authorized Inspection Authority who witnessed the welding and testing of the test pieces, for each of the listed items as per Section 3.2.1.
- PMI Report
 - The *Contractor* will provide PMI reports, obtained from a calibrated X-Ray Fluorescence (XRF) meter, to verify the material grade of each weld repair, prior to welding.
- Weld Map
 - A weld map will be provided by the *Contractor*, clearly indicating welded areas with allocated weld numbers for traceability purposes.
- NDT Reports
 - NDT reports as received from the *Employer's* NDT service provider will be reviewed by the *Contractor* to ensure accuracy and traceability. The weld numbers, as per the weld maps, must be referenced on NDT reports.
- Welding Consumable Certificates
 - 3.1 Material Certificates, as stipulated per Section 3.2.2.5, will be provided by the *Contractor*.
- Material Certificates
 - 3.1 Material Certificates, as stipulated per Section 3.2.2.6, will be provided by the *Contractor*. The *Contractor* only supplies material for Section 3.2.1.15 for the welding of embedded pipework blanks and bottom facing plate blanks.
- Approved Concessions
 - All requested concessions, with the *Employer's* response, as stipulated per Section 3.2.2.8, will be included to the databook for reference, by the *Contractor*.
- Non-conformance Reports
 - Non-conformance Reports raised during execution of the *works* will be included to the final databook for reference.
- Heat Treatment
 - Heat Treatment Procedures, Record Graphs and Calibration Certificates - Requirements stipulated as per Section 3.2.2.4.

8.11 Rectification of Defects

Unacceptable indications and defects, as per the acceptance criteria of BS EN ISO 5817, identified on the *Contractor's* welding, by means of the required NDT that will be performed by the *Employer's* service provider, must be repaired by the *Contractor* by means of a process subject to the *Employer's* approval.

8.12 Completion

Completion is when the following has been done by completion date:

- The *Contractor* has done everything required to provide the *works*, and the *works* is accepted by the *Employer*.

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- The *Contractor* submitted all signed documentation as required to the *Employer* for acceptance.
- The *Contractor's* data book is accepted by the *Employer*.

9. REQUIREMENTS FOR THE PROGRAM

- a) The *Contractor* submits a quality control plan for the *Employer's* acceptance.
- b) The *Contractor* submits the finalized program within one week after contract award.
- c) The program indicates the start date, completion date and duration of each activity.
- d) With regards to welding, the *Contractor* indicates the following on his program submitted to the *Employer* for acceptance, as a minimum, and is not limited to:
 - The time required for each weld repair as per section 3.2.1, including NDT, machining and PWHT (where applicable).
 - The time required for the various inspections such as PMI, visual and dimensional inspections and issuing of the relevant reports.
 - The program must include transport durations for offsite activities.
 - Final offsite and onsite inspection dates for each weld repair as per section 3.2.1,
 - Final submission date for the databook.
 - Statutory and other non-working days included in the contract period and occurring just after the contract period.
- e) The *Contractor* confirms that current test certificates apply to all Equipment identified in the programme.

10. SERVICES AND OTHER THINGS PROVIDED BY THE *EMPLOYER*

The *Employer* provides the following to the *Contractor*:

10.1 Crane

A crane is available in the *Employer's* power station machine hall. The *Contractor* ensures that all necessary arrangements and preparations are made for the use of this crane.

10.2 Area for site establishment and storage

The *Employer* indicates a storage yard to the *Contractor*.

All other services, parts, equipment, tools, etc. needed to provide the works, is supplied by the *Contractor*.

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11.ADDENDUM A

11.1 Guide Vane Bush Casing (Middle and Bottom) Repairs



Figure 11.1.1: Guide vane bush casing repairs



Figure 11.1.2: Bottom bush casing before and after repairs

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11.2 Line-Boring Setup Examples

The welding *Contractor* to take note of the line-boring setup for information purposes only. The line-boring will be performed by the *Employer's* line-boring service provider.



Figure 11.2.1: 2007 Guide vane top bush machining setup



Figure 11.2.2: 2007 Guide vane top bush boring



Figure 11.2.3: 2007 Guide vane middle bush boring

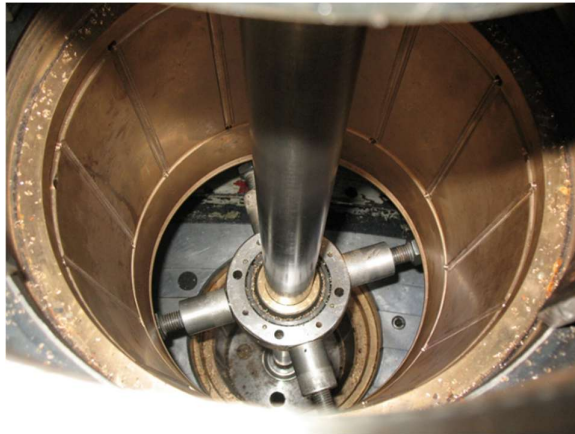
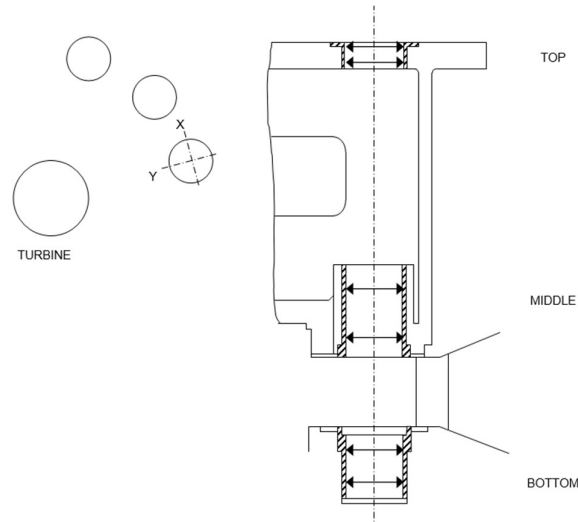


Figure 11.2.4: 2007 Guide vane bottom bush line boring setup

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LINE BORING QUALITY CONTROL PLAN											
<u>CONTRACTOR :</u>		<u>UNIT</u>		4		<u>GUIDE VANE</u>		1			
<u>INSPECTION STATUS</u>		H = HOLD POINT		W = WITNESS POINT		I = INSPECTION POINT		S = SURVEILLANCE			
Activity no	Activity description Scope of work	Measurements after machining	Measurements after machining				Inspection status	Contractor		Accepted by ESKOM	
			Acceptance criteria	Upper	Lower	Date		Signature	Date	Signature	
			X	Y	X	Y					
1	Set up satisfactory, datum=bottom bush, no damage to bushes						W				
2	Top bush boring bar run-out	<0.030					W				
3	Top bush ID measurement	TBD					I				
4	Top bush surface roughness	0.8					W				
5	Middle bush boring bar run-out	<0.030					I				
6	Middle bush ID measurement	TBD					I				
7	Middle bush surface roughness	0.8					I				
8	Bottom bush boring bar run-out	<0.030					w				
9	Bottom bush ID measurement	TBD					I				
10	Bottom bush surface roughness	0.8					I				

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Figure 11.2.5: Example of line boring check sheet

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11.3 Spiral Casing Liner, Stay Vanes and Mandoor Repairs

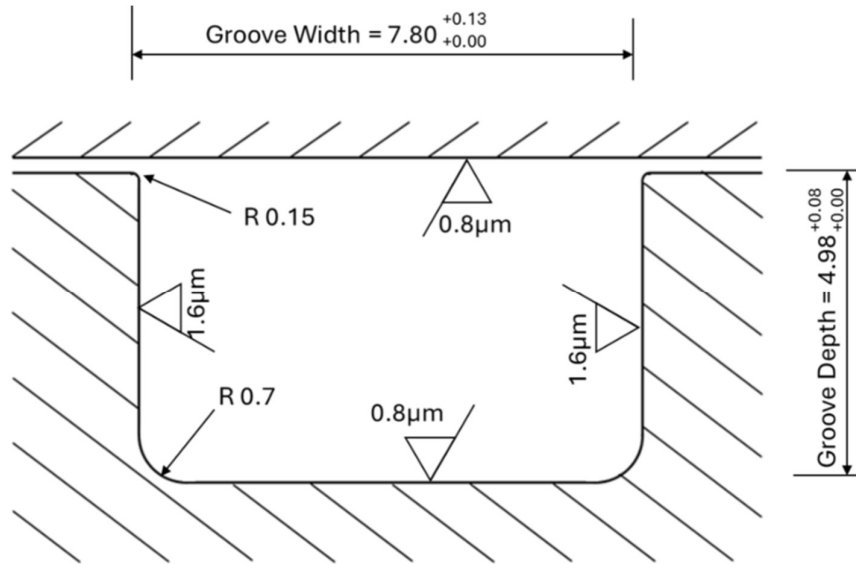


Figure 11.3.1: Spiral casing mandoor 6mm O-ring groove



Figure 11.3.2: Example of damage on vertical stay vane

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11.4 Draft Tube Liner and Mandoor Repairs



Figure 11.4.1: Draft tube liner damage (typical for spiral casing liner as well)



Figure 11.4.2: Draft tube mandoor with sealing surfaces on flange

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11.5 Turbine Head Cover Surface Repairs and Stay Ring O-ring Groove, O-ring Lead-In and O-ring Sealing Surface Repairs



Figure 11.5.14: O-ring groove and surrounding surfaces' damage as per previous outages

11.6 Guide Vane Link Pin (Eccentric & Straight) and Governor Servomotor Link Pin Locking Plate Welding

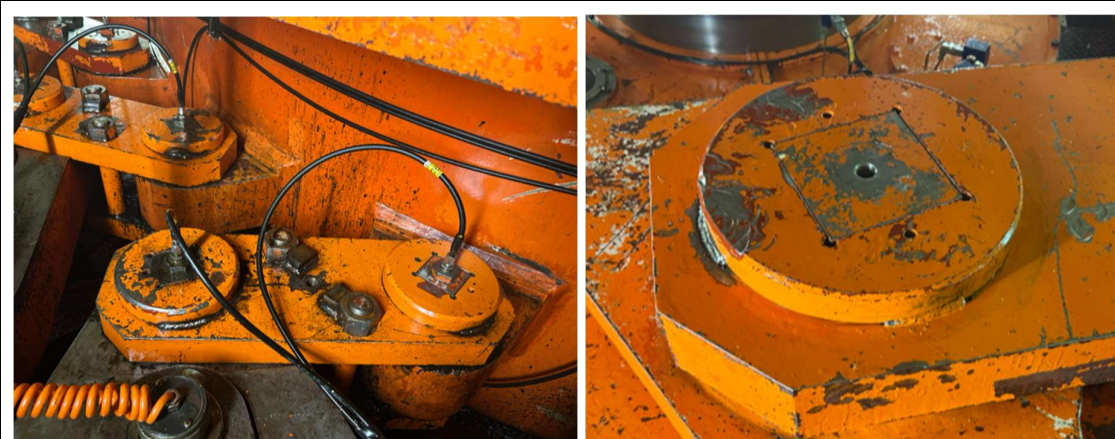


Figure11.6.1: GV and Servomotor Pin Circular Locking Plates with stitch welding

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11.7 Operating Ring Vertical Wearing Plate Journal Repair and Welding of Wear Plate Locking Plates

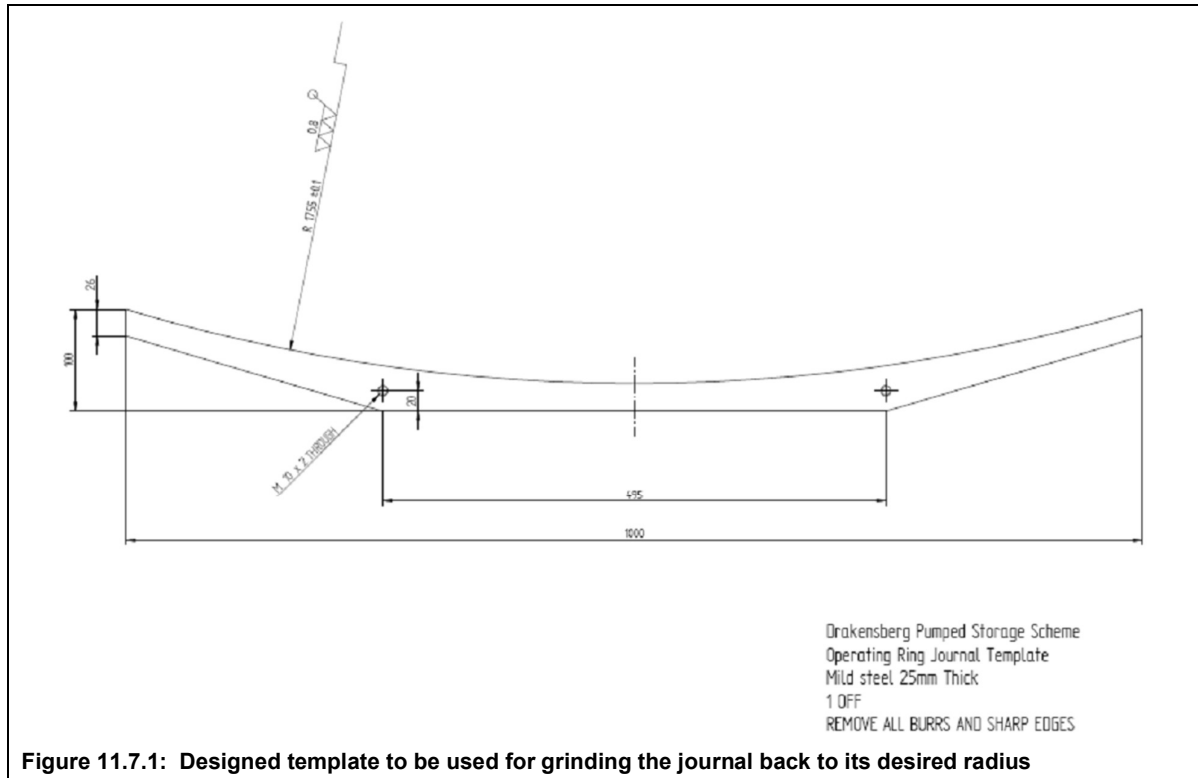


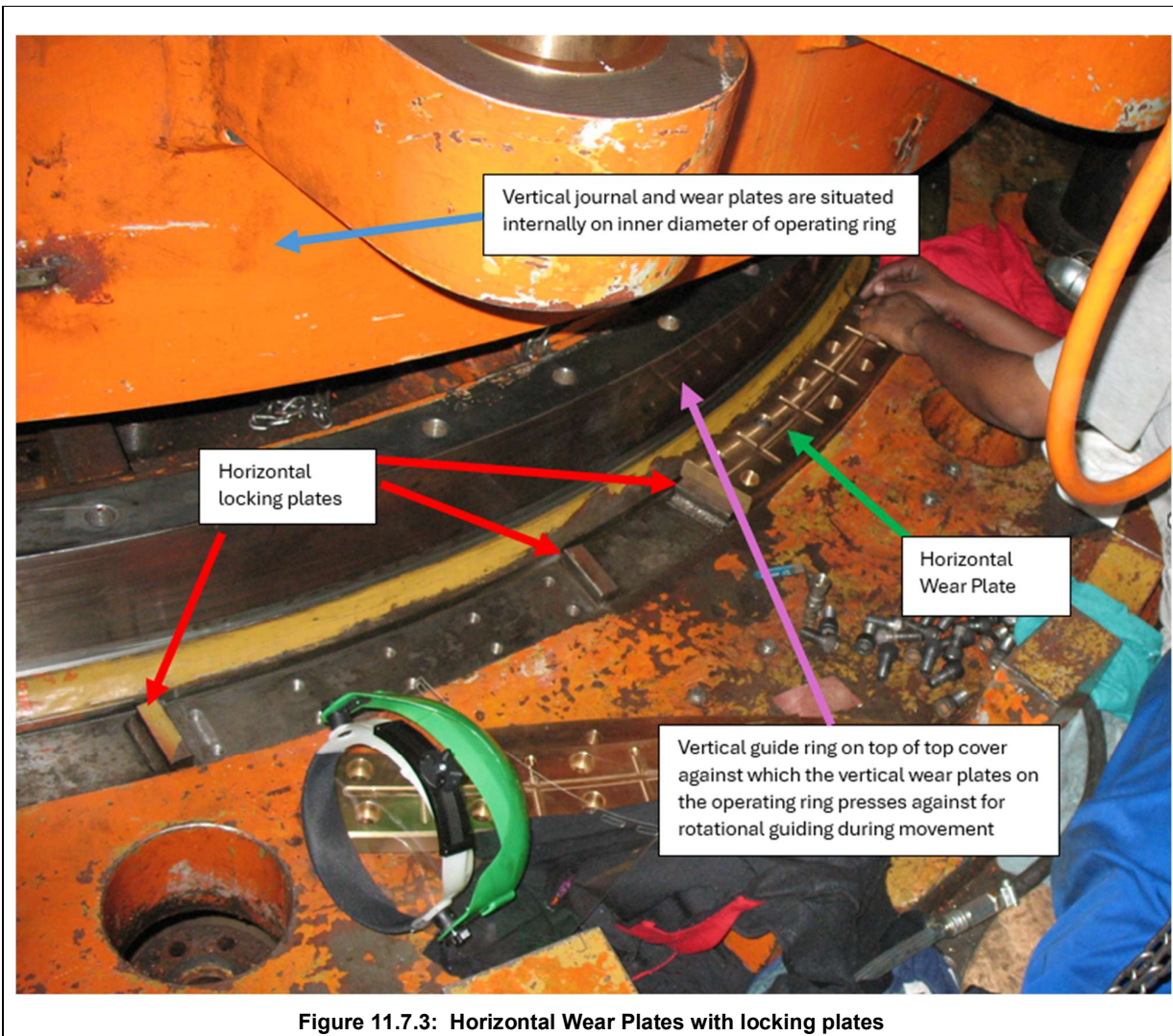
Figure 11.7.1: Designed template to be used for grinding the journal back to its desired radius



Figure 11.7.2: Vertical wear plate with flat rectangular locking plate on each side

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11.8 Guide Vanes Blade Repairs



Figure 11.8.1: Example of dispersed guide vane cavitation



Figure11.8.2: Guide vane and guide vane blade

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Figure 11.8.3: Guide vanes removed and placed on machine hall floor



Figure 11.8.4: Guide vane upper and lower interfacing face repair welding prior to lathe machining

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Figure 11.8.5: Guide vane collar damage

11.9 Guide Vanes Facing Plate Repairs



Figure 11.9.1: Guide vane facing plate previous pick-up removal by flapper disc

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11.10 Turbine Runner Blade Repairs



Figure11.10.1: Turbine runner blades cavitation and damage

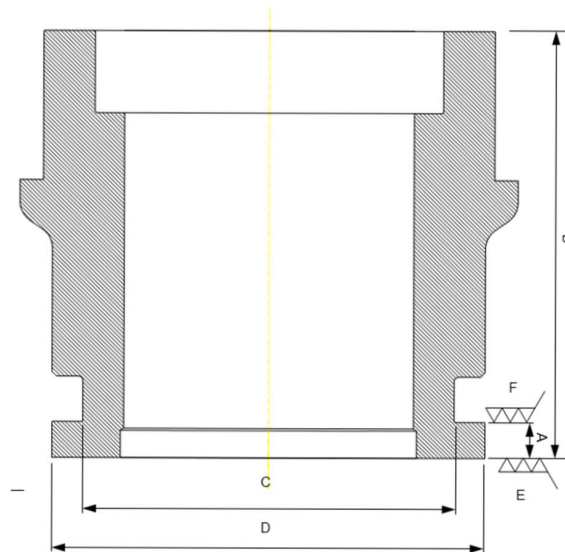


Figure 11.10.2: Bottom view of runner blades with marked cavitation areas

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11.11 Guide Vane Head Repairs



GUIDE VANE HEAD MACHINING QUALITY CONTROL PLAN									
<u>CONTRACTOR :</u>		<u>UNIT</u>	4	<u>GUIDE VANE HEAD</u>	1				
<u>INSPECTION STATUS</u>	<u>H = HOLD POINT</u>	<u>W = WITNESS POINT</u>	<u>I = INSPECTION POINT</u>		<u>S = SURVEILLANCE</u>				
Activity no.	Activity description Scope of work	MEASUREMENTS			Inspection status	Contractor		Accepted by ESKOM	
		Acceptance criteria	X	Y		Date	Signature	Date	Signature
1	Set up run-out in bore	<0.03			I				
2	Collar thickness A	40.000 - 39.975			I				
3	Overall length Bs	473.20 - 472.80			I				
4	Collar ID C	410.00 - 409.95			I				
5	Collar ID D	478.00 - 477.95			I				
6	Surface roughness E	<0.8Ra			I				
7	Surface roughness F	<0.8Ra			I				
					I				
					I				

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Figure 11.11.1: Example of check sheet used previously for guide vane head repair and distortion checks

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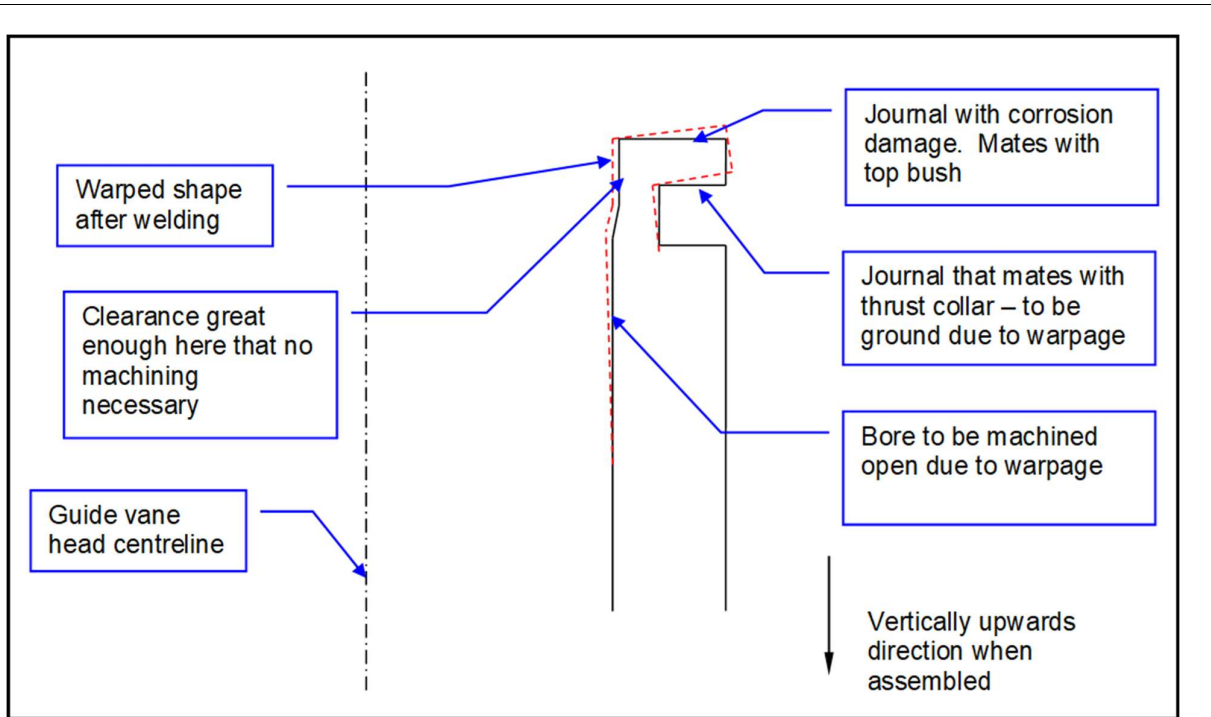


Figure 11.11.2: Previous distortion that occurred on one of the guide vane heads



Figure11.11.3: Example of previous damage on guide vane head bottom flange surface

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11.12 Shaft Seal Sleeve Replacement

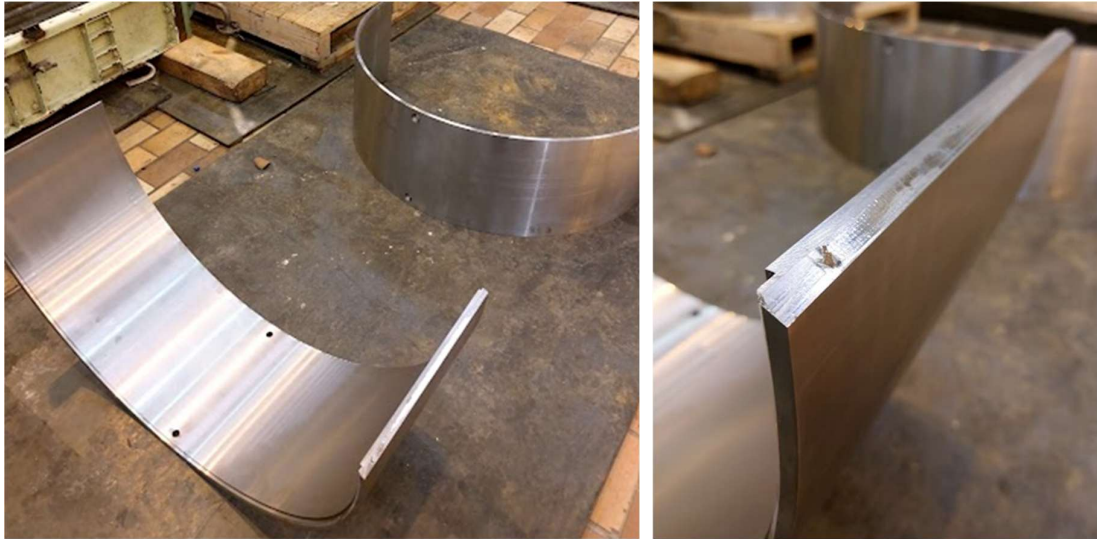


Figure 11.12.1: New shaft sleeve segments prior to installation



Figure 11.12.2: Old sleeve after removal

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11.13 Shaft Seal Base Plate Repairs

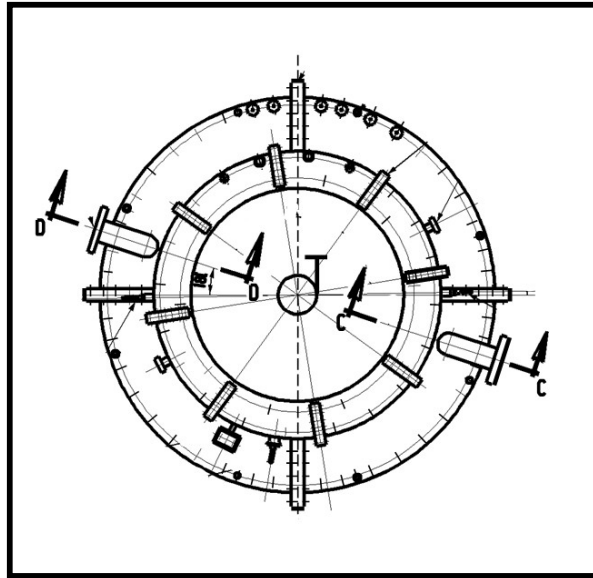


Figure 11.13.1: Top view of shaft seal assembly

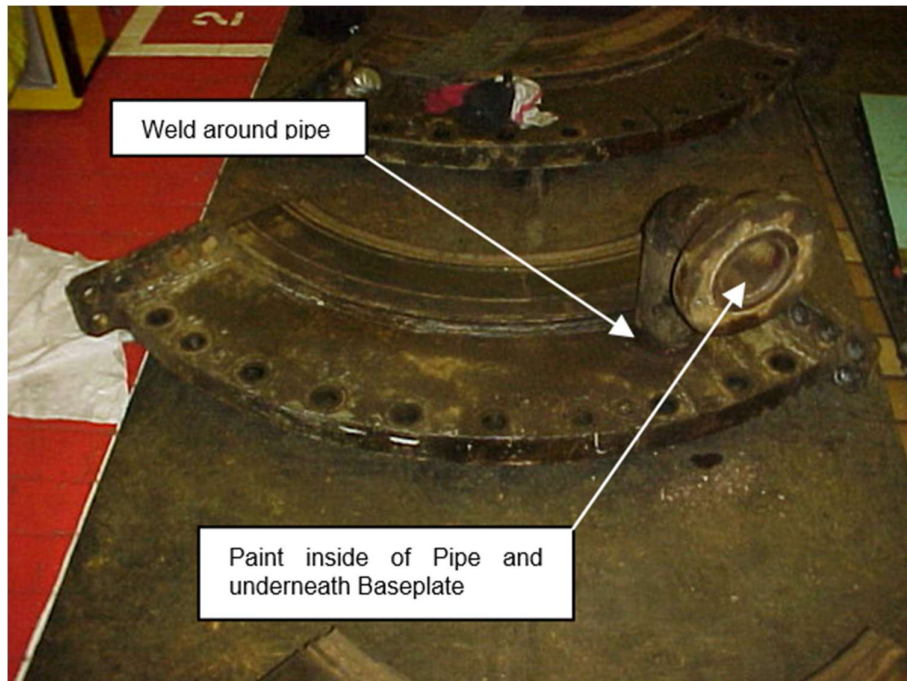


Figure 11.13.2: One of the shaft seal base plate segments with piping

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11.14 Shaft Seal Upper Case Housing O-ring Groove Refurbishment



Figure 11.14.1: Shaft seal upper case housing O-ring groove damage_1



Figure 11.14.2: Shaft seal upper case housing O-ring groove damage_2



Figure 11.14.3: Shaft seal upper case housing O-ring groove damage_3

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11.15 Turbine Embedded Pipework and Bottom Facing Plate Blanking

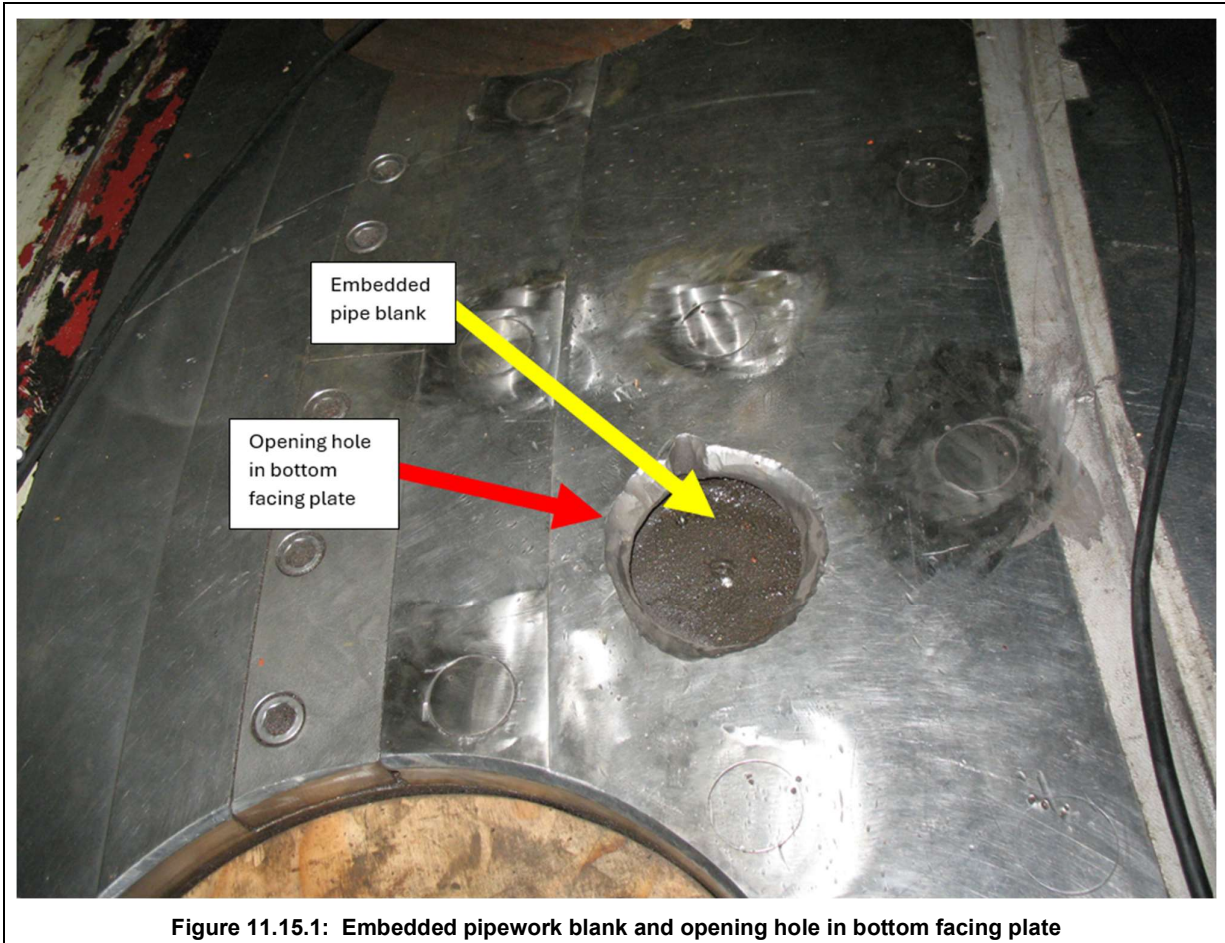


Figure 11.15.1: Embedded pipework blank and opening hole in bottom facing plate

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