Eskom	Standard	Technology

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1. INTRODUCTION

The purpose of standard is to specify the requirements for heat treatment of welded components at Eskom Holdings SOC Ltd, in order to comply with applicable Design codes and Eskom requirements.

2. SUPPORTING CLAUSES

2.1 SCOPE

This standard applies to all welded components to be installed or used on Eskom plant. The heat treatment can be either done at the contractor's workshop (off site or on site) or in-situ at Eskom stations. It shall be used in conjunction with the respective plant's design code.

While this document was developed from a Level 1 and 2 plant perspective, the intention is that the fundamentals shall be applied plant wide where applicable.

2.1.1 Purpose

This standard shall be used as part of the Weld Rule Book (WRB) suite of standards to ensure proper heat treatment of welded components on all Eskom plant, especially pressure and level 1 and 2 equipment.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] ISO 9001 Quality Management Systems.

[2] 240-42512353 - Training guide for various Eskom Welding Careers.

[3] 240-56355225 - Welding of High Pressure Temperature Tube and Pipework Standard.

[4] 240-56246601 - Personnel and entities performing welding related special processes on Eskom plant.

[5] 240-56241933 - Control of Plant Construction Repair and Maintenance Welding Activities Standard

[6] 240-56241639 - Repair welding of PA, ID and FD fans.

[7] 240-44175038 - Control of Non-Conforming Product or Service Procedure.

[8] 240-53464409 - Corrective and Preventive Action Procedure.

[9] SANS 3834 – Quality requirements for fusion welding of metallic materials.

[10] BS EN 10052 – Vocabulary of heat treatment terms for ferrous products

[11] BS EN 13480 – Metallic Industrial Piping.

[12] BS EN 12952 – Water-tube Boilers and Auxiliary Installations.

[13] BS EN 13445 – Unfired Pressure Vessels.

[14] BS EN 1011 - Welding — Recommendations for welding of metallic materials.

[15] BS EN 60584 – Thermocouples.

[16] BS EN 10052 – Vocabulary of heat treatment terms for ferrous products.

[17] BS EN ISO 13916 - Welding — Guidance on the measurement of preheating temperature, interpass temperature and preheat maintenance temperature.

[18] BS EN ISO 17663 - Welding — Quality requirements for heat treatment in connection with welding and allied processes (ISO 17663:2009).

[19] BS 2633 – Specification for Class I arc welding of ferritic steel pipework for carrying fluids.

[20] BS EN ISO 21952 – Welding consumables – Wire electrodes, wires, rods and deposits for gas-shielded arc welding of creep-resisting steel – Classification.

[21] PD CEN ISO/TR 20173 – Welding – Grouping systems for materials – American materials.

[22] ASME Boiler and Pressure Vessel Code.

[23] AWS D10.10/D10.10M – Recommended practises for local heating of welding in Piping and Tubing.

[24] South African Pressure Equipment Regulation No. R 734.

[25] Occupational Health and Safety Act and Regulations of South Africa.

2.2.2 Informative

None.

2.3 DEFINITIONS

Definition	Description
Baking	Heat treatment permitting the release of hydrogen occluded in a ferrous product without modifying the structure.
Cooling conditions	Conditions under which the cooling of the product takes place: nature and temperature of the medium, relative movements, agitation, etc.
Cooling rate	Variation in temperature as a function of time during cooling.
Heat band	The surface area over which the heat source shall be applied to achieve the required temperature in the soak band and limit induced stresses in the vicinity of the weldment.
Heat treatment	Series of operations in the course of which a solid product is totally or partially exposed to thermal cycles to bring about a change in its properties and/or structure.
Heat treatment Procedure	Procedure shall also be taken for the purposes of this standard to include HT Method Statement or Instruction.
Heating rate	The variation of the temperature as a function of time during heating.
Interpass temperature	The temperature in a multi-run weld and adjacent parent metal immediately prior to the application of the next run and normally expressed as the maximum temperature.
Local PWHT	Controlled heat applied to the weld metal, HAZ and a limited volume of base/parent material adjacent to the weld as opposed to heating the complete weldment/component in a furnace or oven.
Preheat temperature	The temperature of the work piece in the weld zone immediately prior to starting any welding operation and expressed as the minimum temperature.
Preheat maintenance temperature	The minimum temperature in the weld zone which shall be maintained if welding is interrupted.
Soaking	That part of the thermal cycle during which the temperature is held constant.

Definition	Description
Soak band	The volume of metal which must be heated to the minimum but not exceed the maximum required temperature for the heat treatment. As a minimum is shall consist of the weld, HAZ and a portion of the base/parent material adjacent to the weld being heated.

2.3.1 Disclosure Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
°C	Degrees Celsius
AIA	Approved Inspection Authority
HAZ	Heat Affected Zone
HB	Heat band
HT	Heat Treatment
Max	Maximum
Min	Minimum
MTP	Material Test Piece
PTP	Production Test Piece
PWHT	Post Weld Heat Treatment
SB	Soak band
TAU	Thermocouple attachment unit
WPQR	Welding Procedure Qualification Record
WPS	Welding Procedure Specification
WRB	Welding Rule Book

2.5 ROLES AND RESPONSIBILITIES

It is the duty of the contractor performing welding activities on Eskom plant to ensure compliance to this Standard.

2.6 PROCESS FOR MONITORING

- Implementation of this Standard shall be facilitated by the various welding personnel as detailed in Eskom Standard 240-56246601 “Personnel and entities performing welding related special processes on Eskom plant”.
- All contractors shall include the adherence to this standard into their welding quality management system.
- Non-compliance to the requirements of this standard including the process for monitoring shall result in a non-conformance being raised as per Eskom Standard 240-53464409 “Corrective and Preventative Action Procedure” and 240-44175038 “Control of non-conforming Product or Service” by the Engineer involved either in implementation of the Standard or the work being carried out.

2.7 RELATED/SUPPORTING DOCUMENTS

Refer to Normative References.

3. HEAT TREATMENT

3.1 GENERAL HEAT TREATMENT REQUIREMENTS

If any of the above/following requirements are not met, the weld will be deemed invalid and the component can be rejected.

3.1.1 Service Providers

All heat treatment (HT) service providers shall be subjected to an annual technical audit, led by the Eskom Welding Care Group, to ensure compliance to this standard. Also that HT operators being utilised to perform the HT are adequately qualified and competent to carry out such actions.

3.1.2 Quality Control of Heat Treatment Activities

- Only qualified heat treatment technicians shall perform heat treatment operations on Eskom plant. Refer to Eskom standard 240-56246601 for qualification requirements.
- There shall be constant supervision provided by the HT service provider at all times.
- Trainee technicians shall work under the direct supervision of experienced qualified technicians.

3.1.3 Thermocouples

- Thermocouples shall be attached as per the requirements of the applicable design code.
- All connections for thermocouples shall be mechanically sound. No bare wires wedged into connection points on the power source and control panel shall be allowed on Eskom plant.

3.1.4 Heat treatment equipment

- Heat treatment equipment shall be attended to by suitably qualified operators at all times, including automated units which shall be monitored continuously.
- Review of recorder calibration certificate - this shall be available before work commences and at the recorder for the duration of the work. In addition this shall form part of the data book.
- No bare wire connections between lengths of compensating cable and between compensating cables and the thermocouple are permitted. Proper connectors designed for this purpose shall be utilised.

3.1.5 Insulation

a. There shall be no gaps from insulation to component and insulation to heating pads.

b. It shall be securely fastened using the appropriate strapping technique which shall be suitable for the intended temperature range.

3.1.6 Safety

- During shift changes the Contractor's HT supervisor shall notify all the relevant parties of HT that is being carried out on plant.
- All isolation and tag out points must be verified by Contractor's HT supervisor any areas of concern shall be discussed with Eskom personnel.

3.2 HEAT TREATMENT METHOD STATEMENT/PROCEDURE/INSTRUCTION

- A job specific HT procedure shall be compiled strictly in accordance with the applicable WPS.
- The job specific HT procedure shall be reviewed by Eskom and accepted before work commences, it shall have been reviewed and approved by Contractor before submission to Eskom. This shall include pre-heat, interpass, PWHT and post welding bake-out where applicable.
- Non-standard configurations and no experience in the particular HT to be performed shall necessitate a qualification to prove that the HT will be effective for the intended application. This procedure shall also be submitted for Eskom's acceptance prior to commencement of work.
- Recommend precautions to be addressed in the procedure, but not limited to, are: -
    - The welds to be heat treated shall be free from any product that can adversely affect the HT process.
    - The components to be heat treated and those surrounding it shall be protected against oxidation and mechanical damage.
    - Where applicable open ends shall be closed off to prevent the cooling associated with draughts (chimney effects).

3.3 PRE-HEATING

- Gas preheating on high pressure and high temperature plant shall be allowed as detailed in Eskom Standard 240-56355225 – Welding of High Pressure Temperature Tube and Pipework. Monitoring of the process to ensure that the correct temperatures as set out in the WPS are being reached shall be done by AIA/Third Party, Contractor and Eskom.
- Resistance heating on high pressure and high temperature plant shall be allowed as detailed in Eskom Standard 240-56355225 Welding of High Pressure Temperature Tube and Pipework.

  Note: - *Whatever method of preheating is used, care shall be taken to ensure that the temperatures recorded are representative of those at the inner surface before welding commences; this is especially important for thick walled components.*
- Prior to welding contractor technician and welder/welding supervisor shall verify that the required preheat temperature has been achieved with contact thermometer e.g. tempilstick and digital thermometer if required for confirmation purposes.
- The minimum preheat temperature shall be to those given in Appendix A
- Temperature shall be measured on the base material as stipulated in applicable Health and Safety standard/code and in addition the actual weld temperature shall be verified with either contact thermometer or temperature indicating crayon. Root temperature shall be measured manually using a calibrated temperature probe prior to welding commencement.

3.4 INTERPASS TEMPERATURE

- Interpass temperature shall be monitored between welding passes. This is the temperature immediately before each weld pass is performed. If the temperature measured is above the maximum allowable interpass temperature, as per WPS, welding shall not continue until the correct temperature is obtained.
- The maximum interpass temperature shall be to those given in Appendix A.
- Temperature shall be measured on the base material as stipulated in applicable Health and Safety standard/code and in addition the actual weld temperature shall be verified with either contact thermometer or temperature indicating crayon.

Note: - *When temperature indicating crayons are used the HT operator and/or welder shall have a crayon rated for min preheat, max interpass and intermediate for proper control. Each temperature crayon shall have permanent legible writing of the rated temperature on it.*

The measured preheat, interpass and preheat maintenance temperature in °C shall be recorded as part of the final report, that shall be included in the data book, as per designations in the applicable application standard/code.

3.5 POST WELD HEAT TREATMENT

- The temperature ranges used for PWHT shall be to the ranges given in Appendix A.

3.5.1 HT Procedure

i. Before post weld heat treatment (PWHT) starts or as part of the HT procedure or method statement the following minimum information is required and shall be recorded either separately or on the PWHT information tag. *Note if PWHT information tag is used and the information required cannot be fitted onto it, reference shall be made as to where the information is recorded*: -

- Component identification number i.e. kks number, unit, system, weld number, drawing number.
- Start and finish time and date.
- Name of PWHT technician, welder and welding supervisor.
- Applicable WPS number.
- Weld card or job number where applicable.
- Drawings detailing the major dimensions of the heat treated component. *(Note this is especially important where there are valves/pumps, etc. or change in dimension relative to the area of welding and PWHT.*)
- Number of cables as per set-up specification.
- The number and position of thermocouples. Each thermocouple's relation to the heater, the component and the PWHT recorder. Also the function of each i.e. controlling, monitoring or half-peak. The actual reference points for the thermocouples shall also be recorded, distance in mm from 0 reference point as opposed to clock references.
- Reference point on the component to be heat treated and shall also be indicated on the drawing as well.
- Method of heat treatment, e.g. furnace, inductive, resistance. In case of Furnace heat treatment the furnace atmosphere shall be measured and recorded before components are loaded.
- Position and dimensions of the heating, soaking and insulation band.
- Method of heating control to obtain uniform heating without creating localised hotspots.
- Minimum and maximum heating and cooling rates in °C per hour, as per Eskom accepted WPS.
- Minimum and maximum soak temperature in °C per hour and duration as per Eskom accepted WPS.
- Method for stabilising all temperature measurements before reaching soaking temperature.
- Overlap of heated sections.
- Detail of PWHT in areas with attachments and how to prevent repeated PWHT in these areas
- A schematic of the furnace or local PWHT area showing location of component with the thermocouple placement.

- Insulation type and characteristics.
- Cooling conditions, i.e. still air, forced cooling, etc. Harmful thermal gradients shall be avoided at all times in all situations.
- Supporting and loading of the components/product, where applicable. Components shall be properly secured to allow adequate thermal expansion so as to prevent permanent deformation after the PWHT cycle.
- Environmental conditions e.g. if there is any requirement for protection against draft on any contamination that is detrimental to the HT.

ii. The PWHT form shall be checked for content by the designated Contractor welding personnel and shall be given to PWHT supervisor for implementation.

iii. The PWHT supervisor shall give the form and all relevant documentation to the technician for commencement of work. AIA/Third party representative, HT contractor, Contractor and/or Eskom System Engineer shall sign the chart before work starts, without these signatures work shall not commence.

iv. The PWHT technician shall check functionality of equipment before work starts.

v. Welds to be heat-treated shall be free from grease, lubricants and coatings to prevent damage and short circuiting of accessory equipment.

vi. Thermocouples shall be attached in accordance with the requirements for thermocouples, heating band and insulation that are provided on a typical set-up. The detailed sketch of HT shall be provided by the Contractor. As a minimum additional thermocouples shall be fitted at each controlling point as back-up for use in the event of the primary thermocouple failing.

vii. Thermocouples shall be attached using resistance discharge welding method. Other techniques shall be evaluated if required in consultation with Eskom Engineering. Thermocouples shall be type K Nickel-Chrome/Nickel-Aluminium or Platinum-Rhodium.

viii. The heating pads shall be securely strapped to the component for the duration of the heating cycle.

ix. In case of furnace PWHT, the temperature of the furnace at the time when components of complicated shapes or with thicknesses greater than 60 mm are placed in or taken out of the furnace temperature shall not exceed 300°C.

x. In case of furnace PWHT, each component placed inside the furnace shall be furnished with its own thermocouple and shall be recorded accordingly on the heat treatment chart.

xi. 60 minutes prior to cycle completion, a notification shall be sent to all relevant parties so they can be available at end to review the PWHT.

xii. On completion of HT cycle when the component has been stripped it shall be examined for distortion, discolouring, damaged (e.g. holed) and arching.

xiii. The thermocouple area shall be cleaned and surface crack tested.

xiv. Heat treatment equipment: -

- The equipment shall be of a proper make suitable for HT and it shall bear proper electrical power input/output.
- Local PWHT - Power distribution (supply) shall be of 380/440V Ph, with either single phase secondary output or step down transformer secondary output (heat treatment unit) supplying low voltage circuit. The temperature control equipment shall be operated manually or through regulators or it shall be operated automatically with the help of modular controls.
- The chart type temperature recorder shall be used for recording temperature.

xv. The following data shall be recorded for every heat treated component and shall form part of the final data book together with the chart: -

- Power station/Project name
- Job/Procedure number
- Date
- Weld number
- System/Sub system
- Drawing number and KKS number
- Component material/s
- Dimensions
- Chart speed (add to check sheet – job monitoring)
- Allocation of the recorder colour to the measuring point/welding seam.
- Recorder number
- Start and end point of soaking period, signed off by all the relevant parties.
- Unique chart number.

xvi. The time at soaking temperature shall be measured from the time when the last thermocouple reading reaches the min temperature of the specified range.

xvii. Individual HT cycles and/or cumulative HT times shall be limited to the number or time simulated during the welding procedure qualification test. Otherwise the weld shall be cut out and a new weld performed.

3.5.2 PWHT parameters for service-aged materials

When welding is performed on service-aged materials, heat treatment parameters may have to be reviewed/revised to accommodate the material condition. Typical requirements are reduced heating and cooling ramp rates, flush grinding of weld reinforcements before PWHT commences. Additional measures to reduce cooling rates in the event of power source failure shall be in place. As a minimum, insulation of the affected component shall extend at least 1 meter either side of the heating source. A back up power generator is strongly recommended.

3.5.3 PWHT Chart

The PWHT chart shall be reviewed by the Contractor Welding Engineer/Technologist, AIA Welding Engineer/Technologist and Eskom Welding Engineer/Technologist prior to it being included into the final data book. This review shall be done immediately after PWHT and shall be confirmed by name, signature and date on the chart.

3.6 INTERRUPTION OF HEAT TREATMENT

- It shall be avoided within all practical limits. A back up power generator shall be available at all times.
- Interruption during HT execution can be caused by the following:-
  i. Loss of power to the power source and/or controlling unit and/or data recorder.
  ii. Detached or malfunction thermocouples.
  iii. Detached insulation.

iv. Electrical shorts on thermocouple compensation cables.

- Discrepancies within the parameters of the HT instruction shall be reviewed and analysed by the Contractor and shall be made available to Eskom when requested and shall be included in the final data book. – This shall be categorised as a non-critical interruption.
- In the event of unavoidable/critical interruption, that deviates from the HT instruction, the following shall be done: -

i. Following persons shall be contacted at the time of interruption, in the order provided: -

- HT supervisor
- Contractor Welding Engineer/Technologist/Supervisor.
- AIA/Third party.
- Eskom responsible System Engineer.
- Eskom Metallurgist.
- Eskom Chief Welding Engineer/Technologist/Co-ordinator/Convenor of Welding Care Group.

ii. Relevant information in relation to the interruption shall be provided to the above persons by the HT operator/Supervisor for evaluation.

iii. Furthermore the following shall be adhered to: -

The same chart shall be used and at the interruption point it shall be signed by HT operator, AIA/Third Party and Eskom System Engineer with time and reason.

4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

Date	Rev.	Compiler	Remarks
June 2014	0.1	N.D. Didiza	First issue
October 2014	0.2	N.D. Didiza	Draft Document
November 2014	1	N.D. Didiza	Final Document for Authorisation and Publication

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- Hennie Coetzer
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- Donovan Govender
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7. ACKNOWLEDGEMENTS

N/A

APPENDIX A: WELDING PROCESSES FILLER METAL, PREHEAT, INTERPASS AND PWHT TEMPERATURE

Material	Welding process	Filler material	Preheat °C (min)	Interpass °C (max)	PWHT °C
15NiCuMoNb5-6-4 to 15NiCuMoNb5-6-4	141 (TIG) 111 (MMA) 121 (SAW)	W MoSi E 55 4 1Ni Mo B S3NiMo1 SA FB 1 65 DC	150	220	570 to 620 *Note: Do not exceed the mill tempering temperature.*
15NiCuMoNb5-6-4 to 13CrMo4-5	141 (TIG) 111 (MMA) 121 (SAW)	W MoSi E Mo B 4 2 H5 S2Mo SA FB 1 65 DC	150	200	600 to 620 *Note: Do not exceed the mill tempering temperature for the 15NiCu material.*
7CrMoVTiB10-10 to 16Mo3	141 (TIG) 111 (MMA) 121 (SAW)	W MoSi E Mo B 4 2 H5 S2Mo SA FB 1 65 DC	150	250	These material combinations shall be limited to thicknesses ≤ 10mm and nominal diameter ≤ 120mm, thus no PWHT shall be required and design mean wall temperature of >480°C.
7CrMoVTiB10-10 to 13CrMo4-5	141 (TIG) 111 (MMA) 121 (SAW)	W CrMo1 Si E CrMo1 B 4 2 H5 S CrMo1 SA AB 1 56 AC H5	200	280	These material combinations shall be limited to thicknesses ≤ 10mm and nominal diameter ≤ 120mm, thus no PWHT shall be required and design mean wall temperature of >480°C.
7CrMoVTiB10-10 to 7CrMoVTiB10-10	141 (TIG) 111 (MMA) 121 (SAW)	WZ CrMo2VTi/Nb EZ CrMoV 2 B SZ CrMoV 2 1 TiB SA FB 1 55 AC	200	280	730 to 750
7CrMoVTiB10-10 to 10CrMo9-10 /11CrMo9-10	141 (TIG) 111 (MMA) 121 (SAW)	W CrMo2 Si E CrMo2 B 4 2 H5 S CrMo2 SA FB 1 65 DC	200	280	730 to 750
7CrMoVTiB10-10 to X20CrMoV11-1	141 (TIG) 111 (MMA) 121 (SAW)	W CrMo2 Si E CrMo2 B 4 2 H5 S CrMo2 SA FB 1 65 DC	220	280	730 to 750
7CrMoVTiB10-10 to X10CrMoVNb9-1	141 (TIG) 111 (MMA) 121 (SAW)	W CrMo91 E CrMo91 B 2 4 H5 S CrMo91 SA FB 1 65 DC	180	280	730 to 750
7CrMoVTiB10-10 to X10CrWMoVNb9-2	141 (TIG) 111 (MMA) 121 (SAW)	WZ CrMoWVNb9 0,5 1,5 EZ CrMoWVNB9 0,5 2B SZ CrMoWVNb9 0,5 1,5	180	280	730 to 750
X20CrMoV11-1 to	141 (TIG)	W CrMoWV12 Si	250	450	730 to 770

X20CrMoV11-1	111 (MMA) 121 (SAW)	E CrMoWV12 B 4 2 H5 S CrMoWV12 SA FB 1 65 DC			
X20CrMoV11-1 to 10CrMo9-10 /11CrMo9-10	141 (TIG) 111 (MMA) 121 (SAW)	W CrMoWV12 Si E CrMoWV12 B 4 2 H5 S CrMoWV12 SA FB 1 65 DC	250	450	730 to 760
X10CrMoVNb9-1 to 10CrMo9-10 / X20CrMoV11-1 / VM12-SHC / X10CrMoVNb9-1 /	141 (TIG) 111 (MMA) 121 (SAW)	W CrMo9 1 E CrMo91 B 4 2 H5 S CrMo9 1 SA FB 2 55 DC	X20CrMoV11-1 250 All others 200	350	10 CrMo9-10 740 to 760 All others 740 to 770
X10CrWMoVNb9-2 to 10CrMo9-10 / X20CrMoV11-1 / VM12-SHC / X10CrMoVNb9-1 / X10CrWMoVNb9-2 /	141 (TIG) 111 (MMA) 121 (SAW)	WZ CrMoWVNb9 0,5 1,5 EZ CrMoWVNb9 0,5 2 B SZ CrMoWVNb9 0,5 1,5 SA FB 2 55 DC	X20CrMoV11-1 250 All others 200	350	10 CrMo9-10 740 to 760 All others 740 to 770
VM12-SHC to					
7CrMoVTiB10-10	141 (TIG)	WZCrMoV2	100	280	730 to 750
X20CrMoV11-1		W CrMoWV12 Si	100		750 to 770
X10CrMoVNb9-1		WCrMo91	180		750 to 770
X10CrWMoVNb9-2		WZCrMoWVNb9 0,5 1,5	180		760 to 780
VM12-SHC		WZ CrCoW 12 2 2	100		760 to 780

Note - For the table above the European designation system has been used, where applicable the American equivalent shall be treated in exactly the same manner but using the American designation system.

APPENDIX B: HEAT TREATMENT CHECK SHEET

Eskom	**HEAT TREATMENT CHECKSHEET**			
POWER STATION NAME				
	Activity	**Information**	**Page 1 of 1**	**Sign**
1.	**Weld Identification**	1.1. Unit	1.2. System/Sub system	
		1.3. Drawing number and KKS	1.4. Component	
		Weld orientation (horizontal/vertical)		
2.	**Material Identification**	Material type, component dimensions		
3.	**Heat treatment personnel Identification**	3.1. Supervisor	3.2. Identification number 1	
		3.3. Technician	3.4. Identification number 2	
4.	**Work Environment**	4.1. Possible interferences (Vibrations, bumps, DRAFTS) that might affect the Heat treatment. If present, please describe		
5.	**Heat treatment temperature**	5.1. Preheat temperature (record actual values in °C) 5.2. Interpass temperature(record actual values in °C) 5.3. PWHT temperature (record actual values in °C)		
6. 6.	**Equipment**	Functionality		
7. 7.	**PWHT chart speed**	(Record actual chart speed)		
8.	**Procedure shall be available**	8.1 Welding Procedure Specification 8.2 Heat treatment Procedure number 8.3 Method statement number		
9.	**Interruptions**	9.1. Did anything prevent continuous heat treatment? If so has it been recorded and the relevant personnel notified? Report number to be recorded		

- Note: This form should be completed for each individual weld.
- Complete a new form for every weld or weld repair.
- Attach any support document / information to this document to assist with investigations.
- The information on this form will be used to identify good and bad practices, so as to improve the overall heat treatment cycle.

This document was completed by:

10. Heat treatment Technician	**Name**	**Signature**	**Date**
11. Heat Treatment Supervisor	**Name**	**Signature**	**Date**
12. Contractor Welding Supervisor/Technologist or Engineer (state designation)	**Name**	**Signature and/or stamp**	**Date**