

3.1.1. HP Seamless Piping Technical Specification

Ferritic Steels:

Seamless tube with dimensions, steel grades and quantities as per attached schedule, in accordance with most stringent of all requirements in EN10216-2, VGB Specification VGB-R 109, VdTÜV WB511 (03.2009) and Eskom Technical Specification, to test category 2, with a 3.2 certificate in accordance with EN10204.

Important: TE1 – Complete a Works Information Check List point TE1 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements.

3.1.1.1. Quality Gatekeepers

The information listed below must be included in the tender submission for each material grade and dimension group. Failure to supply the information (known as the quality gatekeepers) will result in automatic disqualification of the tender.

- Name, street and postal address, contact names and telephone numbers of the **plant** (*site of manufacturing, inspection, testing, and release – if any activity is done at a different plant it must be listed*) where the material will be manufactured, must be supplied with the tender submission. Note that Eskom reserves the right to audit the facilities (or arrange for it by a third party). Under no circumstances can material be manufactured elsewhere without Eskom's written approval.

Important: TE2 / QGK1 - Complete Works Information Check List point TE2 / QGK1 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements. Note that a sheet must be filled in for each manufacturing plant - material grade combination (if one manufacturing plant will supply 4 material grades in this contract, 4 Works Information Check Lists must be completed for the tender, if 3 manufacturing plants will all supply 1 material grade, 3 Works Information Check Lists must be completed for the tender).

- Third Party / Notifying Body certification that the **plant** has been audited and authorised having a quality assurance system for material manufacture in accordance with PED 97/23/EC (Pressure Equipment Directive) to produce the material grades and dimension ranges tendered for. It is Eskom's preference that this certificate is issued by TÜV. Contact details of other third party bodies to be supplied for evaluation by Eskom. Certificates and supporting / additional information must be supplied with the tender submission. For materials operating in the creep regime (>500°C) certificates to prove that material of same grade and similar dimensions of the ordered material was manufactured at the plant and subjected to actual creep testing of at least 40kh is required, no extrapolation is permitted.

Important: TE3 / QGK2 - Complete Works Information Check List Attached point TE3 / QGK2 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements, include certificates and documents marked as TE3 / QGK2 in tender files.

Important: TE4 / QGK3 - Complete Works Information Check List Attached point TE4 / QGK3 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements, include certificates and documents marked as TE4 / QGK3 in tender files.

- To limit the technical risk, the **plant** should have delivered at least 500 tons of a material grade within the range of dimensions listed. A reference list with contact details of the end users (Utilities) should be supplied with tender submission for evaluation by Eskom. The reference list must include dates of delivery, material grade, dimensions, tonnage and user contact details. Eskom reserves the right to audit the manufacturing **plants** or arrange for an audit by a third party without any obligation to give reasons for executing this right. Should a **plant** be unable to prove manufacturing of a specific grade of material, proof should be provided that the mill has produced pipes in a material grade of similar chemical composition and manufacturing complexity in the past.

Important: TE5 / QGK4 - Complete Works Information Check List Attached point TE5 / QGK4 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements, include certificates and documents marked as TE5 / QGK4 in tender files.

- Heat treatment dummy charts and furnace packing plans are supplied with tender documents.

Important: TE6 / QGK5 - Complete Works Information Check List Attached point TE6 / QGK5 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements, include dummy charts, furnace loading plans, thermocouple locations, certificates and documents marked as TE6 / QGK5 in tender files.

- A declaration form must be signed to confirm that all the requirements of this specification can be met. If requirements cannot be met those should be listed on the declaration form. Supporting documents should be attached for evaluation and as proof. This is required for each **plant** where tubes will be manufactured and must be included with the tender submission. **Failure to do so will disqualify the tender.**

Important: TE7 / QGK6 - Complete Works Information Check List Attached point TE7 / QGK6 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements, include a declaration of conformance (letter) and documents stating non-conformance areas marked as TE7 / QGK6 in tender files.

3.1.1.2. General Requirements:

Material must be ordered as seamless tube to the requirements of British Standard BS EN 10216, incorporating newest amendments (A1:2004 and A2:2007). The requirements of VGB Specification VGB-R 109 "Material Specification for Components in Fossil-fired Power Plants", VdTüV WB511 (03.2009) and additional Eskom requirements in the technical specification shall be included as minimum requirements to be adhered to.

In all cases seamless tubes to test category 2 (with all mandatory and optional tests as per tables in EN 10216) are ordered. Suppliers must indicate in their tenders (before evaluation by Eskom) if requirements cannot be met fully or if alternative limits are proposed.

Manufacturing processes not covered by EN 10216 will not be considered where seamless tube manufacture to EN10216 is possible. If dimensions or quantities of pipes required by Eskom fall outside the capabilities of processes governed by EN

10216, the supplier must propose alternative standards (eg EN 10222) with a full description of the manufacturing processes (including forging processes and heat treatments), qualification of personnel and processes, non-destructive testing, mechanical testing, reduced unit length limitations, etc to demonstrate that the critical special requirements of this standard is incorporated. As a minimum, Eskom will require that it is demonstrated as well that the requirements of EN10216 test category 2 and additional requirements listed for the material will be met. An Eskom technical committee consisting of both Pipework and Materials Specialists from the Group Technology and Sustainability Divisions as well as the Power Station System Engineer will evaluate the acceptability of these processes.

The requirements of this document are complementary to those laid down in national codes and standards, and are based on latest knowledge available and experience necessary to design and manufacture of pipework and boiler pressure parts operating at high pressures and temperatures, which may be used safely with minimum routine maintenance, for not less than 200 000 hours under design conditions. In all cases the requirements of SANS 347 and the Pressure Equipment Regulations or PED 97/23/EC (Pressure Equipment Directive) must be complied with, e.g. Certificate of Conformity, etc.

3.1.1.3. Steel Making Process

The foundries used to supply cast billets for tube manufacturing shall be listed in the tender documents.

Material shall be manufactured under controlled melting processes (as a minimum, electric arc process with vacuum degassing, argon bubbling, inductive stirring, bottom pouring and appropriate after-treatment) to ensure that clean steel which is also “free” of inclusions is delivered to the tube manufacturing plant. Details of process shall be supplied with the tender.

Raw material and scrap control by foundries must demonstrate low contamination levels of trace and dangerous (poisonous and radioactive) elements. The process followed and the supplier of the castings/billets must be listed on the foundries' material certificates.

Important: TE8 - Complete Works Information Check List point TE8 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance to clean steel making processes, include documents of proof marked as TE8 in your tender files.

Important: TE9 - Complete Works Information Check List point TE9 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include documents of proof marked as TE9 in your tender files.

Note: Welding is not permitted during pipe manufacture or forming processes.

3.1.1.4. Inspection Certificate

In all cases a 3.2 inspection certification in accordance with EN 10204 is required and shall be issued at the plant of manufacture, prior to dispatch to Eskom.

Important: TE10 - Complete Works Information Check List point TE10 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE10 in your tender files.

3.1.1.5. Heat Treatment

The following requirements shall apply, must be demonstrated and listed on the tender evaluation documents and certificates.

- The calibration status of the furnace, temperature sensors (thermocouples) and monitoring instrumentation loops must be verified before heat treatment commences.
- The control thermocouple shall maintain the target temperature within 2°C (+/- 1°C)
- The horizontal, vertical and diagonal temperature differentials of the furnace must be less than 20°C (+/- 10°C) over the areas where the tubes will be positioned during heat treatment.
- This must be demonstrated by placing at least 1 calibrated thermocouple block per furnace control area distributed over the entire loading area and to include the extremes. The plan to show how this will be achieved must be supplied and agreed on before the tender is awarded and the results to prove that it was achieved must be included in the furnace calibration certificates. Thermocouples must be used for the austenizing, hardening, tempering, and solution annealing heat treatments.
- Eskom reserves the right to waiver the use of thermocouples where the plant can prove to Eskom's satisfaction that the gradients will be within the tolerances required for the loading pattern of the furnace. This right is exercisable without any obligation to supply details for the decision.
- Pieces must be packed and separated to avoid non-uniform heating and cooling rates (especially during austenizing, hardening and tempering of CSEF) and associated non-uniform material properties. A furnace loading plan must be supplied during the proposal. A detailed report to indicate how this was achieved must be included in the data book. For CSEF steels and X20CrMoV121 the plan must include details of how the high risk areas will be marked for hardness testing on the potential soft spots after final heat treatment.
- The heat treatment plan (heating and cooling rates and mediums, with holding temperatures, times and sequence) for each material type and dimensions batch must be supplied with the quality control plans for approval by Eskom before work commences. These heat treatment plans and the actual heat treatment charts of each batch should be included in the data books.
- The most stringent parameters of EN 10216, VGB-R 109, VdTÜV WB511 (03.2009) or this Eskom Technical Specification must be adhered to.
- For heat treatments the following apply:
 - For each step (eg. Austenitizing, hardening, tempering) soaking time must allow the full thickness to reach the desired temperature. Soaking must be done for at least 10 minutes at temperature (or longer for some materials) in the last area reaching temperature. For martensitic steels, continuous and uniform cooling after austenizing must be done at a rate >5°C/min at least down to 450°C and then slower to a temperature below the Martensite finish temperature (at least <80°C for the CSEF steels and X20CrMoV111). Care

must be taken that the components in the hardened condition do not crack (keep dry and avoid thermal and mechanical shock). Cooling rates for austenitic stainless steels must prevent sensitisation, and requires rates $\gg 5^{\circ}\text{C}/\text{min}$.

- For X10CrMoVNb9-1 (P91) the following limits must be adhered to:
 - Austenitizing should be done at 1060°C . The minimum temperature on any component should be 1050°C and the maximum 1080°C . Once the full thickness reaches the desired temperature, soaking must be carried out for at least 10 minutes at this temperature. After Austenitizing, the hardening process requires cooling to temperatures $< 80^{\circ}\text{C}$, reached by the through thickness of the product. Tempering should be done at $750^{\circ}\text{C} - 780^{\circ}\text{C}$. Soaking starts once the full thickness reaches the desired temperature. Temper temperature and soaking time must be chosen to provide the required hardness limits (215HV – 260HV). The aim must be to achieve hardness in the centre towards the higher range to allow a minimum hardness of $> 205\text{HV}$ after bending and welding heat treatment processes. Cooling must be in air after tempering. Please note that upper and lower limits specified must not be exceeded at all, even including measurement tolerances.

Important: TE6 / QGK5 - Complete Works Information Check List Attached point TE6 / QGK5 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance with the above requirements, include dummy charts, furnace loading plans, thermocouple locations, certificates and documents marked as TE6 / QGK5 in tender files.

3.1.1.6. Options

Several options exist within EN 10216 and will be required as follows:

Ferritic steels according to EN10216-2 (A1:2004 and A2:2007)

1 Option 1: Cold finishing (paragraph 7.3.2)

The tubes shall be manufactured by a hot finished seamless process.

2 Option 2: Restriction on Copper and Tin Content (Table 2)

$\text{Cu} < 0.250$, accept for 15NiCuMoNb5-6-4 where it must be within the tolerances listed in EN 10216-2.

$\text{Sn} < 0.010$. These chemical analyses results per batch must be supplied with the certificates.

Important: TE11 - Complete Works Information Check List point TE11 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE11 in your tender files.

3 Option 3: Chemical composition (paragraphs 8.2.1 & 8.2.2)

(a) Trace elements to be controlled and reported for the cast analysis of the materials. The following limits must be adhered to:

$\text{P} \leq 0,020$; $\text{S} \leq 0,010$; $\text{As} \leq 0,010$; $\text{Sb} \leq 0,003$; and $\text{As} + \text{Sn} + \text{Sb} + \text{Pb} < 0.01$

(b) Product analysis must be done for the following materials on the same tube subjected to mechanical testing:

14MoV63

15NiCuMoNb5-6-4 (WB36)

7CrWVNb9-6 (P/T23)
7CrMoVTiB10-10 (P/T24)
X10CrMoVNb9-1 (P/T91)
X10CrWMoVNb9-2 (P/T92)
X20CrMoV11-1
VM12-SHC (as per V&M data sheet and VGB-R 109)

Special requirements for these steels include analysis for adherence to the following:

$P \leq 0,020$; $S \leq 0,010$; $Ni \leq 0,20$ (excl X20 and VM12); $As \leq 0,010$; $Sb \leq 0,003$; $Al \leq 0,020$; $Zr \leq 0,01$ and

Important: TE12 (a) - Complete Works Information Check List point TE12 (a) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE12 (a) in your tender files.

(b) The following special requirements must also be maintained and specifically reported on the material certificates.

- For: X10CrMoVNb9-1 (P/T91), X10CrWMoVNb9-2 (P/T92) and VM12-SHC:
 $N \leq 0,035 - 0,060$; $N/Al > 4$; $Ni \leq 0,20$ and to control delta ferrite:
 $(Cr + 6Si + 4Mo + 1,5W + 11V + 5Nb + 9Ti + 12Al) - (40C + 30N + 4Ni + 2Mn + 1Cu) < 12$
- For: X20CrMoV11-1:
 $Ni \leq 0,40$ and to control delta ferrite:
 $(Cr + 6Si + 4Mo + 1,5W + 11V + 5Nb + 9Ti + 12Al) - (40C + 30N + 4Ni + 2Mn + 1Cu) < 12$
- For: 7CrWVNb9-6 (P/T23):
 $Ti \leq 0,005 - 0,060$; $N \leq 0,015$; $Ti/N > 3,5$; $Ni < 0,40$; $B \leq 0,001 - 0,006$.
- For: 7CrMoVTiB10-10 (P/T24):
 $Ni < 0,20$.

The chemical analysis results and techniques used must be reported for all these elements on the test certificates (part of 3.2 certificates).

Note: Number of samples per test unit shall be in accordance with paragraph 10.1.2 accept for material grades listed above where a minimum of two sample tubes per test unit will apply, even if the total number of tubes is less than 20 tubes.

Important: TE12 (b) - Complete Works Information Check List point TE12 (b) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE12 (b) in your tender files.

4 Option 4: Test pieces for impact test (paragraph 10.2.2.4)

Impact testing must be done in the transverse direction except where dimensions do not allow it. The sample orientation must be noted on the test report. The most stringent of the minimum values given in VBG R-109 and Table 4 apply. For

X10CrMoVNb9-1 (P/T91), X10CrWMoVNb9-2 (P/T92) and VM12-SHC the values in the latest VdTÜV Material Data Sheets apply.

Note: Number of samples per test unit as per "Note" in paragraph 4.6.1.3.

Important: TE13 (a) - Complete Works Information Check List point TE13 (a) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE13 (a) in your tender files

5 Option 5: Longitudinal impact testing at -10°C for non-alloy steel grades

This option is required for non-alloy steels as per Table 4 and for 15NiCuMoNb5-6-4 (WB36).

Important: TE13 (b) - Complete Works Information Check List point TE13 (b) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE13(b) in your tender files.

6 Option 6: Mechanical properties (paragraph 8.3)

Tensile testing must be done at room temperature in the transverse direction except where dimensions do not allow it. The sample orientation must be noted on the test report. The tensile properties must comply with the most stringent values given in of VGB R-109 and Table 4. The yield strength (or 0.2% proof strength), ultimate tensile strength, elongation and reduction in area must be reported.

Important: TE14 (a) - Complete Works Information Check List point TE14 (a) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE14 (a) in your tender files.

High temperature tensile testing at 600°C (or 550 °C where EN Standard values do not exist at 600 °C) must be done per test unit of material used in the creep range. The yield strength (or 0.2% proof strength), ultimate tensile strength, elongation and reduction in area must be reported and should comply with the limits specified in Table 5 (where it exists). Testing must be done in the transverse direction and the direction of sampling must be noted as well. All tensile curves / graphs must form part of the data books.

In addition to the above tests, a metallographic sample should be prepared for each test sample. The microstructures must be evaluated according to VGB specifications and photographs (taken at 100x & 500x magnification) and included in the data books (not for 10CrMo9-10 and lower grades, except CSEF steels gr23, gr24, and WB36).

Hardness testing (macro Vickers with 10kgf load) must be carried out on a cross section, close to the outside surface (0,5 - 1mm), in the centre and close to the inside surface (0,5 - 1mm) of each sample. Care must be taken to polish away the cold work effects from cutting of the samples. For a hardness correlation of (UTS in MPa = HV / 0.31), the UTS values derived from hardness values must be within the most strict ranges specified in Table 4 (HV = Vickers Hardness Number) and VGB-R 109

For X10CrMoVNb9-1 (P91) manufactured tubes must be in the hardness range of 215HV – 260HV. The hardness range after bending and forming must be 210HV – 260HV and after final site welding processes must be 205HV – 260HV. Hardness ranges listed in VGB-R 109 are further applicable to all materials.

Note: Number of samples per test unit as per “Note” in paragraph 4.6.1.3. Portable hardness testing (Ultrasonic – Microdur) should be performed on all circumferential weldments after manufacture and construction to confirm hardness of each spool and weld. Technique and surface preparation must be agreed with Eskom before work commences and reported with the detailed results.

Important: TE14 (b) - Complete Works Information Check List point TE14 (b) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE14 (b) in your tender files.

7 Option 7: Leak-tightness test method (paragraph 8.4.2.1)

The leak-tightness test shall be Electromagnetic test (paragraph 11.8.2) and performed on each tube.

Important: TE15 - Complete Works Information Check List point TE15 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE15 in your tender files.

8 Option 8: Non-destructive testing (paragraph 8.4.2.2)

All tubes must be subjected to non-destructive testing for the detection of longitudinal imperfections in accordance with paragraph 11.11.1 and transverse imperfections in accordance with paragraph 11.11.2. All recordable indications and dressing there-of must be reported on the test certificate documents.

Important: TE16 (a) - Complete Works Information Check List point TE16 (a) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE16 in your tender files.

9 Option 9: Non-destructive testing (paragraph 8.4.2.2)

All tubes must be subjected to non-destructive testing for the detection of laminar imperfections in accordance with paragraph 11.11.3. All recordable UT indications must be reported.

Important: TE16 (b) - Complete Works Information Check List point TE16 (b) (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE16 in your tender files.

10 Option 11: Diameter and wall thickness (paragraph 8.7.1)

The tubes shall be delivered to the diameters and wall thickness as per the schedule supplied with the tender documents.

Important: TE17 - Complete Works Information Check List point TE17 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE17 in your tender files.

11 Option 12: Lengths (paragraph 8.7.3)

The tubes shall be delivered to random lengths ranging between 6m to 11.8m. Welding of tubes to achieve specified lengths is not acceptable. Deviations in minimum lengths due to manufacturing processes must be reported. The total length per piping size as detailed in the schedule shall not be exceeded. Total tolerance on the number of spools per diameter shall be + 0 spool; - 1 spool.

12 Option 13: Inspection documents (paragraph 9.2)

Inspection certificate 3.2 in accordance with EN 10204, to be issued by an Eskom approved Inspection Authority.

The inspection documents shall also contain copies of the heat treatment charts and reports for optional inspections requested by the purchaser.

Important: TE10 - Complete Works Information Check List point TE10 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance to certification requirements, include certificates and documents of proof marked as TE10 in your tender files.

13 Option 14: Test pressure for hydrostatic leak-tightness test

To be reported by the manufacturer for Eskom approval/agreement.

14 Option 15: Dimensional inspection (paragraph 11.9)

In addition to the wall thickness measurements on both ends, wall thickness measurements to be taken on 4 positions in the centre of each tube, evenly spaced on the circumference. Ultrasonic compression probe technique must be used. Diameter and ovality testing must be done in areas where wall thickness was measured.

Important: TE17 - Complete Works Information Check List point TE17 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE17 in your tender files.

15 Option 16: Non-destructive testing (paragraph 8.4.2.2)

Both full peripheral magnetic particle testing (MT – to EN 10246-12:2000, Class M1) for surface breaking imperfections and full peripheral ultrasonic testing (UT – to EN 10246-7:2000, Level U2 sub category B; EN 10246-6:2000, Level U2 sub category B; EN 10246-14:2000, Level U1) for volumetric imperfections are required on all tubes

16 Option 17: Additional marking (paragraph 12.2)

Standard and clear legible marking (hard stamp and stencil painting) must be applied on the outer surfaces along the lengths of the pipes at both ends of each tube. Requirements of VGB-R 109 must be complied with.

Important: TE18 - Complete Works Information Check List point TE18 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, include certificates and documents of proof marked as TE18 in your tender files.

17 Option 18: Protection (paragraph 13)

All pipes and tubes must be dry, free of corrosion, and a temporary protective coating must be applied on each tube to protect it for long term storage in outside atmospheric conditions (open storage). Tube ends must be covered with tight fitting end caps and desiccant bags or suitable inhibitor must be placed in the inside of each tube to protect it for long term storage in atmosphere (outside storage). The manufacturer must supply details of the coating and desiccant /inhibitor that will be applied. Similar protection is required after bending and other forming operations.

Important: TE19 - Complete Works Information Check List point TE19 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, documents with details of coatings and inhibitors/desiccant to be supplied and marked as TE19 in your tender files.

18 Surface finish

Inside + outside: The surface of all tubes and pipes must be clear of mill scale and the surface finish must be adequate to allow non-destructive testing as per paragraph 6.1.13. The manufacturer must supply detail of surface finishes with the tender. As a minimum a surface roughness of $R_a < 1,6$ ($RMS < 64$) or better on both inner and outer surfaces is required.

Note: Welding is not allowed during pipe manufacture or forming processes.

Important: TE20 - Complete Works Information Check List point TE20 (APPENDIX 2) for each material grade and manufacturing plant by stating/committing to full compliance, documents with details of surface finish to be supplied (if outside Eskom requirement) and marked as TE20 in your files.

3.1.2. Additional Information Requirements

Eskom or its agent shall supply a material schedule, listing the intended design conditions, required material grades, critical dimensions and quantities required. If special component manufacturing is required, a user requirement specification must be supplied.

The supplier must commit delivery timelines to the material schedule during the tendering process and for time critical projects penalties should be included if timelines are not adhered to.

All tenders must include required documentation for evaluation of gatekeepers and to assess adherence to requirements as part of the technical evaluation. Severe penalties will be incurred where adequate proof/information stipulated in the Eskom Technical Specification is not supplied. Tenders will go through a technical evaluation, commercial evaluation and local content and BEE evaluation, each conducted independently by committees and according to standardised criteria for the specific order.

Important: TE21 – Indicate the Works Information Check List is completed in full.

Once the contract is awarded, the successful supplier must supply quality control plans which will be evaluated and approved by the technical committee of Eskom (normally the Power Station and Group Technology Engineer). Plant assessments can be arranged as and when required

Concession requests for deviations must be presented via the contract manager to the Engineer, who should make the decision after consulting specialists as and when required.

Upon completion, technical data books must be supplied containing as a minimum

- Order requirements and specifications (including the declaration form and supporting documents supplied with the tender) as well as heat treatment and furnace packing plans
- Signed quality control plans.
- Steel making processes and foundry material certificate
- 3.2 Certificate including detailed results for all destructive and non-destructive testing, tensile curves, etc.
- Heat treatment charts (austenizing and tempering) and or detail explanation of the heat treatment processes with ramp rates, quench media, holding times and temperatures
- Agreed surface finish and protection applied.
- All concessions correspondence.
- The data books shall be supplied as follows (unless agreed differently):
- On or before material delivery to Eskom
- Originals to the Eskom Project Manager with hard copy to Eskom Project Engineer and AIA
- Electronic copies to each of the Eskom Project Manager, Engineer and AIA who will keep it safe. One copy must go onto HyperWave (BTFR or Pipework site).

Important: TE22 – Works Information Check List must be completed for a quality Control Plan (or ITP) and supporting documents added and marked as TE22 in your tender files.

APPENDIX 2: Tube Order Works Information Check Sheet

One form is required per manufacturing plant and per material group listed in the *Materials Grades Table* below

TE2 / QGK 1 Manufacturer details:

Company Name
Street Address
Postal Address
Contact Name
Tel No

MATERIAL GRADE TENDERED FOR:

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(See Material Grades Table Below)

Reference	Description	Compliance Commitment (Yes/No)	Documentation of Proof Included in Tender	COMMENTS
TE1	Manufacturing according to enclosed Eskom Works Information (Yes/No)			
TE3 / QGK2	Certificate of Quality Assurance System for Material Manufacture to PED 97/23/EC:			
TE3 / QGK2 (a)	<i>Manufacturing facility certified - State compliance and supply valid copy as proof in tender</i>			
TE3 / QGK2 (b)	<i>Material grades certified - State compliance and supply valid copy as proof in tender (list all materials)</i>			
TE3 / QGK2 (c)	<i>Certified by: (Note certification body under "comments" column, supply valid copy as proof)</i>			
TE4 / QGK3	Creep Testing and Usage			
TE4 / QGK3 (a)	<i>State compliance to creep testing requirements and supply Creep Test Certificates as proof</i>			
TE4 / QGK3 (b)	<i>State compliance to usage requirements and supply proof of usage for 10 years (VM 12 - 5 years)</i>			
TE5 / QGK4	Previous material supply reference list with contact detail:			
TE5 / QGK4 (a)	<i>State compliance to requirements, tonnage manufactured & delivered (in comments column) and attach documents of proof</i>			
TE5 / QGK4 (b)	<i>State compliance to requirements, date of delivery and years in operation (in comments column), attach detail/proof</i>			
TE5 / QGK4 (c)	<i>Users' Names (attach detail/proof)</i>			
TE5 / QGK4 (d)	<i>Users Contact details (attach detail/proof)</i>			
TE6 / QGK5	Furnace Capabilities and Calibration			
TE6 / QGK5 (a)	<i>State compliance to requirements and supply Dummy Heat Treatment charts / procedure limits</i>			
TE6 / QGK5 (b)	<i>State compliance to requirements and supply Furnace Capability Certificates</i>			
TE6 / QGK5 (c)	<i>State compliance to requirements and supply Furnace loading plans</i>			
TE6 / QGK5 (d)	<i>State compliance to requirements and supply Thermocouple locations to be used</i>			
TE 7	Declaration of Conformance (included as a letter with technical information)			
TE 8	Original Material Supply			
TE 8 (a)	<i>State compliance and list of foundries supplying billet material (in comments column)</i>			
TE 8 (b)	<i>State how compliance to clean steel making process will be guaranteed. Supply documentation indicating steel making processes to be followed up to billet phase</i>			
TE 9	Delivery Condition			
TE 9 (a)	<i>State compliance to delivery condition minimum requirement of CFD (Yes / No)</i>			
TE 9 (b)	<i>State compliance to deliver DMV 347HFG shot peened on internal bore (Yes / No) and add detail documentation of how it will be done.</i>			
TE 10	Compliance to EN 10204 Inspection Certificate and testing (as per Eskom Works Information)			
TE 11	Compliance to restriction on Cu and Sn			
TE 12	Chemical Composition			
TE 12 (a)	<i>State Compliance to restrictions on trace elements</i>			
TE 12 (b)	<i>Compliance to requirements of Product Analysis as per Works Information</i>			
TE 13	Impact Testing			
TE 13 (a)	<i>State compliance to requirements and indicate orientation and where it will be applied</i>			
TE 13 (b)	<i>State compliance to Longitudinal Impact Testing at -10°C for non alloy steels</i>			
TE 14	Mechanical Testing			
TE 14 (a)	<i>State full compliance to Tensile Testing requirements (list deviations if any)</i>			
TE 14 (b)	<i>State full compliance to Hardness Testing requirements (list deviations if any)</i>			
TE 15	Electromagnetic Leak Tightness Testing (state compliance to requirement)			
TE 16	Non Destructive Testing for Imperfections (state compliance to requirement)			
TE 16 (a)	<i>State full compliance to non-destructive testing for the detection of transverse imperfections requirements (list deviations if any)</i>			
TE 16 (b)	<i>State full compliance to non-destructive testing for the detection of the laminar imperfections requirements (list deviations if any)</i>			
TE 17	Compliance to Outside Diameter and Minimum Thickness (and rifling) as per Schedule			
TE 18	Marking of Tubes (state compliance to requirement)			
TE 19	Supply details for the protection to be applied to tubes in supporting documentation			
TE 20	State compliance and supply details of the surface finish of the tubes			
TE 21	Works information Checksheet completed			
TE 22	Inspection and Test Plan - example/sample included			

MATERIAL GRADES TABLE

1	C Steels & C-Mn Steels
2	0,3% Mo and 0,5% Mo Steels
3	1%Cr,Mo & 2,25%Cr,Mo Steels
4	7CrWVnMoNb9-6 (T23)
5	X20CrMoV11-1
6	X10CrMoVnNb9-1 (T91)
7	VM 12 SHC (V&M Supply Only)
8	TP-347H (SA-213 Grade TP 347H) X5CrNiMo17-12-2 (316 SS)
9	X8CrNi19-11 (DMV 347HFG)
10	Others (materials not covered above)

