Eskom	Guideline	Asset Management

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1. INTRODUCTION

ESKOM Power Stations operate numerous plant and components with significant safety, availability and cost impact in the event of failures. Premature failures often result from the use of sub-standard materials. Many recent examples exist in Eskom and internationally where insufficient product specification and quality control contributed to sub-standard material being used, resulting in costly premature failures.

From experience and fundamental science it is well understood that microstructure and resultant material properties are determined by the chemical composition, manufacturing/forming processes and heat treatment. Meticulous control of these variables allows repeatable production of materials with specific properties. Designers use these unique properties to design specific plant and components for specific functions and applications. When these three variables (i.e. chemistry, forming processes and heat treatment) are not controlled within narrow tolerances during manufacturing and construction, the material properties can deviate significantly from the designer's intent. In most applications for power plant components, international codes were developed to describe minimum criteria for control of critical variables.

Procurement of power plant components requires:

- Enforcement of clear product specifications with international codes as a basis and certification of plant.
- Cost effective control of suppliers throughout the manufacturing value chain to provide quality products with expected performance.

Most specialised power plants and components are sourced and imported through *intermediaries (agents or suppliers)* by Eskom. Such a procurement system depends on strong specifications that will enforce and control quality at the point of manufacture.

This guideline provides clear guidance to Eskom Engineers on how to prepare material specifications and use suitable material certification as part of the product specification in an effort to improve quality of products procured for critical Eskom plant and components.

2. SUPPORTING CLAUSES

2.1 SCOPE

This document is used as a guide for *Eskom Engineers* when preparing *material specifications* included in the *procurement* of Eskom power plants and components. The *materials specification* must:

- consider Eskom's *Asset Criticality Classification* and the *material complexity*
- specify requirements for control of chemical composition, forming processes, welding and heat treatment, to *national and international codes*, specific experience which is stricter than code, and the principles contained in codification when working with proprietary products, *at the point of manufacture*
- specify minimum material testing i.e. destructive and non-destructive, for critical material properties to be achieved in the application, with acceptance criteria according to *national and international codes*, specific experience which is stricter than code), and the principles contained in codification when working with proprietary products *at the point of manufacture*
- enforce certified *quality assurance* of *manufacturing plant and processes,* as well as *quality control* of the *manufacturing and distribution of the product*, according to *national and international standards* or the principles contained there-in, from manufacturing to delivery
- standardise and enforce *material certification* to national and international codes, and the principles contained there-in to ensure *traceability* and *compliance* to the *Eskom material specifications,*

throughout the procurement value chain and with full emphasis on the manufacturing plant rather than the intermediaries

- strengthen the procurement process to disqualify intermediaries and manufacturers on technical grounds when the nominated manufacturing plants cannot comply to the requirements of Eskom's material specifications
- considers technical accountabilities and sign-off for control and acceptance of technical processes during procurement; these are and not limited to - correct product specification, technical evaluations, inspection and test plans, concessions, receiving of goods as per product specification

All product and materials specifications is mandated by the plant's *design base*, including *modifications* within the boundaries of Eskom's official *Engineering Change Management* system to ensure alignment with the designer's intent and limits.

Product, materials specifications and procurement processes must be influenced by all the relevant Technical Governance structures in Eskom i.e. Plant Area as well as Materials, NDT and Welding Study Committees, and Eskom Technical Specialists.

2.1.1 Purpose

The purpose of this document is to improve the quality and cost of procuring plant systems and components (including refurbishments done off-site). This is done by standardisation and enforcement of materials specification and certification in product specifications according to design base and within the boundaries and principles of national and international standards and industry experience.

2.1.2 Applicability

This document shall apply throughout Generation.

Nuclear applications are not included in adequate detail as specific nuclear safety and quality regulations will apply which is stricter than the limits set in this guideline.

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] 240-72273656, Power Generation Asset Criticality Classification Standard

[3] EN 10204:2004, Metallic Products – Types of Inspection Documents

[4] EN Standards for Power Generation Plant and Materials

[5] ASME Standards for Power Generation Plant and Materials

[6] ASTM Standards for Power Generation Plant and Materials

[7] 240-86546783, Procurement Standard for Material Certification Requirements Applicable to Metallic Products Used on Low and Medium pressure application

[8] ISO 3834: Quality requirements for welding

2.2.2 Informative

N/A

2.3 DEFINITIONS

Definition	Description
Component [2]	"clearly defined item within the Eskom Power Generation infrastructure i.e. Power Plant"
Critical Plant [2]	"equipment which upon failure might result in fatalities, major costs, multiple power generating unit trips or power station shutdown"
Power Plant [2]	machinery, property and other items and related systems that have a distinct and quantifiable function in the generation of electricity
Intermediary [3] (also agent or supplier)	"organization that is supplied by the manufacturers and which then in turn supplies them without further processing or after processing without changing the properties specified in the purchase order and referenced product specification"
Manufacturer [3]	"organization that manufactures the respective products according to the requirements of the order and to the properties specified in the referenced product specification"
Product Specification [3]	"complete detailed technical requirements relevant for the order, stated in written form e.g. referenced regulations, standards and other specifications"
Non-specific inspection [3]	"inspection carried out by the manufacturer in accordance with his own procedures to assess whether or not products defined by the same product specification and made by the same manufacturing process, are in compliance with the requirements of the order. The products inspected are not necessarily the products actually supplied"
Quality assurance	Process that concerns an organisation to place a quality product on the market through implementation of systematic and repetitive actions during manufacturing and handling. The process should be verifiable and auditable.
Quality control	Process that concerns a product to confirm quality by defined testing for adherence to defined criteria. The process should be verifiable and auditable.
Specific inspection [3]	"inspection carried out, before delivery, according to the product specification, on the products to be supplied or on test units of which the products supplied are part, in order to verify that these products are in compliance with the requirements of the order"
Declaration of Compliance with the Order "Type 2.1" [3]	"Document in which the manufacturer declares that the products supplied are in compliance with the requirements of the order, without inclusion of test results." This declaration is made based on *non-specific inspection*
Test Report "Type 2.2" [3]	"Document in which the manufacturer declares that the products supplied are in compliance with the requirements of the order and in which he supplies test results based on non-specific inspection."
Inspection Certificate 3.1 "Type 3.1" [3]	"Document issued by the manufacturer in which he declares that the products supplied are in compliance with the requirements of the order and in which he supplies test results. The test unit and the tests to be carried out are defined by the product specification, the official regulation and corresponding rules and/or the order. The document is validated by the manufacturer's authorised inspection representative, independent of the manufacturing department. It shall be permissible for the manufacturer to transfer on to the EN10204 inspection certificate 3.1 relevant test results obtained by specific inspection on primary or incoming products he uses, provided that the manufacturer operates traceability procedures and can provide the corresponding inspection documents required."
Inspection Certificate 3.2 "Type	"Document prepared by both manufacturer's authorized inspection

Definition	Description
3.2" [3]	representative, independent of the manufacturing department and either the purchaser's authorized inspection representative or the inspector designated by the official regulations and in which they declare that the products supplied are in compliance with the requirements of the order and in which test results are supplied. It shall be permissible for the manufacturer to transfer on to the EN10204 inspection certificate 3.2 relevant test results obtained by specific inspection on primary or incoming products he uses, provided that the manufacturer operates traceability procedures and can provide the corresponding inspection documents required."
Level 1 plant [2]	"This level covers all plant that can severely jeopardise personnel safety, surrounding plant and equipment and have major impact on production costs that should the component fail, will impact structural integrity and design parameters". Failure of components in this level could result in serious personnel injury or fatalities, catastrophic plant or equipment failure, multiple unit trip or serious contravention of legislative requirements.
Level 2 plant [2]	"This level covers all plant components and spares in which components' failure, with a limited impact on production costs, would directly result in: partial load loss or a decrease in plant availability or a decrease in plant reliability or create unsafe conditions or result in personnel injuries or an impact on legislative requirements"

2.3.1 Disclosure Classification

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

2.4 ABBREVIATIONS

Abbreviation	Description
AIA	Approved Inspection Authority
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
EN	Euronorm – European Standards
HP	High Pressure
ISO	International Organisation for Standardization
NDT	Non-Destructive Testing
OEM	Original Equipment Manufacturer
PED	Pressure Equipment Directive
PER	Pressure Equipment Regulation
QA	Quality Assurance
QC	Quality Control
RT&D	Eskom Research, Testing & Development Department
SANS	South African National Standards

2.5 ROLES AND RESPONSIBILITIES

Power Station *Engineering Managers* are responsible to supply resources (i.e. *system engineers*) to:

- compile detailed procurement specifications, which include *material specifications* with *certification requirements*
- engage with procurement and control technical product quality according to the procurement specifications during the procurement process.

Plant *System Engineers* are responsible to:

- compile or facilitate workgroups to assist with compilation of procurement specifications and the enforcement thereof. These include detailed material specifications with certification requirements according to this Guideline for procurement of plant and plant components under their control
- involve or set-up and lead teams with technical specialists from relevant plant areas as well as Materials, NDT, Welding and RT&D
- assist with development of correct specifications and implementation of good technical controls (i.e. technical evaluation of suppliers, inspection and test plan development, and sign-off) and decision making (to handle deviation/concession requests, accept material and certification) during the procurement and offsite refurbishment processes. This is a critical process for non-off the shelf items but is also applicable to ensuring the correct level of certification is obtained for off the shelf items which are used in low and medium pressure areas"
- always involve the Materials, NDT and Welding specialists to review and approve materials specifications for specialised items
- engage the commercial process (procurement/buying) to ensure technical requirements are met for all suppliers.
- control all records in official Eskom systems and keep them for the life of the plant. This will require loading these onto the relevant electronic systems (e.g. HyperWave and Sharepoint)

Materials, NDT and Welding Specialists (Technical Team):

- set up work teams to assist and guide system engineers with compilation of materials specifications and certification requirements
- enforce technical requirements during the procurement process on all HP applications or when alloy materials are required except if the material is an exact replacement and as per drawing/original design, then the engineer must decide on either 3.1 or 3.2 certification as defined in [7]
- approve all material specifications and Standards

Engineers from Generation and RT&D or technical governance workgroups who develop Standards for procurement of Power Plant systems and components are responsible for considering and including all the requirements in this Guideline into the Standards.

Eskom buyers and all people sourcing and procuring Power Plant components must ensure that proper procurement specifications, including material specification and certification requirements, are used to control technical quality of products throughout the manufacturing and refurbishment value chain with sound traceability through the procurement value chain. No order should be placed without confirming with the system engineer or technical governance workgroup lead that the procurement specification includes materials specification and certification requirements as per this guideline. They should also ensure the materials certificates were reviewed and accepted by the Engineers before accepting the material and activation of payment

2.6 PROCESS FOR MONITORING

N/A

2.7 RELATED/SUPPORTING DOCUMENTS

N/A

3. PROCUREMENT SPECIFICATIONS

Globalisation introduced many opportunities and risks in the manufacturing industry. Sound technical specifications in the procurement process are a fundamental document to manage the risks and contain cost of manufactured products in a fair and transparent way.

Eskom's *Power Generation Asset Criticality Classification Standard* [2] requires control of procurement specifications according to the criticality level of plant, with the aim to prevent premature and unexpected failures. *Procurement (or technical) specifications* are used to stipulate and control critical technical, quality and legal requirements during the manufacturing and distribution processes. It must be written to ensure predictable safe and reliable operation of plant within the design intent and limits, if components are manufactured to the specification.

Material properties are set during manufacturing and refurbishment and is a cause of many premature failures or replacement in Eskom and globally. Material specification and certification forms a critical part of *procurement specifications* and is often absent or lacking in the current Eskom procurement system. This guideline will assist Eskom engineers and technical teams to include detailed material specifications and certification requirements that will limit technical and quality risks in a cost effective way.

3.1 MATERIAL SPECIFICATIONS

Designers consider design/operating conditions, degradation/failure mechanisms, and safety factors described by codes or testing to choose the cheapest materials with the required properties for an application. Scatter in material properties depends strongly on three main variables:

- chemical composition
- manufacturing (including welding during refurbishment) and forming processes (which controls dimensions and can also introduce defects)
- heat treatment condition

Materials specifications must consider the asset criticality level as per Standard [2] and define practical limits for these three main variables to obtain predictable scatter in material properties within defined boundaries. For all level 1 and 2 plant *Materials specifications should define*:

- As a minimum, *modern smelting, de-oxidation and pouring/casting processes* that will ensure "clean" material (normally not specified in codes)
- *Material grade/type* and *chemical composition limits* using codes, and its principles for proprietary parts, as a minimum - for some high risk applications, stricter control of poisonous, embrittling, alloying and trace elements, based on industry learning, and specialists advice might be required for specific applications, e.g. for P91 and P92 high pressure pipework.
- *Manufacturing* and *forming processes* that will provide description of the microstructure and defects in the highest stress direction for critical applications (extrusion and forging process with reduction ratio of >4:1 is preferred to casting and welding processes). In many cases the codes are for specific manufacturing and forming processes and by specifying the code of manufacture pins this requirement.
- Manufacturing plants' *heat treatment plant capabilities and limits* (not listed as part of the codes and not adequately addressed in standard QA processes) for high risk applications and complex materials (e.g. High alloy steels). This can be different for each *manufacturing plant* of a manufacturer/company and the specification must thus control this requirement per manufacturing plant.
- *Heat treatment limits* for the material/product (ramp rates, holding temperature and time ranges and sequences – only the temperature limits are listed in some codes). Use of complex materials (e.g.

high alloy steels) on critical components require clear definition of heat treatment cycles and limits, while it can be omitted for simple materials.

- *Dimensional* (either aligned with codes/schedules or to specific design drawings) and *surface condition/protection/conditioning limits* (normally codes leave it to the supplier to choose, if not specified specifically. For critical applications it might require special consideration for detailed specification)
- Practical *tests of material properties*, relevant to the application, with the boundaries/limits of testing and properties aligned with codes or design specifications (to be made available to Eskom if not in codes) as minimum and with consideration of special limits, stricter than code, based on industry experience for complex materials in high risk applications (e.g. P91, P92 HP Pipework). Specialist advice should be obtained for test requirements for complex materials in high risk applications. These tests refer mostly to mechanical testing e.g. tensile testing, charpy impact testing, bend tests, etc. Electrical and other applications might require specific testing to confirm specific material type or physical properties for an application.
- Practical tests (normally *non-destructive testing*) for *dimensions and defects* potentially introduced by manufacturing and forming processes, with *acceptance criteria* that will ensure safe operation within design limits. Minimum requirements must conform to code or designer specification with stricter special requirements only based on expert opinion for special high risk applications.

Note: expert opinion or specialist advice is as a minimum the view of workgroups consisting of the technical plant area and material, NDT and welding specialists (Generation, RT&D). OEM and industry input is also considered by the workgroups.

Note: The same principles apply for materials specification of level 3 [2] plant and components on medium pressure applications that are higher than level 3 although minimum specification to international material grade and dimension schedule is acceptable – unless expert opinion or specialist advice requires more specific requirements.

Minimum requirements of *National and International standards (code)*, including relevant materials standards, used for consistent and predictable design and manufacture of the asset, must be used as a basis for Eskom's *materials specifications*. Where older codes are replaced by newer versions (e.g. replacement of British, German and other European standards with Euronorm (EN) standards) the newest versions should be used as a basis and should be verified by at least generation engineering specialists, Materials, NDT, etc. Eskom currently makes extensive use of harmonised EN standards for boilers pressure vessels and pipework, but also uses ASME standards. Where other international standards are used, the principle of controlled design safety factors, limits and material standards for control of critical properties must be observed and ensured in the Eskom specifications.

Where *industry experience* informs critical shortcomings in the codes, on level 1 and level 2 plant [2], the relevant adjustments to overcome these shortcomings must be made in Eskom's *materials specifications* (e.g. adjustment of Nickel, Aluminium and Nitrogen contents of T/P91 pressure parts steels operating in the creep range). These adjustments require additions in the *materials specification* that are still within the code limits but more stringent than the code. Specialist advice and expert opinion is required for complex materials in critical applications. Often OEMs and designers have specifications that are stricter than code and these can be adopted provided that the OEM demonstrates which code is used as the basis of the specification.

Where code is not specific on critical manufacturing plant/equipment controls, for level 1 and level 2 plant [2], Eskom's *materials specifications* must define demonstration of these critical controls and limits (e.g. heat treatment furnace calibration, capabilities and temperature variation limits). Additional checks or controls not specifically specified by the code but critical to ensure plant and process will be controlled within specification requirements; these must be covered by the materials specification.

The principles discussed above for *materials specifications* according to code must be applied diligently when *proprietary materials* are used (often by turbine original equipment manufacturers) on level 1 and 2

plant [2]. Eskom's *materials specifications* must enforce supply / evaluation (confidential or otherwise) of the critical processes, tests and limits with regards to the components to be manufactured and plant where it will be manufactured. Particular Material Appraisals (to EN) or code cases as per international standards can be considered by Eskom and accepted if found acceptable by specialist teams and technical governance structures. As a minimum the following information should be considered and mandated:

- Smelting and pouring/casting processes limits to ensure "clean steel" or "clean material" is used as per modern steel making processes
- material grade and chemical composition limits for alloying elements but also for trace elements and embrittling elements
- further manufacturing, forming and conditioning processes with critical limits
- heat treatment plant capabilities and control limits
- heat treatment process with ramp rates, holding temperature (ranges) and time (ranges) for each step of the heat treatment process
- sampling and materials testing (mechanical, creep, physical, electrical, corrosion, technological and other) with acceptance criteria or reject limits for the relevant material properties – testing and limits should be aligned to application critical properties
- materials data sheets with materials properties (mechanical, creep, physical, corrosion, technological, electrical and other) are required for the proprietary materials, or else code materials must be used
- non-destructive testing and acceptance criteria to ensure absence of critical manufacturing flaws
- surface finish, treatment and protection
- critical dimensions, geometries and tests for confirmation

Materials specifications must also define the QA and QC processes that will ensure control of plant, people processes and product within the limits specified. It is a fundamental quality requirement that QA and QC processes be controlled at the manufacturing/forming/testing plant. *Materials specifications* must clearly define the QA and QC requirements addressing the manufacturing plant, process and product for items on critical plant, on off the shelf items the engineer must confirm on delivery that the material certificate stipulates and quantifies the processes as per the relevant material standard for the item (Code requirements).

For all level 1 and 2 plant, QA and QC systems must be demonstrated accordingly depending on the complexity of the materials by 3.1 certification (in accordance with relevant standards) or 3.2 certification through an independent party or an Eskom audit. National and International QA and QC systems are used as a basis to give Eskom assurance that quality products can be delivered, within the requirements of the specifications, by organisations and plants with auditable and certifiable quality systems. The *materials specification* must define the following as a minimum for the manufacturing plant and intermediaries:

- ISO 9001 quality management system and certification for the relevant plant, people and processes (part of QA requirements)
- ISO 3834: Quality requirements for welding, if welding is part of the manufacturing/refurbishment process
- That the manufacturing plant for pressure equipment has a certified quality management system in accordance with EN 764-5, as well as a conformance assessment certificate to the requirements of European Directive 97/23/EC (PED certification), for the plant, materials and processes. Certified ASME assessment of conformity for an ASME authorised manufacturer performed by an ASME authorised agency and mandatory marking of conformity (e.g. U-stamp for pressure vessels) can be accepted as an alternative for ASME materials. Inclusion of ASME stamps and certification of conformity legalise the plant and processes in our safety regulations with similar status to the PED certification. Certification to the requirements of the PER and SANS 347 can also be accepted as an

alternative. For non-pressure part applications on safety, availability and cost critical plant (level 1 and 2) either similar international recognised certification or an Eskom technical audit of the manufacturing plant is required whereby the principles of repeatable quality is demonstrated by the QA and QC processes of the manufacturers. This is part of the QA requirements.

- *Material certification* requirements for traceability and quality records of conformance to the requirements of the specification. These requirements are part of the QC process and are covered in the next paragraph.
- AIA/notifying body/third party requirements and appointments to act as QA and QC agents, for 3.2 inspections
- Minimum Inspection and Test Plan requirements with critical hold points for AIA/notifying body/third party and Eskom engineers, only for items that are manufactured after order placement such as typical specialized items
- That the plant of manufacture is listed and all the relevant certificates are supplied for evaluation at the technical evaluation processes. Absence of relevant certificates should lead to disqualification of the tender, as risk exists that the plant does not have adequate quality systems in place. These should form part of the mandatory requirements of the tender returnables.

Where procurement is done through intermediaries, it is critical that all the gatekeepers set by Eskom are met and that all the relevant certificates and extra information requested by the specification (e.g. heat treatment plant capabilities, and procedures, etc.) for the manufacturing plant be supplied for technical evaluation. Intermediaries can then only supply material manufactured at plants subjected to the technical evaluation.

Where off-the-shelve products are procured, the technical evaluation process can be reversed to ensure, from paperwork and additional testing, that the material specification can be met with reasonable certainty. The amount of additional testing to assess conformance of the product to the Eskom specifications will be dependent on the criticality of the component and available information on its manufacture. Relevant technical area specialists from Generation engineering and RT&D must be involved to assist with the scope of conformance assessment for level 1 and 2 plants. The same process can be used for material for which certificates were lost (typically chemical analysis, mechanical testing – or hardness testing and NDT for defects).

Engineers and teams developing procurement specifications must involve relevant technical area specialists from Generation and RT&D to optimise material specifications for level 1 and level 2 plants. level 3 plant can be ordered to the discretion of the Engineer.

3.2 MATERIAL CERTIFICATION

The purpose of *material certification* is to mandate the quality control (QC) processes at each point of manufacture and describe the minimum inspection and test documentation to be supplied with marking of components as part of traceability. EN10204 is the European Norm standard on which Eskom's material certification requirements are based. The increasing cost of more rigorous certification must always be taken into consideration. Provided that a thorough technical specification is written, within the guidance given in this guideline, a minimum certification approach is acceptable as per the following mandatory minimum certification requirements that should be listed in Eskom's material specifications:

- *Level 3 plant and components*: At least *test report "type 2.2"* to *EN 10204*. An *ASME Certificate of Compliance* by the materials manufacturer in which it is stated that all the requirements of the order were fulfilled, with test results included, can be accepted as alternative.
- *Level 2 plant and components*: At least *inspection certificate 3.1 "type 3.1"* to *EN 10204. For materials that are non-European origin an ASME Manufacturer's Test Report (MTC)* by the materials manufacturer in which it is stated that all the requirements of the order were fulfilled, with specific test results included, can be accepted as alternative.

- *Level 1 plant and components*: At least *inspection certificate 3.1 "type 3.1"* to *EN 10204 for non-high alloy materials. For high alloy materials (see elsewhere in this document) a 3.2 certificate will be mandated.* An *ASME Manufacturer's Test Report (MTC)* by the materials manufacturer in which it is stated that all the requirements of the order were fulfilled, with specific test results included, can be accepted as alternative, with exceptions of exempted components.

It is important to also consider the following when defining *material certification requirements* in the *material specifications*:

- Higher level certification is always better and when material specifications are not comprehensive as per this guideline, this certification should then become the default (e.g. 3.1 certificate for level 2 or 3 plant).
- Engineers and specialist groups must always consider the complexity of materials, plant risk and commercial/industry circumstances at the time to enforce higher level of certification. In some instances industry experience (as listed in some guidelines of EPRI and VGB) indicates that *inspection certificate 3.2 "type 3.2" to EN 10204* is required for cost saving over the plant life cycle. Typical applications where this level of certification should be considered to include but are not limited to:
    - Complex materials (i.e. high alloy bainitic and martensitic steels containing >2%Cr, V, W, Ti, Nb, B, N, Cu as alloying elements) that operate in the creep range, or in the stress corrosion and fatigue environments of level 1 and 2 plant and components. The long term material properties of these complex steels are dependent on rigorous control of narrow chemistry and heat treatment limits and the *creep strength enhanced ferritic steels (CSEF)* are typical examples. Another example is high strength martensitic LP turbine blades (typically >9%Cr).
    - Where large strategic orders are placed on pressure parts or critical turbine and pressure vessel components, the economies of scale might make it worthwhile to consider the highest levels of quality control.
    - Where manufacturers only sporadically produce critical components from specialised complex alloys (typical in specific design turbine applications) additional quality control measures can highlight shortcomings in processes and pro-actively prevent introduction of sub-standard materials
    - Where technical specialist groups have any technical concerns about specific manufacturing plants or material groups due to users' experiences shared in international forums
    - An independent authority must be appointed either by Eskom or the manufacturer (as as required for the specific material and agreed to by Eskom and manufacturer) to assist with 3.2 certification and properly briefed on all the expectations as defined by Eskom specialists. On certain items specified by Eskom, the supplier is allowed to appoint the AIA but the QCP and plan must be presented to Eskom in a kick off meeting. These expectations typically include extra evaluation of heat treatment facilities and processes, stamp transfers, and expected critical hold/witness points and potential verification points to optimise benefit and minimise cost
- Whenever doubt exists on authenticity of material certificates, verification testing can be performed on samples from the products. Critical testing will include chemical analysis, mechanical testing and NDT, of which a detailed scope of work can be identified by Eskom specialists after evaluation of the specific risks.
- All certificates, easily traceable to the markings on components, must be carefully controlled and kept for the life of the plant in the official Eskom records control systems at the Power Stations. SAP, Smartplant, Hyperwave and Sharepoint systems must be developed and used to keep records in an easy retrievable and traceable manner. It is important to retrieve chemical analysis, heat treatment, mechanical tests and NDT results of materials/components for failure analysis and integrity / life assessment processes.

- Engineers and Technical teams compiling specifications must ensure that all the technical requirements of the materials specification and certification can be met at the manufacturing plant and that traceability exists. Full compliance should be a technical gatekeeper, which can disqualify manufacturers. Technical evaluation criteria should be considered with care, and included in the procurement specification with clear guidance on minimum information (and format thereof) of the manufacturing plant to be supplied for technical evaluation. If the minimum information is not supplied it should automatically lead to disqualification of that supplier.
- Engineers and Technical teams compiling specifications must ensure that proper Inspection and Test Plans (ITP) are developed (for non-off the shelf items) which list how each of the critical processes and steps will be controlled (specific spec and procedures) by the manufacturer, with relevant hold and review and witness points to be adhered to. Special care should be given to control all critical parameters, including but not limited to; the chemistry, forming, heat treatment, material properties, NDT defects, critical dimensions and surface conditioning to the required specification.
- Engineering and Technical teams compiling specifications must define the technical evaluation criteria within the requirements of the Eskom procurement process with respect to all deviation and concession requests. When material specifications are compiled as per this guideline a basic principle to be applied is that no concession on chemical analysis, heat treatment, material properties and NDT/dimensional limits should be given.
- Engineering and Technical teams must also sign off acceptance of the material/components and its certificates before payment is made. This requires that copies of material certificates be sent through for scrutiny before delivery of the material. AIA support can be co-opted to assist with acceptance processes without delegating accountability to sign-off acceptance of the material/components and its certificates.
- Procurement/buyers must ensure acceptance of the material by Engineering before payment can materialise and this requirement must be included as standard in procurement specifications. The store-men sign-off should only act as a quantity surveyor check that materials were received and should only be one step of the payment release process.

4. AUTHORISATION

This document has been seen and accepted by:

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5. REVISIONS

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6. DEVELOPMENT TEAM

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

- N/A

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