

 Eskom	<b>Position Paper</b>	<b>Technology</b>
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Compiled by	Functional Responsibility	Authorised by
		
A.M. Xaba Divisional Compliance Officer: Technology	D.D. Bhimma Senior Manager : Production Engineering Integration Coal	W.F. Majola Senior General Manager: Engineering
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## **1. INTRODUCTION**

Currently there is a variety of interpretations of the law and practices around pressure equipment compliance management which creates many challenges with respect to the organisational objective of achieving and maintaining a compliant status for the Fleet. This paper presents the preferred practice with respect to compliance to the Vessels under Pressure (VuP) and Pressure Equipment Regulations (PER) and seeks to create clarity and a common approach by all stakeholders.

The paper gives a high level content of what the Employer considers to be critical success factors as opposed to repeating the content of the VuP, PER and related Standards.

## **2. SUPPORTING CLAUSES**

### **2.1 SCOPE**

#### **2.1.1 Purpose**

The purpose of this document is to clarify the Employer's position and to standardise on best practice with respect to compliance to the VuP and the PER.

#### **2.1.2 Applicability**

This document is applicable to Generation and Group Technology Divisions.

### **2.2 NORMATIVE/INFORMATIVE REFERENCES**

#### **2.2.1 Normative**

- [1] OHS Act: Occupational Health and Safety Act 85 of 1993
- [2] PER: Pressure Equipment Regulations, 2009.
- [3] SANS 10227:2007 - Criteria for Operation of Inspection Authorities Performing Inspections in Terms of Pressure Equipment Regulations

#### **2.2.2 Informative**

- [4] SABS 0227:2000 - The Evaluation of the Technical Competence of Inspection Authorities for the Certification, Re-certification, Modification or Repair of Vessels Under Pressure

### **2.3 DEFINITIONS**

- **Approved Certification Body** - a body for management system certification in accordance with SANS 17021 and approved by the regulatory authority and accredited by a government-endorsed national accreditation body.
- **Approved Inspection Authority** - a South African organization that is approved by the regulatory authority in terms of SANS 10227.
- **Certificate of Conformity or Certificate of Manufacture** - a written declaration of conformance to the relevant health and safety standard(s) and to the relevant national legislation.
- **Conformity Assessment** - a process undertaken by the manufacturer and when applicable by the AIA in order to demonstrate that the statutory requirements are satisfied.
- **Manufacturing Data Book** - an organised collection of manufacturing and inspection documentation for new pressure equipment and related components or sub-assemblies.
- **In-Service Inspection and Repair Data Book** - an organised collection of repair, fabrication and inspection documentation for in - service equipment and related components or sub-assemblies
- **Statutory Inspection Report** - an organised collection of statutory related documentation for in - service equipment and related components or sub-assemblies.

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- **Health and Safety Standard or Code of Construction** - a standard that is approved in terms of the relevant national legislation by the relevant regulatory authority, and that contains requirements for the design, manufacture, repair, modification, inspection and testing of pressure equipment.
- **Inspection** - an examination or measurement to verify whether an item or activity complies with specified requirements.
- **Manufacturer** - any person who has overall control and is responsible for the construction of the pressure equipment.
- **Modification** - any change to the original design conditions of pressure equipment e.g. design pressure and temperature, including re-rating, the addition or removal or change of elements that could affect the integrity of the pressure equipment and “modify” has a corresponding meaning.
- **Pressure Equipment** - a steam generator, vessel, piping, pressure accessory and safety accessory and includes, but not limited to accumulator, transportable gas container, fire extinguisher and hyperbaric chambers.
- **Surveillance** – an act of monitoring or observing to verify whether an item or activity complies with specified requirements.
- **Verification** - an act of reviewing, inspecting, testing, checking, auditing or otherwise determining and documenting whether items, processes, services or documents comply with specified 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
CoE	Centre of Excellence
GTD	Group Technology Division
GO	General Overhaul or Major Outage
IRM	Integrated Risk Management
ITP	Inspection and Test Plan
KKS	Kraftwerk-Kennzeichen System
MPI	Magnetic Particle Inspection
NCR	Non-conformance Report
NDE	Non-Destructive Examination
OEM	Original Equipment Manufacturer
PEIC	Production Engineering Integration Coal
OHS Act	Occupational Health and Safety Act 85 of 1993
QC/QA/QE	Quality Control/Quality Assurance/Quality Examination
RBI	Risk Based Inspection
SANAS	South African National Accreditation System
SME	Subject Matter Expert
WPS	Weld Procedure Specification

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## **2.5 ROLES AND RESPONSIBILITIES**

GTD is responsible to give direction and assurance to the Employer with respect to PER compliance. Generation Division, as the User of the pressure equipment, is responsible for implementing processes for the VuP and PER compliance, seeking guidance where guidance is required and reporting on the status of pressure equipment compliance on a regular basis.

## **2.6 PROCESS FOR MONITORING**

N/A

## **2.7 RELATED/SUPPORTING DOCUMENTS**

N/A

## **3. STANDARDISED APPROACH**

The Employer's position is that, for each plant and equipment, statutory compliance should be achieved in a standardised and optimised manner. In support of this objective and to create uniformity with respect to the interpretation of legal requirements, the Employer has adopted the position outline herein.

### **3.1 VUP VS PER**

The PER replaced the VuP on the 1 October, 2009.

The PER applies to all pressure equipment except Regulations 3, 4, 5, 9(1), 9(2), 9(3) which do not apply to pressure equipment in use, supplied or on order prior to 1 October, 2009.

The repair and modification of pressure equipment in use, constructed, supplied or on order before 1 October, 2009 may be regulated under the applicable regulations of the time.

Equipment which was not classified as vessels under pressure under the VuP regulation shall not be re-classified as such under the PER even if the design pressure is equal to or greater than 50 kPa provided that the same is not modified in a manner which makes it pressure equipment under the VuP in which case the equipment must comply to the PER.

Valid determinations and statutory records generated under the VuP carry the same force and effect under the PER as under the VuP e.g. a pressure test due date that was determined under the VuP 75 months exemption remains valid under the PER until the equipment or unit has undergone a statutory inspection GO or the exemption has lapsed.

Where the PER regulatory framework is superior the VuP framework, the User or Employer may take advantage of the PER framework on VuP equipment.

### **3.2 SANS 347**

SANS 347 was ushered in by the PER and is applicable to the PER equipment only unless the equipment is planned for modification, re-rating or re-certification in which case Module G shall apply.

PER equipment must be categorised and subjected to the applicable SANS 347 conformity assessment module.

### **3.3 COMPLIANCE TO CODES AND STANDARDS**

Codes and standards are approved in terms of the PER by the Regulatory Authority and contain requirements for the design, manufacture, repair, modification, inspection and testing of pressure equipment.

Codes and standards are incorporated under Section 44 of the OHS Act and enlisted in Annex A of SANS 347 and GNR 735 in Government Gazette no. 32395 in the PER.

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Unlike in the European environment, code compliance is a statutory requirement in the South African legal framework and AIAs must be accredited by SANAS for each code and standard under their scope of regulation as per the Standards Act 29 of 1993.

All parties involved in pressure equipment processes must be competent in distilling the essence of each code or standard requirement and in ensuring that the necessary compliance measures are incorporated into the design, operation and maintenance plans.

The relevant users (CoEs, PEIC, Generation) shall define the design, manufacture, inspection, testing, certification and the index of the Code Data Book of the intended Pressure Equipment and make it available to the Manufacturer/Modifier/Repairer, Importer or Supplier, prior to the order placement or commencement of work.

The proposed requirements shall be discussed with the Manufacturer/Modifier/Repairer, Importer or Supplier prior to the order placement or commencement of work.

The Manufacturer/Modifier/Repairer shall compile a Pressure Equipment Data Book index for each Pressure Equipment to be manufactured/modified/repared and submit it for approval to the relevant users and verification by the AIA before the order placement or commencement of work.

The Manufacturer/Modifier/Repairer shall be responsible to maintain the Manufacturing Data Book in parallel and progressively with the manufacturing, modification, repair and assembly process as managed in the Inspection and Test Plan (ITP) or Quality Control Plan (QCP).

The Manufacturing Data Books shall be reviewed in stages of completion by the Manufacturer/Modifier/Repairer's QC Department, Eskom QC/QE and the AIA e.g. as guidance on 25%, 50%, 75% and on completion of critical activities. Intervention points shall be indicated in QCP's or ITP's to allow progressive review by the relevant stakeholders.

Imported Pressure Equipment shall not be released for Shipment, if the associated Manufacturing Data Books have not been reviewed, approved and released by all affected parties.

### **3.3.1 A Typical New or Modified Steam Generator and Pressure Vessel Manufacturing Data Book Index**

#### **3.3.1.1 Generic Index**

1. A Volume Number in the event of multiple volumes for large and complex pressure equipment.
2. Pressure equipment name and description.
3. Item, KKS, ISO or Trigramme number.
4. Serial numbers, in the event of multi parts of the same design and manufacture.
5. Manufacturer, Modifier, Importer or Supplier's name.
6. Approval section dedicated for the following appointed personnel/parties:
  - i. Manufacturer, Modifier, Importer or Supplier's QC/QA Representative.
  - ii. User's Representative.
  - iii. AIA Inspector.

#### **3.3.1.2 SANS 347 Hazard Category Pressure Equipment Index:**

##### **1. Sound Engineering Practice (SEP)**

- i. Operating Instructions.
- ii. Clear and reproducible image or rubbing of the equipment marking.
- iii. Design Data and a full set of drawings.

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## **2. Category I**

- i. Operating Instructions,
- ii. Certificate of manufacture, modification issued by the Manufacturer, Modifier, Importer or Supplier, when required by the relevant Health and Safety Standard,
- iii. Certificate or declaration of conformity issued by the Importer or Supplier.
- iv. Clear and reproducible image or rubbing of the equipment marking.
- v. Design Data and a full set drawings.

### **3.3.1.3 Category II to IV**

- i. Operating Instructions,
- ii. Certificate of Manufacture/Modification issued by the Manufacturer/Modifier and countersigned by an AIA, when required by the relevant Health and Safety Standard.
- iii. Certificate or declaration of conformity issued by the Importer or Supplier and countersigned by an AIA.
- iv. Certificates issued by an AIA, when required, e.g. Module B certificate.
- v. Clear and reproducible image or rubbing of the equipment marking,
- vi. Technical documentation, examined by an Independent Body, as defined in the applicable conformity assessments in SANS 347.
- vii. A full set of electronic drawings.
- viii. A full set of hardcopy, "as-built", general arrangement and detailed drawings endorsed by an AIA.
- ix. Certified material mill test certificates and diagram(s) clearly linking actual vessel part or item with the certificates.
- x. NDE reports.
- xi. Copies of qualifications of all technicians performing NDE.
- xii. Copies of qualifications of all Welders and/or Welding operators performing welding.
- xiii. Weld maps, clearly linking actual welds with the welding documents such as WPS's, Welder qualifications and Welder stamp numbers.
- xiv. NDE Maps, clearly linking actual welds, vessel part or item with NDE reports.
- xv. Approved Heat treatment procedures, when applicable, including diagram(s) of thermocouple location and charts for each heat treatment conducted.
- xvi. Pressure test certificates, including calibration certificates of pressure gauges.
- xvii. Approved concessions and NCR's.
- xviii. Special Reports e.g. Mechanical test reports, Ferrite check reports, Water analysis reports, approved NCR corrective actions.

No Pressure Equipment shall be released for site commissioning activities if the associated Manufacturing Data Books have not been reviewed, approved and released by all affected parties. Manufacturing Data Books must be made available to the site responsible In - service AIA for their pre-commissioning inspection activities. All statutory related documentation requirements must be complied with, before pre-commissioning activities can commence.

### **3.3.2 A Typical In - Service Statutory Inspection Report Index**

- 1. Certificate of Repair/Continuance/Release Note
- 2. In-service AIA Report by an in-service AIA.
- 3. Equipment functionality inspection report - System Engineer
  - a. Tube plug report (for heat exchanger vessels)
  - b. Tube plug map (for heat exchanger vessels)

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4. Inspection records/reports
  - a. MPI/PT
  - b. UT
  - c. VT (Including pre-repair and post-repair photographic images, dimensional check sheets)
  - d. Tube plate map(for heat exchanger vessels)
  - e. Post plugging/As assembled tube plate photographic image(for heat exchanger vessels)
5. Pressure test report
6. Pressure test gauge calibration certificates
7. Safety valve calibration certificates
8. Recommendations and approvals
9. Design appraisals
10. Minimum thickness calculations associated with shell inserts, stubs etc.
11. Data verification documents (Camera settings to reflect the date)
  - a. Photographic image of the data/name plate.
  - b. Photographic image of redlined test gauge at pressure
  - c. Photographic image of installed safety valve with lead seal prominently shown.
12. Concessions

The AIA Site Inspector shall ensure that the statutory inspection dossier/report has been compiled in accordance with the stipulated index.

### **3.4 PRESSURE TEST PRESSURE WHEN TESTING WITH WATER**

The minimum pressure test pressure shall be 1.25 x Design Pressure for all pressure equipment including VuP equipment. The Maximum Permissible Operation Pressure (MPOP) or Maximum Allowable Working Pressure (MAWP) shall be deemed to be the design pressure unless specified otherwise. Any test pressure below the stipulated value shall be deemed to be non-compliant and invalid.

Both the User and the AIA must ensure that the stipulated test pressure is reached or marginally exceeded during a pressure test and that the pressure gauge used in the test is of the correct test range and has a calibration certificate issued by a SANAS accredited laboratory or traceable to national standards in which the expiry date is clearly indicated.

### **3.5 CERTIFICATE OF CONTINUANCE**

A certificate of continuance issued by an In-service AIA is not a statutory document but is required by the Employer for administrative purposes e.g. for stipulation of the approved inspection and test due dates.

### **3.6 PRESSURE TEST PERIODICITY**

The in-service inspection and pressure test periodicity shall be 72 months maximum for all pressure equipment covered under the PER 72 month's exemption. Such equipment shall include, but not limited to, all unitised pressure equipment and pressure and safety accessories.

The in-service inspection and test periodicity for all equipment not covered under the 72 months exemption shall be 36 months maximum.

Where the in-service inspection and pressure test due date was determined under the 75 months exemption, such due date shall remain in force until the next statutory inspection GO or the due date after which it will revert to the 72 months cycle or a frequency as determined under an RBI Management System.

Inspection and calibration test periodicity of the safety valves shall follow that of the vessel it protects as per the PER guidance note in Regulation 11.

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### **3.7 SYNCHRONISATION OF UNIT EQUIPMENT INSPECTION TEST CYCLE**

In the current unit outage scenario the inspection and test periods dates may be spread over many months resulting in an equal spread in inspection and test due dates which creates a challenge for outage planning.

To effect the synchronisation of all unit pressure equipment inspection and test due dates, all equipment Release Notes or Certificates of Continuance (CoCs) issued during an outage shall reflect the unit return to service or synchronization date as the issue date.

### **3.8 PRESSURE TESTING AFTER REPAIRS**

The pressure testing of pressure equipment in use after repairs, e.g. boiler tube leak repairs, feedwater heater tube leak, shall not be required provided the In – service Inspection Data Book pertaining to the repair provide objective evidence of compliance to the statutory requirements. A leak test will be adequate. The site AIA may prescribe a pressure test after repairs to address specific safety risks or to comply.

Where the repair pertains to new equipment before commissioning, the repair shall be followed by a pressure test before the CoM may be issued provided that such a pressure test may be dispensed with by the AIA in writing if it is deemed unnecessary.

### **3.9 VALVES**

#### **3.9.1 Pipeline valves**

Pipeline valves are not pressure vessels but are defined as pressure accessories in the PER because they are not designed to a pressure vessel code.

The minimum statutory requirement for new a valve shall be a Manufacturing Data Book and a CoM and for a refurbished valve an In-Service Inspection and Repair Data Book and a Certificate of Repair.

#### **3.9.2 Safety Valves**

The minimum statutory requirement for a new valve shall be a Manufacturing Data Book, CoM, pressure and calibration test certificates and for a refurbished valve a Repair/Refurbishment Data Book, pressure and calibration test certificates.

The Employer or User shall ensure that Manufacturing or Repair Data Books are part of the deliverables for every Order.

### **3.10 SURVEILLANCE OF THE SUPPLIER'S MANUFACTURING OR REPAIR PROGRAMME**

The AIA shall develop and maintain procedures for the planning and execution of all inspection and verification activities, including quality and quality control plans prepared by the Client, Supplier or Organisation responsible for the manufacture of, modification to and repair of pressure equipment.

The AIA shall also ensure that all applicable codes, standards and quality requirements have been catered for in the procedures.

If the results of the initial AIA assessment of the Supplier's Quality Management System and product quality are satisfactory, subsequent verification and inspection activities shall be limited to surveillance unless the PER or VuP prescribes additional requirements.

### **3.11 IN SERVICE INSPECTION AND TEST REPORTS**

In-service Inspection Data Books and Statutory Inspection Reports form part of the compliance status audit trail. Both the User and the AIA must ensure that inputs to these are factual, accurate, professionally documented, protected and preserved. Since statutory records may not be tampered with

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or altered in any way, any errors in an inspection and test report may result in a statutory violation by the User or Employer and a revocation of the permission to operate the equipment.

An error which runs through all the inspection and test reports has the potential of necessitating the shutdown of all the affected pressure equipment which could have dire consequences for the Employer.

### **3.12 RISK BASED INSPECTION**

The PER makes a provision for a risk based approach, as opposed to a fixed interval interventions, in the management of pressure equipment. RBI offers the User an opportunity to minimise the risk associated with the operation of pressure equipment and to optimise the utilisation of resource by maximising the inspection and test effort on the high risk equipment and minimising the same on the low risk equipment.

The Employer is currently implementing a CWA 15740 RIMAP Standard based RBI Management System on the pressure equipment with the aim of replacing the fixed-term interval with a risk based interval approach. The RBI Management System will be certified by a Certification Body for the designated equipment or plant provided that the management system is compliant to CWA 15740 RIMAP Standard and other legal obligations.

Once the system and plant has been certified, the User may replace the fixed term intervention of Regulation 11.1(d) with a risk based interval in Sub-Regulation 12.

In this management system, a Risk Assessment Team comprising the GMR2.1&7, AIA, IRM Specialist, SMEs, Operating and Maintenance Staff, System Engineers, amongst others, is set up to analyse plant or pressure equipment risks following the CWA 15740 RIMAP Standard.

The AIA provide assurance with respect to the compliance to the PER and the certified RBI Management System.

#### **3.12.1 MINI-RBI**

The Mini-RBI Management System in the Plant Equipment Risk Assessment Procedure 474 – 305, has been introduced to manage plant risks associated with non-compliance to inspection and test periodicity or other PER requirements where the option for inspection and test does not exist due to system constraints.

The Mini-RBI management system is CWA 15740 RIMAP Standard compliant, has been approved by the Certification Body and has been shared with the Department of Labour as a system to manage non-compliant pressure equipment risks until the full RBI project is fully implemented.

The Site Mini-RBI Risk Assessment Teams are mandated to carry out a plant risk assessment and to prescribe a risk treatment plan for review and approval by the Certification Body before the equipment can be operated any further.

In line with the CWA 15740 Standard, no Manager or Executive may set aside or alter a determination of the Risk Assessment Team without undertaking due diligence.

### **3.13 STATUTORY RECORDS**

The User shall keep records for all pressure equipment, which shall be open for inspection by an inspector, in which the CoC, CoM and the results of manufacturing, inspections, tests, modifications and repairs shall be recorded.

In addition the User shall ensure that a user-friendly document storage and retrieval system is provided for all statutory records including a protection and a disaster recovery system.

The Manufacturer shall keep pressure equipment manufacturing records for a period of not less than 12 years after manufacture and the User shall ensure that such records are kept by the Manufacturer and that the relevant data packs are transferred to the User as part of the contract deliverables.

Statutory records must reference the applicable codes, define the statutory requirements and applicable compliance measures, provide the objective evidence of compliance measures undertaken and the compliance status of the equipment in question.

### **3.14 RE-CERTIFICATION**

Re-certification of a steam generator or pressure vessel is required where the equipment is unidentified due to unavailability of required documentation, data plate (nameplate), unknown or unconfirmed history or where equipment that was imported does not meet the requirements of the Occupational Health and Safety Act or the Minerals Act as applicable at time of manufacture or import. A duplicate data plate may be applied by the user if all information required on the data plate is available and can be positively linked to the vessel such as hard stamping evidence of serial number or equipment number and shall be verified by an AIA.

### **3.15 RE-RATING**

Re-rating is required where the User intends to modify the original design and operating envelop. Equipment that has been re-rated shall be re-certified by an AIA.

### **3.16 ESKOM AIA AUTHORITY**

The Eskom AIA has been granted authority provided for in the PER, a Chief Inspector's special determination and by the Employer.

#### **3.16.1 PER Authority**

The AIA may extend the inspection and test periodicity from three to nine years where pressure equipment is not subject to deterioration processes.

Pressure equipment that is subject to corrosion or erosion shall be excluded from this category of pressure equipment.

#### **3.16.2 Authority Granted by the Chief Inspector**

In Section 5 of the 75 Months Exemption Letter, the Chief Inspector did not grant exemptions but made special provisions for the Eskom AIA to grant deferments where the pressure vessel contents are non-corrosive.

This provision shall typically apply to air-blast breaker air receivers, hydraulic accumulators, refrigerant vessels and any vessel in which the contents are non-corrosive.

#### **3.16.3 Authority Granted by the Employer**

If for reasons of safety, serious quality concerns or lack of compliance with the requirements and the AIA considers that the Work of a Work Contractor or Others should be stopped and the Employer's Agent be unavailable, the AIA may issues a work stoppage instruction to the Work Contractor or Others on behalf of the Employer.

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#### **4. AUTHORISATION**

This document has been seen and accepted by:

<b>Name and Surname</b>	<b>Designation</b>
Shanil Narain Singh	Chief Engineer
Manare Magolego	Chief Advisor
Michael Amir	Senior Consultant
Herman van Niekerk	Senior Consultant
Gerhard van Oudtshoorn	GMR 2.1
Josef Peters	CEO -TUV Rheinland Group SA
Matthew Smith	Business Dev. Manager, Parsons Brinckerhoff
Brad Pierson	Associate Director, Phambili Merz.

#### **5. REVISIONS**

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
August 2014	0	A.M. Xaba	Draft Document
August 2014	0.2	A.M. Xaba	Draft Document for Comments Review
September 2014	1	A.M. Xaba	Final Document for Authorisation and Publication

#### **6. DEVELOPMENT TEAM**

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

- None

#### **7. ACKNOWLEDGEMENTS**

- None

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