

 Eskom	<b>Manual</b>	<b>Asset Management</b>
---	---------------	-------------------------

Title: **Pressure Equipment Regulations Compliance Manual**

Unique Identifier: **240-154283718**

Alternative Reference Number: **N/A**

Area of Applicability: **Generation**

Documentation Type: **Manual**

Revision: **1**

Total Pages: **17**

APPROVED FOR AUTHORISATION



6x ASSET MANAGEMENT

DOCUMENT CENTRE ☎x4962

Next Review Date: **May 2025**

Disclosure Classification: **CONTROLLED DISCLOSURE**

**Compiled by**

**Herman van Niekerk**

**Snr Consultant Mechanical Engineering CoE Asset Management**

Date: **15 May 2020**

**Approved by**

**Mandla Mthembu**

**General Manager Mechanical Engineering CoE Asset Management**

Date: **2020-05-20**

**Authorised by**

**Dr. Titus Mathe**

**General Manager Asset Management**

Date: **20 May 2020**

**Supported by SCOT SC**

**Dheshan Naran**

**SCOT SC Chairperson**

Date: **20 May 2020**

PCM Reference : **RBI and Statutory**

SCOT Study Committee Number/Name : **Materials, Welding and NDT Study Committee**

## CONTENTS

	Page
<b>1. INTRODUCTION .....</b>	<b>3</b>
<b>2. SUPPORTING CLAUSES .....</b>	<b>3</b>
2.1 SCOPE .....	3
2.1.1 Purpose .....	3
2.1.2 Applicability .....	3
2.2 NORMATIVE/INFORMATIVE REFERENCES .....	3
2.2.1 Normative .....	3
2.2.2 Informative .....	3
2.3 DEFINITIONS .....	4
2.3.1 Disclosure Classification .....	7
2.4 ABBREVIATIONS .....	7
2.5 ROLES AND RESPONSIBILITIES .....	8
<b>3. PRESSURE EQUIPMENT REGULATIONS (PER) .....</b>	<b>8</b>
<b>4. SANS 347 .....</b>	<b>9</b>
<b>5. DISCREPANCY BETWEEN PER AND SANS 347: 2019 EDITION 3. ....</b>	<b>9</b>
<b>6. RE-CLASSIFICATION OF SATURATED WATER OR STEAM; SANS347 EDITION 2 VS EDITION 3. ....</b>	<b>9</b>
6.1 BACKGROUND .....	9
6.2 CATEGORIZATION AND CONFORMITY ASSESSMENTS .....	9
6.3 CATEGORIZATION DURING RBI ASSSSMENTS .....	9
<b>7. COMPLIANCE TO HEALTH AND SAFETY STANDARDS .....</b>	<b>10</b>
<b>8. STATUTORY RECORDS .....</b>	<b>10</b>
8.1 GENERAL REQUIREMENTS .....	10
8.2 TYPICAL DATA RECORD FOR NEW (LOCAL MANUFACTURED OR IMPORTED) OR MODIFIED PRESSURE EQUIPMENT. ....	11
8.3 A TYPICAL IN - SERVICE STATUTORY INSPECTION .....	12
<b>9. PRESSURE TESTING .....</b>	<b>13</b>
9.1 PRESSURE TESTING AFTER REPAIRS .....	13
9.2 PRESSURE TESTING DURING MANUFACTURING PROCESS .....	14
9.3 PRESSURE TESTING AFTER INSTALLATION OF NEW EQUIPMENT. ....	14
<b>10. VALVES .....</b>	<b>14</b>
10.1 PROCESS VALVES .....	14
10.2 SAFETY VALVES .....	15
<b>11. RISK BASED INSPECTION .....</b>	<b>15</b>
<b>12. RE-INSTATEMENT OF CONFORMITY .....</b>	<b>16</b>
<b>13. AIA RELEASE NOTE: .....</b>	<b>16</b>
<b>14. AUTHORISATION .....</b>	<b>17</b>
<b>15. REVISIONS .....</b>	<b>17</b>
<b>16. DEVELOPMENT TEAM .....</b>	<b>17</b>
<b>17. ACKNOWLEDGEMENTS .....</b>	<b>17</b>

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

## 1. INTRODUCTION

The Pressure Equipment Regulations (GN R734) of the Occupational Health and Safety Act were promulgated in July 2009 and came into effect in October 2009. The PER Guidance Notes Rev. 0 was introduced in 2012, and further revised again 2015 as Rev. 1 to clarify the intent of the PER. Additional clarifications in the PER Guidance Notes Rev. 1, led to the current publication of the PER Guidance Notes Rev. 2 of November 2017.

SANS 347 is an invaluable reference Standard in the PER. The latest SANS 347: 2019, Edition 3 contains a significant number of changes. The purpose of this Manual is to bring about Eskom's position in so far as the Standard interpretation and guidance to ensure compliance in the application of the PER and SANS 347.

## 2. SUPPORTING CLAUSES

### 2.1 SCOPE

#### 2.1.1 Purpose

The purpose of this document is to cultivate a common understanding and to standardise on best practice with respect to the interpretation and application of the PER and SANS 347.

#### 2.1.2 Applicability

This document is applicable to Eskom Generation with exception of Nuclear. Document 240-146399257 will apply to Koeberg Power Station.

### 2.2 NORMATIVE/INFORMATIVE REFERENCES

#### 2.2.1 Normative

- [1] OHS Act: Occupational Health and Safety Act (Act 85 of 1993) as amended.
- [2] PER: Pressure Equipment Regulations (GN R734), 2009 (including Guidance Notes Rev. 2, 2017).
- [3] SANS 10227, 2012: Criteria for Operation of Inspection Authorities Performing Inspections in Terms of Pressure Equipment Regulations.
- [4] SANS 347: 2019, Edition 3: Categorization and Conformity Assessment Criteria for All Pressure Equipment.
- [5] 240-84045193 Rev. 3: Eskom RBI Manual.
- [6] PED 2014: European Pressure Equipment Directive 97/23/EC.

#### 2.2.2 Informative

- [7] ASME B16.34: Valves - Flanged Threaded and Welding End.
- [8] BS3602: Steel pipes and tubes for pressure purposes: carbon and carbon manganese steel with specified elevated temperature properties.
- [9] EN 10216: European norm for Seamless steel tubes for pressure purposes — Technical delivery conditions.
- [10] EN 10204: Metallic products — Types of inspection documents.
- [11] EN 12516: Industrial valves — Shell design strength.

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

- [12] SANS 17021: Conformity assessment — Requirements for bodies providing audit and certification of management systems.
- [13] SANS 17020: Conformity assessment — Requirements for the operation of various types of bodies performing inspection.
- [14] AMD 240-84046587.2: Amendment to Risk Based Inspection Guideline Document 240-84046587: RBI Strategy for Critical Safety Valves Guideline
- [15] 240-110600232 Rev. 1: Pressure vessel Wall Thickness Measurement and Evaluation Standard.
- [16] 240-56239129 Rev. 1: High Pressure Pipework for Fossil Fired Power Stations Standard
- [17] 240-84513751: Material Specification and Certification Guideline for Power Generation Plant.
- [18] 240-146399257: Nuclear Engineering Standard for implementing the Pressure Equipment Regulations as applicable to Koeberg.
- [19] 240-63160711: Boiler Safety Valves Functional Test Procedure Work Instruction
- [20] Government Notice R1591: Vessels under Pressure Regulations, 1996.

## 2.3 DEFINITIONS

Definitions and references quoted are as reflected in PER Guidance Notes Rev. 2 or / or SANS 347: 2019, Edition 3. It is included into this document to provide the function of cross referencing and clarity.

Definition	Description
<b>Approved Certification Body</b>	Body for management of a system for certification in accordance with SANS 17021 and approved by the relevant regulatory authority and accredited by SANAS for the specific conformity assessment modules within their scope of accreditation or relevant Health and Safety Standards.
<b>Approved Inspection Authority</b>	Organization approved by the relevant regulatory authority and accredited by the SANAS in accordance with SANS 17020 and SANS 10227.
<b>Approved Inspection Authority – In Service {AIA(is)}</b>	AIA responsible for in service inspections duties in accordance to PER sub-regulations 11.1(c): 11.1(d) and PER 12. This function will be performed by a competent person as per requirements in Table 2 of SANS 10227.
<b>Approved Inspection Authority – Manufactory {AIA(m)}</b>	All other functions defined as the AIA duties in PER and / or SANS347: 2019 Edition 3, other than PER sub-regulation 11.1(c): PER 11.1(d) and PER 12, is deemed the responsibility of the AIA(m). This function will be performed by a person as per requirements of Table 1 of SANS 10227.
<b>Calibration of safety valves</b>	Process followed to adjust a safety relief valve, in order for it to lift at a given set pressure. This set pressure (lifting pressure) may never exceed the design pressure of the pressure equipment it protects. This action can be performed with the valve on a test bench (for valves removed from the line / vessel). Butt-welded valves are normally set in situ by means of a Trevi-test. Refer to procedure 240-63160711 "Boiler Safety Valves Functional Test Procedure Work Instruction".
<b>Certificate of Manufacture</b>	A written declaration of conformance by the Manufacturer of conformance to the Relevant Health and Safety Standard (as listed in OHS Act) and Pressure Equipment Regulations as defined in OHS Act for pressure equipment manufactured.
<b>Certificate of Repair / Modification</b>	A written declaration of conformance by the Repairer / Modifier in which the extent of the modification or repair is described and certifies that such work is in accordance with the relevant Health and Safety Standard as listed in OHS Act.
<b>Conformity Assessment</b>	Process undertaken by the Manufacturer and / or the Importer verified by the AIA(m) for category II and higher equipment (as applicable) in order to demonstrate that the statutory requirements are satisfied.
<b>Construction:</b>	An activity that includes all materials, design, fabrication, modification, repair, installation, examination, inspection and certification applicable to the pressure

## CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

Definition	Description
	equipment. Construction implies any work activities during manufacturing and / or repairs / modification of in-service pressure equipment.
<b>Health and Safety Standard (Code of Construction)</b>	Standard that is approved in terms of Occupational Health and Safety Act by the Department of Employment and Labour, which contains requirements for the design, manufacture, repairs, modification, inspection, testing and certification of pressure equipment.
<b>Importer</b>	<p>The Importer is an entity that imports pressure equipment for use and / or re-sale in Republic of South Africa. The Importer must be a juristic person in RSA and the entity shall assume liability of the Manufacturer in terms the PER. The Importer formally declare conformance to the PER in the form of the Importer's Conformity Assessment Review Certificate for all imported pressure equipment Hazard category I to category IV.</p> <p>For steam generators, pressure vessels and assemblies the AIA(m) shall review the conformity assessment package for category II and higher and countersign such document (as applicable). The User will review all conformity assessment documents or category I to IV.</p> <p>The Importer shall ensure that all pressure equipment has been categorised in terms of SANS 347: 2019, Edition 3. Equipment categorised in terms of the PED does not need to be re-categorised under PER where fluid groups are different.</p> <p>Importer shall ensure that a certificate of manufacture is issued and reflect verification by an AIA(m) as defined in PER sub-regulation 4.3. The Importer shall take all reasonable steps as specified in PER Guidance Note 5(i) – with all eleven elements adequately addressed.</p> <p>Importer shall ensure that the foreign inspection and certification bodies meets the requirements of the PER sub-regulation 7.3(b) with respect to ISO 17020, 17021 or higher accreditation and scope of accreditation together with the applicable Health and Safety Standard.</p>
<b>In-Service Inspection and Repair Data Book</b>	An organised collection of repair, modification, fabrication, inspection, testing and certification documentation, AIA reviews (where applicable) for all in-service inspection and repair of equipment and related components or sub-assemblies.
<b>Inspection</b>	An examination or measurement to verify whether an item or activity complies with specified requirements of the regulation authority and relevant Health and Safety Standard.
<b>Manufacturer</b>	Any person who has overall control and is responsible for the construction, (also see repairer / modifier definition), of the pressure equipment in the Republic of South Africa.
<b>Manufacturer's Data Book</b>	An organised collection of Manufacturer's design, AIA(m) verification report (where applicable), declaration of conformity and inspection / test records for the new equipment components and / or sub-assemblies.
<b>Modification</b>	Means any change to the original design conditions of pressure equipment, including re-rating, or the addition or removal of elements that could affect the integrity of the pressure equipment, and component replacement with different material types, replacement with different material grades or the replacement of obsolete materials can be deemed as a modification, depending on the rules and requirements of the applicable Health and Safety Standard or in-service Health and Safety Standards.
<b>Release note</b>	Document issued by the AIA(is) upon completion of statutory inspections of pressure vessels and steam generators, in which it is declared that the equipment is safe to be returned to service, and that all statutory and RBI requirements are fulfilled. This may include specific notes or reservations for future actions to be executed.
<b>Repair</b>	Means the restoration to the original standard by means of application of heat or welding to any pressure equipment and / or the replacement of expanded tubes.

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

Definition	Description
	Replacement materials that is deemed natural progression of materials is deemed a repair. Material replacement will be reviewed by Eskom metallurgist or SME for final decision
<b>Repairer / Modifier</b>	An entity that performs any work during the in-service period of pressure equipment as defined under definition of "construction". The entity is deemed to be the Manufacturer for all in-service activities as defined for "construction". On completion of repair or modification a certificate repair / modification (as applicable) shall be issued by the Repairer / Modifier.
<b>Re-rating</b>	<p>Re-rating is required where the User intends to modify the original design parameters of pressure equipment. This may include an increase or decrease of the design of pressure / temperature, operating media, etc.</p> <p>During fitness for service calculations the recommendation may be that the vessel is only safe to operate at a lower temperature or pressure than the original design. To legally allow the User to operate the vessel further the vessel needs to be re-rated. Fitness for service calculations for category II and higher must be reviewed by Professional Engineer in his field of expertise and be verified by an AIA(m), as applicable.</p>
<b>Statutory In-service inspection</b>	<p>A statutory inspection activity performed by the AIA(is) to determine the integrity of the pressure equipment of pressure vessels, assemblies and steam generators as stipulated in PER sub-regulation 11.1(c) and 11.1(d). On completion of the in-service inspection, an inspection report as well as a release note shall be issued by the AIA(is) to state condition of the pressure equipment and permits the equipment to be returned to service, based on the in-service inspection / test results and satisfactory repairs (as applicable).</p> <p>PER sub-regulation 11.1(d) stipulates the minimum criteria for such inspection and the pressure testing interval for steam generators. The User may request the AIA(is), to inspect assemblies based on the AIA level of expertise.</p> <p>PER 12 provides the User to an alternative in-service inspection and testing interval requirements referred to in PER sub-regulation 11.1(d) through the implementation of the Risk Based Inspection management system whereby the User may extend the in-service inspection / testing intervals and determine the in-service inspection scope content based on risk associated with the pressure equipment. Risk is determined based on probability of failure and consequence of such failure. The RBI process and implementation shall be verified by an ISO 17021 Certification Body accredited by SANAS and approved by Department of Employment &amp; Labour specifically for Risk Based Inspection.</p>
<b>Statutory Inspection Report</b>	An organised collection of statutory related documentation for in-service inspection of pressure equipment, related components or sub-assemblies performed by the AIA(is), inclusive of an internal (where practical) and external visual inspections, hydraulic pressure test certification (where applicable), and all related supplementary NDE records performed on the equipment as per agreed scope.
<b>User</b>	<p>Entity that ensures pressure equipment is operated and maintained within its design and operating parameters. System Engineer (as User representative) ensures that all pressure equipment has a certificate of manufacture as well as a pre-commissioning inspection / test certificate issued by AIA(m) where applicable. The System Engineer shall ensure that all records as defined in PER 14 are maintained for the life of the pressure equipment.</p> <p>The User shall review all conformity assessment documents for equipment of categorised in terms of SANS 347: 2019, Edition 3, as hazard category I and higher. User shall also review all documentation and compliance in terms of PER for SEP equipment.</p> <p>The User shall provide the Manufacturer, Repairer or Modifier (as applicable) with comprehensive information of the operating or intended operating conditions of the pressure equipment, including the characteristics of the fluid and operating parameters of other connected pressure equipment, where</p>

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

Definition	Description
	reasonably practicable. For high pressure pipework (as specified in 240-56239129) the operating and design conditions shall be specified as part of the order for information to be supplied to the Importer / Manufacturer.
<b>Verification</b>	An act of reviewing, inspection, testing, verification, auditing or otherwise determining and documenting results whether items, processes, services and / or records comply with specified technical requirements.

### 2.3.1 Disclosure Classification

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

### 2.4 ABBREVIATIONS

Abbreviation	Description
AKZ	Anlagenkennzeichnungssystem – German plant numbering system
AIA	Approved Inspection Authority
AIA(m)	Approved Inspection Authority Manufacturing
AIA(is)	Approved Inspection Authority In Service
ASME	American Society of Mechanical Engineers
GMR	General Machinery Regulations
BOM	Bill of Material
GO	General Overhaul or Major Outage
GX	Generation Division
PS GM	Power Station General Manager
IRM	Integrated Risk Management
ITP	Inspection and Test Plan
KKS	Kraftwerk-Kennzeichen System
MDT	Multi-Disciplinary Team for RBI Certified sites
MT	Magnetic Particle Testing
NCR	Non-conformance Report
NDE	Non-Destructive Examination
OHS Act	Occupational Health and Safety Act 85 of 1993
PED	European Pressure Equipment Directive
PER	Pressure Equipment Regulations
Pr. Eng.	Professionally registered Engineer as per recognised Engineering fraternity
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
RBI	Risk Based Inspection
RSA/CI/OHSA	Equipment where manufacturing process is primarily fusion welding and meets all the requirements of a relevant ASME code or ANSI NB 23 except for the marking and certification requirements, and the Manufacturer has a certified quality management system in accordance to PER sub-regulation 7.1.10 .

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.



RIMAP	Risk-Based Inspection and Maintenance Procedures for European Industry
SANAS	South African National Accreditation System
SANS	South African National Standard
SME	Subject Matter Expert
SEP	Sound Engineering Practise
UT	Ultrasonic Testing
WPS	Welding Procedure Specification
VT	Visual testing / inspection
VUP	Vessels under Pressure
PQR	Welding Procedure Qualification Record

## 2.5 ROLES AND RESPONSIBILITIES

Site Engineering with the support of Generation Asset Management is responsible to give direction and assurance to Eskom and / or User with respect to PER compliance. Generation Division, as the User of the pressure equipment, is responsible for PER compliance, seeking guidance where it is required and reporting on the status of pressure equipment compliance on a regular basis.

Site GMR 2.1 appointee is accountable for legal compliance of each respective site with respect to the requirements of the PER.

The Power Station GM is accountable for implementation of this manual.

The Power Station Engineering Manager is fully accountable for the System Engineer's responsibility as defined in this manual.

## 3. PRESSURE EQUIPMENT REGULATIONS (PER)

The PER was promulgated in July 2009 and came into effect in October 2009, and supplementary Guidance Notes were initially issued in 2012, with the latest and current revision dated 2017. The PER applies to all pressure equipment with a manufacturing date from 1 October 2009. PER sub-regulations 3, 4, 5, 9.1, 9.2 and 9.3 shall not apply to pressure equipment in use, supplied or on ordered prior to 1 October, 2009.

The repair and / or modification of pressure equipment in use, constructed, supplied or on order before 1 October 2009 is regulated under the PER with relaxation as mentioned above.

Equipment which was not regulated as vessels under pressure as defined in terms of the VUP shall not be re-classified as pressure vessels under the PER. However, if after modification the same pressure equipment is deemed to be regulated under VUP, then it is regulated under the PER.

As defined in the PER Guidance Note Rev. 2, a material change to a different grade of material shall be deemed a repair or modification. To clarify this statement: should the new material be a natural progression from an obsolete material, for example, a low alloy to BS3602 grade 620 to EN 13CrMo45, it shall be seen as natural progression of material and thus be deemed a repair. Care must be taken when dealing with carbon steel from the old BS to the new EN, as mechanical and chemical properties do differ. In these cases due diligence must be applied by performing stress calculations and this must be part of the repair / modification file. These calculations / verifications shall be reviewed by a metallurgist or SME.

However, if a different grade of material such as a stainless steel or alloy steel or carbon steel with different yield strength is used, it will affect the design integrity and will be deemed a modification.

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.



#### 4. SANS 347

This standard is based on the European Pressure Equipment Directive (PED), and is applicable to the certification, re-instatement, modification and / or repair of pressure equipment. This standard specifies the criteria used for the categorization and conformity assessment of pressure equipment in accordance to the relevant Hazard level of the pressure equipment, and its scope / extent to all relevant parties that are generally involved in the manufacturing of pressure equipment.

#### 5. DISCREPANCY BETWEEN PER AND SANS 347: 2019 EDITION 3.

Previous versions of PER and SANS 347 stated that pressure equipment where the design pressure is equal to and above 50 kPa (gauge) shall be regulated. The European PED on the other hand, only regulated equipment where the design pressure was above 50 kPa gauge.

The new SANS 347: 2019, Edition 3, requires that only pressure equipment with a design pressure above 50 kPa be regulated. This presents a discrepancy between the requirements of the PER ( $\geq 50$  kPa) and SANS 347: 2019, Edition 3 ( $> 50$  kPa).

In the event of a discrepancy between the national legislation (PER) and any referenced standards such as SANS 347, the current Edition of PER will take preference unless otherwise further clarified in any current revision of the PER Guidance Notes. Thus, in summary as per the latest PER Guidance Notes Rev. 2, all pressure equipment  $\geq 50$  kPa is deemed regulated as defined in PER.

#### 6. RE-CLASSIFICATION OF SATURATED WATER OR STEAM; SANS347 EDITION 2 VS EDITION 3.

##### 6.1 BACKGROUND

SANS 347 deals with the classification of fluids in two different groups, Group 1 being seen as dangerous media and Fluid Group 2 as non-dangerous.

PER was developed with the PED as the basis, however PED classified Steam as a Fluid Group 2 media. The European Norm (EN) Health and Safety Standards utilize the same criteria as PED to determine the conformity modules during manufacturing.

Due to the difference between PER and PED items that are imported or manufactured to PED has different hazard categories and conformity assessments become problematic and leads to contradictions. Equipment in PED can be SEP in some instances, but in SANS347 (RSA) it could be category II. This leads to inconsistencies of documents and compliance required as per the respective categories. Therefore, the decision was made to align the South African definition of steam to the European fluid group definition.

##### 6.2 CATEGORIZATION AND CONFORMITY ASSESSMENTS

Eskom shall follow the approach of SANS 347: 2019 Edition 3 for all conformity assessments of imported pressure equipment / components, with respect to the latest Fluid Group listings (steam being Fluid Group 2).

##### 6.3 CATEGORIZATION DURING RBI ASSESSMENTS

The RBI Care Group took a more conservative approach assessing risk as if steam is in Fluid Group 1 during the RBI assessment sessions. This is only applicable for the RBI process and is still within the legal requirements as the User may opt for a more conservative approach. Thus there is no change in categorisation and risk level determination in the RBI process since the introduction of SANS 347: 2019 Edition 3. For repairs and modifications the category shall be based on the requirements of SANS 347: 2019 Edition 3.

#### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

## 7. COMPLIANCE TO HEALTH AND SAFETY STANDARDS

A list of Health and Safety Standards are currently gazetted in the OHS Act as a separate publication / regulation as an interim measure until the release of the updated PER.

In the updated PER the Health and Safety Standards shall be integrated into the regulations.

During the SANAS assessment process of AIA's for accreditation, the AIA have to provide demonstrable proof of the Health and Safety Standards in their possession.

The AIA may only operate in accordance within its scope of accreditation as per SANAS schedule.

The User requirements shall define the minimum requirements for the design, manufacture, inspection, testing, and certification of the pressure equipment. The manufacturing Data Record shall contain these aspects as a minimum, and shall be agreed to by the User before manufacturing commences.

The proposed conformity module in accordance with SANS 347: 2019 Edition 3 shall also be agreed to before manufacturing commences.

The Manufacturer / Modifier / Repairer shall compile a Pressure Equipment Data Record index for each item of Pressure Equipment to be manufactured/modified/repared and submit it for approval to the User and verification by the AIA (where applicable) before commencement of work.

The Manufacturer / Modifier / Repairer shall be responsible for maintaining the Manufacturing Data Record in parallel and progressively with the manufacturing activities, modification, repairs and the assembly process as managed in the Inspection and Test Plan (ITP) or Quality Control Plan (QCP).

The Manufacturing Data Record shall be reviewed in stages of completion by the Manufacturer / Modifier / Repairer's QC Department, Eskom QC/QA and the AIA e.g. as guidance at 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.

No pressure equipment shall be released for shipment from abroad or from a local Manufacturer / Repairer / Modifier unless the associated Manufacturing Data Records have been reviewed, approved and released by AIA (where applicable), Manufacturer design and QC department and User representative and conformity assessment done to requirements of SANS 347: 2019 Edition 3, as applicable. This release shall be done by reviewing the full data pack as per agreed index and all parties shall ensure that all documents are included as preapproved Data Record index and fully endorsed (as applicable).

## 8. STATUTORY RECORDS

### 8.1 GENERAL REQUIREMENTS

The User shall keep records for all pressure equipment as detailed in PER 14.

The records shall be compiled in a manner that constitutes a User-friendly audit trail and shall be maintained throughout the life of the pressure equipment, including all manufacturing records.

All documents shall be registered on SAP / Hyperwave (or similar depending on site systems) system in electronic format with unique document identifier linked to equipment serial number as reflected on name plate, as well as plant location number (KKS, AKZ). Hard copies shall be filed in the documentation department on site. All the User statutory documents shall be stored by Eskom and not at the contractor or AIA.

The responsibility of record storage and control shall not reside with AIA, Manufacturer or Importer, but solely with Eskom.

Statutory records must reference the following as a minimum:

- applicable codes and Standards,

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

- define the statutory requirements and scope of work,
- applicable compliance measures (acceptance criteria),
- summary report on compliance status of the equipment.

The requirements above do not override any requirement applicable to the Manufacturer's own document / record keeping as detailed in the PER 14.

Data Records (data books) for the various actions shall comply with aspects below as a minimum.

## 8.2 TYPICAL DATA RECORD FOR NEW (LOCAL MANUFACTURED OR IMPORTED) OR MODIFIED PRESSURE EQUIPMENT.

A Typical New Manufacturing Data Record Index shall include the following as a minimum. Bullet points are to clarify the minimum contents of the respective section. This requirement is applicable to steam generators, pressure vessels and assemblies. These requirements are also applicable to erection and installation of High Pressure Pipework Erection as defined in Eskom document 240-56239129.

- For complex equipment that require more than one Data Record file, each file / dossier shall be marked uniquely and reference the total amount of files (for example file 1 of 12).
- Pressure equipment name, KKS or AKZ number, description, serial number and Manufacturers name shall appear on each file.
- Section indicating main contractor, sub-contractors as well as Importer with contact details in the foreword.
- Proof signature page with name designation and proof signatures as reference for the following entities. Any individual / entity that endorse documents during the manufacturing and design process shall complete this page as a traceability record.
  - Manufacturer, Modifier, Importer or Supplier's QC/QA Representative.
  - User's Representative.
  - AIA Representative.
- Design document section shall include the following as a minimum:
  - Design overview page, that indicate, Health and Safety Standard used (and year of issue), design pressure, design temperature, medium, short description of pressure equipment and conformity assessment module to be used during manufacturing.
  - Approved design drawings, and calculations and where applicable the AIA(m) design verification report.
  - Bill of materials (BOM) to be used indicating the material certification requirements.
  - Proposed NDE and weld map in support of the welding inspection as selected during the design.
- Section for inspection records during manufacturing:
  - Weld maps, clearly linking actual welds with the welding documents such as WPS's, Welder qualifications and Welder stamp numbers.
  - A detailed weld record map that includes the specific WPS as a reference.
  - Detailed NDE Map that clearly indicates all NDE techniques performed for each weld.
  - Technical documentation, examined by an Independent Body / AIA(m), as defined in the applicable conformity module.
- Material certification
  - Certified copy of all material certificates for material used, these certificates to be cross referenced to the actual BOM drawing / listing as in (v) above.
  - Any additional testing that was performed to validate material certification to be included.
- Heat treatment
  - Approved heat treatment procedures, where applicable, including diagram(s) of thermocouple location and charts for each heat treatment conducted, this shall include:
    - Certificates from Forgemaster for Imported / Local forged

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

- Heat treatment of sub-assemblies
- Heat treatment of final products as and when applicable
- ix. Pressure testing
  - Pressure test procedure
  - Copies of calibration certificates of pressure gauges
  - Water analysis certificate
  - Final completed certificate endorsed by Manufacturer, Eskom's representative and AIA(m) (where applicable)
- x. Certificate of Manufacture counter signed by AIA(m) as applicable.
- xi. Quality control plan / inspection and test plan records:
  - One QCP per individual item (QCP shall not be for a number or similar vessels (each vessel shall have its own QCP and uniquely document number.
  - In the event that Witness or Hold points were waived either by AIA(m) or Eskom representative a copy of such waivers shall be included, with reasons given.
- xii. As-built drawings and bill of materials shall include:
  - Fully endorsed "as-built general arrangement drawings"
  - Fully endorsed "Bill of materials listing drawings" and cross linking to material certificates.
  - Records above shall be endorsed by Manufacturer design engineer (Pr. Eng.), AIA(m) as applicable and the User representative.
  - This shall be in the Data Record in the form of hard copies as well as available in electronic format.
- xiii. Clear and reproducible image or rubbing of the pressure equipment marking (name plate). This includes additional name plates that are fitted to imported equipment as a result of the conformity assessment reviews.
- xiv. Operating and maintenance manuals
  - Full detailed maintenance and operating manuals to be included. Where the equipment is of a complex of nature and different items constitutes an assembly where items are to be operated individually, one consolidated maintenance manual shall be supplied to include the full assembly. This means the maintenance and operating manuals shall be specific to the item and not generic brochures.
- xv. Certificate or declaration of conformity issued by the Manufacturer, Importer or Supplier, countersigned by AIA(m) as applicable.

No Pressure Equipment shall be released for site commissioning activities if the associated Manufacturing Data Records have not been reviewed, signed and released by all relevant parties, and the nameplate is stamped by an AIA(m). Manufacturing Data Records shall be made available to the site responsible AIA(is) for each respective site to support the pre-commissioning inspection / test activities. All statutory related documentation requirements shall be complied with before pre-commissioning activities can commence.

### 8.3 A TYPICAL IN - SERVICE STATUTORY INSPECTION

In-service Inspection Data Books and Statutory Inspection Reports form part of the compliance status audit trail. Both the User and the AIA(is) shall ensure that inputs to these are factual, accurate, professionally documented, protected and preserved. Since statutory records may not be tampered with or altered in any way documents must be signed by all parties that had input into the repair / modification etc. of the pressure equipment. Before these documents are filed on record they shall be signed off by all signatories / interested parties.

During statutory inspections of the pressure vessel or steam generator the AIA(is) shall include a photograph of the current name plate, and should the name plate be damaged or eligible this shall be

#### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

brought to the attention of the relevant System Engineer for corrective action. Corrective action may include fitment of a duplicate name plate, as the original name plate as may not be removed as stated in PER sub-regulation 9.4.

### Typical in-service statutory report index:

- i. Certificate of Repair / Modification / Manufacture (as applicable)
- ii. In-service AIA(is) report
- iii. Equipment functionality inspection report - System Engineer
  - Tube plug map (for heat exchanger vessels)
- iv. Inspection records/reports of pressure envelope
  - MT/PT
  - UT
  - VT (Including pre-repair and post-repair photographic images, dimensional check sheets), other than the AIA inspections
  - Wall thickness measurements records with acceptance criteria
  - Any additional NDE inspections that was performed
  - Post plugging / As assembled tube plate photographic image (shell and tube heat exchanger vessels)
- v. Official Eskom Drawings that will be used for cross referencing of NDE reports
- vi. Pressure test / leak test report, where applicable
- vii. Pressure test gauge calibration certificates
- viii. Safety valve calibration certificates
- ix. Recommendations and approvals (cutting instructions)
- x. Design appraisals for modifications, repairs and minimum thickness calculations in accordance with document 240-110600232 requirements, where applicable.
- xi. Data verification documents (Photographs to be date stamped)
  - Photographic image of the data/name plate.
  - Photographic image of installed safety valve with lead seal prominently indicated.
  - Photograph indicating any repairs / window inserts.
- xii. Dispensations / Deferments / Concessions.
- xiii. Contactor NDE Level 3 responsible person report as defined in Eskom NDE Standard 240-83539994

## 9. PRESSURE TESTING

Pressure testing in certain instances may be required to prove integrity of the pressure equipment. Pressure testing may also be used as a method under RBI to determine the condition of pressure equipment.

### 9.1 PRESSURE TESTING AFTER REPAIRS

Eskom dispensed with the pressure test requirements after repairs and modifications with the written approval of the current respective contracted AIA(m) Technical Managers. The contracted AIA's are PSC Integrity, TÜV Rheinland, High Profile Inspection Authority and Amazim-zim Inspection Solutions.

Upon renewal of the Eskom AIA Contracts, this approval of dispensation shall be reviewed.

In the event that the design configuration of the pressure equipment concerned does not permit a 100% coverage using conventional volumetric testing methodology as applicable in the relevant Health & Safety Standard/s, the User and or Repairer / Modifier shall use an alternative suitably qualified NDT Technique(s) subject to approval by Eskom Level 3 NDT Representative. This shall be documented in a method statement accepted by all interested parties in writing prior to the actual commencement with the required task / activity. Hydraulic pressure testing shall be the last option if not satisfactory solution can be sourced or agreed to.

### CONTROLLED DISCLOSURE



Where in-service statutory hydraulic pressure testing is required, such testing shall be performed to a minimum 1.25 times the design pressure as defined in PER sub-regulations 11.1(c) or 11.1(d). Leak testing for purpose such as (a) determining leaking tubes in shell and tube heat exchanger or, (b) where the operating pressures are far lower than the design leak test pressure value shall be agreed upon between AIA(is), Manufacturer / Repairer / Modifier and Eskom before repair / modification may commence.

Both the User and the AIA(is) shall ensure that the stipulated test pressure is reached or marginally exceeded (2% of test pressure value or 50 kPa whichever is the higher) during a pressure test and that the pressure gauge used in the test is of the correct range (test pressure to be achieved shall be within 40-70% of the indicated scale range). The pressure gauge latest calibration date as stated on the calibration certificate shall be older than 12 months prior to the date of pressure test. Calibration test shall be performed by a SANAS accredited Test Laboratory. The pressure equipment shall hold / maintain test pressure for at least 30 minutes or in case of the steam generator at least sufficient time to perform a full visual inspection. A shorter time frame may be agreed to by the System Engineer and AIA(is) in cases where the pressure decay is due to a passing isolating valve or blocking device.

## 9.2 PRESSURE TESTING DURING MANUFACTURING PROCESS

Newly manufactured pressure equipment shall undergo a proof pressure test as determined by the relevant Health and Safety Standard. This test pressure shall be documented and form part of the Manufacturing Data Records. The pressure test shall be witnessed by AIA(m), Manufacturer and the User representative, in accordance with the requirements of the applicable SANS 347 conformity assessment module.

## 9.3 PRESSURE TESTING AFTER INSTALLATION OF NEW EQUIPMENT.

Where new pressure equipment has undergone a pressure test (proof test) during the manufacture as defined by the relevant Health and Safety Standard, another pressure test after installation may not be required provided that:

- Upon delivery of pressure equipment to site a thorough external visual inspection shall be performed to confirm that no transport damages occurred during loading / off loading, or during transport. This inspection shall confirm that no unauthorised welding / hot work on pressure envelope were performed. The visual inspection shall be performed by the following parties as a team; Contractor (Manufacturer / Modifier / Repairer), User and AIA(m). On completion of inspection an inspection report shall be issued by the Contractor and countersigned by System Engineer and AIA(m).
- In the event of any incurred damage, the damage shall be assessed and with mutual agreement between the Contractor, User and AIA(m). All repair activities / methods shall be accurately documented and repair actions shall be clearly specified.

After installation or re-installation, and during the final inspection of the plant, this visual inspection report shall form part of the AIA(m)'s pre-commissioning inspection certificate.

## 10. VALVES

### 10.1 PROCESS VALVES

Valves are pressure accessories as defined in PER. All imported valves need to be subjected to a conformity assessment review by the Importer, to declare conformance to the national legislation. The South African (local) AIA(m) is not required to counter-sign this declaration. This conformity assessment review certificate shall be issued to the User for acceptance. The conformity assessment shall clearly indicate the Health and Safety Standard (including year of issue), pressure testing and material certification in accordance with EN 10204, and also the conformity assessment module used during the manufacture.

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.



Valves shall be manufactured and designed in accordance with an accredited valve manufacturing Health and Safety Standard such as ASME B16.34, EN 12516 or an international accepted valve design Health and Safety Standard. The User will ensure that the selected valve complies with the temperature and body pressure rating for applicable Valve body rating as stated in the applicable Health and Safety Standard, and is suitable for the design conditions of the piping system.

Valves will be supplied complete with material certificates in accordance with EN 10204 Type 3.1 certification for low alloy materials and basic carbon steel or stainless steel. For complex materials the requirements of 240-84513751 will apply. Batch produced valves shall be supplied with EN10204 2.2 certification.

## 10.2 SAFETY VALVES

The requirements as for all new safety valves shall include those in 10.1 above.

For new safety / relief valves a full sizing certificate of valve capacity must be issued. Certificates must include the maximum flow rates and media as well as the Health and Safety Standard that the flow capacity is based on.

Repaired / Refurbished valves data books will include:

- i. Visual inspection report issued by Repairer.
- ii. Surface and volumetric NDE reports
- iii. Welding documentation in event of weld repair (WPS, PQR and welder qualifications)
- iv. Final calibration report
- v. Photograph clearly indicating the lead seal.

Since safety accessories are the responsibility of the User, the calibration shall be witnessed by an Eskom Representative knowledgeable on safety accessories.

Calibration is thus not a mandated function of the AIA, thus this function shall be undertaken by User (System Engineer).

The calibration of safety valves on unfired vessels will follow the inspection interval of the vessel it protects as PER 11 guidance note (j). The inspection and test of safety accessories on unfired pressure vessels that follows a RBI regime shall be limited to a maximum interval between inspection and test of 9 years.

The setting or adjustment gear on conventional safety accessories shall be sealed with a wire and lead seal and where breakage of such is noted, will serve as an indicator of unauthorized adjustment. Should seal or wire found to be damaged, immediate action to be taken to rectify. This to be brought to attention of GMR 2.1

The control and setting gear of non-conventional safety accessories on steam generators shall be rendered inaccessible to unauthorized person(s).

## 11. RISK BASED INSPECTION

PER 12 makes provision for a risk based inspection approach, as opposed to a fixed in-service inspection and test interval intervention requirement in the management of pressure vessels and steam generators. This approach is based on Risk evaluation of the equipment rather than fixed intervals for inspections and pressure testing as in RER sub-regulation 11.1(d).

The success of this approach depends on evaluating the actual condition of the equipment, historic inspection data, manufacturing data, drawings and operating history.

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

Operational history needs to be maintained specifically where the operating parameter may surpass the design conditions of the vessel.

In this certified management system, (certified by an approved Certification Body), a Multi - Disciplinary Team comprising the GMR 2.1 & 7, AIA, IRM Specialist, SME's, Operating and Maintenance Staff, System Engineers, amongst others, is set up to manage plant or pressure equipment risks following the CWA 15740 RIMAP Standard and assessments and RBI Process will be managed as per the Eskom RBI Manual document 240-84045193.

The AIA provides assurance with respect to compliance with the PER and continues to fulfil the duties of an AIA within the Multi-Disciplinary Team as defined in RBI manual.

Note: The scope certified RBI management system does not include fire-tube steam generators, the mandatory requirements of PER sub-regulation 11.1(c) shall apply.

## **12. RE-INSTATEMENT OF CONFORMITY**

This was previously known as re-certification in the previous version of SANS 347 Rev. 2.

Re-instatement of conformance refers to activities undertaken to determine appropriate design parameters for pressure equipment where such data is unknown or unavailable. Only equipment, which has previously been declared to conform to a Health and Safety Standard, can be re-instated (re-certified).

In cases where pressure and safety accessories were not regulated before, reinstatement of conformity shall not apply.

For imported batch-type pressure equipment as defined in SANS 347: 2019, Edition 3, which does not conform to the general requirements as set out in the PER and / or SANS 347: 2019 Edition 3, Annexure D.5 shall apply.

For new and imported individual units / pressure equipment that were manufactured to a Health and Safety standard from the country of origin, that is not listed as an approved Health & Safety Standard in the OHS Act, the requirements of SANS 347: 2019, Edition 3 - Annexure D.6 shall apply.

## **13. AIA RELEASE NOTE:**

On completion of the AIA(is) statutory inspection and upon review of the certificate of repair / modification (as applicable), a document (Release Note) is issued by the AIA(is). This declaration shall summarise the findings of the statutory inspection report and declares status of the pressure equipment as either fit for service or not. The Release Note may include for any short / medium or long-term actions that shall provisionally be complied with.

The AIA Release Note in essence replaces the former COC (Certificate of Continuance).

The release note will cover the aspects as per Eskom RBI manual section 3.12.2 (b), except for the date of next inspection as well as risk level of the respective equipment. This can only be based on the outcome of the post outage RBI assessment.

The release note will be given to the GMR 2.1 for acceptance; this shall be in place before the unit is returned to service.

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.

## 14. AUTHORISATION

This document has been seen and accepted by:

Name and Surname	Designation
Anisha Ulassi	RBI Care Group Chairperson
Andrew Downs	Senior Consultant Materials
Darrell Daniels	Risk Engineer Koeberg Nuclear Power Station
Dheshan Naran	Chairman of Welding, NDT and RBI SCOT
Erick van Zyl	Corporate Specialist High Pressure Pipework
Francois du Preez	Corporate Specialist Asset Management
Hudson Ramakulukusha	AIA Technical Manager TÜV Rheinland Group SA
Johan van Niekerk	GMR 2.1 Forum Chairman
Jimmy Mbhele	AIA Technical Manager Amazim-zim Inspection Solutions
Leon Enslin	AIA Technical Manager High Profile Inspection Authority
Marthinus Bezuidenhout	Corporate Specialist Power Plant Materials
Michael Amir	Senior Consultant
Morris Maroga	Corporate Specialist Materials and Welding
Nkululeko Thusini	AIA Technical Manager PSC Integrity
Ronnie Scheepers	Corporate Specialist Structural Integrity
Shanil Narain Singh	Chief Engineer RBI Asset Management
Tebogo Molefe	PER compliance officer (Quality)

## 15. REVISIONS

Date	Rev.	Compiler	Remarks
February 2020	0.1	HC v Niekerk	First draft to replace document 474-10327
May 2020	0.2	HC v Niekerk	Final Draft After Comments Review Process
May 2020	1	HC v Niekerk	Final Document for Authorisation and Publication

## 16. DEVELOPMENT TEAM

- H.C. Van Niekerk
- M. Amir
- M. Bezuidenhout
- S. Singh

## 17. ACKNOWLEDGEMENTS

- The Authorisation Team.

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the system.