Eskom	Manual	Koeberg Operating Unit

Title:	**Fourth Interval In-Service Testing Programme Requirements Manual (ISTPRM)**	Unique Identifier:	**240-97087308**
		Alternative Reference Number:	**KBA 0028 NES IST 01**
		Area of Applicability:	**Koeberg Operating Unit**
		Functional Area:	**Nuclear Engineering**
		Revision:	**2**
		Total Pages:	**253**
		Next Review Date:	**As required**
		Disclosure Classification:	**CONTROLLED DISCLOSURE**

Compiled by	Functional Responsibility	Authorised by
.....	.....	.....
G Mdluli	**N Jakoet**	**R Bakardien**
Senior Technologist, Engineering Programmes	**Middle Manager, Specifications Programmes and Sciences**	**General Manager, Nuclear Engineering**
Date: 2017/02/14	Date: 2017.02.14.	Date: 2017-02-23

ADDITIONAL CLASSIFICATION INFORMATION

Business Level:	**3**
Working Document:	**3**
Importance Classification:	**CSR (S2017/0067)**
NNR Approval:	**[NNR approval Reference](Deviations only)**
Safety Committee Approval:	**Yes (Deviations only; done on the 17 June 2015)**
ALARA Review:	**Yes**
Functional Control Area:	**Nuclear Engineering**

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

PLANT PARTICULARS

Plant: Koeberg Nuclear Power Station Unit 1 and Unit 2
R27 Off West Coast Road
Melkbosstrand Western Cape
Private Bag X10 Kernkrag
Republic of South Africa

Design: PWR Westinghouse 3-loop, built by Framatome

Owner: Eskom Holdings SOC Ltd Reg No 2002/015527/30
PO Box 6841
Headquarters Megawatt Park Johannesburg
Republic of South Africa

Commercial Service Dates: Unit 1: 4 April 1984
Unit 2: 25 July 1985

1. INTRODUCTION

This document provides the 4th interval ISTPRM for Koeberg Nuclear Power Station (KNPS). The compilation of this document satisfies the requirements stipulated in the US Code of Federal Regulations, Title 10, Part 50.55a (10CFR50.55a), paragraphs (f) and (g), which Eskom has voluntarily adopted. Furthermore, the ISTPRM also fulfils the Koeberg nuclear licence requirement contained in NIL-1, Variation 18, Section 5 (*Maintenance and In-Service Inspection Programme*).

The intent of the ISTPRM is to establish assurance on the operability readiness of safety related components under all design basis conditions. This assurance is established by means of a variety of periodic surveillances. The operability readiness statement confirms that the design basis safety functions of IST components remain within acceptable limits throughout their lifetime. To this end, the IST requirements are implemented in order to confirm the following:

- The hypotheses (assumptions) described in the accident studies of the SAR remain respected.
- There are no unfavourable trends that could challenge operability during the course of time.
- The functional (operating) requirements/limits of the OTS / SRSM are respected at all times.

This ISTPRM is compiled by Nuclear Engineering (NE) in particular Engineering Programmes (EP) and addressed to Plant Engineering (PE) for implementation. PE, and in most cases the Inspection and Test (I&T) group, is responsible for developing the relevant implementation procedures for each IST discipline in accordance with the responsibility matrix detailed in procedure 331-177 [11], and to ensure that personnel have the appropriate training, qualifications, and authorisations to fulfil their responsibilities.

2. BASIS AND STRUCTURE OF THE ISTPRM

2.1 Basis for the Koeberg IST Programme

The ASME Section III code was used to design Koeberg. ASME Section XI forms the basis for its in-service inspection programme (which included in-service testing for pumps, valves, and snubbers). This was seen to be in line with world good practice and practical for implementation by Eskom, and was made a licensing basis commitment in the Koeberg principal licensing submission KPS 12 and its supporting documentation for commercial operation.

The Koeberg set of operating technical specifications (OTS), which included periodic (or surveillance) tests, was established by the main contractor (Framatome). These tests confirm operability mainly at a system level.

There has always been a close link between the ISTP and OTS surveillance test requirements for implementation, but there was no accessible engineering link between the bases of these two sets of requirements.

In recent years, Eskom has aligned more closely to formal US requirements for ISI (ASME XI) and IST (ASME OM) practice (at the level of the US NRC Code of Federal Regulations). These requirements have undergone a number of improvements making IST more dynamic and now incorporate more plant-specific, engineering based elements and guidance. The ISTP is now also seen to be a programme in its own right, with the ASME OM code being endorsed by the US NRC.

The Koeberg OTS [31] has become more closely aligned with the EDF OTS and the surveillance testing aligned to EDF's SRSM [30], with more accessible engineering bases. While much work has already been done to minimise duplication of tests, recent developments create the opportunity to further optimise equipment testing requirements.

The Eskom rules for the establishment and management of the ISTPRM are governed by the Koeberg Standard 331-185 [14], which is a key licensing basis document, subject to regulatory approval. In addition to the ASME OM base code as limited by 10CFR50.55a, other internal and external requirements were considered during the compilation of the ISTPRM, as is normal practice in the US. Figure 2-2 depicts the various requirements that were considered, for example, the SAR, OTS, SRSM, US NRC generic letters, IN, RIS, and EDF operating experience (OE).

2.2 ISTPRM Structure

The general structure adopted by Koeberg NE to compile this document as it relates to the various IST requirements is similar to the ASME OM code 2004-2006 addenda. The Koeberg specifics and Deviations are added where required. For reference purposes,

Table 2-1 summaries the ISTPRM sections and their corresponding ASME OM code subsections with high level comments highlighting the major change. The specific details of this change and the ASME OM code requirements that were omitted because they do not apply to Koeberg are summarised in Table 2-3.In general, most of the ASME OM code headings and wording have been retained except where these do not apply to Koeberg; however, in some instances changes and clarification have been introduced to facilitate implementation. The Deviations from the code requirements are detailed under § 2.5.2 . In summary, the practice adopted in compiling this ISTPRM is in line with that of the US utilities and endorsed by NUREG 1482 [3].

2.3 Implementation Responsibilities Matrix

As stated above, I&T have the overall responsibility to implement the ISTPRM and the generation of the statutory reports and waivers; however for clarity purposes and in addition to the responsibility matrix detailed in document 331-177 [11] “Process and Responsibilities for the Development and Implementation of the In-Service Inspection Programme”, specific implementation ISTPRM related tasks for the relevant groups are provided below:

- Vibration monitoring: CE in conjunction with I&T
- Evaluation of LLRT failures: CE in conjunction with EP
- Evaluation of MOVs Viper results: CE in conjunction with EP
- Functional test of safety relief devices: Mechanical Maintenance Section (MMS)
- Evaluation of IST test results: I&T
- Raising of Engineering work requests when required: I&T
- Raising of waivers when required: I&T
- Scheduling of IST requirements: work control with I&T oversight
- Functional test of snubbers: I&T and Areva (steam generators snubbers)
- Manipulation of valves during leak rate test: Operating department
- Calibration of IST instruments (fixed and portable): Instrumentation Sections (ICA, ICB)

Table 2-1
ISTPRM sections with corresponding ASME OM code subsections

ISTPRM Section		ASME OM Code Subsections	Comments
#	Title		
1	Introduction	N/A	NUREG 1482 guidelines and the US utilities' practices were followed
2	Basis and structure of the ISTPRM	N/A	NUREG 1482 guidelines and the US utilities' practices were followed
3	References, Definitions, and Abbreviations	N/A	N/A
4	General Requirements	ISTA	Actual Code Case Deviations were added under Appendix 4-1 and Appendix 4-3
5	In-Service Testing of Pumps	ISTB	Combined few subsections to avoid duplication
6	In-Service Testing of Valves	ISTC	Combined few subsections to avoid duplication
7	In-Service Testing Requirements of Pressure Relief Devices	Mandatory Appendix I	Omitted the BWR section
8	Condition Monitoring Programme (CMP) Requirements for IST Check Valves	Mandatory Appendix II	Added the entire analysis and the conclusions of the check valves Maintenance basis
9	Pre-Service and In-Service Examination and Testing of Dynamic Restraints (Snubbers)	ISTD	Added the request to implement the code case OMN-13
10	Augmented In-Service Testing Requirements of the Emergency Diesel Generator (EDG) Safety Related Components	N/A	Although covered under the SRSM, EP decided to include the EDG in this ISTPRM for conservatism purposes

2.4 Code of Federal Regulations Requirements 10CFR50.55a

In accordance with the latest 10CFR50.55a paragraphs (f) and (g) approved by the Final Rule dated December 2014, licensees of pressurised water reactors are required to establish an IST programme for their initial 120-month (10-year) interval, based on the requirements of the latest edition and addenda of the ASME OM code, incorporated by reference in paragraph (b) 12 months before the issuance of an operating licence.

The regulation continues by requiring that, at the end of this initial interval and each succeeding interval, the licensees shall revise their IST programme to comply with the requirements of the latest edition and addenda of the ASME OM code incorporated (endorsed) by reference in paragraph 10CFR50.55a (b), 12 months before the start of the 120-month interval, subject to the conditions and limitations listed in the same paragraph, i.e. 10CFR50.55a (b), the ones applicable to Koeberg fourth interval ISTPRM will be detailed below.

2.5 Code of Record

For the development of the 4th interval ISTPRM, Koeberg opted to use the latest ASME OM code, incorporated by reference into 10CFR50.55a which is ASME OM Code, 2004 Edition to 2006 Addenda, subject to the conditions and modifications stipulated in 10CFR50.55a(b)(3), which are detailed below.

2.5.1 10CFR50.55A CONDITIONS AND LIMITATIONS

The applicable conditions of 10CFR50.55a for the ASME OM code 2004 edition to 2006 addenda which are prescribed in paragraph (b)(3) are detailed below, with the method that Koeberg has adopted for addressing them.

a) 10CFR50.55a (b)(3)(i) – NQA-1, “Nuclear Quality Assurance Requirements for Nuclear Facilities”

   In the case of Eskom, the National Nuclear Regulator in their regulatory document RD-0034 which was informed by NQA-1 and other international quality assurance requirements standards, require Eskom to establish its own quality assurance programme taking into account NQA-1 requirements. To this end, Eskom applies its own quality assurance and control programmes across its fleet of power utilities, as detailed in the following documents: 238-101, 238-105, and 335-2 [8]. Eskom considered the contents of NQA-1 during the development of these documents. In light of this, the compilation of the 4th Interval ISTPRM document meets this condition.

b) 10CFR50.55a(b)(3)(ii) – Motor-Operated Valve Testing

   Koeberg is already implementing and maintaining a testing programme for motor-operated valves to ensure that they continue to be capable of performing their intended design basis safety function by implementing the requirements contained in document 331-293 [16]. In addition, Koeberg is preparing to implement a more comprehensive MOVs in-service testing programme with reference number 240-98783507. In light of this, this condition is met.

2.5.2 DEVIATIONS FROM CODE OF RECORD

In accordance with 10CFR50.55a, paragraphs (a)(3)(i), (a)(3)(ii), (f)(5)(iii), and (f)(5)(iv), licensees may submit a request for relief from code requirements where conformance with the requirements of the code is determined to be impracticable or result in unusual difficulty. Alternatives and Deviations to these requirements are presented in this ISTPRM. Eskom has documented the applicable alternatives as Deviations for valves and pumps and assigned them with a unique code, which are detailed in Appendix 6-4 (VVD-1), Appendix 7-2 (RVD-1), Appendix 7-3 (RVD-2) Appendix 5-2 (PMD-1), Appendix 5-3 (PMD-2), Appendix 5-4 (PMD-3), Appendix 4-2 (CCD-1), and Appendix 4-3 (CCD-2) for NNR approval.Figure 2-1 provides a visual illustration of the different Deviations with their respective codes and sections. In addition, the Deviation code is referenced at the location where the alternative requirement (Deviation) occurs in the ISTPRM.

Note that all the deviations have been presented and accepted by the Koeberg Safety Committee (KORC) on 17 June 2015. These deviations may only be implemented following the NNR approval.

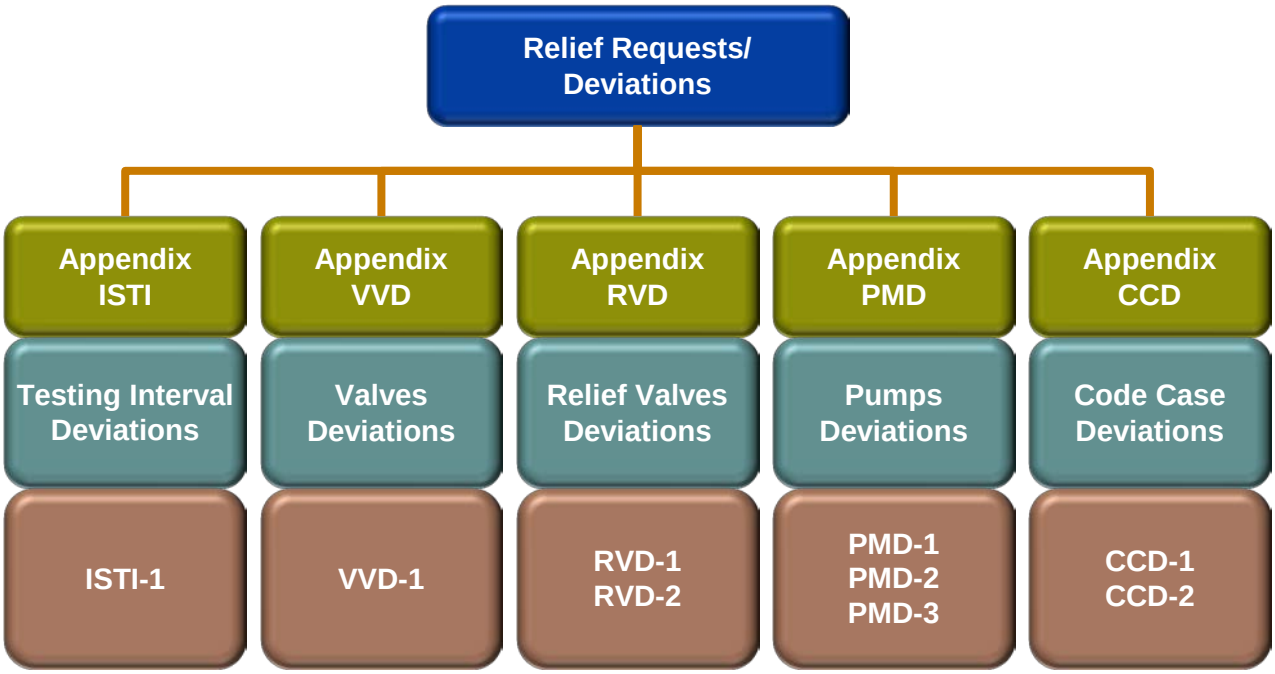

Figure 2-1
Deviations summary

Table 2-2
Deviation's code and description

Appendix	Deviation Code	Deviation Description	Scope Affected
Testing Interval Deviation Appendix 4-1	ISTI-1	The accepted first interval of 12 years places Koeberg outside of ASME OM, ISTA-3120	All IST components
Code Case Deviations Appendix 4-2 Appendix 4-3	CCD-1	Request to use the code case OMN-19	All IST pumps; refer to Appendix 4-2
	CCD-2	Request to use the code case OMN-20	All IST components except snubbers
Pump Deviations Appendix 5-2 Appendix 5-3 Appendix 5-4	PMD-1	Request to deviate from the flow measurement requirements	12 EAS 001 PO 12 EAS 002 PO
	PMD-2	Request to deviate from the Group A performance test frequency requirements	12 RRA 001 PO 12 RRA 002 PO
	PMD-3	Request to deviate from the ASME OM code flow measurement requirements	12 SEC 005 PO 12 SEC 006 PO 12 SEC 007 PO 12 SEC 008 PO
Valve Deviations Appendix 6-4	VVD-1	Request to align the IST check valve requirement with the overhaul frequency	12 ASG 126 VZ
Relief Valve Deviations Appendix 7-2 Appendix 7-3	RVD-1	Request to deviate from the usage of the test medium versus the operating medium	Refer to Appendix 7-2
	RVD-2	Request to align the IST functional test requirements with the overhaul frequency of 12 ASG 126 VZ	12 ASG 126 VZ

Table 2-3
Non Applicable ASME OM code requirements

Related ISTPRM Section	Non Applicable ASME OM code requirement or combined	Comments/Justification
4	Table ISTA-1400-1"Referenced Standards and Specifications"	The applicable standards and specifications were provided in § 3
5	ISTB-3100 "Pre-service Testing (c) and (d)"	No IST positive displacement and reciprocating positive displacement pumps
5	ISTB-3200 "In-service Testing (c) and (d)"	No IST positive displacement and reciprocating positive displacement pumps
5	ISTB-5000 "Specific Testing Requirements" and the following series: 5100,5110,5120,5121,5122,5123,5200,5210,5220 ,5221,5222,5223, 5300,5310,5320,5321,5322,5323	The IST pumps at Koeberg are centrifugal and vertical line shaft. In order to avoid duplication; the different pre-service and in-service test requirements under ISTB-5000 and series were combined under 5.31 and 5.32 and its subparagraphs

Related ISTPRM Section	Non Applicable ASME OM code requirement or combined	Comments/Justification
5	Table ISTB-3000-1 “In service test parameters” and Vibration figure Fig. ISTB-5223-1” Vibrations limit”	Added RMS values as requested by the NNR in letter k21335N
5	ISTB-3430 “Pumps lacking fluid inventory”	None at Koeberg
6	ISTC-5150,5151,5152,5153 Requirements related to solenoid operated valves	None at Koeberg
6	ISTC-5140,5141,5142,5143 Requirements related to hydraulically operated valves	None at Koeberg
6	ISTC-5120,5121,5122,5130,5131,5132,5133 Requirements related to MOVs and AOVs	Combined in Table 6-3000-2
6	ISTC-5250”Rupture disks”	No safety related at Koeberg
7	I-1330”Test frequency, class 1 nonreclosing pressure relief devices”	None at Koeberg
7	I-1340”Test frequency, class 1 pressure relief devices that are used for thermal relief application	None at Koeberg
7	I-1360”Test frequency, classes 2 and 3 nonreclosing pressure relief devices”	None at Koeberg
7	I-1370” Test frequency, classes 2 and 3 primary containment vacuum relief devices”	None at Koeberg
7	I-1380” Test frequency, classes 2 and 3 primary containment vacuum relief devices	None at Koeberg
7	I-2000,I3000 and series, I4000 and series, I5000 and series, I6000 and series	Related to BWR reactors
7	I-6000	Duplicated introduction
7	I-7100, I-7120, I-7130, I-7140, I-7150, I-7200, I-7220, I-7230, I-7240, I-7250, I-7260, I -7270	Requirements related to new plants
7	I-7300”Periodic testing	Included already
7	I-7320”Power actuated relief valves”	Combined in § 7.73.1
7	I-7330”Other class 1 relief valves”	Combined in § 7.73.1
7	I-7340”Class 1 nonreclosing pressure relief devices	None at Koeberg
7	I-7350” Classes 2 and 3 MSSV	Combined in § 7.73.5
7	I-7360” Other classes 2 and 3 pressure relief valves	Combined in § 7.73.5
7	I-7370”Classes 2 and 3 nonreclosing pressure relief devices	None at Koeberg
7	I-7410, I-7420, I-7430, I-7450, I-7460,”Requirements related to disposition after testing or maintenance for the different classes	Combined in § 7.74 and § 7.74.8
7	I-7440, I-7470” Requirement related to nonreclosing pressure relief devices”	None at Koeberg

Related ISTPRM Section	Non Applicable ASME OM code requirement or combined	Comments/Justification
7	I-8110, I-8120, I-8130"Requirements related to set pressure testing under different medium"	Combined under § 7.81 to avoid duplication
9	ISTD-4251"Initial examination interval"	Requirements related to new plants
9	ISTD-5225"Subcomponent test"	There are no physical limitations related to testing of snubbers at Koeberg
9	ISTD-5400 and series " Requirements related to the 37 option"	Koeberg opted to use the 10% option

2.5.3 METHODS TO BE ADOPTED TO COMPLY WITH THE ISTPRM REQUIREMENTS

The various test methods and acceptance criteria are usually contained in the I&T working procedures such as KWR-TP-IST-001 [25] and KWR-TP-IST-002 [26] for valves, specific pump performance test procedures for the different IST pumps group, procedures to determine the leak rate, and the check valves. EP provides guidelines and criteria for the disassembly programme for check valves, and the service life monitoring programme for snubbers, as documented in NEPP 331-228 [18] and EPR E-0039/13 [28] respectively. EP is also responsible to provide acceptance criteria for specific tests and to address the ASME OM code interpretations via letters or EPR to PE if required. The details of these communications are referenced in this document where applicable. EP is also responsible to provide the containment leak rate monitoring programme based on the US 10 CFR Appendix J programme, this is documented in the CLRTPRM [17].

2.5.4 TESTING FREQUENCY TOLERANCE

When considering the plant operating conditions, e.g. transients, long maintenance activities, delays during refuelling outages, and the operating regime, it becomes necessary to implement a tolerance to the testing frequency. Therefore Deviation to implement code case OMN-20 is compiled in Appendix 4-3 for NNR approval. This practice is in line with the requirements of the OTS and the SRSM and with the technical specification (TS) as practised in the US where a 25% tolerance is granted on all surveillances. As this tolerance is granted purely for scheduling convenience, it is expected that it shall be used only for this intended purpose and not to be used in a cumulative manner. I&T, who is responsible for implementing the ISTPRM is required to ensure that the KAA-835 [12] procedure is adhered to in order to monitor and timely execute all statutory work activities and to report any non-compliance with the statutory activities.

2.6 Additional Guidance

The development of the 4th interval ISTPRM used the recommendations and guidance provided in NUREG-1482 Rev 2 (*Guidelines for In-Service Testing at Nuclear Power Plants*) [3] and these have been incorporated into this ISTPRM where applicable.

The compilation of the 4th interval ISTPRM has also as practicable as possible considered the regulatory, technical, and administrative aspects, including local and international IST-related requirements issued

mainly by the US NRC, such as generic letters and information notices. Consideration was also given to the SAR, OTS, SRSM and other Koeberg statutory documents. These considerations are illustrated in Figure 2-2.

2.7 EFFECTIVE DATE

The effective date is the same as the authorisation date.

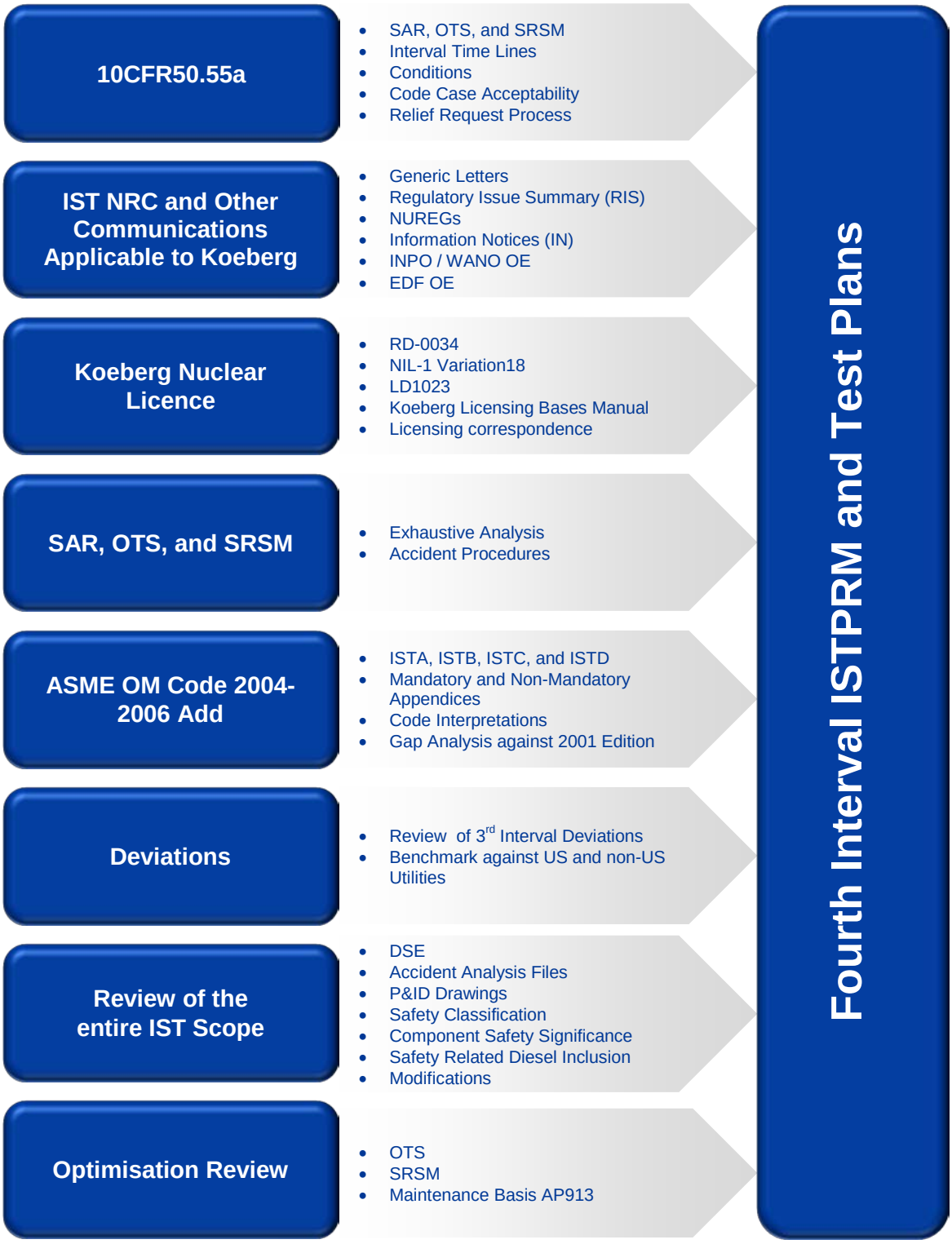

Figure 2-2
IST programme development and considerations

3. REFERENCES, DEFINITIONS, AND ABBREVIATIONS

3.1 Normative

[1] Latest Code of Federal Regulations, Title 10, Part 50, Section 55a, dated December 2014

[2] ASME OM Code, “Code for Operation and Maintenance of Nuclear Power Plants”, 2004 Edition through 2006 Addenda

[3] NUREG-1482, Revision 2, “Guidelines for In-Service Testing at Nuclear Power Plants”

[4] Regulatory Guide 1.192, “Operation and Maintenance Code Case Acceptability, ASME OM Code”

[5] Regulatory Guide 1.193, “ASME Code Cases not Approved for Use”

[6] Koeberg Safety Analysis Report

[7] KSA-010, “Nuclear Safety, Seismic, Environmental, Quality, and Importance Classification”

[8] 238-8, 238-101, 238-105, and 335-2 documents related to Eskom’s Quality Assurance and Management Requirements

[9] ANSI / ANS 56.8 Containment System Leakage Testing Requirements

[10] NEI 094 Industry Guidelines for Implementing Performance – based Option of 10 CFR 50 Appendix J

3.2 Informative

[11] 331-177 (KAA-572), “Process and Responsibilities for the Development and Implementation of the In-Service Inspection Programme”

[12] KAA-835, “Work Activity Monitoring Process”

[13] KAM-038, “Process for Repair/Replacement of Installed Mechanical Components”

[14] 240-110745414 (KSA-021), “Standard for the In-Service Inspection Programme at Koeberg Nuclear Power Station”

[15] KSA-031, “Standard for Repair/Replacement of Installed Mechanical Components”

[16] Nuclear Engineering Paper 331-293, “MOVs Operability in Response to GL 89/10 and GL 96/05”

[17] KBA 0028 NES MA CLR 003, “Containment Leak Rate Testing Programme Manual”

[18] Nuclear Engineering Paper 331-228 “Exercise Tests for Category C Valves (Non-Return) in accordance with the ISTPRM, Sample Disassembly Programme”

[19] Engineering Problem Report E-0039/13 “Service Life Monitoring for the IST Section 9 Snubbers”

[20] KGU-035, “Scoping and Classification of Components”

[21] KGU-037, “Developing PM Templates”

[22] KGU-039, “Developing PM Strategies”

[23] KWM-RM-VIB-001, “Condition Monitoring of Rotating Machinery”

[24] Engineering Problem Report EPR-E11-0050, “PIVs Leak Rate Acceptable Limits”

[25] KWR-TP-IST-001, “Methodology for Analysis and Evaluation of IST Valves Test Results”

[26] KWR-TP-IST-002, “Methodology for Analysis and Evaluation of IST Safety and Relief Valves Test Results”

[27] KLR-001, “IST Valves Reference and Limiting Values List”

[28] EPR E-0065/07 “IST Check Valves Open Test Acceptance Criteria”

[29] EPR E-09-0016 “Review of the Quiri Snubber Functional Test Criteria”

[30] KBA-0022-SRSM-000-00 “Safety Related Surveillance Manual (SRSM)”

[31] KBA-0022-OTS-0000001 “Operating Technical Specifications (8 chapters)”

[32] SPT 6018/07 “EP letter clarifying the interpretation of the ASME OM code requirement as it relates to the application of the 96 hours under § 6.51.15”.

[33] SPT-6137/07 “EP letter for Test Acceptance Criteria for check valves Tested Under parallel pumps configuration”

[34] SPT-6313/11 “Engineering Review of Snubbers Visual Examination Requirements (VT-3) Acceptance Criteria”

[35] KAA-690 “Operability Determinations”

[36] KAA-709 “Process for Performing Safety Screenings, Safety Evaluations, Safety Justifications and Safety Cases”

[37] SPT 6154/08 “EP letter clarifying the set point verification frequency”

[38] KSR-003 “certification and authorisation of personnel performing functional testing at Koeberg nuclear power station”

3.3 Definitions

Refer to § 4.20 Table 4-1.

3.4 Abbreviations

Abbreviation	Description
ASME	American Society Mechanical Engineers
ANSI	American National Standard Institute
AOV	Air-Operated Valve
ALARA	As Low As Reasonably Achievable
ARE	Normal Feed Water System
ASG	Auxiliary Feed Water
BEP	Best Efficiency Point
BWR	Bowling Water Reactor
CFR	Code of Federal Regulations
CMP	Condition Monitoring Programme (for check valves section 8)
CRD	Control Rod Drive
ECCS	Emergency Core Cooling System
EPR	Engineering Problem Report (could be used to document an engineering analysis, acceptance criteria, etc.)
FR	Federal Register
GL	Generic Letter (issued by the NRC)
IN	Information Notice
ISI	In-Service Inspection
ISTPRM	In-Service Testing Programme Manual
JOG	Joint Owners Group
LCO	Limiting Condition for Operation
LD	Licence Document
LOCA	Loss of Coolant Accident
MB	Maintenance Bases
MOV	Motor-Operated Valve
MSSV	Main Steam Safety Valve
MSIV	Main Steam Isolation Valve
MWC	Metres of Water Column
NEI	Nuclear Energy Institute
NNR	National Nuclear Regulator (South Africa)
NRC	Nuclear Regulatory Commission (USA)
OTS	Operating Technical Specifications
OM code	Operating Maintenance Code for Testing Dynamic Components In Nuclear Facilities
PTR tank	Refuelling Storage Tank
PWR	Pressurised Water Reactor

Abbreviation	Description
PIV	Pressure Isolation Valve
PST	Pre-Service Testing
P&ID	Piping and Instrumentation Diagram
RCV	Chemical and Volume Control System
RRA	Residual Heat Removal System
RPM	Revolutions Per Minute
RRI	Nuclear Island Cooling System
RIS	Low Head Safety Injection System
SE	Safety Evaluation
SSC	System, Structure and/or Component
SAR	Safety Analysis Report
SRSM	Safety Related Surveillance Manual

SECTION 4

General Requirements

4. GENERAL REQUIREMENTS

4.10 INTRODUCTION

For reference purposes, the format and the numbering system of the ASME OM code headings are retained in this section with the following change: ISTA is replaced by the number ‘4’ and the subsection numbers are reduced, e.g. ISTA-1000 is now 4.10.

Furthermore, requirements not applicable to Koeberg are omitted, which results in the numbering in this section not following a chronological order.

4.11 Scope

The IST programme establishes the testing and examination requirements for periodically assessing the operability readiness of certain ASME Code Class 1, 2, and 3 components important to nuclear safety. These requirements apply to the following components:

a) pumps and valves required to perform a specific function in shutting down the reactor to a safe shutdown condition, in maintaining the safe shutdown condition, or in mitigating the consequences of an accident;

b) pressure relief devices that protect systems or portions of systems that perform one or more of these three functions stated in a) above;

c) dynamic restraints (snubbers) used in systems that perform one or more of these three functions stated in a) above, or to ensure the integrity of the reactor coolant pressure boundary.

In accordance with the SAR II-3.4.1.2, any condition from hot shutdown to cold shutdown is considered a safe shutdown condition.

Other non-code class components with a safety function credited in the SAR, OTS, or accident analysis and which have one or more of the design functions specified in a), b), or c) above, are also included in the ISTPRM. They are treated as augmented components, which are included in the respective test plans, attachments, and tables such as the emergency diesels under section 10.

4.12 Jurisdiction

The jurisdiction of this ISTPRM covers the individual components that have met all of the requirements of the construction code. When portions of systems or plants are completed at different times, the jurisdiction of this ISTPRM covers only those components on which all construction code requirements related to the components have been completed and found acceptable. In practice, this means that every safety-related component that becomes introduced via modification or other means has to have met the construction code requirements before it is subjected to IST rules.

4.13 Application

4.13.1 Components Subject to Testing and Examination

The ISTPRM is applicable to the entire population of IST components for both units at Koeberg as specified in this document; the requirements thereof are loaded onto the IST database. The details of the test plans, which include the IST surveillance type and frequency specified in § 4.31.1, are included in the relevant sections, i.e. valves, pumps, and snubbers of this ISTPRM.

4.13.2 Classifications

The safety classification of components at Koeberg has already been determined during construction by the use of ANSI 18.2, which is shown on the piping and instrumentation diagrams (P&IDs). Furthermore, Koeberg used PSA modelling to classify components in accordance with their risk ranking, as detailed in the KLA-001 and KSA-010 documents. Any new component introduced via modification or other means shall adhere to the commissioning classification process. The components to be included in the ISTPRM scope as prescribed by 10CFR50.55a (f) are detailed in § 4.11.

4.14 Referenced Standards and Specifications

The standards and specifications used in this ISTPRM are referenced under § 3.

4.15 Organisational Implementation Responsibilities

Plant Engineering is responsible for the execution of the following tasks detailed below except for a), b), c), and d) which fall within the Nuclear Engineering (i.e. Engineering Programmes (EP) and System Design Engineering (SDE)) domain of responsibilities. These tasks are fundamentally required for the correct implementation of the ISTPRM.

a) Determine the appropriate code safety class in accordance with the requirements specified in § 4.11 and § 4.13.2 for each component, identification of system boundaries for each class of components subject to test or examination, and the components exempt from testing or examination requirements.

b) Design and arrange system components to include allowance for adequate access and clearances, valves, instrumentation, test connections, test loops, the required fluid inventory, etc. to facilitate IST surveillances and examinations.

c) Include the components (pumps, valves, pressure relief devices, and snubbers) in the scope of the ISTPRM.

d) Categorise the components (pumps, valves, pressure relief devices, and snubbers) in accordance to the relevant sections as specified in this document in order to ensure appropriate testing and examination requirements are met.

e) Establish component performance reference values and acceptance criteria.

f) Prepare plans and schedules for testing and for post-repair and replacement.

g) Prepare written instructions and procedures for tests and examinations.

h) Qualify personnel who perform and evaluate examinations and tests in accordance with the Koeberg quality assurance programme (refer to § 2.5.1 a).

i) Qualify the application, method, and capability of each non-intrusive technique.

j) Perform the required tests and examinations.

k) Raise a request to EP to perform an evaluation when an IST requirement implementation cannot be achieved. This request shall be raised before the actual test schedule.

l) Record the results of the required tests and examinations that provide a base line for evaluation, trending and facilitate comparison with the results of subsequent tests or examinations.

m) Evaluate the results of tests and examinations.

n) Keep adequate records of tests and examinations, such as test and examination data and descriptions of the procedures used.

o) Retain all test and examination records for the service lifetime of the component or system.

4.16 Accessibility

This is part of the organisational implementation responsibilities as detailed in § 4.15 above. The details of the specific group's responsibilities are provided in procedure 331-177 [11].

4.20 DEFINITIONS

The definitions of the related terms used in this ISTPRM with their applicable section are summarised in Table 4-1 below in alphabetical order.

Table 4-1
Definitions

Term	Definition	IST Sect
Activation	Change of condition from passive to active, in which the snubber resists rapid displacement of the attached pipe or component	9
Application-induced failures	Failures resulting from environmental conditions or application of the snubber for which it has not been designed or qualified	9
Defined test plan group (DTPG)	Population of snubbers selected for testing in accordance with the 10% or 37 testing sample plan	9
Design or manufacturing failure	Failures resulting from a potential defect in manufacturing or design that give cause to suspect other similar snubbers. This includes failures of any snubber that fails to withstand the environment or application for which it was designed	9

Table 4-1
Definitions

Term	Definition	IST Sect
Diagnostic testing	Testing to determine the cause or mechanism associated with failure, degradation, or performance anomaly of a snubber	9
Drag force	The force that will sustain low-velocity snubber movement without activation throughout the working range of the snubber stroke	9
Equipment dynamic restraint (snubber)	Device that provides restraint to a component or system during the sudden application of forces, but allows essentially free motion during thermal movement	9
Examination/test	Observing, visual monitoring, or measuring to determine conformance to Koeberg's specified requirements	5, 6, 7, 8, and 9
Exercising	Demonstration based on direct visual or indirect positive indications that the moving parts of a component function	6
Failure mode group (FMG)	Group of snubbers that have failed and those other snubbers that have similar potential for similar failure	9
Full-stroke time	The interval from initiation of the actuating signal to the indication of the end of the operating stroke	6
Group A pumps	Pumps that are operated continuously or routinely during normal operation, cold shutdown, or refuelling operations	5
Group B pumps	Pumps in standby systems that are not operated routinely except for testing	5
Hydraulic snubbers	Equipment dynamic restraints in which the load is transmitted through a hydraulic fluid	9
Inaccessible snubbers	Snubbers that are in a high radiation area or other conditions that would render it impractical for the snubbers to be examined under normal plant operating conditions without exposing plant personnel to undue hazards	9
In-service test	Test to assess the operational readiness of a system, structure, or component after first electrical generation by nuclear heat	5, 6, 7, 8, and 9
Instrument loop	Two or more instruments or components working together to provide a single output	5, 6, 7, 8, and 9
Instrument loop accuracy	Accuracy based on the square root of the sum of the squares of the inaccuracies of each instrument or component in the loop when considered separately	5, 6, 7, 8, and 9
Isolated failure	A failure that does not cause other snubbers to be suspect	9
Maintenance	Replacement of parts, adjustments, and similar actions that do not change the design (configuration and material) of a component	5, 6, 7, 8, and 9
Maintenance, repair, and installation-induced failures	Failures that result from damage during maintenance, repair, or installation activities, the nature of which causes other components to be susceptible	5, 6, 7, 8, and 9
Modification	Alteration in the design of a system, structure, or component	5, 6, 7, 8, and 9

Table 4-1
Definitions

Term	Definition	IST Sect
Monitoring	Continuous or periodic observation or measurement to ascertain the performance or obtain characteristics of a system, structure, or component	5, 6, 7, 8, and 9
Non-intrusive testing	Testing performed on a component without disassembly or disturbing the boundary of the component.	5, 6, 7, 8, and 9
Normal operating conditions	Operating conditions during reactor start-up, operating at power, hot standby, reactor cool-down, and cold shutdown	5, 6, 7, 8, and 9
Obturator	Valve closure member (disk, gate, plug, etc.)	6, 7, 8
Operational readiness	The ability of a component to perform its specified design function(s)	5, 6, 7, 8, and 9
Operational readiness testing	Measurement of the parameters that verify component operational readiness	5, 6, 7, 8, and 9
Overpressure protection	Means by which components are protected from overpressure by the use of pressure-relieving devices or other design provisions as required by the BPV code, Section III, or other applicable construction codes	7
Performance testing	Test to determine whether a system or component meets specified acceptance criteria	5, 6, 7, 8, and 9
Plant operation or plant state	Operating conditions at start-up, power, hot standby, and reactor cool-down, as defined by plant operating technical specifications	5, 6, 7, 8, and 9
Power-operated relief valve (PORV)	A device that can perform a pressure-relieving function and is remotely actuated to do so by either a signal from a pressure-sensing device or a control switch. PORVs are not capacity certified	6, 7
Pre-service test	Test performed after completion of construction activities related to the component and before first electrical generation by nuclear heat, or in an operating plant, before the component is initially placed in service	5, 6, 7, 8, and 9
Pre-service test period	The period following completion of construction activities related to the component and before first electrical generation by nuclear heat, in which component and system testing takes place, or in an operating plant before the component is initially placed in service or following a repair, replacement, or modification	5, 6, 7, 8, and 9
Qualitative testing	Testing performed to establish parameters without determining the specific measure of the parameter	5, 6, 7, 8, and 9
Quantitative testing	Testing performed to establish the specific measure or limit of a parameter, such as that required to establish that a parameter is within a specified range	5, 6, 7, 8, and 9
Reactor coolant system pressure isolation (PIV)	That function that prevents intersystem over pressurisation between the reactor coolant system and connected low-pressure system	6
Reference point	A point of operation at which reference values are established and in-service test parameters are measured for comparison with applicable acceptance criteria	5, 6

Table 4-1
Definitions

Term	Definition	IST Sect
Reference values	One or more values of parameters as measured or determined when the equipment is known to be operating acceptably	5, 6
Release rate	The rate of the axial snubber movement under a specified load after activation of the snubber takes place	9
Repair	The process of restoring a degraded item to its original design requirements	5, 6, 7, 8, and 9
Routine servicing	Performance of planned, preventive maintenance	5, 6, 7, 8, and 9
Service life	The period during which an item is expected to meet the operational readiness requirements without maintenance	5, 6, 7, 8, and 9
Service life population	Those snubbers for which the same service life has been established	9
Skid-mounted pumps and valves	Pumps and valves integral to or that supports operation of major components, even though these pumps and valves may not be located directly on the skid. In general, these pumps and valves are supplied by the manufacturer of the major component	5, 6, and 10
Swing clearance	The movement envelope within which the snubber must operate without restriction from the cold installed position to the hot operating position	9
Rod measurement	The movement envelope within which the snubber must operate without restriction, from the cold installed position to the hot operating position	9
System resistance	Hydraulic resistance to flow	5
Trending	A comparison of current data to previous data obtained under similar conditions for the same equipment	5, 6, 7, 8, and 9
Unexplained failure	Failure for which the cause has not been determined	9
Valves, active	Valves that are required to change obturator position to accomplish a specific function in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, or mitigating the consequences of an accident	6, 8
Valves, passive	Valves that maintain obturator position and are not required to change obturator position to accomplish the required function(s) in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, or mitigating the consequences of an accident	6, 8
Vertical line shaft pump	A vertically suspended pump where the pump driver and pump element are connected by a line shaft within an enclosed column.	5

4.30 SPECIFIC GENERAL REQUIREMENTS

4.31 Test and Examination Programme

4.31.1 Test and Examination Plans

The test and examination requirements for each IST component prescribed by the ASME OM code 2004-2006 addenda should be translated into summarised test plans and shall include at least the following items:

a) The applicable testing code edition and addenda;

b) The safety classification of the component;

c) Identification of each IST component (trigram);

d) Specific testing code requirement for each component;

e) Justification for alternative test and examinations in cases where testing code requirements cannot be implemented or it can be met with an alternative way to which prescribed;

f) Code cases to be used; and

g) Test frequency for each component or schedule as applicable.

The above are included in the relevant sections of this ISTPRM.

4.31.2 In-Service Test Interval

The in-service test intervals are every 10 years. They may be extended or decreased by as much as one year. Adjustments shall not cause successive intervals to be altered by more than one year from the original pattern of intervals.

Units that are out of service continuously for six months or more, the in-service interval during which the outage occurred may be extended for a period equivalent to the duration of the outage and the original pattern of intervals extended accordingly for successive intervals. In this regard, Koeberg had a first interval of approximately 12 years (Deviation ISTI-1 applied).

As stated in the engineering letter EA-14-171, the 2nd and the 3rd ISIP intervals will not exceed 20 years ± 1 year (excluding any continuous outage lasting 6 months or more).

Based on the above limitation and with consideration of the current authorised Koeberg production plan the end dates of the 3rd interval and the start date of the 4th interval shall coincide with the end date for outage 222.

4.31.3 Application of Code Cases

As prescribed by 10CFR50.50a(b), the code cases referenced in Regulatory Guide (RG) 1.192, (*Operation and Maintenance Code Case Acceptability for ASME OM Code*) may be used without obtaining further review from the NRC. RG 1.192 lists code cases that are acceptable provided that they

are used in their entirety and with any supplemental conditions specified in the regulatory guide. RG 1.192 also lists code cases which are “conditionally acceptable”, meaning that they are acceptable within prescribed limitations.

The following requirements shall be observed before the use of code cases:

a) Code cases will be documented through amendments to this ISTPRM; or through a Relief/Deviation request to the South African licensing authority (NNR).

b) Code cases that have been selected to be used at Koeberg during a pre-service or in-service test or examination for the 4th IST interval, which are applicable to the code of record ASME OM 2004-2006 addenda, are listed below:

(i) OMN-13 “Requirements for Extending Snubber In-Service Visual Examination (VT3) Interval at LWR Power Plants”.

- This code case is acceptable for use and listed in the RG 1.192. I&T shall incorporate the contents of this code case into the current working procedures.

(ii) OMN-16 “Use of Pump Curve for Testing”

- This code case is acceptable for use and listed in the RG 1.192. I&T shall incorporate the contents of this code case into the current working procedures.

(iii) OMN-19 “Alternative Upper Limit for Comprehensive Pump Test”

- This code case was developed and has already been published in the ASME OM-2012 edition which is not yet incorporated by reference into 10CFR 50.55a. Due to the NRC back log, this code case is currently not listed in RG 1.192. The Deviation to use this code case is documented in Appendix 4-2 for NNR approval.

(iv) OMN-20 “Use of the Tolerance Grace on the Testing Frequency of Pumps and Valves”

- This code case has not been listed in the RG 1.192, however, the NRC has granted relief to many utilities in the USA. The Deviation to use this code case is documented in Appendix 4-3 for NNR approval.
- Work control department is required to strictly adhere to the requirements of code case OMN-20 (once approved by the NNR) and the clarification of the practical use of this tolerance as detailed in § 2.5.4.

4.31.4 Application of Revised Code Cases

Superseded code cases approved for use in accordance with § 4.31.3 may still to be used.

4.31.5 Application of Annulled Code Cases

Code cases approved for use in accordance with § 4.31.3 and § 4.31.4 may be used after annulment for the duration of that test plan. In practice, this means that all the code cases declared in § 4.31.3 b) will be used for the entire duration of the 4th interval, even if it has been annulled during the interval.

4.31.6 Test and Examination Procedures

All IST-related tests and examinations shall be conducted in accordance with written procedures. In addition to the test requirements, the procedures shall clearly state the acceptance criteria and how they should be applied. The acceptance criteria established for IST, which are specified in the respective sections of the ISTPRM, are based on the OM code provisions or limits specified in OTS, SAR, SRSM, protection files, or other licensing bases, whichever are more conservative. The acceptance criteria derived from ranges or multiples of reference values in the ASME OM code shall be adjusted if necessary, to ensure that the limits specified in the licensing basis are not exceeded. To this end, I&T in cooperation with EP, shall credit other statutory surveillance requirements where possible instead of duplicating testing activities for different programmes.

4.32 Administrative Requirements

The IST plans and schedules detailed in this ISTPRM are submitted to the NNR for review and comments. The IST requirements compiled in this ISTPRM are at all times subject to the review of the NNR site inspector.

4.33 Corrective Actions

Corrective actions involving repair/replacement or modification shall be taken in accordance with the ISIPRM, which is based on ASME XI and will be governed by the modification process used at Koeberg. Other types of corrective action related to plant conditions shall be taken in accordance with the appropriate Koeberg standards and processes such as KAA-690, KAA-688, KAA-709 and others.

4.40 INSTRUMENTATION AND TEST EQUIPMENT

4.41 Range and Accuracy

In addition to the accuracy limit specified under the different section for the different test parameters, the instrumentation and test equipment used in performing the examination and testing programme shall have the range and accuracy necessary to demonstrate conformance to specific examination or test requirements. In practice, this means that every instrument used to implement an IST examination or test shall conform to the Eskom and Koeberg quality assurance programme as referenced in [8].

4.42 Calibration

Similar to the requirements stated in § 4.41 above, all instruments and test equipment used in performing the examination and test programme shall be calibrated and controlled in accordance with Koeberg’s administrative procedures or a quality assurance programme.

4.90 RECORDS AND REPORTS

4.91 Scope of Records

The requirements for retention and other requirements associated with IST records apply to those records generated in the course of performing the pre-service and in-service tests and examinations required by this ISTPRM.

4.92 Requirements

4.92.1 Organisational Implementation Responsibilities

In order to meet the intent of the IST requirements for examinations and tests, I&T shall be responsible for implementing the following:

a) developing the plans (service notes, SAP images) for every IST requirement (pre-service and in-service);

b) requesting the relevant group e.g. Maintenance, to raise the service notes if the activity falls outside the mandate of I&T, e.g. functional test of safety relief devices; and

c) preparing and retaining records of all IST pre-service and in-service tests and examinations.

For further details of the specific roles and responsibilities, refer to procedure 331-177 [11].

4.92.2 Preparation

In conjunction with the relevant test requirements contained in the different sections of this document, all test and examination records shall have at least the following info:

a) date of record completion;

b) component designation;

c) test identification number.

4.92.3 In-Service Test and Examination Results

The results of tests and examinations shall be documented and shall include at least the following:

a) equipment identification;

b) date of test or examination;

c) reason for test or examination (for example, post-maintenance, routine in-service test or examination, and establishing reference values);

d) the test examination procedure used;

e) the identification of the test equipment used;

f) calibration records;

g) values of the measured parameters;

h) comparison with allowable ranges of test and examination values, and analysis of deviations;

i) requirement for corrective action;

j) printed or typed name and signature of the person(s) responsible for conducting and analysing the test and examination.

4.92.4 Record of Corrective Actions

I&T shall be responsible for maintaining the IST records related to any corrective action. These records shall include a summary of the corrective actions taken, the subsequent in-service test or examination, confirmation of operational adequacy, and the printed or typed name and signature of the person(s) responsible for the corrective action and the verification of results.

4.93 Retention of IST Records

4.93.1 Maintenance of Records

I&T shall retain the records listed in § 4.93.3 as a minimum. The records shall be filed and maintained. I&T shall provide suitable protection from deterioration and damage for all records in accordance with Koeberg's quality assurance programme for the service lifetime of the component or system. Storage shall be either at the plant site or at another location that meets the access requirements and the requirements of the quality assurance programme.

4.93.2 Reproduction of Records

Records shall be either the original or a legible copy of the original.

4.93.3 Test and Examination Records

I&T shall be responsible for designating the records to be maintained. Such records shall include the following as a minimum:

a) An index-to-record file (identification reference to facilitate gaining access);

b) Test plans (SAP work orders);

c) Test and examination results (data sheet and related documents and engineering letters, if applicable); and

d) Records of corrective actions (evaluation reports, analysis, etc.).

APPENDIX 4-1
TESTING INTERVAL DEVIATION
ISTI-1

Deviation No. ISTI-1 – The Accepted First Interval of 12 Years Places Koeberg Outside of ASME OM, ISTA-3120

A4-1.1 ASME OM Code Components Affected

Koeberg Nuclear Power Station: Class 1, 2 and 3 Components.

A4-1.2 Applicable Code Edition and Addenda

ASME OM, 2004 Edition (up to and including 2006 addenda).

A4-1.3 Applicable Code Requirement

ASME OM, ISTA-3120

A4-1.4 Reason for Request

A4-1.4.1 Background

According to ISTA-3120(d), for components tested/inspected under the IST programme, each of the inspection test intervals may be extended by as much as 1 year and reduced without restriction. Successive test intervals shall not extend more than 1 year beyond the original pattern of 10-year intervals and shall not exceed 11 years in length. According to ASME OM ISTA 3120(e), in addition to the interval adjustment allowed according to ISTA-3120(d), for power units that are out of service continuously for 6 months or more, the inspection test interval during which the outage occurred may be extended for a period equivalent to the outage and the original pattern of intervals extended accordingly for successive intervals.

Koeberg through Waiver 069/1 (reflected in deviation DV-3-ISI-20) has a first interval of approximately 12 years and the original pattern of intervals is extended accordingly for successive intervals. The second interval for units 1 and 2 were to be completed within 11 years of the start of the interval, when the 12 month extension allowed by ASME OM ISTA-3120 (d) is applied. Eskom applied the 1-year extension to both units and further exceeded the 11 years on unit 1 by about 3 months when considering outage 116 to be completed by the end of October 2007. As a result of this extension beyond 11 years, it was necessary that Eskom started the third interval at the beginning of outage 116 which accommodated the second and third interval outage requirements.

APPENDIX 4-1
TESTING INTERVAL DEVIATION
ISTI-1

Recognising that the 1-year tolerance was used during the 2nd interval, the 3rd interval completion dates was scheduled such that the interval lasted 9 years, so that the combined 2nd and 3rd Intervals are a nominal 20 years (plus the 1-year tolerance if desired).

A4-1.4.2 Request

The objective of this submittal is to document the deviation to ASME OM ISTA 3120 of the start of the 4th interval, which is 32 nominal years of plant life as opposed to 30 nominal years as a result of the altered pattern of successive interval start dates due to the 1st interval at Koeberg being 12 years.

A4-1.5 Basis for Use

Eskom may choose to shorten (unrestricted) or extend the nominal 10 year 4th Interval for Koeberg by 1 year on the basis that the maximum duration of the 2nd, 3rd, and 4th intervals combined is 31 years.

A4-1.6 Duration of Proposed deviation

This deviation is applicable for the duration of the 4th interval in-service testing programme.

A4-1.7 References

- ASME OM, 2004 Edition (up to and including 2006 Addenda)
- USNRC Code of Federal Regulations, 10 CFR 50.55a
- KBA 0028 NES MA IST 01: Third Interval In-Service Testing Programme Requirements Manual
- 240-110745414 (KSA-021) Standard for the In-Service Inspection Programme at Koeberg Nuclear Power Station

APPENDIX 4-2
CODE CASE DEVIATION
CCD-1

Page 1 of 4

Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(i) Alternative Provides Acceptable Level of Quality and Safety.

The alternative is to use the code case OMN-19 "Alternative Upper limit for the Comprehensive Pump Test"

A4-2.1 ASME Code Components Affected

IST Pumps (units 1 and 2)	Design Flow (t/h)	IST Pumps (units 1 and 2)	Design Flow (t/h)	IST Pumps (units 1 and 2)	Design Flow (t/h)
ASG 001 PO	90	REA 004 PO	13.6	SEC 001PO	2500
ASG 002 PO	90	RIS 001 PO	910	SEC 002 PO	2500
ASG 003 PO	180	RIS 002 PO	910	SEC 003 PO	2500
PTR 001 PO	360	RRA 001 PO	910	SEC 004 PO	2500
PTR 002 PO	360	RRA 002 PO	910	SEC 005 PO	32.84 Ref Head
RCV 001PO	160	RRI 001 PO	2061	SEC 006 PO	32.84 Ref Head
RCV 002 PO	160	RRI 002 PO	2061	SEC 007 PO	32.84 Ref Head
RCV 003 PO	160	RRI 003 PO	2061	SEC 008 PO	32.84 Ref Head
REA 003 PO	13.6	RRI 004 PO	2061		

A4-2.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition, 2006 Addenda

A4-2.3 Applicable Code Requirements

ISTB section Table ISTB-5121-1, "Comprehensive Test Procedure (CPT)" "Centrifugal Pump Test Acceptance Criteria" that requires an upper required action limit of 1.03 Q_r and 1.03 DP_r where Q_r is the reference flow rate and DP_r is the reference differential pressure.

ISTB section Table ISTB-5221-1, "Comprehensive Test Procedure" "Vertical Line Shaft Centrifugal Pump Test Acceptance Criteria" that requires an upper required action limit of 1.03 Q_r and 1.03 DP_r where Q_r is the reference flow rate and DP_r is the reference differential pressure.

APPENDIX 4-2
CODE CASE DEVIATION
CCD-1

A4-2.4 Reason for Request

The initial intent of the CPT requirement was to address the limited ability of detecting deterioration of pumps using only minimum flow lines in the low-flow region of the pump curve. The testing of pumps at close to their design flow rates, which is normally on the portion of the pump curve which is well sloped, increases the performance test sensitivity, thus allowing better detection of deviation from the original OEM pump curve. This deviation may be an indication of pump degradation. The CPT imposes an absolute upper limit of 1.03, which very penalising compared to Group A test upper limit of 1.10.

In accordance with the code requirement, if the 1.03 CPT upper limit is exceeded, this will cause the pump to be in the “required action range” which essentially means the pump is inoperable. Generally, the CPT at Koeberg is performed during outages, declaring the pump inoperable based on an over performance excess is not sensible as it is not a sign of degradation. This will result in considerable outage delays.

The ASME Committee on OM developed ASME OM Code Case OMN-19 and published it in the 2011 Addenda of the ASME OM Code. OMN-19 code case allows the use of a multiplier of 1.06 times the reference value in lieu of the 1.03 multiplier for the CPT upper “Acceptable Range” criteria and “Required Action Range, High” criteria referenced in Table ISTB-5121-1 and Table ISTB-5221-1.

Since the inception of the 1.03 CPT upper limit requirement, many utilities worldwide and at Koeberg experienced great difficulties in meeting this criterion. Koeberg, during outages 118 and 217, had to justify the operability of RCV pumps under waivers W017/3 and W024/3 due to the pumps exceeding the upper limit of 1.03. In addition, many CPT results are on the border of the 1.03 limit hence Koeberg often run the risk of exceeding it. The aforementioned waivers were for administrative purposes only as the over performance of a pump is theoretically impossible without a major hydraulic unit and/or motor speed modification, which were not the case in these instances. Thus, the over performance experienced was directly associated with instrument inaccuracies, which could become significant at certain points of the pump head – flow reference curve. The test configuration (plant line-up) could also influence the CPT results.

Compliance to the code CPT upper limit of 1.03 is impractical, hence this Deviation is sought to use an upper limit of 1.06 as detailed in code case OMN-19.

A4-2.5 Proposed Alternative and Basis for Use

The code requires that every IST pump be tested in a region of ± 20% of its design flow where a reference flow (Q_r) and a differential pressure (DP_r) are established. In subsequent tests, the pump should be run at the same flow Q_r and any deviation of $DP_r > 1.03$ will render the pump inoperable.

APPENDIX 4-2
CODE CASE DEVIATION
CCD-1

The difficulty of not exceeding the 1.03 limit arises when normal data scatter yields a low measured reference value on either flow or differential pressure which could be high when compared to the actual measured values for subsequent in-service tests. In these cases, some of the test data trend high near the upper required action range limit and may exceed the upper limit on occasion. The problem can be more severe for pumps with low differential pressures due to the smaller acceptable range.

Theoretically, the over performance (more than the 100% limit) of a pump is impossible unless major intervention takes place on the hydraulic unit or the motor. The only reason that the upper limit of 1.03 is set by the code is to ensure that the instrument accuracies stipulated by the code are respected and the test repeatability in terms of plant configuration is assured.

The evaluation of the pump performance historical trends of Koeberg from the second IST interval shows that in many instances the performance of pumps exceeded the 1.03 threshold (refer to the table below for a sample from unit 1 pumps, similar examples are found in unit 2 pumps); these results were then acceptable as the upper limit was set to 1.10. The test results in the table below are expressed in percentages.

Trigramme	Test Date	Pump Results (%)
1 ASG 001 PO	2007/08/13	103.35
1 ASG 003 PO	2003/03/01	103.59
1 PTR 001 PO	2000/10/03	105.33
1 PTR 001 PO	2001/01/02	104.99
1 PTR 001 PO	2007/10/22	104.16
1 RCV 001 PO	1995/04/11	105.1
1 RCV 001 PO	1996/07/12	105.1
1 RCV 001 PO	2000/05/11	104.3
1 RCV 001 PO	2003/02/15	105.37
1 RCV 001 PO	2004/04/07	103.75
1 RCV 001 PO	2010/10/05	105.58
1 REA 003 PO	1999/08/12	103.16
1 RRA 001 PO	2003/08/07	104.39
1 RRA 001 PO	2001/09/10	109.74
1 RRA 001 PO	2001/10/10	108.51
1 RRA 001 PO	2006/04/11	106.96

APPENDIX 4-2
CODE CASE DEVIATION
CCD-1

The US NRC in their document NUREG 1482 § 5.5.1 (range and accuracy of instruments) clarifies that by using the ranges allowed by the code, the overall uncertainty on the instrumentation alone could easily exceed the 3% CPT upper limit. Under the same paragraph, the US NRC staff stated that they will consider granting relief to utilities when the combination of the range and accuracy yields a reading that is at least equivalent to that achieved using instruments that meet the code requirements.

The intent of code surveillances in general and in this particular case, the CPT pump test is to detect and monitor any degradation that could jeopardise the safety function of the safety related pump. Therefore, the establishment of the true reference values and the subsequent CPT test results are thoroughly monitored not to be lower than 0.93 of the reference value. In fact, the alarm will be raised by the IST engineer when the 0.95 threshold is reached based on the current engineering practice to provide the component engineer enough time to make an informed decision on pump overhaul schedule. In summary, for degradation monitoring purposes, the lower limit of the CPT is more relevant.

The NRC has determined that licensees choosing to implement OMN-19 must implement a pump periodic verification (PPV) test programme to verify that a pump can meet the required differential (or discharge) pressure as applicable, at its highest design basis accident flow rate. However, this is not required at Koeberg as all the design basis accident flow rate stipulated in the SAR is bounded by the CPT or Group A test except for the EAS pumps which are excluded from the scope of pumps for which the code case OMN-19 will be applicable to as detailed in the table under A4-2.1 above.

Based on the information provided above, compliance with the code requirements is impractical and the proposed alternative provides reasonable assurance of the operational readiness of the IST pumps.

A4-2.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A4-2.7 Precedents

A similar relief was sought during the 3rd IST interval.

The NRC has granted approval to use the code case OMN-19 to many utilities in the US. Refer to the NRC web site to retrieve the NRC approval letters.

A4-2.8 References

- NUREG 1482
- NRC web site

APPENDIX 4-3
CODE CASE DEVIATION
CCD-2

Proposed Alternative in Accordance with 10 CFR 50.55a(a)(3)(i) Alternative Provides Acceptable Level of Quality and Safety.

The alternative is to use the code case OMN-20 "Use of the grace period on IST surveillance frequencies"

A4-3.1 ASME Code Components Affected

The entire IST scope (all sections) except for snubbers.

A4-3.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A4-3.3 Applicable Code Requirements

All testing frequencies stipulated in the code subsections ISTB, ISTC, Appendix I and Appendix II.

A4-3.4 Reason for Request

When consideration is given to plant operating conditions, e.g. transients, long maintenance activities, different plant states and operating regimes, it becomes difficult to strictly adhere to the testing frequencies stipulated in the code. In order to facilitate the surveillances scheduling and to prevent violation of code requirements, a grace period on the IST surveillances frequencies is needed. Hence, this Deviation is sought to allow some flexibility on the IST surveillance frequencies.

A4-3.5 Proposed Alternative and Basis for Use

Even though this grace is unnecessary for the US plants as it is already included in their technical specification (TS) which encompasses the IST surveillances, the NRC has granted relief to use the code case OMN-20 for many utilities. Refer to the NRC website to retrieve examples of this approval. This practice is also granted by the current SRSM [30] where a 25% tolerance is permitted on every SRSM surveillance frequency.

In order to alleviate difficulty associated with possible plant trips and risks related to systems and components malfunction when implementing an IST requirement at a fixed frequency, it is proposed to make use of the grace period as detailed in the code case OMN-20. If this grace is granted by the NNR, Koeberg commits not to use it in cumulative way. This will be ensured by adherence to KAA-835 [12] to monitor and timely execute all statutory work activities and the reporting of any non-compliance thereof.

Based on the information provided above, compliance with the code requirements related to the strict adherence to the testing frequencies is impractical and the proposed alternative does provide an acceptable level of quality and safety. Compliance with the Code requirement would result in an unusual difficulty without a compensating increase in the level of quality and safety.

APPENDIX 4-3
CODE CASE DEVIATION
CCD-2

A4-3.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A4-3.7 Precedents

This grace was used before as it was incorporated in the ISTPRM 3rd Interval.

A4-3.8 References

- SRSM
- ISTPRM 3rd Interval
- NUREG 1482
- NRC web site

SECTION 5

In-Service Testing of Pumps

5. IN-SERVICE TESTING REQUIREMENTS OF PUMPS

5.10 INTRODUCTION

For reference purposes, the format and the numbering system of the ASME OM code headings are retained in this section with the following change: ISTB is replaced by number 5 and the subsection numbers are reduced, i.e. ISTB-1000 is now 5.10.

Furthermore, in order to avoid duplication, similar requirements for different pump types are grouped under one subsection as applicable, thus making the structure different from that of the ASME OM code (ISTB). The general and specific requirements are detailed under the same paragraph. An example of this is; section ISTB-5000 of the code is summarised under § 5.32.

Requirements not applicable to Koeberg are omitted, with a result that the numbering system in this section does not necessarily follow a chronological order.

5.11 Applicability

This section applies to safety class 2 and 3 centrifugal and vertical shaft pumps that have an emergency power source and that are required to perform at least one of the functions specified in the general IST scope requirements § 4.11.

> *NOTE: The IST pump scope does not contain positive displacement and reciprocating positive displacement pumps, therefore all the code requirements associated with these two types of pumps have been omitted from this section.*

A complete list of pumps in the scope of the ISTPRM and their associated required tests are listed in Appendix 5-1.

5.12 Exclusions

a) Drivers, except where the pump and driver form an integral unit and the pump bearings are in the driver;

b) Pumps supplied with emergency power solely for operating convenience; and

c) Skid-mounted pumps and component subassemblies that are tested as part of the major component.

5.13 Pump Categories

All the IST pumps selected in accordance with § 4.11 and § 5.11 shall be categorised as either group A or group B pumps, based on their frequency of being in operation. These groups are then used to determine the test frequency, the test parameters measured, and the acceptance criteria.

5.14 Organisational Implementation Responsibility

In addition to the responsibilities detailed under § 4.15, I&T is responsible for performing the following tasks in order to facilitate meeting the requirements of this section:

a) Ensure that the necessary test points, instrumentation, and test loops are available and functional.

b) Categorise all IST pumps in accordance with the definitions of § 5.20 and develop a record of each IST pump in accordance with § 5.90. A pump that meets both group A and group B pump definitions shall be categorised as a group A pump.

5.20 DEFINITIONS

The following definitions are repeated below in order to be consistently used in this section:

a) *Group A pumps*: pumps that are operated continuously or routinely during normal operation, cold shutdown or refuelling.

b) *Group B pumps*: pumps in standby systems that are not operated routinely except for testing.

c) *Vertical Line Shaft pump* (VLS): a vertically suspended pump where the pump driver and pump element are connected by a line shaft inside an enclosed column.

5.30 GENERAL TESTING REQUIREMENTS

The intent of pump testing is to detect deviation from reference values of the hydraulic and the mechanical condition of IST pumps. Pump-testing requirements vary, based on the type of pump and the type of test to be performed. There are four different types of pump tests that may be required, depending on the pump group and the reason for the test. These pump test types are: *pre-service test*, *group A test*, *group B test*, and *comprehensive test*. The *pre-service test* is a condition-based test (following maintenance activities that may have modified the pump's performance), also termed a *re-qualification test* at Koeberg. The remaining test types are considered in-service tests and are frequency-based tests.

The test parameters to be measured during pre-service and in-service testing are specified in Table 5-3000-1.

Table 5-3000-1
Test parameters to be measured during pre-service and in-service testing

Quantity	Pre-Service Test	Group A Test	Group B Test	Comprehensive Test	Remarks
Speed, N	X	X	X	X	If variable speed
Differential pressure, ΔP	X	X	X (1)	X	Centrifugal pumps, including vertical line shaft pumps
Flow rate, Q	X	X	X (1)	X	
Vibration, displacement, V_d velocity, V_v	X	X		X	Measure either V_d or V_v Peak-to-peak Peak or (RMS)(2)

NOTE:
(1) Differential pressure or flow rate shall be measured or determined.
(2) Refer to the vibration measurement requirements detailed in § 5.35.4.

5.31 Pre-Service Testing (PST) Requirements for Centrifugal and Vertical Line Shaft Pumps

In order to credit a PST requirement, the following steps shall be observed (as applicable):

a) Before fulfilling the in-service testing requirements, an initial set of reference values shall be established for each pump, which values are referred to as PST reference values. These tests shall be conducted under conditions as near as practicable to those expected during subsequent in-service testing.

b) Except as specified in § 5.33.1, only one PST is required for each pump. The requirements for establishing a set of reference values for each IST pump are detailed in § 5.33.

c) The test parameters to be measured are those listed group A, group B, and comprehensive tests shown in Table 5-3000-1.

d) For pumps where the system resistance can be varied, the flow rate and differential pressure shall be measured at a minimum of five points. A pump curve shall be established, based on the measured points and at least one point shall be designated as the reference point. If practical, these points shall be from pump minimum flow to at least pump design flow. A pump curve need not be established for pumps in systems where resistance cannot be varied.

e) Vibration measurements are only required to be taken at the reference point(s).

f) A bypass test loop may be used, if the flow rate through the loop meets the requirements of § 5.33.

5.32 In-Service Testing (IST) Requirements for Centrifugal and Vertical Line Shaft Pumps

The in-service testing shall commence when the pump is required to be operable (refer to § 5.11). The requirements of the different IST pump types (groups A, B, and comprehensive) related to the different type of pumps (centrifugal and vertical line shaft) are stated in § 5.32.1, § 5.32.2, and § 5.32.3.

5.32.1 Group A Test Procedure

The group A tests shall be conducted with the pump operating at a specified reference point. I&T shall develop and stipulate these reference points in the relevant pump test procedure.

After pump conditions are as stable as the system permits at the specified reference point, the pump shall be run for at least two minutes. The test parameters specified in Table 5-3000-1 shall be determined and recorded in accordance with the following requirements:

a) The pump shall be operated at nominal motor speed for constant speed drives or at a speed adjusted to the reference point (± 1%) for variable speed drives.

b) The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate may be varied until the differential pressure equals the reference point and the flow rate is determined and compared to its reference value.

c) Where resistance cannot be varied, flow rate and pressure shall be determined and compared to their respective reference values.

d) Vibration (displacement or velocity) shall be determined and compared with the reference value in accordance with the Koeberg implementation procedure KWM-RM-VIB-001[23]. Refer to the requirements for vibration measurement specified in § 5.35.4.

e) All deviations from the reference values shall be compared with the ranges in Table 5-5121-1 or Table 5-5221-1 as applicable and corrective action taken as specified in § 5.62.

f) The vibration measurements shall be compared to both the relative and absolute criteria shown in the alert and required action ranges.

g) A bypass test loop may be used, if the flow rate through the loop meets the requirements of § 5.33.

5.32.2 Group B Test Procedure

The group B tests shall be conducted with the pump operating at a specified reference point. I&T shall stipulate these reference points in the relevant pump test procedure.

After pump conditions are as stable as the system permits at the specified reference point, the pump shall be run for at least two minutes. The test parameters specified in Table 5-3000-1 shall be determined and recorded in accordance with the following requirements:

a) The pump shall be operated at nominal motor speed for constant speed drives or at a speed adjusted to the reference point (± 1%) for variable speed drives.

b) The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate may be varied until the differential pressure equals the reference point and the flow rate is determined and compared to its reference value.

c) Where resistance cannot be varied, the flow rate and pressure shall be determined and compared to their respective reference values.

d) All deviations from the reference values shall be compared with the ranges in Table 5-5121-1 or Table 5-5221-1 as applicable and corrective action taken as specified in § 5.62.

e) A bypass test loop may be used, if the flow rate through the loop meets the requirements of § 5.33.

5.32.3 Comprehensive Test Procedure

The comprehensive tests shall be conducted with the pump operating at a specified reference point. I&T shall stipulate these reference points in the relevant pump test procedure.

After pump conditions are as stable as the system permits at the specified reference point, the pump shall be run for at least two minutes. The test parameters specified in Table 5-3000-1 shall be determined and recorded in accordance with the following requirements:

a) The pump shall be operated at nominal motor speed for constant speed drives or at a speed adjusted to the reference point (± 1%) for variable speed drives.

b) The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate may be varied until the differential pressure equals the reference point and the flow rate is determined and compared to its reference value.

c) Where resistance cannot be varied, the flow rate and pressure shall be determined and compared to their respective reference values.

d) Vibration (displacement or velocity) shall be determined and compared with the reference value in accordance with the Koeberg implementation procedure KWM-RM-VIB-001. Refer to the requirements for vibration measurements specified in § 5.35.4

e) All deviations from the reference values shall be compared with the ranges in Table 5-5121-1 or Table 5-5221-1 as applicable and corrective action taken as specified in § 5.62.

f) The vibration measurements shall be compared to the relative and the absolute criteria shown in the alert and required action ranges.

g) A bypass test loop may be used, if the flow rate through the loop meets the requirements of § 5.33.

5.32.4 Acceptance Criteria

The in-service testing results shall be compared to the ranges specified in Table 5-5121-1 for centrifugal pumps and Table 5-5221-1 for vertical line shaft centrifugal pumps.

Table 5-5121-1

Centrifugal pump test acceptance criteria

Test Type	Pump Speed	Test Parameter	Acceptable Range	Alert Range	Required Action Range	
					Low	High
Group A Test (1)(2)(3)	N/A	Q	0,90 to 1,10 Q_r	None	< 0,90 Q_r	> 1,10 Q_r
	N/A	ΔP	0,90 to 1,10 ΔP_r	None	< 0,90 ΔP_r	> 1,10 ΔP_r
	≥ 600 r/min	V_v or V_d	≤ 2,5 V_r	>2,5 V_r to 6 V_r or > 0,325 to 0,7 in./s (0,8 to 1,7 cm/s)(peak) = 0.56 to 1.2 cm/s (RMS)	None	> 6 V_r > 0,7 in./s (1,7 cm/s)(peak) = 1.2 cm/s (RMS)
Group B Test	N/A	Q or	0,90 to 1,10 Q_r	None	< 0,90 Q_r	> 1,10 Q_r
	N/A	ΔP	0,90 to 1,10 ΔP_r	None	< 0,90 ΔP_r	> 1,10 ΔP_r
Comprehensive Test (1)(2)(3)	N/A	Q	0,94 to 1,03 Q_r	0,90 to < 0,94 Q_r	< 0,90 Q_r	> 1,03 Q_r
	N/A	ΔP	0,93 to 1,03 ΔP_r	0,90 to < 0,93 ΔP_r	< 0,90 ΔP_r	> 1,03 ΔP_r
	≥ 600 r/min	V_v or V_d	≤ 2,5 V_r	> 2,5 V_r to 6 V_r or > 0,325 to 0,7 in./s (0,8 to 1,7 cm/s)(peak) = 0.56 to 1.2 cm/s (RMS)	None	> 6 V_r > 0,7 in./s (1,7 cm/s)(peak) = 1.2 cm/s (RMS)

The subscript *r* denotes reference value, the subscript *v* denotes vibration velocity reference value, and the subscript *d* denotes displacement.
NOTES:
(1) V_r is vibration reference value in the selected units.
(2) Refer to Figure 5-5223-1 to establish the velocity limits.
(3) The acceptance criteria ranges shall be truncated if necessary to ensure licensing basis limits are not exceeded.

Table 5-5221-1
Vertical Line Shaft (VLS) Centrifugal Pump Test Acceptance Criteria

Test Type	Pump Speed	Test Parameter	Acceptable Range	Alert Range	Required Action Range	
					Low	High
Group A Test[(1)(2)(3)]	N/A	Q	0,95 to 1,10 Q_r	0,93 to < 0,95 Q_r	< 0,93 Q_r	> 1,10 Q_r
	N/A	ΔP	0,95 to 1,10 ΔP_r	0,93 to < 0,95 ΔP_r	< 0,93 ΔP_r	> 1,10 ΔP_r
	≥ 600 r/min	V_v or V_d	≤ 2,5 V_r	> 2,5 V_r to 6 V_r or > 0,325 to 0,7 in./s (0,8 to 1,7 cm/s)(peak) = 0.56 to 1.2 cm/s (RMS)	None	> 6 V_r > 0,7 in./s (1,7 cm/s)(peak) = 1.2 cm/s (RMS)
Group B Test	N/A	Q or	0,90 to 1,10 Qr	None	< 0,90 Q_r	> 1,10 Q_r
	N/A	ΔP	0,90 to 1,10 ΔP_r	None	< 0,90 ΔP_r	> 1,10 ΔP_r
Comprehensive Test [(1)(2)(3)]	N/A	Q	0,95 to 1,03 Q_r	0,93 to < 0,95 Q_r	< 0,93 Q_r	> 1,03 Q_r
	N/A	ΔP	0,95 to 1,03 ΔP_r	0,93 to < 0,95 ΔP_r	< 0,93 ΔP_r	> 1,03 ΔP_r
	≥ 600 r/min	V_v or V_d	≤ 2,5 V_r	> 2,5 Vr to 6 V_r or > 0,325 to 0,7 in./s (0,8 to 1,7 cm/s)(peak) = 0.56 to 1.2 cm/s (RMS)	None	> 6 V_r > 0,7 in./s (1,7cm/s)(peak) = 1.2 cm/s (RMS)

The subscript *r* denotes reference value, the subscript *v* denotes vibration velocity reference value, and the subscript *d* denotes displacement.
NOTES:
(1) V_r is vibration reference value in the selected units.
(2) Refer to Figure 5-5223-1 to establish the velocity limits.
(3) The acceptance criteria ranges shall be truncated if necessary to ensure licensing basis limits are not exceeded.

5.33 Reference Values

Reference values shall be obtained as follows:

a) Initial reference values shall be determined from the results of pre-service tests meeting the requirements specified in § 5.31 or from the results of the first in-service test.

b) New or additional reference values shall be established in accordance with the requirements specified in § 5.33.1, § 5.33.2, and § 5.62 c).

c) Reference values shall be established only when the pump is known to be operating acceptably.

d) Reference values shall be established at the point(s) of operation (reference point) readily duplicated during subsequent tests.

e) Reference values should be established in the region(s) of relatively stable pump flow:

1. Reference values shall be established within ± 20% of the pump design flow rate for the comprehensive test;

2. Reference values shall be established within ± 20% of design flow for group A and group B pumps, if practical. If not practical, the reference flow rate shall be established at the highest practical flow rate.

f) All subsequent test results shall be compared to these initial reference values or to new reference values established in accordance with § 5.33.1, § 5.33.2, and § 5.62 c).

g) If the particular parameter being measured or determined can be significantly influenced by other related conditions, then these conditions shall be analysed and documented in the record of test in accordance with § 5.64.

5.33.1 Effect of Pump Replacement, Repair, and Maintenance on Reference Values

a) When a reference value or set of reference values may have been affected by the repair, replacement, or routine servicing of a pump, a new reference value or set of reference values shall be determined in accordance with § 5.31 or the previous value reconfirmed by a comprehensive or group A test run before declaring the pump operable.

b) The component engineer (CE) shall determine whether the requirements for pre-service testing specified in § 5.31 to re-establish the reference values apply.

c) Deviations between the previous reference values and new values shall be evaluated, and verification that the new values represent acceptable pump operation shall be placed in the record of test in accordance with § 5.90.

5.33.2 Establishment of Additional Set of Reference Values

If it is considered necessary or desirable for a reason other than those specified in § 5.33.1 to establish an additional set of reference values, a group A or comprehensive test shall be performed at the conditions of an existing set of reference values and the results analysed. If operation is acceptable in accordance with § 5.62, an additional set of reference values may be established as follows:

a) For centrifugal and vertical line shaft pumps, the additional set of reference values shall be determined from the pump curve established during pre-service testing in accordance with § 5.31 or in-service testing in accordance with § 5.32. Vibration acceptance criteria shall be established by a group A or comprehensive test at the new reference point. If vibration data were taken at all points used in determining the pump curve, an interpolation of the new vibration reference value is acceptable;

b) A requalification test shall be run to verify the adequacy of new reference values as these relate to the pump and/or system operability readiness before their implementation. Whenever an additional set of reference values is established, the reason for so doing shall be justified and documented in the record of test in accordance with § 5.92.

5.34 Frequency of In-Service Tests

In addition to the test frequencies specified in Table 5-3400-1, the following are applicable:

a) The pre-service tests shall be performed during the pre-service period or before the implementation of in-service testing as detailed in § 5.31 or as warranted by a repair or replacement in accordance with § 5.33.1.

b) The in-service tests shall commence when the pumps are required to be operable.

Table 5-3400-1
In-service test frequency

Pumps Test Type	Test Frequency	Comments
Group A and Group B	Quarterly (every 3 months)	Except if there is a plant limitation hardship, which is justified under a Deviation or as provided in §5.34.1 and §5.34.2.
Comprehensive	2-yearly	At Koeberg, this is done every refuelling outage.

5.34.1 Pumps in Regular Use

Group A pumps that are operated more frequently than every three months need not be run or stopped for a test, provided that the plant records show the pump was operated at least once every three months at the reference conditions and that the quantities specified were determined, recorded and analysed in accordance with § 5.60.

5.34.2 Pumps in Out-of-Service Systems

The test schedule need not be followed for a pump in a system that has been declared inoperable or when it is not required to be operable. The pump shall be tested within three months before the system is placed in an operable status and then the normal test schedule shall be followed. Pumps that can only be tested during plant operation shall be tested within one week following plant start-up.

5.35 Data Collection

5.35.1 General

a) Accuracy

Instrument accuracy shall be within the limits specified in Table 5-3510-1. If a parameter is determined by analytical methods instead of by measurement, the determination shall meet the requirements of Table 5-3510-1 (for example the flow rate determination shall be accurate to within ± 2% of actual). For individual analogue instruments, the required accuracy is a percentage of the full scale. For digital instruments, the required accuracy is over the calibrated range. For a combination of instruments, the required accuracy is loop accuracy.

Table 5-3510-1
Required instrument accuracy

Test Parameter	Group A and Group B Tests (%)	Comprehensive and Pre-Service Tests (%)
Pressure	± 2	± ½
Flow Rate	± 2	± 2
Speed	± 2	± 2
Vibration	± 5	± 5
Differential Pressure	± 2	± ½

b) Instrument Range (excluding vibration instruments)

The full-scale range of each analogue instrument shall not be greater than three times the reference value.

Digital instruments shall be selected such that the reference value does not exceed 90% of the calibrated range of the instrument.

c) Instrument Location

The sensor location shall be established by I&T, with the support of other departments if necessary, and shall be documented in the plant records in accordance with § 5.90 and shall be appropriate for the parameter being measured. The same location shall be used for subsequent tests. Instruments that are position-sensitive shall be either permanently mounted, or provision shall be made to duplicate their position during each test.

d) Fluctuations

Symmetrical dampening devices or averaging techniques may be used to reduce instrument fluctuations. Hydraulic instruments may be damped by using gauge snubbers or by throttling small valves in instrument lines.

e) Frequency Response Range

The frequency response range of the vibration measuring transducers and their read-out system shall be from one-third of the minimum pump shaft rotational speed to at least 1000 Hz.

5.35.2 Pressure

a) Gauge Lines

If the presence or absence of liquid in a gauge line could produce a difference of more than 0.25% in the indicated value of the measured pressure, a means shall be provided to ensure or determine the presence or absence of liquid as required for the static correction used.

b) Differential Pressure

When determining differential pressure across a pump, a differential pressure gauge or a differential pressure transmitter that provides a direct measurement of the pressure difference or the difference between the pressure at a point in the inlet and the pressure in the outlet shall be used.

5.35.3 Rotational Speed

The rotational speed measurements of variable speed pumps shall be taken by a method that meets the requirements specified in § 5.35.1.

5.35.4 Vibration

a) As there is no IST pump at Koeberg that rotates at a speed below 600 rpm, Table 5-5121-1 and Table 5-5221-1 have been updated accordingly as they relate to vibration requirements. In addition to the ASME OM code vibration limits specified in peak values, the corresponding RMS values have been added to Table 5-5121-1, Table 5-5221-1, and Figure 5-5223-1. This is in compliance with the NNR recommendation made in letter k21335N.

b) For all IST pumps, the velocity measurement method will be implemented as it is the most sensitive to degradation monitoring for high-speed pumps. If a pump is run below 600 rpm, the displacement measurement could be used.

c) The vibration measurement at Koeberg related to velocity will be performed using the root mean square (RMS) values that were approved by the NNR in letter k21335N, and alternative acceptance criteria will be used for smooth running pumps.

d) On centrifugal pumps, except for vertical line shaft pumps, measurements shall be taken in a plane approximately perpendicular to the rotating shaft in two approximately orthogonal

directions on each accessible pump thrust bearing housing. Measurements shall also be taken in the axial direction on each accessible pump thrust bearing housing.

e) On vertical line shaft pumps, measurements shall be taken on the upper motor bearing housing in three approximately orthogonal directions, one of which is the axial direction.

f) If a portable vibration indicator is used, the measurement points shall be clearly indicated on the pump to permit subsequent duplication in both location and plane.

The vibration limits are indicated in Figure 5-5223-1.

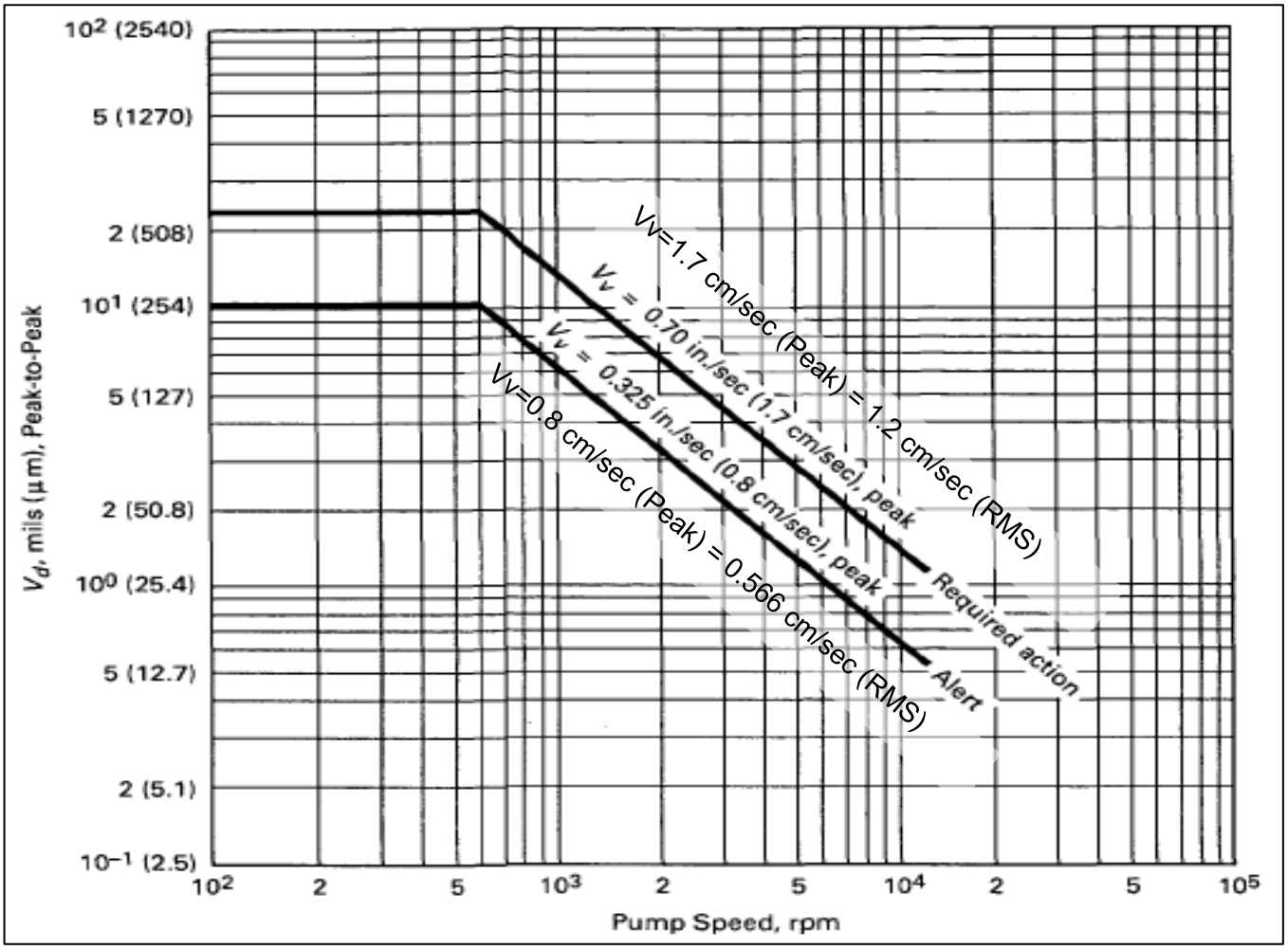

Figure 5-5223-1
Vibration limits (peak and RMS)

5.35.5 Flow Rate

When measuring flow rate, a rate or quantity meter shall be installed in the pump test circuit. If a meter does not indicate flow rate directly, the record shall include the method used for determining the flow rate.

Internal recirculated flow need not be measured. External recirculated flow need not be measured if it is not practical to isolate, has a fixed resistance, and has been evaluated as not having a substantial effect on the results of the test. I&T shall declare these cases if they exist in the relevant pump testing procedures.

5.60 MONITORING, ANALYSIS, AND EVALUATION

5.61 Trending

The test parameters specified in Table 5-3000-1, except for fixed values, shall be trended. Component Engineering (CE) shall make these trends available and accessible to the IST programme engineer.

5.62 Corrective Action

a) Alert Range

If the measured test parameter values fall within the alert range specified in Table 5-5121-1 or Table 5-5221-1 as applicable, the frequency of the testing specified in § 5.34 shall be doubled until the cause of the deviation is determined and the condition corrected.

b) Action Range

If the measured test parameter values fall within the required action range specified in Table 5-5121-1 or Table 5-5221-1 as applicable, the pump shall be declared inoperable[1] until the cause of the deviation is determined and the condition corrected, or the pump is analysed and new reference values established in accordance with § 5.33.2.

c) New Reference Values

If the measured test parameter values fall within either the alert or the required action range specified in Table 5-5121-1 or Table 5-5221-1 as applicable, and the continued use of the pump is supported by an analysis, a new set of reference value may be established. I&T in conjunction with Component Engineering (CE) shall ensure that this analysis includes the pump and system operability readiness justification, the cause of the change in the pump performance and an evaluation of all the trends indicated by the available data. The results of this analysis and supporting documents shall be included in the pump record in accordance with § 5.90.

5.63 Systematic Error

When a test shows measured parameter values that fall beyond the acceptance range specified in Table 5-5121-1 or Table 5-5221-1 as applicable, and that have resulted from a known systematic error such as improper system line-up or inaccurate system instrumentation, the test shall be rerun after correcting the error. The Koeberg condition report (CR) process may be warranted in this instance.

[1] In terms of Koeberg's corrective action processes, it is implied that the KAA-690 route shall be followed for the resolution of the inoperability statement.

5.64 Analysis of Related Conditions

If the reference value of a particular parameter being measured or determined can be significantly influenced by other related conditions, these conditions shall be analysed[2] and documented in accordance with § 5.90.

5.65 Koeberg Specific Augmented Requirements

Based on Koeberg's analysis, it was confirmed that although not required by the ASME OM code, the requirements specified under this paragraph are important to detect degradation on the pumps specified below. Therefore, they are included in this ISTPRM as augmented requirements and are detailed as follows:

- 12 ASG 001 / 002 PO

  In line with the conclusions made in many Koeberg documents related to the ASG design performance criteria as detailed in the engineering letter SPT6019/07, the sum of degradation of the two motor-driven pumps i.e. 12 ASG 001 / 002 PO shall not to exceed 4%. This is to ensure that the delivered flows during accident conditions are adequate.

  I&T shall implement this requirement as interpreted in SPT6019/07.

- 12 RCV 001 / 002 / 003 PO

  The measured head difference between the pumps required to operate under a safety injection signal (pumps 001 and 003 PO relative to 002 PO) must not exceed 25 mwc at flow of 25 m^3/h or less. This is to protect the pump with lower performance being deadheaded (could be damaged as the mini-flow is isolated) during a loss of feed water accident. Note that this requirement may change following the EDF corrective action.

5.90 RECORDS AND REPORTS

5.91 Pump Records

I&T shall maintain records for each IST pump, which shall include at least the following:

a) the manufacturer's model and serial number or the trigram;

b) the manufacturer's acceptance test report, if available; and

c) the manufacturer's performance curve and operating limits.

[2] An example of a possible condition that could influence the IST results is the vibration measurement of a pump, which could be dependent on the foundation, driver, or piping. If the vibration measurements are high but it has been confirmed that they are not directly related to the pump degradation, then the vibration measurements should be done at the foundation, driver, or piping and analysed to ensure that the measured vibrations on the pump, even though high, will not prevent the pump from performing its design function, as they are influenced by a specific condition.

5.92 Test Plans

In addition to the requirements specified in § 4.31.1 and § 4.31.6, the test plans and procedures shall include the following:

a) category of each pump;

b) the line-up to be used;

c) the location and the type of measurement for the required test parameters; and

d) the method of determining the test parameter values that are not directly measured.

5.93 Records of Tests

Refer to § 4.92.3.

5.94 Record of Corrective Action

Refer to § 4.92.4.

APPENDIX 5-1
IST PUMP TEST PLANS

Pump	Description	P&ID	Coord	Pump Group	Pump Type	Speed	Test Type	Test Freq	Deviation	Remarks
12 ASG 001 PO	Motor-Driven Auxiliary Feedwater Pump	ASG 500	E7	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 ASG 002 PO	Motor-Driven Auxiliary Feedwater Pump	ASG 500	E5	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 ASG 003 PO	Turbine-driven Auxiliary Feedwater pump	ASG 500	E3	A	C-H	Vari	Grp. A - N, Q, dP, V Comp. - N, Q, dP, V	Q1 2YR		
12 EAS 001 PO	Containment Spray Pump	EAS 500	E5	B	VLS	Fixed	Grp. B - Q, dP Comp. - Q, dP, V	Q1 2YR	PMD-1	
12 EAS 002 PO	Containment Spray Pump	EAS 500	E2	B	VLS	Fixed	Grp. B - Q, dP Comp. - Q, dP, V	Q1 2YR	PMD-1	
12 PTR 001 PO	Spent Fuel Pit Circulation Pump	PTR 500	F3	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 PTR 002 PO	Spent Fuel Pit Circulation Pump	PTR 500	F5	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 PTR 006 PO	Spent Fuel Pit Circulation Pump (PTR 3rd Train)	PTR 500	F3	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RCV 001 PO	Chemical and Volume Control Charging Pump	RCV 110	B2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RCV 002 PO	Chemical and Volume Control Charging Pump	RCV 110	B2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RCV 003 PO	Chemical and Volume Control Charging Pump	RCV 110	B1	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 REA 003 PO	Boric Acid Pump	REA 500	F3	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		

APPENDIX 5-1
IST PUMP TEST PLANS

Pump	Description	P&ID	Coord	Pump Group	Pump Type	Speed	Test Type	Test Freq	Deviation	Remarks
12 REA 004 PO	Boric Acid Pump	REA 500	F4	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RIS 001 PO	Low Head Safety Injection Pump	RIS 110	F1	B	VLS	Fixed	Grp. B - Q, dP Comp. - Q, dP, V	Q1 2YR		
12 RIS 002 PO	Low Head Safety Injection Pump	RIS 110	F2	B	VLS	Fixed	Grp. B - Q, dP Comp. - Q, dP, V	Q1 2YR		
12 RRA 001 PO	Residual Heat Removal Pump	RRA 010	F6	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR	PMD-2	
12 RRA 002 PO	Residual Heat Removal Pump	RRA 010	F4	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR	PMD-2	
12 RRI 001 PO	Nuclear Component Cooling Water Pump	RRI 500	E7	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RRI 002 PO	Nuclear Component Cooling Water Pump	RRI 500	E6	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RRI 003 PO	Nuclear Component Cooling Water Pump	RRI 500	E4	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 RRI 004 PO	Nuclear Component Cooling Water Pump	RRI 500	E2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 SEC 001 PO	Essential Service Water Pump	SEC 501	E5	A	C-V	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 SEC 002 PO	Essential Service Water Pump	SEC 502	E5	A	C-V	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 SEC 003 PO	Essential Service Water Pump	SEC 501	C5	A	C-V	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		

APPENDIX 5-1
IST PUMP TEST PLANS

Pump	Description	P&ID	Coord	Pump Group	Pump Type	Speed	Test Type	Test Freq	Deviation	Remarks
12 SEC 004 PO	Essential Service Water Pump	SEC 502	C5	A	C-V	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR		
12 SEC 005 PO	Wash Water Pumps	SEC 501	D2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR	PMD-3	
12 SEC 006 PO	Wash Water Pumps	SEC 502	D2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR	PMD-3	
12 SEC 007 PO	Wash Water Pumps	SEC 501	D2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR	PMD-3	
12 SEC 008 PO	Wash Water Pumps	SEC 502	D2	A	C-H	Fixed	Grp. A - Q, dp, V Comp. - Q, dP, V	Q1 2YR	PMD-3	

Page 3 of 3

APPENDIX 5-2
PUMP DEVIATION
PMD-1

Page 1 of 2

"Relief Request in Accordance with 10 CFR 50.55a(f)(5)(iii) In-Service Testing Impracticality"

A5-2.1 ASME Code Components Affected

Pumps	Description	P&ID	Coord	Group	Speed
12 EAS 001 PO	Train A Containment Spray Pump	EAS 500	E2	B	Fixed
12 EAS 002 PO	Train B Containment Spray Pump	EAS 500	E5	B	Fixed

A5-2.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A5-2.3 Applicable Code Requirements

ISTB-3300(e)(1) requires reference values for comprehensive pump tests to be established within ± 20% of design flow.

A5-2.4 Reason for Request

Based on the limitation of the mini-flow pipe sizing, it is impossible to achieve the design flow for the containment spray system unless the actual spraying of containment will take place. This option is not considered as it is associated with potential radiological and corrosion hazards. Hence, this relief is sought to deviate from the requirements of ISTB-3300(e)(1), such that the comprehensive test reference values may be established with the pump operating at less than 80% of the design flow rate.

A5-2.5 Proposed Alternative and Basis for Use

The EAS pumps are tested using a test loop that circulates back to the refuelling water storage tank (PTR). This flow path produces a flow rate of approximately 71% (600 versus 850 t/hr) of the actual design flow. The only other EAS system flow path available that can produce the required increase in flow would spray the entire containment with borated water. This would require an extensive clean-up and would be detrimental to carbon steel material and non-qualified electrical circuits. This method is not acceptable. Therefore, the ability to test to the design flow rate would require a substantial plant modification.

These pumps are classified as Group B pumps, and are subject to quarterly in-service tests where only differential pressure and flow rate are required to be monitored. However, Koeberg will conduct quarterly in-service tests monitoring extra parameters such as differential pressure, discharge pressure, flow rate, and vibration as specified for a group A test. As stated above, the pumps are tested around 71% of the design flow, which is within the pump's curve slope, which is adequate to detect degradation. Furthermore, the new SRSM calls for extra surveillances on the pumps and motor which will aid in detecting degradation.

APPENDIX 5-2
PUMP DEVIATION
PMD-1

In light of the information presented above, there is reasonable assurance that operational readiness of the EAS pumps is maintained. The proposed alternative provides an acceptable level of quality and safety. Compliance with the code requirement would result in an unusual difficulty without a compensating increase in the level of quality and safety.

A5-2.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A5-2.7 Precedents

A similar relief was sought during the 3rd IST interval.

A5-2.8 References

- 3rd Interval ISTPRM

APPENDIX 5-3
PUMP DEVIATION
PMD-2

"Relief Request in Accordance with 10 CFR 50.55a(f)(5)(iii) In-Service Testing Impracticality"

A5-3.1 ASME Code Components Affected

Pumps	Description	P&ID	Coord	Group	Speed
12 RRA 001 PO	Train A Residual Heat removal Pump	RRA 010	F4	A	Fixed
12 RRA 002 PO	Train B Residual Heat removal Pump	RRA 010	F6	A	Fixed

A5-3.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A5-3.3 Applicable Code Requirements

ISTB-3400, Frequency of In-Service Tests and Table. ISTB-3400-1, Quarterly In-Service Test Frequency.

A5-3.4 Reason for Request

The RRA pumps are physically located inside containment and are inaccessible during normal power operation. In addition, these pumps are isolated during normal operation to prevent the RCP system from over pressurizing the RRA system. Therefore it is impractical to operate these pumps for the quarterly Group A test.

A5-3.5 Proposed Alternative and Basis for Use

The group A test will be performed within 1 week of the RRA system being placed in service. The performance history of these pumps shows that there was no failure based on pump degradation. Furthermore the maintenance bases for these pumps with their intrusive and non-intrusive tasks will be used to detect any degradation.

In light of the information presented above, there is reasonable assurance that operational readiness of the RRA pumps is maintained. The proposed alternative provides an acceptable level of quality and safety. Compliance with the code would result in an unusual difficulty without a compensating increase in the level of quality and safety.

A5-3.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A5-3.7 Precedents

A similar relief was sought during the 3rd IST interval

A5-3.8 References

- 3rd Interval ISTPRM

APPENDIX 5-4
PUMP DEVIATION
PMD-3

Page 1 of 2

"Relief Request in Accordance with 10 CFR 50.55a(f)(5)(iii) In-Service Testing Impracticality"

A5-4.1 ASME Code Components Affected

Pumps	Description	P&ID	Coord	Group	Speed
12 SEC 005 PO	Train A Screen Wash water Pump	SEC 501	D2	A	Fixed
12 SEC 006 PO	Train B Screen Wash water Pump	SEC 502	D2	A	Fixed
12 SEC 007 PO	Train A Screen Wash water Pump	SEC 501	D2	A	Fixed
12 SEC 008 PO	Train B Screen Wash water Pump	SEC 502	D2	A	Fixed

A5-4.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A5-4.3 Applicable Code Requirements

Table ISTB-3000-1 requires that the flow be a parameter to be measured during the pump performance test.

A5-4.4 Reason for Request

The configuration and material (PVC) of the screen wash pump discharge piping system does not allow for a permanent flow meter to be installed. The lack of permanent or temporary flow instrumentation makes it impractical to adjust pump flow to specific value(s) and measure the associated differential pressure as required for performance of pre-service group A and comprehensive pump tests. Thus, this Deviation is sought to deviate from the flow measurement requirement.

A5-4.5 Proposed Alternative and Basis for Use

The safety function of these wash water pumps is to clean any debris from the turning drums filters SEC 010, 011, 012, and 013 FI. The SAR stipulates that the specifications of these pumps shall be a nominal flow rate of 52.5 m^3/h with a corresponding total head of 38 wcm. As stipulated above, there is no flow meter at the discharge of the pumps. The pump performance test will be performed by setting the system resistance to the same point for each test with the throttle valves fully open. The flow will not be measured; however, the remaining variable that could affect system resistance is the spray nozzles. The condition of the spray nozzles will be inspected during each test performance with corrective actions initiated as necessary, thus providing assurance that the spray nozzle condition will not affect the flow rate. With system resistance maintained constant for each test, pump degradation would be noticeable through changes in differential pressure. Differential pressure is calculated using suction and discharge pressure. Plant Engineering is required to include the following practical steps related to the pump performance test in order to confirm that the pumps are operating within their intended design margins:

APPENDIX 5-4
PUMP DEVIATION
PMD-3

1. Take pump discharge and suction pressures of SEC 005, 006, 007, and 008 PO.
2. Calculate pump DP.
3. Take pressure reading of pressure gauges installed on filters SEC 010, 011, 012, and 013 FI.
4. Compare pressure of associated filter + 170 kPa (height pressure loss) to pump discharge pressure.
5. Follow the performance troubleshooting chart for SEC wash water pumps; done by I&T and CE.
6. If any anomalies are noted, inform CE and EP immediately.

The pump performance will be trended for degradation based on differential pressure at the assumed flow reference point. Vibration readings will also be taken at this reference point. The pumps will be tested in this manner for the pre-service test programme, the quarterly group A, and the biennial comprehensive in-service tests.

Instrument accuracy and acceptance criteria for pump differential pressure and vibration will meet the requirements of Table ISTB-3510-1. The pre-service test data for differential pressure and vibration data will be evaluated to verify it represents acceptable pump operation and will be used as reference values for subsequent quarterly group A and comprehensive in-service tests.

Based on the information provided above, compliance with the code requirements is impractical and the proposed alternative provides reasonable assurance of the operational readiness of the SEC 005, 006, 007, and 008 PO screen wash pumps.

A5-4.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A5-4.7 Precedents

A similar relief was sought during the 3rd IST interval.

A5-4.8 References

- 3rd Interval ISTPRM

SECTION 6

In-Service Testing of Valves

6. IN-SERVICE TESTING REQUIREMENTS OF VALVES

6.10 INTRODUCTION

For reference purposes, the format and the numbering system of the ASME OM code headings were kept similar in this section with the following change: ISTC was replaced by the number 6 and the subsection numbers were reduced, i.e. ISTC-1000 will be 6.10.

Furthermore, the requirements that are not applicable to Koeberg were omitted with the result that the numbering system in this section does not follow a chronological order.

6.11 Applicability

The requirements of this section apply to the scope of valves and pressure relief devices and their actuation and position indication controls, as defined in § 4.11. The requirements for the pressure relief devices are covered in § 7.

6.12 Exemptions

The following valves are excluded from this section if they do not perform a specific safety function as described in § 4.11.

a) valves used only for operating convenience such as vent, drain, instrument, and test valves;

b) valves used only for system control, such as pressure regulating valves;

c) valves used only for system or component maintenance;

d) the external control and protection systems for the purpose of sensing plant conditions and providing signals for valve operation; and

e) skid-mounted valves and component subassemblies that are tested as part of the major component. Refer to § 4.20 for examples of skid-mounted valves.

6.13 Valve Categories

Valves shall be placed in one or more of the categories listed below. When there is more than one distinguishing category characteristic, all requirements of each of the individual categories are applicable, although the duplication or repetition of common testing requirements is not necessary.

a) Category A: valves for which seat leakage is limited to a specific maximum amount in the closed position for the performance of their required function(s), as specified in § 4.11.

b) Category B: valves for which seat leakage in the closed position is inconsequential for the performance of the required function(s), as specified in § 4.11.

c) Category B/SAR: valves which are optionally included in the IST programme, based on their safety significance as described in the plant SAR, OTS, or SRSM.

d) Category C: valves that are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves) for the performance of their function(s), as specified in § 4.11.

In addition to the valve categories described above, valves are also characterised as active or passive and these are defined in § 4.20.

6.14 Organisational Implementation Responsibilities

In addition to the requirements stated in § 4.15, I&T is responsible for the following:

a) Include all necessary instrumentation and other provisions that are required to comply with the requirements of this section.

b) Categorise the valves in accordance with § 6.13 and record the testing methodology (procedure) which shall include the test acceptance criteria in accordance with § 6.90.

c) Ensure that the application, method, and capability of each non-intrusive technique used to credit any IST requirements are qualified in accordance with industry norms.

6.20 DEFINITIONS

The definitions listed below are repeated to ensure a standard understanding throughout this section.

a) Full stroke time: the time interval between the signal initiation to the end of the operating stroke;

b) Power-operated relief valve (PORV): a power-operated valve that can performs a pressure relieving function and is remotely actuated either from a pressure sensor or a control switch. PORVs are not capacity certified under ASME III overpressure protection requirements.

c) Reactor coolant system pressure isolation valve (PIV): a valve with a design function to prevent intersystem over pressurisation between the reactor coolant system and connected low-pressure systems.

6.30 GENERAL TESTING REQUIREMENTS

Some of the requirements in this section have been grouped and summarised in Table 6-3500-1 and Table 6-3500-2, which makes the structure different from the ISTC subsection of the ASME OM code.

6.31 Pre-Service Testing

Every IST valve shall be tested during the pre-service test period. This test is termed the pre-service test (PST). The PST shall be conducted under conditions as near as practicable to those expected during subsequent in-service testing. Only one PST is required, except in the following cases:

a) Any valve that has undergone maintenance or any other intervention that could affect its performance after the PST, shall be tested (re-qualified) in accordance with § 6.33.1.

b) Safety and relief devices shall meet the PST requirements contained in section 7.

6.32 In-Service Testing

The in-service testing shall commence when the valves are required to be operable to perform one of their intended functions as defined in § 4.11.

6.33 Reference Values

Reference values shall be determined from the results of the pre-service testing or from the results of in-service testing. These tests shall be performed under conditions as near as practicable to those expected during subsequent in-service testing.

Reference values shall be established only when the valve is known to be operating acceptably. If the particular parameter being measured can be significantly influenced by other related conditions, then these conditions shall be analysed.

6.33.1 Effects of Valve Repair, Replacement, or Maintenance on Reference Values

When a valve or its control system has been replaced, repaired, or has undergone maintenance[3] that could affect the valve's performance, a new reference value shall be determined or the previous value shall be reconfirmed by an in-service test run before it is returned to service or immediately if it is not removed from service. This test shall demonstrate that the performance parameters that could be affected by the replacement, repair, or maintenance, are within acceptable limits. Differences between the previous and the new reference values shall be analysed. The justification and verification that the new reference value(s) is acceptable shall be documented as specified in § 6.91.20.

6.33.2 Establishment of Additional Set of Reference Values

If it is considered necessary or desirable for some reason (based on I&T, EP, and CE discretion), other than the requirements specified in § 6.33.1, additional reference values should be established, an in-service test shall first be run at the conditions of an existing set of reference values or, if impractical, at the conditions for which the new reference values are required, and the results analysed.

If operation is acceptable in accordance with the requirement of § 6.51, a second test shall be performed under the new conditions as soon as practicable. The results of the second test shall establish the additional reference values.

The reasons for establishing additional reference values shall be justified and documented in the record of tests in accordance with § 6.91.20.

[3] The following are some example of maintenance that could affect the valve performance parameters: adjustment of stem packing, limit switches or control system valves; and removal of the bonnet, stem assembly, actuator, obturator, or control system components.

Table 6-3500-1
Valve performance parameters affected by maintenance

Valve Category	Valve Function	Leakage Test Procedure and Frequency	Exercise Test Procedure Frequency	Special Test Procedure(1)	Position Indication Verification and Frequency
A	Active	See § 6.36	See § 6.35.1	None	See § 6.37
A	Passive	See § 6.36	None	None	See § 6.37
B	Active	None	See § 6.35.1	None	See § 6.37
B	Passive	None	None	None	See § 6.37
C (Safety and Relief)(3)	Active	None(2)(3)	See §6.52.30 and § 6.52.40	None	See § 6.37
C (Check)(4)	Active	None(2)	See § 6.35.1	None	See § 6.37

(1) Note additional requirement for fail-safe valves, refer to § 6.35.6.
(2) Leak test as required for § 7, 'Pressure Relief Device Testing Requirements.'
(3) When more than one distinguishing category characteristic is applicable, all requirements of each of the individual categories are applicable, although duplication or repetition of common testing requirements is not necessary.
(4) If a check valve used for a pressure relief device is capacity certified, then it shall be classified as a pressure or vacuum relief device. If a check valve used to limit pressure is not capacity certified, then it shall be classified as a check valve.

6.35 Valve-Testing Requirements

Active and passive valves in the different categories defined in § 6.13 shall be tested in accordance with the requirements detailed in Table 6-3500-1, with the applicable requirements specified in § 6.51 and § 6.52.

6.35.1 Exercising Test Frequency

Active valves falling under category A, B, and C shall be tested nominally every three months, except as stated in § 6.35.2, § 6.35.4, § 6.35.5, § 6.35.7, § 6.52.21, and § 6.52.22. At Koeberg, the PORVs 12 RCP 8 / 9 / 10 VP shall be tested during every refuelling outage (1RO).

In compliance with the requirements specified in § 6.92 b), the justifications for test intervals greater than once every three months are provided in Appendix 6-2 (Test deferral justifications).

6.35.2 Stroke Exercising / Testing Requirements

6.35.2.1 Category A and Category B Valves

Valves shall be tested as follows:

a) Full-stroke testing of category A or B valves during plant operation at power to the position required to perform its function(s);

b) If full-stroke testing during plant operation at power is not practicable, it may be limited to part-stroke testing during plant operation at power and full-stroke testing during cold shutdowns;

c) If stroke testing is not practicable during plant operation at power, it may be limited to full-stroke testing during cold shutdowns;

d) If stroke testing is not practicable during plant operation and full-stroke testing during cold shutdowns is not practicable either, it may be limited to part-stroke testing during cold shutdowns, and full-stroke testing during refuelling outages;

e) If stroke testing is not practicable during plant operation at power or cold shutdowns, it may be limited to full-stroke testing during refuelling outages;

f) Except as specified in g) below, valves that have been full-stroke tested during cold shutdowns shall be stroked during each cold shutdown. Stroke testing is not required if the period since the previous full-stroke test is less than three months. During extended shutdowns, valves that are required to perform their intended function in accordance with § 4.11 shall be stroke tested every three months, if practicable;

g) Valve stroke testing during cold shutdown shall commence within 48 hours of achieving cold shutdown and continue until all testing has been completed or the plant is ready to return to power. For extended outages, testing need not be commenced within 48 hours, provided that all valves required to be tested during cold shutdowns must be tested before plant start-up. The intention is not to keep the plant in cold shutdown to complete the cold shutdown testing;

h) The testing of all valves for which testing is required to be performed during a refuelling outage, shall be completed before returning the plant to operation at power.

6.35.2.2 Category C Check Valves

Valves shall be stroke tested as follows:

a) During plant operation, valves shall be stroke tested or examined in a manner that verifies obturator travel by using the methods specified in § 6.52.21;

b) Each check valve stroke test shall include open and close tests. Open and close tests need only be performed at an interval when it is practicable to perform both tests. Open and close tests need not be done at the same time if both are performed within the same interval (e.g. quarterly or cold shutdown);

c) If testing is not practicable during plant operation at power, it shall be done during cold shutdowns;

d) If testing is not practicable during plant operation at power and cold shutdowns, it shall be done during refuelling outages;

e) Valves tested at shutdowns shall be tested during each shutdown, except as specified in g) below. Such stroking is not required if the interval since the previous test is less than three months;

f) During extended shutdowns, valves that are required to perform their intended function in accordance with § 4.11 shall be stroke tested every three months, if practicable;

g) Valve testing shall commence within 48 hours of achieving cold shutdown and continue until all testing has been completed or the plant is ready to return to power. For extended outages,

testing need not be commenced within 48 hours if all the valves required to be tested during cold shutdown will be tested before plant start-up. However, it is not the intention to keep the plant in cold shutdown to complete the cold shutdown testing;

h) The testing of all valves required to be done during refuelling outages shall be completed before returning the plant to operation at power.

6.35.3 Valve Obturator Movement

The necessary valve obturator movement shall be determined by stroking the valve while observing an appropriate indicator, such as indicating lights, or while observing other evidence such as changes in system pressure, flow rate, level, or temperature that confirms the change of the obturator position.

6.35.4 Manual Valves

Manual valves that are required to perform their intended function in accordance with § 4.11 shall be full-stroke tested at least once every two years, except where adverse conditions[4] may require the valve to be tested more frequently to ensure operational readiness. For the test to be accepted, the valve shall exhibit the required change of obturator position.

If a valve fails to exhibit the required change of obturator position, the valve shall be immediately declared inoperable.

Passive manual valves equipped with remote position indication shall be tested in accordance with § 6.37.

6.35.5 Valves in Regular Use

Valves that operate in the course of plant operation at a frequency that satisfies the stroking requirements need not be additionally stroked, provided that the observations otherwise required for testing are made and analysed during operation. The results shall be recorded in the plant record at intervals no greater than those specified in § 6.35.1.

6.35.6 Fail-Safe Valves

Valves with fail-safe actuators shall be tested by observing the operation of the actuator upon the loss of valve actuator power, in accordance with the exercising frequency specified in § 6.35.1.

6.35.7 Valves in System Out of Service

The exercising test schedule need not be followed for valves in a system that has been declared inoperable or is not required to be operable. Valves shall be exercised within three months before placing the system in operable status and the normal test frequency shall be resumed.

[4] Examples of adverse conditions: harsh service environment, lubricant hardening, corrosive or sediment-laden process fluid or degraded valve components.

6.36 LEAK TESTING REQUIREMENTS

6.36.1 Scope of Seat Leak Rate Test

Every IST category A valve shall be tested for leakage, except those valves that function in the course of plant operation in a manner that demonstrates adequate seat leak tightness need not be additionally leak tested. In such cases, the valve record shall provide the basis for the conclusion that operational observations constitute a satisfactory demonstration of operability. I&T shall keep a record of all such valves in their testing procedures. This will eliminate over-testing and unnecessary effort.

6.36.2 Containment Isolation Valves (CIVs)

Containment isolation valves with a leak rate requirement based on the US 10CFR50, Appendix J shall be tested in accordance with Koeberg's Containment Leak Rate Testing Programme Requirements Manual (CLRTPRM) [17] which meets the intent of the US 10CFR50, Appendix J option B.

The global allowable seat leak rate for containment isolation valves is as defined in the SAR, paragraph II-4.2.2.2, which states that the combined air leak rate for all containment isolation valves may not exceed 8 m^3/h. The CLRTPRM reference [17] provides guidance on the methods used for calculating the combined leak rate of all containment isolation valves and the requirements associated with the testing frequencies.

In order to keep preparatory work for testing to a minimum, testing is done with penetrations in their as-is condition, that is, piping normally containing water shall be tested with water, and piping normally containing gas shall be tested with that gas. This test condition is contrary to 10CFR50 Appendix J for certain valves, which requires all valves to be tested with air. Consequently, a correlation is applied when tests are performed using water. All leakage measured with water is multiplied by a factor of 155. This is in line with the practice applied during commissioning and is similar to that applied by EDF.

CIVs with a leakage requirement based on other functions shall be tested in accordance with § 6.36.3. An example of these is reactor coolant system pressure isolation valves (PIVs). I&T shall implement the acceptance criteria deduced in EPR E11-0050 [24].

6.36.3 Leak Rate for Valves other than CIVs

Every IST category A valve with a leakage requirement not based on a 10CFR50 Appendix J (CLRTPRM) programme or in addition to it, shall be tested to verify that its seat leakage is within acceptable limits (refer to EPR E11-0050 [24]). Valve closure before seat leakage testing shall be done by using the valve operator with no additional closing force applied. The following testing requirements shall be implemented:

a) Tests shall be done at least once every two years if the performance based (option B) methodology has not been implemented.

b) Differential pressure shall be applied in the same direction as that when the valve is performing its function, with the following exceptions:

1. Globe valves may be tested with the pressure under the seat.
2. Butterfly valves may be tested in either direction, provided that their seat construction is designed for sealing against pressure on either side.
3. Double-disk gate valves may be tested by pressurising between the disks.
4. Leakage tests involving pressure differentials lower than function pressure differentials are permitted in those valves in which service pressure will tend to diminish the overall leakage channel opening, as by pressing the disk into or onto the seat with greater force. Gate valves, check valves, and globe-type valves having a function pressure differential applied above the seat, are examples of valve applications that satisfy this requirement. When leakage tests are performed in such cases using pressures lower than the function maximum pressure differential, the observed leakage shall be adjusted to the value of the function maximum pressure differential. The adjustment shall be made by calculation appropriate to the test media and the ratio between the test and function pressure differential, assuming leakage to be directly proportional to the pressure differential to the one-half power.
5. Valves that do not qualify for reduced pressure testing shall be tested at the maximum function pressure differential.

c) Valve seat leakage shall be determined by one of the following methods:

1. measuring leakage through a downstream tell-tale connection while maintaining pressure on one side of the valve; or
2. measuring the feed rate required to maintain test pressure in the test volume or between two seats of a gate valve, provided that the total apparent leak rate is charged to the valve or valve combination or gate valve seat being tested and the conditions specified in b) above are met; or
3. determining leakage by measuring pressure decay in the test volume, provided that the total apparent leakage rate is charged to the valve or valve combination or gate valve seat being tested and the conditions specified in b) above are met.

d) Test Medium

As stated above, testing is done with penetrations in their as-is condition, that is, piping normally containing water shall be tested with water, and piping normally containing gas shall be tested with that gas. The test medium shall be specified by I&T in its working procedures.

e) Analysis of Leak Rates

Leak rate measurements shall be compared with the permissible leak rates specified in EPR E11-0050 [24] for a specific valve or valve combination (indicated in the implementing test procedure). If leak rates are not specified by Engineering Programmes, the permissible leak rate may be used as follows (values in brackets are SI units):

1. for water: 0,5 D gal/min (12,4 d ml/s) or 5 gal/min (315 ml/s), whichever is less, at functional differential pressure, where *D* equals nominal valve size;

2. for air at function pressure differential, 7,5 *D* standard ft^3/day (58 d cm^3/min),
   where: *D* equals the nominal valve size in inches; and
   d equals the nominal valve size in centimetres.

f) Corrective Action
Valves or valve combinations with leak rates exceeding the values specified in e) above shall be declared inoperable and either repaired or replaced. A retest demonstrating acceptable operation shall be done following any required corrective action before the valve is returned to service.

6.37 Position Verification Testing

Valves with remote position indicators shall be observed locally at least once every two years to verify that valve operation is accurately indicated. Where practicable, this local observation should be supplemented by other indications such as flow, pressure, or temperature to verify the obturator position. These observations need not be concurrent. Where local indication is not possible, other indications shall be used to verify valve operation. I&T shall record in its working procedures what parameters are used to supplement the correct valve operation and to indicate the valves where local indication is impractical.

6.38 Instrumentation

Instrumentation accuracy shall be considered when implementing any IST requirement in this section.

6.50 SPECIFIC TESTING REQUIREMENTS

6.51 Power-Operated Valves (POVs)

All IST valves shall be tested in accordance with the applicable general requirements specified in § 6.30 and as documented below for specific testing requirements.

In order to avoid duplication, the POV requirements related to valve stroke testing, stroke test acceptance criteria and stroke test corrective action are similar to those of the PORVs with a variation of reference value limits which has been summarised in Table 6-3500-2. In other words, the requirements stated in § 6.51.13, § 6.51.14, and § 6.51.15 apply to motor- and pneumatically operated valves in addition to the requirements specified in the subsections of § 6.51.

6.51.10 Power-Operated Relief Valves (PORVs)

The PORVs shall meet the requirements of § 6.51 for category B valves and § 6.52.40 for category C valves.

6.51.11 Valve Testing Requirements

a) Testing shall be done in the following sequence or concurrently. If testing in the following sequence is impractical, it may be done out of sequence, and a justification shall be documented in the record of tests for each test or in the test plan.

1. Leakage testing;
2. Stroke testing; and
3. Position indication testing.

b) Pressure-sensing devices shall be calibrated in accordance with Koeberg's quality assurance programme. The pressuriser PORVs are treated as safety class 1 safety relief valves. In addition to the requirements of § 7, I&T shall confirm that the requirements stated in (i) and (ii) below are met:

(i) Set point verification by means of the pressure sensor validation with the relevant set pressures are as follows:
12 RCP 008 VP: This PORV is on standby with 2 pilots and can be triggered via both train A and train B therefore the set point verification shall be demonstrated via both trains.
Set point verification on LTOP (train A) = 55 bar (abs)
Set point verification on HTOP (train A) = 159 bar (abs)
Set point verification on LTOP (train B) = 70 bar (abs)
Set point verification on HTOP (train B) = 162 bar (abs)
12 RCP 009 VP: This PORV can only be triggered by train A.
Set point verification on LTOP (train A) = 55 bar (abs)
Set point verification on HTOP (train A) = 159 bar (abs)
12 RCP 010 VP: This PORV can only be triggered by train B.
Set point verification on LTOP (train B) = 70 bar (abs)
Set point verification on HTOP (train B) = 162 bar (abs)

(ii) Manoeuvrability of the valve by means of stroking the valve at an appropriate plant state.

6.51.12 Leak Testing

The seat tightness of the PORVs shall be verified by leak testing in accordance with the requirements stipulated in section 7. The seat tightness test could be monitored during normal operation via the downstream temperature sensors.

6.51.13 Valve Stroke Testing

a) Active valves shall have their stroke times measured when exercised in accordance with § 6.35. The following requirements shall also be met:

1. The limiting value of full-stroke time of each POV is established by I&T and documented in KLR-001 Procedure [27] which shall be kept up to date. The stroke testing deviation limits from reference values for each POV are summarised in Table 6-3500-2.

2. The stroke time shall be measured to at least the nearest second.

b) Any abnormality or erratic action shall be recorded in accordance with § 6.91.20 and an evaluation shall be made to determine whether corrective action is required.

6.51.14 Stroke Test Acceptance Criteria

Test results shall be compared to the reference values established in accordance with § 6.33, § 6.33.1, and § 6.33.2. Refer to Table 6-3500-2 for the different POVs and their respective deviation limits.

6.51.15 Corrective Action

a) If a valve fails to exhibit the required change of obturator position or exceeds the limiting values of full-stroke time as specified in § 6.51.13 a), the valve shall be immediately declared inoperable.

b) Valves with measured stroke times that do not meet the acceptance criteria specified in § 6.51.14 or fall in the alert range of Table 6-3500-2 shall be immediately retested or declared inoperable. If the valve is retested and the second set of data also falls in the alert range, the data shall be analysed within 96 hours [32] to verify that the new stroke time represents acceptable valve operation or the valve shall be declared inoperable. If the second set of data meets the acceptable range, the cause of the initial deviation shall be analysed within 96 hours [32] and the results shall be documented in the record of tests in accordance with § 6.91.20.

NOTE: The 96 hours limit will not apply if the system where the valve is installed is no longer required to be operable / in service.

c) Valves declared inoperable shall be repaired or replaced, or the data analysed to determine the cause of the deviation and the valve shown to be operating acceptably.

d) Valve operability based upon analysis shall have the results recorded in the record of tests as specified in § 6.91.20.

e) Before returning a repaired or replaced valve to service, a test demonstrating satisfactory operation shall be performed.

NOTE: The declaration of inoperability remains the responsibility of Operating. I&T and EP will advise Operating of the above code requirements and that the valve is inoperable.

Table 6-3500-2
POVs and their deviation limits

Valve Type	Reference Value (sec)	Acceptable deviation limit (sec)	Alert [4] Range	Limiting Value
PORV	tr > 10	0,75 t_r to 1,25 t_r	< 0,75 t_r, and > 1,25 t_r to multiplier t_r	Refer [1]
PORV	tr ≤ 10	0,50 t_r to 1,50 t_r	< 0,50 t_r, and > 1,5 t_r to multiplier t_r	Refer [1]
Motor-operated	tr > 10	0,85 t_r to 1,15 t_r	< 0,85 t_r, and > 1,15 t_r to multiplier t_r	Refer [1]
Motor-operated	tr ≤ 10	0,75 t_r to 1,25 t_r, or ± 1 s whichever is greater	< 0,75 t_r, and > 1,25 t_r to multiplier t_r	Refer [1]
Other power-operated valves	tr > 10	0,75 t_r to 1,25 t_r	< 0,75 t_r, and > 1,25 t_r to multiplier t_r	Refer [1]
Other power-operated valves	tr ≤ 10	0,50 t_r to 1,5 t_r	< 0,50 t_r, and > 1,5 t_r to multiplier t_r	Refer [1]
All power-operated valves[2]	tr ≤ 1,4	≤ 2,0 s[3]	N/A[3]	Refer [1]

Notes
t_r Reference stroke time.
1. The multiplier for calculating the limiting value is defined by EP and I&T as documented in KLR-001 [27]. However, the limiting value shall not exceed the maximum stroke time defined in the SAR, protection files, or DSEs (licensing basis). When a limiting value is defined in the licensing basis, it shall be listed in Appendix 6-1 for the applicable valve under limiting value column.
2. This criterion is optional.
3. Valves that stroke in less than 2 s may be exempt from the deviation limit. In such cases, the maximum limiting stroke time shall be 2 s.
4. The alert range has been added as an administrative limit to allow I&T and CE to detect and report early valve degradation. The alert range has no enforced operability question related to the result.

6.52 Other Valves

6.52.10 Manually Operated Valves

The manual valves shall be tested in accordance with § 6.35. If a valve fails to exhibit the required change of obturator position, the valve shall be immediately declared inoperable. Valves equipped with a remote position indication shall be tested in accordance with § 6.37.

6.52.20 Check Valves

6.52.21 Valve Obturator Movement

a) The necessary valve obturator movement shall be demonstrated by performing both an open and a close test.

1. Check valves that have a safety function in both the open and close directions shall be stroked by initiating flow and observing that the obturator travelled to either the full open position, or to the position required to perform its intended function in accordance with

§ 4.11, and it shall also be verified that, on the cessation or reversal of flow, the obturator has travelled to its seat.

2. Check valves that have a safety function in only the open direction shall be stroked by initiating flow and observing that the obturator has travelled to either the full open position or to the position required to perform its intended function in accordance with § 4.11 and closure shall be verified.

3. Check valves that have a safety function in only the close direction shall be exercised by initiating flow and observing that the obturator has travelled to at least the partially open position[5], and it shall be verified that, on cessation or reversal of flow, the obturator has travelled to its seat.

Observations shall be made by observing a direct indicator (for example, a position-indicating device) or by other positive means such as a change in system pressure, flow rate, level, temperature, seat leakage testing, or non-intrusive testing.

b) If the test methods described in a) above are impractical for certain check valves, or if sufficient flow cannot be achieved or verified, a sample disassembly examination programme shall be used to verify the movement of the valve obturator. The details of this programme are documented in the Nuclear Engineering Position Paper 331-228 [18].

NOTE: This programme will be discontinued when the CMP is implemented (refer to § 6.52.22 and § 8).

The sample disassembly programme shall group valves of similar design, application, and service condition, and require a periodic examination of one valve from each group. The details and bases for the sampling programme are documented in the Nuclear Engineering Position Paper 331-228 [18].

1. The grouping[6] of check valves shall be technically justified and shall consider as a minimum the valve manufacturer, design, service, size, materials of construction, and orientation. The grouping should also consider the need for checks of tolerance or critical dimensions.

2. The full-stroke motion of the obturator shall be verified during the disassembly process. The full-stroke motion of the obturator shall be re-verified immediately before completing reassembly. Check valves that have their obturator disturbed before full-stroke motion has been verified, shall be examined to determine whether a condition exists that could prevent the full opening or re-closure of the obturator. The full-stroke motion of the obturator shall be verified (in the as-found condition) before any intervention. Any anomalies found shall be reported to Component Engineering for evaluation.

[5] The partially open position should correspond to the normal or expected system flow.
[6] Maintenance and modification history should be considered in the grouping. At Koeberg, more criteria are considered under the maintenance basis for task determination (AP913 process).

3. At least one valve from each group shall be disassembled and examined during each refuelling outage. All valves in each group shall be disassembled and inspected at least once every eight years.

4. Before return to service, valves that were disassembled for examination or that underwent maintenance that could affect their performance shall be exercised (full-stroke or part-stroke), if practicable, with flow in accordance with § 6.35.2. These valves shall also be tested for other requirements such as leak rate before returning them to service.

c) In general, when performing a test to verify the closure capability of a check valve that does not have a seat leakage limit, the achievement of the required system flow rate through the intended flow path is an adequate demonstration of the closure capability based on the fact that the valve's closure prevented a loss of system flow. This could be applied to a parallel pump configuration to verify the opening capability of the check valve of the running pump and the closure capability of the standby pump by simply verifying that the required safety flow rate has been achieved under the correct line-up. I&T shall ensure a correct line-up by means of confirming that check valves under test are subjected to the full required system flow rate and not isolated by a downstream isolation valve. The details of the safety flow rates which constitute the acceptance criteria of the open and close test are taken from the SAR and detailed in the Nuclear Engineering letter SPT-6137/07 [33]. Further guidelines on testing and details of specific acceptance criteria for all IST check valves that are not tested with a pump test, are provided in EPR-E0065/07 [28].

6.52.22 Condition Monitoring Programme

As an alternative to the testing or examination requirements specified in § 6.35.1, 6.35.2, 6.35.3, 6.35.5, and 6.52.21, Nuclear Engineering has established a condition monitoring programme (CMP); refer to § 8. The purpose of this programme is to improve valve performance and also to optimise testing, examination, and preventive maintenance activities in order to maintain the continued acceptable performance of a select group of check valves. Nuclear Engineering has developed this programme in accordance with the ASME OM code's mandatory Appendix II, which is detailed in this document under § 8. I&T shall consider the following:

a) The CMP may be implemented on a valve or group of similar valves.

b) The programme shall be implemented in accordance with § 8.

c) If the CMP for a valve or group of valves is discontinued, the requirements specified in § 6.35.1, 6.35.2, 6.35.3, 6.35.5, and 6.52.21 shall be implemented.

d) The CMP takes credit for the maintenance basis (MB) of all IST check valves; therefore, even though the CMP (§ 8) is fully developed, it cannot be implemented until the IST check valves' MB is authorised. I&T shall initiate the necessary supporting requirements as specified in § 8 in order to ensure the timely implementation of the CMP.

6.52.23 Series Valves in Pairs

If two check valves are in a series configuration without provisions to verify individual reverse flow closure (for example, keep-fill pressurisation valves), and the plant safety evaluation assumes the closure of either valve (but not both), the valve pair may be operationally tested as a unit while closed.

If the plant safety analysis assumes that a specific valve or both valves of the pair do close to perform the safety function, the required valve(s) shall be tested to demonstrate individual valve closure.

6.52.24 Corrective Action

If a check valve fails to exhibit the required change of obturator position, it shall be declared inoperable. A retest showing acceptable performance shall be run following any required corrective action before the valve is returned to service.

Check valves in a sample disassembly programme that are not capable of being full-stroke tested (i.e. due to binding or other phenomena), or have unacceptable degraded internals, shall have the cause of the failure analysed and the condition corrected. Other check valves in the same sample group that may also be affected by this failure mechanism shall be examined or tested during the same refuelling outage to determine the condition of the internal components and their ability to function[7].

Series valves tested as a unit in accordance with § 6.52.23 that fail to prevent reverse flow shall be declared inoperable, and both valves shall be either repaired or replaced.

6.52.30 Vacuum Breaker Valves

Vacuum breaker valves shall meet the in-service test requirements specified in § 6.52.20 and § 7, if applicable.

6.52.40 Safety and Relief Valves

Safety and relief valves shall meet the in-service test requirements specified in § 7.

6.90 RECORDS AND REPORTS

6.91 Records

6.91.10 Valve Records

I&T shall keep a record of each IST valve, which record shall contain the following:

a) The manufacturer, model, and serial number or other identification number;

b) Pre-service test results; and

[7] Ascertain whether there are valves outside the sampling group that could have been affected or are susceptible to a similar failure mechanism. Valves that are confirmed to be susceptible to the same failure mechanism shall be tested.

c) Limiting values of the different subsections as specified in Table 6-3500-2.

6.91.20 Records of Tests

Refer to § 4.92.3.

6.91.30 Records of Corrective Action

Refer to § 4.92.4.

6.92 TEST PLANS

In addition to the requirements specified in § 4.31.1, I&T shall keep records of test plans that shall include the following:

a) Category of each valve;

b) Justification for deferral of stroke testing in accordance with § 6.35.2;

c) Details and bases for the check valves disassembly examination programme and the justification for not performing an exercise test to at least a partially open position after reassembly; and

d) Bases for testing check valves in series as a unit in accordance with § 6.52.23.

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 APG 004 VL	APG 500	F7	B	Act	2	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		15 sec
12 APG 005 VL	APG 500	F4	B	Act	2	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		15 sec
12 APG 006 VL	APG 500	F1	B	Act	2	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		15 sec
12 ARE 031 VL	ARE 010	G5	B/SAR	Act	16	Globe	Air	O	C	C	No	Yes		EXR	CSD	ARE-01	
														FSP-C	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	5 sec
12 ARE 032 VL	ARE 010	G3	B/SAR	Act	16	Globe	Air	O	C	C	No	Yes		EXR	CSD	ARE-01	
														FSP-C	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	5 sec
12 ARE 033 VL	ARE 010	G7	B/SAR	Act	16	Globe	Air	O	C	C	No	Yes		EXR	CSD	ARE-01	
														FSP-C	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	5 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ARE 034 VL	ARE 010	G5	B/SAR	Act	16	Gate	Motor	O	C	N/A	No	Yes		EXR	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	40 sec
12 ARE 035 VL	ARE 010	G3	B/SAR	Act	16	Gate	Motor	O	C	N/A	No	Yes		EXR	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	40 sec
12 ARE 036 VL	ARE 010	G7	B/SAR	Act	16	Gate	Motor	O	C	N/A	No	Yes		EXR	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	40 sec
12 ARE 037 VL	ARE 010	F5	C	Act	16	Swing NRV	Air Assist	O	C	N/A	No	Yes		CM*	Section 8		
														RPI	2YR		
12 ARE 038 VL	ARE 010	F3	C	Act	16	Swing NRV	Air Assist	O	C	N/A	No	Yes		CM*	Section 8		
														RPI	2YR		
12 ARE 039 VL	ARE 010	F7	C	Act	16	Swing NRV	Air Assist	O	C	N/A	No	Yes		CM*	Section 8		
														RPI	2YR		
12 ARE 040 VL	ARE 010	C5	C	Act	16	Swing NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 ARE 041 VL	ARE 010	C3	C	Act	16	Swing NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 ARE 042 VL	ARE 010	C7	C	Act	16	Swing NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 ARE 242 VL	ARE 010	G5	B/SAR	Act	6	Globe	Air	C	C	C	No	Yes		EXR	CSD	ARE-01	
														FSP-C	CSD	ARE-01	
														RPI	2YR		
														STR-C	CSD	ARE-01	5 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ARE 243 VL	ARE 010	G3	B/SAR	Act	6	Globe	Air	C	C	C	No	Yes	EXR	CSD	ARE-01	
													FSP-C	CSD	ARE-01	
													RPI	2YR		
													STR-C	CSD	ARE-01	5 sec
12 ARE 244 VL	ARE 010	G4	B/SAR	Act	6	Globe	Air	C	C	C	No	Yes	EXR	CSD	ARE-01	
													FSP-C	CSD	ARE-01	
													RPI	2YR		
													STR-C	CSD	ARE-01	5 sec
12 ARE 245 VL	ARE 010	G5	B/SAR	Act	6	Gate	Motor	C	C	N/A	No	Yes	EXR	Q1		
													RPI	2YR		
													STR-C	Q1		40 sec
12 ARE 246 VL	ARE 010	G3	B/SAR	Act	6	Gate	Motor	C	C	N/A	No	Yes	EXR	Q1		
													RPI	2YR		
													STR-C	Q1		40 sec
12 ARE 247 VL	ARE 010	G7	B/SAR	Act	6	Gate	Motor	C	C	N/A	No	Yes	EXR	Q1		
													RPI	2YR		
													STR-C	Q1		40 sec
12 ASG 005 VD	ASG 500	E7	C	Act	4	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 006 VD	ASG 500	E5	C	Act	4	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 010 VD	ASG 500	E3	C	Act	4	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ASG 012 VD	ASG 500	D3	B	Act	3	Globe	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		KLR-001
12 ASG 013 VD	ASG 500	D2	B	Act	3	Globe	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		KLR-001
12 ASG 014 VD	ASG 500	D5	B	Act	3	Globe	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		KLR-001
12 ASG 015 VD	ASG 500	D4	B	Act	3	Globe	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		KLR-001
12 ASG 016 VD	ASG 500	D7	B	Act	3	Globe	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		KLR-001
12 ASG 017 VD	ASG 500	D6	B	Act	3	Globe	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ASG 018 VD	ASG 500	C3	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 019 VD	ASG 500	C2	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 020 VD	ASG 500	C5	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 021 VD	ASG 500	4	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 022 VD	ASG 500	C7	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 023 VD	ASG 500	C6	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 024 VD	ASG 500	B3	C	Act	4	Swing NRV	Air Assist	C	O/C	N/A	No	Yes	CM* RPI	Section 8 2YR		
12 ASG 025 VD	ASG 500	B5	C	Act	4	Swing NRV	Air Assist	C	O/C	N/A	No	Yes	CM* RPI	Section 8 2YR		
12 ASG 026 VD	ASG 500	B7	C	Act	4	Swing NRV	Air Assist	C	O/C	N/A	No	Yes	CM* RPI	Section 8 2YR		
12 ASG 027 VD	ASG 500	B4	C	Act	4	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 028 VD	ASG 500	B5	C	Act	4	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 ASG 029 VD	ASG 500	B7	C	Act	4	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ASG 126 VZ	ASG 500	G7	C	Act		Relief	Self	C	O/C	N/A	No	No		CKV-C	6RO	VVD-1	
														CKV-O	6RO	VVD-1	
														S-PT	6RO	RVD-2	0,13 bar(g)
12 ASG 131 VV	ASG 503	G8	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 ASG 132 VV	ASG 503	G8	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 ASG 133 VV	ASG 503	G8	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 ASG 135 VV	ASG 503	E7	B	Act	3	Globe		C	O/C	N/A	No	Yes		EXR	1RO	ASG-01	
														RPI	1RO	ASG-01	
12 ASG 136 VV	ASG 503	E7	B	Act	3	Globe		C	Throt	O	No	Yes		EXR	1RO	ASG-01	
														FSP-O	1RO	ASG-01	
														RPI	1RO	ASG-01	
12 ASG 137 VV	ASG 503	F7	B	Act	3	Gate	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		15 sec
12 ASG 138 VV	ASG 503	F7	B	Act	3	Gate	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		15 sec
12 ASG 148 VD	ASG 500	E3	C	Act	1,5	Lift NRV	Self	C	O	N/A	No	No		CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J	Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 DEG 013 VD	DEG 500	D3	A	Act	8	Gate	Motor	C	C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	DEG-01	KLR-001
12 DEG 014 VD	DEG 500	D3	A/C	Act	8	Swing NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 DEG 043 VD	DEG 500	A4	A/C	Act	1	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 DEG 044 VD	DEG 500	A4	A	Act	8	Gate	Motor	O	C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	DEG-01	KLR-001
12 DEG 045 VD	DEG 500	A4	A	Act	8	Gate	Motor	O	C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	DEG-01	KLR-001
12 DEG 640 VD	DEG 500	D3	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 DEG 643 VD	DEG 500	A4	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 EAS 001 VB	EAS 500	E6	B	Act	14	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		50 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 EAS 002 VB	EAS 500	F6	B	Act	14	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		50 sec
12 EAS 003 VB	EAS 500	E6	C	Act	14	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 EAS 004 VB	EAS 500	F5	C	Act	14	Swing NRV	Self	C	O/C		No	No		CM*	Section 8		
12 EAS 007 VB	EAS 500	C5	A	Act	14	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		22 sec
12 EAS 008 VB	EAS 500	C2	A	Act	14	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		22 sec
12 EAS 009 VB	EAS 500	C5	A	Act	14	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		22 sec
12 EAS 010 VB	EAS 500	C2	A	Act	14	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		22 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 EAS 011 VB	EAS 500	B5	A/C	Act	14	Swing NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 EAS 012 VB	EAS 500	B2	A/C	Act	14	Swing NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 EAS 013 VB	EAS 500	G3	A	Act	16	Gate	Motor	C	O/C	N/A	Yes	Yes	EXR	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-O	Q1		25 sec
12 EAS 014 VB	EAS 500	G2	A	Act	16	Gate	Motor	C	O/C	N/A	Yes	Yes	EXR	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-O	Q1		25 sec
12 EAS 017 VB	EAS 500	F5	C	Act	16	Swing NRV	Self	C	O	N/A	No	No	CM*	Section 8		
12 EAS 018 VB	EAS 500	F2	C	Act	16	Swing NRV	Self	C	O	N/A	No	No	CM*	Section 8		
12 EAS 113 VB	EAS500	C1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 EAS 114 VB	EAS500	C1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 EAS 131 VB	EAS 500	C4	B	Pass	6	Gate	Motor	C	C	N/A	No	Yes	RPI	2YR		
12 EAS 132 VB	EAS 500	C3	B	Pass	6	Gate	Motor	C	C	N/A	No	Yes	RPI	2YR		
12 EAS 133 VB	EAS 500	C4	B	Pass	6	Gate	Motor	C	C	N/A	No	Yes	RPI	2YR		
12 EAS 134 VB	EAS 500	C3	B	Pass	6	Gate	Motor	C	C	N/A	No	Yes	RPI	2YR		
12 EAS 166 VB	EAS 500	C3	A	Pass	0,75	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 EAS 167 VB	EAS 500	C5	A	Pass	0,75	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 EAS 184 VB	EBA 500	C3	A	Pass	0,75	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 EAS 185 VB	EAS 500	C5	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 EAS 220 VB	EAS 500	E6	C	Act	6	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
12 EAS 903 VE	EAS 500	E6	B	Pass	6	Globe	Manual	C	O/C	N/A	No	No	MAN	2YR		
12 EBA 001 VA	EBA 500	G5	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes	EXR	1RO		
													FSP-C	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO		3 sec
12 EBA 002 VA	EBA 500	H5	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes	EXR	1RO		
													FSP-C	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO		3 sec
12 EBA 003 VA	EBA 500	G2	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes	EXR	1RO		
													FSP-C	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO		3 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 EBA 004 VA	EBA 500	H2	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes		EXR	1RO		
														FSP-C	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO		3 sec
12 EBA 013 VA	EBA 500	D7	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes		EXR	1RO		
														FSP-C	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO		3 sec
12 EBA 014 VA	EBA 500	D7	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes		EXR	1RO		
														FSP-C	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO		3 sec
12 EBA 015 VA	EBA 500	D4	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes		EXR	1RO		
														FSP-C	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO		3 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 EBA 016 VA	EBA 500	D4	A	Act	30	Butterfly	Motor	O/C	O/C	C	Yes	Yes	EXR	1RO		
													FSP-C	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO		3 sec
12 EPP 114 VA	EPP 501	H10	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 115 VA	EPP 501	H10	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 116 VA	EPP 501	H10	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 120 VA	EPP 501	G4	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 214 VA	EPP 500	H10	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 215 VA	EPP 500	H10	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 216 VA	EPP 500	D6	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP 220 VA	EPP 500	G4	A	Act		Ball	Motor	O/C	O/C	N/A	Yes	Yes	RPI	2YR		
													SKID	1RO		
12 EPP900 VA	EPP 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 EPP901 VA	EPP 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ETY 003 VA	ETY 500	G5	A	Act	10	Butterfly	Air / Motor	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec
12 ETY 004 VA	ETY 500	G4	A	Act	10	Butterfly	Air / Motor	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec
12 ETY 005 VA	ETY 500	G5	A	Act	10	Butterfly	Man / Motor	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec
12 ETY 006 VA	ETY 500	G4	A	Act	10	Butterfly	Man / Motor	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ETY 007 VA	ETY 500	E5	A	Act	10	Butterfly	Man / Motor	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec
12 ETY 008 VA	ETY 500	E4	A	Act	10	Butterfly	Man / Motor	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec
12 ETY 009 VA	ETY 500	E5	A	Act	10	Butterfly Air / Motor		O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec
12 ETY 010 VA	ETY 500	E4	A	Act	10	Butterfly Air / Motor		O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		1 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ETY 042 VA	ETY 500	G2	A	Act	2	Globe	Air	O	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 ETY 043 VA	ETY 500	F2	A	Act	2	Globe	Air	O	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 ETY 044 VA	ETY 500	F2	A	Act	2	Globe	Air	O	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 ETY 045 VA	ETY 500	E2	A	Act	2	Globe	Air	O	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 ETY 049 VA	ETY 500	G5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 ETY 050 VA	ETY 500	G4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 ETY 051 VA	ETY 500	E5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 ETY 052 VA	ETY 500	E4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 059 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 060 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 073 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 074 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 081 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 220 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 ETY 221 VA	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 GCT 128 VV	GCT 501	D1	B	Act	6	Gate	Motor	C	Throt	N/A	No	Yes	EXR	6M		
													RPI	2YR		
													STR-C	6M	GCT-01	KLR-001
													STR-O	6M	GCT-01	KLR-001
12 GCT 129 VV	GCT 501	C1	B	Act	6	Gate	Motor	C	Throt	N/A	No	Yes	EXR	6M		
													RPI	2YR		
													STR-C	6M	GCT-01	KLR-001
													STR-O	6M	GCT-01	KLR-001
12 GCT 130 VV	GCT 501	B1	B	Act	6	Gate	Motor	C	Throt	N/A	No	Yes	EXR	6M		
													RPI	2YR		
													STR-C	6M	GCT-01	KLR-001
													STR-O	6M	GCT-01	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 GCT 131 VV	GCT 501	E1	B	Act	6	Globe	Air	C	O	C	No	Yes		EXR	6M		
														FSP-C	6M	GCT-01	
														RPI	2YR		
														STR-C	6M	GCT-01	KLR-001
														STR-O	6M	GCT-01	20 sec
12 GCT 132 VV	GCT 501	C1	B	Act	6	Globe	Air	C	O	C	No	Yes		EXR	6M		
														FSP-C	6M	GCT-01	
														RPI	2YR		
														STR-C	6M	GCT-01	KLR-001
														STR-O	6M	GCT-01	20 sec
12 GCT 133 VV	GCT 501	B1	B	Act	6	Globe	Air	C	O	C	No	Yes		EXR	6M		
														FSP-C	6M	GCT-01	
														RPI	2YR		
														STR-C	6M	GCT-01	KLR-001
														STR-O	6M	GCT-01	20 sec
12 JPI 054 VE	JPI 500	E3	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 JPI 070 VE	JPI 500	C1	A	Pass	4	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 JPI 071 VE	JPI 500	E3	A/C	Pass	4	Swing NRV	Self	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 PTR 004 VB	PTR 500	F5	C	Act	10	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 PTR 005 VB	PTR 500	F3	C	Act	10	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 PTR 021 VB	PTR 500	G5	A	Pass	12	Gate	Manual	C	C	N/A	Yes	Yes	LLRT	CLRTPRM		
													MAN	2YR		
													RPI	2YR		
12 PTR 022 VB	PTR 500	H5	A	Pass	12	Gate	Manual	C	C	N/A	Yes	Yes	LLRT	CLRTPRM		
													MAN	2YR		
													RPI	2YR		
12 PTR 023 VB	PTR 500	H4	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 PTR 129 VB	PTR 501	D8	A	Pass	6	Gate Wedge	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 130 VB	PTR 501	E8	A/C	Pass	6	Swing NRV	Self	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 140 VB	PTR 501	E1	A	Pass	10	Gate	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 141 VB	PTR 501	D1	A	Pass	10	Gate	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 145 VB	PTR 501	E2	A	Pass	4	Gate	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 146 VB	PTR 501	D2	A	Pass	4	Gate	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 170 VB	PTR 501	E2	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 PTR 171 VB	PTR 501	E1	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 PTR 328 VB	PTR 500	F5	C	Act	10	Swing NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 PTR 403 VB	PTR 501	D8	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 PTR 406 VB	PTR 501	D1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 PTR 530 VB	PTR 501	D7	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 PTR 533 VB	PTR 501	D2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 PTR 537 VB	PTR 501	D2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RAZ 905 VZ	ETY 500	F1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RAZ 009 VZ	RAZ 500	E1	A	Act	1	Globe	Air	O/C	C	C	Yes	Yes	EXR	Q1		
													FSP-C	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001
12 RAZ 010 VZ	RAZ 500	E1	A/C	Act	1	Lift NRV	Self	O/C	C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RAZ 032 VZ	RAZ 500	E2	A	Act	1	Globe	Air	O/C	C	C	Yes	Yes	EXR	Q1		
													FSP-C	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001
12 RAZ 034 VZ	RAZ 500	E2	A/C	Act	1	Lift NRV	Self	O/C	C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RAZ 402 VZ	RAZ 500	E1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RAZ 405 VZ	RAZ 500	E2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RCP 005 VP	RCP 210	D3	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes	EXR	Q1		
													RPI	2YR		
													STR-C	Q1		12 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCP 006 VP	RCP 210	D3	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		12 sec
12 RCP 007 VP	RCP 210	E3	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		12 sec
12 RCP 008 VP	RCP 210	D3	B	Act	3	Globe	Air	C	O/C	C	No	Yes		EXR	CSD	RCP-01	
														FSP-C	CSD	RCP-01	
														HTOP(A)	Section 7		6.51.11
														HTOP(B)	Section 7		6.51.11
														LTOP(A)	Section 7		6.51.11
														LTOP(B)	Section 7		6.51.11
														RPI	2YR		
														STR-C	CSD	RCP-01	KLR-001
														STR-O	CSD	RCP-01	2 sec
12 RCP 009 VP	RCP 210	D3	B	Act	3	Globe	Air	C	O/C	C	No	Yes		EXR	CSD		
														FSP-C	CSD	RCP-01	
														HTOP(A)	Section 7		6.51.11
														LTOP(A)	Section 7		6.51.11
														RPI	2YR		
														STR-C	CSD	RCP-01	KLR-001
														STR-O	CSD	RCP-01	2 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCP 010 VP	RCP 210	E3	B	Act	3	Globe	Air	C	O/C	C	No	Yes	EXR	CSD		
													FSP-C	CSD	RCP-01	
													HTOP(B)	Section 7		6.51.11
													LTOP(B)	Section 7		6.51.11
													RPI	2YR		
													STR-C	CSD	RCP-01	KLR-001
													STR-O	CSD	RCP-01	2 sec
12 RCP 011 VP	RCP 210	G3	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		171,3 bar(g)
12 RCP 012 VP	RCP 210	F3	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		171,3 bar(g)
12 RCP 013 VP	RCV 210	E3	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		171,3 bar(g)
12 RCP 036 VP	RCV 210	G2	C	Act	2	Lift NRV	Self	O/C	C	N/A	No	No	CM*	Section 8		
12 RCP 120 VP	RCP 506	D3	A/C	Act	6	Swing NRV	Self	O	O/C	N/A	No	No	CM*	Section 8		
													L/R	2YR		
12 RCP 121 VP	RCP 506	D2	A/C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
													L/R	2YR		
12 RCP 122 VP	RCP 506	D1	A/C	Act	6	Swing NRV	Self	C	O/C	N/A	No	No	CM*	Section 8		
													L/R	2YR		
12 RCP 130 VP	RCP 506	B3	C	Act	2	Lift NRV	Self	O	C	N/A	No	No	CM*	Section 8		
12 RCP 212 VP	RCP 506	F3	A	Act	14	Gate	Motor	C	O/C	N/A	No	Yes	EXR	CSD		
													L/R	2YR		
													RPI	2YR		
													STR-O	CSD	RCP-02	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCP 215 VP	RCP 506	F3	A	Act	14	Gate	Motor	C	O/C	N/A	No	Yes		EXR	CSD		
														L/R	2YR		
														RPI	2YR		
														STR-O	CSD	RCP-02	KLR-001
12 RCP 220 VP	RCP 506	F3	A/C	Act	6	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RCP 221 VP	RCP 506	F1	A/C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RCP 222 VP	RCP 506	F1	A/C	Act	6	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RCP 223 VP	RCP 506	F1	C	Act	3	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RCP 230 VP	RCP 506	H3	C	Act	2	Lift NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 RCP 320 VP	RCP 506	F5	A/C	Act	6	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RCP 321 VP	RCP 506	F3	A/C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RCP 322 VP	RCP 506	G3	A/C	Act	6	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RCP 330 VP	RCP 506	H5	C	Act	2	Lift NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 RCV 002 VP	RCV 110	G1	B	Act	2	Globe	Air	O	C	C	No	Yes		EXR	CSD		
														FSP-C	CSD	RCV-01	
														RPI	2YR		
														STR-C	CSD	RCV-01	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 003 VP	RCV 110	H1	B	Act	2	Globe	Air	O	C	C	No	Yes		EXR	CSD		
														FSP-C	CSD	RCV-01	
														RPI	2YR		
														STR-C	CSD	RCV-01	13 sec
12 RCV 007 VP	RCV 110	G3	A	Act	2	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RCV 008 VP	RCV 110	G3	A	Act	2	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RCV 009 VP	RCV 110	G3	A	Act	2	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RCV 010 VP	RCV 110	G3	A	Act	2	Globe	Air	O/C	C	C	Yes	Yes		EXR	1RO		
														FSP-C	1RO	RCV-01	
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RCV-01	13 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 033 VP	RCV 110	C3	B	Act	4	Gate	Motor	O	C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		11 sec
12 RCV 034 VP	RCV 110	C3	B	Act	4	Gate	Motor	O	C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		11 sec
12 RCV 035 VP	RCV 110	C2	C	Act	4	Swing NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 RCV 039 VP	RCV 110	B2	C	Act	3	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 040 VP	RCV 110	B2	C	Act	3	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 041 VP	RCV 110	B1	C	Act	3	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 048 VP	RCV 110	A4	A	Act	3	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RCV-02	11 sec
12 RCV 049 VP	RCV 110	A4	A/C	Act	3	Swing NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RCV 050 VP	RCV 110	H1	B	Act	3	Gate	Motor	O	C	N/A	No	Yes		EXR	1RO		
														RPI	2YR		
														STR-C	1RO	RCV-02	13 sec
12 RCV 051 VP	RCV 110	H1	C	Act	3	Swing NRV	Self	O	C	N/A	No	No		CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 052 VP	RCV 110	G2	C	Act	2	Lift NRV	Self	O/C	C	N/A	No	No		CM*	Section 8		
12 RCV 053 VP	RCV 110	C2	B	Act	8	Gate	Motor	O	C	N/A	No	Yes		EXR	CSD		
														RPI	2YR		
														STR-C	CSD	RCV-03	KLR-001
12 RCV 054 VP	RCV 110	C2	B	Act	8	Gate	Motor	O	C	N/A	No	Yes		EXR	CSD		
														RPI	2YR		
														STR-C	CSD	RCV-03	KLR-001
12 RCV 070 VP	RCV 310	F5	A/C	Act	2	Lift NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RCV 071 VP	RCV 310	F4	A/C	Act	2	Lift NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RCV 072 VP	RCV 310	F2	A/C	Act	2	Lift NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RCV 076 VP	RCV 310	F5	A	Act	2	Globe	Motor	O	C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	RCV-04	KLR-001
12 RCV 077 VP	RCV 310	F4	A	Act	2	Globe	Motor	O	C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	RCV-04	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 078 VP	RCV 310	F2	A	Act	2	Globe	Motor	O	C	N/A	Yes	Yes	EXR	CSD		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	CSD	RCV-04	KLR-001
12 RCV 082 VP	RCV 110	G4	A	Pass	2	Globe	Air	C	C	N/A	Yes	Yes	LLRT	CLRTPRM		
													RPI	2YR		
12 RCV 083 VP	RCV 110	A2	B	Act	4	Gate	Motor	O	O/C	N/A	No	Yes	EXR	CSD		
													RPI	2YR		
													STR-C	CSD	RCV-03	KLR-001
													STR-O	CSD	RCV-03	KLR-001
12 RCV 084 VP	RCV 110	A2	B	Act	4	Gate	Motor	O	O/C	N/A	No	Yes	EXR	CSD		
													RPI	2YR		
													STR-C	CSD	RCV-03	KLR-001
													STR-O	CSD	RCV-03	KLR-001
12 RCV 085 VP	RCV 110	A2	B	Act	4	Gate	Motor	O	O/C	N/A	No	Yes	EXR	CSD		
													RPI	2YR		
													STR-C	CSD	RCV-03	KLR-001
													STR-O	CSD	RCV-03	KLR-001
12 RCV 086 VP	RCV 110	A1	B	Act	4	Gate	Motor	O	O/C	N/A	No	Yes	EXR	CSD		
													RPI	2YR		
													STR-C	CSD	RCV-03	KLR-001
													STR-O	CSD	RCV-03	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 088 VP	RCV 310	B4	A	Act	3	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RCV-04	15 sec
12 RCV 089 VP	RCV 310	B4	A	Act	3	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RCV-04	15 sec
12 RCV 114 VP	RCV 110	D3	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		4,02 bar(g)
12 RCV 130 VP	RCV 110	D2	C	Act	2	Lift NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 201 VP	RCV 110	C3	A/C	Act	2	Relief	Self	C	O/C	N/A	Yes	No		LLRT	CLRTPRM		
														S-PT	Section 7		43 bar(g)
12 RCV 203 VP	RCV 110	F3	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		13,8 bar(g)
12 RCV 214 VP	RCV 110	E3	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		3,83 bar(g)
12 RCV 216 VP	RCV 110	B3	C	Act	2	Lift NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 217 VP	RCV 110	B3	C	Act	2	Lift NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 218 VP	RCV 110	B2	C	Act	2	Lift NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RCV 222 VP	RCV 110	A2	B	Act	2	Gate	Motor	O	C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		12 sec
12 RCV 223 VP	RCV 110	A2	B	Act	2	Gate	Motor	O	C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		12 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 224 VP	RCV 110	F3	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		10,3 bar(g)
12 RCV 252 VP	RCV 310	5	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		9,3 bar(g)
12 RCV 253 VP	RCV 310	B4	A/C	Act	1	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RCV 367 VP	RCV 110	F4	A	Pass	3	Gate	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RCV 368 VP	RCV 110	G4	A/C	Pass	3	Swing NRV	Self	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RCV 373 VP	RCV 110	C1	B	Act	0,75	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RCV 374 VP	RCV 110	C2	B	Act	0,75	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RCV 375 VP	RCV 110	C3	B	Act	0,75	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		11 sec
12 RCV 376 VP	RCV 110	B3	B	Act	0,75	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		11 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 404 VP	RCV 310	A4	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RCV 409 VP	RCV 310	F5	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RCV 412 VP	RCV 310	F3	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RCV 415 VP	RCV 310	F1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RCV 419 VP	RCV 110	C5	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 506 VP	RCV 310	B3	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 509 VP	RCV 310	F6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RCV 517 VP	RCV 110	C3	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 523 VP	RCV 110	G7	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 545 VP	RCV 110	G3	A	Pass	0,5	Globe	Manual	C	C	C	Yes	No	LLRT	CLRTPRM		
01 RCV 546 VP	RCV 110	G3	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 547 VP	RCV 110	G4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 550 VP	RCV 110	G3	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RCV 556 VP	RCV 110	G4	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RCV 581 VP	RCV 110	F2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RCV 589 VP	RCV 110	G3	A	Pass		Globe	Manual	C	C	C	Yes	No	LLRT	CLRTPRM		
02 RCV 592 VP	RCV 110	G3	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RCV 593 VP	RCV 310	F6	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RCV 594 VP	RCV 310	B3	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RCV 597 VP	RCV 310	C3	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RCV 887 VP	RCV110	A4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RCV 905 VP	RIS 110	B2	B	Act	2	Gate	Motor	C	O	N/A	No	No	EXR	1RO	RCV-05	
													RPI	1RO	RCV-05	
													STR-C	1RO	RCV-05	
													STR-O	1RO	RCV-05	
12 RCV 910 VP	RIS 110	B2	C	Act	2	Swing NRV	Self	C	O	N/A	No	No	CM*	Section 8		
12 RCV 911 VP	RIS 110	B2	C	Act	2	Swing NRV	Self	C	O	N/A	No	No	CM*	Section 8		
12 RCV 918 VP	RIS 110	B2	C	Act	2	Swing NRV	Self	C	O	N/A	No	No	CM*	Section 8		
12 REA 056 VB	REA 500	E3	C	Act	2	Lift NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 REA 057 VB	REA 500	E4	C	Act	2	Lift NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 REA 130 VD	REA 501	C7	A	Act	3	Globe	Air	O/C	C	C	Yes	Yes	FSP-C	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001
12 REA 131 VD	REA 501	C2	A/C	Act	3	Swing NRV	Self	O/C	C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 REA 210 VB	REA 500	C2	B	Act	2	Globe	Motor	C	O	N/A	No	Yes	EXR	Q1		
													RPI	2YR		
													STR-O	Q1		KLR-001
12 REA 401 VD	REA 501	C7/C2	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 REA 534 VD	REA 501	C7	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 101 VP	REN 505	G8	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 102 VP	REN 505	G6/G7	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 103 VP	REN 505	G8	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 104 VP	REN505	G6/G7	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 121 VP	REN 505	H5	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 122 VP	REN 505	G6	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 123 VP	REN 505	G4/H4	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 124 VP	REN 505	G5	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 131 VP	REN 505	G5	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 132 VP	REN 505	G4	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 161 VB	REN 504	G8	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 162 VB	REN 504	G7	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 163 VB	REN 504	G6	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 164 VB	REN 504	G8	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 165 VB	REN 504	G7	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 166 VB	REN 504	G6	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 185 VL	REN 503	H5	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 186 VL	REN 503	H4	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 187 VL	REN 503	H4	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 191 VL	REN 503	H5	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 192 VL	REN 503	H4	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 193 VL	REN 503	H3	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 194 VL	REN 503	G5	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 195 VL	REN 503	G4	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 196 VL	REN 503	G3	B	Act	0,375	Globe	Air	O/C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 231 VY	REN 504	G2	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 232 VY	REN 504	G2	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 REN 235 VY	REN 504	G1	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 REN 236 VY	REN 504	F1/G1	A	Act	0,375	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
02 REN 538 VP	REN 505	G4	A	Pass		Globe	Manual	C	C	N/A	No	No		LLRT	CLRTPRM		
02 REN 539 VY	REN 504	G1	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
01 REN 540 VP	REN 505	H5	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
02 REN 540 VP	REN 504	G2	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
02 REN 541 VP	REN 505	G5	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
01 REN 546 VP	REN 505	H6	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
01 REN 547 VB	REN 504	G6	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 001 VP	RIS 210	G4	B	Act	12	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
														STR-O	Q1		KLR-001
12 RIS 002 VP	RIS 210	G4	B	Act	12	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
														STR-O	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 003 VP	RIS 210	F3	B	Act	12	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
														STR-O	Q1		KLR-001
12 RIS 004 VP	RIS 210	E6	A/C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RIS 005 VP	RIS 210	E4	A/C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RIS 006 VP	RIS 210	E3	A/C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RIS 011 VP	RIS 110	G4	C	Act	8	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RIS 012 VP	RIS 110	G4	B	Act	8	Gate	Motor	C	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
														STR-O	Q1		10 sec
12 RIS 013 VP	RIS 110	G4	B	Act	8	Gate	Motor	C	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
														STR-O	Q1		10 sec
12 RIS 017 VP	RIS 110	G4	C	Act	8	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 020 VP	RIS 110	D5	A	Act	3	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	CSD	RIS-02	KLR-001
12 RIS 021 VP	RIS 110	D3	A	Act	3	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	CSD	RIS-02	KLR-001
12 RIS 022 VP	RIS 110	D3	A/C	Act	3	Swing NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														L/R	2YR		
														LLRT	CLRTPRM		
12 RIS 032 VP	RIS 110	E5	B	Act	3	Gate	Motor	C	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-O	Q1		12 sec
12 RIS 033 VP	RIS 110	E5	B	Act	3	Gate	Motor	C	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-O	Q1		12 sec
12 RIS 034 VP	RIS 110	D7	A	Act	3	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		12 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 035 VP	RIS 110	D7	A	Act	3	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		12 sec
12 RIS 040 VP	RIS 110	C7	A/C	Act	2	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														L/R	2YR		
														LLRT	CLRTPRM		
12 RIS 041 VP	RIS 110	C5	A/C	Act	2	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														L/R	2YR		
														LLRT	CLRTPRM		
12 RIS 042 VP	RIS 110	C6	A/C	Act	2	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														L/R	2YR		
														LLRT	CLRTPRM		
12 RIS 051 VP	RIS 110	G1	A	Act	14	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		100 sec
12 RIS 052 VP	RIS 110	G1	A	Act	14	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-O	Q1		100 sec
12 RIS 053 VP	RIS 110	G1	C	Act	14	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 054 VP	RIS 110	G2	C	Act	14	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RIS 057 VP	RIS 110	E1	C	Act	10	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RIS 058 VP	RIS 110	E2	C	Act	10	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RIS 061 VP	RIS 110	D5	A	Act	10	Gate	Motor	O	O/C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	RIS-01	KLR-001
														STR-O	CSD	RIS-01	KLR-001
12 RIS 062 VP	RIS 110	D4	A	Act	10	Gate	Motor	O	O/C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	RIS-01	KLR-001
														STR-O	CSD	RIS-01	KLR-001
12 RIS 063 VP	RIS 110	D1	A	Act	10	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	RIS-02	KLR-001
														STR-O	CSD	RIS-02	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 064 VP	RIS 110	D2	A	Act	10	Gate	Motor	C	O/C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	CSD	RIS-02	KLR-001
														STR-O	CSD	RIS-02	KLR-001
12 RIS 069 VP	RIS 110	D1	A/C	Act	10	Swing NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														L/R	2YR		
														LLRT	CLRTPRM		
12 RIS 070 VP	RIS 110	D2	A/C	Act	10	Swing NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														L/R	2YR		
														LLRT	CLRTPRM		
12 RIS 071 VP	RIS 110	D5	A/C	Act	10	Swing NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RIS 072 VP	RIS 110	C6	A/C	Act	2	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RIS 073 VP	RIS 110	C5	A/C	Act	2	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RIS 074 VP	RIS 110	C5	A/C	Act	2	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
														L/R	2YR		
12 RIS 075 VB	RIS 110	H4	B	Act	12	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		120 sec
12 RIS 076 VP	RIS 110	H3	C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 077 VP	RIS 110	F3	B	Act	8	Gate	Motor	C	O	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-O	Q1		50 sec
12 RIS 078 VP	RIS 110	F3	B	Act	8	Gate	Motor	C	O	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-O	Q1		50 sec
12 RIS 081 VP	RIS 110	D4	A/C	Act	10	Swing NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RIS 085 VB	RIS 110	H4	B	Act	12	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		120 sec
12 RIS 086 VP	RIS 110	H3	C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RIS 091 VP	RIS 110	B6	B	Act	0,75	Globe	Air	C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RIS 092 VP	RIS 110	B5	B	Act	0,75	Globe	Air	C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 093 VP	RIS 110	C5	B	Act	0,75	Globe	Air	C	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RIS 102 VZ	RIS 210	F7	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		48,3 bar(g)
12 RIS 104 VZ	RIS 210	F5	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		48,3 bar(g)
12 RIS 106 VZ	RIS 210	F4	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		48,3 bar(g)
12 RIS 122 VP	RIS 210	D1	A	Pass	0,75	Globe	Air	C	C	C	Yes	Yes		LLRT	CLRTPRM		
														RPI	2YR		
12 RIS 124 VP	RIS 210	C1	A	Pass	0,75	Globe	Air	C	C	C	Yes	Yes		LLRT	CLRTPRM		
														RPI	2YR		
12 RIS 128 VP	RIS 110	D2	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		15,5 bar(g)
12 RIS 129 VP	RIS 110	D2	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		15,5 bar(g)
12 RIS 132 VP	RIS 110	E1	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RIS 133 VP	RIS 110	E2	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RIS 136 VB	RIS 210	G4	A	Pass	1	Globe	Air	C	C	C	Yes	Yes		LLRT	CLRTPRM		
														RPI	2YR		
12 RIS 137 VB	RIS 210	G4	A/C	Pass	1	Lift NRV	Self	C	C	N/A	Yes	No		LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 144 VP	RIS 110	E1	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RIS 145 VP	RIS 110	E1	B	Act	3	Gate	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RIS 205 VP	RIS 110	E6	C	Act	1	Lift NRV	Self	O/C	C	N/A	No	No		CM*	Section 8		
12 RIS 206 VP	RIS 110	E6	B	Act	0,5	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
12 RIS 208 VP	RIS 110	D6	B	Act	1	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
12 RIS 209 VP	RIS 110	D6	B	Act	1	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
12 RIS 215 VP	RIS 110	E7	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		204 bar(g)

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 361 VP	RIS 110	D5	A	Act	0,5	Globe	Air	O	C	N/A	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		10 sec
12 RIS 362 VP	RIS 110	D5	A	Act	0,5	Globe	Air	O	C	N/A	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		10 sec
12 RIS 363 VP	RIS 110	D5	B	Act	0,5	Globe	Air	O	C	N/A	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
12 RIS 401 VP	RIS 110	C5	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 408 VP	RIS 110	D3	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
01 RIS 410 VP	RIS 110	C4	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 412 VP	RIS 110	D4	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 414 VP	RIS 110	D2	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 417 VP	RIS 110	D1	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 421 VP	RIS 110	D5	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RIS 423 VB	RIS 210	C4	A	Pass		Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RIS 531 VP	RIS 110	C6	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RIS 532 VP	RIS 110	C7	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RIS 533 VP	RIS 110	C5	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
01 RIS 550 VP	RIS 210	C1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RIS 555 VP	RIS 110	C5	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
02 RIS 572 VP	RIS 210	D1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RIS 620 VP	RIS 210	C1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RIS 621 VP	RIS 210	C1	A	Pass		Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RIS 869 VP	RIS 110	C6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RIS 870 VP	RIS 110	C6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RIS 871 VP	RIS 110	C6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 RPE 002 VY	RPE 501	H5/H4	A	Act	1	Globe	Air	O/C	C	C	Yes	Yes	EXR	Q1		
													FSP-C	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001
12 RPE 003 VY	RPE 501	H6/H5	A	Act	1	Globe	Air	O/C	C	C	Yes	Yes	EXR	Q1		
													FSP-C	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RPE 017 VP	RPE 501	H4/H3	A	Act	3	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RPE 018 VP	RPE 501	H3	A	Act	3	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RPE 027 VP	RPE 501	H5	A	Act	3	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RPE 028 VP	RPE 501	H5	A	Act	3	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RPE 055 VE	RPE 501	H5	A	Act	2	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RPE 056 VE	RPE 501	F5/D5	A	Act	2	Globe	Air	O/C	C	C	Yes	Yes		EXR	Q1		
														FSP-C	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
02 RPE 538 VP	RPE 501	C6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RPE 405 VP	RPE 501	H5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 RRA 001 VP	RRA 010	H5	A	Act	14	Gate	Motor	C	O/C	N/A	No	Yes		EXR	CSD		
														L/R	2YR		
														RPI	2YR		
														STR-O	CSD	RRA-01	KLR-001
12 RRA 004 VP	RRA 010	F6	C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RRA 005 VP	RRA 010	F4	C	Act	12	Swing NRV	Self	C	O/C	N/A	No	No		CM*	Section 8		
12 RRA 014 VP	RRA 010	A6	A	Act	10	Gate	Motor	C	O/C	N/A	No	Yes		EXR	CSD		
														L/R	2YR		
														RPI	2YR		
														STR-O	CSD	RRA-01	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRA 015 VP	RRA 010	B5	A	Act	10	Gate	Motor	C	O/C	N/A	No	Yes		EXR	CSD		
														L/R	2YR		
														RPI	2YR		
														STR-O	CSD	RRA-01	KLR-001
12 RRA 018 VP	RRA 010	E8	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		44 bar(g)
12 RRA 021 VP	RRA 010	H5	A	Act	14	Gate	Motor	C	O/C	N/A	No	Yes		EXR	CSD		
														L/R	2YR		
														RPI	2YR		
														STR-O	CSD	RRA-01	KLR-001
12 RRA 115 VP	RRA 010	D8	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		39 bar(g)
12 RRI 005 VN	RRI 500	E7	C	Act	20	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RRI 006 VN	RRI 500	E3	C	Act	20	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RRI 007 VN	RRI 500	F5	C	Act	20	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RRI 008 VN	RRI 500	F2	C	Act	20	Swing NRV	Self	O/C	O/C	N/A	No	No		CM*	Section 8		
12 RRI 011 VN	RRI 501	G5	A	Act	14	Gate	Manual	C	O/C	N/A	Yes	Yes		LLRT	CLRTPRM		
														MAN	2YR		
														RPI	2YR		
12 RRI 012 VN	RRI 500	G4	A	Act	14	Gate	Manual	C	O/C	N/A	Yes	Yes		LLRT	CLRTPRM		
														MAN	2YR		
														RPI	2YR		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 013 VN	RRI 501	G5	A/C	Act	14	Swing NRV	Self	O	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RRI 014 VN	RRI 501	G4	A/C	Act	14	Swing NRV	Self	O	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RRI 019 VN	RRI 500	D5	A	Act	14	Gate	Motor	O	O/C	N/A	Yes	Yes	EXR	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001
12 RRI 020 VN	RRI 500	D4	A	Act	14	Gate	Motor	O	O/C	N/A	Yes	Yes	EXR	Q1		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	Q1		KLR-001
12 RRI 021 VN	RRI 500	D5	A	Act	14	Gate	Manual	C	O/C	N/A	Yes	Yes	LLRT	CLRTPRM		
													MAN	2YR		
													RPI	2YR		
12 RRI 022 VN	RRI 500	D4	A	Act	14	Gate	Manual	C	O/C	N/A	Yes	Yes	LLRT	CLRTPRM		
													MAN	2YR		
													RPI	2YR		
12 RRI 035 VN	RRI 500	D7	B	Act	24	Butterfly	Air	O	O/C	O	No	Yes	EXR	Q1		
													FSP-O	Q1		
													RPI	2YR		
													STR-O	Q1		80 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 036 VN	RRI 501	E3	B	Act	24	Butterfly	Air	C	O	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-O	Q1		80 sec
12 RRI 040 VN	RRI 500	H5	B	Act	24	Butterfly	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		57 sec
12 RRI 041 VN	RRI 500	H6	B	Act	24	Butterfly	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		57 sec
12 RRI 058 VN	RRI 500	C6	B	Act	24	Butterfly	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		57 sec
12 RRI 059 VN	RRI 500	C5	B	Act	24	Butterfly	Motor	O	O/C	N/A	No	Yes		EXR	Q1		
														RPI	2YR		
														STR-C	Q1		57 sec
12 RRI 130 VN	RRI 501	E4	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		9 bar(g)
12 RRI 131 VN	RRI 501	E6	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		9 bar(g)
12 RRI 146 VN	RRI 500	A5	B	Act	12	Gate	Motor	O	C	N/A	No	Yes		EXR	CSD		
														RPI	2YR		
														STR-C	CSD	RRI-04	22 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 170 VN	RRI 502	H2	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes	EXR	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO	RRI-02	KLR-001
12 RRI 177 VN	RRI 502	C2	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes	EXR	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO	RRI-02	KLR-001
12 RRI 188 VN	RRI 502	G2	A/C	Act	6	Swing NRV	Self	O	C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RRI 189 VN	RRI 502	D2	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes	EXR	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO	RRI-02	KLR-001
12 RRI 209 VN	RRI 503	G6	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		9 bar(g)
12 RRI 210 VN	RRI 502	H5	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes	EXR	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO	RRI-01	KLR-001
12 RRI 211 VN	RRI 502	H6	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes	EXR	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO	RRI-01	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 212 VN	RRI 502	H7	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001
12 RRI 213 VN	RRI 502	G5	A/C	Act	6	Swing NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 214 VN	RRI 502	G6	A/C	Act	6	Swing NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 215 VN	RRI 502	G7	A/C	Act	6	Swing NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 219 VN	RRI 502	G5	C	Act	2	Lift NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 RRI 220 VN	RRI 502	G6	C	Act	2	Lift NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 RRI 221 VN	RRI 502	G7	C	Act	2	Lift NRV	Self	O	C	N/A	No	No		CM*	Section 8		
12 RRI 225 VN	RRI 502	E5	B	Act	2	Globe	Air	O	C	O	No	Yes		EXR	CSD		
														FSP-O	CSD		
														RPI	2YR		
														STR-C	CSD	RRI-01	KLR-001
12 RRI 226 VN	RRI 502	E6	B	Act	2	Globe	Air	O	C	O	No	Yes		EXR	CSD		
														FSP-O	CSD		
														RPI	2YR		
														STR-C	CSD	RRI-01	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 227 VN	RRI 502	E7	B	Act	2	Globe	Air	O	C	O	No	Yes		EXR	CSD		
														FSP-O	CSD		
														RPI	2YR		
														STR-C	CSD	RRI-01	KLR-001
12 RRI 280 VN	RRI 502	C5	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	CSD		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001
12 RRI 281 VN	RRI 502	C6	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001
12 RRI 282 VN	RRI 502	C7	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001
12 RRI 283 VN	RRI 502	B5	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001
12 RRI 284 VN	RRI 502	B6	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 285 VN	RRI 502	B7	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	1RO		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	1RO	RRI-01	KLR-001
12 RRI 300 VN	RRI 502	H3	A	Act	6	Gate	Motor	O	C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RRI 304 VN	RRI 502	C4	A	Act	0,75	Globe	Motor	O	C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RRI 313 VN	RRI 502	C3	A	Act	3	Gate	Motor	O	C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RRI 317 VN	RRI 502	E3	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		9 bar(g)
12 RRI 318 VN	RRI 502	D4	A	Act	0,75	Globe	Motor	O	C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 319 VN	RRI 502	D4	A	Act	3	Gate	Motor	O	C	N/A	Yes	Yes		EXR	Q1		
														LLRT	CLRTPRM		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 RRI 320 VN	RRI 502	G3	A/C	Act	3	Swing NRV	Self	O	C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 330 VN	RRI 505	E1	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		9 bar(g)
12 RRI 335 VN	RRI 502	D1	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		9 bar(g)
12 RRI 465 VN	RRI 503	H2	B	Act	24	Butterfly	Man / Motor	O	C	N/A	No	Yes		EXR	CSD		
														RPI	2YR		
														STR-C	CSD	RRI-03	57 sec
12 RRI 466 VN	RRI 503	B1	B	Act	24	Butterfly	Man / Motor	O	C	N/A	No	Yes		EXR	CSD		
														RPI	2YR		
														STR-C	CSD	RRI-03	57 sec
12 RRI 476 VN	RRI 502	C7	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 477 VN	RRI 502	C6	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 478 VN	RRI 502	C4	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		
12 RRI 479 VN	RRI 502	D4	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No		CM*	Section 8		
														LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 480 VN	RRI 502	D3	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RRI 481 VN	RRI 502	D1	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RRI 539 VN	RRI 501	D5	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 RRI 540 VN	RRI 501	D4	A/C	Act	0,75	Lift NRV	Self	C	O/C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
09 RRI 546 VN	RRI 504	B4	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		9 bar(g)
12 RRI 551 VN	RRI 501	A5	B	Act	12	Butterfly	Motor	O	C	N/A	No	Yes	EXR	CSD		
													RPI	2YR		
													STR-C	CSD	RRI-04	22 sec
12 RRI 552 VN	RRI 501	B5	C	Act	12	Swing NRV	Self	O	C	N/A	No	No	CM*	Section 8		
12 RRI 685 VN	RRI 502	E5	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		172 bar(g)
12 RRI 686 VN	RRI 502	E6	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		172 bar(g)
12 RRI 687 VN	RRI 502	E7	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		172 bar(g)
12 RRI 725 VN	RRI 500	D8	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		10 bar(g)
12 RRI 726 VN	RRI 500	F4	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		10 bar(g)
12 RRI 727 VN	RRI 500	F6	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		10 bar(g)
12 RRI 728 VN	RRI 500	F2	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		10 bar(g)
12 RRI 729 VN	RRI 501	D7	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		10,5 bar(g)

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 730 VN	RRI 501	E3	C	Act		Relief	Self	C	O/C	N/A	No		No	S-PT	Section 7		10,5 bar(g)
12 RRI 731 VN	RRI 501	E7	C	Act		Relief	Self	C	O/C	N/A	No		No	S-PT	Section 7		10 bar(g)
12 RRI 732 VN	RRI 501	E1	C	Act		Relief	Self	C	O/C	N/A	No		No	S-PT	Section 7		10 bar(g)
12 RRI 733 VN	RRI 505	F3	C	Act		Relief	Self	C	O/C	N/A	No		No	S-PT	Section 7		9 bar(g)
12 RRI 734 VN	RRI 505	F2	C	Act		Relief	Self	C	O/C	N/A	No		No	S-PT	Section 7		9 bar(g)
12 RRI 735 VN	RRI 503	G5	C	Act	0,5	Relief	Self	C	O/C	N/A	No		No	S-PT	Section 7		9,5 bar(g)
12 RRI 751 VN	RRI 501	G5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 752 VN	RRI 501	G4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 757 VN	RRI 501	D5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 758 VN	RRI 501	D4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 761 VN	RRI 502	G5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 762 VN	RRI 502	G6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 763 VN	RRI 502	H7	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 767 VN	RRI 502	B5	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 768 VN	RRI 502	B6	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 769 VN	RRI 502	B7	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 773 VN	RRI 502	G4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 777 VN	RRI 502	C4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 778 VN	RRI 502	C4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		
12 RRI 781 VN	RRI 502	G2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes		No	LLRT	CLRTPRM		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 RRI 784 VN	RRI 502	C2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 SAR 432 VA	SAR 201	H3	A	Act	2	Globe	Motor	O	C	N/A	Yes	Yes	EXR	1RO		
													LLRT	CLRTPRM		
													RPI	2YR		
													STR-C	1RO	SAR-01	KLR-001
12 SAR 433 VA	SAR 201	G3	A/C	Act	2	Lift NRV	Self	O	C	N/A	Yes	No	CM*	Section 8		
													LLRT	CLRTPRM		
12 SAR 579 VA	SAR 201	H2	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 SAT 052 VA	SAT 201	C1	A	Pass	2	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 SAT 053 VA	SAT 201	C1	A	Pass	2	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 SAT 401 VA	SAT 201	C1	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No	LLRT	CLRTPRM		
12 SEC 005 VE	SEC 501	E7	C	Act	24	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 006 VE	SEC 502	E7	C	Act	24	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 007 VE	SEC 501	C7	C	Act	24	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 008 VE	SEC 502	C7	C	Act	24	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 023 VE	SEC 501	D2	C	Act	4	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 024 VE	SEC 502	D2	C	Act	4	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 025 VE	SEC 501	D2	C	Act	4	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		
12 SEC 026 VE	SEC 502	D2	C	Act	4	NRV	Self	O/C	O/C	N/A	No	No	CM*	Section 8		

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 SEC 037 VE	SEC 501	G3	B	Act	3	Butterfly	Air	O/C	C	C	No	No		EXR	Q1		
														FSP-C	Q1		
														STR-C	Q1		KLR-001
12 SEC 038 VE	SEC 502	G3	B	Act	3	Butterfly	Air	O/C	C	C	No	No		EXR	Q1		
														FSP-C	Q1		
														STR-C	Q1		KLR-001
12 SEC089VA	SEC 503	D7	C	Act	4	NRV	Self	C	O	O	No	No		CM*	Section 8		
12 SEC090VA	SEC 503	D7	C	Act	4	NRV	Self	C	O	O	No	No		CM*	Section 8		
12 SED 200 VD	SED 507	C4	A	Pass	2	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 SED 201 VD	SED 507	B4	A/C	Pass	2	Lift NRV	Self	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 SED 401 VD	SED 507	G3/B3	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
01 SED521 VD	SED 507	G4	A	Pass	0,5	Globe	Manual	C	C	N/A	Yes	No		LLRT	CLRTPRM		
12 VVP 001 VV	VVP 501	D7	B	Act	32	Globe	Air	O	C	C	No	Yes		EXR	CSD		
														FSP-C	CSD	VVP-01	
														RPI	2YR		
														STR-C	CSD	VVP-01	5 sec
12 VVP 002 VV	VVP 501	D5	B	Act	32	Globe	Air	O	C	C	No	Yes		EXR	CSD		
														FSP-C	CSD	VVP-01	
														RPI	2YR		
														STR-C	CSD	VVP-01	5 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 VVP 003 VV	VVP 501	D3	B	Act	32	Globe	Air	O	C	C	No	Yes	EXR	CSD		
													FSP-C	CSD	VVP-01	
													RPI	2YR		
													STR-C	CSD	VVP-01	5 sec
12 VVP 100 VV	VVP 501	E7	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 101 VV	VVP 501	E5	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 102 VV	VVP 501	E4	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 103 VV	VVP 501	E7	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 104 VV	VVP 501	E5	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 105 VV	VVP 501	E4	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 106 VV	VVP 501	E7	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 107 VV	VVP 501	E5	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 108 VV	VVP 501	E4	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 109 VV	VVP 501	E7	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 110 VV	VVP 501	E5	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 111 VV	VVP 501	E4	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 112 VV	VVP 501	F7	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 113 VV	VVP 501	F7	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 114 VV	VVP 501	E4	C	Act		Relief	Air Assist	C	O/C	N/A	No	No	S-PT	Section 7		73,0 bar(g)
12 VVP 115 VV	VVP 501	F7	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)
12 VVP 116 VV	VVP 501	F7	C	Act		Relief	Self	C	O/C	N/A	No	No	S-PT	Section 7		75,6 bar(g)

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 VVP 117 VV	VVP 501	E4	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		75,6 bar(g)
12 VVP 118 VV	VVP 501	F7	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		75,6 bar(g)
12 VVP 119 VV	VVP 501	F7	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		75,6 bar(g)
12 VVP 120 VV	VVP 501	E4	C	Act		Relief	Self	C	O/C	N/A	No	No		S-PT	Section 7		75,6 bar(g)
12 VVP 127 VV	VVP 501	D7	B	Act	3	Globe	Air	O	O/C	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 VVP 128 VV	VVP 501	D5	B	Act	3	Globe	Air	O	O/C	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 VVP 129 VV	VVP 501	D4	B	Act	3	Globe	Air	O	O/C	O	No	Yes		EXR	Q1		
														FSP-O	Q1		
														RPI	2YR		
														STR-C	Q1		KLR-001
12 VVP 140 VV	VVP 501	D7	B	Act	3	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec

APPENDIX 6-1
VALVE TEST PLANS

Valve	P&ID	Coord	Cat	Act Pass	Size	Valve Type	Act Type	Norm Pos	Safe Pos	Fail	App J Type	C	Pos Ind	Test Type	Test Freq	Test Defe/Dev	Limiting Value/Setpoint
12 VVP 141 VV	VVP 501	D5	B	Act	3	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec
12 VVP 142 VV	VVP 501	D3	B	Act	3	Globe	Air	O	C	C	No	Yes		EXR	Q1		
														FSP-C	Q1		
														RPI	2YR		
														STR-C	Q1		10 sec

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

ARE-01
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 ARE 031 VL	001 GV FEED WATER FLOW CONTROL	ARE 010	G5	B/SAR	Act	O	C
12 ARE 032 VL	002 GV FEED WATER FLOW CONTROL	ARE 010	G3	B/SAR	Act	O	C
12 ARE 033 VL	003 GV FEED WATER FLOW CONTROL	ARE 010	G7	B/SAR	Act	O	C
12 ARE 034 VL	001 GV FEED WATER FLOW ISOLATION	ARE 010	G5	B/SAR	Act	O	C
12 ARE 035 VL	002 GV FEED WATER FLOW ISOLATION	ARE 010	G3	B/SAR	Act	O	C
12 ARE 036 VL	003 GV FEED WATER FLOW ISOLATION	ARE 010	G7	B/SAR	Act	O	C
12 ARE 242 VL	001 GV FEED WATER FLOW BYPASS CONTROL	ARE 010	G5	B/SAR	Act	C	C
12 ARE 243 VL	002 GV FEED WATER FLOW BYPASS CONTROL	ARE 010	G3	B/SAR	Act	C	C
12 ARE 244 VL	003 GV FEED WATER FLOW BYPASS CONTROL	ARE 010	G4	B/SAR	Act	C	C

Function

Feedwater flow to steam generators during normal operation.

Deferred Testing

Exercise, stroke time and loss of power test (air operated valves) quarterly.

Cold Shutdown Test Justification

The operation (exercising) of these valves during the cycle (normal plant operation) may cause a steam generator level transient which may result in a Unit trip. Failure of these valves in the closed position will result in a plant trip. The bypass valves are normally closed at power, which is the required safety position. The operation of the bypass valves will result in changes to the feed water flow rate and increase the risk of a plant transient or unit trip. The operation of these valves at cold shutdown intervals is consistent with the Safety Related Surveillance Manual (SRSM) reference [30] and Operating Technical Specifications (OTS) reference [31].

Cold Shutdown Testing

Exercise, stroke time and loss of power test (air operated valves) at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

ASG-01
Refueling Outage Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 ASG 135 VV	ASG TURBINE OVERSPEED TRIP VALVE	ASG 503	E7	B	Act	C	O/C
12 ASG 136 VV	ASG TURBINE CONTROL	ASG 503	E7	B	Act	C	Throt

Function

Open to provide auxiliary feed water flow to the steam generators when main feed water is unavailable and close to provide isolation capability.

Deferred Testing

Test of the turbine pump as it relates to it's over speed trip and turbine control test. Deferring the IST surveillances i.e. exercise remote position and the fail safe position.

Refueling Shutdown Test Justification

These tests could only be done with full flow delivered by the turbine pump and this may result in unwarranted cyclic stresses to the main feed water piping and potential positive reactivity additions due to the addition of cooler water into the steam generators. In addition, the excess water could result in steam generator level transients that may cause a plant transient or unit trip. Performance of a forward flow test at a less frequent interval (e.g., cold shutdowns or reduced power proceeding to or transiting from shutdown) is practical. Therefore, these IST surveillances will be performed in conjunction with the associated comprehensive turbine driven pump test.

Refueling Shutdown Testing

The above IST surveillances will be done in conjunction with the forward flow and reverse flow exercise test of the turbine driven pump 12 ASG 003 PO at cold shutdown or refuelling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

DEG-01
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 DEG 013 VD	CHILLED WATER CONTAINMENT ISOLATION PEN #537 (CIV)	DEG 500	D3	A	Act	C	C
12 DEG 044 VD	CHILLED WATER CONTAINMENT ISOLATION PEN #538 (CIV)	DEG 500	A4	A	Act	O	C
12 DEG 045 VD	CHILLED WATER CONTAINMENT ISOLATION PEN #538 (CIV)	DEG 500	A4	A	Act	O	C

Function

Provide chilled water to reactor pit and containment ventilation systems.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Exercising these valves while at power will isolate all cooling water flow to the Containment and Reactor Pit ventilation systems. Cooling water is needed for these systems at power. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

GCT-01
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 GCT 128 VV	001 GV ATMOSPHERIC BY-PASS ISOL.	GCT 501	D1	B	Act	C	Throt
12 GCT 129 VV	002 GV ATMOSPHERIC BY-PASS ISOL.	GCT 501	C1	B	Act	C	Throt
12 GCT 130 VV	003 GV ATMOSPHERIC BY-PASS ISOL.	GCT 501	B1	B	Act	C	Throt
12 GCT 131 VV	001 GV ATMOSPHERIC BY-PASS	GCT 501	E1	B	Act	C	O
12 GCT 132 VV	002 GV ATMOSPHERIC BY-PASS	GCT 501	C1	B	Act	C	O
12 GCT 133 VV	003 GV ATMOSPHERIC BY-PASS	GCT 501	B1	B	Act	C	O

Function

Steam dump to atmosphere

Deferred Testing

Exercise, stroke time, loss of power test quarterly.

Cold Shutdown Test Justification

During the implementation of the Safety Related Surveillance Manual (SRSM) Rev 1, it was discovered that there is misalignment between the ISTPRM and the SRSM surveillance frequencies associated with the steam dump to atmosphere (GCT) Air Operated and Motor Operated Valves covered under the operating Periodic Test KWB-PT-12-GCT-005.
The SRSM exhaustive analysis has concluded that the risk to the plant by rendering one GCT to atmosphere line inoperable during the test of the GCT valves under GCT 005 PT will be tolerable if performed at a 6 Monthly (6M) frequency. The ISTPRM frequency is based on the ASME OM code deterministic frequency of 3 Monthly (3M).
The SRSM stipulates an analysed frequency of 6M for the GCT AOVs and MOVs tests which in practice means that if the test is performed at 6M frequency, the LCO Group 1 Event will be an acceptable planned event. The ISTPRM requires the surveillance of the subject valves to be performed at 3M frequency which will render a GCT to atmosphere line inoperable thus invoking a voluntary LCO Group 1 Event as dictated by the new OTS. Hence, NNR approval is required to enter the Group 1 Event or the ISTPRM surveillances for the subject valves will be missed.

The historical test data of the subject valves show consistent acceptable results as it relates to the exercise and stroke time requirements. In addition to the ISTPRM surveillances, the subject valves are maintained under a PM task at 3 RO frequency. Based on this, the operability readiness of the subject valves will not be modified by deferring the stroke test to 6 M and is in compliance with the ASME OM code requirement. The proposed SRSM test frequency provides an acceptable level of quality and safety. Performing the test at the STPRM frequency of 3 M would result in unusual hardship without a compensating increase in the level of operability readiness assurance.

Cold Shutdown Testing

Full stroke exercise, stroke time and loss of power test (air operated valves) at 6 Monthly (6M).

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCP-01
Refueling Outage Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCP 008 VP	PRESSURIZER RELIEF VALVE	RCP 210	D3	B	Act	C	O/C
12 RCP 009 VP	PRESSURIZER RELIEF VALVE	RCP 210	D3	B	Act	C	O/C
12 RCP 010 VP	PRESSURIZER RELIEF VALVE	RCP 210	E3	B	Act	C	O/C

Function

Provide overpressure protection for the reactor coolant system (PORVs) at low and high temperatures

Deferred Testing

Exercise, stroke time and fail-safe loss of power(for PORVs) test quarterly.

Refueling Shutdown Test Justification

Recognizing that the new installed PORVs at Koeberg cannot be stroked during normal operation, the provisions in the ASME OM code subsection ISTC 3510 allows the exercise test of the PORVs to be once per fuel cycle. The operation of these valves during refuelling intervals is consistent with the Safety Related Surveillance Manual (SRSM) reference [30] and Operating Technical Specifications (OTS) reference [31].

Refueling Shutdown Testing

Exercise, stroke time and loss of power test (air operated valves) at refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCP-02
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCP 212 VP	LOOP 2 HOT LEG TO RRA (PIV)	RCP 506	F3	A	Act	C	O/C
12 RCP 215 VP	LOOP 2 HOT LEG TO RRA (PIV)	RCP 506	F3	A	Act	C	O/C

Function
Provide suction flow path to RRA pumps during plant shutdown conditions.

Deferred Testing
Exercise and stroke time quarterly.

Cold Shutdown Test Justification
Operation of these valves to complete testing could expose a high pressure system (RCP) to a low pressure system (RRA). This action could result in damage to major plant equipment and reduce RCP barrier integrity. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing
Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCV-01
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCV 002 VP	RCV LETDOWN ISOLATION	RCV 110	G1	B	Act	O	C
12 RCV 003 VP	RCV LETDOWN ISOLATION	RCV 110	H1	B	Act	O	C
12 RCV 010 VP	RCV LETDOWN CONT. ISOL. PENETRATION #255 CIV)	RCV 110	G3	A	Act	O/C	C

Function

Letdown from reactor coolant system.

Deferred Testing

Exercise, stroke time and loss of power test quarterly.

Cold Shutdown Test Justification

Exercising these valves during power operation would isolate RCV let-down flow from the Main Reactor Coolant (RCP) system, resulting in a primary plant transient and interrupt flow to the regenerative heat exchanger. Isolation of let-down flow will cause the pressuriser level to increase, resulting in a corresponding reduction to charging flow. This imbalance would result in abnormal operating conditions and may result in a plant transient or unit trip due to pressuriser level variations and uncontrolled positive reactivity addition as a result of cold water injection. Failure of any valve in the test position would isolate let-down. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise, stroke time and loss of power test (air operated valves) at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCV-02
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCV 048 VP	CHARGING LINE CONT. ISOLATION PEN #260 (CIV)	RCV 110	A4	A	Act	O	C
12 RCV 050 VP	CHARGING FLOW ISOLATION	RCV 110	H1	B	Act	O	C

Function

Charging flow to reactor coolant system isolation.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Exercising these valves will isolate RCV makeup flow to the reactor coolant system; which could result in pressuriser level transients. Operation of alternate injection pathways may lead to uncontrolled reactivity changes since these pathways are not normally in service during power operations and the boron concentration in the isolated section of piping is unknown. Operation of these valves will also upset the seal injection flow rate to the RCPs pumps. Valve failure in the closed position would require that the alternate pathway for boron injection remain in service and is not desired. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCV-03
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCV 053 VP	RCV PUMP SUCTION ISOLATION	RCV 110	C2	B	Act	O	C
12 RCV 054 VP	RCV PUMP SUCTION ISOLATION	RCV 110	C2	B	Act	O	C
12 RCV 083 VP	RCV PUMP DISCHARGE CROSSOVER	RCV 110	A2	B	Act	O	O/C
12 RCV 084 VP	RCV PUMP DISCHARGE CROSSOVER	RCV 110	A2	B	Act	O	O/C
12 RCV 085 VP	RCV PUMP DISCHARGE CROSSOVER	RCV 110	A2	B	Act	O	O/C
12 RCV 086 VP	RCV PUMP DISCHARGE CROSSOVER	RCV 110	A1	B	Act	O	O/C

Function

RCV pump suction isolation and discharge crossover.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Exercising these valves during power operation would reduce system availability and require starting and stopping of HHSI pumps to assure that RCV flow is not interrupted. Additional cycling of plant equipment in order to support testing is not warranted. Valve failure in the closed position would result in a temporary loss of flow leading to pressuriser level transients that may result in a unit shutdown. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCV-04
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCV 076 VP	SEAL INJECT CONT. ISOLATION PENETRATION #257 (CIV)	RCV 310	F5	A	Act	O	C
12 RCV 077 VP	SEAL INJECT CONT. ISOLATION PENETRATION #256 (CIV)	RCV 310	F4	A	Act	O	C
12 RCV 078 VP	SEAL INJECT CONT. ISOLATION PENETRATION #259 (CIV)	RCV 310	F2	A	Act	O	C
12 RCV 088 VP	SEAL RETURN CONT. ISOLATION PENETRATION #258 (CIV)	RCV 310	B4	A	Act	O	C
12 RCV 089 VP	SEAL RETURN CONT. ISOLATION PENETRATION #258 (CIV)	RCV 310	B4	A	Act	O	C

Function

Reactor coolant pump seal injection supply and return.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Exercising these valves during power operation would cause a loss of seal injection; which is needed to support operation of the RCPs pumps. Loss of seal injection may cause damage to the RCP pumps seals; which would require that the unit be shutdown. Valve failure in the closed position would result in a complete loss of the seal injection flow and may result in a unit shut down and potential RCP system undesirable transient. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RCV-05
Refueling Outage Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RCV 905 VP	ISOL FROM PTR TANK (SBO mod 96074)	RIS 110	B2	B	Act	C	O

Function
Beyond design Station black out RCP pump seal injection emergency valves

Deferred Testing
Exercise, stroke time quarterly.

Refueling Shutdown Test Justification
This is to align with the SRSM requirement.

Stroking these valves under the new OTS may incur and require an entry into a group 1 event which is not permitted by the NNR. Thus, the SRSM exhaustive analysis concluded that in order to establish an operability readiness of the emergency seal injection system and the associated valves, they shall be stroked every refuelling outage.The operation of these valves at cold shutdown intervals is consistent with the Safety Related Surveillance Manual (SRSM) reference [30] and Operating Technical Specifications (OTS) reference [31].

Refueling Shutdown Testing
Exercise, stroke time and RPI test at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RIS-01
Refueling Outage Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RIS 061 VP	LHSI TO COLD LEGS CONT. ISOL. PENETRATION #104 (CIV)	RIS 110	D5	A	Act	O	O/C
12 RIS 062 VP	LHSI TO COLD LEGS CONT. ISOL. PENETRATION #207 (CIV)	RIS 110	D4	A	Act	O	O/C

Function
LHSI and Accumulator injection isolation.

Deferred Testing
Exercise and stroke time quarterly.

Refueling Shutdown Test Justification
These valves are secured in the open position in accordance with SAR T-II-4.2.4-1 to assure maximum availability of the LHSI pumps and RIS accumulators flow path towards the cold legs following a LOCA. Exercising these valves to support testing is not warranted since these valves are already in the required position to mitigate the initial consequences of an accident as confirmed in the safety injection analysis. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Refueling Shutdown Testing
Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RIS-02
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RIS 020 VP	HHSI TO COLD LEGS CONT. ISOL PENETRATION #262 (CIV)	RIS 110	D5	A	Act	C	O/C
12 RIS 021 VP	HHSI TO HOT LEGS CONT. ISOL. PENETRATION #263 (CIV)	RIS 110	D3	A	Act	C	O/C
12 RIS 063 VP	LHSI TO HOT LEGS CONT. ISOL. PENETRATION #102 (CIV)	RIS 110	D1	A	Act	C	O/C
12 RIS 064 VP	LHSI TO HOT LEGS CONT. ISOL. PENETRATION #101 (CIV)	RIS 110	D2	A	Act	C	O/C

Function

HHSI injection isolation to the Hot Legs.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

These valves are under a constant HHSI / LHSI pressure and they should remain close in accordance with SAR T-II-4.2.4-1 in the initial stage of an accident to assure maximum flow to the cold legs as it is confirmed through analysis. Exercising these valves to support testing is not warranted since these valves are already in the required position to mitigate the initial consequences of an accident. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RRA-01
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RRA 001 VP	RRA PUMP SUCTION ISOLATION (PIV)	RRA 010	H5	A	Act	C	O/C
12 RRA 014 VP	RRA TO LOOP 1 COLD LEG ISOL.(PIV)	RRA 010	A6	A	Act	C	O/C
12 RRA 015 VP	RRA TO LOOP 3 COLD LEG ISOL(PIV)	RRA 010	B5	A	Act	C	O/C
12 RRA 021 VP	RRA PUMP SUCTION ISOLATION(PIV)	RRA 010	H5	A	Act	C	O/C

Function

RRA pump suction and discharge isolation.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Operation of these valves to complete testing could expose a high pressure system (RCP) to a low pressure system (RRA). This action could result in an intersystem loss of coolant accident which may damage major plant equipment and reduce the RCP barrier integrity. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RRI-01
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RRI 210 VN	RRI TO RCP 001 PO CONT. ISOL. PENETRATION #201a(CIV)	RRI 502	H5	A	Act	O	C
12 RRI 211 VN	RRI TO RCP 002 PO CONT. ISOL. PENETRATION #201b(CIV)	RRI 502	H6	A	Act	O	C
12 RRI 212 VN	RRI TO RCP 003 PO CONT. ISOL. PENETRATION #210(CIV)	RRI 502	H7	A	Act	O	C
12 RRI 225 VN	RRI FROM RCP 001 PO THERMAL BARRIER	RRI 502	E5	B	Act	O	C
12 RRI 226 VN	RRI FROM RCP 002 PO THERMAL BARRIER	RRI 502	E6	B	Act	O	C
12 RRI 227 VN	RRI FROM RCP 003 PO THERMAL BARRIER	RRI 502	E7	B	Act	O	C
12 RRI 280 VN	RRI FROM RCP 001 PO CONT. ISOL. PENETRATION #202a(CIV)	RRI 502	C5	A	Act	O	C
12 RRI 281 VN	RRI FROM RCP 002 PO CONT. ISOL. PENETRATION # 202b(CIV)	RRI 502	C6	A	Act	O	C
12 RRI 282 VN	RRI FROM RCP 003 PO CONT. ISOL. PENETRATION #209 (CIV)	RRI 502	C7	A	Act	O	C
12 RRI 283 VN	RRI FROM RCP 001 PO CONT. ISOL. PENETRATION #202a (CIV)	RRI 502	B5	A	Act	O	C
12 RRI 284 VN	RRI FROM RCP 002 PO CONT. ISOL. PENETRATION #202b (CIV)	RRI 502	B6	A	Act	O	C
12 RRI 285 VN	RRI FROM RCP 003 PO CONT. ISOL. PENETRATION #209 (CIV)	RRI 502	B7	A	Act	O	C

Function

RRI supply and return for RCP bearing coolers and thermal barriers.

Deferred Testing

Exercise, stroke time, loss of power (air operated valves) quarterly.

Cold Shutdown Test Justification

Exercising these valves during power operation would interrupt Component Cooling Water flow to all three Reactor Coolant Pumps (RCPs), resulting in potential damage to the RCP thermal barrier, bearings and seals. Valve failure in the closed position may result in a forced unit shutdown in order to secure the RCPs pumps and make repairs, if needed. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RRI-02
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RRI 170 VN	RRI TO RRM RF CONT. ISOL. PENETRATION #212 (CIV)	RRI 502	H2	A	Act	O	C
12 RRI 177 VN	RRI FROM RRM RF CONT. ISOL. PENETRATION #211(CIV)	RRI 502	C2	A	Act	O	C
12 RRI 189 VN	RRI FROM RRM RF CONT. ISOL. PENETRATION #211(CIV)	RRI 502	D2	A	Act	O	C

Function

RRI supply and return to RRM.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Exercising these valves during power operation would temporarily interrupt Component Cooling Water to the Control Rod Drive Mechanism (CRDM) Cooling System. Interruption of cooling water flow may cause the CRDMs to overheat, resulting in potential damage to major plant equipment and a forced unit shutdown. Valve failure in the closed position would increase the potential for damage and unit shutdown. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RRI-03
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RRI 465 VN	NON ESSENTIAL EXCHANGER ISOLATION	RRI 503	H2	B	Act	O	C
12 RRI 466 VN	NON ESSENTIAL EXCHANGER ISOLATION	RRI 503	B1	B	Act	O	C

Function

RRI supply and return to non-essential heat exchangers.

Deferred Testing

Exercise and stroke time quarterly.

Cold Shutdown Test Justification

Exercising these valves during power operation would temporarily isolate cooling water flow to non-essential heat exchangers that are used to cool plant equipment and may result in damage to major plant equipment. Valve failure in the closed position may require a plant shutdown or trip and may result in damage to plant equipment. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing

Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

RRI-04
Cold Shutdown Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 RRI 146 VN	RRI TO DEG ISOL. VALVE	RRI 500	A5	B	Act	O	C
12 RRI 551 VN	RRI TO DEG ISOLATION	RRI 501	A5	B	Act	O	C

Function
RRI supply and return to DEG.

Deferred Testing
Exercise and stroke time quarterly.

Cold Shutdown Test Justification
Exercising these valves during power operation would temporarily isolate cooling water flow to essential loads (EVF and EVC heat exchangers) which may result in damage to major plant equipment due to overheating. Valve failure in the closed position may require a plant shutdown or trip and may result in damage to plant equipment. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Cold Shutdown Testing
Exercise and stroke time at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

SAR-01
Refueling Outage Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 SAR 432 VA	INSTRUMENT AIR CONT. ISOL. PENETRATION #203a(CIV)	SAR 201	H3	A	Act	O	C

Function

supplying instrument air to all air operated components inside containment.

Deferred Testing

Exercise, stroke time quarterly.

Refueling Shutdown Test Justification

Exercising these valves while at power will isolate instrument air from all air operated components inside containment. This will result in a unit trip. A partial stroke exercise test will not be performed. The valves are not constructed or equipped to accommodate a partial stroke exercise test.

Refueling Shutdown Testing

Exercise, stroke time and RPI test at cold shutdown or refueling outage conditions.

APPENDIX 6-2
IST VALVES RELATED TEST DEFERRAL JUSTIFICATIONS

VVP-01
Refueling Outage Test Justification

Valve	Description	P&ID	Coord	Category	Active Passiv	Normal Positio	Safety Position
12 VVP 001 VV	MAIN STEAM 001 GV ISOLATION PISTON	VVP 501	D7	B	Act	O	C
12 VVP 002 VV	MAIN STEAM 002 GV ISOLATION PISTON	VVP 501	D5	B	Act	O	C
12 VVP 003 VV	MAIN STEAM 003 GV ISOLATION PISTON	VVP 501	D3	B	Act	O	C

Function
Main steam isolation valves.

Deferred Testing
Exercise, stroke time, loss of power test quarterly.

Refueling Shutdown Test Justification
Full stroke exercising these valves while at power will isolate steam flow from the respective steam generators, resulting in a significant steam generator level transient and probable plant trip. Failure of these valves in the closed position will result in a plant trip. Full stroke exercise (fast closure) of these valves at hot shutdown condition is consistent with the Safety Related Surveillance Manual (SRSM) reference [30] and Operating Technical Specifications (OTS) reference [31].

Although the partial closure is discouraged by the NRC due to high plant trip risk as stipulated in the NUREG 14.82, Koeberg will be performing a partial closure test of the MSIVs in compliance with the SRSM (VVP system) on 1 monthly frequency. The basis of this test is documented in KIT -3312-13.

Refueling Shutdown Testing
Full stroke exercise, stroke time and loss of power test (air operated valves) at cold shutdown or refueling outage conditions.

APPENDIX 6-3
IST VALVE TEST PLAN ABBREVIATIONS / DEFINITIONS

Page 1 of 3	
A description of each column in the IST valve table is shown below with applicable abbreviations.	
Valve	Unique alphabetical designator assigned to each valve.
Description	Descriptive name of the valve.
P&ID	Plant and instrumentation drawings where the component is located.
Coord	Drawing coordinate of valve location on the P&ID.
Cat	Category as defined in paragraph. A Valves for which seat leakage is limited to a specific amount in the closed position for fulfilment of their required function(s). A/C Valves which are both self-actuating and for which seat leakage is limited to a specific amount in the closed position for fulfilment of their required function(s). B Valves for which seat leakage in the closed position is inconsequential for fulfilment of the required function(s). B/SAR Valves, which optionally included in the IST programme, based on their safety significance as described in the plant SAR. C Valves which are self-actuating in response to some system characteristic, such as pressure (relief valves) or flow direction (check valves) for fulfilment of the required function(s).
Act Pass	Identifies whether the valve performs an active or passive safety function. Act Active valve Pass Passive valve
Size	Valve size, in inches.
Valve Type	Valve design body style. Ball Butterfly Gate Gate Wedge Globe Lift NRV NRV Relief Swing NRV
Act Type	Actuator type used to change valve obturator position. Air Air Assist Air/Motor Manual Manual/Motor Motor Self

APPENDIX 6-3
IST VALVE TEST PLAN ABBREVIATIONS / DEFINITIONS

Page 2 of 3	
Norm Pos	Indicates the valve position during normal plant operation as defined by plant operating procedures. C Closed O Open O/C Open and Closed
Safe Pos	Indicates the valve position required for the valve to perform its function. C Closed O Open O/C Open and Closed Throt Throttled
Fail Pos	Indicates the position of the valve on loss of actuator power. C Closed O Open N/A Not applicable. Valve does not have a fail position.
App J Type C	Indicates whether the valve is included in the 10CFR50 Appendix J, Type C testing programme (CLRTPRM). No Yes
Pos Ind	Indicates whether the valve is equipped with remote position indication. No Yes
Test Type	Indicates the test requirements, which apply to the valve. CKV-C Full stroke close verification of a check valve (closed as required to prevent reverse flow). CKV-O Full stroke open verification of a check valve (passes accident flow or opens to backstop). CM* Testing as required by the check valve condition monitoring programme (§ 8). DI Disassembly Inspection in accordance with nuclear engineering position paper 331-228. FSP-C Verification that valve closes on loss of power (simulated or actual loss of power). FSP-O Verification that valve opens on loss of power (simulated or actual loss of power). LLRT Leak test in accordance with 10CFR50 Appendix J, containment leak rate testing programme, Type C test. L/R Leak test for valves other than containment isolation valves (e.g. pressure isolation valves). MAN Manual full stroke. OV Verification of a check valve's capability to at least partially open (full stroke not required). RPI Verification of valve remote position indication. SKID Valve function is demonstrated by testing of the major component (e.g. EPP personnel air lock). S-PT Relief valve testing in accordance with pressure relief device testing programme

APPENDIX 6-3
IST VALVE TEST PLAN ABBREVIATIONS / DEFINITIONS

	(§ 7.0).
Page 3 of 3	
	HTOP Pressuriser relief valves high temperature overpressure protection set point (§ 6.8.1.4). LTOP Pressuriser relief valves low temperature overpressure protection set point (§ 6.8.1.4) STR-C Stroke time of valve full stroke close. STR-O Stroke time of valve full stroke open.
CM: NOTE: The condition monitoring programme (CMP) cannot be implemented until the maintenance basis compiled through the AP 913 is approved. Therefore, the requirements in § 6 for check valves will still be required to credit the IST requirements.*	
Test Freq	Indicates the frequency required for valve testing as determined by OM code. Section 7 Test frequency in accordance with pressure relief device testing, ASME OM App I. Section 8 Test frequency in accordance with check valve condition monitoring programme, ASME OM APPII. CLRTPRM Test frequency in accordance with the CLRTPRM based on 10CFR50 Appendix J, containment leak rate testing programme. CSD Cold shutdown, testing performed during the cold shutdown condition (if not performed during the previous 92 days). If required, testing may be done during the transition period between normal operation and cold shutdown. Q1 Quarterly, once per 92 days. 1RO Refuelling outage, testing done during the refuelling outage condition. If required, testing may be done during the transition period between normal operation and refuelling. 2YR 2 years.
Test Deferral	This field indicates, by unique number cold shutdown test justification, and refuelling outage test justification for the individual component or test. These Deviations and test deferral justifications are provided in Appendix 4-2, Appendix 4-3, Appendix 5-2, Appendix 5-3, Appendix 5-4, Appendix 6-1, Appendix 6-2, Appendix 7-2, and Appendix 7-3.
Limiting Value/Set Point	For power-operated valves, the limiting value of stroke time is established in accordance with § 6. Specific limiting values are listed in Appendix 6-1 for those valves that have a maximum stroke time defined in the SAR, protection files, DSEs or OTS. Otherwise, a reference to KLR-001 is provided. For relief valves, the valve set point is generally stated in bar(g).

APPENDIX 6-4
VALVE DEVIATION
VVD-1

Page 1 of 2

"Relief Request in Accordance with 10 CFR 50.55a(f)(5)(iii) In-Service Testing Impracticality"

A6-4.1 ASME Code Components Affected

Valve ID	Description	Catg	Act/ Pass	Vlv Type	Normal Position	Safe Position	Fail Position
12 ASG 126 VZ	12 ASG 001 BA protect against over and under pressure	C	Act	Relief	C	O/C	C

A6-4.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A6-4.3 Applicable Code Requirements

ISTC 5230 and ISTC 5220. Forward flow and reverse flow exercise test quarterly (check valve open and close test).

A6-4.4 Reason for Request

This valve fulfils two design functions, namely (i) the overpressure protection, and (ii) under pressure protection (vacuum breaker) opens to atmosphere if the tank pressure drops below – 0.75 kPa(g). The check valve open and close tests were introduced in the 3rd interval ISTPRM and since then, several problems were reported following the 1RO check valve test surveillance to verify the freedom of movement of the flap. The movement of the flap disturbs the seal between the "vacuum pallet" and its seat; this subsequently creates a leak path for the nitrogen blanket. Difficulties are later experienced to eliminate this test induced leak. In addition, if this leak will be apparent after the plant start-up, this will make the ASG tank unavailable which has stringent OTS LCO conditions [31]. Compliance to the code in this instance may produce a negative effect by the introduction of potential maintenance/human induced failures, hence this Deviation is sought to deviate from this code requirement.

A6-4.5 Proposed Alternative and Basis for Use

To align the check valve open and close test with the scheduled overhaul and set pressure testing at 4RO frequency.

In addition to the ISI VT2 visual inspection, there are many SRSM [30] stringent requirements related to the tank level monitoring and other examination and tests related to the overall operability readiness of the ASG system. If any degradation is noted on this valve, a corrective maintenance will be raised.

An enhanced maintenance programme of disassembly and inspection of this valve's internals was evaluated. This method was not considered appropriate for the following reasons:

APPENDIX 6-4
VALVE DEVIATION
VVD-1

1. Frequent disassembly can lead to distortion of the valve parts caused by the repetitive handling of the soft seat. This distortion could cause unacceptable operational seat leakage when the nitrogen blanket is present, binding of internal parts, and other operational problems.
2. The physical appearance of the internal parts does not always provide clear and evident verification of acceptable valve operation.

Based on the performance history of this valve, the verification of the freedom of movement of the flap at a less frequent interval does not reduce the assurance of this valve fulfilling its design function when required. It is also confirmed via the probabilistic safety assessment (PSA) associated with this valve that the risk increase factor is low.

In summary, this valve is a special valve that has been designed to fail conservatively, i.e. both overpressure and vacuum parts will leak externally than fail in the closed position. It is a special valve thus not prone to the same failure modes as conventional vacuum breakers. For this reason, it should not be subjected to the same maintenance and testing methods/regimes. The dominant failures on this valve are caused by human intervention. In light of this, the operability readiness of the ASG tank will be maintained if the actual freedom of movement of the flap will be performed in conjunction with the scheduled maintenance of the entire valve (overpressure and the vacuum side).

Based on the above information, compliance with the code requirements is impractical and the proposed alternative provides reasonable assurance of the operational readiness of the over and under pressure protection valve of the 12 ASG 001 BA tank.

A6-4.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A6-4.7 Precedents

A similar relief was sought during the 3rd IST interval

A6-4.8 References

- 3rd Interval ISTPRM
- OTS and SRSM
- NEI white paper (standard format for relief requests)

SECTION 7

In-Service Testing of Pressure Relief Devices

7. IN-SERVICE TESTING REQUIREMENTS OF PRESSURE RELIEF DEVICES

7.10 GENERAL REQUIREMENTS

For reference purposes, the format and the numbering system of the ASME OM code Appendix I headings were kept similar in this section with the following change: “I” was replaced by the number 7 and the subsection numbers were reduced, e.g. I-1000 will be 7.10.

Furthermore, in order to avoid duplication and clutter, the requirements that do not apply to Koeberg due to the difference in design were deliberately omitted and the requirements that apply for the same safety relief devices were grouped under the same paragraph.

As a result of the omission of requirements not applicable to Koeberg, the numbering system in this section does not follow a chronological order.

7.11 Applicability and Scope

The requirements of this section apply to the scope of pressure relief devices and their servo devices which have a safety function as defined in § 4.11. A complete list of pressure relief devices included in the IST programme is provided in Appendix 7-1 at the end of this section.

7.11.2 Limitations

a) The requirements of this section take cognisance of differences between the as-installed operating conditions and the conditions under which a pressure relief device may be tested. Specifically, Deviation RVD-1 addresses testing of pressure relief devices using an alternate test medium (for example, air versus water) at ambient temperature of the test bench location versus the ambient temperature of the installed valve location. Deviations specific to relief valves are provided in Appendix 7-2 and Appendix 7-3.

b) The requirements of this section apply only to pressure relief devices required for overpressure protection.

c) The requirements of this section are not intended to demonstrate conformance to design specifications.

d) The requirements of this section are not intended to verify or demonstrate all aspects of pressure relief device operation.

7.12 Applicable Definitions

Term	Definition
Ambient temperature	The temperature of the environment surrounding a pressure relief device at its installed plant location during the phase of plant operation for which the device is required for overpressure protection.
Auxiliary actuating device	A device requiring an external energy source to provide in-service remote actuation capability of a pressure relief valve with static inlet pressure below set pressure.
Control rings	Internal rings used to adjust the opening characteristic, blow-down, and lift of a pressure relief valve.
Normal system operating conditions	System fluid, pressure, and temperature during the phase of the plant operation for which that system is intended to function.
Overpressure protection	The means by which components are protected from an overpressure incident by the use of pressure relieving devices.
Power-actuated relief valve	A relief valve in which the major relieving device is combined with and controlled by a device requiring an external energy source. (example PORVs)
Remote actuated relief valve	Actuation of a pressure relief device through a generated signal rather than inlet static pressure.
Thermal relief application	A relief device whose only overpressure protection function is to protect isolated components, systems, or portions of systems from fluid expansion caused by changes in fluid temperature (thermodynamic effect).

7.13 Guiding Principles

7.13.1 General

a) Operational Maintenance Instruction: Complete operation and maintenance instructions are available in procedures. I&T shall ensure that these procedures are up to date.

b) Valve Testing Frequency: The valve testing frequency for each device is detailed in this section. I&T in conjunction with the Maintenance group shall ensure that strict adherence to the schedule to these frequencies is maintained in order to establish operability readiness. The testing frequency shall be applied from the time the valve is required to fulfil its design function. The time lapsed shall be taken from the last testing date of the asset regardless of its functional location. Refer to further clarification documented in the EP letter SPT 6154/08 [37].

c) Valve Disassembly: In order to implement the requirements of this section, it is not necessary that valves be disassembled or removed from their installed position.

d) Visual Examination: I&T are responsible to develop the visual examination procedure in accordance with the design and manufacturer's specifications.

e) Acceptance Criteria: I&T shall document the Koeberg-specific set point pressures of the IST relief valves scope with their associated tolerances as specified in this section. This document shall be reviewed by Engineering Programmes (EP) before implementation. In summary, the following acceptance criteria shall be applicable:

(i) Visual Examination: External surfaces of relief valves shall not show signs of distress that may affect the operability of the valve.

(ii) Set Pressure Criteria:

1. The pressuriser safety valves shall exhibit a lift set point within ± 1% of the stamped valve nameplate pressure (on the as-found test).
2. The main steam safety valves shall exhibit a lift set point within ± 1 bar of the stamped valve nameplate pressure (on the as-found test). However, the valve should be adjusted to ± 1% of the stamped valve nameplate pressure (on the as-left test).
3. All other valves shall exhibit a lift set point within ± 3% of the stamped valve nameplate pressure.

(iii) Seat Tightness Criteria: The maximum acceptable seat leak rate is specified in the maintenance working procedures for each valve group.

f) I&T shall group the valves based on similarities such as the same manufacturer, type, system, application, and service media.

g) When calculating the number of valves required to be tested, resultant fractions shall be rounded to the next higher whole number (for example, 20% of 6 valves in a valve group = 2 valves).

7.13.2 Test Frequency, Class 1 Pressure Relief Valves

a) 5-year Test Interval: The test interval for any individual valve shall not exceed 5 years. At least 20% of the valves in each valve group shall be tested within any 24-month period and this 20% shall be valves that have not been tested during the current 5-year interval if they exist within the same group. This 20% is referred to as a sample group. There is no specific upper limit to the number of valves to be tested in each 5-year interval.

b) Replacement with Pre-Tested Valves: Test requirements may be satisfied by installing pre-tested valves to replace valves that have been in service, provided the additional requirements listed below are satisfied:

1. For replacement of a partial complement of valves, the valves removed from service shall be tested before resumption of electric power generation (start-up); or
2. For replacement of a full complement of valves, the valves removed from service shall be tested within 12 months of removal from the system.

c) Requirements for Testing Additional Valves: Additional valves shall be tested in accordance with the following requirements:

1. For each valve tested in which the as-found set-pressure (first test actuation) does not meet acceptance criteria specified in § 7.13.1 e), two additional valves shall be tested from the same valve group;

2. If the as-found set pressure of any of the additional valves tested does not meet the acceptance criteria specified in § 7.13.1 e), all remaining valves of that same valve group shall be tested.

d) The cause and effect of any valve that fails to meet Koeberg's specified acceptance criteria for the required tests such as seat tightness, bellows integrity, etc. shall be determined and evaluated. This information will be used to determine the need for any additional (to the minimum requirements) tests to address generic concerns that could apply to valves in the same or other valve groups.

7.13.5 Test Frequency, Class 2 and 3 Pressure Relief Valves

a) 10-year Test Interval: Class 2 and 3 pressure relief valves with the exception of the main steam safety valves (MSSV) shall be tested every 10 years. There is no upper limit of the number of valves to be tested every cycle, however, at least 20% of the valves in each valve group shall be tested within any 48-month period and this 20% shall be valves that have not been tested during the current 10-year interval, if they exist. This 20% is referred to as a sample group.

b) The MSSV shall be treated as safety class 1 in terms of their testing periodicity thus performed in accordance with the requirements specified in § 7.13.2.

c) Test requirements may be satisfied by installing pre-tested valves to replace valves that have been in service provided the additional requirements listed below are satisfied:

1. For replacement of a partial complement of valves, the valves removed from service shall be tested within 3 months of removal from the system or before resumption of electric power generation, whichever is later; or

2. For replacement of a full complement of valves, the valves removed from service shall be tested within 12 months of removal from the system/plant.

d) Requirements for Testing Additional Valves: Additional valves shall be tested in accordance with the following requirements:

1. For each valve tested in which the as-found set pressure (first test actuation) does not meet acceptance criteria specified in § 7.13.1 e), two additional valves shall be tested from the same valve group;

2. If the as-found set pressure of any of the additional valves tested does not meet the acceptance criteria specified in § 7.13.1 ne) then all remainig valves of that same valve group shall be tested.

e) The cause and effect of any valve that fails to meet Koeberg's specified acceptance criteria for the required tests such as seat tightness, bellows integrity, etc. shall be determined and evaluated. This information will be used to determine the need for any additional (to the minimum requirements) tests to address generic concerns that could apply to valves in the same or other valve groups.

7.13.8 Test Frequency, Class 2, 3 Vacuum Relief Valves

All classes 2 and 3 vacuum relief valves shall be tested every two years, unless performance data suggest the need for more appropriate test interval.

7.13.9 Test Frequency, Class 2, 3 Pressure Relief Devices used for Thermal Relief Application

Tests shall be performed on all class 2 and 3 relief devices used in thermal relief application every 10 years, unless performance data indicate that more frequent testing is necessary. In lieu of tests, the relief devices may be replaced at a frequency of 10 years, unless performance data indicate that more frequent replacements are necessary.

7.14 Instrumentation

7.14.10 Set Pressure Measurement Accuracy

Test equipment (for example, gauges, transducers, load cells, calibration standards) used to determine valve set pressure, shall have an overall combined accuracy not exceeding ± 1% of the indicated (measured) set pressure.

7.70 PWR PRESSURE RELIEF DEVICE TESTING

7.73.1 Periodic Testing Requirements for Class 1 Safety Valves and Power-Actuated Relief Valves

The following requirements shall apply:

a) No maintenance, adjustment, disassembly, or other activity that could affect the as-found set pressure or seat tightness data is permitted before testing.

b) Control ring adjustments are permitted in accordance with § 7.81.

c) When on-line testing is done to satisfy periodic testing requirements, visual examination may be performed out of sequence.

d) The following tests (1. to 3. below) shall be performed in sequence and before maintenance or set pressure adjustment, or both:

1. Visual examination;

2. Seat tightness determination[8], if practicable; and
3. Set pressure determination.

e) The remaining tests (4. to 7. below) shall be done after maintenance or set pressure adjustment:

4. Determination of operation and electrical characteristics of bellows alarm switch (if they exist).
5. Verification of the integrity of the balancing device on balanced valves.
6. Determination of operation and electrical characteristics of position indicators (if they exist).
7. Determination of compliance with seat tightness criteria specified in § 7.82.3.

7.73.5 Periodic Testing Requirements for Class 2 and 3 Pressure Relief Valves including the MSSV

The following requirements shall apply:

a) No maintenance, adjustment, disassembly, or other activity that could affect the as-found set pressure or seat tightness data is permitted before testing.

b) Control ring adjustments are permitted in accordance with § 7.81.

c) When on-line testing is done to satisfy periodic testing requirements, visual examination may be done out of sequence.

d) The following tests (1. to 3. below) shall be done in sequence and before maintenance or set-pressure adjustment, or both:

1. Visual examination;
2. Seat tightness determination[8], if practicable; and
3. Set-pressure determination.

e) The remaining tests (4. to 7. below) shall be performed after maintenance or set pressure adjustment:

4. Determination of operation and electrical characteristics of bellows alarm switch (if they exist);
5. Verification of the integrity of the balancing device on balanced valves;
6. Determination of operation and electrical characteristics of position indicators (if they exist); and
7. Determination of compliance with seat tightness criteria specified in § 7.82.3.

[8] This test is not necessary at the same pressure as the final seat tightness test. This test may be quantitative or qualitative, depending on the observed condition. This test is intended for a gross determination of the as-found seat tightness.

7.73.8 Periodic Testing Requirements for Class 2 and 3 Vacuum Relief Valves

a) These valves shall be actuated to verify open and close test capability and their set pressure confirmed. The open and close test will be done in accordance with § 6.

b) Compliance with the seat tightness criteria shall be as specified in the maintenance working procedures.

7.74 Disposition after Testing or Maintenance

The following requirements apply to all pressure relief devices except for class 2 and 3 vacuum relief valves:

a) Valves and accessories that comply with their respective acceptance criteria for the tests as specified in § 7.13.1 e) may be returned to service without further testing.

b) Valves and accessories that do not comply with their respective acceptance criteria shall be adjusted, refurbished, or replaced in accordance with written procedures. Valves shall be adjusted to meet the acceptance criteria specified in § 7.13.1 e).

c) Refurbished equipment shall be subjected to test(s) specified in § 7.73.1, § 7.73.5, as applicable. If disassembly includes valve disk (main) components, then stroke capability of the valve disk shall be verified by mechanical examination or tests.

d) Valves and accessories that do not comply with their respective criteria, whether the problem is associated with the component, the system, or associated equipment, shall be evaluated to determine the ability of the valve to perform its intended function until the next testing interval or maintenance opportunity. Corrective actions shall be taken, as appropriate, to ensure valve operability.

7.74.8 Disposition after Testing of Maintenance for Class 2 and 3 Vacuum Relief Valves

a) Valves that comply with their respective acceptance criteria as specified in § 7.13.1 e) may be returned to service without further testing.

b) Valves and accessories that do not comply with their respective acceptance criteria shall be adjusted, refurbished, or replaced in accordance with written procedures. Valves shall be adjusted to meet the acceptance criteria specified in § 7.13.1e)

c) Valves that have undergone maintenance shall be subjected to tests specified in § 7.73.8.

7.80 PWR TEST METHOD

7.81 Set Pressure Testing

a) Test Media:

The MSSV will be tested in situ with steam and all other IST valves will be tested with air or nitrogen as justified in Deviation RVD-1 under Appendix 7-2.

b) Accumulator Volume:

The volume of the accumulator drum and the pressure source flow rate shall be sufficient to determine the valve set pressure. Valves may have their lifts restricted during set pressure testing.

c) Servo Devices:

For steam service and other compressible fluid service, servo devices may be used for set-pressure testing, provided the accuracy meets the requirements of specified in § 7.14.10.

d) Thermal Equilibrium:

Ambient temperature and test media temperature shall be established and valve thermal equilibrium confirmed before starting set pressure testing. The valve shall be considered at thermal equilibrium only when the valve body temperature has stabilised and does not change more than 5,5°C in 30 minutes as measured directly or determined by correlation from other valve temperature measurements. Valves insulated in service shall be insulated in a like manner during testing. Verification of thermal equilibrium is not required for valves that are tested at ambient temperature using a test medium at ambient temperature.

e) Ambient Temperature:

Ideally, the ambient temperature of the operating environment shall be simulated during testing. As Koeberg does not have such facilities and, except for the MSSV, IST safety relief valves will be set-pressure tested using an ambient temperature different from the operating ambient temperature as justified in the Deviation RVD-1 under Appendix 7-2 and Appendix 7-3.

f) Superimposed Back Pressure:

1. Consideration of variable or constant back pressure in set pressure setting is not required for balanced pressure relief valves, if the back pressure does not exceed 50% of the valve set pressure. However, the set pressure shall consider the effects of bonnet pressure when the bonnet vent is piped to a pressure or vacuum discharge other than atmospheric.

2. Constant superimposed back pressure in set pressure setting shall be considered for non-balanced pressure relief valves when the back pressure exceeds 1% of the set pressure. For conventional non-balanced valves with constant superimposed back pressure, the required set pressure shall be calculated by subtracting the superimposed back pressure from the stamped set pressure.

g) Control Rings:

For steam service and other compressible fluid service, adjustment of control rings to ensure valve action is permitted. For set pressure acceptance testing, control ring positions shall not be altered between successive openings. Adjusted control rings shall be returned to their proper operating position before return to service and documented in the record of test. I&T shall review the maintenance working procedures to ensure that this requirement is met.

h) Time Between Valve Openings:

A minimum of 5 minutes shall elapse between successive openings.

i) Number of Tests:

The number of openings at set pressure shall be sufficient to demonstrate satisfactory repeatability with a minimum of two consecutive openings within acceptance criteria. Any subsequent opening at the same set point adjustment shall be within acceptance criteria.

7.82 Seat Tightness Testing

The following requirements shall apply:

a) Seat tightness testing shall be done in accordance with the maintenance test procedures. I&T has the overall responsibility to ensure that these procedures are adequate and in line with best industry practices.

b) Seat tightness testing shall be done using the same test medium as used in set pressure testing except as provided by § 7.83.

7.82.1 Inlet Pressure

The inlet pressure for seat leak testing shall be in accordance with one of the following:

a) Maximum system operating pressure;

b) 90% of spring setting or 5 psig (34 kPa) below spring setting for valves having spring set pressure less than 50 psig (344 kPa); and

c) According to the pressure established in the maintenance working procedure.

7.82.2 Acceptable Seat Tightness Testing Methods

Table 7-8220-1 provides acceptable methods that can be used to confirm the seat tightness capability of pressure relief devices. The Koeberg acceptance criteria were compared to the API RP-527 standard and found to be more conservative.

Table 7-8220-1
Acceptable seat tightness testing methods

Test Method	Service Fluid			
	Steam	**Air/Gas**	**Liquids**	**Remarks**
Audible/visible	X	X	X	
API RP-527	X(1)	X(1)		
Air/gas under water (usually bubbles per minute)	X	X	X	Koeberg tests with gas only
Downstream temperature measurement	X	X	X	Installed valves only such as PORVs and RRA 018 / 115 VP
Weighed condensate	X(1)			Min. 10-minute test
Volumetric or weight measurement			X	Min. 10-minute test
Cold bar	X(2)			This can be used with MSSV if the leak cannot be heard
Acoustic emission	X	X	X	This is qualitative

NOTES:
(1) On exposed spring valves, care must be exercised to avoid leakage past the valve stem and adjacent valve pieces.
(2) Defined as 1-inch diameter polished stainless steel bar at a temperature less than 38°C passed in the plane parallel to the outlet flange face.

7.82.3 Acceptance Criteria for Seat Leakage Testing

The original equipment manufacturer (OEM) acceptance criteria can be used or as determined in accordance with an engineering analysis. I&T shall document the seat tightness criteria for each IST relief device in its working procedures.

7.83 Alternative Test Media

Pressure relief devices may be subjected to set pressure and seat tightness tests using a test medium (fluid and temperature) other than that for which they were designed, provided the testing complies with the requirements specified in § 7.83.1, § 7.83.2. For more details, refer to RVD-1 in Appendix 7-2.

7.83.1 Correlation and Procedure

Plant Engineering (CE and the Maintenance group) is required to either purchase a test bench that can simulate the operating conditions (fluid and temperature) or establish correlation factors to be used to adjust the set pressure accordingly. The correlation factors at Koeberg are provided for the applicable pressure relief devices in the maintenance and operating working procedures. For more details, refer to Appendix 7-2.

7.83.2 Certification of Correlation Procedure

Plant Engineering (CE and Maintenance group) shall ensure that the correlation factors established will be of sufficient accuracy such that the pressure relief devices when tested or adjusted or both using an

alternative medium shall comply with the acceptance criteria related to set pressure and seat tightness as specified in this section.

7.90 PWR RECORDS AND RECORD KEEPING

7.91 Requirements

I&T shall compile and maintain a record for each safety relief device included in the scope of this section which shall contain the following:

a) OEM model, design type, and other identifiers;

b) Copy of the OEM acceptance test report; and

c) PST reports.

7.92 Records of Tests

In addition to the requirements of § 4.92.3, if testing is done with another test medium, a copy of the correlation factors used shall be included in the respective valve record. During the functional test results evaluation, I&T shall verify with the Maintenance group that the specified correlation factors in their working procedures have been implemented during the testing and setting of the applicable pressure relief devices.

7.93 Record of Modification and Corrective Action

In addition to the requirements specified in § 4.92.4, I&T shall document all modifications made to or corrective action that affect the set pressure or the operation of any safety relief device covered under this section.

APPENDIX 7-1
PRESSURE RELIEF DEVICE TEST PLANS

Valve	Function	P&ID	Safety Class	Setpoint bar(g)	Location Unit 1	Location Unit 2
12 ASG 126 VZ	001 BA GAS PRE. DEPRESS.	ASG 500	3	0,13	W232	W272
12 RCP 011 VP	PRESSURIZER NO. 1 SAFETY	RCP 210	1	171.3	R848	R888
12 RCP 012 VP	PRESSURIZER NO. 2 SAFETY	RCP 210	1	171.3	R848	R888
12 RCP 013 VP	PRESSURIZER NO. 3 SAFETY	RCV 210	1	171.3	R848	R888
12 RCV 114 VP	PROTECTION FOR RCV 002 BA	RCV 110	2	4.02	NA310	NB320
12 RCV 201 VP	LETDOWN RELIEF VALVE CONT. ISOL. PENETRATION #255 (CIV)	RCV 110	2	43	R314	R314
12 RCV 203 VP	PROTECTION FOR AVL RCV 013 VP	RCV 110	2	13.8	NA214	NB224
12 RCV 214 VP	PROTECTION FOR RCV 002 BA	RCV 110	2	3.83	NA35	NB35
12 RCV 224 VP	PROTECTION FOR RCV 003 RF	RCV 110	2	10.3	NA24	NB24
12 RCV 252 VP	NO 1 SEAL WATER RETURN LINE	RCV 310	2	9.3	R31	R28
12 RIS 102 VZ	PROTECTION FOR RIS 001 BA	RIS 210	2	48.3	R211	R251
12 RIS 104 VZ	PROTECTION FOR RIS 002 BA	RIS 210	2	48.3	R221	R261
12 RIS 106 VZ	PROTECTION FOR RIS 003 BA	RIS 210	2	48.3	R231	R271
12 RIS 128 VP	PROTECTS RIS 001 PO	RIS 110	2	15.5	K012	K052
12 RIS 129 VP	PROTECTS RIS 002 PO	RIS 110	2	15.5	K013	K053
12 RIS 215 VP	PROTECTS RIS 004 BA	RIS 110	2	204	W217	W257
12 RRA 018 VP	PROTECTS LINES BETWEEN 001PO	RRA 010	2	44	R444	R484
12 RRA 115 VP	AND 002 PO TO 001RF AND 002RF	RRA 010	2	39	R444	R484
12 RRI 130 VN	RRA 002 RF**	RRI 501	3	9	R144	R184
12 RRI 131 VN	RRA 001 RF**	RRI 501	3	9	R144	R184
12 RRI 209 VN	RCV 002 RF DOWNSTREAM**	RRI 503	3	9	NA215	NB225
12 RRI 317 VN	PROTECTS RCV 021 RF**	RRI 502	3	9	R346	R386
12 RRI 330 VN	PROTECTS PTR 004 RF**	RRI 505	3	10		
12 RRI 335 VN	RRM RF DOWNSTREAM**	RRI 502	3	9	R220	R250
09 RRI 546 VN	WASTE MANIFOLD	RRI 504	3	9	NC302	
12 RRI 685 VN	RCP 001 PO THERMAL BARRIER	RRI 502	3	172	R311	R351
12 RRI 686 VN	RCP 002 PO THERMAL BARRIER	RRI 502	3	172	R321	R361
12 RRI 687 VN	RCP 003 PO THERMAL BARRIER	RRI 502	3	172	R331	R371
12 RRI 725 VN	RRI 07.11 RF - RRI 001 PO**	RRI 500	3	10	NC010	ND020
12 RRI 726 VN	RRI 06.12 RF - RRI 002 PO**	RRI 500	3	10	NC012	ND022

** Thermal relief valves (Implement the requirements specified in § 7.13.9)

APPENDIX 7-1
PRESSURE RELIEF DEVICE TEST PLANS

Valve	Function	P&ID	Safety Class	Setpoint bar(g)	Location	
					Unit 1	Unit 2
12 RRI 727 VN	RRI 09.13 RF - RRI 003 PO**	RRI 500	3	10	NC010	ND020
12 RRI 728 VN	RRI 08.14 RF - RRI 004 PO**	RRI 500	3	10	NC012	ND022
12 RRI 729 VN	PROTECTS EAS 001 RF**	RRI 501	3	10,5	K016	K056
12 RRI 730 VN	PROTECTS EAS 002 RF**	RRI 501	3	10,5	K026	K056
12 RRI 731 VN	PROTECTS DVH 001 RF**	RRI 501	3	10	W218	W258
12 RRI 732 VN	PROTECTS DVH 002 RF**	RRI 501	3	10	W218	W258
12 RRI 733 VN	PROTECTS PTR 001 RF**	RRI 505	3	9	K316	K356
12 RRI 734 VN	PROTECTS PTR 002 RF**	RRI 505	3	9	K316	K356
12 RRI 735 VN	PROTECTS RCV 003 RF**	RRI 503	3	9.5	NA215	NB225
12 VVP 100 VV	MTRZD SAFETY VALVE #1 ON SG 01	VVP 501	2	73,0	W734	W775
12 VVP 101 VV	MTRZD SAFETY VALVE #1 ON SG 02	VVP 501	2	73,0	W733	W773
12 VVP 102 VV	MTRZD SAFETY VALVE #1 ON SG 03	VVP 501	2	73,0	W735	W774
12 VVP 103 VV	MTRZD SAFETY VALVE #2 ON SG 01	VVP 501	2	73,0	W734	W775
12 VVP 104 VV	MTRZD SAFETY VALVE #2 ON SG 02	VVP 501	2	73,0	W733	W773
12 VVP 105 VV	MTRZD SAFETY VALVE #2 ON SG 03	VVP 501	2	73,0	W735	W774
12 VVP 106 VV	SAFETY VALVE #3 ON SG 01	VVP 501	2	75,6	W734	W775
12 VVP 107 VV	SAFETY VALVE #3 ON SG 02	VVP 501	2	75,6	W733	W773
12 VVP 108 VV	SAFETY VALVE #3 ON SG 03	VVP 501	2	75,6	W735	W774
12 VVP 109 VV	SAFETY VALVE #4 ON SG 01	VVP 501	2	75,6	W734	W775
12 VVP 110 VV	SAFETY VALVE #4 ON SG 02	VVP 501	2	75,6	W733	W773
12 VVP 111 VV	SAFETY VALVE #4 ON SG 03	VVP 501	2	75,6	W735	W774
12 VVP 112 VV	MTRZD SAFETY VALVE #5 ON SG 01	VVP 501	2	73,0	W734	W775
12 VVP 113 VV	MTRZD SAFETY VALVE #5 ON SG 02	VVP 501	2	73,0	W733	W773
12 VVP 114 VV	MTRZD SAFETY VALVE #5 ON SG 03	VVP 501	2	73,0	W735	W774
12 VVP 115 VV	SAFETY VALVE #6 ON SG 01	VVP 501	2	75,6	W734	W775
12 VVP 116 VV	SAFETY VALVE #6 ON SG 02	VVP 501	2	75,6	W733	W773
12 VVP 117 VV	SAFETY VALVE #6 ON SG 03	VVP 501	2	75,6	W735	W774
12 VVP 118 VV	SAFETY VALVE #7 ON SG 01	VVP 501	2	75,6	W734	W775
12 VVP 119 VV	SAFETY VALVE #7 ON SG 02	VVP 501	2	75,6	W733	W773
12 VVP 120 VV	SAFETY VALVE #7 ON SG 03	VVP 501	2	75,6	W735	W774

** Thermal relief valves (Implement the requirements specified in § 7.13.9)

APPENDIX 7-2
RELIEF VALVES DEVIATION
RVD-1

Page 1 of 2

"Relief Request in Accordance with 10 CFR 50.55a(f)(5)(iii) In-Service Testing Impracticality"

A7-2.1 ASME Code Components Affected

Components		Operating Media	Test Media	Comments	
1/2	RCP 011 VP	Water/Steam	Compressed Air	Tested in accordance with OES (Framatome) recommendations KWM-MM-RCP-006	
1/2	RCP 012 VP				
1/2	RCP 013 VP				
		Water	Nitrogen	Pressure On Bench	Set Pressure
1/2	RCV 114 VP			4,10	4.02
1/2	RCV 201 VP			42,23	43
1/2	RCV 203 VP			13,8	13,8
1/2	RCV 214 VP			3,90	3,83
1/2	RCV 224 VP			10,3	10,3
1/2	RCV 252 VP			9,3	9,3
1/2	RIS 128 VP			15,80	15,5
1/2	RIS 129 VP			15,80	15,5
1/2	RRA 018 VP			44	44
1/2	RRI 130 VN	Water	Nitrogen	<u>Working Temp</u> <u>Factor</u> 18°C to 66°C 0 % 67°C to 315°C 2 % 316°C to 430°C 4 %	
1/2	RRI 131 VN				
1/2	RRI 209 VN				
1/2	RRI 317 VN				
1/2	RRI 335 VN				
9	RRI 546 VN				
1/2	RRI 685 VN				
1/2	RRI 686 VN				
1/2	RRI 687 VN				
1/2	RRI 725 VN				
1/2	RRI 726 VN				
1/2	RRI 727 VN				
1/2	RRI 728 VN				
1/2	RRI 729VN				
1/2	RRI 730 VN				
1/2	RRI 731 VN				
1/2	RRI 732 VN				
1/2	RRI 733 VN				
1/2	RRI 734 VN				
1/2	RRI 735 VN				

APPENDIX 7-2
RELIEF VALVES DEVIATION
RVD-1

A7-2.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A7-2.3 Applicable Code Requirements

Appendix I, I-8300.

A7-2.4 Reason for Request

The IST pressure relief devices indicated in the table above have their set points verified on a pneumatic test bench with air or nitrogen as a medium and the valve at room temperature. The code allows the use of alternative test media and temperatures provided correlation data between the alternative and operating fluids has been established and certified.

A7-2.5 Proposed Alternative and Basis for Use

Except for the pressuriser safety valves, the correlation factors were already incorporated in the maintenance working procedures as indicated in the table above. These correlation factors were provided by the OEM in the maintenance manuals. This practice does not modify the overpressure protection capability of the subject relief valves thus maintaining the overpressure protection of the system in which they are installed as assumed in the design basis. For the pressuriser safety valves, Framatome has performed an analysis and concluded that the current set point is adequate when using air as a medium for testing and setting. This study was further reviewed by Component Engineering and documented in CE 14799. International experience and research has also demonstrated that this setting practice as detailed above will result in the pressure relief devices lifting at a lower pressure than specified in the design basis (refer to NRC information notice 89-90, Supplement 1). Koeberg operational history also reflects that the set pressure of the IST relief valves is high enough to prevent spurious opening at power.

A7-2.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A7-2.7 Precedents

A similar relief was sought during the 3rd IST interval

A7-2.8 References

- CE 14799
- Framatome document EEX-DC-55

APPENDIX 7-3
RELIEF VALVE DEVIATION
RVD-2

Page 1 of 2

"Relief Request in Accordance with 10 CFR 50.55a(f)(5)(iii) In-service Testing Impracticality"

A7-3.1 ASME Code Components Affected

Valve ID	Description	Categ	Act/Pass	Vlv Type	Normal Position	Safe Position	Fail Position
12 ASG 126 VZ	001 BA GAS PRE. DEPRESS.	C	Act	Relief	C	O/C	C

A7-3.2 Applicable Code Edition and Addenda

ASME OM Code, 2004 Edition through 2006 Addenda

A7-3.3 Applicable Code Requirements

Appendix I, I-1350

A7-3.4 Reason for Request

Due to the special design of this valve, the functional testing is very impractical as already discussed under VVD-1. In addition, the set point pressure of this valve is realised via a number of fixed lead weights that will remain constant over time. For this reason, the frequent functional test as called for by I-1350 will not add any value with regards to degradation detection and performance monitoring of this valve associated with the set point drift phenomenon. The compliance to the code in this instance may produce a negative effect by the introduction of potential maintenance/human induced failures, hence this Deviation is sought to deviate from this code requirement.

A7-3.5 Proposed Alternative and Basis for Use

To align the set point verification (the fixed lead weights rings) with the scheduled overhaul and set pressure testing at 6RO frequency. Further arguments are provided below:

Due to the low system pressures and seating forces, this valve has none of the design features of a conventional spring loaded safety relief valve, and therefore does not have the same failure modes, in particular set point drift, seat bonding and stiction phenomena.

This valve has been manufactured from corrosion resistant materials. Corrosion has not been recorded on the valve components. This is evident from the historical visual inspection reports.

The different subcomponents on the moving parts are loose, which will prevent mobility related failures.

This valve is not high cycling valve, which means that wear of the moving components and the seats is minimal.

APPENDIX 7-3
RELIEF VALVE DEVIATION
RVD-2

Seat pressure is achieved by predetermined and tested weights (rings) that are attached to the discs. The discs and weights are not subject to corrosion wastage, which means that the set point cannot change with time without deliberate human intervention.

The disc seat for this valve is Teflon sheets and the body seats are metal. The disc seats are flimsy and the valves tend to leak when they have been disturbed due to a lift or a maintenance intervention.

This valve is located on top of the ASG tank, which makes its removal for maintenance and re- instatement after maintenance a difficult task. On many occasions, a leak was found following the installation of this valve on the plant yet it was leak tight when tested in the workshop.

Based on the above information, compliance with the code requirements is impractical and the proposed alternative provides reasonable assurance of the operational readiness of the over pressure protection valve 12 ASG 126 VZ.

A7-3.6 Duration of the Proposed Alternative

For the 120 months of the 4th IST interval.

A7-3.7 Precedents

A similar relief was sought during the 3rd IST interval.

A7-3.8 References

- CE 13626 Rev 1

SECTION 8

Condition Monitoring Programme (CMP) Requirements of IST Check Valves

8. CONDITION MONITORING PROGRAMME (CMP) REQUIREMENTS OF IST CHECK VALVES

8.10 PURPOSE AND INTRODUCTION

For reference purposes, the format and the numbering system of the ASME OM code Appendix II headings were kept similar in this section with the following change: II-10 will be 8.10. Furthermore, the practical implementation requirements and the conclusions of AP913 were added as needed.

The CMP is a dynamic (dependent on the current check valve status) programme that continuously monitors check valve condition, evaluates data, and specifies actions to ensure that check valves remain capable of performing their safety function(s). The use of the CMP is encouraged by the NRC as it is considered to be an improvement to the deterministic requirements of the ASME OM code. Refer to NUREG 1482 § 4.1.8.

Since commissioning, Koeberg implemented the deterministic IST rules with regard to check valves i.e. implementation of the open and close testing requirements. These requirements were generally credited using the required accident flow with the exception of some valves that were either disassembled or radiographed to confirm their close test. This has resulted in the accumulation of a considerable amount of test performance data. Subsequently, this data, in conjunction with the EDF fleet data related to check valves, were used as input for the reliability analysis known at Koeberg as the AP913 process which resulted in the compilation of maintenance strategies for each group of NRVs. The AP913 process also considers other statutory surveillances that are assigned to safety related check valves.

Although the maintenance strategies known as maintenance bases have been finalised and adopted by the CMP in accordance with the ASME OM code Appendix II requirements as limited by 10CFR50.55a and detailed in this Section 8, the CMP cannot be implemented until the maintenance bases (MB) for all IST check valves are authorised. For this reason, the deterministic requirements associated with check valves shall be implemented as specified in § 6.

8.20 GROUPING AND SCOPE

Based on the available performance and maintenance historical data of the IST check valves, EP decided to include every IST check valve into the CMP as allowed by section 6 in § 6.52.22. Each check valve in the scope of the ISTPRM shall be either tested or examined in accordance with the requirements of the CMP as described in this § 8 (mainly performance based) or § 6 (prescriptive/deterministic based) but cannot be tested by both at the same time.

Check valves in the CMP are broadly grouped according to the intended purpose of the CMP. The two major purposes used for grouping the CMP activities are either performance improvement (PI) or optimisation (OP), which are detailed below.

8.20.1 Performance Improvement (PI)

Candidates for the PI scope shall include check valves that:

a) have an unusually high failure rate during IST activities or operations;

b) cannot be exercised under normal operating conditions or during shutdown;

c) exhibit unusual, abnormal, or unexpected behaviour during exercising or operation; or

d) I&T, in conjunction with the IST engineer, elect to monitor for performance improvement.

8.20.2 Optimisation (OP)

Candidates for OP scope of testing, examination, and preventive maintenance activities include check valves with documented acceptable performance that:

a) have had their performance improved under the CMP if they exist;

b) cannot be stroked or are not readily stroked during normal operating conditions or during shutdown;

c) can only be disassembled and examined; or

d) I&T, in conjunction with the IST engineer, elect to optimise all of the associated activities of the valve group in a consolidated programme.

8.20.3 Grouping Criteria

The groupings of check valves within the two broad groupings of PI and OP shall be based on the following:

a) Analysis of test results and maintenance history; and

b) Design characteristics, application, and service conditions.

Additional guidance for grouping should consider valve manufacturer, design, service, size, materials of construction, orientation, potential flow instabilities, the degree of disassembly required if any, and the need for tolerance or critical dimensional checks. The valve groupings will be reflected in each CMP and the CMP number will serve as the group identification (ID).

In addition, CE in conjunction with Reliability Engineering (RE) shall assess the significance to plant safety if an extended test or examination interval is planned.

The CMP groups with their respective condition monitoring (CM) activities as concluded by the AP913 check valves MB strategies are summarised and documented in Appendix 8-1. EP considered the sample disassembly programme as detailed in [18] and decided that it shall be discontinued once the CMP is implemented. This was based on the adequacy of CM activities for the groups in the disassembly programme to confirm operability readiness.

8.30 ANALYSIS

The analysis of the test and maintenance history of each valve or valve group have been performed and documented via the AP913 process. This analysis was used to specify the frequency and type of CM activities that will be applied. In addition to other requirements, Engineering Programmes confirms that this analysis has considered the following:

a) The identification of common failure or maintenance patterns; and

b) The analysis of these patterns to determine their significance and to identify potential failure mechanisms.

This information was subsequently used to determine the significance and potential failure modes and failure mechanisms and determined the need for:

1. Certain preventive maintenance activities would mitigate identified failure or maintenance patterns;
2. Certain condition monitoring tests such as non-intrusive testing (NIT) are feasible and effective in monitoring for these failure mechanisms;
3. Periodic disassembly and examination activities or overhaul would be effective in monitoring for these failure mechanisms; and
4. Changes in the valve groupings.

The EDF approach in analysing the different check valves was adopted by Koeberg. The final conclusions, as they relate to the maintenance strategies, are very robust as it took into account the entire EDF fleet. For further details on the methodology and the steps followed to derive the different strategies of every IST check valve, refer to references [20], [21] and [22].

8.40 CONDITION MONITORING (CM) ACTIVITIES

The valve obturator movement during applicable test or examination activities shall be sufficient to determine the bidirectional functionality of the moving parts. A full open exercise test, or an open test to the position required to perform its intended function as specified in § 4.11 is not required for this assessment. The valve opening and closing capabilities must be demonstrated when flow testing or examination methods (non-intrusive testing (NIT), or disassembly and inspection) are used. Table 8-4000- below provides the list of CM activities that could be trended to monitor the performance of a check valve or group of check valves. This list applies to both PI and OP scope.

Table 8-4000-0
Example of CM activities and their definitions

Abbreviation	Description
CKV-C	Full stroke close exercise verification of a check valve (closed as required to prevent reverse flow).
CKV-O	Full stroke open exercise verification of a check valve (passes accident flow or opens to backstop).
LLRT	Leak test in accordance with the CLRTPRM “Containment Leak Rate Testing Programme Requirements Manual”, Type C test.
L/R	Leak test for valves other than containment isolation valves (e.g. pressure isolation valves).
OV	Open verification (i.e. with flow during the cycle). This could be a partial exercise only i.e. not using the accident flow.

Abbreviation	Description
CV	Close verification (i.e. no loss of flow with reversal flow against closed obturator). This could be a partial exercise only i.e. not using the accident flow.
Internal Inspection	Valve will be disassembled and visually inspected. Parts will be replaced if deemed necessary by CE.
CM	Condition monitoring via ultrasound or eddy current technique or other to observe and trend the obturator behaviour during service.
Overhaul/Disassembly	As concluded by the AP913 process.

8.40.1 Performance Improvement (PI) Activities

1. The PI activities are required when sufficient information related to the performance of a check valve is not available to complete the analysis required in § 8.30. If the analysis is inconclusive, the PI activities shall be performed at sufficient intervals over an interim period of the next 5 years or two fuel cycles, whichever is less, to determine the cause of failure or the maintenance patterns. Any extension of this interval may not exceed one fuel cycle per extension with a maximum interval not to exceed 10 years. The following PI activities shall be performed and documented in the CMP for each valve or valve group in the PI plan:
   a. interim tests (for example, NIT) to assess the performance of the valve or the group of valves;
   b. interim examinations to evaluate potential degradation mechanisms;
   c. other types of analysis that will be performed to assess check valve condition;
   d. activities to be performed on each valve in the group; and
   e. the interval of each activity.
2. Document attributes that will be trended. Trending and evaluation of existing data must be used as the bases to reduce or extend the time interval between tests or examinations.
3. Complete or revise the CMP in accordance with § 8.60 to reflect the current PI activities and their associated frequencies.
4. Perform the PI activities at their prescribed intervals until such a time that:
   a. Sufficient information is obtained to allow an adequate evaluation of the specific check valve performance and condition; or
   b. Until the end of the interim period.
5. The IST engineer shall review the performance results of those attributes that were selected for trending (refer to 2. above) along with the result of each activity to determine whether any changes to the CMP are required. If significant changes to the CMP are required, it shall be revised prior to the performance of the next activity and the applicable requirements specified in § 8.20, § 8.30, and § 8.40 shall be repeated commensurate with the changes made.

8.40.1.1 Performance Improvement Time Frame

The PI activities shall be performed at their associated intervals until:

a. Sufficient information is obtained to complete the analysis required in § 8.30; or

b. The end of the interim period.

8.40.2 Optimisation of Condition Monitoring Activities

1. The OP activities are allowed when sufficient information is available to complete the analysis required in § 8.30. The following actions shall be performed and documented in the CMP for each valve or valve group in the optimisation plan:

   a. the applicable preventive maintenance (PM) activities including their associated intervals that are required to maintain the continued acceptable performance of the check valve or group of check valves;

   b. the applicable examination activities including their associated intervals that will be used to periodically assess the condition of each check valve or group of check valves;

   c. the applicable test activities including their associated intervals that will be used to periodically verify the acceptable performance of each check valve or group of check valves;

   d. the activities to be performed on each valve in the group; and

   e. the interval of each activity. Interval extensions shall be limited to one fuel cycle per extension. Intervals shall not exceed the maximum intervals shown in Table 8-4000-1. All valves in a group sampling plan must be tested or examined again, before the interval can be extended again, or until the maximum interval would be exceeded. The requirements of in-service test interval specified in § 4.31.2 do not apply;

2. Document attributes to be trended. Trending and evaluation of existing data must be used as the bases to reduce or extend the interval between tests or examinations.

3. Complete or revise the CMP in accordance with § 8.60 to reflect the current OP activities and their associated frequencies.

8.40.2.1 Optimisation Time Frame

The optimisation activities shall be performed at their associated intervals.

Once OP activities are implemented, the IST engineer shall review the performance results of those attributes that were selected for trending (refer to § 8.40.2 2. above), along with the result of each activity to determine whether any changes to the CMP are required. If significant changes to the CMP are required, it shall be revised prior to the performance of the next activity and the applicable requirements specified in § 8.20, § 8.30, and § 8.40 shall be repeated commensurate with the changes made. The change could mean that a check valve could move back to PI activities due to poor performance.

Table 8-4000-1
Maximum intervals when applying interval extensions

Group Size (Valves)	Maximum Interval (1), years
≥ 4	16
3	12
2	12
1	10

(1) The maximum interval was determined by the number of interval extensions that could be obtained based on an 18-month or 24-month fuel cycle. All of the valves had to be tested or examined within the maximum interval to be considered a valid extension.

8.50 CORRECTIVE MAINTENANCE

If corrective maintenance is performed on a check valve in the CMP, then the analysis used to establish the basis for the CM activities for the valve and its associated valve group shall be reviewed to determine whether any changes are required. If significant changes to the CMP are required, it shall be revised prior to the performance of the next activity and the applicable requirements specified in § 8.20, § 8.30, and § 8.40 shall be repeated commensurate with the changes made.

8.60 DOCUMENTATION

The CMP groups with their associated CM activities are summarised in Appendix 8-1. I&T shall compile a CMP procedure with the following information (as a minimum):

a. List of valves in the CMP.

b. List of valves in valve group.

c. Dates when valves were added/deleted to the CMP and the reasons for their inclusion/deletion.

d. Analysis forming the basis for the CMP. This can be taken credit for by the AP913 process.

e. The failure or maintenance history patterns for each valve. This can be taken credit for by the AP913 process.

f. The CMP activities including the trended attributes. The IST engineer shall be notified of any changes to the performance trends.

g. The bases for the associated intervals for each valve or valve group. This can be taken credit for by the AP913 process.

Every time that a test record for a check valve or group of check valves is generated as a result of the implementation of the CMP procedure, it shall be treated as a QA record and transmitted to the vault after all signatures were obtained and stored for the lifetime of the plant.

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-01	Optimised	CKV-C	6RO	12 ARE 037 VL	16
		CKV-O	6RO	12 ARE 038 VL	16
		Diagnostic Test	2RO	12 ARE 039 VL	16
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-02	Optimised	CKV-C	6RO	12 ARE 040 VL	16
		CKV-O	6RO	12 ARE 041 VL	16
		Diagnostic Test	2RO	12 ARE 042 VL	16
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-03	Optimised	CKV-C	6RO	12 ASG 005 VD	4
		CKV-O	6RO	12 ASG 006 VD	4
		CV	1RO	12 ASG 010 VD	4
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	1RO		
		VI (VT2)	2RO		
CM-04	Optimised	CKV-C	6RO	12 ASG 018 VD	3
		CKV-O	6RO	12 ASG 019 VD	3
		Diagnostic Test	2RO	12 ASG 020 VD	3
		Internal Inspection	6RO	12 ASG 021 VD	3
		OV	1RO	12 ASG 022 VD	3
		VI (VT2)	2RO	12 ASG 023 VD	3
CM-05	Optimised	CKV-C	6RO	12 ASG 024 VD	4
		CKV-O	6RO	12 ASG 025 VD	4
		Diagnostic Test	2RO	12 ASG 026 VD	4
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-06	Optimised	CKV-C	6RO	12 ASG 027 VD	4
		CKV-O	6RO	12 ASG 028 VD	4
		Diagnostic Test	2RO	12 ASG 029 VD	4
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-07	Optimised	CKV-C	6RO	12 ASG 131 VV	3
		CKV-O	6RO	12 ASG 132 VV	3
		Diagnostic Test	2RO	12 ASG 133 VV	3
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-08	Optimised	CKV-C	6RO	12 ASG 148 VD	1,5
		CKV-O	6RO		
		CV	Q1		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-09	Optimised	CKV-C	6RO	12 DEG 014 VD	8
		CKV-O	6RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		OV	Q1		
		VI (VT2)	2RO		
CM-10	Optimised	CKV-C	6RO	12 DEG 043 VD	1
		CKV-O	6RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		VI (VT2)	2RO		
CM-11	Optimised	CKV-C	6RO	12 EAS 003 VB	14
		CKV-O	6RO	12 EAS 004 VB	14
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-12	Optimised	CKV-C	4RO	12 EAS 011 VB	14
		CKV-O	4RO	12 EAS 012 VB	14
		Diagnostic Test	2RO		
		Internal Inspection	4RO		
		LLRT	CLRTPRM		
		SRSM Manoeuvr	4RO		
		VI (VT1)	6RO		
		VI (VT2)	2RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-13	Optimised	CKV-C	4RO	12 EAS 017 VB	16
		CKV-O	4RO	12 EAS 018 VB	16
		Diagnostic Test	2RO		
		Internal Inspection	4RO		
		SRSM Manoeuvr	4RO		
		VI (VT2)	2RO		
CM-14	Optimised	CKV-C	4RO	12 EAS 220 VB	6
		CKV-O	4RO		
		Diagnostic Test	2RO		
		Internal Inspection	4RO		
		VI (VT2)	2RO		
CM-15	Optimised	CKV-C	6RO	12 PTR 004 VB	10
		CKV-O	6RO	12 PTR 005 VB	10
		CV	Q1 / 1RO	12 PTR 328 VB	10
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-16	Optimised	CKV-C	6RO	12 PTR 023 VB	0,75
		CKV-O	6RO	12 PTR 170 VB	0,75
		Diagnostic Test	2RO	12 PTR 171 VB	0,75
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		OV	CLRTPRM		
		VI (VT2)	2RO		
CM-17	Optimised	CKV-C	6RO	12 RAZ 010 VZ	1
		CKV-O	6RO	12 RAZ 034 VZ	1
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		OV	CLRTPRM		
		VI (VT2)	2RO		
CM-18	Optimised	CKV-C	6RO	12 RCP 036 VP	2
		CKV-O	6RO	12 RCP 130 VP	2
		Diagnostic Test	2RO	12 RCP 230 VP	2
		Internal Inspection	6RO	12 RCP 330 VP	2
		OV	Q1 / 1RO	12 RCV 052 VP	2
		VI (VT2)	2RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-19	Optimised	CKV-C	6RO	12 RCP 120 VP	6
		CKV-O	6RO	12 RCP 122 VP	6
		CV	1RO	12 RCP 220 VP	6
		Diagnostic Test	2RO	12 RCP 222 VP	6
		Internal Inspection	6RO	12 RCP 320 VP	6
		L/R	2Y	12 RCP 322 VP	6
		OV	1RO		
		SRSM Manoeuvr	1RO		
		VI (VT1)	3RO		
		VI (VT2)	1RO		
CM-20	Optimised	SRSM Manoeuvr	1RO	12 RCP 121 VP	12
		CKV-C	6RO	12 RCP 221 VP	12
		CKV-O	6RO	12 RCP 321 VP	12
		CV	1RO	12 RIS 004 VP	12
		Diagnostic Test	2RO	12 RIS 005 VP	12
		Internal Inspection	6RO	12 RIS 006 VP	12
		L/R	2Y		
		OV	1RO		
		VI (VT1)	3RO		
		VI (VT2)	1RO		
CM-21	Optimised	CKV-C	6RO	12 RCP 223 VP	3
		CKV-O	6RO	12 RCV 051 VP	3
		CV	1RO	12 RIS 022 VP	3
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT (CIVs ONLY)	CLRTPRM		
		OV	1RO		
		VI (VT2)	1RO		
CM-22	Optimised	CKV-C	6RO	12 RCV 035 VP	4
		CKV-O	6RO		
		CV	1RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	1RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-23	Optimised	CKV-C	6RO	12 RCV 039 VP	3
		CKV-O	6RO	12 RCV 040 VP	3
		CV	Q1 / CLRTPRM	12 RCV 041 VP	3
		Diagnostic Test	2RO	12 RCV 049 VP	3
		Internal Inspection	6RO		
		LLRT(CIVs ONLY)	CLRTPRM		
		OV	Q1		
		VI (VT2)	1RO		
CM-24	Optimised	CKV-C	6RO	12 RCV 070 VP	2
		CKV-O	6RO	12 RCV 071 VP	2
		CV	Q1 / CLRTPRM	12 RCV 072 VP	2
		Diagnostic Test	2RO	12 RCV 130 VP	2
		Internal Inspection	6RO	12 RCV 216 VP	2
		LLRT(CIVs ONLY)	CLRTPRM	12 RCV 217 VP	2
		OV	Q1 / CLRTPRM	12 RCV 218 VP	2
		VI (VT2)	1RO	12 RCV 253 VP	1
CM-25	Optimised	CKV-C	6RO	12 RCV 910 VP	2
		CKV-O	6RO	12 RCV 911 VP	2
		CV	1RO	12 RCV 918 VP	2
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	1RO		
		VI (VT2)	1RO		
CM-26	Optimised	CKV-C	6RO	12 REA 056 VB	2
		CKV-O	6RO	12 REA 057 VB	2
		CV	Q1 / 1RO	12 REA 131 VD	3
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1 / 1RO		
		VI (VT2)	2RO		
CM-27	Optimised	SRSM Manoeuvr	2RO	12 RIS 011 VP	8
		CKV-C	6RO	12 RIS 017 VP	8
		CKV-O	6RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	1RO		
		VI (VT1)	3RO		
		VI (VT2)	1RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-28	Optimised	SRSM Manoeuvr	2RO	12 RIS 040 VP	2
		CKV-C	6RO	12 RIS 041 VP	2
		CKV-O	6RO	12 RIS 042 VP	2
		CV	1RO	12 RIS 072 VP	2
		Diagnostic Test	2RO	12 RIS 073 VP	2
		Internal Inspection	6RO	12 RIS 074 VP	2
		L/R	2Y		
		LLRT (CIVs ONLY)	CLRTPRM		
		OV	1RO		
		VI (VT1)	3RO		
		VI (VT2)	1RO		
CM-29	Optimised	CKV-C	4RO	12 RIS 053 VP	14
		CKV-O	4RO	12 RIS 054 VP	14
		Diagnostic Test	2RO		
		Internal Inspection	4RO		
		SRSM Manoeuvr	4RO		
		VI (VT2)	2RO		
CM-30	Optimised	CKV-C	6RO	12 RIS 057 VP	10
		CKV-O	6RO	12 RIS 058 VP	10
		Diagnostic Test	2RO	12 RIS 069 VP	10
		Internal Inspection	6RO	12 RIS 070 VP	10
		L/R (PIVs ONLY)	2Y	12 RIS 071 VP	10
		LLRT(CIVs ONLY)	CLRTPRM	12 RIS 081 VP	10
		OV	1RO		
		VI (VT2)	1RO		
CM-31	Optimised	CKV-C	6RO	12 RIS 076 VP	12
		CKV-O	6RO	12 RIS 086 VP	12
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-32	Optimised	CKV-C	6RO	12 RIS 205 VP	1
		CKV-O	6RO		
		CV	1RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	1RO		
		VI (VT2)	2RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-33	Optimised	CKV-C	6RO	12 RRA 004 VP	12
		CKV-O	6RO	12 RRA 005 VP	12
		CV	CSD		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	CSD		
		VI (VT2)	2RO		
CM-34	Optimised	CKV-C	6RO	12 RRI 005 VN	20
		CKV-O	6RO	12 RRI 006 VN	20
		CV	Q1	12 RRI 007 VN	20
		Diagnostic Test	2RO	12 RRI 008 VN	20
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-35	Optimised	CKV-C	6RO	12 RRI 013 VN	14
		CKV-O	6RO	12 RRI 014 VN	14
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		OV	1RO		
		VI (VT2)	2RO		
CM-36	Optimised	CKV-C	6RO	12 RRI 188 VN	6
		CKV-O	6RO	12 RRI 213 VN	6
		Diagnostic Test	2RO	12 RRI 214 VN	6
		Internal Inspection	6RO	12 RRI 215 VN	6
		LLRT	CLRTPRM		
		OV	Q1		
		VI (VT2)	2RO		
CM-37	Optimised	CKV-C	6RO	12 RRI 219 VN	2
		CKV-O	6RO	12 RRI 220 VN	2
		CV	2RO	12 RRI 221 VN	2
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-38	Optimised	CKV-C	6RO	12 RRI 476 VN	0,75
		CKV-O	6RO	12 RRI 477 VN	0,75
		Diagnostic Test	2RO	12 RRI 478 VN	0,75
		Internal Inspection	6RO	12 RRI 479 VN	0,75
		LLRT	CLRTPRM	12 RRI 480 VN	0,75
		OV	CLRTPRM	12 RRI 481 VN	0,75
		VI (VT2)	2RO	12 RRI 539 VN	0,75
				12 RRI 540 VN	0,75
CM-39	Optimised	CKV-C	6RO	12 RRI 320 VN	3
		CKV-O	6RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		OV	Q1		
		VI (VT2)	2RO		
CM-40	Optimised	CKV-C	6RO	12 RRI 552 VN	12
		CKV-O	6RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-41	Optimised	CKV-C	6RO	12 SAR 433 VA	2
		CKV-O	6RO		
		Diagnostic Test	2RO		
		Internal Inspection	6RO		
		LLRT	CLRTPRM		
		OV	CLRTPRM		
		VI (VT2)	2RO		
CM-42	Optimised	CKV-C	6RO	12 SEC 005 VE	24
		CKV-O	6RO	12 SEC 006 VE	24
		CV	Q1	12 SEC 007 VE	24
		Diagnostic Test	2RO	12 SEC 008 VE	24
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		

APPENDIX 8-1
CMP TEST PLANS

CM Group	CM Type	CM Test	CM Freq	Valve	Size
CM-43	Optimised	CKV-C	6RO	12 SEC 023 VE	4
		CKV-O	6RO	12 SEC 024 VE	4
		CV	Q1	12 SEC 025 VE	4
		Diagnostic Test	2RO	12 SEC 026 VE	4
		Internal Inspection	6RO		
		OV	Q1		
		VI (VT2)	2RO		
CM-44	Optimised	CKV-C	6RO	12 SEC089VA	4
		CKV-O	6RO	12 SEC090VA	4
		CV	Q1		
		Internal Inspection	6RO		
		OV	1RO		
		VI (VT2)	2RO		

SECTION 9

Pre-Service and In-Service Examination and Testing of Dynamic Restraints (Snubbers)

9. PRE-SERVICE AND IN-SERVICE EXAMINATION AND TESTING OF DYNAMIC RESTRAINTS (SNUBBERS)

9.10 INTRODUCTION

For reference purposes, the format and the numbering system of the ASME OM code headings are retained in this section with the following change: ISTB is replaced by number 9 and the subsection numbers are reduced, i.e. ISTD-1000 is now 9.10.

Furthermore, requirements not applicable to Koeberg were omitted. This has resulted in the numbering system not following chronological order.

9.11 Applicability

The requirements of this section apply to the scope of snubbers connected to component classes 1, 2, and 3, and systems performing one of the functions as defined in § 4.11.

The list of the IST snubber population for both units at Koeberg is provided in Appendix 9-1.

9.12 Design and Operating Information

I&T shall develop a basis document for each IST snubber that shall contain the design and operating information. The non-mandatory Appendix C of the ASME OM code can be used as a guide. This will be useful during the evaluation of test and examination results.

9.13 Examination and Test Results

I&T shall ensure that the test results record requirements specified in § 4.92.3 are met.

9.15 Snubber Maintenance or Repair

9.15.1 Maintenance or Repair before Examination or Testing

Snubbers shall not be adjusted, maintained, or repaired before an examination or test specifically to meet the examination or test requirements.

9.15.2 Post Maintenance or Repair Examination and Testing

Snubbers that undergo maintenance or repair activities or adjustment of a part which could modify one of the test requirements specified in § 9.51.2 shall be re-qualified in accordance with § 9.51.2 before return to service. These examinations and tests shall ensure that the parameters that may have been affected by the maintenance or repair activity[9] are verified to be acceptable. In addition, the pre-service requirements specified in § 9.41.1 shall be met.

[9] Examples of parts and activities that can affect the test results of § **9.51.2** are:
- Internal moving parts;

9.16 Snubber Modification and Replacement

9.16.1 Suitability

Replaced or modified snubber(s) shall be suitable for the chosen application and environment.

9.16.2 Examination and Testing

The replaced or modified snubber(s) shall be examined and tested in accordance with written authorised procedures. These procedures shall ensure that the applicable pre-service and in-service examination and testing requirements as specified in this section are satisfied.

9.17 Removal of Unacceptable Snubbers

When an unacceptable snubber is removed from the plant based on piping analysis or other engineering decision, the unacceptable snubber shall still be considered in its respective examination population or failure mode group (FMG) for determining applicable corrective actions.

9.17.5 Transient Dynamic Event

If an unanticipated transient (dynamic event) occurs, for example, water hammer or steam hammer that may affect snubbers and their associated systems, such event shall be reviewed to determine appropriate corrective actions. These corrective actions shall be considered independent of the pre-service and in-service examination and testing requirements specified in this section.

9.18 Supported Component(s) or System Evaluation

The component or system associated with an unacceptable snubber that does not meet examination or testing requirements as specified in this section shall be evaluated (re-analysed) for possible damage.

9.20 DEFINITIONS

The applicable definitions to this section are listed in § 4.20.

9.30 GENERAL REQUIREMENTS

9.31 General Examination Requirements

The following general requirements address both pre-service and in-service examinations. Examinations shall be conducted by qualified inspectors as per KSR-003[38].

- Internal seals;
- Activities that can affect air to be entrapped in the main cylinder or the control valve; and
- Control valve adjustment.

9.31.1 Examination Boundary

The examination boundaries shall include the snubber assembly from pin-to-pin inclusive. The visual examination method shall be used as described in this section.

9.32 General Testing Requirements

The following general requirements address both pre-service and in-service testing. Testing shall be conducted by qualified inspectors.

9.32.1 Operational Readiness Testing Loads

Snubbers shall be tested at a load sufficient to verify the applicable test parameters specified in § 9.51, § 9.52, § 9.53, and § 9.55.

9.32.2 Test Correction Factors

If there is a difference between the operating and testing conditions of the snubbers, a correction factor shall be established and the test results shall be accordingly correlated to operating conditions.

9.32.3 Snubber Test Parameters and Methods

I&T are advised to review the current functional testing procedure against the non-mandatory ASME OM code Appendix H.

9.40 SPECIFIC EXAMINATION REQUIREMENTS

9.41 Pre-Service Examination

9.41.1 Pre-Service Examination Requirements

A pre-service examination is required on all snubbers after installation whether new or maintained. Such examination shall be performed after placing the corresponding system in service. I&T shall review the non-mandatory Appendix B to ASME OM code to determine whether all items are covered under the current working procedure. As a minimum, this examination shall verify the following attributes:

a. The absence of signs of damage or impaired operational readiness as a result of storage, handling, or installation;

b. The snubber load rating, location, orientation, position setting, and configuration (for example, attachments and extensions) are in accordance with design drawings and specifications;

c. Adequate swing clearance is provided to allow snubber movement;

d. If applicable, fluid is at the recommended level, and fluid is not leaking from the snubber system;

e. Structural connections such as pins, bearings, studs, fasteners, lock nuts, tabs, wire, and cotter pins are installed correctly.

9.41.2 Re-Examination

If the period between the pre-service examination and the initial system pre-operational test exceeds six months, a re-examination shall be performed in accordance with § 9.41.1. During this re-examination, the requirements of § 9.41.3 shall be observed.

9.41.3 Pre-Service Thermal Movement Examination Requirements

Snubber thermal movement shall be verified as specified in § 9.41.3.1, § 9.41.3.2 and § 9.41.3.3.

9.41.3.1 Incremental Movement Verification

At Koeberg, incremental movement verification is impractical as the temperature plateaus during system heat-up and cool-down are not maintained to allow examination. For this reason, only the total movement will be verified. Refer to § 9.41.3.3.

9.41.3.2 Swing Clearance

Verify that there is sufficient swing clearance during specific heat up and cool down plateaus to prevent a locked snubber situation. Refer to SPT-6313/11[34] for details related to the clearance requirements for each IST snubber.

9.41.3.3 Total Movement Verification

When the different systems have reached the full operational temperature, I&T shall record the total thermal displacement for each IST snubber and verify that it is within the specified design range. The details of these ranges are provided in document SPT-6313/11 [34]. The cold and hot position settings shall be evaluated and adjusted if required to ensure adequate snubber clearance from the fully extended/retracted positions. Any anomalies or inconsistencies shall be reported to Engineering for further evaluation.

9.41.4 Pre-Service Examination Corrective Action

Snubbers that failed to meet the requirements specified in § 9.41.1 shall be adjusted, repaired, modified, or replaced. The replaced or modified snubbers shall be deemed acceptable when they meet the requirements specified in § 9.41.1. In addition, the replaced snubbers shall meet the requirements specified in § 9.51.2.

9.42 In-Service Examination

Snubbers shall be visually examined at the required frequency to confirm their operability readiness.

9.42.1 Methods and Objective (Acceptance Criteria of the In-Service Examination)

The intent of the visual in-service examination is to detect physical damage, leakage, corrosion, or degradation that may have been caused by environmental exposure or operating conditions. External

characteristics that may indicate operational readiness of the snubber shall be examined using an examination checklist. I&T shall review the non-mandatory Appendix B to ASME OM code to determine whether all items are covered under the current working procedure. As a minimum, this examination shall verify the following attributes:

a. Adequate reservoir fluid level;

b. The absence of loose, missing, or incorrectly installed structural connections or fasteners;

c. Vented reservoir oriented such that hydraulic fluid cannot gravitate to the snubber;

d. The absence of corrosion or solid deposits that could result in unacceptable snubber performance;

e. The absence of deformed structural attachment or piston rod;

f. The absence of weld arc strikes, paint, weld slag, adhesive, or other deposits on the piston rod or support cylinder that could result in unacceptable snubber performance;

g. Spherical bearing fully engaged in attachment lug;

h. Adequate position setting; and

i. The absence of indications of binding, misalignment, or deformation of the snubber.

9.42.2 Snubber Categorisation

a. The snubbers shall be considered as either one population for examination or they may be categorised individually as accessible or inaccessible.

b. I&T shall decide to consider the snubbers either as one population or as separate accessible/inaccessible groups, and such decision shall be documented before scheduled examinations and shall not be changed during the examination.

c. When recombining categories into one population, the shorter interval of the categories shall be used.

9.42.3 Visual Examination Requirements

In addition to the visual examination requirements specified in § 9.42 and § 9.42.1, snubber installation shall also meet the requirements specified in § 9.42.3.1, § 9.42.3.2, and § 9.42.3.3.

9.42.3.1 Restrained Movement

One of the design functions of snubbers is to restrain movement when activated and the examination is intended to detect any condition that could prevent the snubber from restraining the movement. In particular, the examiner shall be observant of the following:

a. The absence of loose fasteners or members that are corroded or deformed;

b. The absence of disconnected components or other conditions that may impede the proper restraint of movement.

Snubbers that are found incapable of restraining movement shall be declared unacceptable.

9.42.3.2 Thermal Movement

The installation of a snubber shall be such that it does not restrain thermal movement to the extent that unacceptable stresses develop in the snubber, pipe, or equipment that the snubber is designed to protect. I&T shall include requirements in their working procedures to verify that there is no binding, misalignment, or deformation of the snubbers that could impede their thermal movement.

9.42.3.3 Design Specific Characteristics

Before installation of a snubber, it shall be verified that all the design specifications are met. As an example, the fluid level shall be verified to be greater than the minimum required.

9.42.4 Operational Readiness Test Evaluation

A snubber that requires further evaluation or found as unacceptable during in-service examination may be tested in accordance with § 9.51.2. If the test results satisfy the acceptance criteria specified in § 9.51.2, this shall be used to declare the snubber fully acceptable, provided that the test results demonstrate that the unacceptable condition (examination) did not affect the operational readiness.

9.42.5 In-Service Examination Intervals

9.42.5.2 Subsequent Examination Intervals

As a general rule, the subsequent examination intervals shall begin at the end of the previous examination interval and finish at the end of the next refuelling outage.

In practice, the interval preceding the most recently completed examination shall be used as the previous interval for the first application of the intervals specified in Table 9-4252-1.

Snubbers determined to be unacceptable based on the visual examination acceptance criteria at any time during the interval shall be counted in determining the subsequent examination interval in accordance with the method specified in Table 9-4252-1.

I&T shall develop a working procedure to include the requirements specified in the code case OMN-13 in order to extend the examination intervals for the eligible snubbers.

Table 9-4252-1
Visual Examination Table

Population or Category[1]	Number of Unacceptable Snubbers		
	Column A for Extended Interval[2][3]	Column B for Interval Same as Previous[2][4][5]	Column C for Interval Reduction to 2/3[2][5][6]
1	0	0	1
80	0	0	2
100	0	1	4
150	0	3	8
200	2	5	13
300	5	12	25

NOTES:
(1) Interpolation between population or category sizes and the number of unacceptable snubbers is permissible. The next lower integer shall be used when interpolation results in a fraction.
(2) The basic interval shall be the normal fuel cycle up to 24 months. The examination interval may be as great as twice, the same, or as small as a fraction of the previous interval as required by the following note: The examination interval may vary ± 25% of the current interval.
(3) If the number of unacceptable snubbers is equal to or less than the number in Column A, then the next examination interval may be increased to twice the previous examination interval, not to exceed 48 months. In that case, the next examination according to the previous interval may be skipped.
(4) If the number of unacceptable snubbers exceeds the number in Column A, but is equal to or less than the number in Column B, then the next visual examination shall be conducted at the same interval as the previous interval.
(5) If the number of unacceptable snubbers exceeds the number in Column B, but is equal to or less than the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous examination interval or, in accordance with the interpolation between Columns B and C, in proportion to the exact number of unacceptable snubbers.
(6) If the number of unacceptable snubbers exceeds the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous interval.

9.42.6 In-Service Examination Sample Size

The in-service examination of snubbers as required under § 9.42.5.2 shall include all snubbers based either on the whole population or on the accessibility categories as decided in accordance with § 9.42.2.

9.42.7 In-Service Examination Failure Evaluation

Snubbers that do not meet the acceptance criteria specified in § 9.42.3 shall be evaluated to determine the root cause of the unacceptable condition.

9.42.8 In-Service Examination Corrective Action

In addition to the Koeberg corrective action process requirements, the unacceptable snubbers shall be adjusted, repaired, modified, or replaced. Additional action regarding the examination intervals shall also be observed as specified in Table 9-4252-1.

9.50 SPECIFIC TESTING REQUIREMENTS

9.51 Pre-Service Operational Readiness Testing

The detailed acceptance criteria of this paragraph reside in the Maintenance and I&T working procedures. These procedures shall be reviewed and approved by Engineering Programmes before implementation and following any revisions. In addition, the functional test acceptance criteria are provided in EPR-09-0016 [29]

9.51.1 General

After installation and after placing the corresponding system in service, all snubbers, whether new or maintained, shall undergo pre-service operational readiness testing. The OEM certificate may be used provided it is done within the period recommended by the OEM.

9.51.2 Test Parameters

The pre-service operational readiness test of snubbers shall verify the following criteria:

a. Activation is within the specified range of velocity or acceleration in tension and in compression.

b. Release rate, when applicable, is within the specified range in tension and in compression. For units specifically required not to displace under continuous load, ability of the snubber to withstand load without displacement.

c. If required to verify proper assembly, drag force is within specified limits in tension and compression.

The acceptance criteria of the above parameters are documented in EPR-09-0016 [29]. I&T shall review the current working procedure to ensure that the acceptance criteria stipulated in this EPR are correctly programmed on the test bench software.

9.51.3 Pre-Service Operational Readiness Testing Failure Corrective Action

9.51.3.1 Test Failure Evaluation

Snubbers that do not meet pre-service operational readiness test shall be evaluated to determine the root cause of failure.

9.51.3.2 Design Deficiencies

If a design deficiency in a snubber is found, it shall be corrected by changing the design or specification or by other appropriate means as mandated by Koeberg processes.

9.51.3.3 Other Deficiencies

Other deficiencies shall be resolved by adjustment, modification, repair, replacement, or any other appropriate means.

9.51.3.4 Re-Test Requirements

If for any reason, a snubber undergoes adjustment, modification, repair or replacement shall be re-qualified to meet the requirements specified in § 9.51.2 before plant start-up.

9.52 In-Service Operational Readiness Testing

Snubbers shall be tested for operational readiness during each fuel cycle. Tests are required to be in accordance with a specified sampling plan. Testing shall be done during normal system operation, or during system or plant outages. I&T shall ensure that specific procedures are used to govern the removal of snubbers from an operable system. For each snubber determined to be unacceptable by operational readiness testing, additional snubbers shall be tested as determined by the type of failure and the corrective action taken.

9.52.1 Test Parameters (In-Service) and Acceptance Criteria

The in-service operational readiness test of snubbers shall verify the following criteria:

a. Activation is within the specified range of velocity or acceleration in tension and in compression.

b. Release rate, when applicable, is within the specified range in tension and in compression. For units specifically required not to displace under continuous load, ability of the snubber to withstand load without displacement.

c. Drag force is within specified limits, in tension and in compression.

The acceptance criteria of the above parameters are documented in EPR-09-0016 [29]. I&T shall review the current working procedure to ensure that the acceptance criteria stipulated in this EPR are correctly programmed on the test bench software.

9.52.2 Test Methods

9.52.2.1 Test as Found

Snubbers shall be tested in their as-found condition regarding the parameters to be tested as practicable as possible.

9.52.2.2 Restriction

The methods used to test the snubbers shall not alter the condition of a snubber to the extent that the results do not represent the as-found condition.

9.52.2.3 In Situ Test

The snubbers may be tested in situ provided approved test procedures are used. This is applicable to the SG snubbers at Koeberg.

9.52.2.4 Bench Test

Snubbers may be removed from the plant and tested on the bench in accordance with approved procedures. After re-installation on the plant, the pre-service examination requirements shall be applied as specified in § 9.41.1.

9.52.2.6 Correlation of Indirect Measurements

When test methods are used in a manner to measure the test parameters indirectly or measure other parameters that are not specified, the test results shall be correlated to the specified parameters using approved methods.

9.52.2.7 Parallel and Multiple Installations

Each snubber in a parallel installation or multiple installations shall be counted individually.

9.52.2.8 Fractional Sample Sizes

Fractional sample sizes shall be rounded off to the next integer.

9.52.3 Qualitative Tests

Qualitative tests may be used instead of quantitative measurements to meet the in-service operational readiness test parameters specified in § 9.52.1 if adequate justification is presented and is acceptable to the NNR. Sufficient data, based upon service history or life cycle testing, shall be obtained to demonstrate the ability of the parameter in question to conform to the specification over the service life of the snubber. A test report that confirms the parameter was within specifications shall be available for each snubber exempted from an in-service quantitative test requirement.

9.52.4 Test Frequency

Testing of snubbers shall be performed every fuel cycle. Snubber testing may not begin earlier than 60 days before a scheduled refuelling outage.

9.52.5 Defined Test Plan Group (DTPG)

9.52.5.1 DTPGs General Requirements

The DTPGs shall include all snubbers except replacement snubbers and snubbers repaired or adjusted as a result of not meeting the examination acceptance requirements specified in § 9.42. These snubbers shall be exempt for the concurrent test interval.

9.52.5.2 DTPGs Alternatives

Except as specified in § 9.52.5.3, the total snubber population may be considered as one DTPG or alternatively differences in design, application, size, or type may be considered in establishing DTPGs.

I&T shall record the different DTPGs with their respective test/examination frequencies in the test procedure or other document.

9.52.5.3 Additional DTPG Requirements for PWR

The DTGP for the snubbers attached to the steam generators and the reactor coolant pumps shall be at least one separate DTPG.

9.52.6 Testing Sample Plans

9.52.6.1 Sample Plans

The snubbers of each DTPG shall be tested using the 10% sample plan. Selection of the snubbers shall be random and equally distributed among the percentages of each model within the DTPG.

9.52.6.2 Plan Selection

I&T shall provide a test plan for each DTPG before the scheduled testing begins in order for the maintenance group to prepare for spares and other logistics.

9.52.6.3 Plan Application

The 10% sample plan shall be used throughout the refuelling outage tests for the DTPG and any resulting failure mode group (FMG) shall be considered.

9.52.7 Continued Testing

For unacceptable snubber(s), the additional testing shall continue in the DTPG or FMG in accordance with § 9.53.3.

9.52.7.1 Test Failure Evaluation

Snubbers that do not meet test requirements specified in § 9.52.1 or § 9.52.3 as applicable, shall be evaluated to determine the root cause of failure.

a. The evaluation shall include review of information related to other unacceptable snubbers found during that refuelling outage in order to detect any common mode failure.

b. The evaluation results shall be used, as applicable, to determine FMGs to which snubbers should be assigned. Additional justifying information should be used to assign snubbers with failures previously detected as unexplained or isolated to an appropriate FMG.

9.52.7.2 Failure Mode Groupings (FMGs)

Snubbers found unacceptable according to operational readiness test requirements should be assigned to FMGs unless the failure is isolated or unexplained. FMGs shall include all unacceptable snubbers with

the same failure mode and all other snubbers with the similar potential for similar failure. The following FMG groups shall be used:

a. Design or manufacturer;

b. Application induced;

c. Maintenance, repair, or installation;

d. Transient dynamic event.

In addition, these FMG shall be communicated to CE and RE to be used as a basis to review the snubber MB.

9.52.7.3 FMG Boundaries

a. When snubbers have been tested as a part of DTPG test requirements and found to be unacceptable, and evaluation establishes an FMG based on the failure of certain snubbers, the number of those unacceptable snubbers shall be used in determining testing in the FMG in accordance with § 9.53.2 and § 9.53.3 However, those snubbers shall be counted only in the value of *N* in § 9.53.3.1 a. as completed tests in the DTPG.

b. When snubbers have been found to be acceptable when tested as part of DTPG test requirements and subsequent evaluation establishes an FMG that would include those snubbers, those snubbers shall not be counted in the value of *NF* in § 9.53.3.1 b. when counting FMG tests.

c. An FMG shall remain as defined until corrective action is complete.

9.52.7.4 Snubbers in Multiple FMGs

When a snubber is assigned to more than one FMG, it shall be counted in each of those FMGs and shall be included in the corrective action of each of these FMGs.

9.52.7.5 Additional FMG Review

After the testing requirements in accordance with § 9.52.5, § 9.52.6, § 9.52.7, and § 9.53.2 are satisfied for a DTPG, any separate and additional FMG review or testing does not require additional tests in the DTPG.

9.52.8 Corrective Action

Unacceptable snubbers shall be adjusted, repaired, modified, or replaced. The provisions specified in § 9.16.2 and § 9.17 shall be considered. Snubbers that do not meet the test requirements specified in § 9.52.1 or § 9.52.3 as applicable, shall be tested in accordance with § 9.53.2.

9.53 The 10% Testing Sample

9.53.1 The 10% Testing Sample Plan, Sample Size, and Composition

9.53.1.1 Initial Sample Size and Composition

The initial sample shall be 10% of the DTPG, composed according to either a. or b. below:

a. As practicable, the sample shall include representation from the DTPG based on the significant features (for example, the various designs, configurations, operating environments, sizes, and capacities) and based on the ratio of the number of snubbers of each significant feature, to the total number of snubbers in the DTPG. Selection of the representative snubbers shall be random.

b. The sample shall be generally representative as specified in a. above, but may also be selected from snubbers concurrently scheduled for seal replacement or other similar activity related to service life monitoring. The snubbers shall be tested on a generally rotational basis to coincide with the service life monitoring activity.

9.53.1.2 Additional Sample Size

When additional samples are required by § 9.53.2, they shall be one-half the size of the initial sample from that DTPG.

9.53.1.3 Additional DTPG Sample Composition

When an unacceptable snubber has not been assigned to an FMG, the additional sample required by § 9.53.2 shall be taken from the DTPG. As practicable, the additional sample shall include the following:

a. Snubbers of the same manufacturer's design;

b. Snubbers immediately adjacent to those found unacceptable;

c. Snubbers from the same piping system;

d. Snubbers from other piping systems that have similar operating conditions such as temperature, humidity, vibration, and radiation;

e. Snubbers that are previously untested.

9.53.1.4 FMG Sample Composition

When samples from an FMG are required, they shall be selected randomly from untested snubbers in the FMG.

9.53.2 The 10% Testing Sample Plan Additional Testing Alternatives

9.53.2.1 Unexplained Failures

When an applicable FMG has not been established, the number of unacceptable snubbers shall determine the additional testing samples in accordance with § 9.53.1.2 and § 9.53.3.

9.53.2.2 Isolated Failure

Isolated failure is a failure that does not cause other snubbers to be suspect. Additional tests are not required for an isolated failure.

9.53.2.3 Design or Manufacturing and Application-Induced FMG Alternatives to Testing

When the corrective action specified in either a. or b. below is taken, no additional testing is required for the applicable FMGs.

a. All snubbers in these FMGs shall be replaced or modified in accordance with § 9.16 or;

b. The unacceptable snubbers in these FMGs in an application-induced FMG shall be replaced or repaired to an acceptable condition and the environment or applications shall be made compatible with the design parameters for all snubbers in this FMG. Also, all this information shall be communicated to Reliability Engineering to re-assess the snubber MB.

9.53.2.4 Design or Manufacturing; Maintenance, Repair, or Installation and Application-Induced FMGs Test

When the corrective actions specified in § 9.53.2.3 above are not applicable, or are not taken, the following apply:

a. Tests in the FMG shall be based both on the number of unacceptable snubbers found in the DTPG and determined by the evaluation specified in § 9.52.7.1 to be appropriate for establishing the FMG, and on the number of unacceptable snubbers subsequently found in the FMG.

b. Testing shall continue until the mathematical expression specified in § 9.53.3.1 b. is satisfied or all snubbers in the FMG have been tested.

9.53.2.5 Transient Dynamic Event FMG Additional Tests

Although additional tests are not required for dynamic event FMG failures, the operational readiness of all snubbers in this FMG shall be evaluated by stroking or testing. All operationally ready snubbers in this FMG remain eligible for selection and tests for other appropriate FMGs and DTPG in accordance with § 9.53.1.3 and § 9.53.1.4.

9.53.3 The 10% Testing Sample Plan Completion

The snubbers of each DTPG and FMG shall be tested as required. Testing is complete when the mathematical expressions stipulated in § 9.53.3.1 are satisfied, or all snubbers in the DTPG or FMG have been tested.

9.53.3.1 Testing Plan Mathematical Expression

a. DTPG Testing Plan Mathematical Expression

N > 0.1n + C (0.1 n/2)

where:

N = total number of snubbers tested that were selected from the DTPG;

n = number of snubbers in the DTPG;

C = total number of unacceptable snubbers found in the DTPG (excluding those counted for FMG tests).

b. FMG Testing Plan Mathematical Expression

NF > CF (0.1n/2)

Where:

NF = all snubbers selected and tested from the FMG after the FMG was established from the DTPG

CF = total number of unacceptable snubbers in the FMG, plus those found in the DTPG and used to establish the FMG

n = number of snubbers in the DTPG

9.55 Retests of Previously Unacceptable Snubbers

Snubbers placed in the same location as snubbers that failed the previous in-service operational readiness test shall be retested at the time of next operational readiness testing unless the cause of the failure is clearly established and corrected. Any retest in accordance with this paragraph shall not be considered a part of in-service operational readiness testing sample selection requirements specified in § 9.52 and § 9.53. In addition, failures found by these retests shall not require additional testing in accordance with § 9.53.2; however, test results shall be evaluated and corrective action taken if applicable.

9.60 SERVICE LIFE MONITORING (SLM)

9.61 Predicted Service Life

In addition to the requirements stipulated below, EP has compiled an EPR E0039/13 [19] that provides the SLM status of the IST snubbers and how it should be implemented. This document was used in

conjunction with the EDF OE to establish the MB for all IST snubbers. I&T shall communicate all the examination and testing data for all snubbers to CE and RE at the end of every outage for possible changes to the MB strategies.

9.62 Service Life Evaluation

Service life shall be evaluated at least once each fuel cycle, and increased or decreased, if warranted. Evaluation shall be based upon technical data from representative snubbers that have been in service in the plant, or other information related to service life. If the evaluation indicates that service life will be exceeded before the next scheduled system or plant outage, one of the following actions shall be taken:

a. The snubber shall be replaced with a snubber for which the service life will not be exceeded before the next scheduled system or plant outage; or

b. Technical justification shall be documented for extending the service life to or beyond the next scheduled system or plant outage; or

c. The snubber shall be reconditioned such that its service life will be extended to or beyond the next scheduled system or plant outage.

9.63 Root Cause Determination of Failures

Root causes for any examination or testing failures shall be determined and considered in establishing or re-establishing the SLM and shall be communicated to RE at the end of every outage for possible changes to the MB strategies.

9.64 Additional Monitoring Requirements for Snubbers that are tested without Applying a Load to the Snubber Piston Rod

The following requirements are applicable to the SG snubbers at Koeberg. I&T shall review Areva's *Anaconda* test procedure and confirm its compliance to the requirements specified in this paragraph and in this section in general.

The service life evaluation for hydraulic snubbers that are tested without applying a load to the snubber piston rod shall consider the results of the following requirements:

a. Monitoring the particulate, viscosity, and moisture content of one or more samples of hydraulic fluid from the main cylinder of the snubber. This may be accomplished using snubbers of the same design in a similar or harsher environment;

b. Monitoring of piston seal, piston rod seal, and cylinder seal integrity. If seal integrity is monitored by pressurisation, pressures less than the snubber's rated load pressure may be used. Minimum pressure allowed shall be specified.

9.65 Testing for Service Life Monitoring Purposes

If testing is done specifically for service life monitoring purposes, the results of such testing do not require testing of additional snubbers in accordance with § 9.53.2; however, test results shall be evaluated and corrective action taken if applicable.

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 APG 001 TY	541 KB1 1782	R512-14	QUIRI	M30
1 APG 001 TY	541 KB1 1978	R410-15A	QUIRI	M1
		R410-15B	QUIRI	M1
		R410-18B	QUIRI	M8A
		R410-32C	QUIRI	M1
		R410-32D	QUIRI	M1
1 APG 001 TY	541 KB1 2223	R448-5	QUIRI	M1
		R448-5A	QUIRI	M1
1 APG 003 TY	541 KB1 1870	R430-28C	QUIRI	M30
		R430-28D	QUIRI	M1
1 APG 004 TY	541 KB1 1789	R512-12	QUIRI	M30
		R512-15	QUIRI	M1
1 APG 005 TY	541 KB1 2717	R522-13	QUIRI	M1
1 APG 006 TY	541 KB1 2363	R532-21	QUIRI	M10
1 ARE 002 TY	545 KB1 1604	R510-2	LISIEGA	306256
		R510-2A	LISIEGA	306256
		R520-3	QUIRI	M61
		R520-3A	QUIRI	M61
		R541-2	LISIEGA	306256
		R541-2A	LISIEGA	306256
		R541-2AL	LISIEGA	306256
		R541-2AR	LISIEGA	306256
		R622-2	QUIRI	M51
		R622-2A	QUIRI	M51
		R722-1	QUIRI	M60
		R722-1A	QUIRI	M60

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 ARE 003 TY	545 KB1 1605	R530-2	QUIRI	M51
		R530-2A	QUIRI	M51
		R530-6	QUIRI	M61
		R530-6A	QUIRI	M61
		R632-2L	QUIRI	M51
		R632-2R	QUIRI	M51
		R732-1	QUIRI	M60
		R732-1A	QUIRI	M60
1 EAS 007 TY	731 KB1 1460	AS122	QUIRI	M6
1 EAS 007 TY	731 KB1 1471	SA866	QUIRI	M6
		SA867	QUIRI	M6
		SA927	QUIRI	M6
1 EAS 008 TY	731 KB1 1460	AS127	QUIRI	M6
1 EAS 008 TY	731 KB1 1472	SA865	QUIRI	M6
		SA924	QUIRI	M6
1 EAS 050 TY	731 KB1 1458	AS113	QUIRI	M6
1 EAS 051 TY	731 KB1 1458	AS119	QUIRI	M6
1 EAS 052 TY	731 KB1 1459	AS110	QUIRI	M6
1 EAS 053 TY	731 KB1 1459	AS104	QUIRI	M6
1 GCT 001 TY	545 KB1 1617	W634-4	QUIRI	M40
1 GCT 002 TY	545 KB1 1635	W633-4	QUIRI	M40
1 GCT 003 TY	545 KB1 1653	W635-4	QUIRI	M40
1 GCT 004 TY	545 KB1 1617	W634-5	QUIRI	M8B
		W634-5A	QUIRI	M8B
		W734-8	QUIRI	M8B
1 GCT 005 TY	545 KB1 1635	W633-5	QUIRI	M8B
		W633-5A	QUIRI	M8B
		W733-8	QUIRI	M8B
1 GCT 006 TY	545 KB1 1653	W635-5	QUIRI	M8B
		W635-5A	QUIRI	M8B
		W735-8	QUIRI	M8B

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 RCP 001 GV	439 KBY 5006	SN1-001GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN2-001GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN3-001GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN4-001GV	MESSIER-HISPANO-BUGATTI	MHB17061
1 RCP 001 PO	449 KBY 5001	SN-001PO	QUIRI	Quiri DA8
1 RCP 002 GV	439 KBY 5006	SN1-002GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN2-002GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN3-002GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN4-002GV	MESSIER-HISPANO-BUGATTI	MHB17061
1 RCP 002 PO	449 KBY 5001	SN-002PO	QUIRI	Quiri DA8
1 RCP 003 GV	439 KBY 5006	SN1-003GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN2-003GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN3-003GV	MESSIER-HISPANO-BUGATTI	MHB17061
		SN4-003GV	MESSIER-HISPANO-BUGATTI	MHB17061
1 RCP 003 PO	449 KBY 5001	SN-003PO	QUIRI	Quiri DA8
1 RCP 011 TY	541 KB1 2191	R648-14	QUIRI	M8
		R648-15	QUIRI	M8
1 RCP 014 TY	541 KB1 1772	R511-7	QUIRI	M2
		R511-7A	QUIRI	M2
		R612-5	QUIRI	M1
1 RCP 014 TY	541 KB1 2190	R648-6	QUIRI	M1
		R648-6A	QUIRI	M1
1 RCP 021 TY	541 KB1 2304	R512-11A	QUIRI	M1
1 RCP 021 TY	541 KB1 2311	R512-10	QUIRI	M1
		R512-10A	QUIRI	M1
1 RCP 022 TY	541 KB1 2303	R411-5	QUIRI	M30
		R411-5A	QUIRI	M1
1 RCP 023 TY	541 KB1 2310	R413-3	QUIRI	M1
		R511-10	QUIRI	M1
1 RCP 027 TY	541 KB1 2706	R522-9	QUIRI	M1
		R522-9A	QUIRI	M1
1 RCP 028 TY	541 KB1 2391	R522-7A	QUIRI	M1

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 RCP 028 TY	541 KB1 2392	R421-4	QUIRI	M1
		R421-4A	QUIRI	M30
1 RCP 029 TY	541 KB1 2393	R423-10	QUIRI	M1
		R521-8	QUIRI	M1
1 RCP 033 TY	541 KB1 2394	R532-15	QUIRI	M3
		R532-15A	QUIRI	M3
1 RCP 033 TY	541 KB1 2732	R532-12	QUIRI	M1
1 RCP 034 TY	541 KB1 2390	R431-4	QUIRI	M30
		R431-4A	QUIRI	M1
1 RCP 035 TY	541 KB1 2296	R433-1C	QUIRI	M7
		R531-2	QUIRI	M1
		R531-2A	QUIRI	M1
1 RCP 037 TY	541 KB1 1796	R313-8A	QUIRI	M40
		R313-8B	QUIRI	M40
1 RCP 039 TY	541 KB1 2385	R422-3	QUIRI	M2
		R422-3A	QUIRI	M2
1 RCP 040 TY	541 KB1 2378	R323-8A	QUIRI	M60
1 RCP 041 TY	541 KB1 2713	R322-6B	QUIRI	M1
		R322-6C	QUIRI	M1
		R322-6D	QUIRI	M1
		R322-6E	QUIRI	M1
1 RCP 046 TY	541 KB1 2297	R331-1	QUIRI	M1
		R331-1B	QUIRI	M1
1 RCP 048 TY	541 KB1 2293	R433-1	QUIRI	M42
		R433-1A	QUIRI	M40
1 RCP 050 TY	541 KB1 2184	R748-20	QUIRI	M60
		R748-20A	QUIRI	M60
1 RCP 055 TY	541 KB1 2193	R448-9AA	QUIRI	M60
		R448-9AB	QUIRI	M60
		R548-8	QUIRI	M2
		R548-8A	QUIRI	M2
		R548-8B	QUIRI	M6
		R548-8C	QUIRI	M6

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 RCP 056 TY	541 KB1 2182	R849-1A	QUIRI	M40
1 RCP 057 TY	541 KB1 2182	R849-1D	QUIRI	M5
		R849-1M	QUIRI	M2
1 RCP 063 TY	541 KB1 2183	R748-21	QUIRI	M51
		R748-21A	QUIRI	M51
		R848-1AA	QUIRI	M40
		R848-1AB	QUIRI	M40
		R849-4	LISIEGA	306256
		R849-4A	LISIEGA	306256
1 RCP 083 TY	541 KB1 2378	R323-7	QUIRI	M40
1 RCP 101 TY	541 KB1 2316	R511-12	QUIRI	M30
1 RCP 201 TY	541 KB1 2707	R521-17	QUIRI	M30
1 RCP 301 TY	541 KB1 2336	R531-5	QUIRI	M1
1 RCV 101 TY	541 KB1 2298	R333-3B	QUIRI	M1
		R333-3C	QUIRI	M1
		R333-4	QUIRI	M1
1 RCV 102 TY	541 KB1 2002	R145-47	QUIRI	M1
1 RCV 104 TY	541 KB1 2176	R145-41C	QUIRI	M5
		R145-41D	QUIRI	M5
1 RCV 106 TY	541 KB1 1998	R145-45	QUIRI	M2
1 RCV 110 TY	541 KB1 1642	R220-20LA	QUIRI	M1
		R220-20LB	QUIRI	M1
1 RCV 110 TY	541 KB1 1661	R210-39J	QUIRI	M1
		R210-39L	QUIRI	M1
		R220-4P	QUIRI	M1
		R220-4Q	QUIRI	M1
1 RCV 115 TY	541 KB1 2475	NA214-20B	QUIRI	M1
		NA214-8C	QUIRI	M1
1 RCV 158 TY	541 KB1 2549	NA211-1	QUIRI	M6
1 RCV 211 TY	541 KB1 1665	R210-91	QUIRI	M1
1 RIS 014 TY	541 KB1 1779	R511-2	QUIRI	M3
		R511-2A	QUIRI	M3

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 RIS 014 TY	541 KB1 2020	R477-7A	QUIRI	M3
1 RIS 015 TY	541 KB1 2121	R341-11A	QUIRI	M2
		R341-11B	QUIRI	M2
1 RIS 028 TY	541 KB1 1627	R120-3D	QUIRI	M30
		R120-3E	QUIRI	M30
1 RIS 028 TY	541 KB1 2206	R448-11	QUIRI	M5
1 RIS 029 TY	541 KB1 1910	R344-6A	QUIRI	M30
		R344-6B	QUIRI	M30
1 RIS 030 TY	541 KB1 1619	R120-29	QUIRI	M8
		R120-29A	QUIRI	M8
		R130-1	QUIRI	M30
		R130-3A	QUIRI	M6
		R130-3B	QUIRI	M6
1 RIS 030 TY	541 KB1 2035	R347-2	QUIRI	M6
1 RIS 031 TY	541 KB1 1639	R210-61	QUIRI	M1
		R210-61A	QUIRI	M1
1 RIS 037 TY	541 KB1 2400	N211-7	QUIRI	M8
1 RIS 047 TY	541 KB1 2077	W217-61B	QUIRI	M1
1 RIS 051 TY	541 KB1 1781	R511-3	QUIRI	M1
1 RIS 051 TY	541 KB1 2016	R547-17	QUIRI	M1
1 RIS 056 TY	541 KB1 2299	R333-2	QUIRI	M1
1 RIS 059 TY	541 KB1 2085	W217-32A	QUIRI	M1
1 RIS 073 TY	541 KB1 2150	W217-31A	QUIRI	M1
1 RIS 122 TY	541 KB1 2274	R211-1	QUIRI	M51
		R211-1A	QUIRI	M51
1 RIS 123 TY	541 KB1 1826	R221-22	QUIRI	M40
		R221-22A	QUIRI	M40
1 RIS 123 TY	541 KB1 2242	R323-15	QUIRI	M51
		R323-15B	QUIRI	M51
1 RIS 124 TY	541 KB1 2283	R233-4	QUIRI	M40
		R233-4A	QUIRI	M40

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 RRA 001 TY	541 KB1 2380	R323-6	QUIRI	M40
		R323-6A	QUIRI	M40
		R323-6B	QUIRI	M40
		R323-6C	QUIRI	M51
1 RRA 002 TY	541 KB1 2034	R245-20A	QUIRI	M42
		R245-22	QUIRI	M40
		R245-22A	QUIRI	M40
1 RRA 004 TY	541 KB1 2037	R245-7	QUIRI	M3
		R245-7A	QUIRI	M3
1 RRA 005 TY	541 KB1 2037	R245-6	QUIRI	M3
		R245-6A	QUIRI	M3
1 RRA 005 TY	541 KB1 2160	R246-12	QUIRI	M2
		R246-12A	QUIRI	M2
		R246-13	QUIRI	M1
		R246-13A	QUIRI	M1
		R246-14	QUIRI	M40
1 RRA 009 TY	541 KB1 1882	R144-26	QUIRI	M2
1 RRA 011 TY	541 KB1 1810	R123-9	QUIRI	M6
		R123-9A	QUIRI	M6
1 RRA 011 TY	541 KB1 1882	R122-9	QUIRI	M5
		R144-2A	QUIRI	M5
1 RRA 013 TY	541 KB1 1810	R147-12	QUIRI	M6
		R147-12A	QUIRI	M5
1 RRA 029 TY	541 KB1 2383	R323-3	QUIRI	M40
1 RRA 032 TY	541 KB1 2380	R323-1A	QUIRI	M40
		R323-1B	QUIRI	M40
1 RRI 001 TY	732 KB1 2372	SA4296	QUIRI	M6
		SA4296A	QUIRI	M6
1 RRI 003 TY	732 KB1 2272	SA5201	QUIRI	M6
		SA5201A	QUIRI	M6
1 RRI 007 TY	735 KB1 0371	SA1018	QUIRI	M42
1 RRI 010 TY	735 KB1 0373	SA1029	QUIRI	M42

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
1 RRI 011 TY	735 KB1 0374	SA1031	QUIRI	M6
		SA1031A	QUIRI	M6
1 RRI 012 TY	735 KB1 0376	SA1020	QUIRI	M6
		SA1020A	QUIRI	M6
1 RRI 019 TY	735 KB1 0427	SA1664	QUIRI	M6
1 VVP 002 TY	545 KB1 1601	R610-4	LISIEGA	307256
		R610-4A	LISIEGA	307256
		R620-2	LISIEGA	307256
		R620-2A	LISIEGA	307256
1 VVP 003 TY	545 KB1 1602	R630-2	LISIEGA	307256
		R630-2A	LISIEGA	307256
		R630-5	LISIEGA	307256
		R630-5A	LISIEGA	307256
2 APG 003 TY	541 KB2 1790	R487-16	QUIRI	M1
		R487-7	QUIRI	M1
2 APG 003 TY	541 KB2 2094	R572-15A	QUIRI	M1
		R572-15B	QUIRI	M1
2 ARE 001 TY	545 KB2 1603	R550-1	QUIRI	M61
		R550-1A	QUIRI	M61
		R550-3	QUIRI	M61
		R550-3A	QUIRI	M61
		R570-2	QUIRI	M51
		R570-2A	QUIRI	M51
		R581-2	QUIRI	M61
		R581-2A	QUIRI	M61
2 ARE 002 TY	545 KB2 1604	R560-3	QUIRI	M61
		R560-3A	QUIRI	M61
		R570-5	LISIEGA	306256
		R570-5A	LISIEGA	306256
		R570-8	LISIEGA	306256
		R570-8A	LISIEGA	306256
2 EAS 007 TY	731 KB2 1510	SA648	QUIRI	M42
		SA649	QUIRI	M6

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
2 EAS 007 TY	731 KB2 8014	SA117	QUIRI	M6
2 EAS 008 TY	731 KB2 1511	SA646	QUIRI	M42
		SA647	QUIRI	M6
2 EAS 008 TY	731 KB2 8014	SA103	QUIRI	M6
2 EAS 050 TY	731 KB2 8011	SA114	QUIRI	M6
2 EAS 051 TY	731 KB2 8009	SA108	QUIRI	M6
2 EAS 052 TY	731 KB2 8008	SA94	QUIRI	M6
2 EAS 053 TY	731 KB2 8010	SA100	QUIRI	M6
2 GCT 025 TY	545 KB2 1617	W675-4	QUIRI	M40
		W675-5	QUIRI	M8B
		W675-5A	QUIRI	M8B
		W775-8	QUIRI	M8B
2 GCT 026 TY	545 KB2 1635	W673-4	QUIRI	M40
		W673-5	QUIRI	M8B
		W673-5A	QUIRI	M8B
		W773-8	QUIRI	M8B
2 GCT 027 TY	545 KB2 1653	W674-4	QUIRI	M40
		W674-5	QUIRI	M8B
		W674-5A	QUIRI	M8B
		W774-8	QUIRI	M8B
2 PTR 026 TY	541 KB2 2294	R284-12	QUIRI	M42
2 PTR 100 TY	735 KB2 7287	SG1494	QUIRI	M6
2 RCP 001 GV	439 KBY 5006	001GV-SN1	MESSIER-HISPANO-BUGATTI	MHB17061
		001GV-SN2	MESSIER-HISPANO-BUGATTI	MHB17061
		001GV-SN3	MESSIER-HISPANO-BUGATTI	MHB17061
		001GV-SN4	MESSIER-HISPANO-BUGATTI	MHB17061
2 RCP 001 PO	449 KBY 5001	001PO-SN	QUIRI	Quiri DA8
2 RCP 002 GV	439 KBY 5006	002GV-SN1	MESSIER-HISPANO-BUGATTI	MHB17061
		002GV-SN2	MESSIER-HISPANO-BUGATTI	MHB17061
		002GV-SN3	MESSIER-HISPANO-BUGATTI	MHB17061
		002GV-SN4	MESSIER-HISPANO-BUGATTI	MHB17061
2 RCP 002 PO	449 KBY 5001	002PO-SN	QUIRI	Quiri DA8

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
2 RCP 003 GV	439 KBY 5006	003 GV-SN1	MESSIER-HISPANO-BUGATTI	MHB17061
		003GV-SN2	MESSIER-HISPANO-BUGATTI	MHB17061
		003GV-SN3	MESSIER-HISPANO-BUGATTI	MHB17061
		003GV-SN4	MESSIER-HISPANO-BUGATTI	MHB17061
2 RCP 003 PO	449 KBY 5001	003PO-SN	QUIRI	Quiri DA8
2 RCP 014 TY	541 KB2 2212	R551-1A	QUIRI	M1
2 RCP 021 TY	541 KB2 2195	R552-34	QUIRI	M1
2 RCP 021 TY	541 KB2 2205	R552-31	QUIRI	M1
		R552-31A	QUIRI	M1
2 RCP 022 TY	541 KB2 2189	R451-24	QUIRI	M1
		R451-24A	QUIRI	M1
2 RCP 023 TY	541 KB2 2190	R551-17	QUIRI	M5
		R551-17A	QUIRI	M5
2 RCP 023 TY	541 KB2 2203	R453-12A	QUIRI	M2
2 RCP 027 TY	541 KB2 2273	R562-27	QUIRI	M1
		R562-27A	QUIRI	M1
2 RCP 028 TY	541 KB2 2250	R461-19	QUIRI	M1
		R461-19A	QUIRI	M1
2 RCP 028 TY	541 KB2 2261	R562-30A	QUIRI	M1
2 RCP 029 TY	541 KB2 2261	R463-8	QUIRI	M1
2 RCP 029 TY	541 KB2 2276	R561-20	QUIRI	M1
2 RCP 033 TY	541 KB2 2131	R572-21	QUIRI	M1
		R572-21A	QUIRI	M1
2 RCP 034 TY	541 KB2 2121	R471-39	QUIRI	M1
		R471-39A	QUIRI	M1
2 RCP 034 TY	541 KB2 2126	R572-25A	QUIRI	M1
2 RCP 035 TY	541 KB2 2126	R473-2	QUIRI	M1
2 RCP 035 TY	541 KB2 2137	R571-5A	QUIRI	M1
2 RCP 039 TY	541 KB2 2270	R463-11	QUIRI	M2
2 RCP 040 TY	541 KB2 2266	R363-13	QUIRI	M51
2 RCP 055 TY	541 KB2 2059	R788-23	QUIRI	M60
		R788-23A	QUIRI	M60

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
2 RCP 055 TY	541 KB2 2080	R488-7	QUIRI	M60
		R488-7A	QUIRI	M60
		R588-7	QUIRI	M2
		R588-7A	QUIRI	M2
		R588-7B	QUIRI	M6
		R588-7C	QUIRI	M6
2 RCP 056 TY	541 KB2 2062	R889-1A	QUIRI	M40
2 RCP 057 TY	541 KB2 2062	R889-1D	QUIRI	M5
		R889-1J	QUIRI	M2
2 RCP 063 TY	541 KB2 2063	R889-4	LISIEGA	306256
		R889-4A	LISIEGA	306256
2 RCP 063 TY	541 KB2 2064	R788-24	QUIRI	M60
		R788-24A	QUIRI	M60
		R888-10A	QUIRI	M40
		R888-10B	QUIRI	M40
2 RCP 083 TY	541 KB2 2266	R363-14	QUIRI	M40
		R363-14A	QUIRI	M40
2 RCP 088 TY	541 KB2 2371	R361-24	QUIRI	M1
2 RCP 101 TY	541 KB2 2184	R451-26	QUIRI	M1
		R551-4	QUIRI	M1
2 RCP 201 TY	541 KB2 2252	R461-29	QUIRI	M1
		R561-9	QUIRI	M1
2 RCP 301 TY	541 KB2 2123	R471-43	QUIRI	M1
		R571-9	QUIRI	M1
2 RCV 101 TY	541 KB2 1710	R185-22A	QUIRI	M1
2 RCV 101 TY	541 KB2 2291	R161-24	QUIRI	M1
2 RCV 105 TY	541 KB2 1716	R185-27B	QUIRI	M2
		R185-27C	QUIRI	M1
2 RCV 110 TY	541 KB2 1913	R250-15	QUIRI	M1
2 RCV 110 TY	541 KB2 1933	R250-37A	QUIRI	M30
2 RCV 117 TY	541 KB2 2541	NB224-46	QUIRI	M5
2 RCV 158 TY	541 KB2 2552	NB221-1	QUIRI	M5

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
2 RCV 186 TY	541 KB2 1714	R185-28A	QUIRI	M1
		R185-28B	QUIRI	M1
2 RCV 186 TY	541 KB2 2501	W257-63A	QUIRI	M5
		W257-63B	QUIRI	M5
2 RCV 199 TY	541 KB2 1709	R185-23A	QUIRI	M1
2 RCV 209 TY	541 KB2 2520	W257-62C	QUIRI	M1
2 RCV 232 TY	541 KB2 2222	R362-2	QUIRI	M1
		R362-2A	QUIRI	M1
2 RIS 015 TY	541 KB2 1703	R387-4	QUIRI	M1
2 RIS 020 TY	541 KB2 2206	R353-15	QUIRI	M1
		R353-15A	QUIRI	M1
2 RIS 021 TY	541 KB2 2286	R561-2	QUIRI	M42
		R561-2A	QUIRI	M42
2 RIS 028 TY	541 KB2 2196	R453-14	QUIRI	M2
2 RIS 030 TY	541 KB2 2130	R387-1A	QUIRI	M5
2 RIS 122 TY	541 KB2 2213	R253-6	QUIRI	M40
		R253-6A	QUIRI	M40
2 RIS 123 TY	541 KB2 1687	R161-2	QUIRI	M42
		R161-2A	QUIRI	M42
2 RIS 123 TY	541 KB2 2277	R361-2	QUIRI	M5
		R361-2A	QUIRI	M5
2 RIS 124 TY	541 KB2 1821	R271-2	QUIRI	M5
		R271-2A	QUIRI	M5
2 RIS 124 TY	541 KB2 2133	R373-4	QUIRI	M61
		R373-4A	QUIRI	M61
2 RRA 001 TY	545 KB2 2264	R363-18	QUIRI	M40
		R363-18A	QUIRI	M40
		R363-19	QUIRI	M40
		R363-19A	QUIRI	M40
2 RRA 002 TY	541 KB2 1802	R285-6A	QUIRI	M1
2 RRA 002 TY	545 KB2 1802	R285-3A	QUIRI	M1
		R285-6	QUIRI	M1

APPENDIX 9-1
IST DYNAMIC RESTRAINT TEST PLANS

Trigramme	ISO Number	Item Number	Make	Model
2 RRA 004 TY	541 KB2 1800	R285-9	QUIRI	M3
		R285-9A	QUIRI	M3
2 RRA 005 TY	541 KB2 1799	R286-4	QUIRI	M2
		R286-4A	QUIRI	M2
		R286-6	QUIRI	M1
		R286-6A	QUIRI	M1
		R286-9	QUIRI	M3
2 RRA 005 TY	545 KB2 1801	R285-13	QUIRI	M3
		R285-13A	QUIRI	M3
2 RRA 029 TY	541 KB2 2265	R363-15	QUIRI	M40
2 RRA 032 TY	541 KB2 2262	R363-21	QUIRI	M40
		R363-22	QUIRI	M40
2 RRI 007 TY	735 KB2 0861	SA1190	QUIRI	M6
		SA1190A	QUIRI	M6
2 RRI 010 TY	735 KB2 0863	SG1195-3	QUIRI	M6
		SG1195-3A	QUIRI	M6
2 RRI 012 TY	735 KB2 0866	SG1193-1	QUIRI	M6
		SG1193-1A	QUIRI	M6
2 RRI 015 TY	735 KB2 0586	SA568	QUIRI	M6
2 RRI 016 TY	735 KB2 0548	SA570	QUIRI	M6
		SA634	QUIRI	M6
2 RRI 018 TY	735 KB2 0550	SA222	QUIRI	M6
2 RRI 019 TY	735 KB2 0917	SA1664	QUIRI	M6
2 RRI 164 TY	735 KB2 0921	SA1670	QUIRI	M6
2 VVP 001 TY	545 KB2 1600	R650-2	LISIEGA	307256
		R650-2A	LISIEGA	307256
		R650-5	LISIEGA	307256
		R650-5A	LISIEGA	307256
2 VVP 002 TY	545 KB2 1601	R660-2	LISIEGA	306256
		R660-2A	LISIEGA	306256
		R670-4	LISIEGA	307256
		R670-4A	LISIEGA	307256

SECTION 10

Augmented In-Service Testing Requirements of the Emergency Diesel Generator (EDG) Safety Related Components

10. AUGMENTED IN-SERVICE TESTING REQUIREMENTS OF THE EMERGENCY DIESEL GENERATOR (EDG) SAFETY RELATED COMPONENTS

10.1 Introduction

Following the re-classification of the mechanical components for the Koeberg EDGs to ASME safety class 3, it became apparent that the EDGs will form part of the ISIP selected scope.

10.2 Background of EDG Scope

The EDGs are designed to provide alternating current (ac) power to the vital safety related components during accidents as well as during a loss of off-site power. For this reason, EDGs with their related subcomponents (pumps and valves) do fulfil a safety related function, which is recognised by the ASME OM code; however, it is exempt from the basic IST scope as specified in ISTB 1200 and ISTC 1200 provided the following two conditions are fulfilled:

- The component which forms part of the EDG is skid-mounted (refer to definition in Table 4-1).
- The component is verified to be adequately tested.

EP evaluated the EDG scope and concluded that it is skid-mounted and adequately tested under the current SRSM. However, EP decided to include the EDG scope as an augmented IST requirement as detailed in this section. This decision was based on conservatism and the practice of some US plants related to the IST surveillances requirements of EDGs.

The EDG scope comprises pumps and various types of valves which are detailed below.

10.3 Detailed Scope and Acceptance Criteria

10.3.1 PUMPS

There are different types installed at different locations on the EDGs as detailed in Appendix 10-1 which can be grouped as follows:

- Fuel pumps have a safety function to provide diesel fuel to the fuel tank during operation of the EDG. Failure of these pumps will result in total EDG failure if the fuel pump is not promptly reinstated.
- Water cooling pumps are engine-driven; failure due to cavitation will result in total failure of the EDG.
- Pre-lubrication pumps are put in service on periodic bases to condition the EDG and they are normally on standby when the EDG is running; therefore, failure of these pumps will be detected before the EDG will be required to be operable.

In order to take credit for the requirements of the IST pumps located on the EDG circuits (refer to Appendix 10-1) the acceptance criteria stated in the periodic tests listed under § 10.4 shall be met. This can be achieved either during the 2-monthly partial testing or during the 6-monthly full testing.

10.3.2 THERMAL RELIEF VALVES

Thermal relief valves are designed to protect components such as the compressed air tank, fuel and oil pumps, and the engine crank case from overpressure. These valves are normally in a closed position and only open when the system is over pressurised. If the valve fails to reseat on the air or fuel circuit, the EDG will not start. The operability readiness of the relief valves scope will be dependent on the implementation of the MB tasks which normally require a replacement of the entire valve after a specified frequency. Therefore, I&T shall verify that the planned overhauls are performed as scheduled. Refer to Appendix 10-5 for details.

10.3.3 CHECK VALVES

The bi-directional movement of the obturator in check valves shall be verified every two years. This shall be achieved by direct observation of the position indicating devices, or else by other indicators such as flow rate, level, temperature, seat leakage testing, or other positive means. Several check valves are located on the piping without test connections and instrumentation to facilitate check valve open and close tests. These valves have no external mechanisms or position indication. In order to take credit for the IST check valves requirements located on the EDG circuits (refer to Appendix 10-4), the overall correct functioning of the EDG as prescribed in the periodic tests listed under § 10.4 shall be met.

10.3.4 SOLENOID VALVES

According to the IST, solenoid valves are required to have their stroke times measured. An evaluation shall be made when any abnormal or erratic action is encountered. Currently, there are no limit switches or any form of indication to confirm a solenoid’s operability. It is apparent that in order to perform the stroke time test, the design would have to be changed. The modification would include changing the valve design to include position limit switches, and providing a light indication or position indication to the control room. This remote valve indication would be installed solely to meet the IST requirements and would serve no other operational purpose. In order to take credit for the IST solenoid valves requirements located on the EDG circuits (refer to Appendix 10-2), the overall correct functioning of the EDG as prescribed in the periodic tests listed under § 10.4 shall be met.

10.3.5 MANUAL VALVES

A manual valve is normally either in the open or in the closed position, and its safety function is to allow fluids (air, fuel, oil, etc.) through to the diesel engine. Failure to open will isolate the relevant components, which will result in failure of the EDG to start since there is no fluid available to the diesel engine. These valves have to be stroked every two years. This will be achieved by following the line-up instructions in procedure KWB-S-LHJ, which is normally used to place the major component in service.

10.4 Implementation

I&T shall review the requirements as outlined in Appendix 10-1, Appendix 10-2, Appendix 10-3, Appendix 10-4, and Appendix 10-5 for the various subcomponents. The following operating periodic tests are used to test the EDG:

- KWB-PT-12-LHJ- 255;
- KWB-PT-12-LHQ-065;
- KWB-PT-12-LHP- 045;
- KWB-PT-09-LHS- 031;
- KWB-PT-12-LHQ- 058;
- KWB-PT-12-LHP- 044; and
- KWB-PT-09-LHS- 108.

APPENDIX 10-1
PUMPS

Components	Description	Safety Class	IST Pump Group	Credit SRSM / OTS
12 LHP/Q 001 PO 9 LHS 001 PO	Fuel transfer pumps	3	B	Group A, 1-Cycle, discharge pressure 80 < P < 110 kPa at 002 LP
12 LHP/Q 002 PO 9 LHS 002 PO	Fuel transfer pumps	3	B	Group A, 1-Cycle, discharge pressure 80 < P < 110 kPa at 003 LP
12 LHP/Q 003 PO 9 LHS 003 PO	Fuel electrical pump	3	B	Group B, 2-monthly; discharge pressure 150 < P < 450 kPa at 001 LP / 005 LP
12 LHP/Q 007 PO 9 LHS 007 PO	Fuel engine-driven pump skid	Non-class, but SRSM included	B	Group A, 1-cycle; discharge pressure 150 < P < 450 kPa at 005 LP
12 LHP/Q 006 PO 9 LHS 006 PO	Back-up hand pump to 003 PO (non-class)	3	B	Manual prime of the main circuit
12 LHP/Q 014 PO 9 LHS 014 PO	Back-up pump to 001 and 002 PO (non-class), hand-operated	3	B	15 mWC
12 LHP/Q 011 PO 9 LHS 011 PO	HT water engine-driven pump skid	3	B	Group B, 2-monthly; discharge pressure 400 < P < 500 kPa at 015 LP
12 LHP/Q 008 PO 9 LHS 008 PO	HT water engine-driven pump	3	B	Discharge 150 kPa, 016 LP (when engine is on standby)
12 LHP/Q 004 PO 9 LHS 004 PO	Pre-heating oil and water pump	3	B	2-monthly
12 LHP/Q 009 PO	Direct engine driven pump LHJ 009 PO skid	3	B	Group B, 2-monthly, 540 < P < 800 kPa at 012 LP
9 LHS 009 PO	Direct engine-driven pump LHJ 009 PO skid	3	B	Group B, 2-monthly, 500 < P < 800 kPa at 012 LP, LHJ 255
12 LHP/Q 013 PO 9 LHS 013 PO	LT water engine-driven pump skid	3	B	Group B, 2-monthly; discharge pressure 400 < P < 500 kPa at 014 LP

APPENDIX 10-2
SOLENOID VALVES

Components	Description	Norm. Pos.	Test Requirements	Credit SRSM / OTS
12 LHP/Q 035 VA 9 LHS 035 VA	Solenoid valve, pneumatic starter, skid	C	Solenoid opening 6Y valve overhaul	Pressure drop 001 and 002 BA, Group B, 2-monthly Post maintenance
12 LHP/Q 036 VA 9 LHS 036 VA	Solenoid valve, governor starting, skid	C	Solenoid opening, 6Y valve overhaul	Pressure drop 001 and 002 BA, Group B, 2-monthly Post maintenance
12 LHP/Q 037 VA 9 LHS 037 VA	Solenoid valve, normal and emergency stop, 030 EL	C	Solenoid close, 6Y valve overhaul	EDG running, resets the racks of the engine injection pumps at zero Post maintenance
12 LHP/Q 051 VA 9 LHS 051 VA	Pressure reducing, stopping air, skid	O	Solenoid opening	EDG running
12 LHP/Q 052 VA 9 LHS 052 VA	Pressure reducing, starter line, skid	O	Solenoid opening	EDG running
12 LHP/Q 053 VA 9 LHS 053 VA	Solenoid valve, governor starter line, skid	C	Solenoid close	EDG running
12 LHP/Q 054 VA 9 LHS 054 VA	Pressure reducing, starter line, skid	O	Solenoid opening	EDG running

APPENDIX 10-3
MANUAL VALVES

Page 1 of 2

Components	Description	Norm. Pos.	Test Requirements	Credit SRSM / OTS
12 LHP/Q 001 VF 9 LHS 001 VF	Manual valve outlet 004 BA	O	Exercise test	With 001 PO in service
12 LHP/Q 002 VF 9 LHS 002 VF	Pump, manual valve standby fuel transfer	O	Exercise test	With 002 PO in service
12 LHP/Q 013 VF 9 LHS 013 VF	Pump, manual valve standby pump suction 002 PO	O	Exercise test	With 002 PO in service
12 LHP/Q 014 VF 9 LHS 014 VF	Pump, manual valve transfer pump suction 001 PO	O	Exercise test	With 001 PO in service
12 LHP/Q 020 VF 9 LHS 020 VF	Manual valve, standby pump discharge 002 PO	O	Exercise test	With 002 PO in service
12 LHP/Q 023 VF 9 LHS 023 VF	Manual valve, isolation inlet 005 BA, 001 PO	O	Exercise test	With 002 PO in service
12 LHP/Q 021 VF 9 LHS 021 VF	Manual valve, transfer pump discharge 001 PO	O	Exercise test	With 001 PO in service
12 LHP/Q 024 VF 9 LHS 024 VF	Manual valve, level column isolation 005 BA	O	Exercise test	With 001 PO in service
12 LHP/Q 032 VF 9 LHS 032 VF	Manual valve, isolation pump suction 003 PO	O	Open when 003 PO in service	2-monthly
12 LHP/Q 033 VF 9 LHS 033 VF	Manual valve, isolation pump suction 003 PO	O	Open when 003 PO in service	2-monthly
12 LHP/Q 030 VF 9 LHS 030 VF	Manual valve, isolation pump suction 007 PO	O	Exercise test	Open exercise when 007 PO in service
12 LHP/Q 031 VF 9 LHS 031 VF	Manual valve, isolation pump suction 007 PO	O	Exercise test	Open exercise when 007 PO in service

APPENDIX 10-3
MANUAL VALVES

Components	Description	Norm. Pos.	Test Requirements	Credit SRSM / OTS
12 LHP/Q 035VF 9 LHS 035 VF	Manual valve, bypass solenoid 005 EL, 007 PO	C	Exercise test	Open exercise when bypass line in service
12 LHP/Q 034 VF 9 LHS 034 VF	Manual valve, bypass solenoid valve 006 EL, suction 003 PO	C	Exercise test	Open exercise when bypass line in service
12 LHP/Q 040 VF 9 LHS 040 VF	Manual valve, isolation pump discharge 003 PO	O	Open when 003 PO in service, exercise test	2-monthly, 2-yearly, in line with IST
12 LHP/Q 036 VF 9 LHS 036 VF	Manual valve, isolation suction 006 PO	C	Exercise test	Open exercise with 006 PO in service
12 LHP/Q 015, 053 VF 9 LHS 015, 053 VF	Manual valves, suction 014 PO	C	Exercise test	Open exercise with 014 PO in service
12 LHP/Q 045, 022 VF 9 LHS 045, 022 VF	Manual valves, discharge 014 PO	C	Exercise test	Open exercise with 014 PO in service
12 LHP/Q 018 VH 9 LHS 018 VH	Manual valve, preheat pump suction 004 PO	O	Exercise test	With 004 PO in service
12 LHP/Q 014 VH 9 LHS 014 VH	Manual valve, filling from tank 006 BA, skid	C	Exercise test	Open exercise when 006 BA gravity feed line in service
12 LHP/Q 009 VA 9 LHS 009 VA	Manual valve, isolation inlet 001 BA	O	Full stroke exercise	Group B, 2-monthly
12 LHP/Q 010 VA 9 LHS 010 VA	Manual valve, isolation inlet 002 BA	O	Full stroke exercise	Group B, 2-monthly
12 LHP/Q 015 VA 9 LHS 015 VA	Manual valve, isolation outlet to 001 BA	O	Exercise test	Group B, 2-monthly
12 LHP/Q 016 VA 9 LHS 016 VA	Manual valve, isolation outlet to 002 BA	O	Exercise test	Group B, 2-monthly
12 LHP/Q 020 VA 9 LHS 020 VA	Manual valve, air 1/2 int con	C	Exercise	Open when one of the tanks 001, 002 BA is empty

APPENDIX 10-4
CHECK VALVES

Components	Description	Norm. Pos.	Test Requirements	Credit SRSM/OTS
12 LHP/Q 041 VF 9 LHS 041 VF	Check valve, pump discharge 003 PO	O	CKV-O (003 PO) CKV-C (006 PO)	Open 2-monthly Group B, Close with 006 PO in service
12 LHP/Q 049 VF 9 LHS 049 VF	Check valve, fuel return line, skid	O	CKV-O	Group A, 2-monthly
12 LHP/Q 042 VF 9 LHS 042 VF	Check valve, discharge 007 PO, skid	O	CKV-O	Group A, 2-monthly
12 LHP/Q 046 VF 9 LHS 046 VF	Check valve, discharge 007 PO, skid	O	CKV-O	Group A, 2-monthly, 12Y maintenance
12 LHP/Q 037 VF 9 LHS 037 VF	Check valve, discharge 006 PO	O	CKV-O (006 PO) CKV-C (003 PO)	CKV-O priming of the engine with 006 PO in service, 2-monthly CKV-C with 003 PO
12 LHP/Q 017 VC 9 LHS 017 VC	Check valve, discharge 011 PO, skid	O	CKV-O (011 PO) CKV-C (008 PO)	2-monthly CKV-O Group B CKV-C with 008 PO in service
12 LHP/Q 016 VC 9 LHS 016 VC	Check valve, discharge 008 PO	O	CKV-O (008 PO) CKV-C (011 PO)	CKV-O with 008 PO in service CKV-C with 011 PO in service
12 LHP/Q 017 VH 9 LHS 017 VH	Check valve, heater outlet 001 EX	O	CKV-O	CKV-O with 004 PO in service
12 LHP/Q 030 VC 9 LHS 030 VC	Check valve, cooler vent 002 RF	O	CKV-O (011 PO)	CKV-O with 011PO in service
12 LHP/Q 013 VA 9 LHS 013 VA	Check valve, inlet 001 BA	O	CKV-O	Group B, 2-monthly
12 LHP/Q 014 VA 9 LHS 014 VA	Check valve, inlet 002 BA	O	CKV-O	Group B, 2-monthly

APPENDIX 10-4
CHECK VALVES

Components	Description	Norm. Pos.	Test Requirements	Credit SRSM/OTS
12 LHP/Q 017 VA 9 LHS 017 VA	Check valve, governor servo motor, skid (not incl. in classification document)	O	CKV-O CKV-C	2-monthly CKV-O Group B CKV-C when starting No. 1 is in service
12 LHP/Q 018 VA 9 LHS 018 VA	Check valve, starting air 1, skid	O	CKV-O CKV-C	2-monthly CKV-O Group B CKV-C when governor servo-motor is in service
12 LHP/Q 019 VA 9 LHS 019 VA	Check valve, stopping air, skid	O	CKV-O CKV-C	2-monthly CKV-O, Group B 002 BA line-up and 020 VA open
12 LHP/Q 021 VA 9 LHS 021 VA	Check valve -fuel pipe purge - skid	O	CKV-O CKV-C	2-monthly Group B 001 BA line-up and 020 VA open
12 LHP/Q 024 VA 9 LHS 024 VA	Check valve -fuel pipe purge - skid	O	CKV-O	Group B, 2-monthly

APPENDIX 10-5
SAFETY RELIEF VALVES

Components	Description	Norm. Pos.	Test Requirements	Credit SRSM / OTS
12 LHP/Q 020 VH 9 LHS 020 VH	Relief valve, preheat oil pump 004 PO	C	12Y overhaul	Set at 350 kPa,
12 LHP/Q 021 VH 9 LHS 021 VH	Oil pressure relief valve, skid	C	10Y replacement	Set at 1200 kPa
12 LHP/Q 022 VH 9 LHS 022 VH	Oil pressure relief valve, skid	C	12Y inspect and refit	Opens at 600 kPa
12 LHP/Q 018 VF 9 LHS 018 VF	Relief valve transfer pump 001 PO	C	Thermal relief valve, 10Y replacement	Discharge pressure 400 kPa (max 1 600 kPa)
12 LHP/Q 019 VF 9 LHS 019 VF	Relief valve standby transfer pump 002 PO	C	Thermal relief valve, 10Y replacement	Discharge pressure 400 kPa (max 1600 kPa)
12 LHP/Q 039 VF 9 LHS 039 VF	Relief valve, 003 PO	C	Thermal relief valve, 10Y replacement	Opens at 400 kPa
12 LHP/Q 047 VF 9 LHS 047 VF	Relief valve, discharge 003 PO, skid	C	Thermal relief valve, 10Y replacement	Regulates engine fuel flow between 150, 450 kPa
12 LHP/Q 043 VF 9 LHS 043 VF	Relief valve, 007 PO, skid	C	Thermal relief valve, 10Y replacement	Discharge pressure 250 kPa
12 LHP/Q 029 VA 9 LHS 029 VA	Relief valve, 001 BA	C	Set pressure verification, Thermal relief valve, 9Y valve overhaul	Set pressure 3 200 kPa
12 LHP/Q 030 VA 9 LHS 030 VA	Relief valve, 002 BA	C	Set pressure verification, Thermal relief valve, 9Y valve overhaul	Set pressure 3 200 kPa
12 LHP/Q 031 VA 9 LHS 031 VA	Relief valve, stopping air rack position, skid	C	Set pressure verification, 9Y functional test	Set pressure 880 kPa
12 LHP/Q 032 VA 9 LHS 032 VA	Relief valve, starter line, skid	C	Set pressure verification, 9Y functional test	Set pressure 1 270 kPa

11. ACCEPTANCE

This document has been seen and accepted by:

Name	Designation
V. Ntuli	Power Station Manager
N. Jakoet	SPS Manager
D. Kerr	Inspection & Test Manager (Acting)
N. Ryland	Engineering Programmes Manager
M. Moeketsi	Component Engineering Manager
R. Menacere	Senior Engineer

12. REVISION TRACKING

Revision	Date	Pages	Comments or Reason for Revision
0	2015-09-28	All	First Issue: As documented in 240-110745414 (*Standard for the In-Service Inspection Programme at Koeberg Nuclear Power Station*) [14], Koeberg has committed to develop and maintain the in-service testing programme manual (ISTPRM) in accordance with the requirements stipulated in the US Code of Federal Regulations, Title 10, Part 50.55a (10CFR50.55a), paragraphs (f) and (g). These regulations require that Koeberg develop or update the ISTPRM 12 months before the start of the new 10-year interval, hence this first issue.
1	2015-10-08	All	Authorised document
2	2016-11-30	Various pages	The main change in the document is the inclusion of the Testing Interval Deviation, the rest of the changes are process and editorial related.

13. DEVELOPMENT TEAM

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

- R. Menacere
- G. Mdluli