

	SPECIFICATION	NUCLEAR ENGINEERING
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Title: **Electromagnetic Flow Meter for
RIS 014 MD and RIS 015 MD**

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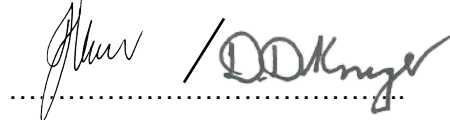
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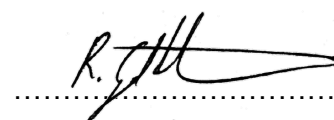
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1. INTRODUCTION

The original electromagnetic flow meters for the Safety Injection System (RIS) Low Head Safety Injection (LHSI) RIS 014 MD and RIS 015 MD are degraded and have been evaluated as obsolete. In addition, the flow meters are no longer accurate. The flow measurements are therefore conducted manually. New flow meters are therefore required to automatically determine the flow rate.

2. SCOPE

This specification provides the general technical requirements and rules that apply to all the activities that relate to the design, design verification, procurement, manufacturing, inspection, testing, cleaning, packaging, shipping, documentation updates, and delivery of the electromagnetic flow meter for the RIS System.

The Contractor is responsible for compliance with all the requirements presented in this specification and its references. Approval of any specifications by the Employer shall in no way relieve the supplier of the responsibilities and accountability created by the required compliance.

Any omissions from this specification, conflicts in this specification or between the requirements of this specification or its references, shall be brought to the attention of the Employer by the Contractor. The Contractor shall not proceed with work, until he has received written clarification from the Employer's authorised project manager.

2.1 SCOPE OF SUPPLY

The supply shall include, but is not limited to, the following:

2.1.1 Electromagnetic flow meter assembly including flanges

2.1.2 Signal converter

2.2 SUPPLIER RESPONSIBILITY

2.2.1 Design

2.2.2 Manufacturing

2.2.3 Testing and qualification

2.2.4 Calibration (Factory configuration of the flow sensor with the corresponding signal converter)

2.2.5 Quality Assurance Data Package (QADP)

2.2.6 Preparation of the QA documentation package

2.2.7 Certification that all requirements of this specification, its references and the ASME Boiler and Pressure Vessel Code or equivalent code have been met.

2.2.8 Packaging, Storage and Transport

2.2.9 Technical Support

2.3 PURPOSE

This specification shall be used to describe the technical requirements for the purchase of an

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electromagnetic flow meter for the Safety Injection System (RIS) Low Head Safety Injection (LHSI) flow rate measurement of both units at Koeberg Nuclear Power Station.

2.4 APPLICABILITY

This specification shall apply throughout Eskom Holdings Limited Divisions.

3. REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs. However, the Code Editions and Addenda and; Standards Revisions specified in this document shall be applied.

3.1 NORMATIVE

- [1] RD-0034: NNR Requirement Document - Quality and Safety Management Requirements for Nuclear Installations
- [2] PP-0012: NNR Position Paper – Manufacturing of Components for Nuclear Installations
- [3] PP-0016: NNR Position Paper – Conformity Assessment of Pressure Equipment in Nuclear Service
- [4] SANS 347: 2019 Edition 3 – Categorization and Conformity Assessment Criteria for All Pressure Equipment
- [5] OHSA No 85/93: Occupational Health And Safety Act No 85 of 1993 (including Pressure Equipment Regulations)
- [6] U.S.NRC 10 CFR 50.55a: Codes and Standards
- [7] ASME III NC 2007 Edition up to and including 2009b Addenda: ASME Boiler & Pressure Vessel Code – Division 1 – Subsection NC – Class 2 Components
- [8] ASME II 2007 Edition up to and including 2009b Addenda: Materials ISO 9001 Quality Management Systems.
- [9] ASME IX 2007 Edition up to and including 2009b Addenda: Welding and Brazing Qualifications
- [10] ASME V 2007 Edition up to and including 2009b Addenda: Non-destructive Examination
- [11] ASME B16.5 2003: Pipe Flanges and Flanged Fittings
- [12] ANSI/ASME B36.19M 1985 (R1994): Stainless Steel Pipe
- [13] KNC-001: Chemistry Operating Specifications for Safety Related Systems
- [14] DSG-317-094: Specifications for Chemical Products and Materials used at Koeberg Nuclear Power Station
- [15] DSG-318-087: Quality Requirements for the Procurement of Assets, Goods and Services
- [16] ASME NQA-1 2008 Edition: Quality Assurance Requirements for Nuclear Facility Applications
- [17] DSG-318-033: Specification for Seismic Qualification of Electrical and Mechanical Equipment
- [18] KBA0022E00082: Instrumentation Specification
- [19] DSG-310-164: Seamless and Welded Stainless Steel Piping for Use in ASME III NC Applications
- [20] KBA1222E0200801: Qualification of Safety Related Electrical Equipment (Class 1E) General Seismic Test Specification

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[21] 331-172: Standard for the Repair/Replacement of Installed Mechanical Components

3.2 INFORMATIVE

[22] SAR – Safety Injection System (II-4.3) and General Safety Principles (I-4.0)

[23] DSE – Safety Injection System

[24] 02023-M: Mechanical Modification for New Flow Meters for RIS 014 MD and RIS 015 MD

[25] 02023-E: Electrical Modification for New Flow Transmitters for RIS 014 MD and RIS 015 MD

[26] ANSI N18.2-1973: American National Standard Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants

[27] KBA1222E10002: 0202/87Q – Koeberg Equipment Classification (Mechanical)

[28] 0025/88Q: 1/2/9 RIS System – All Instrumentation Components

[29] 0004/09Q: Classification: All Plant Systems, Structures and Components

[30] 0002/96Q: Classification: Various

4. DEFINITIONS AND ABBREVIATIONS

4.1 DEFINITIONS

The following terms shall have the meanings given below unless in any particular instance the context expressly indicates otherwise. Words imparting person includes corporations. Words imparting only the singular include the plural and vice versa when the context requires.

4.1.1 Codes: Codes means codes, standards, or criteria which may be applicable to or effect the manner in which the work must be designed, installed or tested, including without limitation those published by the Government Authorities, the American Society of Mechanical Engineers (ASME), and the American National Standards Institute (ANSI), and the Institute of Electrical and Electronics Engineers (IEEE).

4.1.2 Contractor: The Company to whom a purchase order may be or has been awarded by the Employer for the subject equipment.

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

4.1.4 Employer: Eskom, KNPS: the ultimate project approval authority for contractual and quality matters.

4.1.5 Equipment: Equipment means all equipment, materials, components, and parts to be furnished by the Contractor to the Employer under this specification for the replacement of the RIS flow meter.

4.2 ABBREVIATIONS

Abbreviation	Description
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CMTR	Certified Material Test Reports

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Abbreviation	Description
DSE	Dossier System Elementaire (Elementary System Description)
FRS	Floor Response Spectrum/Spectra
IST	In-Service Test Programme
LHSI	Low Head Safety Injection
KNPS	Koeberg Nuclear Power Station
NDE	Non-Destructive Examination
NDT	Non-Destructive Test
NNR	National Nuclear Regulator
NRV	Non-return Valve
OBE	Operating Basis Earthquake
RCP	Reactor Coolant System
RIS	Safety Injection System
SAR	Safety Analysis Report
SSE	Safe Shutdown Earthquake
U.S.NRC	United States Nuclear Regulatory Commission
QADP	Quality Assurance Data Package
QCP	Quality Control Plan

5. REQUIREMENTS

A 10" nominal size ASME III NC Safety Class 2 electromagnetic flow sensor manufactured from stainless steel Grade 316L shall be designed. The pressure retaining part shall be designed in accordance with reference [7] and as stipulated in Section 6.1.7 below. The electromagnetic flow sensor shall be 150 lbs class. A remote wall mount signal converter shall be supplied with the flow sensor. All the requirements of this specification shall be met. The head loss across the new flow meter requires to be the same as the original component or negligible. The flow meter selection shall align with EDF 900 MW pressurised water reactor nuclear power plants and have 10 years good operating experience in a pressurised water reactor nuclear power station. The designer and supplier of the flow meter shall be contractors that are experienced in the nuclear industry.

6. PROCUREMENT SPECIFICATION

6.0 SPECIFICATION

6.1 DESIGN REQUIREMENTS

6.1.1 Interfaces

6.1.1.1 The flow meter shall interface with 10" nominal bore, raised face, welding neck 150 lbs class flanges in accordance with ASME B16.5 reference [11].

6.1.1.2 The signal converter shall interface with a 4 to 20 mA plant system and a 220 Vac supply.

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6.1.2 Dimensional Requirements

6.1.2.1 The flow meter shall have ASME III NC Safety Class 2, 10" nominal bore, raised face, welding neck 150 lbs class flanges in accordance with ANSI B16.5 reference [11].

6.1.2.2 The flow meter (including both flanges) shall be 504 mm long.

6.1.3 Service Conditions

Room locations are K012, K013, K052 and K053 for which the information below applies:

Service Conditions

The equipment selected shall be able to function under the following conditions:

Normal Environment

Temperature	:	20 to 30 °C
Pressure	:	< 101,3 kPa (abs)
Humidity	:	Approximately 45 %
Radiation	:	10 to 15 µSv/hr

Accident Condition Environment

Temperature	:	< 80 °C
Pressure	:	0,20 to 0,45 MPa (abs)
Humidity	:	90 %
Radiation	:	2x10 ⁶ µSv/hr

Process Conditions

The equipment selected shall be able to function under the following conditions:

Normal Condition

Flow rate	:	50 m ³ /h (minimum recirculation flow through PTR tank)
Process Fluid	:	Borated Water (2500 to 2700 ppm boric acid content)
Pressure	:	1,13 MPa (gauge)
Temperature	:	8 to 40 °C
Conductivity of fluid	:	≥ 9,6 µS/cm
Radiation	:	10 - 20 µSv/hr

Accident Condition

Max Flow rate	:	530 m ³ /h (direct injection into core) to 1122 m ³ /h (recirculation through core)
Process Fluid	:	Borated Water (2500 to 2700 ppm boric acid content)
Pressure	:	1,5 MPa (gauge)
Temperature	:	149 °C
Radiation	:	3,6 x 10 ⁷ µSv/hr

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6.1.4 Characteristics

6.1.4.1 Power Supply: 220 V $\pm 10\%$ - 50 Hz ± 1 Hz

6.1.4.2 Output Signal: 4 to 20 mA

6.1.4.3 Electrical Connection: Signal cable (with 30m cable)

6.1.5 Reliability

The new flow meter shall be designed and manufactured to have a service life that will last till the decommissioning of the plant (25 years).

6.1.6 Maintainability

Where practicable, maintenance should be able to be performed with the flow meter and its parts left installed. If this is not practicable, the flow meter and its parts should be able to be repaired.

6.1.7 Construction Design

6.1.7.1 The flow meter shall be designed and manufactured in accordance with ASME Section III NC reference [7].

6.1.7.2 The Contractor shall be responsible for all documents required for demonstration of the acceptability for nuclear regulatory and statutory purposes.

6.1.7.3 The Contractor is not authorised to use any ASME code interpretation or code case special ruling without formally requesting and receiving written permission from the Employer prior to its use.

6.1.7.4 An alternative nuclear design Code is acceptable, such as RCC–M, provided that the Contractor compiles a reconciliation report to ensure that ASME Section III NC reference [7] is conformed to.

6.1.7.5 All code reconciliation reports required to ensure conformance to ASME Section III NC reference [7] shall be included in the QADP.

6.1.7.6 The Contractor shall compile an ASME compliant design specification in accordance reference [7] (if required).

6.1.7.7 Material:

6.1.7.7.1 Certain chemical products are prohibited for use and shall not be used in the manufacture and handling of the equipment. All metallic material shall be austenitic stainless steel Grade 316L. The amount/s of total chemical products content of all other material shall satisfy the limitation requirements of reference [13] for the Reactor Coolant System (RCP) and reference [14].

6.1.7.7.2 Flow meter pressure retaining part: ASME SA-312 TP316L

6.1.7.7.3 Flanges: ASME SA-182 Type F316L

6.1.7.7.4 Liner material: must not have free halogens and the radiation resistance must be ≥ 1000 kGy.

6.1.7.7.5 Non-metallic parts: Gaskets and other non-metallic parts which can potentially come into

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contact with the process fluid must not have free halogens and have radiation resistance ≥ 1000 kGy.

6.1.8 Functional or Operating Requirements

- 6.1.8.1 Seismic Resistance: In order to meet the system design requirements, the flow meter shall withstand a design base Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) such that the flow meter remains leak proof.
- 6.1.8.1.1 The seismic specific requirements of reference [20] and additional requirements reference [17] are applicable.
- 6.1.8.1.2 Although the flow meter classification is not seismic class 1E, the seismic response spectra to apply for this assessment and testing is given in reference [20] §5.1.2 and Figure 3 which is also shown in Appendix A.
- 6.1.8.2 Measurement range: 0 to 1122 m³/h
- 6.1.8.3 Performance: The flow meter shall have accuracy with a total error in measured flow value of $\pm 1\%$ when installed in the configuration shown in Appendix B.
- 6.1.8.4 Performance: The flow meter pressure loss shall be negligible.
- 6.1.8.5 Table 1 below lists the SANS 347 reference [4] Conformity Assessment and Design Verification Parameters.

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Table 1: SANS 347 Conformity Assessment and Design Verification Parameters

Functional Location	Design Pressure (g)	Design Temperature	Operating Pressure	Operating Temperature	Fluid State	Hazard Category	Design Code	Fabrication, Inspection and Testing Requirements	Pipe Routing and Support Information	Stress Isometric
1RIS014MD	1,5 MPa	149 °C	1,13 MPa	8 - 40 °C	Gas (Note 1)	III	ASME III NC (see reference [9])	ASME III NC (see reference [7]) and SANS 347 (see reference [4])	As per drawing mark-ups Appendices B1 – B4 of reference [24]	N/A
2RIS014MD	1,5 MPa	149 °C	1,13 MPa	8 - 40 °C	Gas (Note 1)	III	ASME III NC (see reference [9])	ASME III NC (see reference [7]) and SANS 347 (see reference [4])	As per drawing mark-ups Appendices B1 – B4 of reference [24]	N/A
1RIS015MD	1,5 MPa	149 °C	1,13 MPa	8 - 40 °C	Gas (Note 1)	III	ASME III NC (see reference [9])	ASME III NC (see reference [7]) and SANS 347 (see reference [4])	As per drawing mark-ups Appendices B1 – B4 of reference [24]	N/A
2RIS015MD	1,5 MPa	149 °C	1,13 MPa	8 - 40 °C	Gas (Note 1)	III	ASME III NC (see reference [9])	ASME III NC (see reference [7]) and SANS 347 (see reference [4])	As per drawing mark-ups Appendices B1 – B4 of reference [24]	N/A

Note 1: Gas (superheated - flashes following leakage; see reference [4])

6.2 MANUFACTURING REQUIREMENTS

6.2.1 Manufacturing

- 6.2.1.1 **Prior to manufacture start, a non-nuclear grade instrument shall be calibrated for 1% accuracy for the configuration in Appendix B.**
- 6.2.1.2 **Prior to manufacture start, the design including the seismic qualification requirements shall be reviewed and approved by Eskom.**
- 6.2.1.3 The ASME Section III NC reference [7] shall be used for design, for fabrication, manufacturing and examination of the flow meter.
- 6.2.1.4 The approved work plans shall demonstrate consideration of the following factors, as a minimum, in accordance with the specified codes, operational experience, and international best practice:
- 6.2.1.4.1 Cleanliness requirements and material control.
- 6.2.1.4.2 The cobalt content in the material shall be lower than 0,2%.
- 6.2.1.4.3 Procedures to control and limit material such as mercury, lead, aluminium, cadmium, magnesium, tin, zinc, silver, indium, gallium, antimony, arsenic, bismuth, copper, sulphur, chlorides, halogens, and phosphorous shall be detailed by the Contractor.
- 6.2.1.4.4 The responsibility for establishing, ensuring, and maintaining cleanliness shall rest with the Contractor. The hardware shall be delivered to the Employer in a clean condition, free of contaminants and loose parts, and suitable for the intended service.
- 6.2.1.4.5 The Contractor shall state and document to the Employer, the final inspection criteria, contamination limits and requirements in the approved specification.
- 6.2.1.4.6 Factory welders must be qualified and their certificates issued in accordance with the ASME Section III and Section IX requirements.
- 6.2.1.4.7 Prevention of build-up of excessive residual stresses in welds or parent material due to manufacturing activities.
- 6.2.1.4.8 Certain chemical products are prohibited for use and shall not be used in the manufacture and handling of the equipment. All metallic material shall be austenitic stainless steel Grade 316L. The amount/s of total chemical products content of all other material shall satisfy the limitation requirements of reference [13] for the Reactor Coolant System (RCP) and reference [14].
- 6.2.1.4.9 Additional requirements of references [1] to [4] shall be adhered to.

6.2.2 Painting

Stainless steel components are to be left unpainted.

6.2.3 Marking and Identification

- 6.2.3.1 Each flow meter shall be clearly and permanently identified. The nameplate shall be engraved, not limited to, as follows:
- 6.2.3.1.1 Flow direction

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6.2.3.1.2 Manufacturer's name

6.2.3.1.3 Flow meter type

6.2.3.1.4 Flow meter material

6.2.3.1.5 Flow meter liner material

6.2.3.1.6 Electrode material

6.2.3.1.7 Measurement range

6.2.3.1.8 Power supply and connection data on the signal converter

6.2.3.1.9 Marking and identification of equipment shall be performed in accordance with references [7] and [2] – [4].

6.2.4 Installation

6.2.4.1 Flow meter: Mounted horizontally in-line between two flanges in accordance with modification 02023-M reference [24].

6.2.4.2 Signal Converter: Wall mounted remotely located in accordance with modification 02023-E reference [25].

6.2.5 Verification and Tests

6.2.5.1 **Prior to manufacture start, a non-nuclear grade instrument shall be calibrated for 1% accuracy for the configuration in Appendix B.**

6.2.5.2 **Prior to manufacture start, the design including the seismic qualification requirements shall be reviewed and approved by Eskom.**

6.2.5.3 The approved verification and test plans shall demonstrate consideration of the following factors, as a minimum, in accordance with the specified codes, operational experience, and international best practice:

6.2.5.3.1 Inspection personnel qualification, training and experience.

6.2.5.3.2 Examination procedures, records, and acceptance standards.

6.2.5.3.3 Examination of welds with reference to the acceptance criteria in every instance, in accordance with ASME Section III NC reference [7].

6.2.5.3.4 Examination of welds build-ups in accordance with ASME Section III NC reference [7].

6.2.5.3.5 ASME Section III NC reference [1] hydrostatic pressure test examination.

6.2.5.3.6 Visual examination in accordance with ASME Section III NC reference [7].

6.2.5.3.7 Dimensional inspections.

6.2.5.3.8 An Authorised Inspector shall witness the hydrostatic pressure test. No leakage during the hydrostatic pressure test is acceptable.

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6.2.5.3.9 The seismic test shall be performed to meet the requirements of §6.1.8.1 and sub-bullets §6.1.8.1.1 - §6.1.8.1.2.

6.2.5.3.10 An Authorised Inspector shall witness the seismic test.

6.2.5.3.11 The instrument shall be calibrated for 1% accuracy for the configuration in Appendix B.

6.2.5.3.12 Results of tests shall be submitted as part of the QADP.

6.2.5.3.13 Additional requirements of references [2] to [4] shall be adhered to.

6.3 ENGINEERING QUALITY REQUIREMENTS

6.3.1 Classification:

6.3.1.1 The flow meter classification in terms of safety, seismic, importance and quality is classified as:

Safety class: 2 (ANSI/ANS N18.2-1973)

Seismic class: 1

Quality level: Q2 (refer to section 6.3.3)

QA category: 2

Environmental category: NEV (According to Employer Classification 0202/87Q reference [27])

6.3.1.2 The Signal converter is classified as follows:

Safety class: Non-Safety function

Seismic class: NC

Quality level: Q3 (The higher quality level shall apply to the whole unit)

QA category: 2

Environmental category: 0 (According to Employer Classification 0025/88Q reference [28])

6.3.2 NNR RD-0034 Level

Design: Level 2, Employer Classification 0004/09Q reference [29]

Installation: Level 2, Employer Classification 0002/96Q reference [30]

6.3.3 Quality Data

6.3.3.1 The Contractor is to supply a QADP for the flow meter.

6.3.3.2 The QADP shall include, but not be limited to the following:

6.3.3.2.1 Certificate of conformance (including Reconciliation Reports if applicable).

6.3.3.2.2 Certificate of manufacture.

6.3.3.2.3 Copy of Eskom order.

6.3.3.2.4 Copy of the specifications.

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6.3.3.2.5 QCP (Quality Control Plan).

6.3.3.2.6 Material certificates for the components and parts not required to comply to ASME III NC.

6.3.3.2.7 Welder qualification and certificates.

6.3.3.2.8 Weld qualifications.

6.3.3.2.9 NDE/NDT reports.

6.3.3.2.10 Hydrotest report.

6.3.3.2.11 Dimensional tests.

6.3.3.2.12 Eskom waivers (if applicable).

6.3.3.2.13 Non-conformance reports.

6.3.3.2.14 The Certified Material Test Reports (CMTRs) for the components and parts required to comply to ASME III NC shall be as part of the QADP.

6.3.3.2.15 Seismic design evaluation report.

6.3.4 QA Programme

6.3.4.1 The Contractor shall meet the requirements of references [15] and [16] for the classification level of the service described in this specification (Classification: Q2).

6.3.4.2 Additional requirements of references [1] - [4] shall be adhered to.

6.3.4.3 The QA programme shall be contained in the purchase order.

6.3.5 General

The Contractor shall submit copies of its QA programme and Quality Control Plan 4 weeks after award of contract for Employer review and oversight.

6.4 TRAINING

The manufacturer shall provide suitable training on the set-up, calibration, use, maintenance and other applicable information on the flow meters to the Employer personnel.

6.5 CALIBRATION TOOL

Tools for periodic in-situ calibration (during operation) shall be supplied for ownership by the Employer.

6.6 DOCUMENTATION

6.6.1 The Contractor shall compile and provide an ASME compliant design specification in accordance reference [7] (if required).

6.6.2 The Contractor shall provide all the documentation updates to KNPS documentation and a Quality Assurance Data Package.

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6.6.3 Documents to be submitted with quote:

6.6.3.1 The technical data sheet.

6.6.3.2 The operating manual.

6.6.3.3 The overall drawing with a bill of materials included.

6.6.3.4 Lists of spare parts recommended to comply with the operating conditions for a minimum of 5 years.

6.6.3.5 Accreditation or Certification indicating independent acceptance of the supplier's quality assurance programme.

6.6.3.6 Manufacturer's commitment to supporting the proposed electromagnetic flow meters for the future, in terms of replacements and spares.

6.6.3.7 Manufacturer's recommended maintenance requirements to ensure qualification.

6.6.3.8 Manufacturer to supply track record of equipment and expected life expectancy of equipment.

6.6.4 Documents to be submitted on delivery of equipment: QADP

6.6.5 **NOTE:** An Eskom title block shall appear on all drawings.

6.6.6 The documents which shall be supplied, such as drawings, manuals, and instructions, shall be listed. This shall not include documents that are covered by the QA requirements.

6.7 PACKAGING AND SHIPMENT

6.7.1 The supplier is responsible for packaging in accordance with ASME NQA-1 reference [16] as a minimum for transportation to South Africa, and for the transportation to a mutually agreed port of shipment.

6.7.2 The supplier is responsible for defining how the material shall be stored on site.

6.8 RECORDS

All records including specifications shall be retained as permanent records in accordance with 331-3.

7. DEVELOPMENT TEAM

Name	Designation or Business area
Zia Mia	Senior Engineer

8. ACCEPTANCE AND AUTHORISATION

Name	Designation or Business area

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9. APPENDICES

APPENDIX A: KBA1222E0200801: QUALIFICATION OF SAFETY RELATED ELECTRICAL EQUIPMENT (CLASS 1E) GENERAL SEISMIC TEST SPECIFICATION

APPENDIX B: PIPING LAYOUT FOR CALIBRATION

APPENDIX C: VALVE DRAWINGS (NON-RETURN VALVE AND GATE VALVE)

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10. REVISION INFORMATION

Date	Rev.	Compiler	Remarks
January 2022	2	Z Mia / R Maapola	a) §3.2: Updated references [29] and [30]. b) §6.3.2: Updated design and installation Organisation Safety Levels and Classifications.
September 2021	1	Z Mia / R Maapola	c) Full review d) Change to new template 331-298 and new document numbering system. e) Changed Material Grade from 304L to 316L in accordance with recommendation in drawings KBA0117RIS110, KBA0217RIS110, KBA0107Q02182, KBA0107Q02190, KBA0207Q02157 and KBA0207Q02164. f) §3.0: Added code and standards revisions g) §3.1: Added references [1] – [6] and [11] - [12]; Changed reference [16] to 2008 Edition and; changed reference [20] to seismic requirements for Class 1E equipment for conservatism. h) §3.2: Added references [22] to [28] i) §5: Head loss and quality requirements added. j) §6.1.3: Changed Normal condition environment humidity from 90% to 45% to align with 02023-M reference [24]; Changed Accident condition environment pressure from $\pm 101,3$ kPa to 0,20 to 0,45 MPa (abs) to align with 02023-M reference [24] and; Corrected flow rates for normal and accident process conditions and corresponding pressure for normal process condition. k) §6.1.7.7.5: Added material requirement for non-metallic parts. l) §6.1.8.5: Added requirements and Table 1 for SANS 347 Conformity Assessment and Design Verification Parameters m) §6.2: Updated manufacturing section making reference to ASME III NC for clarity. n) §6.2.1.1 - §6.2.1.2: Added hold points. o) §6.2.1.4.9: Changed to include additional requirements of references [1] – [4].

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Date	Rev.	Compiler	Remarks
			<p>p) §6.2.3.1.9: Changed to include additional requirements of references [7] and [2] – [4].</p> <p>q) §6.2.5.1 - §6.2.5.2: Added hold points.</p> <p>r) §6.2.5.3.13: Added requirement for adherence to additional requirements of references [2] to [4].</p> <p>s) §6.3.4.2: Added requirement for adherence to additional requirements of references [1] to [4].</p> <p>t) Appendix A: Corrected seismic response spectra to that for Class 1E equipment for conservatism.</p>
2013-05-21	0a	Z Mia / R Maapola	<p>Note: This revision was in the old template.</p> <p>a) Code requirements (§2.5, §4.1, §4.9, §6.1 and §6.2)</p> <p>b) Chemical product requirements (§4.10)</p> <p>c) Seismic spectra (§3.12, §4.18 and §10.0)</p>
2013-02-14	0	Z Mia / R Maapola	<p>Note: This revision was in the old template.</p> <p>Original</p>

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APPENDIX A - KBA1222E0200801: QUALIFICATION OF SAFETY RELATED ELECTRICAL EQUIPMENT (CLASS 1E) GENERAL SEISMIC TEST SPECIFICATION

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TITLE

TD & RM
COVER SLIP

Reference No.: KFI-RE-003

Revision: 1

Page: 1 of 1

Associated
Procedure: KAA-767

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TITLE

QUALIFICATION OF SAFETY-RELATED
ELECTRICAL EQUIPMENT (CLASS 1E) GENERAL
SEISMIC TEST SPECIFICATION

DOCUMENT TYPE

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SECURITY CLASS

R

ORIGINATOR / AUTHOR

TRIGRAMME (STATUS COMMENTS)

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19791030

KIS / SHELF LOCATION

PD3.18.1.14

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40

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KRA1222E02008
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KGP-4860

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KEYWORDS

Qualifications
Safety-Related
Electrical
Equipment
Seismic
Tests
Specifications

QUALIFICATION OF SAFETY-RELATED ELECTRICAL

EQUIPMENT (CLASS 1E)

GENERAL SEISMIC TEST SPECIFICATION ✓

FOR INFORMATION

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REV.	DATE	By	CH. by	APP. by	MODIFICATIONS		STATUS

KOEBERG NUCLEAR POWER STATION



ESCOM

ELECTRICITY SUPPLY COMMISSION

FRAMATOME — ALSTHOM ATLANTIQUE
SPIE DATIGNOLLES — FRAMATEG

CONTRACT N. OPN 11229

CONTRACTOR MEMBER	FRAMATOME										CONTRACTOR MEMBER DOC N	600 KBY 7202									
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REV.	1																				

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Téléphone : 796-14-14 - Télex : FRAMA 630 635 F

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EQUIPMENT (CLASS 1E)

GENERAL SEISMIC TEST SPECIFICATION

Title for
information
system

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File :

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D, C

0, 1, 3, 7

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REVISION A**REVISIONS**

REV	DATE	PARAGRAPH	PAGE	DRAWING	SCOPE OF THE REVISION
A	30 OCT 79				First issue in English. This is the translation of French specification TS/EC -DC- 0069, Rev. A.

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FRAM: 0346



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REVISION A

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- 2.2. Test principle
- 2.3. Choice of the test method
- 2.4. Applying the time-history method to KOEBERG

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- 3.2. Mounting equipment on the shake table
- 3.3. Exploratory tests
- 3.4. Verification of vibratory motion - Measurements
- 3.5. Verification of equipment seismic strength
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- 5.2. Accelerograms

FRAMATOME S.A. : Tour Fiat - 1, Place de la Coupole - COURBEVOIE (Hauts-de-Seine)



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1. AIM

The aim of the present specification is to define procedures and method for seismic tests run on safety-related (Class 1E) electrical equipment, so as to meet guidelines detailed in IEEE Standard 344-1971.

These tests are intended for qualification of only those pieces of equipment that have been shown to be capable of ensuring their safety function during and after a design basis earthquake (DBE) or a safe shutdown earthquake (SSE).

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2. GENERAL

2.1. Vibration specifications

In the event of seism, the floors upon which the various pieces of electrical equipment are installed are subjected to vibratory waves. These waves are transmitted by the structural elements of the buildings, which serve to filter out some of the seismic in communicated to them by the underlying earth. If time histories (actually recorded or theoretical) are available, the waveform of these vibrations can be learned.

The effects of the vibratory waves can be predicted from the behaviour of dummy oscillators anchored to the floors. This behaviour is transformed into floor oscillator response or floor response spectra. Such spectra are generally of the acceleration response type.

The spectrum for a given floor consists of a family of parametric curves which vary with the oscillator reduced damping factor.

Seismic floor motion occurs simultaneously in all directions, but it can be broken down into three fundamental axes. Response spectra are generally established for one random horizontal axis and the vertical direction as well.

Required response spectra (RRS)

By joining together the response spectra for the various floors of the building, one horizontal envelope spectrum and one vertical envelope spectrum can be determined. Such spectra represent the sum of seismic phenomena that will take place at equipment anchoring points. They constitute the required response spectra (RRS) for qualification purposes. In determining envelope spectra, it is preferable to select those curves which correspond to the assumed damping level for the piece of equipment to be qualified.

In most cases, however, this value can be assumed to be 5 %.

2.2. Test principle

These tests shall be run by subjecting the equipment to a vibratory motion that conservatively simulates the vibration expected to occur at the equipment anchoring point in the event of an SSE.

Consequently, motion observed on the shake table shall produce effects identical or superior to those specified by the reference spectra.



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2.3. Choice of the test method

Sinusoidal excitation methods (sine beats, continuous or decaying sine), which in the past have been frequently utilized, are adequate to meet testing conditions enumerated above.

The best technique, however, consists in applying the reference seismic excitation signal defined by the accelerogram to the shake table (acceleration in time).

This accelerogram, or time history method, has the following advantages :

- it makes it possible to faithfully reproduce actual seismic excitation on the test table ;
- it facilitates conduct of the test.

Two conditions, however, must be met :

- a) Two excitation accelerograms shall be developed (one corresponding to the excitation level along a randomly-selected horizontal axis, the other representing excitation about the vertical axis).

These curves can be obtained :

- either from recordings taken on site during an actual earthquake. In actual practice, this is never done,
or,
- through calculation. This results in synthesized accelerograms, i.e. those developed artificially in such a way that the response spectrum generated by each accelerogram envelops its corresponding reference spectrum.

- b) Adequate test facility controls must be available ; this is generally the case at the present time.

2.4. Applying the time-history method to KOEBERG

The time-history method has been selected for seismic tests run within the electrical equipment qualification program.

The basic documents mentioned above (RRS) were drawn up so as to enable this testing method be applied to KOEBERG. Copies are appended to the present specification.

Excitation duration is set at 20 s. This amply covers the mean duration of the most severe portion of a seismic motion (strong motion).

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3. TEST PROCEDURE SPECIFICATIONS

3.1. Axes of excitation

The test shall be of the single-axis type, i.e. it shall be carried out along one axis at a time.

The appropriate excitations shall be applied successively to the three main orthogonal axes determined for the equipment to be tested :

- OX : horizontal longitudinal axis (front-rear),
- OY : horizontal transverse axis (left to right),
- OZ : vertical axis.

3.2. Mounting of equipment on shake table

Equipment shall be mounted on the shake table so as to simulate actual intended on-site mounting. The position of the equipment shall be identical to its location on site, as the effect of gravity is of particular importance.

Connections shall be identical to those utilized in actual erection (bolting, welding, etc.).

Equipment to be qualified comprises either :

- discrete devices or components (relays, pickups, motors, etc.),
- or,
- assemblies (switchboards, panels, etc.).

Generally speaking, discrete devices are designed to be mounted (on panelboards, instrument panels, etc.). When such devices are qualified, then, the assemblies upon which they are to be mounted shall be included in the test facility.

The effect of electrical connections, conduits, and sensing lines shall be taken into account.

In general, mounting shall conform to the rules and regulations enumerated in para. 3.1. of CEI Standard 68.2.6., 4th edition (1970).



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3.3. Exploratory tests

3.3.1. Purpose

An exploratory test shall be conducted prior to the actual seismic test. The purpose of this preliminary test shall be to locate the natural frequencies, if any, and the damping factor specific to the piece of equipment.

It can be assumed that a natural frequency exists if the ratio between the measured acceleration level (at a curve peak) and the applied input level is greater than, or equal to, 1.5.

3.3.2. Test description

The exploratory test shall entail frequency-sweeping of a sine excitation waveform of constant amplitude.

Sine sweep shall be cyclic, the cycle to consist in continuous sweeping, once in each direction (increasing and decreasing), through the full frequency range defined for seismic motion (1 - 33 Hz).

The sine sweep rate shall not exceed 1 octave/minute.

In theory, the acceleration peak shall be 0.2 g throughout the spectrum. If necessary, however, this figure may be halved (for example, when the equipment shows overly-high resonance values).

Generally speaking, sweeping procedure shall conform to sub-para. 3.2.4. of CEI Standard 68.2.6., 4th edition (1970).

3.4. Verification of vibratory motion - Measurements

3.4.1. Readings taken on shake table (input vibrations)

Actual motion produced by the shake table shall be monitored during the conduct of the various tests in such a way as to verify that the reference motion has been correctly arrived at.

Acceleration readings shall be recorded for the subsequent drafting of test response spectra (TRS).

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As concerns time history seismic testing, the actual test accelerogram shall be compared to the reference excitation accelerogram, and the test response spectrum (TRS) to the required response spectrum (RRS).

3.4.2. Readings taken on equipment (response vibrations)

Vibrations transmitted to the equipment being tested shall also be monitored.

An adequate number of measurement points (accelerometers) shall be provided, to be selected on the basis of representativity, and in particular :

- the point farthest removed from the shake table platform,
- mass points likely to give rise to resonance in the given frequency range.

Locations of the measurement points shall be documented in the resulting test report.

3.4.3. Tolerance levels

Test tolerances for vibration and frequency levels shall conform to sub-para. 3.2.2. and 3.2.3. of CEI Standard 68.2.6., 4th edition (1970).

3.5. Verification of equipment seismic strength

The seismic test shall be performed so as to subject the equipment to normal conditions of service. Such conditions may be simulated, but it must be shown that they are equivalent to actual service conditions.

Specifications relative to each individual piece of equipment shall set forth test conditions, giving detailed data as to loads (electrical, mechanical, etc.) and electrical/mechanical functions and duty to be considered in qualifying the equipment.

The object of these checks shall be to ensure that the equipment is capable of fulfilling functions detailed in the corresponding specifications.

They shall be performed :

- prior to,
 - during,
 - and
 - subsequent to
- the various tests.

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Adequate monitoring equipment shall be used for evaluating performance of the equipment to be qualified.

3.6. Test report

Once testing has been concluded, a separate document shall be drawn up for each piece of equipment tested.

This document shall contain all data necessary to show that the equipment has been properly qualified.

The following items shall be included :

- a) equipment identification,
- b) equipment specification,
- c) test facility description,
- d) test method description,
- e) test data (including proof of performance),
- f) test results and conclusions (comparison of TRS and RRS),
- g) date and approved signature.



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4. DESCRIPTION OF FULL TEST SEQUENCE

4.1. Horizontally-applied excitation (OX axis)

The equipment to be tested shall be mounted on the table of a horizontal-vibration shaker as per para. 3.2. in such a way that it is subjected to excitation applied horizontally along the OX axis.

Testing shall be broken down into three stages :

- a) exploratory test : cf. para. 3.3.
- b) seismic proof test : the degree of excitation applied shall be defined by the horizontal reference accelerogram. Time of excitation shall be 20 s.
- c) verification : carried out as per para. 3.4. and 3.5.

4.2. Horizontally-applied excitation (OY axis)

The equipment shall be rotated 90° about the vertical axis to enable the OY direction to be excited. Testing shall be divided up as follows :

- a) exploratory test,
- b) seismic proof test : identical to above (para. 4.1.b.),
- c) verification.

4.3. Vertically-applied excitation (OZ axis)

The equipment shall be mounted on the table of a vertical-vibration shaker (with the axis of excitation normal to the platform).

Testing shall comprise :

- a) exploratory test,
- b) seismic proof test : applied excitation shall be defined by the vertical reference accelerogram. Time of excitation shall be 20 s,
- c) verification.



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5. APPENDIX - SEVERITY LEVEL SPECIFICATIONS

5.1. Required response spectra (RRS)

5.1.1. Electrical control and instrumentation assemblies

Two envelope spectra have been drawn up (one vertical and one horizontal), with 5 % damping factor.

These spectra are representative of severity levels determined for the KOEBERG plant. They are represented in Figures 1 and 2, respectively, by solid lines.

Equipment to be qualified shall meet seismic conditions defined by these spectra.

NOTE :

There exists a critical point on the horizontal spectrum at 1 Hz (high acceleration). As low-frequency service can not be simulated on the test facility (shake table travel and velocity are usually limited), it must be shown that equipment subjected to testing does not carry any natural frequency in the 1 Hz range.

Two further spectra, of a more rigorous nature, are given by way of information. These are shown by dotted lines in Figures 1 and 2, and represent "Universal power plant" envelope spectra.

The Sub-contractor may utilize them, should he so desire, to obtain a qualification covering all possible future applications.

5.1.2. Devices

When devices are to be tested alone, i.e. without their supporting structure, severity levels higher than the preceding shall be applied. This is to enable amplification due to mounting structure behaviour to be taken into consideration.

A single envelope response spectrum has been determined for horizontal and vertical axes. It is given in Figure 3.



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5.1.3. Electric motors

This equipment is intended to be floor-mounted at relatively low levels. An examination of the various cases has led to the two envelope response spectra shown in Figures 4 and 5. It should be noted that the damping factor chosen is 2 %, a value better-adapted to the specific case of motors.

NOTE :

For motors of the upright-layout type, mounted on stools, it is imperative that the motor/support assembly be tested as one unit (a different support may be used as long as it shows equivalent stiffness characteristics).

5.2. Accelerograms

Excitation accelerograms derived from aforementioned spectra may be calculated directly by the testing laboratory. However, these synthesized accelerograms, together with corresponding response spectra, must be thoroughly checked before tests are conducted.



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SPECTRA : Horizontal SSE

DAMPING : 5%

FRAMATOME S.A. - Tour Flat - 1, Place de la Coupole - COURBEVOIE (Hauts-de-Seine)

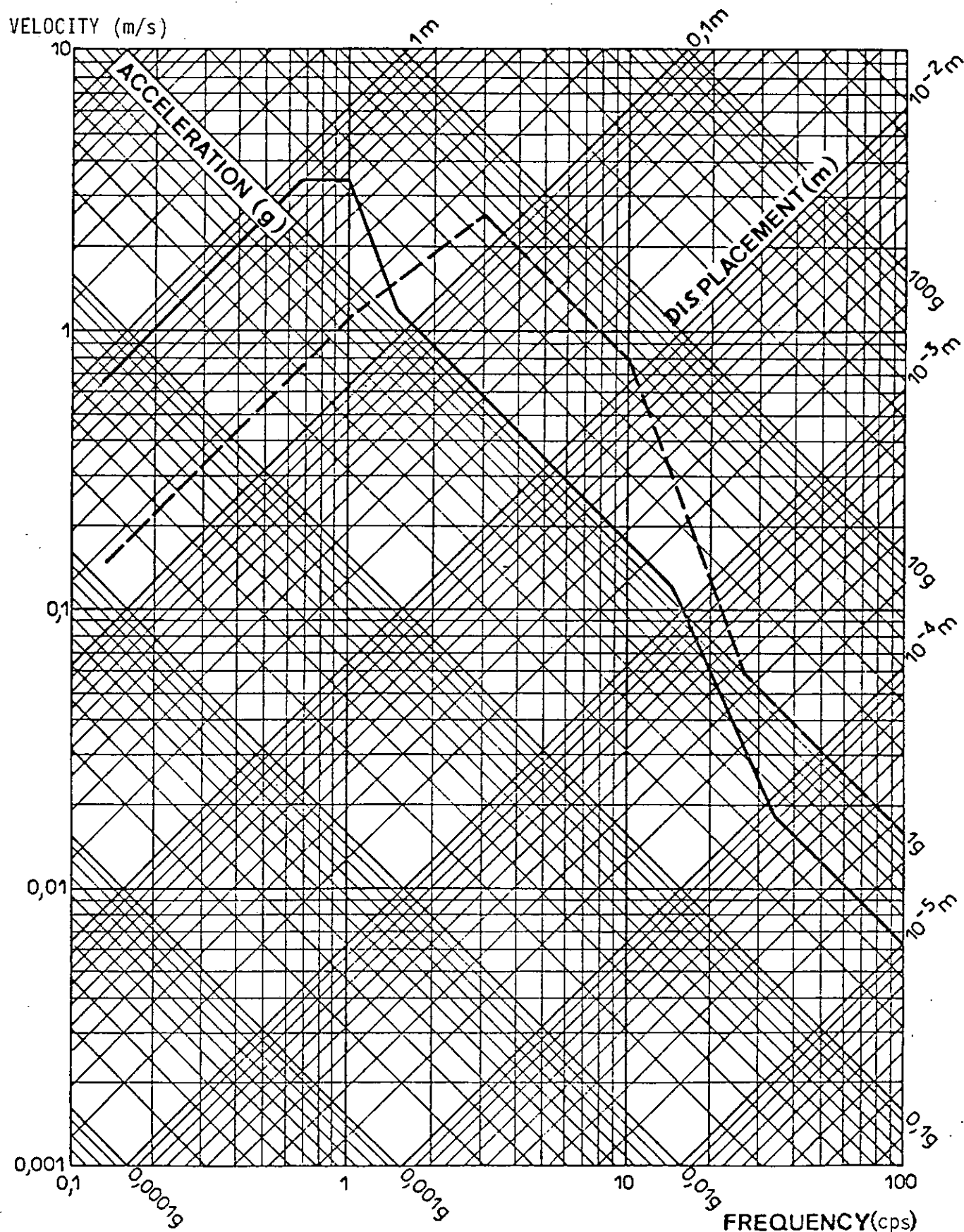


FIGURE 1



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REVISION

A

SPECTRA : Vertical SSE

DAMPING : 5%

VELOCITY (m/s)

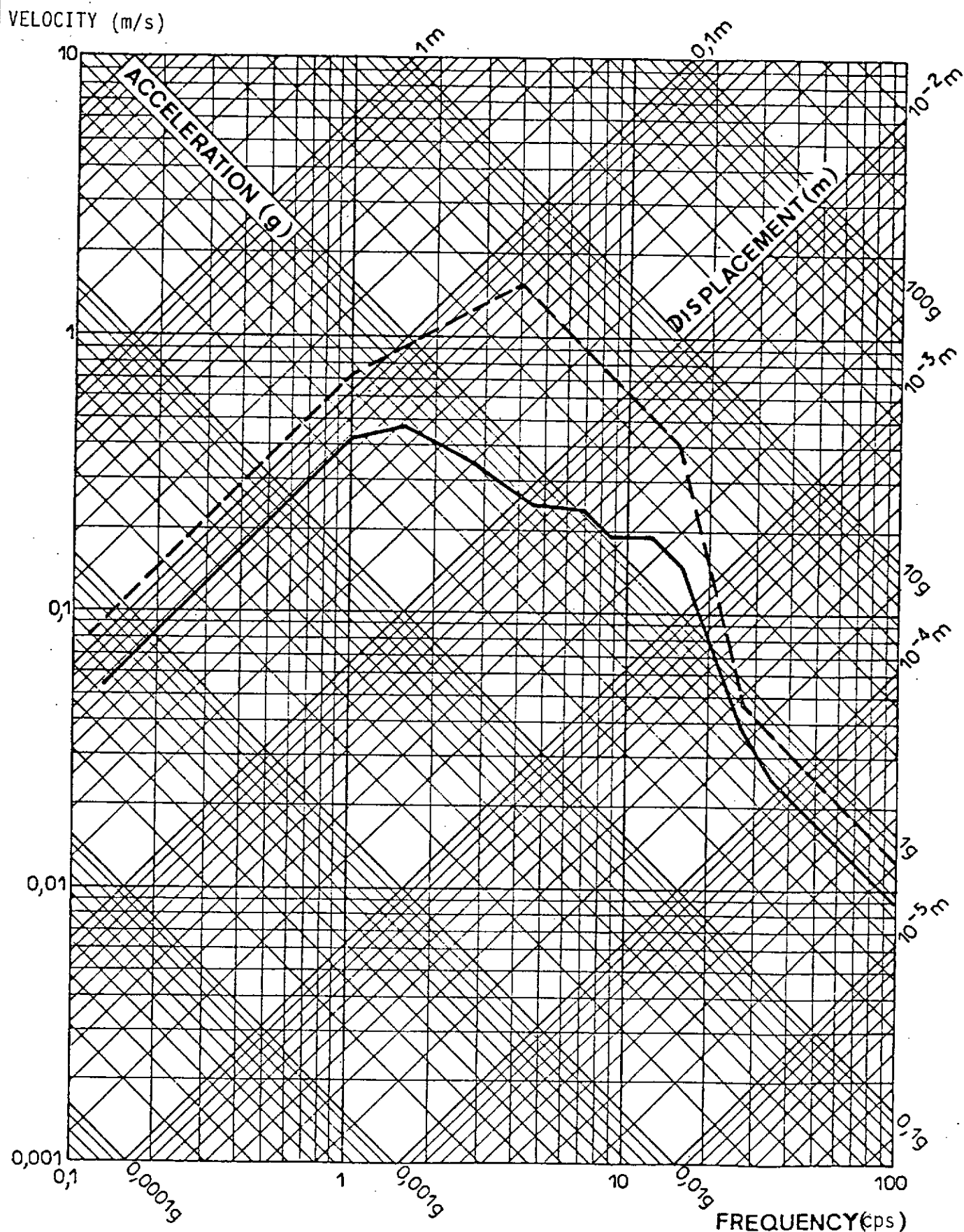
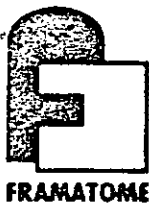


FIGURE 2

FRAMATOME S.A. : Tour Fiat - 1, Place de la Coupole - COURBEVOIE (Hauts-de-Seine)



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REVISION A

SPECTRA : Horizontal-Vertical SSE

DAMPING : 5%

FRAMATOME S.À. - Tour Flat - 1, Place de la Coupole - COURBÉVOIE (Hauts-de-Seine)

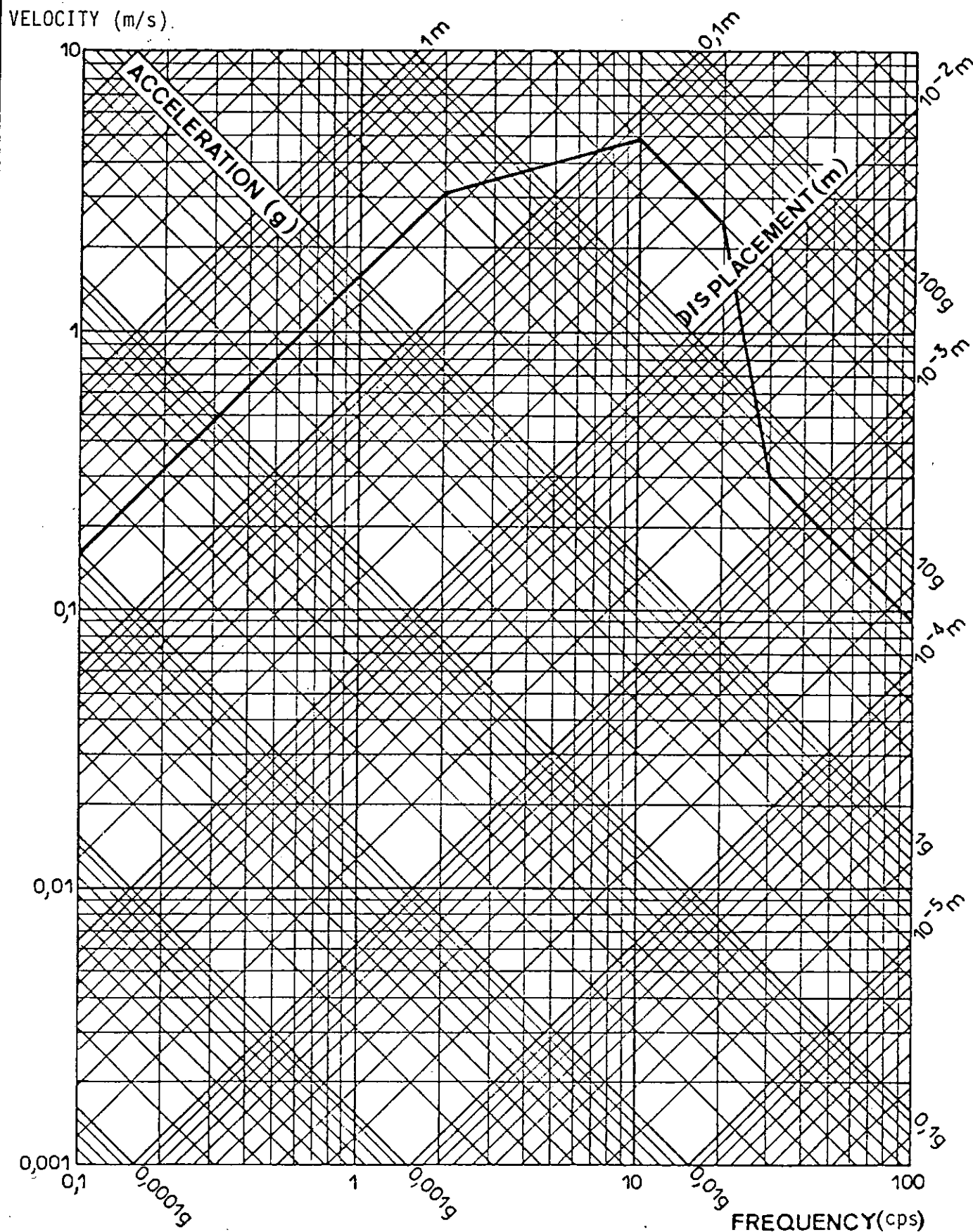


FIGURE 3



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SPECTRA : Horizontal SSE

DAMPING : 2%

FRAMATOME S.A. - Tour Flat - 1, Place de la Coupole - COURBEVOIE (Hauts-de-Seine)

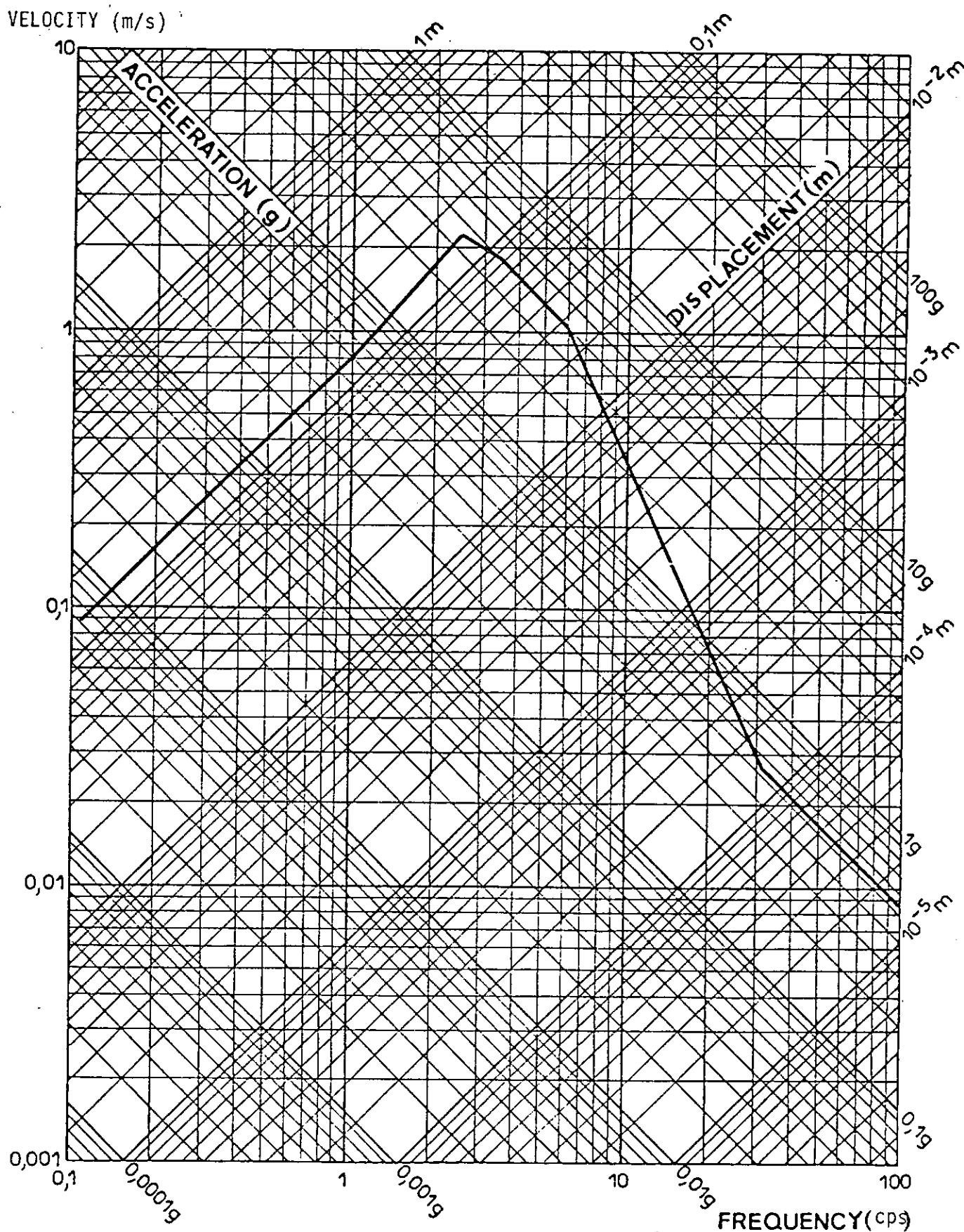
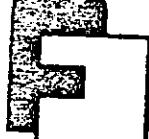


FIGURE 4



FRAMATOME

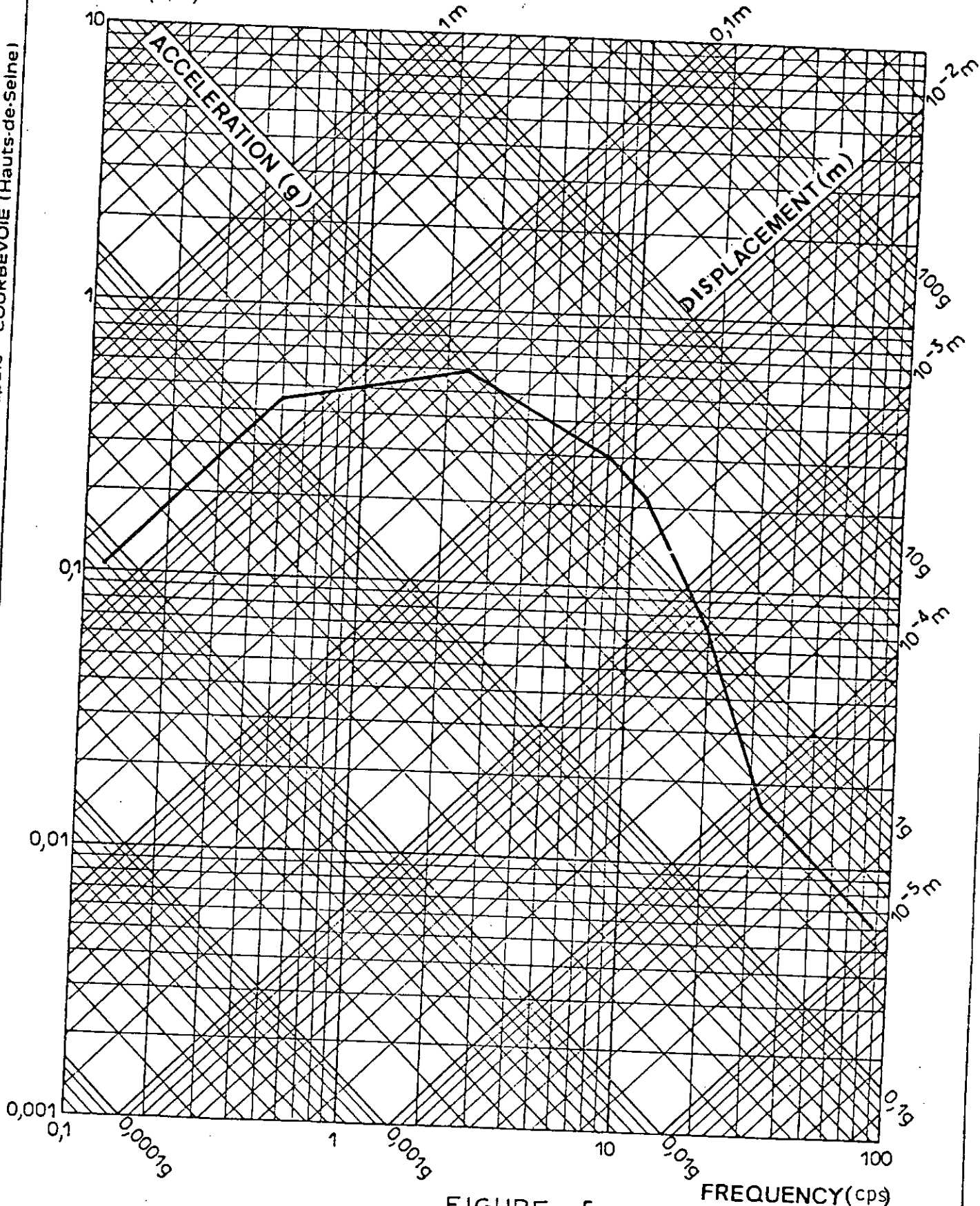
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SPECTRA : Vertical SSE

DAMPING : 2%

VELOCITY (m/s)



FRAMATOME S.A. - Tour Flat - 1, Place de la Coupole - COURBEVOIE (Hauts-de-Seine)

FIGURE 5

FREQUENCY(cps)

APPENDIX B - PIPING LAYOUT FOR CALIBRATION

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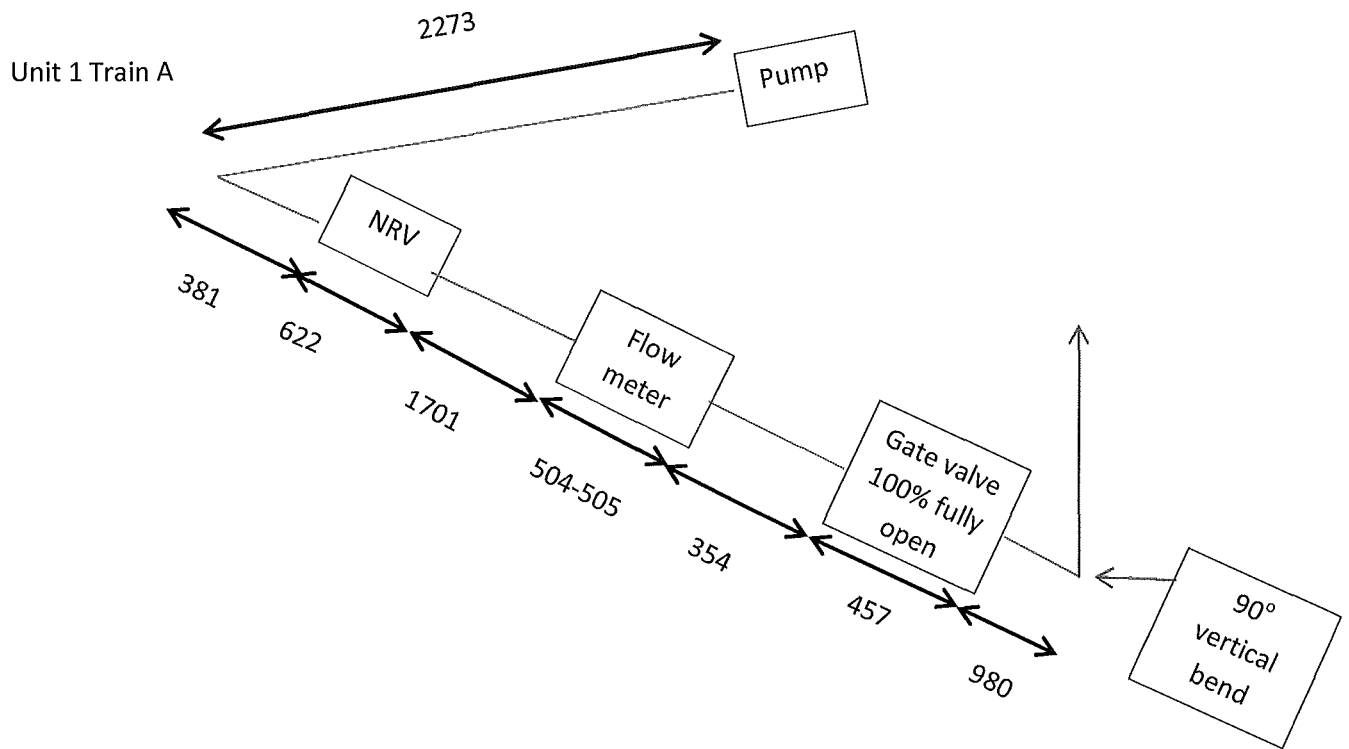
Piping Layout For Calibration

Appendix B

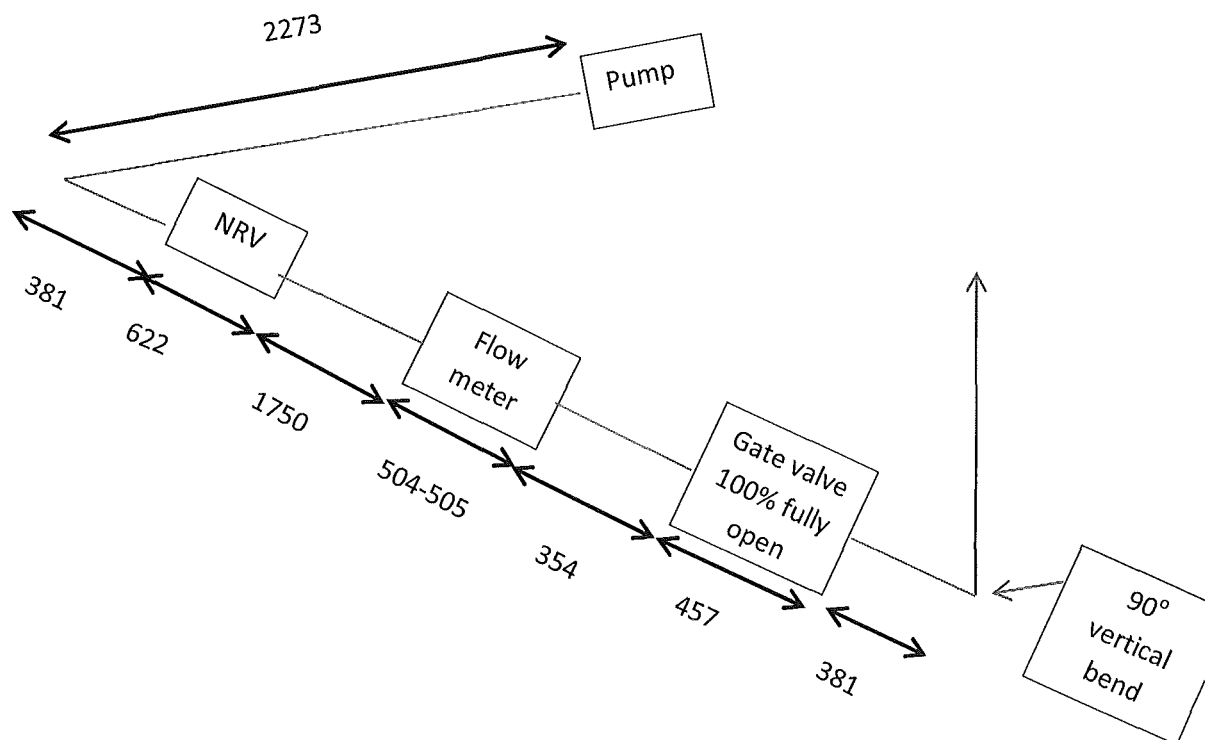
Note:

Unit of measurement for lengths: mm

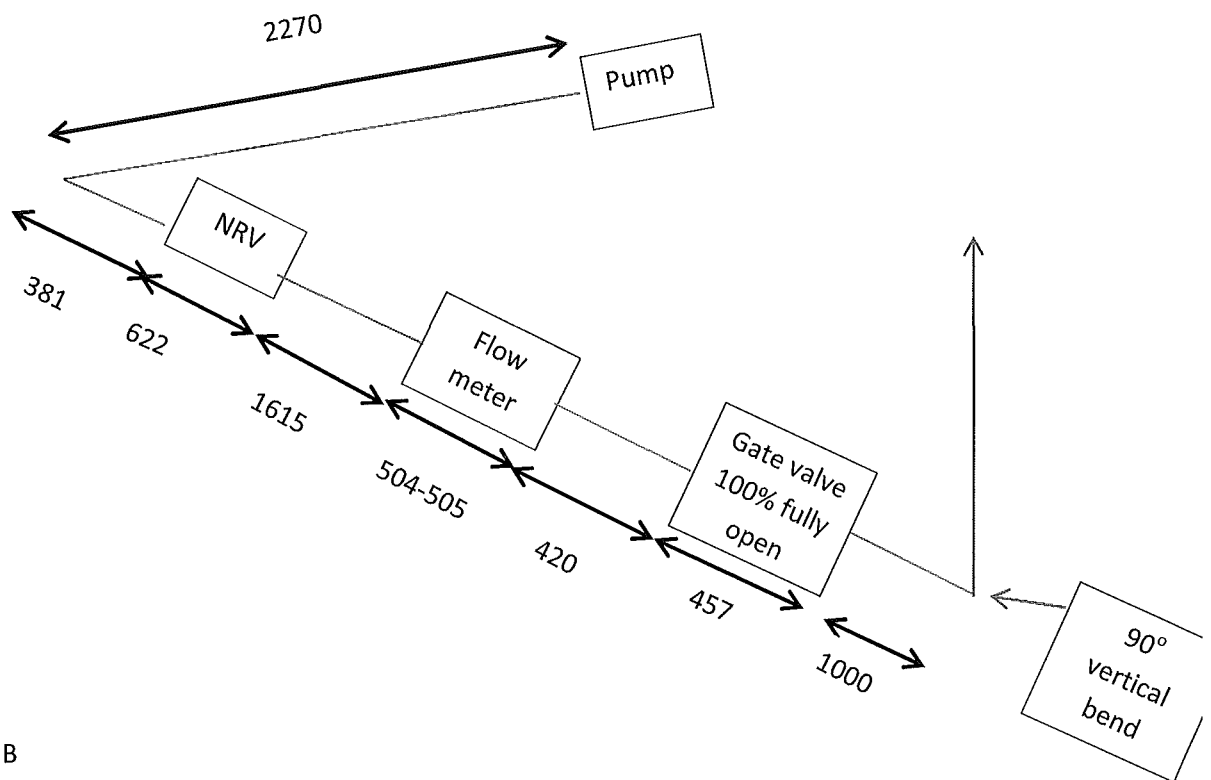
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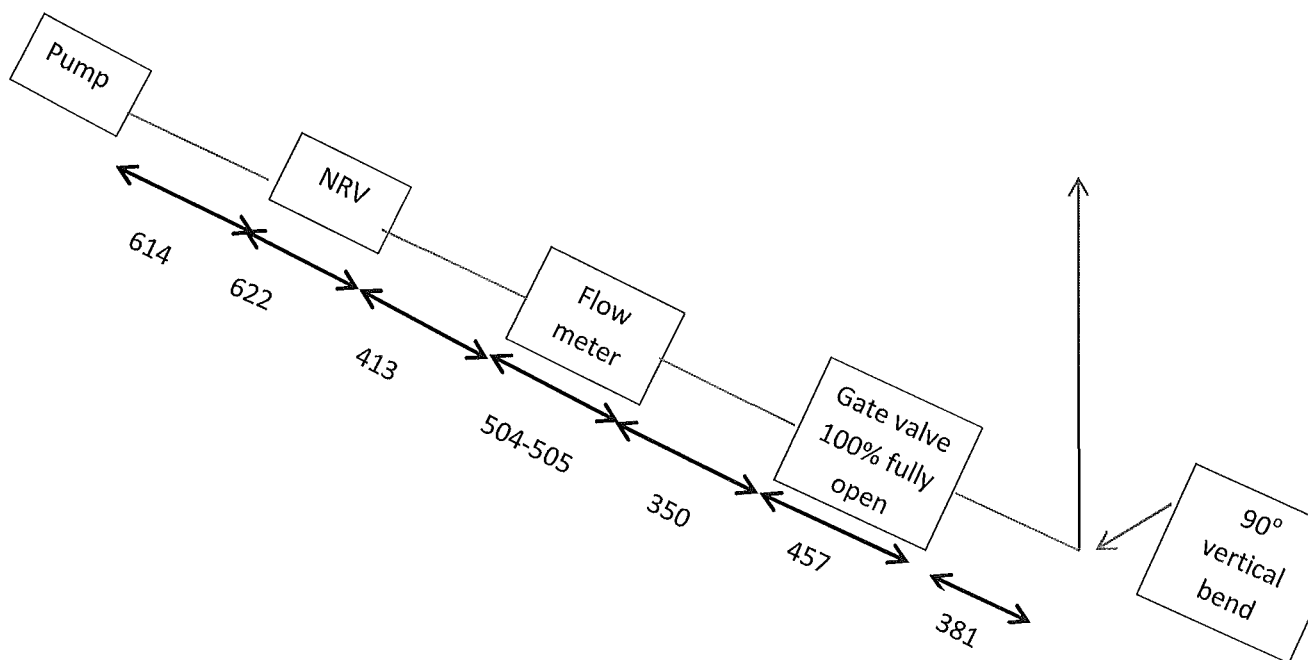
Unit1 Train B



Unit2 Train A



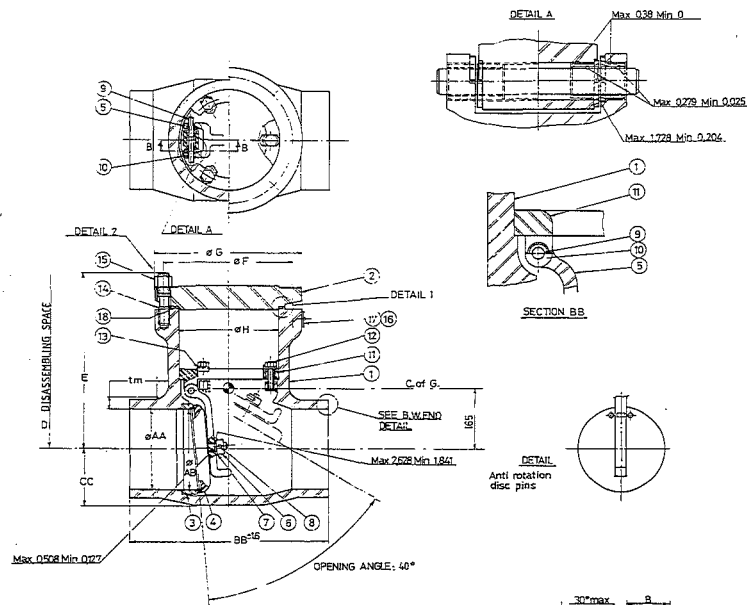
Unit 2 Train B



APPENDIX C - VALVE DRAWINGS (NON-RETURN VALVE AND GATE VALVE)

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REP	QTY	DESCRIPTION	MATERIAL	MTL SPEC.	REMARKS	GENERAL DRAWING
1	1	BODY	SS F 316	SA 182		8309.023
2	1	BONNET	SS F 316	SA 182		8163.028
3	1	SEAL	SS F 316	SA 182	STELLITE N° 6	8189.072
4	1	DISC	SS CF 3M	SA 351	STELLITE N° 6	8203.030
5	1	HANGER	SS CF 3M	SA 351		8215.019
6	1	DISC NUT	SS 330	SA 352		8506.041
7	1	WASHER	SS 330	SA 352		8506.005
8	1	SPLIT COTTER PIN	SS 4 1/4"			
9	1	HANGER PIN	SS 330	SA 352	HARDENED	8258.000
10	4	BLUSHING	STELLITE N° 6			8237.006
11	1	HANGER BRACKET	SS CF 3M	SA 351		8102.005
12	3	FIXING SCREW	SS GR 8H	SA 182	1/2" UNF 2A X 1/2"	
13	3	LOCK BRACKET	SS 302	SA 275		9502.008
14	3	BRACKET STUD	SS 330	SA 352	1/2" UNF 2A X 1/4"	
15	8	NUT	SS GR 8H	SA 182		
16	2	WELT	SS			5314
17	1	NAME PLATE	SS			
18	1	GASKET	SS 36L asbestos	FL EXALIC STYLE "R"		8979.071

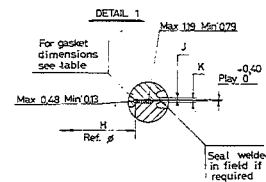
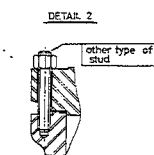
* RECOMMENDED SPARE PARTS



NOTES:

- POSSIBLE FITTING AT 45° ON BOTH SIDE OF THE VERTICAL POSITION
- N° OF THE MAINTENANCE INSTRUCTIONS 57 KEY-6901
- SAME AS GENERAL DRAWING 553 CNY 1004 (G)

DIMENSIONS TABLE	
VALVE SIZE	250
AA	242
BB	150 ± 0.22/23
CC	175
DD	150
EE	150
FF	358.77
GG	397
HH	288.92
II	238
JJ	426
KK	242
LL	2750
MM	2750
NN	2750
OO	2750
PP	2750
QQ	2750
RR	2750
SS	2750
TT	2750
UU	2750
VV	2750
WW	2750
XX	2750
YY	2750
ZZ	2750



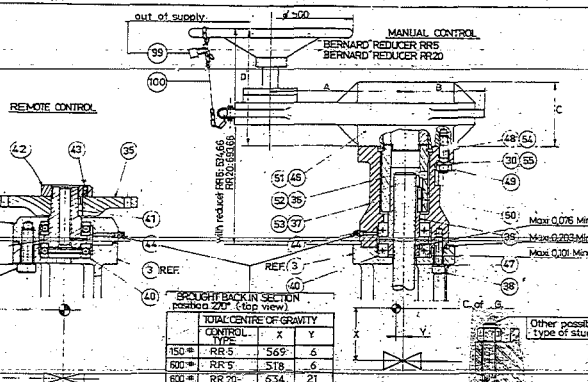
BODY/BONNET BOLTS DIMENSIONS		
Ø VALVE	DESCRIPTION	QTY
250	1/2" UNF 2A X 1/2"	8
	LENGTH OF THREAD ENGAGEMENT	38
	MAXIMUM TIGHTENING TORQUE	95nmkg

VELAN REF. MARK	Ø VALVE	PRESSURE RATING	FIGURE N°	Nuclear Class	Max design conditions Temperature Pressure	TAG N°
31	250	150"	B16.01/4.8.13 WS	2	130°C 11 bars	RIS 57.58 VP

ITEM	National Identity Mark	TAG N°	SCH.	A	B	C
553.3004/01	NJNSSB 0250	RIS 57 VP, RIS 58 VP	105	273.05	6.3	264.6

SHEET 02 ORIGINAL FRENCH DRAWING / SHEET 2/2 ENGLISH TRANSLATION	
VELAN RATEAU	10.111
OVER ALL DIMENSIONS DRAWING	
SWING CHECK VALVE Ø 10" Ø 250	
LOW PRESSURE	
KOEBERG	NUCLEAR POWER STATION
ESCOM	FRAMATOME - ALSTOM FLUATIME
SPEE BATHOLES - FRANCE	
FRAMATOME	553 KBY1004
KBA12208010261FRVNH03	

A	B	C	D
RR-5224	148	121	201
RR-5224	120	220	140



FITTING WITH	TAG N°
BERNARD REDUCER RR 5	150 # PTR 140 VB-147 VB
BERNARD REDUCER RR 20	600 # RRA 10 VP-60 VP
BERNARD REDUCER RR 5	150 # RIS 5 VP-15 VP

BELLEVILLE WASHERS				
GATE VALVE	REF. MARK 19			QTY
	EXT.	INT.	THICKNESS	
250	80	41	5	28
TIGHTENING TORQUE - MAXI TO MIN 9				

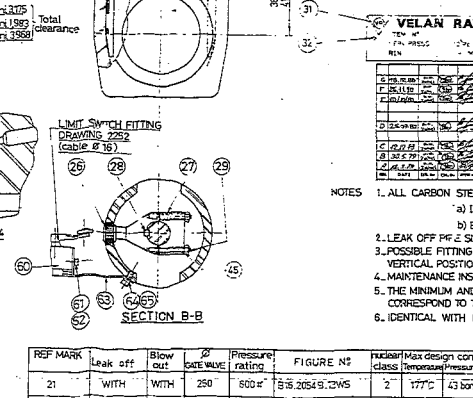
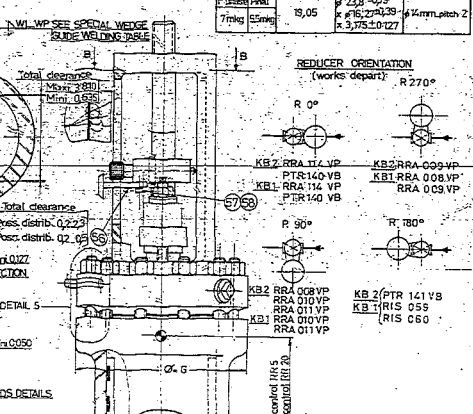
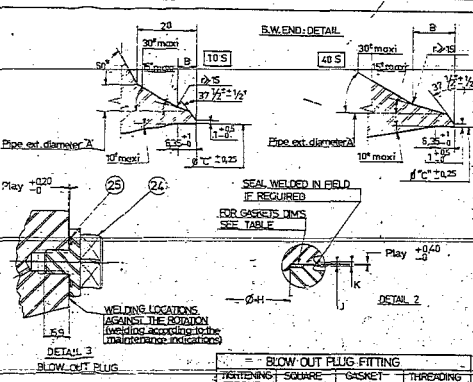
Ø	REF. MARK 14	Ø	REF. MARK 22
W	DESCRIPTION	W	DESCRIPTION
250	1" 8 UNC-72.121 G	600	7/8" 9 UNC-72.121 G

MAX. TIGHTENING TORQUE : 55 Nm

DIMENSIONS TABLE

GATE VALVE SIZE	250
AA	235.50
BB	150
AB	600
AC	711.2
AD	2380
AE	1125
AF	282.22
AG	9.17
AH	47.82
AI	3.36
AJ	75.17
AK	85.63
AL	39.21
AM	26.36
AN	3.77
AO	8.45
AP	16.33
AQ	510 kg
AR	550 kg
AS	500 kg
AT	6165

ITEM	NATIONAL IDENTITY	TAG N°	Sch	A	B	C
157, 1015/01	CJSSS B 0250 BR	RRA 08 VP-147 VB	40 S	273.05	13.90	255.8
157, 1015/02	CJSSS B 0250 BR	RRA 10 VP-147 VB	40 S	273.05	13.90	255.8
157, 1015/03	CJSSS B 0250 BR	RRA 12 VP-147 VB	40 S	273.05	13.90	255.8
157, 1015/04	CJSSS B 0250 BR	RRA 14 VP-147 VB	40 S	273.05	13.90	255.8
157, 1015/05	CJSSS B 0250 BR	RRA 16 VP-147 VB	40 S	273.05	13.90	255.8
157, 1015/06	CJSSS B 0250 BR	RRA 18 VP-147 VB	40 S	273.05	13.90	255.8
157, 1015/07	CJSSS B 0250 BR	RRA 20 VP-147 VB	40 S	273.05	13.90	255.8



QTS	DESCRIPTION	MATERIAL	MTL SPEC	REMARKS	ISO 500 #	ISO #
1	BONNET	SA-192	SA-192		893.071	893.071
2	WEDGE	SA-192	SA-192		893.071	893.071
3	WEDGE GUIDE	SA-192	SA-192		893.071	893.071
4	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
5	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
6	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
7	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
8	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
9	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
10	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
11	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
12	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
13	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
14	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
15	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
16	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
17	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
18	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
19	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
20	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
21	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
22	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
23	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
24	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
25	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
26	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
27	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
28	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
29	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
30	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
31	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
32	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
33	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
34	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
35	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
36	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
37	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
38	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
39	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
40	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
41	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
42	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
43	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
44	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
45	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
46	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
47	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
48	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
49	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
50	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
51	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
52	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
53	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
54	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
55	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
56	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
57	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
58	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
59	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
60	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
61	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
62	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
63	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
64	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
65	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
66	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
67	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
68	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
69	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
70	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
71	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
72	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
73	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
74	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
75	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
76	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
77	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
78	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
79	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
80	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
81	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
82	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
83	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
84	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
85	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
86	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
87	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
88	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
89	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
90	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
91	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
92	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
93	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
94	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
95	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
96	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
97	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
98	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
99	PACKING FLUSHING	SA-192	SA-192		893.071	893.071
100	PACKING FLUSHING	SA-192	SA-192		893.071	893.071

- NOTES
1. ALL CARBON STEEL PARTS WILL BE
 - a) Inner parts parkerized
 - b) External parts shotblasted and painted
 2. LEAK OFF PIPE SIZE IS 1/2" SCH 80.4 1/2" LG
 3. POSSIBLE FITTING / ON BOTH SIDES OF THE VALVE POSITION
 4. MAINTENANCE INSTRUCTION N° 557 KRY 8301
 5. THE MINIMUM AND MAXIMUM PLAYS INDICATED CORRESPOND TO THE TOTAL PLAYS
 6. IDENTICAL WITH DRAWING 557 CPT 1015 (G)

VELAN RATEAU - VELAN LICENSEE

TECHNICAL DRAWING

OVERALL DIMENSIONS DRAWING

LOW PRESSURE MANUAL GATE VALVE

ISO 500 # 250

KOBERG - NUCLEAR POWER STATION

FRAMATOME - ALSTOM ATLANTIQUE

SPE. ENTENDES - FRAMATOME

FRAMATOME

557 KRY 1015

KRY 1015

557 KRY 1015