

Technical Specification



Replacement Motor for RHAPRH01, RHAPRH02 Nuclear Power Plant KRŠKO

SP-ES5127 Rev. 1

Krško, 16.05.2024

SAFETY RELATED

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RECORD OF REVISION PAGES

Revision	Date	Subject
0	24.06.2020	Original issue
1	16.05.2024	Minor corrections based on QA comments. Update pages: 17, 21 and APPENDIX A2 removed.



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1. SCOPE OF WORK

This specification establishes the general requirements for design, performance, materials, quality assurance, testing, packing and shipping of a vertical induction motor that will be utilized as the replacement motor for originally supplied Westinghouse motors on Residual Heat Removal Pumps at Nuclear Power Plant KRŠKO.

This specification shall be used in conjunction with any other Purchaser documents listed in the purchase order. Any conflicts between this specification and listed references shall be brought to the attention of Purchaser for clarification prior to any action by the Supplier.

1.1. Work Included

The Supplier shall be responsible for the design, procurement of materials, fabrication, testing, cleaning, packing, and shipping (including the supply of shipping containers) of all items included in this Specification, including any items supplied by a subcontractors or other Supplier divisions.

The Supplier is responsible for compliance with all detailed requirements presented in this Specification. Approval of any drawings, specifications and/or tests by Purchaser shall in no way relieve the Supplier from these responsibilities. There shall be no deviations from this specification or its references without prior written approval from Purchaser.

Nothing in this Specification shall relieve the Supplier of the responsibility for performing, in addition to the requirements of this Specification, such analyses, tests, inspections and other activities which the Supplier consider necessary to ensure service intended, or as may be required by common usage or good practice.

The Supplier shall furnish the complete and operable motor assemble to drive the Residual Heat Removal Pump including, but not limited to the following:

- 1.1.1. The Supplier shall design, fabricate, assemble, test, and deliver one (1) set of the Residual Heat Removal Pump (RH) Motor, that will be fit, form and function equivalent replacement motor for any of two existing Westinghouse motors (P.O. 546-237021, S.O. 0205, S/N: 1-S-77 and 2-S-77) on any of the two operating locations (RHAPRH01-MTR or RHAPRH02-MTR).
- 1.1.2. The new Residual Heat Removal Pump (RH) Motor for NEK will be designed to meet the original RH Motor design requirements as specified in this specification. The motor will be a 3 phase, 50 Hz, 4 pole WP1 enclosure, form wound stator coils, brazed squirrel cage rotor induction motor rated at 400 volts designed to rotate at 1,500 rpm.
- 1.1.3. Instruments which are part of the motor assembly shall be supplied as shown on the outline dwg of existing motors in Appendix 3
- 1.1.4. Integral supports on the motor and lifting lugs on parts removable as assemblies
- 1.1.5. Terminal boxes for motor connections and instrument connections
- 1.1.6. Painting and protection
- 1.1.7. Drawings as specified in section 5, 25
- 1.1.8. Test results as specified in section 10
- 1.1.9. Performance data
- 1.1.10. Quality assurance data



1.1.11. Stress report

1.1.12. In service inspection procedure

1.1.13. Specification and layout of internal wiring

1.1.14. Spare part list with list of special tooling

1.1.15. Operating and maintenance instructions with disassembly and reassembly procedure

1.1.16. Receipt Inspection, handling & long and short term storage procedure

1.1.17. The Supplier shall furnish the services of technical supervision in erection and testing during the installation of the motor assembly on site.

1.2. Related Work Not Included

The following items of work and/or equipment are not included in this Specification for motor assembly:

1.2.1. Receiving, unloading and storage

1.2.2. Installation and connection

1.2.3. Motor coupling will be supplied by Purchaser

1.3. Responsibility

1.3.1. Responsibility for proper design, construction, and performance of the equipment specified rests on the Supplier. Approval of drawings and procedures, and inspection approval by Purchaser is not to be construed as relieving the Supplier of any of this responsibility.

1.4. Deviation from Specification

1.4.1. If the Supplier and/or his subcontractors desire to deviate in any respect from the requirements of this Specification, he must obtain specific written approval of each and every deviation.

1.4.2. Approval of a drawing or other document in which deviations occur does not release the Supplier from this responsibility.

1.5. Safety Classification

1.5.1. Safety classification of motor, motor parts and services in the scope of this Specification is classified as Class 1E. The motor shall be provided under a 10 CFR 50, Appendix B Quality program that has been approved by NEK.

2. ABBREVIATIONS AND DEFINITIONS

2.1. Abbreviations

2.1.1.	ANSI	American national Standards Institute
2.1.2.	ASL	Approved Supplier List
2.1.3.	ASME	American Society of Mechanical Engineers
2.1.4.	ASTM	American Society for Testing materials
2.1.5.	EQ	Environmental Qualification
2.1.6.	FME	Foreign Material Exclusion
2.1.7.	IEEE	Institute of Electric and Electronic Engineers



2.1.8.	NCR	Nonconformance Report
2.1.9.	NEK	Nuklaearna Elektrarna KRŠKO (NPP KRŠKO)
2.1.10.	NDE	Non-Destructive Examination
2.1.11.	NEMA	National Electric Manufacturer Association
2.1.12.	NPP KRŠKO	Nuclear Power Plant KRŠKO
2.1.13.	NRC	Nuclear Regulatory Commission
2.1.14.	OEM	Original Equipment Manufacturer
2.1.15.	OLM	Online Maintenance
2.1.16.	PAOT	Required Post Accident Operating Time
2.1.17.	PMM	Project Management Manual
2.1.18.	P.O.	Purchase Order
2.1.19.	RH	Residual Heat Removal System
2.1.20.	RFQ	Request for Quotation
2.1.21.	S/N	Serial Number
2.1.22.	S.O.	Shop Order
2.1.23.	TIR	Total Indicator Reading
2.1.24.	TQR	Technical and Quality Requirement
2.1.25.	VPI	Vacuum Pressure Impregnated Insulation

2.2. Definitions

- 2.2.1. OEM: In the course of this specification this shall mean Westinghouse Electric Corporation which was the Original Equipment Manufacturer for NPP KRŠKO RH motors under S.O. 0205 and P.O. No. 546-237021.
- 2.2.2. MSDS: Material Safety Data Sheet
- 2.2.3. MTDS: Motor Technical Data Sheet, completed by the Vendor, which provides the Purchaser with technical details for the spare or replacement motor they are purchasing.
- 2.2.4. Purchaser: Purchaser shall mean the person(s) or Vendor(s) requesting the equipment to which this document is applicable.
- 2.2.5. RFP: Request for proposal
- 2.2.6. SDS: Specification Data Sheet, completed by the Purchaser, provides the Vendor with technical details for the motor.
- 2.2.7. TDS Test Data Sheet, completed by the Vendor, provides the results of tests performed on the motor after assembly.
- 2.2.8. Technical Contact: The person appointed by Purchaser to resolve any technical issues that arise during the motor manufacture.
- 2.2.9. Thermal Limit: Curve of motor current versus time between locked rotor and maximum continuous design operating load.
- 2.2.10. Torque Versus Speed Curve: Curve of motor or driven equipment torque versus speed between zero speed and maximum operating speed.
- 2.2.11. Supplier: The company performing the work per this document.

3. CODES & STANDARDS

The Supplier shall control the quality of goods and services to meet the requirements of this Specification, applicable Codes and Standards and TQRs as specified in procurement documentation.

3.1. Reference Codes and Standards

- 3.1.1. The Motor shall be designed, built, rated, and tested and shall perform in accordance with applicable ANSI, IEEE, NEMA, ASTM, ASME Codes and/or Standards.
- 3.1.2. The Supplier shall provide to the Purchaser a listing of codes, standards, and specifications (identifying the effective issue by date) which govern the work performed within the scope of this Specification.
- 3.1.3. If the vintage of used Codes and/or Standards differ from those specified in or those listed in Section 3.2 for original RH motor design the Supplier shall perform the Code and/or Standards reconciliation analysis and document the equivalency and/or justification that this



change does not affect (degrade) motor reliability, performance and/or integrity in any way.

3.2. Codes and Standards Applicable to RH Motor

3.2.1. Standards

The following standards or documents are referred to in this document:

3.2.1.1. NEMA

MG1-2006 Motors and Generators
MG2-1989 Safety Standard for Construction and Guide for Selection, Application, and Use of Electric Motors and Generators
NEMA C50.41-2000 American National Standard for Polyphase Induction Motors for Power Generating Stations
ANSI/ABMA Std 9 Load Ratings and Fatigue Life for Ball Bearings
ANSI/ABMA Std 11 Load Ratings and Fatigue life for Roller Bearings
ANSI/ABMA Std 20 Radial Bearings of Ball, Cylindrical Roller and Spherical Roller Type – Metric Design

3.2.1.2. IEEE

43-2000 Recommended Practice for Testing Insulation Resistance of Rotating Machinery
112-2004 IEEE Standard Test Procedures for Polyphase Induction Motors and Generators
1-2000 IEEE General Principles for Temperature Limits in the Rating of Electric Equipment
323-1974 Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations, or later edition
334-2006 IEEE Standard for Qualifying Continuous Duty 1E Motors for Nuclear Generating Stations
344-1975 IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Plants
522-2004 IEEE Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating-Current Rotating Electric Machines

3.2.1.3. Code of Federal Regulations (CFR)

10 CFR 21 Reports of Defects and Noncompliance
10 CFR 50 Appendix B QA Criteria for Nuclear Power Plants
10 CFR 50.49 Environmental Qualification of Electrical Equipment Important to Safety

4. SUPPLEMENTAL DATA

4.1. References not Attached

4.1.1. Codes and Standards listed in 3.2

5. DOCUMENT SUBMITTAL

5.1. Required Documents

Drawings and documents shall be submitted in accordance with Documents and Data Requirements and Submittal Schedule and Quality-Verification Documentation List requirements as summarized and augmented by detailed requirements in this Specification.



5.1.1. Outline Drawing

- 5.1.1.1. The outline drawing is required two (2) months after the order is placed. Four (4) prints are to be submitted for approval prior to release for manufacture.
- 5.1.1.2. Details and dimensions of terminal boxes; motor connections to support stand and coupling shall be shown.
- 5.1.1.3. Overall dimensions and clearances shall be shown.
- 5.1.1.4. Weights of the motor and rotor, center of gravity of motor and rotor, and oil quantities shall be shown.
- 5.1.1.5. Auxiliary power requirements shall be shown.
- 5.1.1.6. Details of piping, wiring, and conduit connections to the motor and auxiliary units are to be shown.
- 5.1.1.7. The drawing shall be identified by motor rating and descriptive data.

5.1.2. General Assembly Drawing

- 5.1.2.1. The general assembly drawing is required four (4) months after manufacturing release.
- 5.1.2.2. Cross section details of the assembly shall be shown.
- 5.1.2.3. A list of weights of component parts shall be shown.

5.1.3. Motor Data Sheet

- 5.1.3.1. A completed motor data sheet (NPP Krško SP-ES5127, App. A1 Form, or equivalent) shall be submitted three (3) months after order is placed.

5.1.4. Calculated Performance Curves

- 5.1.4.1. Calculated motor performance curves are required four (4) months after order is placed. Motor curves are to be marked "CERTIFIED FOR CONSTRUCTION."
- 5.1.4.2. Motor performance at 100% voltage and at the specified minimum starting voltage for the following curves shall be submitted.
 - 1. Current vs. Speed
 - 2. Torque vs. Speed
 - 3. Power Factor vs. Speed
 - 4. Efficiency vs. Horsepower
 - 5. Speed vs. Horsepower
 - 6. Input KW vs. Horsepower
 - 7. Starting Current and Power Factor vs. Voltage
 - 8. Current vs. Safe Time

5.1.5. Motor Data

- 5.1.5.1. Calculated motor data as follows are required four (4) months after order is placed.
 - 1. Time to reach full speed at 100% voltage and minimum starting voltage.
 - 2. Open circuit and short circuit time constants.
 - 3. Heat load to system air-conditioning.
 - 4. Unbalanced magnetic pull.



5.1.6. Stress Report

- 5.1.6.1. Two copies of the motor stress analysis report are to be submitted to NEK six (6) months after order is placed.

5.1.7. Instruction Book

- 5.1.7.1. Supplier is responsible for the technical content of the motor instruction book and will provide all illustrations, technical bulletins on accessories, and engineering drawings to be included in the motor instruction book. All material provided by Supplier shall be high quality, readable documents capable of being reproduced.
- 5.1.7.2. Supplier is responsible for the editing and printing of the motor instruction book.
- 5.1.7.3. Supplier will submit to Purchaser a draft copy of a proposed motor instruction book for comment and approval.
- 5.1.7.4. Three weeks after receipt of the draft copy, Purchaser will return this copy with comments.

5.2. Data Sheets

- 5.2.1. Motor data sheets per Appendix 1 shall be supplied with proposal.

5.3. Quality Verification Documents

The Supplier shall submit the Quality Verification Documents in accordance with the requirements of QS-610.

6. DESIGN REQUIREMENTS AND DESIGN INPUTS

6.1. General

The motor is intended as a spare for existing Residual Heat Removal System pumps' motors, preferably their duplicate, in any case electrically and mechanically interchangeable with existing ones.

It must be designed as a vertical motor with form wound stator coils and brazed squirrel cage rotor, suitable for use on a 50 Hz, high resistance grounded power system having a voltage of 380 V, with the following general characteristics:

250 HP, 1474 rpm, 50 Hz, 380 V, 3 phase, class F or better insulation, 1,15 S.F.

Specified thrust 4200 Lbs continuous Up and Down, 5250 Lbs momentary Up and Down.

Motor shall have special shaft extension per attached drawing 8974D61.

As a minimum, it shall meet the following from original motors' outline drawing:

- main flange dimensions and bolts size & pattern
- main leads size and connection relative orientation
- all accessories' wires size and connections relative orientations
- oil level indicators, grounding pads and lifting lugs relative orientation
- shaft extension and keyway dimensions
- overall envelope of the offered motor shall not exceed the existing one
- total weight of the offered motor shall not exceed the existing one
- center of gravity

The motor shall be constructed, tested and shall perform in accordance with the latest version of NEMA Std. MG1, and with the latest versions of IEEE Std. 112 and IEEE Std. 522 except as modified herein.

Since the motor is intended for use in a generating station with an expected useful life of approximately 40 years, it is required that it be designed and built for long, reliable service and designed to allow the carrying out of routine preventive maintenance with a minimum of time



and effort. A high efficiency motor design shall be offered. The motor efficiency shall not be less than of existing motors.

Only a service proven design should be offered. When a design is offered that has not been proven in service for at least two years, proposals shall indicate which parts of the motor are affected (e.g., bearings and insulation) and the extent of experience with these parts.

In case when "duplicate" is offered:

- latest drawing revision shall be used unless if interchangeability is affected
- modifications or upgrading of overall design and/or parts may be applied but only after Purchaser approval
- cast parts on the original motors may be manufactured as fabricated parts after Purchaser approval until interchangeability is maintained and material qualification is met
- the insulation system shall be according to the latest technology

6.2. Conditions of Services and Environmental Qualification (EQ) requirements

6.2.1. Supplier shall certify that the supplied motor is in Environmentally Qualified compliance with IEEE Standard 323-1974 (or newer version of IEEE 323) with IEEE Standard 334-2006 considering following EQ conditions:

Normal operating environmental (ambient) conditions (reference ZVNE/SA/EQ-TR, Rev.7) – see Appendix A6:

- Temperature: 50 C
- Pressure: 101.3 kPa
- RH: 60 %
- 60-year gamma dose: 7.17E+03 Gy

Accident environmental (ambient) conditions (reference ZVNE/SA/EQ-TR, Rev.6):

- Temperature: 51.7 C
- Pressure: 105.0 kPa
- RH: 100 %
- Gamma dose: 7.28E+04 Gy
- Chemical Spray: N/A
- Submergence: N/A

Required Post Accident Operating Time (PAOT): 30 days.

6.2.2. Required motor performance requirements shall be confirmed by Environment Qualification.

6.2.3. Environmental qualification shall be documented in Test Report prepared in accordance with IEEE 323-1974, Section 8. Subject Test Report shall be delivered. Certificate of Compliance for equipment to subject Test Report and IEEE 323 or newer version of IEEE 323 Std.) shall be provided. Only one acceptable method of environmental qualification is environmental qualification testing of motor and/or its insulation system at environmental conditions enveloping specified EQ conditions.

6.2.4. In case that equipment has not been qualified to this Purchase Order technical specification requirements yet, Supplier shall prepare qualification test procedure and send it to NEK for review and approval. Qualification testing may be proceeded after NEK approval of qualification procedure.

6.2.5. Qualification documentation shall define designed qualified life with following aging data for aging sensitive materials: material/parts identification and safety function description; aging time; aging (accelerated) temperature; activation energy (Ev). Qualification documentation shall provide sufficient data enable NEK to calculate qualified life for equipment and its spare parts. Equipment target qualified life is 40 years.

6.2.6. If there is any difference (material, design/construction or performance parameters) between



tested equipment and subject supplied equipment, the differences should not degrade original equipment qualification level in any viewpoint to accomplishing its safety function during and subsequent to the harsh environments at the end of qualified life. Accordingly, supporting similarity analysis with references shall be provided and delivered to confirm acceptability of difference.

- 6.2.7. Supplier shall state whether the item requires any periodic maintenance or replacement of parts in order to maintain the qualified life during item installed life.
- 6.2.8. Installation details (orientation, sealing, electrical and process connection etc.) required to maintain qualified tested configuration shall be specified and supplied with qualification records.

6.3. Mechanical details

Motor shall be mechanically interchangeable with existing ones.

6.3.1. Enclosure

The motor enclosure shall be open drip-proof (ODP), type weather protected Type 1 (WP1) enclosure. The enclosure ventilating opening shall be constructed to prevent falling objects such as chips, dirt, or dripping liquids, from entering the motor. The ventilation passage shall be constructed to minimize the entrance of rain, snow, and air-borne particles to electric parts.

6.3.2. Cooling

The motor shall be self-ventilated. Air inlet and outlet openings shall be protected with metal guard screens to prevent entrance of foreign objects.

6.3.3. Bearings

Motor Bearings shall be mounted in housings that are sufficiently tight to exclude dust and prevent the escape of lubricant. The bearings shall be insulated to prevent circulation of shaft currents through bearings.

The bearings shall be designed for normal stator temperature rise of 80 degrees C measured by resistance in a 50 degree C ambient.

Purchaser prefer angular contact ball bearings (thrust) and ball bearings (guide).

6.3.4. Dimensions and Threads

- [1] Dimensions and data on all drawings incorporating an interface with Purchaser (e.g., outline, soleplates, etc.) shall be shown in US units.
- [2] Dimensions on drawings of component parts, submitted for approval, should be in inches, but soft conversions from metric units are permissible.
- [3] Studs, nuts and bolts shall have UNC (preferred) threads.
- [4] Tapped holes for the connection of pipes or conduits shall have NPT threads per ANSI B2.1
- [5] Pipe flanges interfaces shall conform to ANSI B 16.5

6.3.5. Shaft and Coupling

Motor shall have solid shaft with a non-standard shaft extension per attached dwg 8974D61 designed with an ample margin for all stresses encountered in starting and running, including over speed operation, electrical fault conditions, and taking into account external imposed loads carried by the motor shaft.

The Vendor shall provide a suitable keyway and key on the shaft extension to accept the driving half of the coupling. Tolerances shall be in accordance with NEMA MG-1.

6.3.6. Direction of Rotation

The motor shall preferably be bi-directional by interchanging two of the motor leads. Motor main terminal leads shall be stenciled T1, T2, and T3, or shall have metal tags attached, for



identification. Motors shall have the direction of rotation marked by an arrow on the stator frame or on the nameplate. The manufacturer shall also furnish information on the phase sequence versus mechanical rotation, whereby purchaser can determine the direction of the rotation before energizing the motor.

The phasing shall be verified with a phase rotation meter. The motor shall be tagged with a "Check rotation" tag to ensure the motor's rotation is verified on-site prior to couple the motor.

6.3.7. Stator-to-Rotor Air Gaps

During manufacturing, the air gap shall be verified at four bearing 90-degree diagonal positions at each end of the motor. All four air-gap measurements shall be within +/- 10% of the average, which is $0.25 \times \text{sum}$ (sum of the 4 measurements).

6.3.8. Vibration and noise

Vibration shall not exceed values specified by NEMA MG1 Standards for rigid mountings at no-load operation.

Factory vibration levels shall be obtained with the motor rigidly mounted to the floor, i.e.; resilient mountings are not allowed.

The motor shall be designed and manufactured to operate as quietly as possible. The vendor shall state the noise level for each motor under no-load conditions.

6.3.9. Nameplate Information

6.3.9.1. Each motor shall have a permanent nameplate attached indicating the following nameplate markings required by NEMA MG 1 Paragraphs 10.40:

- [1] Manufacturer's name, serial number or identification number.
- [2] Horsepower output.
- [3] Time rating (see MG 1 – 10.36).
- [4] Temperature rise.
- [5] Insulation system designation.
- [6] RPM at rated load.
- [7] Frequency.
- [8] Number of phases.
- [9] Rated-load amperes.
- [10] Voltage.
- [11] Locked-rotor amperes of code letter for locked-rotor kVA per horsepower (see MG 1 – 10.37).
- [12] Service Factor.
- [13] Frequency.

6.3.9.2 Each motor shall have a permanent nameplate attached indicating the following information in addition to the standard nameplate markings required by NEMA MG 1 Paragraphs 10.39 and 10.40.

- [1] Rotation, phase sequence.
- [2] Starter restriction.
- [3] Terminal lead markings.
- [4] Recommended lubricant.
- [5] Insulation class/temperature rise.

6.3.10 Seismic Qualification

The motor shall be seismically qualified in accordance with attached floor response spectra: figure A37, A38, A39 and A40 (damping factor: 2% OBE and 4% SSE, amplification factor for horizontal: 4.25 and vertical: 4.05) s specified in attachment A5; Flor Response Spectra, Auxiliary Building, el. 100.300.



6.4. Electrical Details

Motor shall be electrically interchangeable with existing ones.

6.4.1. Voltage Ratings

The motor procured under this specification will be capable of starting the design load and bringing the design load to rated speed with a terminal voltage of 80% of nameplate rated voltage (i.e. 80 % of 380 volts), and be capable of carrying the design load indefinitely with a terminal voltage of 100 % of nameplate rated voltage.

Voltages for starting and running may be high as 110 % of rating. The vendor shall provide the full load temperature rise of the motor at 100 % of nameplate rated voltage to ensure the motor does not exceed the insulation system temperature.

6.4.2. Starting Requirements

- 6.4.2.1. The motor shall be designed for full voltage starting. The motor shall be capable of accelerating the pump to rated speed with 80 % of the motor nameplate voltage applied to the motor terminals.

The motor starting duty:

- Motor cold: 2 consecutive starts
- Motor at operating temperature: 1 consecutive start
- Subsequent starts with motor running between starts is 15 minutes apart
- Subsequent starts with motor standing between starts 45 minutes apart

The motor shall be rated for full voltage at 380 volts with the maximum system operating voltage of 418 volts.

- 6.4.2.2. The motor shall be designed for a low starting current without sacrificing unduly other desirable features, such as high efficiency, good power factor and adequate torque characteristics.

- 6.4.2.3. The motor shall be capable of starting and running at plus or minus 10 percent of rated voltage at rated frequency, plus or minus 5 percent of rated frequency at rated voltage. The motor shall be capable of being de-energized, coasting down, and being restarted within 10 seconds without any damage to the motor.

6.4.3. Stator Winding Insulation

- 6.4.3.1. The motor winding shall be standard form wound with class F or better insulation, specifically treated to make it of the sealed type, suitable for protection against severe moisture, oil, chemicals and dust. The windings shall be a vacuum pressure impregnated (VPI) epoxy sealed insulating system. The vendor shall provide a description of the stator winding insulation system, and the methods of wedging and bracing the stator coils.

- 6.4.3.2. The motor will have VPI windings; vendor will make 2 sample coils of each motor line item that is put through the VPI process. The vendor shall ensure that the VPI process conforms to the resin vendor's recommendations (i.e. time, temperature, pressure, vacuum).

- 6.4.3.3. The spare coils shall be connected and tapped with full insulation to demonstrate coils in the stator. The sample coils shall have steel or aluminum channels to simulate stator slots. After the first VPI cycle of the samples, before the first oven cure, one of the sample coils shall be removed from the tank. The channels shall be removed and the insulation cut open to confirm resin penetration depth to the conductors. If inadequate resin penetration is found, vendor shall inform NEK representative and a corrective plan shall be put into place to ensure acceptable penetration. The sample coils shall be tagged and maintained for further inspections.

6.4.4. Service Factor

- 6.4.4.1. The motor shall have a 1.15 service factor. The motor temperature rise shall not exceed 80 degrees C, in a 50 degree C ambient, at the 1.15 service factor load, at rated voltage and frequency, as measured by resistance.



6.4.4.2. While the motor is not designed to operate normally in the service factor range, such operating must be available without reducing the capability of the motor to perform its design function.

6.4.5. Temperature Rise

6.4.5.1. The stator temperature rise when operated at the 1.15 service factor load, and at rated voltage and frequency, in a maximum ambient of 50 degrees C, shall not exceed 80 degrees C when measured by resistance.

6.4.5.2. A motor using Class F insulation operating at a Class B temperature to allow a lower operating temperature rise on the motor to ensure longer life of the motor is acceptable. The vendor shall provide the proper motor ratings for operating in a 50 Degree C ambient.

6.4.6. Motor Leads

6.4.6.1. The motor leads consisting of a continuation of the motor windings and not a spliced extension are preferred. Lead shall be connected (brazed) directly to the windings and shall be continuous and un-spliced.

6.4.6.2. The motor lead cable at the field termination end shall not be subjected to the VPI process.

6.4.7. Overspeed

The motor shall be so constructed as to withstand without mechanical damage, during an emergency not to exceed two minutes, an over-speed of at least 125 percent of rated speed. During this overspeed condition the motor is not connected to the electrical supply.

6.5. Miscellaneous Requirements and Safety

The motor design shall ensure that inadvertent contact with the motor will not result in any injuries to personnel from electrical shock, rotating parts, heat, etc. There shall be adequate lifting points for both motor and major component removal and re-installation.

The vendor shall identify lifting restrictions, if any, in advance. The lifting means shall remain secure during normal operating conditions and shall not affect the operation of the motor.

6.6. Accessories

6.6.1. Terminal Boxes

6.6.1.1 The motor shall be provided with a separate terminal box for the motor main leads, heater leads, RTD leads, if any and leads from the bearing thermocouple devices, if any. Terminal blocks of the proper rating shall be furnished in the accessory terminal boxes for the motor RTD's, thermocouples and space heaters. All boxes shall be oversized and gasketed to prevent the entrance of moisture and dirt. Terminal boxes shall be arranged for rotation in 90-degree steps. Termination information shall be provided in the form of a nameplate and secured on the outside of the motor or inside each termination box, to allow identification of all leads including the motor main lead terminals.

6.6.1.2 The motor main leads termination box (oversized) will be located as shown on original drawing 8974D61.

6.6.2. Space Heaters

Space heaters, wrap around type, 380 VAC, 50 Hz, 200 Watt, 0.53 Amps.

The motor shall be equipped with two identical sets of heaters, one for normal service and the other for spare.

6.6.3. Vibration Monitoring

No special means for vibration monitoring are required.



The motor finish shall consist of epoxy materials as defined in NEK Krško Specification SP-A3000; Service Level II Coatings Inside NEK Technological Area, Appendix C, Paragraph III-i.

7. PERFORMANCE REQUIREMENTS

7.1. General

The Supplier shall guarantee and be responsible for the following:

- 7.1.1. Rigid adherence to the design, arrangement and dimensions of parts and assemblies as shown on Purchaser approved manufacturing drawings, unless deviations are specially authorized in writing by the Purchaser.
- 7.1.2. The quality of all materials and workmanship, and the suitability of all materials and apparatus for their application.
- 7.1.3. Motor efficiency of no less than the value specified in the Supplier's bid and an efficiency of no less than that of the existing motor.

7.2. Operating reliability

- 7.2.1. The motor shall be designed for continuous operation. It shall be adequate for long periods of inactivity, the effects of an atmosphere that may be made corrosive by traces of chemicals normally present in a power plant, and conditions existing at the jobsite such as high humidity, insects, plant life, fungus, rodents, and as forth.
- 7.2.2. The insulation shall be suitable for use in atmospheres containing moisture, wear acid fumes and abrasive dust, all of which are normally encountered in power plants.
- 7.2.3. Only service-proven designs shall be offered. Where a design which has not been proven in service for at least 2 years is offered, the Proposal shall indicate which parts of the motor are affected, such as bearings, insulation, accessories, and the extent of experience with such parts.

7.3. Voltage and frequency variation

Motor performance during voltage and frequency oscillations shall be as described in section 6.4.1-Voltage Ratings.

7.4. Load requirements

Load requirements are described in sections 6.1-General.

7.5. Starting duties

Motor starting duties are described in section 6.4.2-Starting requirements.

7.6. Service factor

The service factor shall be 1,15 as described in section 6.4.4-Service Factor.

8. MATERIAL REQUIREMENTS

See section 6 and 7

- 8.1. The Supplier shall be responsible for the selection of all materials and their procurement specification. The traceability of all purchased materials to material certificates is required.

9. FABRICATION AND ASSEMBLY

See sections 6 and 7.

- 9.1. All shop practices and fabrication shall conform to the specific codes and standards



referenced in this specification. Special attention should be provided during the manufacturing and testing to provided necessary safeguards preventing foreign materials entering the internals of motor. Dimensions and tolerances referenced on the approved drawings are controlled and shall be maintained. NEK reserves the right to check all dimensions at the vendor's plant prior to shipment.

- 9.2. Only new (not used) components and/or materials traceable and certified to meet the design requirements shall be utilized in motor production.
- 9.3. Any subassembly or assembly which fail to meet the acceptance criteria for any test or inspection shall be reworked or replaced and retested

10. INSPECTIONS AND TEST

Test for the motor covered by this specification are to be performed in accordance with NEMA MG 1-12.55.

- 10.1. The following performance tests are required:

- [1] Measurement of winding resistance in accordance with MG1.12.55.2a.
- [2] No-Load readings of current and speed and rated voltage and frequency. Results are expected to closely match design values in accordance with MG.12.55.2b.
- [3] Locked Rotor current in accordance with MG1.12.55.2c.
- [4] AC/DC High Potential Final Acceptance Testing. This test is performed at a test voltage of 1000 plus two times rated voltage. The time duration is one minute. The leakage current shall be recorded (this is required only for DC Hipot, AC is pass/fail).
- [5] Surge Comparison Testing.
- [6] Mechanical Vibration Test. The test results shall be recorded so that a "benchmark" is obtained. This will allow readings taken after installation to be compared with factory readings. The limits of bearing housing vibration acceptance criteria are stated in MG1.7.8.1.
- [7] Direction of rotation versus phase rotation test – to ensure nameplate markings are correct.
- [8] Insulation resistance test and Polarization Index – Take with Megger. Motor insulation to ground shall be at least 100 Megohms @ 500 VDC. PI readings shall be at least 2.0.

- 10.2. Verification testing is performed by the supplier and not herein specified. The results of any verification testing shall be provided to NEK.
- 10.3. In addition to the tests described above, a current versus time (I vs. T) curve is also required to assist in selection of protective relays and to determine tripping time of breakers. The current versus time curves shall be provided for voltage of 80, 100, and 110 percent of nominal voltage.
- 10.4. The supplier shall be responsible that motor furnished under this specification conforms to the procurement requirements stated and is suitable for the purpose outlined herein.
- 10.5. Supplemental tests may be invoked by NEK's representatives when marginal conditions are noted by the tests and inspections specified. The cost of the test, and the effect, if any, on the delivery schedule, shall be determined prior to undertaking the test.
- 10.6. The supplier shall be responsible to provide NEK, in writing, a statement specifying the cost of the additional testing and any impact on delivery schedule resulting from the additional testing. If the test shows the motor is in compliance with this specification, the cost of the test will be borne by NEK.



- 10.7. If the tests shows that the motor is not in compliance with this specification, the supplier shall bear the cost of the test, and shall rectify the situation to the satisfaction of NEK's supplier surveillance representative with no additional cost to NEK.

11. QUALIFICATION AND DOCUMENT TRACEABILITY

11.1. Acceptance

- 11.1.1. Acceptance of the motor by Purchaser will be based on sufficient inspection and tests records and reports to enable the Purchaser to determine that the equipment meets all of the specification requirements. All of the records and reports shall be traceable to Purchaser purchase order and to Supplier shop order and motor serial number.
- 11.1.2. Post installation Startup tests will be made within the NEK OLM/Outage Plant Schedule from the date the motor is completely installed ready for use. The conditions of all field tests shall be developed by the Supplier and mutually agreed upon in the Contract.
- 11.1.3. If inspection and/or tests show the motor or any part thereof not to be represented and/or contracted for, Purchaser may refuse to accept it, but the manufacturer shall have a reasonable time within which to correct the apparatus at his own expense. The contents of this paragraph shall be consistent with warranty requirements.

11.2. Right to Use Work Requiring Correction

- 11.2.1. If, after the motor has been installed it is discovered that it or any part thereof may require correction as herein provided, Purchaser shall nevertheless have the right to use such motor until such time as it is convenient to Purchaser that such motor be removed from service for correction.

12. CLEANING

- 12.1. Supplier shall provide the cleaning procedure for Purchaser review and concurrence.

13. COROSION PROTECTION / COATINGS

- 13.1. Supplier shall provide the painting procedure for Purchaser review and concurrence.

14. MARKING AND IDENTIFICATION

14.1. Match-Marking and Piece Marking

- 14.1.1. All components of the equipment shall be clearly identified and where necessary match-marked in such a way as to eliminate any question or confusion at subsequent assembly or repair of the motor.
- 14.1.2. The Supplier shall establish and maintain a system for the identification of materials, parts, and components, including heat exchangers tubes and fully or partially fabricated assemblies. These measures shall ensure that identification of the item is maintained by the heat number, lot number, serial number, or other appropriate means, either on the item or on records traceable to the item, throughout fabrication, shipment, and use of the item.
- 14.1.3. These identification and control measures shall be designed to prevent the use of incorrect or defective material, parts, and components as well as to provide a permanent record to assist in future evaluations of in-service degradation of parts. They shall also be designed to preclude retention of foreign objects inside the motor unit or its components. As a minimum these procedures shall include detailed accountability procedures for all tools and equipment used during manufacture, appropriate controls on foreign objects such as welding rods,



cleanliness requirements, and accountability procedures for any temporarily installed devices.

15. PACKING, HANDLING AND STORAGE

- 15.1. Packing, Handling, and Storing of the item supplied under this specification shall be in accordance with American National Standards Institute (ANSI) N45.2.2-level B.
- 15.2. The Supplier shall provide, for the Purchaser's review and approval, procedures for packaging, shipping, site receiving, site storage, handling, and cleaning after installation. The packaging procedure shall take into account the method of transportation to be used, as well as the possible storage duration and storage environment.
- 15.3. Reusable packing shall be suitable for shipping the motor to NPP Krško, Slovenia, indoor storage for 18 months, and for domestic transfer by truck. Adequate skidding braces and pads shall be provided to protect the equipment from damage.
- 15.4. One (1) copy of instructions for receiving inspection and storage are to be shipped with motor.

16. NONCONFORMING MATERIALS

- 16.1. Any deviations or design changes which are not fully in accordance with the technical or quality assurance requirements of the procurement documents and which the Supplier desires to accept, must be approved by the Purchaser. Any such deviation request must be made in writing prior to disposition by means of a Deviation/Change Request Form submitted to the Purchaser for approval prior to continuing work.
- 16.2. Nonconformances with specification requirements, and applicable codes and standards invoked by this specification will not be accepted until approved by the Purchaser. Nonconformances to be reported for approval by the Purchaser are those nonconformances, which cannot be brought within specification requirements by rework or replacement. When such a condition exists, Supplier shall initiate Nonconformance Report (NCR) using the Supplier's standard nonconformance document, which identifies the nonconformance and the Supplier's proposed disposition.
- 16.3. The Supplier shall: (1) segregate the nonconforming item to prevent any further processing which may result in a change of the nonconformance as identified, (2) make the NCR available to the responsible inspector for review to ensure the nonconformance is completely identified and accurately stated, and (3) transmit NCR with recommended disposition to the Purchaser in an expeditious manner. The Supplier shall provide technical justification for the recommended dispositions.

Further engineering and/or manufacturing after detection of nonconformances, prior to Purchaser's approval shall be at the Supplier's risk. The requirements of the specification are binding; no departures are acceptable without the prior consent of the Purchaser.

- 16.4. The NCR shall provide the method by which the Supplier shall obtain a documented response and approval from the Purchaser when nonconformances are identified. The use of the NCR will pertain to the work at the Supplier's and/or Sub-supplier's shops.
- 16.5. Once the item is identified with a NCR, that NCR shall remain assigned to that item permanently and Purchaser shall be advised of the originating NCR.

17. RECORDS

17.1. Records system

A record System shall be established and maintained by the Supplier to provide documentary evidence of the quality of items and activities affecting quality. The quality assurance (QA) records shall include results of reviews, inspections, tests, audits, monitoring of work performance and material analyses. Records shall, as minimum, identify inspector or data



recorder, date inspection was performed, type of observation, procedures used, results, acceptability, and action taken with any deficiency noted. Collection, storage and maintenance of records shall be in accordance with the requirements of ANSI N45.2.9.

Additional records or supporting data shall also be maintained. All quality verification records, procedures, and qualifications shall identify the item or activity involved. These shall be retrievable and available for examination.

One copy of all documents required by this specification, applicable regulations, codes and standards, or generated as a result of Supplier's QA program shall be transferred to the Purchaser. As a minimum the record identified in Quality Plan shall be provided.

Responsible persons for generating, completing, or reviewing records shall ensure the following requirements are met:

- a. Assure Records are technically correct in accordance with applicable procedures.
- b. Assure Records are complete including all attachments. Records shall be reviewed to assure all required data, i.e., signatures, dates, etc., have been completed or marked not applicable (N/A) as required.
- c. Assure corrections to data have properly been made. Corrections to data shall include the data and the identification of person authorized to make the correction.
- d. Assure that records are legible – can be clearly read and suitable for microfilming. The original of all records should be transmitted to the Purchaser as a plant record.

17.2. Fabrication records

Additionally to the requirements for manufacturing data the Supplier shall prepare and provide all fabrication records related to Purchaser new RH motor production. As a minimum the record identified in Quality-Verification Documentation List shall be provided.

18. OTHER REQUIREMENTS

18.1. Spare Parts and Tools

18.1.1. A list of tools furnished and recommended spare parts is to be furnished (3 copies).

18.2. Additions and Exceptions

18.2.1. Any additional requirements and/or exceptions imposed beyond this specification requirements during bidding, negotiating and contracting processes shall be identified as change to this specification and brought to the attention of the Purchaser for resolution concurrence and/or approval.

19. RIGHT OF ACCESS

19.1. Purchaser shall have the right to access to the supplier's and any supplier's subcontractor facilities and records for inspection or audit by Purchaser, their designated representative and/or other parties authorized by Purchaser. This shall include, but is not limited to, the right to audit material, test, inspection services and quality records; make surveillance visits during manufacturing; and witness tests to the extent Purchaser deems necessary to assure that work is being performed in accordance with all product design and manufacturing requirements. The supplier shall have the right to have its representatives present during visits by NEK or its designated representatives, to the Supplier's subcontractor facilities.

Inspections or examinations performed by Purchaser, or its designated representative, do not relieve the supplier of its responsibility to meet the requirements of this Specification or related purchase order.



20. QA PROGRAM REQUIREMENTS

- 20.1. The Supplier of the RH motor must qualify for the job by being approved on the NPP KRŠKO ASL
- 20.2. Q A Requirements
- 20.2.1. QA/QC activities shall be performed in compliance with contractor's QA Program approved by NEK, respectively NEK Quality Specification QS-610 requirements.
- 20.2.2. For the scope of activities included in this contract, the contractor (supplier) shall submit the QA Program specific characteristics.
- 20.2.3. QCP (Quality Control Plan) shall include the requirements for the control of inspection activities (R, W, H, T), applicable codes and standards, QA record types, acceptance criteria.
- 20.2.4. QCP shall be approved by NEK before contract signing and is a part of the contract.
- 20.3. NEK preserves the right to verify the suppliers control activities by using the following methods:
- 20.3.1. Documentation review (Report).
- 20.3.2. QC procedures review (Audits).
- 20.3.3. QC activities witnessing (Witness), testing (Test), obligatory presence (Hold)
- 20.4. NEK activities shall be submitted with the approved QC Plan. Supplier shall provide the preliminary QC Plan as a part of the Bid.
- 20.5. Certificate of Compliance
- 20.5.1. The Supplier shall supply a certificate of compliance to certify that the Motor, materials, instruments, and services provided meet the requirements of this Specification and related purchase order. Any deviation from the Specification or repair to the equipment, which have been accepted in writing by the Purchaser, shall not relieve the Supplier from his responsibility for satisfactory equipment performance in accordance with this Specification.

21. SPECIAL HANDLING

- 21.1 Adequate means for lifting and handling are to be provided for all parts and assemblies. Bracket openings are to be provided for lifting the motor. Special handling tools or devices are to be furnished; standard tools are not. Dimensions of lifting devices are to be shown on outline drawing.

22. SHELF LIFE

- 22.1 The supplier shall provide the on-storage maintenance instructions and procedures in order to assure the RH motor not in service will be properly maintained during 5 or 10 years storage periods.
- 22.2 This instructions and procedures shall be precise to the level required to assure the motor not in service is ready to be put in service in any time during storage periods.

23. 10CFR21 REPORTING

- 23.1 The deliverables per this specification and related order is not subject the provisions of the Title 10 of the U.S. Code of Federal Regulations part 21, Reporting of Defects and Noncompliance shall apply per QS-610 requirements. All of the reporting shall be made to (ING.PDO), STANKO MANOJLOVIĆ ENGINEERING SUPPORT FOR LONG TERM OPERATION SUPERINTENDENT, NUKLEARNA ELEKTRARNA KRSKO, VRBINA 12, 8270 KRSKO, SLOVENIA.



24. COMMERCIAL GRADE DEDICATION

- 24.1 The RH motor supplied under this specification is not a commercial grade item.
- 24.2 The motor shall be designed, manufactured, tested, and delivered as Safety Related Component and shall be in full compliance to this specification.

25. SUPPLIERS DOCUMENTATION REQUIREMENTS

25.1. Drawings

The Supplier shall submit reproducible and print copies of each revision of the following typical drawings

25.1.1. Outline

25.1.2. General assembly with Bill of Material

25.1.3. Terminal box and terminal block details, including dimensions and wiring diagram

25.1.4. Piping and instrument drawing schematically showing oil lubrication flowpaths and associated instruments and accessories.

25.1.5. Motor assembly instrumentation with Bill of Material

25.1.6. Scale drawing of nameplate

25.1.7. Shipping arrangement.

25.1.8. Arrangement of motor assembly bearing lubrication system

25.2. Data

The following data shall appear on the outline assembly drawing:

25.2.1. Overall dimension

25.2.2. Support location and details

25.2.3. Clearance required to remove motor from pump and all other clearances required for maintenance

25.2.4. Weight and center of gravity of the motor assembly

25.2.5. Supplier specification for lubrications to be used

25.2.6. Size, orientation and access space required for electrical connection boxes

25.2.7. All connections to the motor assembly, showing orientation and type of connection

25.2.8. Identification of all parts by a parts list with drawing numbers

25.3. Technical Procedures

The Supplier shall submit the following procedures to the Purchaser

25.3.1. Balancing procedure

25.3.2. Performance Test Procedure

25.3.3. Packing and shipping procedure

25.3.4. Post installation Test procedure



25.3.5. Disassembly and Reassembly Procedure

25.3.6. Long Term Storage and Maintenance Procedure

25.4. Administrative Reports

25.4.1. The Supplier shall provide a draft of the overall project management manual (PMM) with the proposal. Three weeks after contract awarded the final PMM shall be prepared for Purchaser review and concurrence.

25.4.2. Schedule

The Supplier shall submit to the Purchaser prior to the start of fabrication an overall manufacturing and quality plan and production bar chart with which collectively indicate sequence and dates for material requisition, fabrication, operation and tests.

Purchaser will identify inspection, witness and hold point steps he intends to participate.

25.4.3. Progress Reports

The Supplier shall submit a monthly report, indicating the actual fabrication progress, status of engineering and material procurement, specifically noting critical items which affect the final delivery date.

26. NEK PROPRIETARY DATA

26.1. Purchaser has a proprietary interest in all of the drawings, designs, specifications, documents, information or know-how which may be furnished pursuant contract execution and in any know-how, improvement, discovery or invention which may be made, developed or conceived in the performance of work hereunder or which may arise or result therefrom (hereinafter collectively referred to as the "Information"). All such information shall be considered to be proprietary to Purchaser. The right to use of all such information shall be transmitted to the Supplier only for its personnel use and shall be entirely restricted to the performance of the contract and subject to the confidentiality provisions.

27. NON CONFORMANCE REPORTS

27.1. The supplier shall provide a copy of all nonconformance reports as repair or use-as-is disposition of materials during the manufacturing process to utilities only in cases that affect environmental qualification, interchangeability, design or operating parameters generated during manufacture of processing of this order. This report shall include technical justification for nonconformance dispositions. All dispositions which do not return an item to the conditions stated in an approved drawing or specification shall be approved by NEK prior to the shipment of the affected item.

28. REPAIR RECORDS

28.1. A "repair record" must accompany the item(s) when submitted to NEK. The repair record shall include the following information as a minimum:

28.1.1. Summary of repair/refurbishment work that has been performed on the item(s).

28.1.2. Brief analysis of the reason for failure of the item(s).

28.1.3. Details of any "special processes" used during repair that were not used during manufacture.

28.1.4. A list of replacement parts installed in the repaired item(s).

29. SOURCE INSPECTION / SURVEILLANCE NOTIFICATION



- 29.1. The supplier shall provide access to the supplier's plant facilities and records pertaining to this purchase order for the purpose of planning and performing source inspection / surveillance activities. Purchaser requires 15 days advance notice for the purpose of establishing hold points and 15 days advance notice that witness or hold points have been reached. The supplier shall contact the Purchaser designated representative when a witness or hold point has been reached and the supplier will not proceed past that point until inspection has been established or waived by Purchaser.

30. SHIPPING REQUIREMENTS

30.1. Preparation for Shipment

- 30.1.1. Packing, shipping, receiving, storage, and handling shall be in accordance with ANSI N45.2.2. Instrumentation, control equipment, and motor are classified as Level B. The Supplier shall provide his shipping preparation procedures to the Purchaser for review. Provisions shall be made for long term (18 month) indoor storage.
- 30.1.2. Shipment of equipment and components from Supplier's shop to the port of export without Submittal of Supplier's QA Quality Release to the Purchaser's shall not be permitted.
- 30.1.3. Each assembly or part of accessory equipment shall be marked for identification in accordance with Supplier's assembly and layout drawings to facilitate assembly in the field. Shipping containers shall be clearly marked to indicate items enclosed. All subassemblies shall be clearly match-marked to facilitate field identification and erection.
- 30.1.4. Lifting points shall be clearly marked and equipment shall be shipped as completely assembled units to the maximum extent.
- 30.1.5. Instructions Covering Handling, Storage, Installation, and Maintenance at the Krško site shall be prepared and submitted by the Supplier at least two weeks prior the motor arrival at Krško site.

30.2. Marking

- 30.2.1. All components of the equipment shall be clearly identified and where necessary match-marked in such a way as to eliminate any question or confusion at subsequent assembly of motor.
- 30.2.2. Motor assembly shall have a nameplate which includes Manufacturer's name, serial number, year of manufacture, voltage, amperage, power factor, rotation and phase sequence, successive start limitations, temperature rise, locked rotor current, total weights of the stator and rotor. The P.O. and/or S.O. shall be included on the nameplate data for traceability.

31. DELIVERY SCHEDULE

- 31.1. The Supplier shall provide an overall schedule with milestones required to supply the RH motor.
- 31.2. Preliminary production schedule and Quality Plan and PMM will be submitted with proposal. This preliminary schedule shall include all Inspection, Witness and Hold points required by Supplier QA/QC and production standards, design standards and this specification required inspections and tests.
- 31.3. The Purchaser will review this preliminary schedule identify the needed changes of the activities that will be witnessed by Purchaser representative and approve the corrected schedule as a basis for contract award.
- 31.4. Within five weeks of receipt of order, detailed production schedule, quality plan and data submittal schedules are to be provided to Purchaser with the Supplier levels of control (Record, Witness or Hold) specified for QC and QA activities.



31.5. The schedules, shall allow two weeks for approval of items submitted to Purchaser.

The production schedule shall list at least the following steps and their milestones:

1. Contract award
2. Design Completion
3. Approval drawings type and number
4. Material ordering
5. Manufacture steps
6. Hold and Witness Points
7. Tool list and Parts Lists including safety classification
8. Test Procedures and Specifications including acceptance criteria and applicable standards identification.
9. Tests
10. Material certificates
11. QA/QC records identification and acceptance
12. Delivery
13. Preparation for installation at NEK
14. Post installation Startup Test

31.6. The detailed manufacturing and quality plans and associated procedures shall be submitted three weeks prior activity took place in order to enable the Purchaser to participate and witness the control activities and hold points that are required to be verified by Purchaser.

31.7. Purchaser is allowed to wave particular witnesses point participation and for such cases the Supplier performed inspections or tests will be accepted based on Supplier QA/QC records acceptance.

32. HOLD POINTS

32.1. Inspection witness / hold point

32.1.1. Inspection witness / hold point notification by the Supplier shall provide access to the supplier's plant facilities and records pertaining to this specification or related purchase order for the purpose of performing inspection activities in accordance with the quality plan. Purchaser requires two weeks advance notice that witness or hold points have been reached.

33. VENDOR TECHNICAL MANUAL AND REGISTERED UPDATES

33.1. Vendor Technical Manual

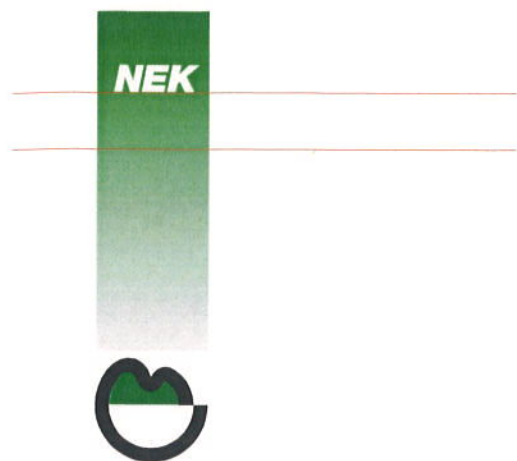
The new motor technical manual and/or instruction book shall be supplied.

34. TRAINING

N/A

35. APPENDICES

- | | |
|----|---|
| A1 | Motor Data Form |
| A2 | N/A |
| A3 | AC Motor Frame 5008P39 Type LLD VSS WP1 Outline drawing 8974D61 |
| A4 | Technical Specification SP-A3000, Rev. 0; Service Level II Coatings Inside NEK Technological Area |
| A5 | Flor Response Spectra, Auxiliary Building, el. 100.300 |
| A6 | ZVNE/SA/EQ-TR, Rev. 7; Development of Environmental Qualification Zone Maps and Conditions (EQTR-44) – EQ Zone Parameters AB-H-05 |



Technical Specification

SP-ES5127

APPENDIX A1 Rev.0

**RHAPRH01, RHAPRH02
MOTOR SPECIFICATION DATA SHEET**

Krško, 24.06.2020



Record of revision pages

Revision	Date	Subject
0	24.06.2020	Original issue



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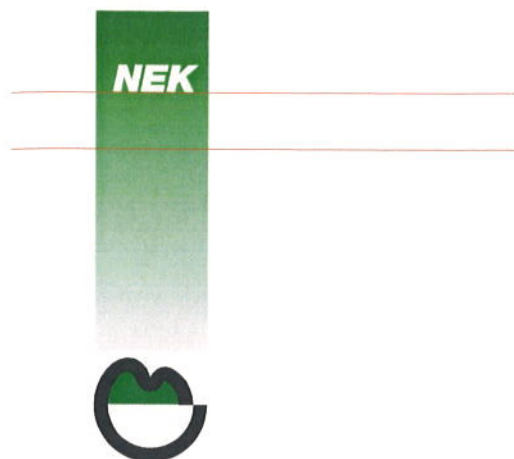
A1.	RHAPRH01, RHAPRH02 MOTOR SPECIFICATION DATA SHEET	1
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RHAPRH01, RHAPRH02 MOTOR SPECIFICATION DATA SHEET		
	Existing Motor	Replacement Motor
Nameplate Data		
Vendor	Westinghouse	
Type	LLD-VSS	
Frame Number	5008P39	
Mounting	Vertical, Solid Shaft	
Rating	250 HP	
Number of Phases	3	
Service Factor	1.15	
Voltage	380 V	
Frequency	50 Hz	
Full Load Current	334 Amps	
LRA	1983	
Design Letter	B	
Ambient Temperature	50 C Maximum	
Rotor Inertia	92.9 FtLb2	
Enclosure	WP1	
Full Load Speed	1474	
DE Bearing Type	Angular Contact, Ball, 7222PDB	
ODE Bearing Type	Ball, 219 S	
Bearing Lubricant	Oil	
Performance Data		
Full Load Torque	890.3 LbFt	
Locked Rotor Torque (% F.L.)	102	
Maximum Torque (% F.L.)	240	
Full Load Efficiency	93.4	
Full Load PF	90.7	
Locked KVA/HP Code	F	
Insulation Class	B (Upgrade to F required on new motor)	
Motor Torque vs. Sped Curve	664448	
Min. Motor Starting Voltage	80 % (304 V)	
Direction of Rotation	CW or CCW	
Motor Duty	Continuous	
Motor Starting Duty	- Motor cold: 2 consecutive starts - Motor at operating temperature: 1 consecutive start - Subsequent starts with motor running between starts is 15 minutes apart - Subsequent starts with motor standing between starts 45 minutes apart	
Motor Load Data		
Driven equipment	Residual Heat Removal Pump	
Pump Type	8 x 22 SPF One Stage	
Pump Impeler Type	Single	
Pump Rating	2250 gpm – 1480 RPM	
Pump Max. Power	270 HP	
Diff. Hd. Max.	315 ft	
Diff. Hd. Min.	265 ft	
Pump Design Pressure	600 psi	
Pump Design Temperature	400 F	
Pump Performance Curves	3773AAA	
Load Inertia referred to Motor Shaft	85 LbFt2	
Shaft Extensions Details		



Motor Shaft Extension Dwg	8974D61	
Diameter	2.7495-2.7500 "	
Length	5.110-5.130 "	
Keyway Dimensions	Per dwg 8974D61	
Shaft Endplay	0.004 to 0.006 "	
Shaft Runout	0.002 " TIR	
Motor Accessories		
Stator winding temperature det.	NO	
Bearing temperature detectors	NO	
Vibration detectors	NO	
Space Heaters	Wrap around, 380 V, 0.53 Amps, 200 Watt	
Motor drawings		
Outline	8974D61	
Assembly		
DE Bearing Assembly		
ODE Bearing Assembly		
Additional Data		
Seismic Qualification	YES	
Vibration Limits - Bearing Housing		
Vibration Limits - Shaft		
Stator to Rotor Radial Air Gape		
Water Immersion Test		
Partial Discharge Test		
Dissipation Factor Test		
Stator Winding Phase Resistance	Line to Line @ 25 C: 0.0196 Ohms	
Stator Winding Impregnation Material	Thermalastic Epoxy	
Stator Winding Method of Impregnation		
Coil Turn Insulation and Description		
Winding Coil Surge Witstand Capability		
Stator Winding Connection Drawing		
Motor Efficiency Evaluation Factor		
Motor Thermal Limit Curve	664449	
Final Finish Painting		



Technical Specification

SP-ES5127

APPENDIX A3 Rev.0

Dwg: 8974D61

AC Motor Frame 5008P39 Type LLD VSS WP1 Outline Drawing



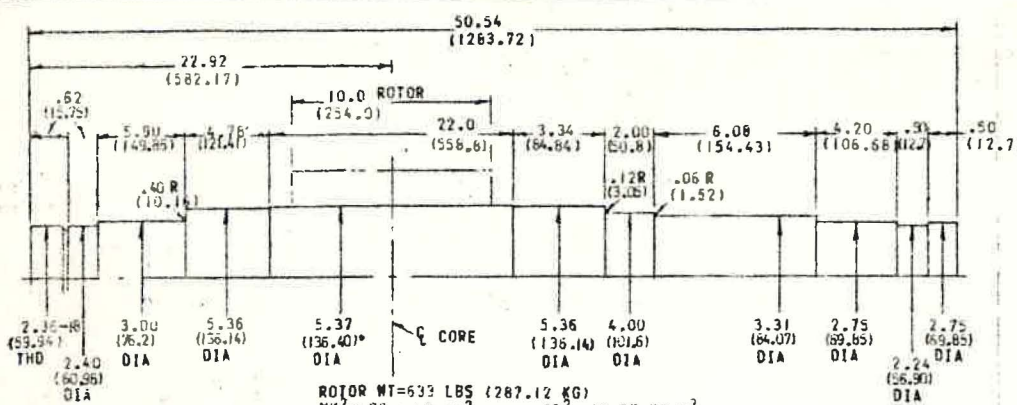
Record of revision pages

Revision	Date	Subject
0	24.06.2020	Original issue



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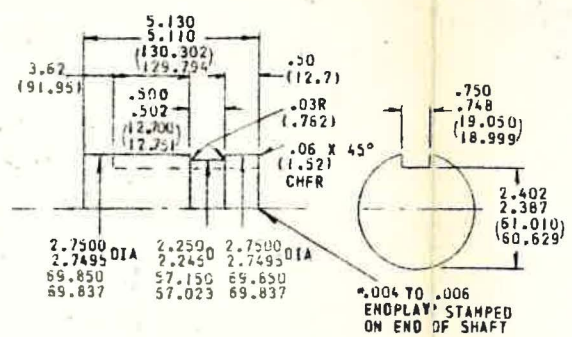
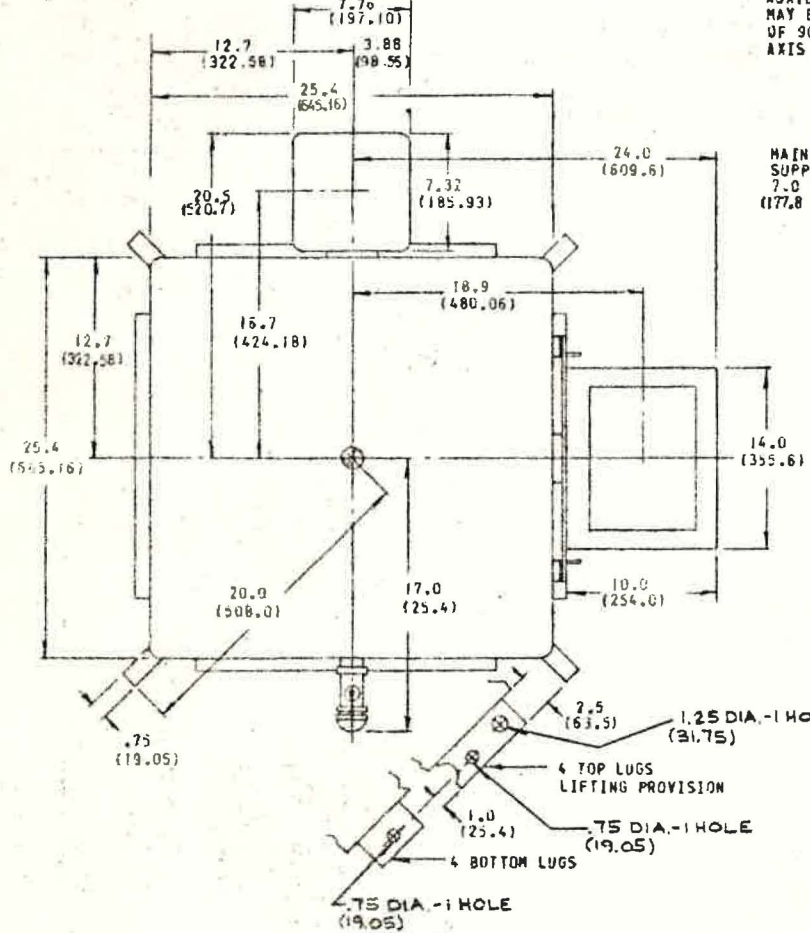
SHAFT DETAIL FOR CUSTOMERS TORSIONAL ANALYSIS

ACCELERATION TIME FOR CUSTOMER SPECIFIED MOTOR LOAD TORQUE		
	SPECIFIED	CALCULATED
1. MINIMUM STARTING VOLTAGE	80% 304 VOLTS	80% 304 VOLTS
2. LOAD INERTIA REFERRED TO MOTOR SHAFT	85 LB FT ²	85 LB FT ²
3. LOAD TORQUE CURVE REFERRED TO MOTOR SHAFT	111-V49-773*	111-V49-773*
4. ACCELERATION TIME	3 SEC	2.33 SEC
5. SPEED-TORQUE DATA		CURVE 66444B

* PACIFIC PUMP DIV. DRESSER INDUSTRIES

AVOID LOCATING MOTOR SO THAT ADJACENT STRUCTURES IMPEDE FLOW OF VENTILATING AIR OR CAUSE RECIRCULATION OF EXHAUST AIR INTO INLET OPENINGS

THESE UNITS MEET NEMA SPECIFICATIONS FOR WEATHER PROTECTED TYPE 1 MOTORS



SHAFT EXTENSION DETAIL

REED FREQUENCY = 1500 CPM

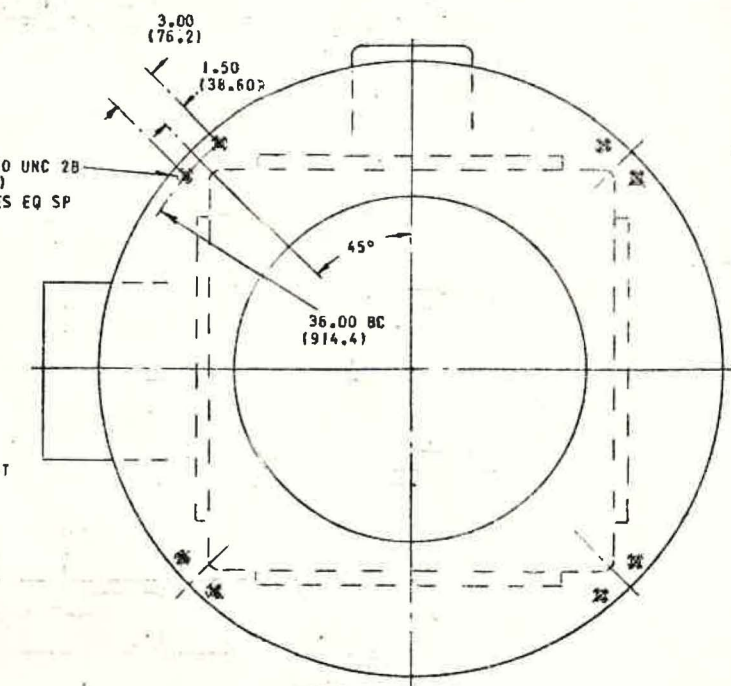
UPPER & LOWER BEARINGS ARE OIL LUBRICATED
STANDARD ROTATION IS CCM WHEN VIEWED FROM TOP OF MOTOR

MAXIMUM VIBRATION OF SHAFT RELATIVE TO MOUNTING FLANGE 2.5 MILS AT LOCATION APPROX 5 IN. (127.0) FROM END OF SHAFT AND IN A PLANE PARALLEL TO LOWER BRACKET FIT.

ROTATION VOLTAGE-SEQUENCE CONNECTIONS
VOLTAGE SEQUENCE T₃-T₂-T₁
MECHANICAL ROTATION CLOCKWISE
FACING END OPPOSITE SHAFT EXTENSION
VOLTAGE SEQUENCE T₁-T₂-T₃
MECHANICAL ROTATION COUNTER-CLOCKWISE
FACING END OPPOSITE SHAFT EXTENSION
NP55853

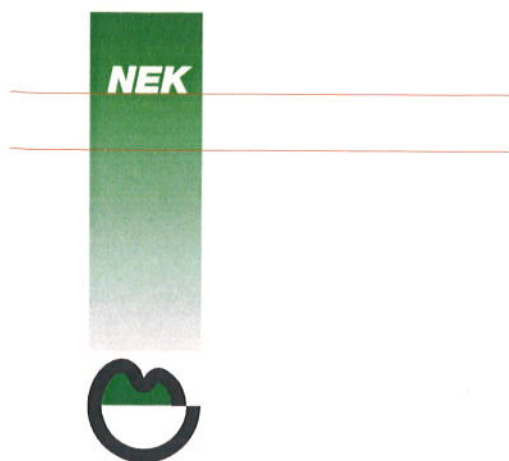
CAUTION
WITH RATED VOLTAGE & FREQUENCY WITHIN NEMA LIMITS AT MOTOR TERMINALS AND WITH CONNECTED LOAD INERTIA NOT EXCEEDING VALUE SHOWN BELOW, THE FOLLOWING STARTING DUTY SHOULD NOT BE EXCEEDED:
LOAD INERTIA AT MOTOR SHAFT 85 LB FT²
MOTOR COLD 2 CONSECUTIVE STARTS
MOTOR AT OPERATING TEMPERATURE 1 CONSECUTIVE STARTS
SUBSEQUENT STARTS WITH MOTOR RUNNING BETWEEN STARTS 15 MINUTES APART
SUBSEQUENT STARTS WITH MOTOR STANDING BETWEEN STARTS 45 MINUTES APART
102P495HD1

Dwg 8974D61 SUB 2
MOTOR RATING & DESCRIPTION
MOTOR TYPE-INDUCTION
SHAFT TYPE VERTICAL-SOLID
THRUST HIGH
FRAME NUMBER 500BP39
HORSEPOWER 250
TIME RATING CONTINUOUS
TEMPERATURE RISE 80°C @ SF
SERVICE FACTOR 1.15
FULL LOAD SPEED 1474 RPM
RATED VOLTAGE 360
FULL LOAD CURRENT 334 AMPS
RATED FREQUENCY 50 HZ
ROTATION CCM OR CCM
AMBIENT TEMP 50°C MAX
CALCULATED MOTOR PERFORMANCE CHARACTERISTICS AT RATED VOLTAGE & FREQUENCY
FULL LOAD 75% LOAD 50% LOAD
% EFFICIENCY 93.4 93.8 93.6
% POWER FACTOR 90.7 89.7 85.7
LOCKED ROTOR CURRENT 1983 AMPS
LOCKED ROTOR POWER FACTOR 27.9%
LOCKED ROTOR TORQUE (% FULL LOAD TORQUE) = 102
MAXIMUM TORQUE (% FULL LOAD TORQUE) = 240
FULL LOAD TORQUE 890.3 LB FT²
MAXIMUM ALLOWABLE STALL TIME: FROM 60°C INITIAL TEMP=16 SECONDS
FROM 30°C INITIAL TEMP=16 SECONDS
STATOR WDG RESISTANCE (LINE TO LINE @ APPROXIMATELY 25°C) .0196 OHMS
NOISE LEVEL ON "C" SCALE 92DB @ 3 FT & NO LOAD
ACCELERATION TIME @ RATED VOLTAGE = 1.06 SECONDS WITH CONNECTED LOAD INERTIA & TORQUE. SEE CURVE 664449
THERMAL LIMIT CURVE 664449
MOTOR BEARING & LUBRICATION DATA
BEARING TYPE ANGULAR CONTACT BALL (THRUST BRG)-BALL (GUIDE BRG)
BEARING PART NO 7222PDB (THRUST)- 219S (GUIDE)
LUBRICANT TYPE OIL
QUANTITY OF LUBRICANT 3 QUARTS
RECOMMENDED LUBRICANT R30 INHIBITED OIL, 200 SSV VISCOSITY @ 100°F
THRUST BEARING RATED CAPACITY (3.09 YEARS 8-10 LIFE) 4200 LB (EXTERNAL)
ACCESSORIES
SPACE HEATERS WRAP AROUND TYPE 360 V .53 AMP 200 WATT
SPECIFIED THRUST - 4200 LBS. CONTINUOUS UP AND DOWN
5250 LBS. MOMENTARY UP AND DOWN.
MAXIMUM IMBALANCE PER END (BALANCING PLANE) IS 1.5 OZ - INCHES.



WPNR SPIN NO KRK-RHAPRH-01/02
PACIFIC PUMPS 50 V49-773
NUCLEAR SAFETY RELATED

WESTINGHOUSE ELECTRIC CORPORATION	
TITLE AC MOTOR FRAME 500BP39 TYPE LLD VSS WPI	
OUTLINE	
DIMENSIONS IN INCHES - SCALE	
DATE	APPD.
REV.	APPD.
8974D61	
DIV. & PLANT LOCATION	
BUFFALO DIVISION, BUFFALO, N.Y., U.S.A.	



Technical Specification

SP-ES5127

APPENDIX A4 Rev.0

**Technical Specification SP-A3000, Rev.0
Service Level II Coatings Inside NEK Technological Area**

Krško, 24.06.2020



Record of revision pages

Revision	Date	Subject
0	24.06.2020	Original issue



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Elektroma Krško MASTER DOCUMENT	
Date Received:	01-03-2017
Log Number:	259815

TECHNICAL SPECIFICATION

SERVICE LEVEL II COATINGS

INSIDE NEK TECHNOLOGICAL AREA

KRŠKO NUCLEAR POWER PLANT

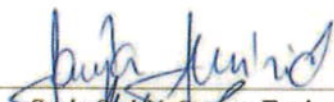
SP-A3000

February 2017

Revision 0

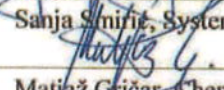
Augmented Quality

Written by:


Sanja Smirnič, System Engineer

Date: 15/02/2017

Verified by:


Matjaž Gričar, Chemistry Superintendent

Date: 15/02/2017

Reviewed by:


B. Bohorč, Civil Maintenance Superintendent

Date: 21/02/2017

Reviewed by:


QA Reviewer

Date: 27.02.17

Approved by:


Janko Cerjak, EDC Superintendent

Date: 28/02/2017

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1.0 SCOPE

1.1. Scope of work

This specification defines surface protection of steel constructions, components (SCCs) and buildings in NEK areas subject to radiation exposure (Service Level II coatings) which are classified as Augmented Quality (AQ).

The selection of adequate coating and related coating work process must comply to requirements regarding Selection and Qualification of coating system, Preparation of substrates, Application of coating system(s), Testing and Inspection Requirements, Personnel Qualification Requirements and Receipt and Storage of protective coating system.

1.2. Work included

The work defines required activities for selection and qualification of adequate coating materials, technical evaluation of coating materials performance, application procedures and applicator's verification, requirements for material application, testing and inspection.

Supplier/Subcontractor shall be responsible for ordering, purchasing, receiving, storage and control of coating materials. Some coating materials may be purchased and stored by NEK (if agreed between NEK and Supplier/Subcontractor).

No change in material selection will be permitted after submittal of the Proposal without written approval of NEK.

1.3. Work not included

Coatings for the following Service Levels and specific locations are not included in this specification:

- Service Level I coatings.
- Service Level III coatings.
- BOP coatings.
- Coatings for control, instrumentation and measuring panels, and electrical boxes (covered by specification TSP 01/2015).
- Coatings outside the technological part of plant.

1.4. Coating damages and coating repairs

After application of surface protection coating system(s) no surface damages are allowed. All damaged areas shall be repaired. Repair of surface protection is responsibility of individual department that contracted service and Subcontractor performing coating application work.

2.0 DEFINITIONS

- 2.1. **Coating Service Level II (SL II)** is a term used to describe areas where coating failure could impair but not prevent normal operating performance. The functions of Service Level II coatings are to provide corrosion protection and decontaminability in those areas outside the reactor containment that are subject to radiation exposure and radionuclide contamination. Service Level II coatings are classified as Augmented Quality (AQ) at NEK site.

SL II coatings at NEK site shall be applied on SCCs and buildings outside Containment Vessel – inside Reactor Building (Annulus Area), on surfaces inside Auxiliary Building (AB), Fuel Handling Building (FHB), Radwaste Storage Area (RWS), Waste Manipulation Building (WMB), Decontamination Building (DB), Control Building on elevation 100.3 (Health Physics) and Component Cooling Building (CCB) on elevation 94.21, room 03A.

- 2.2. **Steel Constructions and Components (SCCs)** is a term used for carbon and low alloy steel constructions, pipelines, valves, pumps and any other equipment or equipment parts.

- 2.3. **Augmented Quality Coatings (AQ Coatings)** is a term used to describe a group of protective coatings applied on SCCs and buildings:

- outside Reactor Containment Vessel that are subject to radiation exposure (Service Level II coatings),
- surfaces inside FME (Foreign Material Exclusion) zones,
- protective coatings in heavy or demanding corrosion exposures:
 - C5-I – very heavy industrial atmospheric,
 - Im 1 – immersion in fresh/sweet water and
 - Im 3 – immersion in soil/buried SCCs,
- Some SCCs surface protection with coatings on equipment listed on Q list (where applicable – as assessed by Nuclear Coating Specialist) and
- Protective coatings on hard to reach areas and/or areas where condition surveillance/inspection is not often (on 5 years or even less often).

- 2.4. **Balance of Plant Coatings (BOP Coatings)** is a term used to describe a group of non safety related coatings applied on external and internal surfaces of secondary plant, buildings and equipment, including Intermediate Building (IB) and remaining parts of Component Cooling (CCB) Building and Control Building (CB).

- 2.5. **Coating and/or lining** is a protective, decorative and/or anyway different functional on surface adhered, one or multi layer film of polymer, inorganic, metal and/or composite material in solid or semisolid (viscoelastic) aggregate state.

- 2.6. **Coating material** is liquid, melt or dust, which is applied on surface to form coating due to means of solvent evaporation, chemical reaction, cooling or melting. Coating material is raw material or semi finished product which applied to the surface with proper technology.
- 2.7. **Surface protection with coatings** is a term which combines all needed activities (design, qualification, material purchasing and storage, surface preparation, material application/curing, inspection, performance monitoring and maintenance) for adequate coatings performance.
- 2.8. **Coating work** is an all-inclusive term to define all operations required to accomplish a complete coating job. The term shall be construed to include materials, equipment, labor, preparation of surfaces, control of ambient conditions, application and repair of coating systems, and inspection (Ref. 3.10).
- 2.9. **Coating work inspection** is a phase of quality control that by way of examination, observation, or measurement determines the conformance of materials, supplies, components, parts, appurtenances, systems, processes, or structures to predetermined quality requirements (Ref. 3.12).
- 2.10. **Coating Technical Specification** is a document which defines quality and qualification requirements for coating materials, coatings/linings, personnel, equipment and coating contractor on basis of NPP Krško specifications and legislation.
- 2.11. **Coating Technology** is a document which defines commercial qualities of coating materials, work activities/phases for surface preparation, coating application/curing and inspection for performance of surface protection with coatings/linings.
- 2.12. Other coating related definitions and terminology are defined in ASTM D16 and ASTM D4538.

3.0 CODES, STANDARDS, REGULATORY

- 3.1. ASTM C868-02: Test Method for Chemical Resistance of Protective Linings.
- 3.2. ASTM D16-16: Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- 3.3. ASTM D714-02 (2009): Test Method for Evaluating Degree of Blistering of Paints.
- 3.4. ASTM D3276-15e1: Standard Guide for Painting Inspectors (Metal Substrates).

- 3.5. ASTM D3843-00 (Reapproved 2008): Standard Practice for Quality Assurance for Protective Coatings Applied to Nuclear Facilities.
- 3.6. ASTM D3912-10: Standard Test Method for Chemical Resistance of Coatings and Linings for Use in Nuclear Power Plants.
- 3.7. ASTM D4060-14: Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- 3.8. ASTM D4227-05 (Reapproved 2012): Standard Practice for Qualification of Coating Applicators for Application of Coatings to Concrete Surfaces.
- 3.9. ASTM D4228-05 (Reapproved 2012): Standard Practice for Qualification of Coating Applicators for Application of Coatings to Steel Surfaces.
- 3.10. ASTM D4286-08 (Reapproved 2015): Standard Practice for Determining Coating Contractor Qualifications for Nuclear Powered Electric Generation Facilities.
- 3.11. ASTM D4417-14: Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
- 3.12. ASTM D4537-12: Standard Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating Work Inspection in Nuclear Facilities.
- 3.13. ASTM D4538-15: Standard Terminology Relating to Protective Coating and Lining Work for Power Generation Facilities.
- 3.14. ASTM D4541-09: Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- 3.15. ASTM D5064-16a: Standard Practice for Conducting a Patch Test to Assess Coating Compatibility.
- 3.16. ASTM D5139-12: Standard Specification for Sample Preparation for Qualification Testing of Coatings to be used in Nuclear Power Plants.
- 3.17. ASTM D5144-08: Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants.
- 3.18. ASTM D5161-04: Standard Guide for Specifying Inspection Requirements for Coating and Lining Work (Metal Substrates).
- 3.19. ASTM D5498-12a: Standard Guide for Developing a Training Program for Personnel Performing Coating Work Inspection for Nuclear Facilities.

- 3.20. ASTM D6577-15: Standard Guide for Testing Industrial Protective Coatings.
- 3.21. ASTM D6677-07 (Reapproved 2012): Test Method for Evaluating Adhesion by Knife.
- 3.22. ASTM D6943-15: Standard Practice for Immersion Testing of Industrial Protective Coatings.
- 3.23. ASTM D7108-12: Standard Guide for Establishing Qualifications for a Nuclear Coatings Specialist.
- 3.24. ASTM D7234-12: Coating Adhesion Testing – Concrete.
- 3.25. Manual of Coating Work for Light-Water Nuclear Power Plant Primary Containment and other Safety-related Facilities (ASTM Subcommittee D01.43; 1979).
- 3.26. Electric Power Research Institute, “Guideline on Nuclear Safety-Related Coatings, Revision 2,” EPRI Formerly TR-109937 and 1003102, December 2009.
- 3.27. Safety Series No. 48, Manual of Decontamination Surfaces, IAEA, 1979.
- 3.28. ANSI N45.2-1972, Quality Assurance Program Requirements for Nuclear Power Plants.
- 3.29. ANSI N45.2.2-1972, Packing, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants.
- 3.30. ANSI N101.4-1972, Quality Assurance for Protective Coatings Applied to Nuclear Facilities.
- 3.31. RG 1.54, Revision 2, Service Level I, II and III Protective Coatings Applied to Nuclear Power Plants, U.S. Nuclear Regulatory Commission, Washington, DC, July 2010.
- 3.32. 10CFR50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.
- 3.33. 10CFR21, Reporting of Defects and Non-compliance.
- 3.34. ISO 4628-2:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 2: Assessment of degree of blistering.

- 3.35. ISO 4628-3:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting.
- 3.36. ISO 4628-4:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 4: Assessment of degree of cracking.
- 3.37. ISO 4628-5:2016: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 5: Assessment of degree of flaking.
- 3.38. ISO 2409:2013: Paints and varnishes - Cross-cut test.
- 3.39. ISO 1514:2016: Paints and varnishes - Standard panels for testing.
- 3.40. ISO 4624:2016: Paints and varnishes - Pull-off test for adhesion.
- 3.41. ISO 12944 (parts 1-8) (1-4:1998, 5:2007; 6-8:1998): Paints and varnishes – Corrosion protection of steel structures by protective paint systems.
- 3.42. ISO 8501-1:2007: Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.
- 3.43. ISO 8501-2:1994: Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 2: Preparation grades of previously coated steel substrates after localized removal of previous coatings.
- 3.44. ISO 8501-3:2006: Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 3: Preparation grades of welds, edges and other areas with surface imperfections.
- 3.45. ISO 8503-3:2012: Preparation of steel substrates before application of paints and related products, Surface roughness characteristics of blast-cleaned steel substrates.
- 3.46. NACE TM0174 Laboratory Methods for the Evaluation of Coating Materials and Lining Material on Metallic Substrates in Immersion Service.
- 3.47. NACE TM0404 Offshore Platform Atmospheric and Splash Zone New Construction Coating System Evaluation.

- 3.48. Joseph V. Koleske, Paint and Coating Testing Manual, 15th Ed., ASTM Stock Number, MNL17-2ND.
- 3.49. QS-610, rev 1: Generic Quality Assurance Program Requirements.
- 3.50. DIN 55634:2010-04: Beschichtungsstoffe und Überzüge - Korrosionsschutz von tragenden dünnwandigen Bauteilen aus Stahl.
- 3.51. ETAG 018 (Parts 1 & 3: 2013, Part 2: 2011, Part 4: 2012), Guideline for European technical approval of fire protective products.

4.0 DOCUMENT SUBMITTAL

- 4.1. Information and documentation to be supplied with the Proposal shall include but not be limited to the following (NEK Nuclear Coating Specialist shall review and evaluate submitted documentation stated below):

- 4.1.1 Quality Assurance

The coating and/or lining Supplier/Manufacturer shall submit declaration about QA program, which should conform to applicable contents of QS-610, rev 1: 1.6, 1.7, 3.1, 4.2, 4.4.6, 4.4.7, 4.5.1, 4.6, 4.8.1, 4.9, 4.11.7, 4.14, 4.15, 4.16 and 4.17.

- 4.1.2 Products Information and Characteristics

The coating and/or lining Supplier/Manufacturer shall provide products information and characteristics (NACE TM0404). Following information and documents shall be provided:

- Product data sheets (PDS) – Manufacturer's guidelines for Surface Preparation, Application, Curing and Storage of Coating Material.
- Material safety data sheets (MSDS) – latest revision of MSDS (in Slovenian language – if applicable) shall be prepared in compliance with Commission Directive 1272/2008/EC and REACH 1907/2006 and shall be submitted together with the Proposal.
- Manufacturer (contact information, contact persons).

- 4.1.3 Coating Technology

The coating and/or lining Supplier/Manufacturer or coating contractor shall submit proposal of Coating Technology for surface protection. Coating Technology shall at least provide:

- Limitations considering ambient and material condition.
- Required surface preparation (NACE/SSPC-SP, ISO 8501), surface profile (ASTM D4417, ISO 8503).

- Protective coatings/linings and/or any other repair composite materials (extent, range of thicknesses, commercial names).
- Application instructions with all needed data for: surface preparation, coating application, material preparation, coating curing and limitations considering coating application (Coating Supplier/Manufacturer).

4.1.4 Qualification Test Reports

A copy of the Qualification Test Reports shall be supplied with the Proposal and shall include required tests determined by NEK Nuclear Coating Specialist. Qualification Test Reports shall provide with reasonable assurance that properly applied surface protective system will provide proper performance within Coating Technology.

NOTE: Submittal of the qualification test reports is not necessary for the qualified coating systems already used and approved by NEK. Traceability to technical reports shall be notified.

- 4.2. Training program, qualification and certification of application personnel of coating work shall be in compliance with ASTM D4227 and ASTM D4228.
- 4.3. Training program, qualification and certification of inspectors of coating work shall be in compliance with ASTM D5498 and ASTM D4537 or ASTM D7108.
- 4.4. Statement of Guarantee.
- 4.5. Information and Documentation to be supplied with the Shipment
 - 4.7.1 Certificate of Conformance.
 - 4.7.2 Qualification Report(s) which certifies that Coating Material is suitable for plant-specific application.
 - 4.7.3 Design Change Documentation for alternate replacement coating – if applicable.
 - 4.7.4 Batch Attest Data (minimum requirements):
 - Name of product,
 - Batch number,
 - Date of manufacture,
 - Specific weight or density (optional),
 - Percentage of solids by volume (optional),
 - Viscosity (optional)...

5.0 GENERAL REQUIREMENTS

- 5.1. Prior to the start of coating work there shall be field meeting between NEK (representative of responsible discipline and Nuclear Coating Specialist) and Supplier/Subcontractor.
- 5.2. All phases of coating work shall be reviewed to assure complete understanding of all specific requirements and coating specifications.

6.0 DESIGN REQUIREMENTS

- 6.1. When selecting appropriate coating system(s) several factors should be considered such as:
 - Service conditions (temperature, humidity, immersion, fluid type...),
 - Type of substrates to be coated,
 - Exposure to radiation,
 - Flow conditions,
 - Thermal conductivity,
 - Surface burning characteristics,
 - Surface preparation requirements,
 - Chemical resistance,
 - Resistance to wear,
 - Coating adhesion properties,
 - Conditions/performance of existing surface protection,
 - Durability and
 - Accessibility.

7.0 PERFORMANCE REQUIREMENTS

- 7.1. Testing requirements shall provide reasonable assurance that properly applied surface protection will be suitable for the intended service for extended period of time.
- 7.2. Materials used as **SL II coatings** shall pass specific testing requirements (where applicable) as stated in Appendix A of this Specification.

8.0 STORAGE, MIXING AND PREPARATION OF PAINT

- 8.1. Coating materials shall be treated in compliance with recommendations in ANSI N45.2.2. for LEVEL B goods (Level B goods are those that are sensitive to environmental conditions and require measures for protection from the effects of temperature extremes, humidity and vapors, acceleration forces, physical damage, and airborne contamination – ref. 3.29).
- 8.2. No paint shall be used or stored after expiration of Shelf Life.
- 8.3. Mixing
 - 8.1.1 Use mixing equipment recommended by the paint Manufacturer.
 - 8.1.2 Use only originally sealed, intact, identified and undamaged paint containers.
 - 8.1.3 Materials that are mixed and not used prior to expiration of Pot Life of the coating shall be discarded.
- 8.4. Thinners and Solvents
 - 8.2.1 Catalysts, thinners and other components shall be added only in the exact quantities specified by the paint Manufacturer.
 - 8.2.2 Use only thinners specified by paint Manufacturer if required.
 - 8.2.3 Use of thinners shall not affect the final quality of protective coatings.

9.0 SURFACE PREPARATION AND COATING APPLICATION

- 9.1. Coating contractor shall meet requirements as stated in Appendix B of this Specification.
- 9.2. Surface preparation
 - 9.1.1 Surface preparation cleanliness, surface profile and other applicable prerequisites shall be consistent with Coating Technology.
 - 9.1.2 Surface preparation depends on several factors such as: type and condition of substrate, condition of existing coating and service environment.
 - 9.1.3 Design and metal finishing requirements considering accessibility, treatment of narrow gaps/blind crevices, preparation grades of welds, edges and/or other areas with surface imperfections.
 - 9.1.4 Surface preparation requirements as needed and/or applicable: surface preparation grades, surface roughness, chemical contamination removal (limits), degreasing, dust removal...
 - 9.1.5 Application of coatings by Supplier/Subcontractor signifies acceptance of the surfaces and responsibility for the performance of coatings applied.

- 9.1.6 Previously shop primed ferrous metals shall be cleaned in accordance with SSPC-SP1 (in case when shop primer is compatible with selected coating system).
- 9.1.7 Immediately report any defects which could adversely affect the quality of coating application.
- 9.3. Coating application
 - 9.2.1 Surface temperature shall be at least 3 degrees above the dew point before painting can proceed.
 - 9.2.2 Relative humidity shall not exceed 80%.
 - 9.2.3 During application and curing process temperature and humidity shall be within specified limits as recommended by paint Manufacturer. This might require usage of additional climatic control equipment (heaters, dehumidifiers) to provide conformity with scheduled work plan.
 - 9.2.4 In conjunction with environmental control temporary enclosure(s) may be required during the preparation, painting and curing operations.
 - 9.2.5 Stainless steel, galvanized and aluminum surfaces shall not be blasted or painted unless otherwise specified. Such surfaces shall be fully protected when they are in proximity to blasting and painting operations.
 - 9.2.6 Filters and openings shall be covered to avoid defilement and clogging during cleaning, blasting and painting operations.
 - 9.2.7 Dry film thickness and number of coat layers shall be in accordance with Coating Technology.
 - 9.2.8 Coating materials shall be compatible: finished coats shall be compatible with existing primed surfaces; coatings for repairs shall be compatible with existing coatings... Use only coating materials specified in Appendix C or defined and approved materials from NEK Nuclear Coating Specialist.
 - 9.2.9 Where practical use a different color shade to identify each coat prior to the final coat.

10.0 QUALIFICATION OF APPLICATION PROCEDURES AND APPLICATOR'S VERIFICATION

- 10.1. Coating contractor shall provide application procedure in compliance with coating Manufacturer application instructions/procedures, coating material documentation and requirements of Coating Technology.
- 10.2. All additional requirements concerning execution of surface protection are defined in Appendix B of this Specification.

11.0 TESTING AND INSPECTION

- 11.1. Inspection personnel shall be qualified according to ASTM D5498 and ASTM D4537 or meet the criteria for Nuclear Coating Specialist, defined in ASTM D7108 or other equivalent standards.
- 11.2. Inspection equipment shall be regularly calibrated, verified and certified as applicable for each type of equipment.
- 11.3. All additional requirements regarding testing and inspection are defined in Appendix B of this Specification.

APPENDIX A

QUALIFICATION REQUIREMENTS FOR SURFACE PROTECTION WITH PROTECTIVE COATINGS AND LININGS IN COATING SERVICE LEVEL II AREA AT KRŠKO NUCLEAR POWER PLANT

Augmented Quality

Testing requirements shall provide reasonable assurance that properly applied surface protection will be suitable for the intended service for extended period of time. Qualification requirements are specified in Coating System Specification. Usually specified requirements are listed below:

I. General requirements:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- Appropriate for established exposure (ISO 12944-5 or for thin walled structures DIN 55634),
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Chemical resistance (ANSI N5.12, ASTM D3912 or similar) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

II. Additional requirements:

NEK Nuclear Coating Specialist shall define additional specific requirements based on protective coating system or location, for example:

- Coatings for fire protection of steel elements – R30 (ETAG 018),
- Floor coatings – flame-spreading rate max. 50 (ASTM E84) or total dry film thickness of protective coating system shall not exceed 3 mm,
- Abrasion: min. 175 (ASTM D4060 or similar),
- Impact resistance (ASTM G14 or similar),
- Verification of maintenance protective coating system for FME areas,
- Dry temperature resistance testing and
- Sustainability to moisture max. 20-70 µm/200 frictions (EN 13300).

APPENDIX B

REQUIREMENTS FOR EXECUTION OF SURFACE PROTECTION WITH PROTECTIVE COATINGS AND LININGS IN COATING SERVICE LEVEL II AREA AT KRŠKO NUCLEAR POWER PLANT

Augmented quality

These requirements shall provide reasonable assurance that coating Supplier/Subcontractor has proper competence and ability to perform surface protection in compliance with this specification.

- Evaluation of coating Supplier/Subcontractor competence (ASTM D4286 or similar),
- Coating Manufacturer and coating Supplier/Subcontractor shall have QA program in accordance with NEK QS-610, ISO 9001 or similar,
- All coating materials shall be properly verified (batch certificates, additional laboratory testing – if required),
- Full traceability of coating materials from purchase till application shall be provided,
- Qualification of personnel for protective coating application (ASTM D4227, ASTM D4228 or similar),
- Qualification of inspection personnel as required by ASTM D5498, ASTM D4537 and/or ASTM D7108,
- Approved Coating Technology by coating Supplier/Subcontractor,
- Approved inspection plan in compliance with Coating System Specification (ASTM D5498 – severe for metal, ASTM D6237 or similar for concrete).

APPENDIX C

SURFACE PROTECTION SYSTEMS WITH PROTECTIVE COATINGS AND LININGS IN COATING SERVICE LEVEL II AREA AT KRŠKO NUCLEAR POWER PLANT

Augmented quality

I. FLOORING

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Chemical resistance (ANSI N5.12, ASTM D3912 or similar),
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar),
- Abrasion: min. 175 (ASTM D4060 or similar),
- Impact resistance (ASTM G14 or similar),
- Floor coatings – flame-spreading rate max. 50 (ASTM E84) or total dry film thickness of protective coating system shall not exceed 3 mm and
- Verification of maintenance protective coating system for FME areas on elevation 107.62 and above in Fuel Handling Building (FHB).

i. Floors for heavier mechanical loads

First protection:

- proper surface preparation (sand-blasting or chemical treatment),
- 1× impregnation Amerlock Sealer,
- 1× surfacer Nu-Klad 110AAN, 3mm,
- 1-2× top-coat Amercoat 90N, total DFT 125µm.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× local impregnation Amerlock Sealer,
- 1× local surfacer Nu-Klad 110AAN, 3mm,
- 1-2× top-coat Amercoat 90N, 1-2× 60-70µm.

ii. Floors for lighter mechanical loads

First protection:

- proper surface preparation (sand-blasting or chemical treatment),
- 1× impregnation Amerlock Sealer,
- 1-2× top-coat Amercoat 90N, total DFT 125µm.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× local impregnation Amerlock Sealer,
- 1-2× top-coat Amercoat 90N, 1-2× 60-70µm.

II. WALLS AND CEILINGS

i. Walls up to 2m height (from floor)

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Chemical resistance (ANSI N5.12, ASTM D3912 or similar) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- proper surface preparation (sand-blasting or chemical treatment),
- 1× impregnation Amerlock Sealer,
- 1× surfacer Nu-Klad 110AAN, 1mm,
- 1-2× top-coat Amercoat 90N, total DFT 125µm.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× local impregnation Amerlock Sealer,
- 1× local surfacer Nu-Klad 110AAN, 1mm,
- 1-2× top-coat Amercoat 90N, 1-2× 60-70µm.

ii. Walls above 2m from floor, ceilings

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar) and
- Sustainability to moisture max. 20-70 µm/200 frictions (EN 13300).

First protection:

- proper surface preparation (sanding, grinding...),
- 1× impregnation Akрил emulzija,
- 1-2× latex leveling putty Jubolin kit F, 1-2mm,
- 2× latex top-coat Acrylcolor.

Repair and Maintenance:

- proper surface preparation (sanding, grinding),
- 1× impregnation Akрил emulzija,
- 1-2× local latex leveling putty Jubolin kit F, 1-2mm,
- 2× latex top-coat Acrylcolor.

III. STEEL CONSTRUCTIONS

i. Steel constructions, pipelines, components and equipment on atmospheric exposures

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C3-medium, high durability (ISO 12944-1/2) in RB ("Annulus"), AB, FHB, applicable parts of CCB, CB and HP,
- Appropriate for exposure C4-medium, high durability (ISO 12944-1/2) in FHB – el. 107 and above, RWS, DB and WMB,
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below),
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- proper surface preparation (Sa 2.5 – ISO 8501-1),
- 2× red-lead primer TT-P-86 minij, 2× 35µm,
- 2× long-oil alkyd top-coat Extra Oplatin emajl, 2× 35µm.

Repair and Maintenance:

- proper surface preparation (P St3 – ISO 8501-2),
- 2× red-lead primer TT-P-86 minij, 2× 35µm
- 2× long-oil alkyd top-coat Extra Oplatin emajl, 2× 35µm.

ii. External surfaces of containment vessel (RB)

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C3-medium, high durability (ISO 12944-1/2),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- Grit-blasting (Sa 2.5 – ISO 8501-1),
- 1× inorganic Zinc silicate primer Dimetcote 6N, 75 µm.

Repair and Maintenance:

- proper surface preparation (P St3 – ISO 8501-2),
- 1-2× epoxy top-coat Amercoat 90N or Carboguard 890N, 1-2× 60-70µm.

iii. Internal surfaces of FHB facade sheets

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C4-medium, high durability (DIN 55643, Zinc galvanized surfaces),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064),
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below) and
- Adhesion resistance: min. 200 psi (ASTM D4541 or similar).

First protection:

- Degreasing,
- 1× epoxy primer Rezistol temelj E, 25µm,
- 1-2× epoxy top-coat Amercoat 66, 125µm.

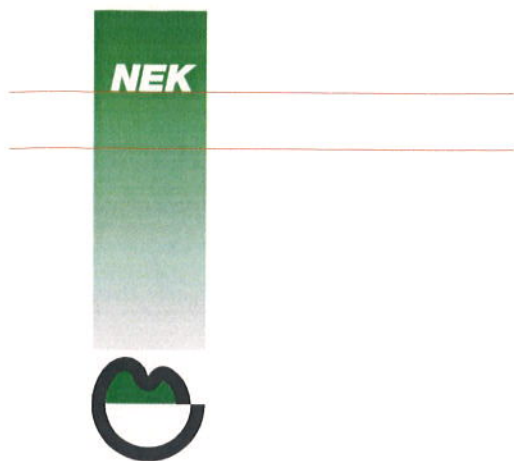
iv. Roof construction in FHB – Fire Protection

Requirements for coating system qualification:

- Identification of coating materials (commercial names, components – if applicable, manufacturer's contact information),
- Appropriate for exposure C4-medium, high durability (DIN 55643, Zinc galvanized surfaces),
- Coatings for fire protection of steel elements – R30 (ETAG 018),
- Reference to NEK Coating Technical Specification or Coating Technical Specification proposal,
- For maintenance purpose proposed protective coating systems shall be compatible with existing coatings (compatibility testing shall be performed by NEK, on site, in compliance with ASTM D5064) and
- Protective coatings shall have proper characteristics for decontamination (historically decontamination factor defined by ANSI N5.12, ASTM D4256: DF 5-20; proper generic coating type – epoxy; and proper chemical and physical properties as stated below).

First protection:

- Gritblasting (Sa 2.5, ISO 8501-1),
- 2× red-lead primer TT-P-86 minij, 2× 30-40µm,
- 4× intumescent coating Pirostop M, 4×250µm,
- 1-2× acrylic top-coat Vinilux, 2× 30µm.



Technical Specification

SP-ES5127

APPENDIX A5 Rev.0

**Flor Responsible Spectra,
Auxiliary Building, el. 100.300; Figures 37, 38, 39 and 40**



Record of revision pages

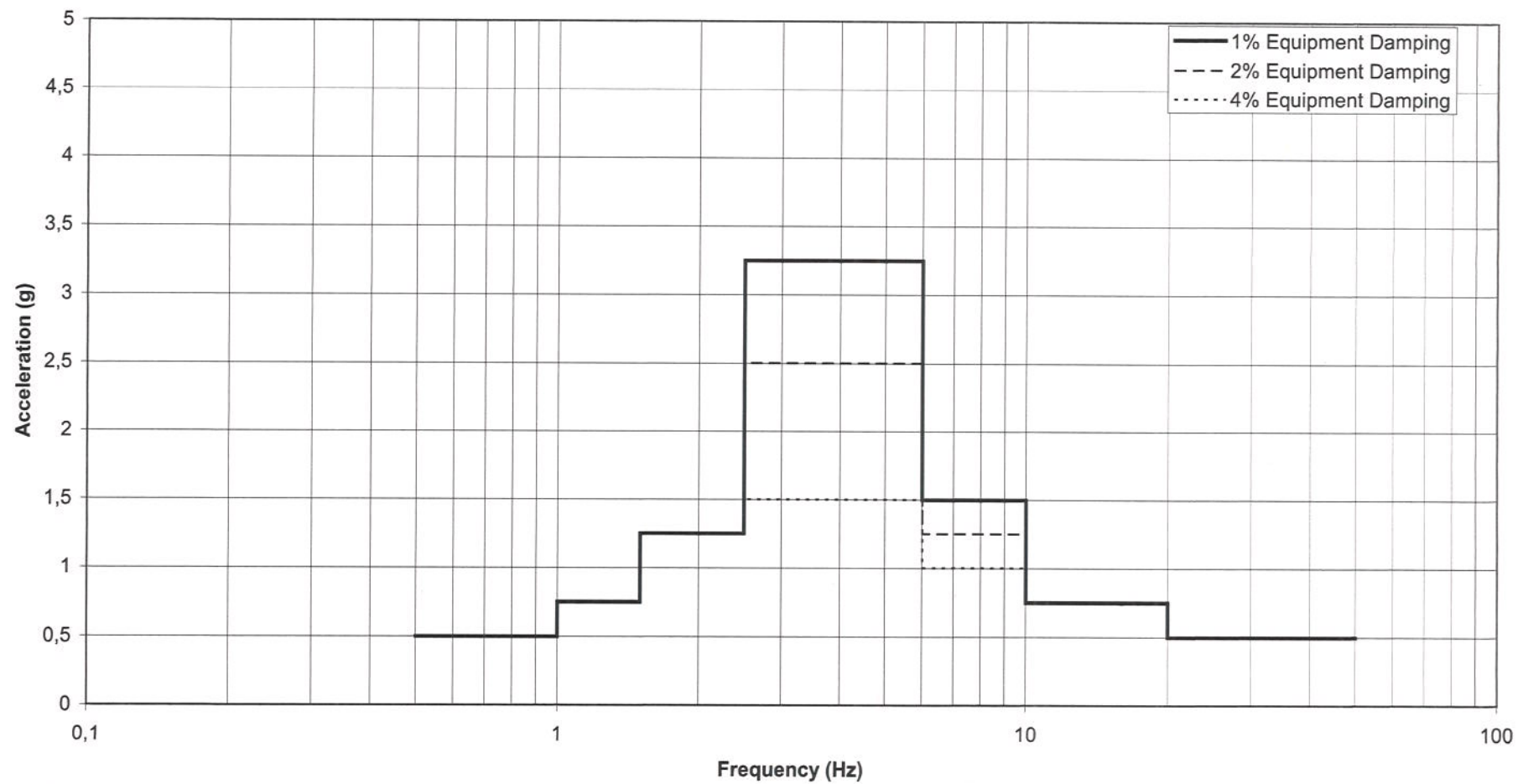
Revision	Date	Subject
0	24.06.2020	Original issue



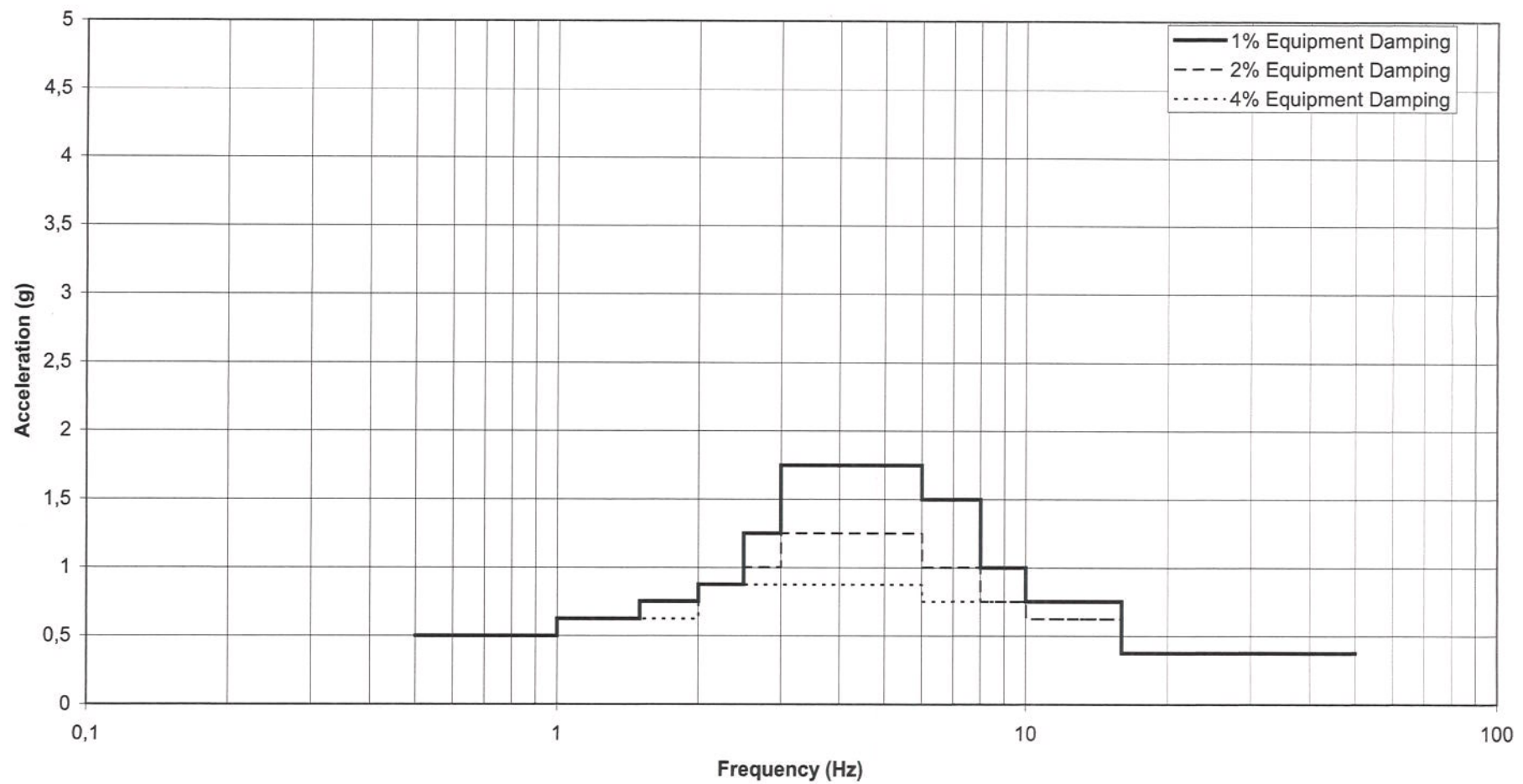
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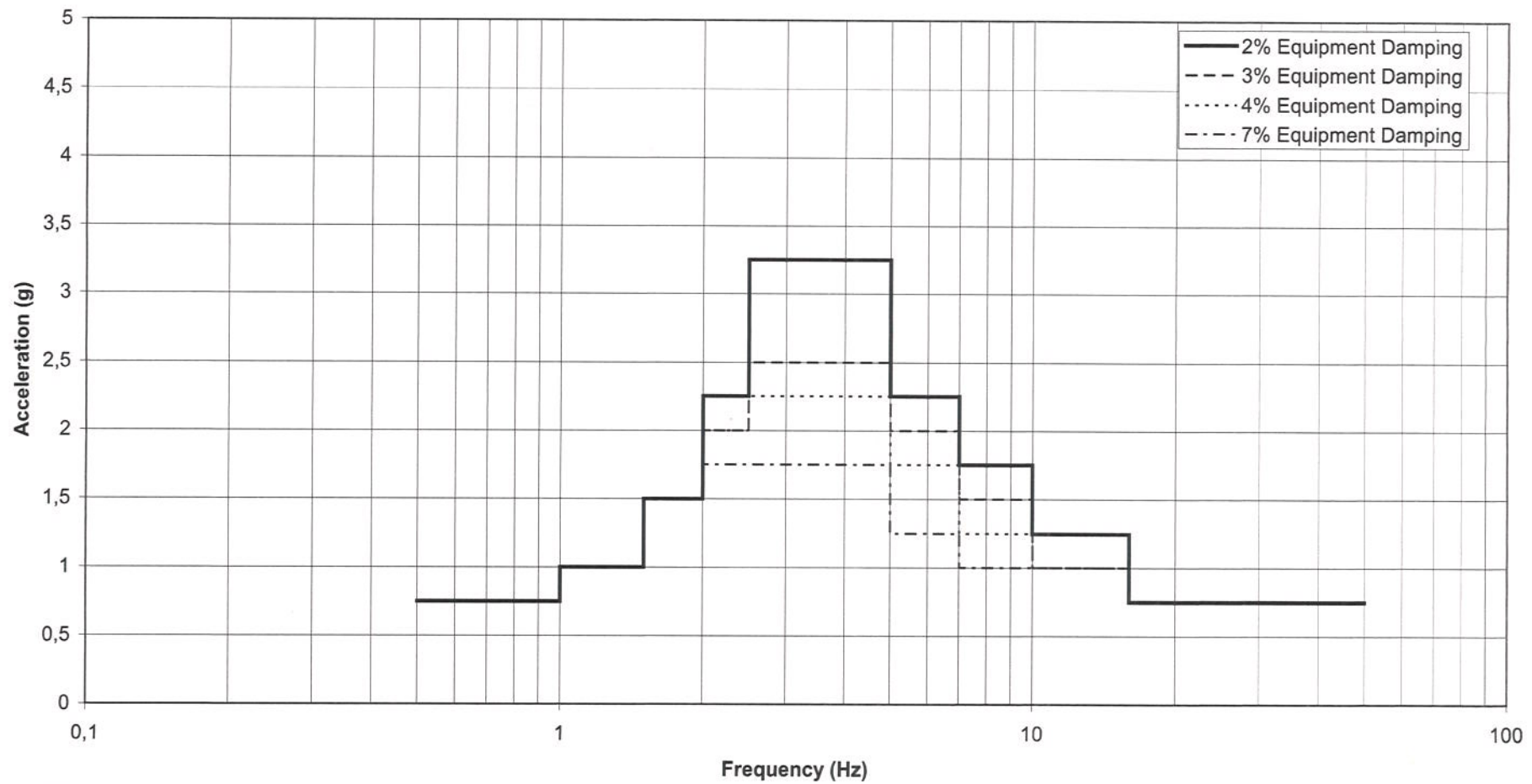
Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Horizontal OBE



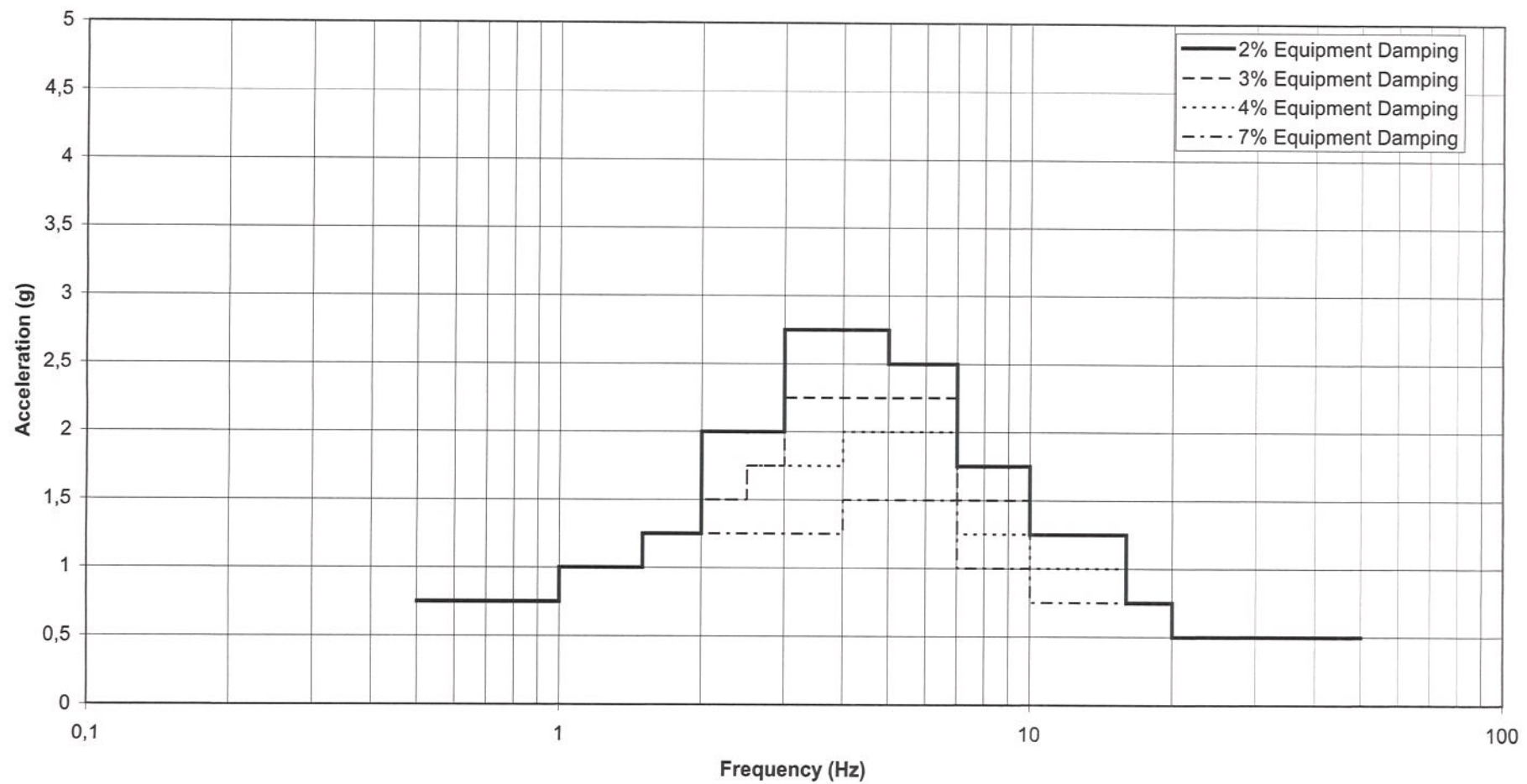
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Auxiliary Building EL. 100.3 M
Vertical OBE**

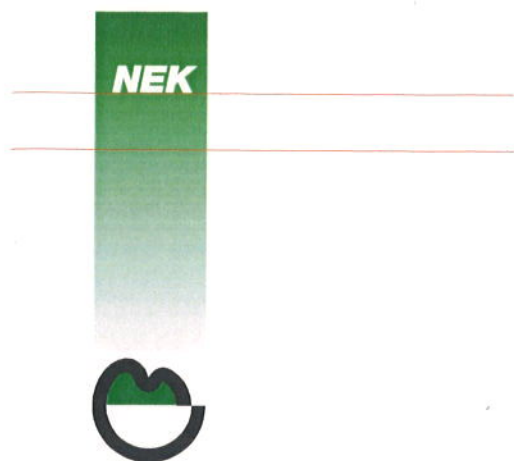


**Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Horizontal SSE**



**Krsko NPP
Floor Response Spectra
Auxiliary Building EL. 100.3 M
Vertical SSE**





Technical Specification

SP-ES5127

APPENDIX A6 Rev.0

ZVNE/SA/EQ-TR, Rev. 7

**Development of Environmental Qualification Zone Maps and
Conditions (EQTR-44)
EQ Zone Parameters AB-H-05**



Record of revision pages

Revision	Date	Subject
0	24.06.2020	Original issue



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EQ Zone Parameters			
AB-H-05			
NORMAL OPERATING CONDITION	PARAMETER	ACCIDENT CONDITION	HARSH
50	Peak Temperature (°C)	51,7	
101,3	Peak Pressure (kPa)	105,0	
60	Maximum Humidity (%)	100	
N/A	Chemical Spray	N/A	
N/A	Flood Level (m)	N/A	
7,17E+03	60 Year Dose Gamma (Gy)	N/A	H
N/A	Accident Dose Gamma (Gy)	7,28E+04	H
N/A	Accident Dose Beta (Gy)	0,00E+00	
N/A	Bremasstrahlung Dose (Gy)	0,00E+00	
N/A	Red. Beta (Gy) (>0,5 MeV)	0,00E+00	
AB-H-05			HARSH

EQ Zone Temperature and Pressure Profiles

AB-H-05

