



Technical Specification


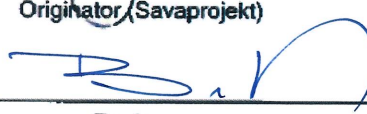
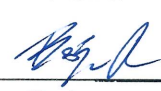

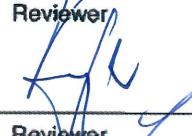
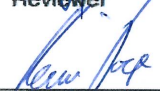
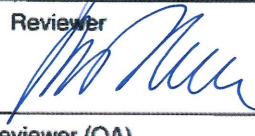
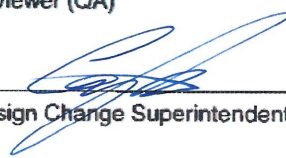
OSC, WATER CHILLERS WITH REMOTE AIR COOLED CONDENSERS AND AUX.EQUIPMENT

KRŠKO NUCLEAR POWER PLANT

SP-B3007 February 2018

Revision 0

AUGMENTED QUALITY

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NUCLEAR POWER PLANT KRŠKO

Project Modification 1056-NA-L

*NEK SAFETY UPGRADE PROJECT – Design and Engineering
for modification 1056-NA-L “Reconstruction of Operational
Support Center (OSC)”*

**TECHNICAL SPECIFICATION
OSC, WATER CHILLERS WITH REMOTE AIR
COOLED CONDENSERS AND AUXILIARY
EQUIPMENT
(Rev. 5)**

Document status: Final

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RECORD OF REVISION

No.	Date	Reason for revision and revision summary	Affected pages
0	30.9.2016	Submitted to NEK for review and approval	---
1	21.3.2017	Complete revision of the specification using alternative solution for high ambient and low ambient temperature operation with remote air cooled condensers (without dry coolers). Changed title of the specification. Changed MECL tag numbers.	---
		A new SR specification SP-A5001 Rev.0 and project specific SP-A5002 Rev.0 replaced old referenced specifications SP-A501A and SP-A504A.	Page 5
2	25.4.2017	Revision correction previously given by investor	---
3	21.7.2017	PLC control option is excluded from specification. Added was NEK's Design Specifications for pumps and Heat exchangers in section 4. OBE and SSE Level 1 seismic spectra is added for chillers VA782CHL-001 and VA782CHL-002	Pages 1, 6, 17 and Attachments 1 & 2
4	25.10.2017	Revision correction previously given by investor	---
5	08.02.2018	Consideration of corrections suggested during technical dialog performed by investor.	---

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Attachment 1: Water Chiller Performance Data Sheet (2 pages)

Attachment 2: Remote Air Cooled Condenser Performance Data Sheet (1 page)

Attachment 3: Applicable Floor Response Spectra Figures from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1 (6 pages)

Attachment 4: Equipment Specification Exceptions (1 page)

Attachment 5: Water Chiller Equipment Data Sheet (2 pages)

Attachment 6: Remote Air Cooled Condenser Equipment Data Sheet (2 pages)

Attachment 7: Pump Equipment Data Sheet (2 pages)

Attachment 8: Vendor Technical Manual Guideline (1 page)

Attachment 9: EAM-MECL Data Tables (2 pages)

1 SCOPE

1.1 Scope of Work

This Specification includes the information required for the procurement of water chillers with remote air cooled condensers and auxiliary equipment for the Operational Support Center (OSC) air cleaning / air conditioning ventilation system in the Krško Nuclear Power Plant (NEK). Specification is classified as Non Safety Related (NSR), however Augmented Quality (AQ), Seismic Category I. Electrical components are classified as Non Class 1E (NSR).

The chillers shall use R134a pure compound (simple mono-phase) ecologically admissible refrigerant with zero ozone depletion potential (ODP) and low global warming potential (GWP) that means low total equivalent warming impact (TEWI) number.

1.2 Equipment, Material, and Services to be Furnished by the SUPPLIER

The equipment, material and services to be furnished by the SUPPLIER shall include, but are not necessarily limited to, the following:

1. Two packed, factory assembled and tested water chiller units with remote air cooled condensers using R134a pure compound (simple mono-phase) ecologically admissible refrigerant are consisting of the following major components mounted on a welded steel base:
 - a. Compressor(s);
 - b. Chilled water heat exchanger (evaporator);
 - c. Refrigerant piping system, complete with valves and controls (flow switches, thermostats, sensing devices, relief valves, etc.);
 - d. Control system shall be hardwired with an automatic capacity modulation system, including a chilled water temperature controller and a local control panel;
 - e. Vibration isolation pads, suitable to withstand required seismic loads;
 - f. Full initial charge of refrigerant and lubricating oil for chiller with air cooled remote condenser;
 - g. Recommended spare parts.
2. Two packed with two separate circuits, factory assembled and tested remote air cooled condensers consisting of the following major components mounted on a welded steel base:
 - a. Refrigerant cooling coils coupled with steel support structure;
 - b. Refrigerant cooling coils fans;
 - c. Recommended spare parts;
 - d. Fans;
3. Auxiliary equipment which will become an integral part of the cooling system

pipng circuits:

- a. Two chilled water pumps;
- b. Chilled water system relief valves;
4. Common water cooling system's control system, which controls operation of the chiller, remote condenser and all auxiliary equipment (pump, etc.).
5. Spare parts for all supplied I&C and digital components.
6. One set of all special tools required for the operation and maintenance of equipment to be furnished.
7. Performance of main components factory acceptance tests.
8. Design specification, for water side pressure vessel shall be prepared per the guidelines of the requirements of ASME Code, Section III Class 3 and manufactured in accordance with ASME Code, Section VIII, Division 1; Subsection A, Part UG and the applicable Parts of Subsection B and C for Section VIII components. The design specification shall contain sufficient details to provide a complete basis for design of system components in accordance with this Code and shall be submitted to the owner prior to fabrication for review and acceptance.
9. Chilled water system design documentation package, which consists of drawings, sizing calculations of equipment, system design description, , user and maintenance manual factory acceptance test procedure, set point list, chiller start-up procedure, etc.
10. Documentation of supplied equipment, as required in sections 5.3, 5.4 and 25 of this Specification.
11. Packaging and preparation for shipment.
12. Start-up support of the chilled water system after installation at the JOBSITE.
13. Operation and maintenance training for the PURCHASER's personnel at NEK site. It shall include cooling system operation, main equipment operation and maintenance trainings.

1.3 Equipment, Material, and Services to be Furnished by OTHERS

The following equipment, material, and services will be furnished by OTHERS:

1. Receiving, unloading and erection of the supplied equipment at the JOBSITE.
2. Foundations, structural support and anchor bolts.
3. Procurement and erection of interconnecting piping between supplied main and auxiliary components addressed above.
4. Procurement of other necessary components like manual operating valves, drains and vents valves, fittings, etc.
5. Vent piping from rupture discs or pressure relief valves to the atmosphere.
6. Power wiring and control wiring between the SUPPLIER's equipment and equipment furnished by OTHERS. Electrical service provided will be 400 V AC

±10%, 3 phase, 50 hertz.

2 DEFINITIONS

AQ	Augmented Quality
BIDDER	An entity, which offers supply of products and/or services and has submitted a bid within a public tendering procedure
CDA	Critical Digital AssetDEC Design Extension Conditions
EAM	Enterprise Asset Management
EAM – MECL	EAM Master Equipment Component List
EMI	Electromagnetic Interference
EQ	Equipment Environmental Qualification
GWP	Global Warming Potential
JOBSITE	Installation location of equipment at the Nuclear Power Plant Krško site
NCN	Nonconformance Notice
NCR	Nonconformance Report
NEK	Nuclear Power Plant Krško
NRC	United States Nuclear Regulatory Commission
NSR	Non Safety Related
OBE	Operating Basis Earthquake
ODP	Ozone Depletion Potential
OSC	Operational Support Center
OTHERS	NEK or other company(ies) contracted by NEK
PURCHASER	Nuclear Power Plant Krško
QA	Quality Assurance
RG	Regulatory Guide
RFI	Radiofrequency Interference
SSE	Safety Shutdown Earthquake
SWC	Surge Withstand Capability
SUPPLIER	An entity, which supplies equipment and/or services to NEK per this Specification
TEWI	Total Equivalent Warming Impact

3 CODES, STANDARDS AND REGULATORY REQUIREMENTS

Water chillers with remote air cooled condensers and auxiliary equipment covered by this Specification are classified as Non Safety Related (NSR), however Augmented Quality (AQ) Seismic Category I. Electrical components are classified as Non Class 1E (NSR). They shall be designed, manufactured, tested, and certified in accordance with the applicable portions of the following codes and standards. Moreover the fluid side of the chiller(s) shall be designed, constructed and tested in accordance with ASME B&PV Code Section VIII: Division 1.

1. Air Conditioning, Heating, and Refrigeration Institute (AHRI):
 - a. AHRI 550/590, Standard for Water Chilling Packages Using the Vapor Compression Cycle;
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
 - a. ASHRAE 15, Safety Standard for Refrigeration Systems;
3. American Society of Mechanical Engineers (ASME):
 - a. ASME AG-1-2015, Code on Nuclear Air and Gas Treatment;
 - b. ASME B&PVC, Section VIII, Division 1 at the latest Code Edition
 - c. ASME B&PVC, Sections II, V, IX of the latest Code Edition;
 - d. ASME B31.5, Refrigeration Piping and Heat Transfer Components;
 - e. ASME B31.1, Power Piping;
 - f. ASME B16.5, Pipe Flanges and Flanged Fittings;
 - g. ASME B16.34 – 2004, Valves – Flanged, Threaded, and Welding End
 - h. ASME B73.1 – 2012 , Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process
 - i. ASME NQA-1, 2008 with 2009/2011 Addenda, Quality Assurance Program Requirements for Nuclear Facility Applications;
4. American Society for Testing and Materials (ASTM):
 - a. ASTM D635, Test for Flammability of Self Supporting Plastics;
5. American Welding Society (AWS):
 - a. AWS D1.1, Structural Welding Code for Steel;
6. Electric Power Research Institute (EPRI):
 - a. EPRI TR-102323, Rev. 4, Guidelines for Electromagnetic Interference Testing in Power Plants;
7. International Electrotechnical Commission (IEC):
 - a. IEC 61000, Electromagnetic Compatibility (EMC), Part 3 - Limits and Part 4 - Testing and Measurement Techniques;
8. Institute of Electrical and Electronics Engineers (IEEE):
 - a. IEEE 1050-2004, Guide for Instrumentation and Control Equipment

Grounding in Generating Stations;

9. National Electrical Manufacturers Association (NEMA):
 - a. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum);
 - b. NEMA MG-1 American National Standard for Motors and Generators;
10. NRC Regulatory Guides:
 - a. RG 1.29, Seismic Design Classification, Rev. 1, August 1973;
 - b. RG 1.76, Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants, Rev. 1, March 2007;
 - c. RG 1.100, Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants, Rev. 3, September 2009;
 - d. RG 1.180, Guidelines for evaluating electromagnetic and radio-frequency interference in SR instrumentation and control systems, Rev. 1, October 2003;
 - e. RG 5.71, Cyber Security Programs for Nuclear Facilities, Rev. 0, January 2010;
11. US Military Standards (MIL):
 - a. MIL-STD-461E, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment;
12. International Organization for Standardization (ISO):
 - a. Quality Management System Requirements 9001; 2015

Unless stated otherwise by the PURCHASER, the SUPPLIER shall use the appropriate codes and a standard listed in this section in effect at the time of Purchase Order issued by the PURCHASER.

The SUPPLIER shall submit criteria for the design and fabrication of equipment not covered by codes given above to PURCHASER for review and approval.

4 SUPPLEMENTAL DATA

Items listed below are hereby made a part of this Specification. Where a conflict exists between supplemental data and this Specification, this Specification shall take precedence.

Supplemental data items:

1. QS-610, Rev. 1, Generic Quality Assurance Program Requirements;
2. SP-A5001, Rev. 0, Technical Specification Service Level III Coatings;
3. SP-A5002, Rev. 0, Coatings for Internal Surfaces of ECR HVAC System;
4. DSP-G513-044687-000 Design Specification ASME Safety Class Heat Exchangers ASME III Class 2 and 3, Exhibit A
5. DSP-G529-044687-000 Design Specification Safety Class Pumps ASME III Class 2 and 3, Exhibit A
6. SP-E311, Rev. 2, Non-Safety Related Fractional Horsepower and Larger Electric Motors;
7. SP-S702, Rev. 10, Seismic Analysis, Testing and Documentation;

NOTE: The specification SP-S702 is provided without Appendices with floor response spectra figures. Applicable flow response spectra figures are provided in the Attachment 3.

8. Document No. OSC Seismic Analysis, 1056-NA-L-PZI-3/1-A1;

NOTE: The OSC Applicable OBE and SSE Floor Response Spectra Figures are taken from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1, and provided in the Attachment 3.

5 DOCUMENT SUBMITTAL

5.1 General

All documents (including drawings, graphs, specifications, etc.) submitted shall be in the form of hard copies and electronic media. Acceptable document format sizes shall be A2 or smaller, A3 and A4 should be used whenever possible.

Preferred format for electronic correspondence is Adobe Acrobat Reader (pdf). Other acceptable formats shall be:

- Word Processing: Microsoft WORD (doc, docx);
- Spreadsheet: Microsoft EXCEL (xls, xlsx); and
- Computer Aided Drafting: AutoCAD (dwg).

All SUPPLIER's documents shall bear at least the following information:

- SUPPLIER's Name;
- Date of issue;
- Document status;
- Document number;
- Revision number;
- Construction Code or Standard;
- Other organizations participating in the manufacturing;
- NEK Purchase Order number; and
- NEK Specification number.

5.2 Information Required with the Proposal

The BIDDER shall submit complete operating data and description of the equipment offered with the Proposal. This data shall include the following:

1. Description of the chiller units, remote air cooled condenser units and auxiliary equipment including instrumentation and control, installed safety features and operating characteristics of components (flow rates, pressure drops, temperatures, pump performance curves, operating environmental temperature limits in winter/summer, etc.).
2. Preliminary outline drawings of the chiller units, air cooled condenser units and auxiliary equipment showing general arrangement, overall dimensions, section views, location and size of piping connections, weight of the units and major components, center of gravity, clearance space required for maintenance or disassembly and other necessary interfaces. The BIDDER may provide standard submittal drawings for this purpose.
3. List of rated power, power factor and voltages for all motors being included on supplied equipment.
4. Estimated sound power levels for eight octave bands.

5. Equipment specification with list of codes to which the equipment conforms and list of materials with ASME or ASTM number and grade.
6. Representative listing of similar installations designed and furnished to nuclear power plants.
7. Description of factory acceptance tests to be performed.
8. Description of proposed procedure for seismic qualification of the equipment.
9. Completion and return of the Equipment Specification Exceptions form with description of any deviations or exceptions to this Specification (see Attachment 4).
10. Completion and return of the Equipment Data Sheets (see Attachments 5, 6, 7 and 8).

The BIDDER shall indicate additional documentation he proposes to supply.

5.3 Documentation Required after Contract Award

The documentation of the supplied equipment shall include the following information:

1. Chilled water system design documentation package, which consists of drawings, sizing calculations of equipment, system design description, and user and maintenance manual.
2. Certified outline drawings showing general arrangement, overall dimensions, section views, location and size of piping connections, weight and center of gravity, clearance space required for maintenance or disassembly and other necessary interfaces. These drawings shall be specifically for the supplied equipment involved. Standard submittal drawings are not acceptable unless clearly marked or modified to indicate the concerned equipment.
3. Detailed drawings of components, sub-components or accessories. If these items are shown on separate drawings appropriate cross references shall be used.
4. Logic diagrams, elementary diagrams, wiring diagrams, and electrical bill of material for supplied equipment showing all components and field connections. These diagrams shall be specifically for the supplied equipment. Standard submittal drawings are not acceptable unless clearly marked or modified to indicate the concerned equipment.
5. Certified pump performance curves with a clearly marked design operating point showing at least total developed head, efficiency, brake horse power and required net positive suction head as a function of pump capacity.
6. Certified sound power level data for eight octave bands.
7. Structural design information including forces and moments at every external equipment support interface, support hardware and bracket details, required anchor bolt sizes, anchor bolt locations, required anchor bolt materials, and specific anchor bolt torque requirements. The SUPPLIER shall make provisions for transmitting any tension or shear loads to the anchor bolts.

8. List of used materials with ASME or ASTM number and grade.
9. Description of required site acceptance tests to be performed including a list of necessary test equipment.
10. Equipment start-up procedure.

The manufacturing documentation shall comprise the following as a minimum:

1. Documentation index;
2. Submittal schedule;
3. Manufacturing and inspection plan;
4. Design and manufacturing documentation;
5. All certificates required with material;
6. Deviation, nonconformance and repair reports;
7. Seismic analysis reports for chillers, remote air cooled condensers, pumps, three-way valves and auxiliary equipment;
8. Test procedures;
9. Test reports showing conformance to all testing procedures;
10. Instrumentation data and set point list;
11. Cleaning procedures;
12. Final inspection/Completion Report;
13. Quality Verification and Release;
14. Packaging, handling and storage procedures;
15. Vendor technical manual;
16. Chiller start-up procedure,
17. List of recommended spare parts with EAM-MECL data tables filled in (see Attachment 9);
18. Statement of shelf life and operational life of the units (40 years);
19. Certificate of conformance/compliance with the requirements of codes, standards and this Specification;

The SUPPLIER shall also provide to the PURCHASER all documentation obtained from manufacturers of auxiliary equipment (pumps, three-way valves, etc.). This documentation shall contain sufficient details to allow for review of design and proper operation and maintenance of the equipment.

5.4 Final Documentation

The SUPPLIER shall submit the original and one (1) electronic copy (CD, DVD, flash memory media) of the final technical and quality documentation as required by codes, standards and this Specification.

6 DESIGN REQUIREMENTS AND DESIGN INPUTS

6.1 General

Supplied equipment shall be designed in accordance with codes and standards listed in the section 3 of this Specification.

Supplied equipment shall be designed for safe continuous operation under the operating conditions noted in the Performance Data Sheets.

The design operating life of equipment supplied under this Specification shall be 40 years.

The SUPPLIER shall warrant that the equipment covered by this Specification shall perform in accordance with the requirements specified in the in the Performance Data Sheets.

6.2 Environmental Conditions

The chiller units and auxiliary equipment will be installed in the OSC Building. The following data shall be used for design of equipment:

- Minimum temperature: 5 °C;
- Maximum temperature 40 °C;
- Relative humidity: 95 % (without condensate)

The remote air-cooled condenser units will be installed outside of the OSC Building. The following data shall be used for design of equipment:

- Minimum temperature: -35,1 °C;
- Maximum temperature: 40.9 °C;
- Relative humidity: 50%

6.3 Noise

Sound pressure level, measured at the distance of 3 feet (0.9 m) from the surface of the equipment and 6 feet (1.8 m) from the floor, shall be limited to 80 dB(A).

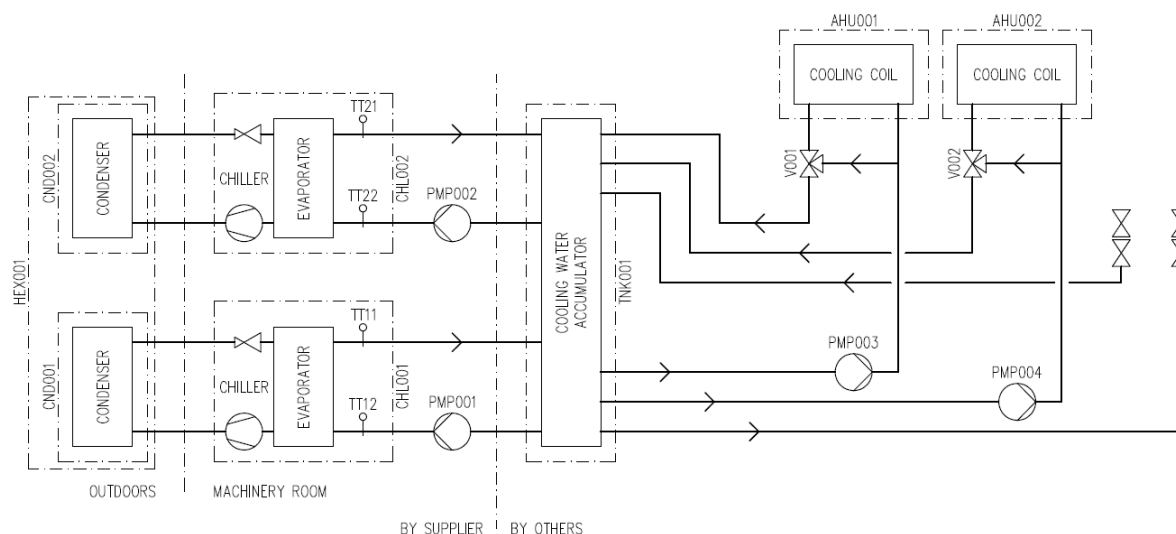
6.4 Cooling System Design

6.4.1 General

Cooling system consists of two subsystems which provide chilled water to cooling coils of associated air handling units AHU001 and AHU002. Both subsystems shall have the same configuration and shall be sized for 50 % of the total cooling capacity.

A conceptual flow diagram which shows water chillers and remote air cooled condenser units, as well as the auxiliary equipment is shown on Figure 1.. Equipment tags in parenthesis represent equipment associated with the air handling units AHU001 and AHU002. For functional diagrams, refer to section 6.8.3.

Figure 1: Conceptual flow diagram of the cooling system



6.4.2 Operation modes

Cooling system design shall have the mechanical refrigeration operation mode.

Discharge head pressure control valves with an appropriately sized refrigerant receiver shall be provided for operation of the cooling system during low outdoor temperatures down to $-35.1\text{ }^{\circ}\text{C}$ ($-31.2\text{ }^{\circ}\text{F}$).

6.5 Water Chiller

The main design code shall be ASME AG-1, Sections RA (refrigeration) and IA (instrumentation and control).

The chillers shall be the SUPPLIER's standard design, condenserless type (with remote condenser) and modified in accordance with the requirements of this Specification.

6.5.1 Refrigerant

The water chiller shall use R134a pure compound (simple mono-phase) ecologically admissible refrigerant with zero ODP and low GWP that means low TEWI number.

6.5.2 Compressor

Compressor shall be fully hermetic scroll or semi-hermetic screw type with crankcase heater and suction strainer.

Compressor motor shall be refrigerant gas cooled, high torque, hermetic induction type, with thermal protection on all three phases.

All rotating parts shall be statically and dynamically balanced. Compressor shall be mounted on external isolation pads to reduce transmission of vibrations to the rest of

the unit.

Capacity control shall be by compressor staging or sliding vane. Additional capacity control shall be provided by hot gas bypass.

6.5.3 Evaporator

The evaporator shall be constructed in accordance with the requirements of ASME Code, Section VIII, Division 1.

The evaporator shall be direct expansion type. Water side design pressure shall be 150 psig (1.03 MPa). Taps for drains and vents shall be provided.

6.5.4 Refrigerant System

The refrigerant system interconnecting piping, valves, and fittings shall meet the requirements of ASME B31.5 and ANSI/ASHRAE 15.

The refrigerant system shall be provided with at least the following components:

1. Liquid line isolation valves;
2. Liquid line solenoid valve;
3. Hot gas bypass valves;
4. Discharge head pressure control valves;
5. Solenoid valves,
6. Refrigerant receiver;
7. Filter drier;
8. Sight glasses with moisture indicators;
9. Expansion valve;
10. High pressure relief valve;
11. Refrigerant charging port.

6.5.5 Insulation

Compressor, evaporator, suction piping and other parts subject to condensation shall be insulated with flexible, closed-cell, foam insulation, conforming to ASTM C534. The insulation shall have a thickness of 1.5 inches (38.1 mm) and shall prevent sweating at 104 °F (40°C) dry bulb and 95% relative humidity.

6.6 Air Cooled Remote Condensers

The main design code shall be ASME AG-1, Section CA.

In lieu of performance testing per CA-5211, performance may be verified by performance testing of the actual unit at the specification design conditions.

Condenser cooling coils shall be designed in accordance with the requirements of ASME B31.5.

Condenser cooling coils shall be mounted either in a horizontal configuration or in a V-bank configuration.

Condenser fans shall be provided with a constant speed motor.

Motors shall be suitable for outdoor use, with permanent lubricated ball bearings and internal current and thermal overload protection. Motors shall conform to the requirements the specification SP-E311.

6.7 Pumps

Pumps shall be designed and manufactured in accordance with the requirements of ASME B73.1. Pumps nozzle forces and moments including load combinations are defined in Exhibit A of design specification DSP-G529-044687-000.

Pumps shall be centrifugal, end suction type, each with motor shaft couplings, seals, integral piping, lubrication subsystem and connections mounted on a common base.

Water side design pressure shall be 150 psig (1.03 MPa). Design temperature shall be consistent with water temperatures in evaporator and condenser cooling circuits.

For preliminary pump sizing, the pressure drop in interconnecting piping is estimated to 20 ft (6 m).

Pump motor shall be constant speed. The motor shall conform to the requirements the specification SP-E311.

The SUPPLIER shall select the pump and motor size that are required to meet the design requirements of water chiller cooling circuit.

6.8 Instrumentation and Control

6.8.1 General

Such system is recognized a critical system and the following shall be used for design, fabrication and testing:

1. Instrumentation and control design shall be hardwired controlled. Detailed design of instrumentation and controls shall be responsibility of the SUPPLIER.
2. System will be located in level 4 zone with one directional connection to the lower protection zones only (if applicable).

Instrumentation and control design shall provide its proper and safe operation under all operating conditions, including the postulated design basis events and design extended event conditions.

Instrumentation and control wiring shall be in accordance with the requirements of

ASME AG-1, Article IA-4000.

Control and alarm wiring shall be a minimum of 16 or 14 AWG 7-strand copper conductors, 600 Volt, 90°C flame retarding insulation. Current transformer circuits shall be 10 AWG minimum. Where wire is subject to flexing on hinged panels, 14 AWG, 41-strand, extra flexible, copper conductors, 600 Volt, 90°C flame retarding insulation shall be used.

6.8.2 Water Chiller Control

The water chiller shall be provided with a local, standalone control panel in NEMA 4 enclosure. The control panel shall be factory wired with a single point power connection and separate control circuit. Electrical power supply for control circuit shall be provided by means of factory installed control transformer.

The chiller shall be provided with a factory installed cooling water flow meter. The flow switch shall be interlocked with the compressor motor, which will start when chilled water flow has been established.

The control panel shall provide controls to safely and efficiently operate the chiller and monitoring of chiller sensors, actuators, relays and switches. Start of cooling system components (pumps, condenser fans, etc.) shall be possible from the chiller control panel.

As a minimum, the instrumentation and control functions shown in ASME AG-1 Mandatory Appendix RA-II shall be provided. In addition, the control panel shall be provided with at least the following:

1. Controls:
 - a. Unit circuit breaker;
 - b. Motor starter;
 - c. Chilled water set point adjustment;
2. Displays and readouts:
 - a. Operation and alarm mode status;
 - b. Chilled water set point temperature;
 - c. Entering and leaving chilled water temperatures;
 - d. Compressor motor electrical current draw;
3. Protections:
 - a. Overcurrent protection
 - b. Evaporator low pressure
 - c. Evaporator low temperature
 - d. Condenser high pressure
 - e. Low chilled water flow

- f. Loss of chilled water flow;
 - g. Low chilled water temperature;
 - h. Compressor anti-recycle timer;
 - i. Motor overloading during chilled water pulldown period;
 - j. Power supply fault;
- 4. Identified terminal strips for field wiring connections.
 - 5. Auxiliary contacts to allow monitoring of unit status and alarms at remote locations.

6.8.3 Cooling system control

The cooling system's control system shall be either integrated in the chiller control panel or provided in a standalone control panel in NEMA 4 enclosure. If provided in a standalone control panel, it shall control both cooling subsystems.

The control system shall provide controls to operate the chiller unit as well as associated auxiliary equipment and monitoring of components. Detailed design of the control system shall be the responsibility of the SUPPLIER.

The chiller units CHL001 (CHL002) shall be started manually by operator's action. Therefore control system shall permit the start of the chiller unit from remote location as well.

When the unit is ON, it shall control and provide power supply to the following associated external equipment (tags in parenthesis mean external equipment controlled by the unit CHL001 (CHL002):

- Chilled water pump PMP001 (PMP002): ON when chiller unit is ON;
- Air cooled condenser CND001 (CND002): Fans cycling ON to maintain constant condenser pressure.

7 PERFORMANCE REQUIREMENTS

Performance requirements of water chillers and air cooled condenser units required under this Specification are given on the Water Chiller Performance Data Sheet and Remote Air Cooled Condenser Performance Data Sheet forms in the Attachments 1 and 2, respectively.

The SUPPLIER shall select the auxiliary equipment (pump) which is required to meet the overall performance requirements of the cooling system.

8 MATERIALS AND DETAILS OF CONSTRUCTION

Materials used in the construction of water chillers shall conform to the requirements of ASME AG-1, Article RA-3000.

Materials used in the construction of condenser cooling coils shall conform to the requirements of ASME AG-1, Subarticle CA-3200.

Electrical and control wiring materials shall conform to the requirements of ASME AG-1, Article IA-3000.

Water cooling system pressure-retaining materials shall conform to the requirements of ASME Code, Section VIII, Division 1.

Other materials not definitely specified shall be standard materials which are normally used for the purpose in commercial practice and which meet applicable code requirements.

The SUPPLIER shall state the identification of all materials used in the construction of the components. Identification shall include ASME or ASTM number and grade.

All materials shall be capable of withstanding a cumulative radiation level of up to 10 Gy. However air cooled condenser cooling coils including its electric fan motors shall be capable of withstanding a cumulative radiation level of up to 100 Gy.

9 FABRICATION AND ASSEMBLY

Fabrication of water chiller shall be in accordance with the requirements of ASME AG-1, Article RA-6000.

Fabrication of air cooled condenser coils shall be in accordance with the requirements of ASME AG-1, Subsubarticle CA-4220 and Article CA-6000.

Water cooling system pressure-retaining components such as evaporator heat exchangers shall be fabricated in accordance with the requirements of the ASME B&PV Code, Section VIII, Division 1, UG-99, UG-100 and UG-103, water side piping ASME B31.1, and water side valves (welding end design) per ASME B16.34. All instruments shall be qualified for seismic use. Welders and welding procedures shall be qualified in accordance with the requirements of the ASME Code, Section IX.

10 INSPECTIONS AND TESTS

10.1 *Test Responsibility*

The SUPPLIER shall perform all necessary factory acceptance tests to verify that supplied equipment meets requirements of applicable codes and standards and this Specification.

The supplier shall prepare test procedures for all factory acceptance tests and submit them to the PURCHASER for review and approval.

The SUPPLIER shall notify the PURCHASER at ten (10) working days in advance with exact date of testing. The tests shall be witnessed by the PURCHASER's representative.

Any deficiencies or malfunctions which occur during the tests shall be corrected and the test repeated.

Test reports shall be prepared for each test and submitted to the PURCHASER for review and approval.

Prior to shipment, the unit shall meet the performance requirements specified in the Water Chiller Performance Data Sheet and Remote Air Cooled Condenser Performance Data Sheet.

10.2 *Water Chiller and Remote Air Cooled Condenser Functional and Performance Testing*

Inspection, rating and testing shall be in accordance with the requirements of ASME AG-1.

Complete assembly functional and performance testing shall be performed in accordance with ASME AG-1, Subsubarticle RA-5222 and its Mandatory Appendix RA-MI (RA-I). Test results shall be documented using ASME AG-1, Data Report Form RA-5.

10.3 *Pressure Vessel Testing*

Components fabricated in accordance with the requirements of the ASME Code, Section VIII, Division 1, shall be hydrostatically or pneumatically tested in accordance with the rules of the requirements UG-99 or UG-100 and UG-103 for nondestructive testing..

The SUPPLIER shall submit test reports obtained from components manufacturers.

10.4 *Compressor Testing*

Proof test, leak test shall be performed in accordance with ASME AG-1, Paragraph RA-5214.

Tests shall be documented using ASME AG-1, Data Report Form RA-3 and RA-3a.

The SUPPLIER shall submit test reports obtained from the compressor manufacturer.

10.5 Control Functional Tests

All control components and assembled control panels shall be functionally tested in accordance with ASME AG-1, Subsubarticle RA-5220 using Manufacturer's documentation. Test results shall be documented using ASME AG-1, Data Report Form RA-4.

The supplier shall submit testing procedures to the PURCHASER for review and approval.

11 ITEM QUALIFICATION

11.1 *Equipment Environmental Qualification (EQ)*

The equipment covered by this Specification will operate in Mild environment during Design Basis and Severe Accidents. This means that environmental parameters during severe accidents will not be more severe than the environmental parameters during normal plant operation, specified in section 6.2. Also the 40 years normal operation total integrated dose, including the severe accident dose at equipment location is expected to be lower than 10 Gy (a formal limit for Harsh environment dose for equipment containing electronic components). However air cooled condenser cooling coils including its electric fan motors shall be capable of withstanding a cumulative radiation level of up to 100 Gy.

The SUPPLIER shall design the equipment to perform under specified environmental conditions, supported by a maintenance schedule of the availability of equipment to perform its function at any time during the designed lifetime (aging addressed by surveillance, maintenance, etc.).

The SUPPLIER shall provide EQ documentation to the PURCHASER for review and approval. The provided documentation shall justify that equipment meets or exceeds the requirements of this Specification.

11.2 *Seismic Qualification*

Seismic qualification shall be performed in accordance with the requirements of specification SP-S702 and the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1.

The supplied equipment shall withstand Design Extension Conditions (DEC) seismic loads. Applicable operating basis earthquake (OBE) floor response spectra and applicable safety shutdown earthquake (SSE) floor response spectra are given in the Attachment 3 of this specification.

The SUPPLIER shall provide seismic qualification documentation to the PURCHASER for review and approval.

11.3 *Electromagnetic and Radiofrequency Interference (EMI/RFI) Evaluation*

Instrumentation and control equipment covered by this Specification shall be designed and tested to ensure that all sensitive components are compatible with the electromagnetic environment for the locations in the power plant where the equipment will be installed. This includes consideration of emissions and susceptibility to both conducted and radiated electromagnetic and radio-frequency interference and capability to withstand power surges (SWC) in accordance with the following:

1. RG 1.180, Rev. 1, Guidelines for evaluating electromagnetic and radio-frequency interference in SR instrumentation and control systems;
2. EPRI TR-102323, Rev. 4, Guidelines for Electromagnetic Interference Testing in Power Plants;

3. MIL-STD-461E, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment;
4. IEEE 1050-2004, IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations;
5. IEC 61000, Electromagnetic Compatibility (EMC), Part 3 - Limits and Part 4 - Testing and Measurement Techniques;

Consideration of EMI/RFI/SWC shall include the effects of interference generated from all permanently mounted and transient EMI/RFI/Surge sources. These sources include such items as radio frequency transceivers, line surges, overhead cranes, motor controllers, relays, and any other electrical equipment located near the sensitive electrical equipment.

The new equipment shall have suitable filters so those instruments will not be sensitive to power spikes either induced or in the supply line. Interconnecting wiring shall be shielded where required. Use of metal oxide varistors and ferrite cores as attenuation devices is acceptable, if approved by the PURCHASER.

Modifications to standard equipment designs (shielding, filtering, and grounding) that are necessary to achieve acceptable testing results must be documented. The equipment must be installed in the same modified configuration and be reflected in the configuration controlled documentation.

Emissions and susceptibility testing shall be performed as applicable in accordance with the standards indicated in Table 1 and Table 2, respectively. A rationale should be provided if any of the tests is omitted.

Table 1: List of emissions tests

		MIL-STD-461	IEC 61000	FCC
Type		Test methods		
Conducted emissions	Low frequency	CE101	None	None
	High Frequency	CE102 (450 kHz – 2 MHz)	IEC 61000-6-4 (CISPR 11 Class A)	FCC Part 15 Class A
Radiated emissions	Low frequency	RE101	None	None
	High Frequency	RE102	IEC 61000-6-4 (CISPR 11 Class A)	FCC Part 15 Class A

Table 2: List of susceptibility tests

		MIL-STD-461	Commercial standard
Type		Test methods	
Conducted susceptibility	Low frequency	CS101 (30 Hz to 150 kHz)	IEC 61000-4-13 (16 Hz to 2.4 kHz) IEC 61000-4-16 (15 Hz to 150 kHz)
	High Frequency	CS114 (10 kHz to 30 MHz)	IEC EN61000-4-6 Disturbances induced by radiofrequency fields
Radiated susceptibility	Low frequency	RS101 Magnetic Field (30 Hz to 199 kHz)	IEC 61000-4-8 Magnetic Field (50 Hz and 60 Hz) IEC 61000-4-9 Magnetic Field (50/60 to 50 kHz) IEC EN61000-4-10 Magnetic Field (100 kHz and 1 MHz)
	High Frequency	RS103 Electric Field (30 MHz to 1 GHz)	IEC 61000-4-3 Electric Field (26 MHz to 1 GHz)
Surge		CS116 Damped Sinusoidal Transients (10 kHz to 100 MHz)	IEC EN61000-4-5 Surges IEC EN61000-4-12 100 kHz Ring Wave or IEEE C62.41-1991 Ring & Combination Wave
Electrically-Fast Transient/Burst		CS115 Bulk Cable Injection, Impulse Excitation	IEC EN61000-4-4 Electrically-Fast Transient/Bursts or IEEE C62.41-1991 EFT
Electrostatic discharge		None	IEC EN61000-4-2

A documented technical basis shall be provided when certification to a commercial testing standard not listed in the tables above is used to satisfy any of the testing requirements of this specification.

Testing limits and frequencies shall be based on Regulatory Guide 1.180, Rev. 1. As stated in the Regulatory Guide any of the three alternate testing programs may be selected. However, regardless of the emissions testing program selected, it is intended that each be applied in its entirety, without selective application of individual methods (i.e. no mixing and matching of test methods) for emission testing.

During and after test the testing the equipment shall operate without degradation of critical functions or performance beyond the limits defined in the functional requirements (i.e. Performance Criterion A as per IEC 61000-6-1).

Critical, essential and protected equipment functions shall be monitored for acceptable operation and performance before, during and shortly after testing. A documented justification shall be prepared for all tests that result in degradation of

function. Non-critical functions may be degraded during the application of the test provided that normal operation of the tested equipment is self-recoverable to the condition immediately before the test (i.e. Performance Criterion B as per IEC 61000-6-1).

The SUPPLIER shall provide EMI/RFI evaluation documentation to the PURCHASER for review and approval.

12 CLEANING

Equipment internals shall be shop cleaned in accordance with ASME AG-1, Subsubarticle AA-6540 and ASME/ANSI NQA-1, Part II, Subpart 2.1. Cleanness level shall be Level B.

Cleaning of external surfaces shall be in accordance with the SUPPLIER's written procedures.

The SUPPLIER shall submit cleaning procedures to the PURCHASER for review and approval.

13 CORROSION PROTECTION AND COATING

Corrosion protection and coating of exterior carbon steel and other surfaces susceptible to corrosion shall be in accordance with the requirements of Specifications SP-A5001 and SP-A5002.

Galvanized steel, stainless steel and non-ferrous surfaces shall not be painted.

The SUPPLIER shall submit corrosion protection and coating procedures to the PURCHASER for review and approval.

14 MARKING AND IDENTIFICATION

Equipment supplied within the scope of this Specification shall be provided with a stainless steel nameplate, affixed in an accessible area with at least the following information:

- Manufacturer's name;
- Manufacturer's serial number;
- Equipment type;
- Year of manufacture;
- Tag numbers as indicated on the Water Chiller and Air Cooled Condenser Performance Data Sheets;
- NEK Purchase Order number.

Components built in accordance with the requirements of ASME Section VIII and ASME/ANSI B31.1 shall be marked in accordance with the rules of that section.

The SUPPLIER shall establish and maintain a system for the identification of materials, parts, and components. These measures shall ensure that identification of the item is maintained by the heat number, lot number, serial number, part number, or other appropriate means, either on the item or on records traceable to the item, throughout fabrication, shipment, and use of the item.

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.

15 PACKAGING, HANDLING AND STORAGE

Packaging, handling and storage shall be in accordance with the requirements of ASME NQA-1, Part I, Requirement 13, Part II, Subpart 2.2. Protection level shall be Level B.

The SUPPLIER shall prepare procedures for packaging, handling, storage 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. The procedures shall be submitted to the PURCHASER for review and approval.

If any special storage requirements are required, the SUPPLIER shall inform the PURCHASER sufficiently in advance of shipping to allow for necessary preparation.

16 NONCONFORMING MATERIALS

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.

Nonconformance with specification requirements, and applicable codes and standards invoked by this Specification will not be accepted until approved by the PURCHASER. When such a condition exists, SUPPLIER shall initiate a Nonconformance Report (NCR) using the SUPPLIER's standard nonconformance document, which identifies the nonconformance and the SUPPLIER's proposed disposition.

The SUPPLIER shall:

1. Segregate the nonconformance 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 PURCHASER inspector for review to ensure the nonconformance is completely identified and accurately stated.
3. Transmit NCR with recommended disposition to the PURCHASER in an expeditious manner. The SUPPLIER shall provide technical justification for the recommended dispositions.

The requirements of the specification are binding; no departures are acceptable without the prior consent of the PURCHASER.

The NCR shall provide the method by which the SUPPLIER shall obtain a documented response and approval from the PURCHASER when non-conformances are identified. The use of the NCR will pertain to the work at the SUPPLIER's shops.

Once the item is identified with a NCR, such NCR shall remain assigned to that item permanently and PURCHASER shall be advised of the originating NCR.

17 RECORDS

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 a minimum, identify inspector or data recorder, data inspection that 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 the SUPPLIER's procedure.

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

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

1. Records are technically correct in accordance with applicable procedures.
2. 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.
3. Corrections to data have properly been made. Corrections to data shall include the data and the identification of person authorized to make the corrections.
4. Records are legible – can be clearly read and suitable for microfilming. The original of all records should be transmitted to the PURCHASER as a record.

18 OTHER REQUIREMENTS

18.1 SUPPLIER's Responsibilities

The SUPPLIER shall be responsible for compliance with all of the detailed requirements presented in this Specification. Review and approval of any drawings, specifications and/or tests by the PURCHASER shall in no way relieve the SUPPLIER from these responsibilities.

Specific requirements which the SUPPLIER shall follow during design and fabrication process are given in the sections 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15 of this Specification.

In addition to the requirements of this Specification, the SUPPLIER shall be responsible for performing analyses, tests, inspections and other activities which the SUPPLIER considers necessary to make sure that the design, material and workmanship are satisfactory for the service intended, or as may be required by common usage or practice.

The SUPPLIER shall obtain resolution of any conflict from the PURCHASER prior to proceeding with any work involving that conflict.

18.2 PURCHASER's Responsibilities

The PURCHASER shall have the following responsibilities:

1. Provide the SUPPLIER with all available documentation upon request.
2. Provide any special requirements applicable to the installation of equipment.
3. Designate a contract Responsible Engineer who will serve as the principal interface with the SUPPLIER.

Whenever the PURCHASER's approval is required in this Specification for submittals, procedures, methodologies, approaches or options, such approval shall be provided in writing or if provided orally shall be confirmed in writing. The PURCHASER will provide all required approvals in a timely fashion consistent with the project schedule.

The PURCHASER shall review proposed additions to the approved products listing and determine if they meet the requirements of the NEK Chemical Control Program. Approved products will be allowed on site with proper labeling.

19 RIGHT OF ACCESS

PURCHASER's representative shall be allowed to the all areas where the design, fabrication, and assembly of the components, subcomponents and accessories will take place such as shops, working areas, and engineering offices of the SUPPLIER and its subsuppliers at any time for the purpose of quality assurance audits, inspection and witnessing. Witness and hold points with advance notice requirements should be stipulated.

Such audits will include examination of documentary evidence and performance of activities affecting quality and will be carried out on a planned, periodic basis during the course of the work to verify compliance with all aspects of the QA program and to determine the effectiveness thereof.

20 QA PROGRAM REQUIREMENTS

20.1 SUPPLIER's QA Program

This specification and NEK QA specification QS-610 Rev.1 establish the SUPPLIER's QA program requirements that shall apply to all activities affecting the quality of supplied equipment, materials, or services.

The SUPPLIER shall have its own Quality Assurance program that complies with ISO 9001 or equivalent, and relevant requirements of QS 610 Rev.1 which shall assure that all services ordered by this specification conform to the requirements of this specification and the Code. Reporting of defects and noncompliance in accordance with SUPPLIER's QA Program and relevant requirements of NEK QS 610 Rev.1, shall be implemented by the SUPPLIER.

The SUPPLIER shall submit with Proposal one controlled copy of its Quality Manual proposed for the scope of work to be performed for the PURCHASER's review and acceptance.

The SUPPLIER shall retain full responsibility to perform QA function in all activities and his responsibility for QA implementation cannot be transferred to others or reduced in any way.

20.2 SUPPLIER's Responsibility for Subcontractors

The SUPPLIER shall ensure that its subcontractors meet applicable requirements of this Specification.

The Specification requirements shall apply to subcontractors for works and services not performed by the SUPPLIER.

The SUPPLIER shall be fully responsible for all actions of his subcontractors in relation to the PURCHASER.

20.3 Certificate of Conformance/Compliance

The SUPPLIER and its subcontractors shall provide a Certificate of Compliance stating that all provided equipment and services meet requirements of codes, standards and this Specification.

20.4 Manufacturing and Inspection Plans

The SUPPLIER shall provide the Manufacturing and Inspection Plans with record (R), witness (W) and hold (H) points to the PURCHASER for review and approval prior to start of manufacturing.

The Manufacturing and Inspection Plans shall cover at least all relevant inspection requirements and shall outline the manufacturing and production sequence and specific inspections that are required to be performed.

The SUPPLIER shall update the Manufacturing and Inspection Plan and submit copies thereof to the PURCHASER when changes are approved by the PURCHASER.

21 SPECIAL HANDLING

The SUPPLIER shall specify any special handling requirements and provide the PURCHASER with appropriate procedure, which shall explain and emphasize them in detail.

The SUPPLIER shall provide any special requirements and advice for maintaining cleanliness of the components during extended site storage, indoors or outdoors, and installation.

The SUPPLIER shall also specify additional requirements necessary to maintain equipment warranties.

Special handling requirements shall be provided in the vendor technical manual.

22 SHELF LIFE

The SUPPLIER shall not ship any item that has less than 5 (five) years remaining shelf life at time of shipment.

The SUPPLIER shall provide shelf life data as follows:

1. Expiration date;
2. Cure date or manufacturing date;
3. Material composition.

If the above requirements are not met the item will be shipped back to the SUPPLIER at the SUPPLIER's expenses.

23 10CFR21 REPORTING

Not applicable.

24 COMMERCIAL GRADE ITEM DEDICATION

Not applicable.

25 SUPPLIER DOCUMENTATION REQUIREMENTS

The SUPPLIER documentation requirements are given in the sections 5, 10, 11, 12, 13, 15, 16, 20, 27, 28, 29, 30, 31, 33 and 34 of this Specification.

Prior to start of fabrication, the SUPPLIER shall prepare a preliminary Documentation Index detailing the quality assurance documents which will be required to comply with this specification and referenced codes and standards. The index shall identify both by document type and the specific component or part, each individual document that will be submitted to the PURCHASER for information and approval. It shall also identify records, which will document the results of operations, inspections and tests. Upon completion of equipment fabrication, testing, and inspection, but prior to release for shipment, the Index shall be finalized to show the drawings and procedures actually used and the records which document the results of all inspections and tests performed. The final Documentation Index shall be verified for accuracy and completeness and submitted to the PURCHASER.

Each shipment must be accompanied by certification containing the signature of a person responsible for the quality control of the SUPPLIER, stating the material or items conform to all purchase order requirements. Applicable part numbers and other item identification, qualification reports and the NEK Purchase Order number shall be referenced by the certification. The SUPPLIER shall be responsible for inspecting the items and checking the applicable records, prior to shipment, to verify compliance with all specific requirements. Acceptance of the completed sets of records by the PURCHASER doesn't relieve the SUPPLIER of responsibility for compliance with specification requirements.

The SUPPLIER shall provide to the PURCHASER a list of recommended spare and replacement parts or assemblies for the ordered / supplied item. The appropriate delineation of the technical and quality assurance related data required for ordering these parts or assemblies shall also be identified. Each part of supplied safety related component must be classified for safety related application and must be notified on replacement parts list or Bill of Material. This data shall be supplied as portion of the final documentation package for information.

26 PURCHASER PROPRIETARY DATA

The 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 there from (hereinafter collectively referred to as the "Information"). All such information shall be considered to be proprietary to the SUPPLIER. The right to use of all such Information shall be transmitted to the PURCHASER only for its personnel use and shall be entirely restricted to the performance of the contract and subject to the confidentiality provision.

27 NONCONFORMANCE REPORTS

Nonconformances with specification requirements, approved drawings, 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 ones, which cannot be brought within specification requirements by rework or replacement. When such condition exists, the SUPPLIER shall initiate a Nonconformance Notice (NCN) using the SUPPLIER's standard proposed disposition. In addition, 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. Properly disposition and send the NCN to the PURCHASER.
3. Provide technical justification if recommended disposition is "Use-As-Is" or "Repair".

The resolution NCN shall be approved by the PURCHASER. Further engineering and/or manufacturing after detection of nonconformances, prior to the PURCHASER's approval shall be at the SUPPLIER's risk.

The nonconformance report shall provide a method by which the SUPPLIER shall obtain a documented response and approval from PURCHASER when nonconformances are identified. The use of the nonconformance reports will pertain to work at the SUPPLIER's and/or subcontractors' shops.

28 REPAIR RECORDS

Together with the documentation package shipment the SUPPLIER shall provide the PURCHASER with all generated repair records and they shall include as a minimum the following information:

1. Summary of repair/refurbishment work that has been performed on the item(s).
2. Brief analysis of the reason for failure of the item(s).
3. Details of any special processes used during repairs that were not used during fabrication.
4. A list of replacement parts installed in the repaired items(s).

29 SOURCE INSPECTION/SURVEILLANCE NOTIFICATION

The SUPPLIER shall provide access to the SUPPLIER 's plant facilities and records pertaining to this Specification for the purpose of planning and performing source inspection / surveillance activities.

The PURCHASER requires ten (10) working days advance notice for the purpose of establishing hold points and ten (10) working days advance notice that witness or hold points have been reached.

The SUPPLIER shall contact the PURCHASER's designated representative as stated in the previous paragraph, when a witness or hold points have been reached. The SUPPLIER will not proceed past that point until inspection has been established or waived by the PURCHASER.

Inspection or examinations performed by the PURCHASER, or designated representatives do not relieve the SUPPLIER of its responsibility to meet the requirements of this Specification.

30 SHIPPING REQUIREMENTS

Shipping shall be in accordance with the requirements of ASME AG-1, Subarticle RA-7300.

Protection level shall be Level B in accordance with ASME NQA-1, Subpart 2.2.

The SUPPLIER shall provide appropriate shipping methods for protection from the effects of temperature extremes, humidity, transit shocks and jarring.

The shipping container shall be clearly tagged with the equipment tag number and NEK Purchase Order number.

Material and all certifications or accompanying documentation supplied within the scope of this specification shall be directly shipped from the SUPPLIER to the PURCHASER.

The PURCHASER's authorized source inspectors have the right to hold shipment if purchase order requirements are not met.

31 DELIVERY SCHEDULE

After contract award, the SUPPLIER shall, on the basis of delivery milestones defined in the contract, provide an integrated detailed delivery schedule with milestones for delivery of documentation, fabrication and delivery of components which will be supplied within the scope of this Specification.

32 WITNESS AND HOLD POINTS

The SUPPLIER shall provide the Manufacturing and Inspection Plan of overall activities in accordance with the scope of contractual activities to the PURCHASER for review and approval.

The PURCHASER shall have the right to determine his own witness and hold points in the SUPPLIER's Manufacturing and Inspection Plan. For these witness and hold points the PURCHASER may establish notification points for which the SUPPLIER shall give prior notification to the PURCHASER. In addition, the PURCHASER may establish hold points and temporary notification points if necessary to ensure resolution of quality problems or temporary quality problems.

Predetermined hold points and notification points require receipt of notification at least ten (10) working days in advance of the scheduled time of performance.

Predetermined witness and hold points require receipt of notification at least ten (10) working days in advance of the scheduled time of performance.

The following hold points for which a prior notification is required are:

1. Factory assembly hydrostatic tests
2. Full load performance test of the chiller units
3. Shipping release.

The SUPPLIER shall not proceed beyond the predetermined hold points without written approval from the PURCHASER.

33 VENDOR TECHNICAL MANUAL AND REGISTERED UPDATES

The SUPPLIER shall furnish a vendor technical manual and DSFS document with all necessary information for operation and maintenance, updated specific data and equipment(s) drawings. Standard manuals are not acceptable unless clearly marked or modified to indicate the concerned equipment.

A special attention shall be paid to technical documentation and instructions for the following topics:

1. Installation;
2. Operating instructions;
3. Maintenance;
4. Set point list;
5. Troubleshooting;
6. Replacement parts;
7. Special tools and instrumentation;
8. Drawings of components and related equipment.

Table of contents of the vendor technical manual is given as a guideline in the Attachment 8.

34 TRAINING

The SUPPLIER shall provide competent personnel to the JOBSITE to perform start-up of the supplied equipment and training of the PURCHASER's personnel who will operate and maintain the equipment.

The training shall cover at least start-up, safe operation, maintenance and checkout of the equipment. The supplier shall provide necessary documentation for training, such as operating and maintenance procedures, drawings, diagrams, etc. to the PURCHASER.

Training date and contents shall be agreed with the PURCHASER in advance.

The SUPPLIER shall send a detailed training description to the PURCHASER for review and approval.

35 ATTACHMENTS

Attachment 1: Water Chiller Performance Data Sheet (2 pages)

Attachment 2: Remote Air Cooled Condenser Performance Data Sheet (1 page)

Attachment 3: Applicable Floor Response Spectra Figures from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1 (6 pages)

Attachment 4: Equipment Specification Exceptions (1 page)

Attachment 5: Water Chiller Equipment Data Sheet (2 pages)

Attachment 6: Remote Air Cooled Condenser Equipment Data Sheet (2 pages)

Attachment 7: Pump Equipment Data Sheet (2 pages)

Attachment 8: Vendor Technical Manual Guideline (1 page)

Attachment 9: EAM-MECL Data Tables (2 pages)

ATTACHMENT 1
WATER CHILLER PERFORMANCE DATA SHEET
KRŠKO NUCLEAR POWER PLANT

1.	Tag number	VA782CHL-001 VA782CHL-002
2.	Quantity required	2
3.	Safety Class	NSR/AQ
4.	Seismic Category	I
5.	Unit location	OSC, P36; El. 101.80
6.	Applicable floor response spectra from 1056-NA-L-3/1-A1	OBE Level 1 SSE Level 1
7.	Ambient conditions at equipment location	
a.	Temperature, °F (°C)	104 (40) max
b.	Relative humidity, %	95 max
c.	Barometric pressure, inch Hg (kPa)	29.37 (99.44)
8.	Evaporator design operating conditions (per chiller)	
a.	Minimum cooling capacity, btu/hr (kW)	464051 (136)
b.	Chilled water flow for 5 K temp. difference, gpm (m ³ /h)	102.9 (23.4)
c.	Chilled water entering temperature, °F (°C)	53.6 (12)
d.	Chilled water leaving temperature, °F (°C)	44.6 (7)
e.	Estimated maximum water side pressure drop through evaporator, ft w.g. (kPa)	7.4 (22)
f.	Evaporator fouling factor, hr-ft ² -F/btu	0.0005
9.	Chiller unit design data	
a.	Cooling medium	Air
b.	Refrigerant type	R134a
c.	Compressor electrical load, kW	(*)
d.	Estimated installation space (L x W x H), ft (m)	7.6 x 3.0 x 6.6 (2.3 x 0.9 x 2.0)
e.	Electrical power supply, V/ph/Hz	400/3/50

(*) shall be determined by the SUPPLIER on the basis of selected condensation temperature

ATTACHMENT 2
REMOTE AIR COOLED CONDENSER PERFORMANCE DATA SHEET
KRŠKO NUCLEAR POWER PLANT

1.	Tag number	VA782CND-001 VA782CND-002
2.	Quantity required	2
3.	Safety Class	NSR/AQ
4.	Seismic Category	I
5.	Unit location	OSC, P41; El. 107.10
6.	Applicable floor response spectra from 1056-NA-L-3/1-A1	OBE Level 2 SSE Level 2
7.	Ambient conditions at equipment location	
a.	Min. temperature, °F (°C)	-31.2 (-35.1)
b.	Max. dry bulb/wet bulb temperature, °F (°C)	105.6/87.9 (40.9/31.1)
c.	Barometric pressure, inch Hg (kPa)	29.37 (99.44)
8.	Condenser operating conditions (per unit)	
a.	Minimum cooling capacity, btu/hr (kW)	(*)
9.	Condenser design data	
a.	Estimated installation space (L x W x H), ft (m)	17.1 x 3.9 x 9.2 (5.2 x 1.2 x 2.8)
b.	Electrical power supply, V/ph/Hz	400/3/50

(*) shall be determined by the SUPPLIER on the basis of heat input from the compressor(s)

ATTACHMENT 3

**Applicable OBE and SSE Floor Response Spectra Figures
from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1**

NOTES:

Names of Floor response spectra on each figure include considered direction (X, Y, Z), state (OBE, SSE), for Level 2 (nivo 2) and value of damping (%).

Considered directions according to “true north” and “plant north”:

- Direction X = East – West response,
- Direction Y = North – South response,
- Direction Z = Vertical response.

Actual levels according to “local zero” (+/-0,00 = altitude +157,85m a.s.l. = NEK altitude 102,650m):

- Level 1 = Slab's axial elevation corresponds to NEK altitude 101,800m;
- Level 2 = Slab's axial elevation corresponds to (NEK altitude 106,200m);

OPC building is considered as shelter, that is why there is a rule for minimum value of equipment accelerations (shown on each FRS chart as “meja 4g (zaklonišča)”):

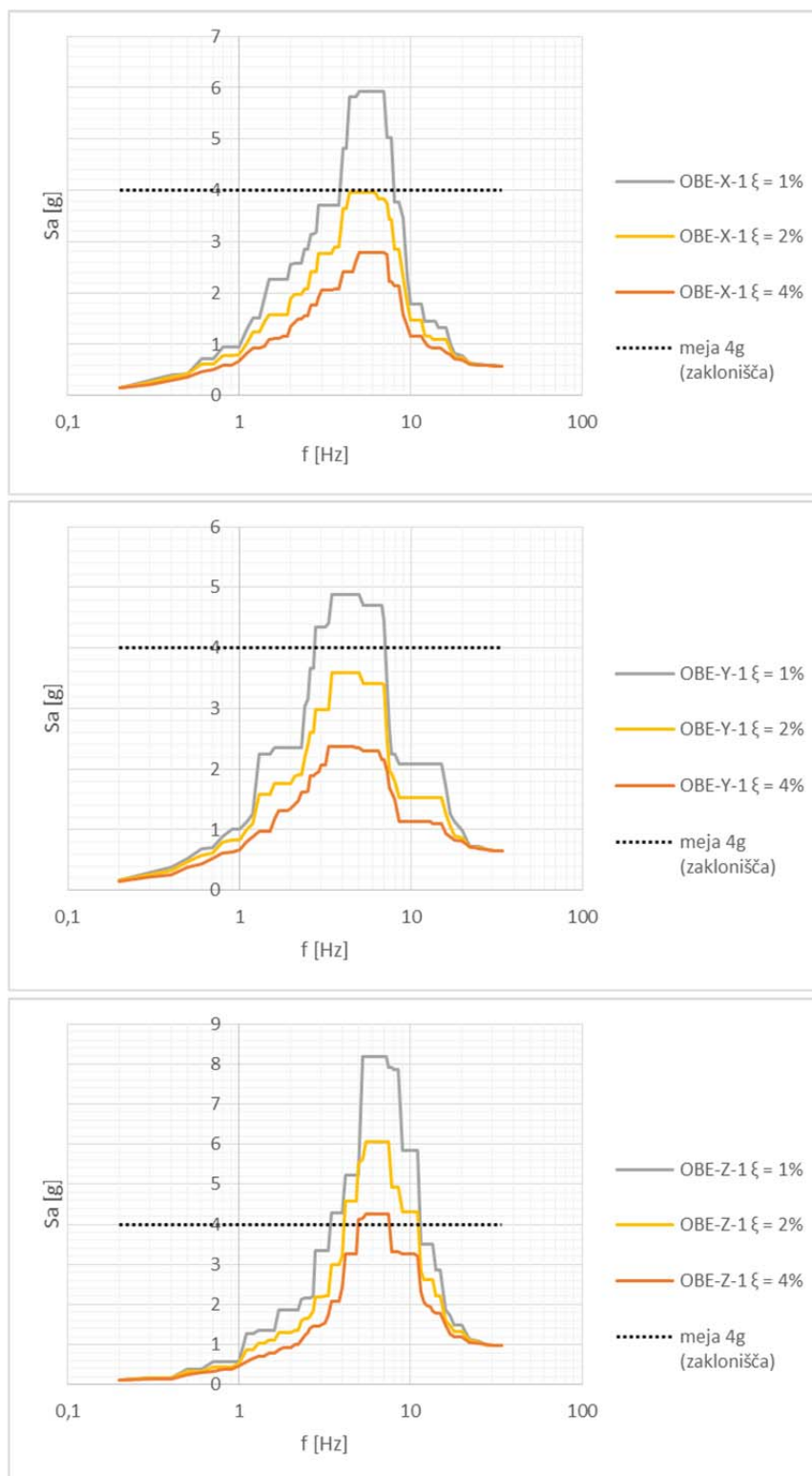
- For higher levels (levels 1, 2, 3): $S_{a,min} = 4g$.

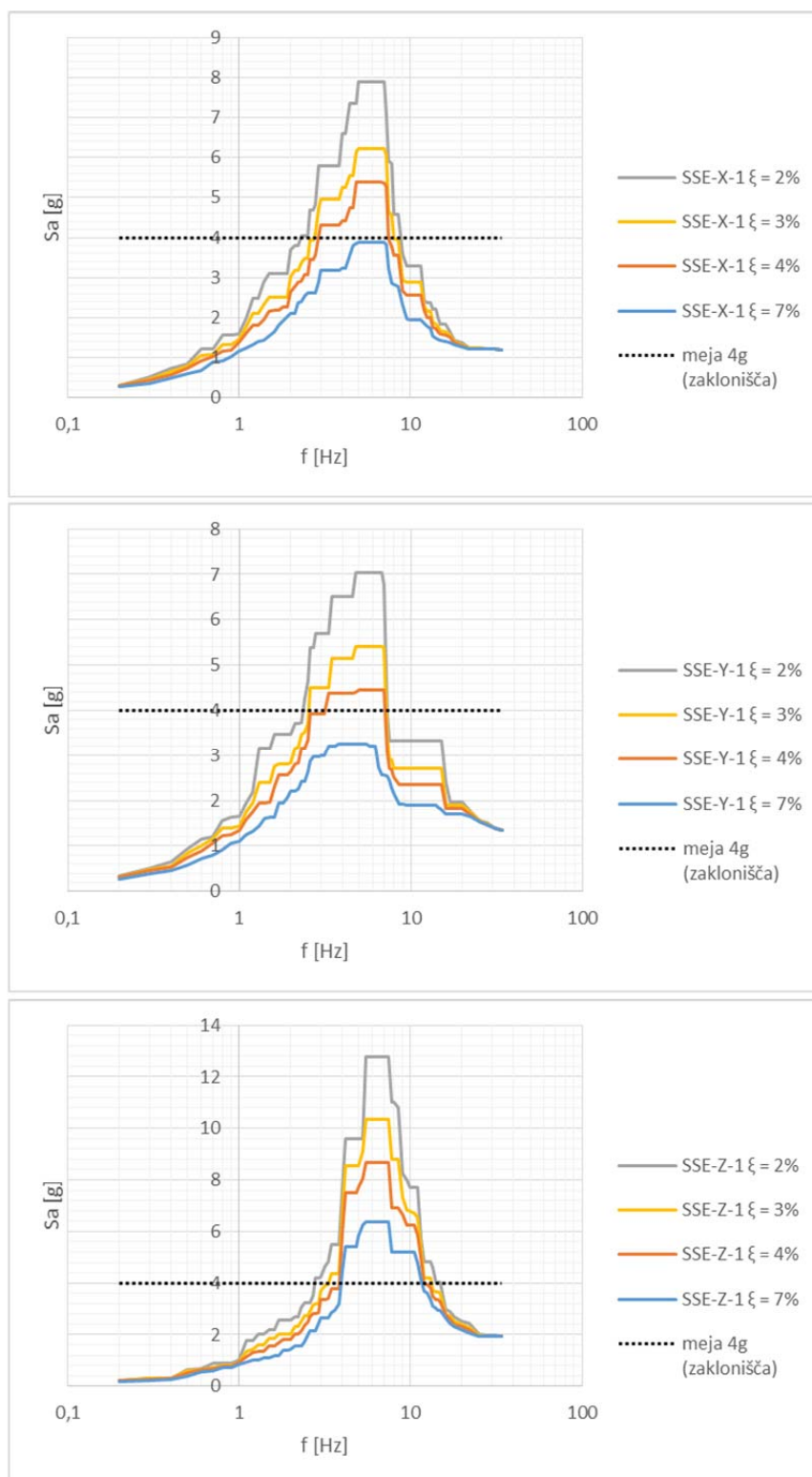
Included floor response spectra:

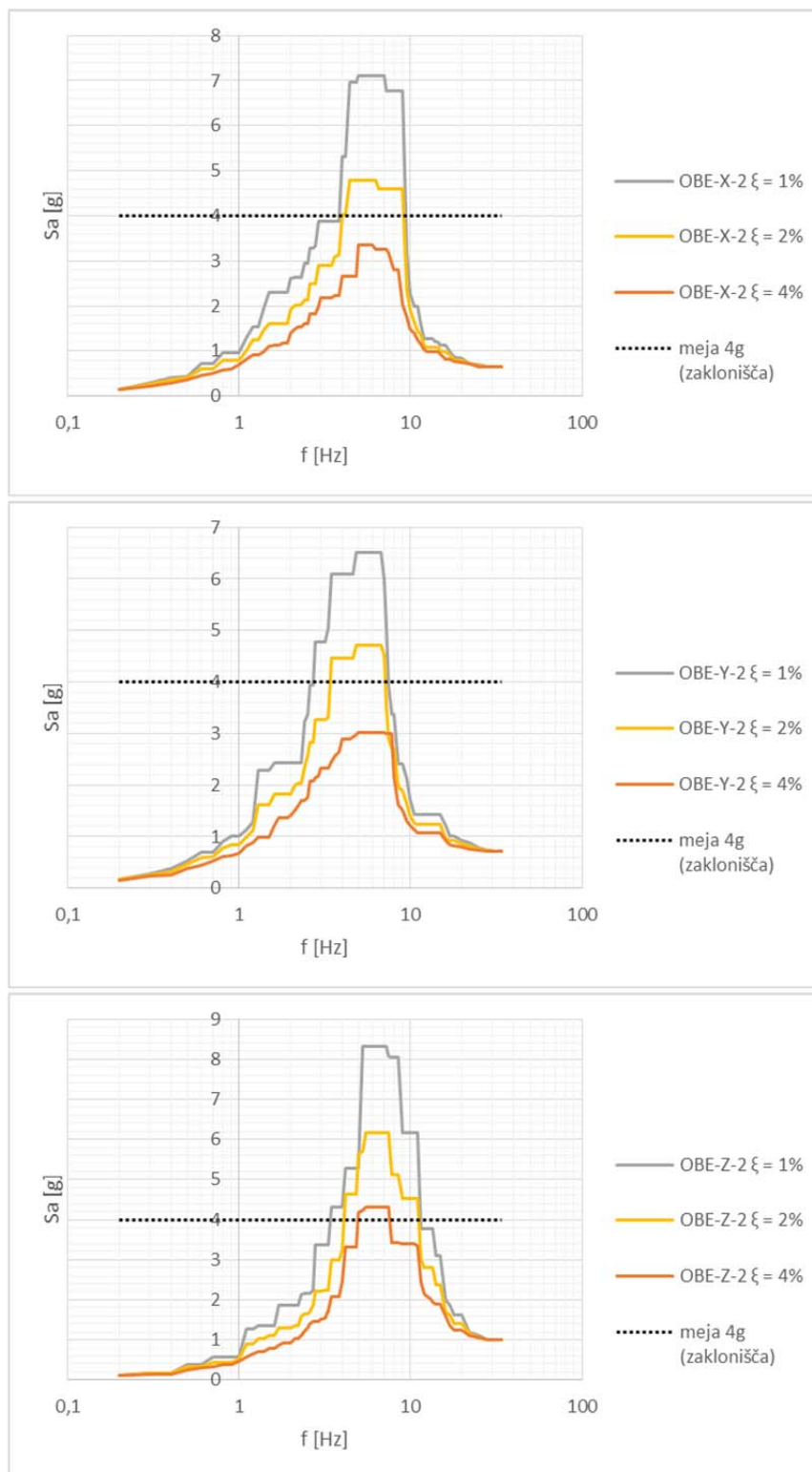
- OBE: Level 1 (Etažni spektri – OBE – nivo 1) for all directions and dampings (page 5 of Appendix A of Document OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1);
- SSE: Level 1 (Etažni spektri – SSE – nivo 1) for all directions and dampings (page 5 of Appendix B of Document OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1).

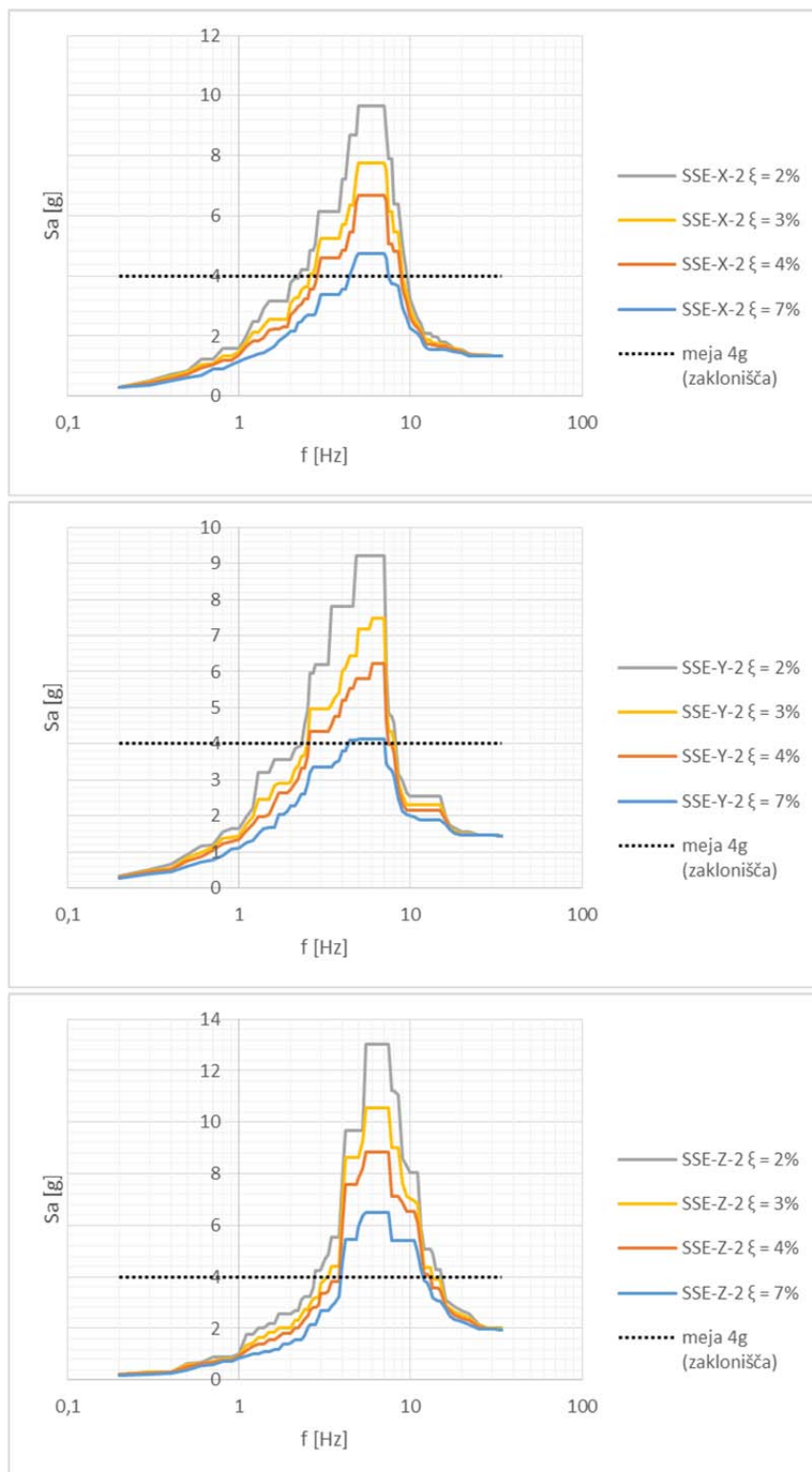
and

- OBE: Level 2 (Etažni spektri – OBE – nivo 2) for all directions and dampings (page 4 of Appendix A of Document OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1);
- SSE: Level 2 (Etažni spektri – SSE – nivo 2) for all directions and dampings (page 4 of Appendix B of Document OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1).

- OBE: Level 1 (Etažni spektri – OBE – nivo 1)

- SSE: Level 1 (Etažni spektri – SSE – nivo 1)

- OBE: Level 2 (Etažni spektri – OBE – nivo 2)

- SSE: Level 2 (Etažni spektri – SSE – nivo 2)

ATTACHMENT 4
EQUIPMENT SPECIFICATION EXCEPTIONS
OSC WATER CHILLERS, AIR COOLED CONDENSERS AND AUXILIARY EQUIPMENT
KRŠKO NUCLEAR POWER PLANT

The BIDDER certifies that the Proposal is in complete and absolute agreement with this Specification, except as specifically outlined below (use additional sheets if required).

BIDDER'S NAME

MANUFACTURER'S NAME

QUOTATION NUMBER

SIGNATURE

TITLE

Exceptions from this Specification:

ATTACHMENT 5
WATER CHILLER EQUIPMENT DATA SHEET
KRŠKO NUCLEAR POWER PLANT

The BIDDER shall return one copy of this form with the Proposal with all the blanks filled in.

BIDDER'S NAME

MANUFACTURER'S NAME

QUOTATION NUMBER

1. Guarantee conditions (per chiller)

- a. Cooling capacity, btu/hr (kW)

- b. Chilled water flow, gpm (m³/h)

- c. Chilled water entering temperature, °F (°C)

- d. Chilled water leaving temperature, °F (°C)

- e. Evaporator water side pressure drop, ft w.g. (kPa)

- f. Evaporator fouling factor, hr-ft²-F/btu

- g. Pressure relief required

2. Chiller unit general data

- a. Unit type

- b. Overall dimensions, ft (m)

- c. Total weight, lb (kg)

- d. Refrigerant type

- e. Refrigerant charge, lb (kg)

3. Chiller unit electrical data

- a. Number of compressors _____
- b. Compressor type _____
- c. Compressor motor electrical power, kW _____
- d. Compressor motor speed, rpm _____
- e. Compressor motor full load current, A _____
- f. Compressor motor locked rotor current, A _____
- g. Electrical power (auxiliaries), kW _____
- h. Electrical power supply, V/ph/Hz _____
- i. Control circuit power supply, V/ph/Hz _____

4. Material data (ASME or ASTM number and grade)

- a. Evaporator shell _____
- b. Evaporator tubes _____
- c. Compressor housing _____
- d. Gaskets and bolts _____

5. Chiller unit design data

- a. Number of refrigeration circuits _____
- b. Number of compressors (per refrigeration circuit) _____
- c. Evaporation temperature, °F (°C) _____
- d. Evaporator water side pressure, psia (MPa) _____
- e. Evaporator refrigerant working pressure, psia (MPa) _____
- f. Evaporator refrigerant design pressure, psia (MPa) _____

ATTACHMENT 6
REMOTE AIR COOLED CONDENSER EQUIPMENT DATA SHEET
KRŠKO NUCLEAR POWER PLANT

The BIDDER shall return one copy of this form with the Proposal with all the blanks filled in.

BIDDER'S NAME

MANUFACTURER'S NAME

QUOTATION NUMBER

1. Guarantee conditions (per condenser)

- a. Cooling capacity, btu/hr (kW) _____
- b. Air flow, cfm (m³/h) _____
- c. Air entering temperature, °F (°C) _____
- d. Air leaving temperature, °F (°C) _____
- e. Air side pressure drop, in w.g. (Pa) _____
- f. Fouling factor, hr-ft²-F/btu _____

2. Condenser unit general data

- a. Unit type _____
- b. Overall dimensions, ft (m) _____
- c. Total weight, lb (kg) _____

3. Condenser unit electrical data

- a. Number of fans _____
- b. Fan motor speed, rpm _____
- c. Fan motor electrical power, kW _____
- d. Fan motor full load current, A _____
- e. Electrical power supply, V/ph/Hz _____

4. Material data (ASME or ASTM number and grade)

- a. Unit housing _____
- b. Cooling coils tube material _____
- c. Cooling coils fin material _____
- d. Gaskets and bolts _____

5. Condenser unit design data

- a. Number of refrigeration circuits _____
- b. Number of cooling coils _____
- c. Condensation temperature, °F (°C) _____
- d. Refrigerant working pressure, psia (MPa) _____
- e. Refrigerant design pressure, psia (MPa) _____

ATTACHMENT 7
PUMP EQUIPMENT DATA SHEET
KRŠKO NUCLEAR POWER PLANT

The BIDDER shall return one copy of this form with the Proposal with all the blanks filled in for each pump size.

BIDDER'S NAME

MANUFACTURER'S NAME

QUOTATION NUMBER**1. Pump data**

- a. Tag number
- b. Manufacturer
- c. Manufacturer's model No.
- d. Pump type
- e. Rated capacity, gpm (m^3/h)
- f. Total developed head at rated capacity, ft (m)
- g. Shutoff head, ft (m)
- h. Pump speed at rated capacity, rpm
- i. Efficiency at rated capacity, %
- j. Driver brake horsepower at rated capacity, hp (kW)
- k. Pump WR^2 , lb ft^2 (kg m^2)
- l. Suction connection size, in (mm)
- m. Discharge connection size, in (mm)
- n. Design pressure, psig (MPa)
- o. Design temperature, °F (°C)

2. Material data (ASME or ASTM number and grade)

- a. Impeller _____
- b. Casing _____
- c. Shaft _____
- d. Shaft sleeves _____
- e. Wearing rings _____
- f. Bearings _____
- g. Mechanical seals _____
- h. Baseplate _____
- i. Keys, bolts, nuts, washers _____
- j. Gaskets _____

3. Coupling data

- a. Manufacturer _____
- b. Type _____
- c. Material _____

4. Weight

- a. Total pump operating weight including coupling, motor and baseplate, lb (kg) _____
- b. Pump assembly, lb (kg) _____
- c. Rotating element, lb (kg) _____
- d. Motor, lb (kg) _____

5. Motor data

- a. Electrical power, hp (kW) _____
- b. Speed, rpm _____
- c. Full load current, A _____
- d. Locked rotor current, A _____
- e. Electrical power supply, V/ph/Hz _____

ATTACHMENT 8
VENDOR MANUAL GUIDELINE
KRŠKO NUCLEAR POWER PLANT

INTRODUCTION

Purpose and Scope of Manual

Definitions

1 EQUIPMENT DESCRIPTION

1.1 System description and purpose

1.2 Equipment Functional Description and Specifications

2 INSTALLATION

2.1 Receiving

2.2 Handling

2.3 Installing

2.4 Connections, grounding and shielding

2.5 Cleaning and inspection

2.6 On-site testing

2.7 Removal of equipment from service

2.8 Storage and maintenance instructions

3 OPERATING INSTRUCTIONS

3.1 General

3.2 Safety precautions

3.3 Start-up procedures

3.4 Operation

3.5 Operational checkout at plant shutdown

3.6 Testing at power

3.7 Equipment set points

4 MAINTENANCE

4.1 Preventive maintenance procedures and programs

4.2 Safety precautions and interlock checks

4.3 Test equipment and tools for maintenance and troubleshooting

4.4 Dismantling and reassembly of assemblies and subassemblies

4.5 Alignment and adjustment procedures (including torque sheet data)

4.6 Operational performance test

5 TROUBLESHOOTING

5.1 Troubleshooting procedures and/or troubleshooting chart

6 REPLACEMENT PARTS

6.1 Parts Lists

6.1.1 Introduction

6.1.2 Maintenance Parts List

6.1.3 List of Manufacturers and addresses with ordering instructions

6.2 Recommended parts List

7 SPECIAL TOOLS AND INSTRUMENTATION

7.1 List of Special Tools, P/N, Spec. Tools DWG's

8 DRAWINGS & FIGURES

ATTACHMENT 9 EAM-MECL DATA TABLES

Table 1: List of equipment data for new components

NO.	EQUIP NO.	DISCIPLINE		
1	EQUIP DISCIPLINE	E	I	M
2	EQUIP CATEGORY			
3	SYSTEM CODE			
4	PARENT EQUIP NO			
5	EQUIP STATUS CODE			
6	EQUIP TYPE			
7	FUNCTIONAL DESCRIPTION			
8	EQUIP NOTE TEXT			
9	TEXT VERIF			
10	LABEL TYPE			
11	POSITION			
12	LABEL TEXT			
13	EQUIP SUBCATEGORY			
14	ASME CODE CLASS			
15	ANSI SAFETY CLASS			
16	IEEE SAFETY CLASS			
17	SEISMIC CATEGORY			
18	EQUIP QUALIFICATION REQUIRED			
19	SAFETY RELATED			
20	INSTR LIST N/A			N/A
21	SCM SC			
22	SAF.FUNC.			
23	BUILDING ID			
24	ROOM NO			
25	EQUIP ELEVATION			
26	EX ZONE			
27	DESIGN PRESSURE	N/A		
28	PRESSURE UOM	N/A		
29	DESIGN TEMPERATURE	N/A		
30	TEMPERATURE UOM	N/A		
31	MODEL			
32	SPIN			
33	SERIAL NO			
34	VALVE ID	N/A	N/A	
35	MANUFACTURER ID			
36	MANUFACTURER BRANCH ID			
37	VENDOR ID			
38	VENDOR BRANCH ID			
39	MANUFACTURER PART NO			
40	PURCHASE ORDER NO			
41	INSTALLATION YEAR			
42	VOLTS N/A			
43	AMPS N/A			
44	HP KW N/A N/A			
45	RPM N			

Table 2: List of equipment data for spare parts

MECL EQUIP. NO.	
EQUIPMENT DESCRIPTION	
PART NUMBER	
MANUFACTURER	
REFERENCE DOCUMENT	INSTRUCTION MANUAL
	DRAWING NO.-REV. NO.
	BILL OF MATERIAL

Table 3: List of equipment spare parts

ITEM NO.				
MANUFACTURER PART NUMBER (MPN)				
MPN DESCRIPTION				
SAFETY CLASSIFICATION				
QUANTITY				
UNIT OF MEASURE (UOM)				
MANUFACTURER TITLE ADDRESS				
SERIAL NUMBER				
LOT/HEAT/REAL/BATCH NO.				
SHELF LIFE CONTROL				
SHELF LIFE MONTHS				
ASME CODE PN				
IEEE PN				
STORAGE LEVEL				
ISM REQ				
QUALIFIED LIFE - MONTHS				
SERVICE/OPERATION LIFE - MONTHS				
RECOMMENDED QUANTITY				
ITEM PRICE				
PURCHASE ORDER NO.				
REFERENCE RECORDS				