





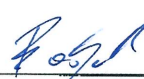

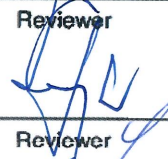

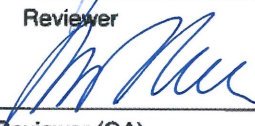
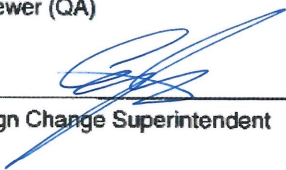
Technical Specification OSC, AIR HANDLING UNITS

KRŠKO NUCLEAR POWER PLANT

SP-B3008 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, AIR HANDLING UNITS
(Rev. 4)**

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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	15.2.2017	Revision correction previously given by the investor	---
		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	18.07.2017	Specification is added with AHU control panel which shall control operation of AHU's fans, chilled water pumps and three way valves that have also been additionally added to it.	Pages: 1, 15, 16, 17, 18
3	11.9.2017	Revision correction previously given by the investor 3.4.2017 and 26.7.2017)	---
4	8.02.2018	Consideration of corrections suggested during technical dialog performed by investor.	---

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Attachment 1: Air Handling Units Performance Data List form (2 pages)

Attachment 2: Applicable Floor Response Spectra Figures from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1 (4 pages)

Attachment 3: Reference drawings SS-906-781-2 Rev.0 and SS-906-781-3 Rev.0 (3 pages)

Attachment 4: Equipment Specification Exceptions form (1 page)

Attachment 5: Air Handling Units Data List form (3 pages)

Attachment 6: Pump Equipment Data Sheet (2 pages)

Attachment 7: Valve Equipment Data Sheet (2 pages)

Attachment 8: Vendor Technical Manual Guideline (1 page)

Attachment 9: MECL Data Tables (2 pages)

1 SCOPE

1.1 Scope of Work

This Specification includes the information required for the procurement of air handling units 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).

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

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

1. Two air handling units containing components, quantities, dimensions, and arrangements, as indicated in this Specification and in the Air Handling Unit Performance Data List. The fluid side of the coil(s) shall be designed, constructed and tested in accordance with ASME Code Section VIII, Division 1. The air handling units have the same configuration but opposite access sides and configured (settled) one above other, check drawings in Attachment 3.
2. Flanged expansion joints for connection to adjacent ductwork at both intake and discharge sides of the each unit.
3. Auxiliary equipment which will become an integral part of the air handling units cooling system piping circuits:
 - a. Two chilled water pumps;
 - b. Two three-way valves with electric actuators for water flow modulation through air handling unit cooling coil;
 - c. Two air flow and temperature measuring devices
 - d. Chilled water system relief valves;
4. Air handling units common cooling and heating control systems which shall control operation of the air handling units' fans, chilled water supply pumps for coolers, chilled water three way valves with electric actuators, electrical heaters, AHUs inlet dampers, and other necessary auxiliary equipment (thermostats, and other necessary sensing devices) to maintain desired preset temperature and constant air flow at the AHUs outlet as indicated on the Air Handling Unit Performance Data List.
5. Air handling units design documentation package which consists of drawings, sizing calculations of equipment, system design description, ladder logic diagrams, elementary diagrams, wiring diagrams, user and maintenance manual, etc. All previous shall be specifically for the supplied equipment.
6. Spare parts for all supplied I&C and digital components
7. One set of any special tools required for the operation and maintenance of all equipment to be furnished under this Specification.
8. Design specification, for water side pressure vessel shall be prepared in

accordance with the requirements of 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. Documentation of supplied equipment, as required in sections 5.3, 5.4 and 25 of this Specification.
10. Performance of all necessary factory acceptance tests.
11. Description of required site acceptance tests to be performed including a list of necessary test equipment.
12. Equipment start-up procedure
13. Packaging and preparation for shipment.

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 units at the JOBSITE.
2. Foundations, structural supports and anchor bolts.
3. Ductwork and piping connections.
4. Procurement and erection of interconnecting piping between supplied main and auxiliary components addressed above.
5. Power wiring and control wiring between the SUPPLIER's equipment and equipment furnished by OTHERS. Electrical service provided will be 400 volt AC $\pm 10\%$, 3 phase, 50 hertz..

2 DEFINITIONS

AC	Alternate Current
AHU	Air Handling Unit
AQ	Augmented Quality
BIDDER	An entity, which offers supply of products and/or services and has submitted a bid within a public tendering procedure
DC	Direct Current
DEC	Design Extension Conditions
EMI	Electromagnetic Interference
EQ	Environmental Qualification
JOBSITE	Installation location of equipment at the Nuclear Power Plant Krško site
MECL	Master Equipment Component List
NCR	Nonconformance Report
NEK	Nuclear Power Plant Krško
NRC	United States Nuclear Regulatory Commission
NSR	Non Safety Related
OBE	Operating Basis Earthquake
OSC	Operational Support Center
OTHERS	NEK or other company(ies) subcontracted by NEK
PURCHASER	Nuclear Power Plant Krško
QA	Quality Assurance
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

3 CODES, STANDARDS AND REGULATORY REQUIREMENTS

The air handling units 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 coil(s) shall be designed, constructed and tested in accordance with ASME Code section VIII, Division 1:

1. American Bearing Manufacturers Association (ABMA):
 - a. ABMA 9, Load Ratings and Fatigue Life for Ball Bearings;
 - b. ABMA 11, Load Ratings and Fatigue Life for Roller Bearings;
2. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
 - a. AHRI 410, Standard for Forced-Circulation Air-Cooling and Air-Heating Coils;
3. American Iron and Steel Institute (AISI):
 - a. Specification for Design of Cold-Formed Stainless Steel Structural Members;
4. Air Moving and Conditioning Association (AMCA):
 - a. AMCA 99, Standards Handbook;
 - b. AMCA 204, Balance Quality and Vibration Levels for Fans;
 - c. AMCA 210, Laboratory Methods of Testing Fans for Rating Purposes;
 - d. AMCA 300, Reverberant Room Method for Sound Testing of Fans;
5. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
 - a. ASHRAE 33, Method of Testing Forced Circulation Air Cooling and Air Heating Coils;
 - b. ASHRAE 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size;
6. 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; 2015 Edition
 - c. ASME B&PVC, Sections II, V, IX of the latest code edition;
 - d. ASME B31.1, Power Piping; 2010 Edition
 - e. ASME B16.5, Pipe Flanges and Flanged Fittings;
 - f. ASME B-16.34 – 2004, Valves – Flanged, Threaded, and Welding End
 - g. ASME NQA-1, 2008 with 2009/2011 Addenda, Quality Assurance Program Requirements for Nuclear Facility Applications;
7. American (ASTM):
 - a. E84, Standard Test Method for Surface Burning Characteristics of Building

Materials

- b. E477, Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
- 8. American Welding Society (AWS):
 - a. AWS D1.1, Structural Welding Code for Steel;
- 9. Electric Power Research Institute (EPRI):
 - a. EPRI TR-102323, Rev. 4, Guidelines for Electromagnetic Interference Testing in Power Plants;
- 10. International Electrotechnical Commission (IEC):
 - a. IEC 61000, Electromagnetic Compatibility (EMC), Part 3 - Limits and Part 4 - Testing and Measurement Techniques;
- 11. Institute of Electrical and Electronics Engineers (IEEE):
 - a. IEEE 1050-2004, IEEE Guide for Instrumentation and Control Equipment Grounding in Generating Stations;
- 12. National Electrical Manufacturers Association (NEMA):
 - a. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum);
 - b. NEMA MG 1 – Motors and Generators;
- 13. National Fire Protection Association (NFPA):
 - a. NFPA 70 National Electric Code;
 - b. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilation Systems;
 - c. NFPA 255, Standard Method of Test of Surface Burning Characteristics of Building Materials
- 14. NRC Regulatory Guides:
 - a. RG 1.29, Seismic Design Classification, Rev. 1, August 1973;
 - b. RG 1.100, Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants, Rev. 3, September 2009;
 - c. RG 1.180, Guidelines for evaluating electromagnetic and radio-frequency interference in SR instrumentation and control systems, Rev. 1, October 2003;
- 15. Underwriters' Laboratories (UL):
 - a. UL 900, Standard for Air Filters Units;
- 16. US Military Standards (MIL):
 - a. MIL-STD-461E, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment;

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 the PURCHASER for review and approval.

4 SUPPLEMENTAL DATA

4.1 *Supplemental Information*

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. SP-G508A-536633-00026 Rev.1 Nuclear Safety Class Valves
5. DSP-G513-044687-000 Design Specification ASME Safety Class Heat Exchangers ASME III Class 2 and 3, Exhibit A
6. DSP-G529-044687-000 Design Specification Safety Class Pumps ASME III Class 2 and 3, Exhibit A
7. SP-E311, Rev. 2, Non-Safety Related Fractional Horsepower and Larger Electric Motors;
8. 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 2.

9. 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 2.

4.2 *Reference Drawings*

Reference drawings SS-906-781-2 Rev.0 and SS-906-781-3 Rev.0 in the Attachment 3 show outside dimensions and general arrangement of components within the unit. The dimensions have been estimated by the design engineer.

The BIDDER shall review the proposed dimensions and propose adjustments/corrections, if necessary. In case of any adjustments/corrections, such information shall be included in the Proposal.

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. General description of proposed equipment with operating characteristics of components (filter efficiencies, coils, fan, motor, bearings, belts, etc.).
2. Preliminary outline drawings of the units, clearly marked with the unit tag number and showing all principal dimensions, configuration of components, weights of the unit and major items, center of gravity, operational and maintenance clearance dimensions and typical cross section views. The BIDDER may provide standard submittal drawings for this purpose.
3. Equipment specification with list of codes to which the equipment conforms and list of materials with ASME or ASTM number and grade.
4. Data for filter media, filter cells MERV value and filter mounting frames.
5. Fan performance curve with a clearly marked design operating point.
6. Estimated sound power levels for eight octave bands.

7. Heating coil performance.
8. Cooling coil performance.
9. Sound attenuation performance
10. Noise dB(A) leaving the AHU in both directions
11. Description of factory acceptance tests.
12. Description of proposed procedure for seismic qualification of the equipment.
13. If the units cannot be shipped completely assembled, the number, dimensions, weight of each shipping unit and amount of welding required to be performed at jobsite to completely assemble the units.
14. Completion and return of the BIDDER'S Air Handling Units Data List form (see Attachment 5).
15. Completion and return of the Equipment Specification Exceptions form with description of any deviations or exceptions to this Specification (see Attachment 4).

The BIDDER shall indicate additional documentation he proposes to supply.

5.3 Documentation Required after Contract Award

The documentation of the unit assembly shall include the following information as a minimum:

1. Certified outline drawings of the units, clearly marked with the unit tag number and showing all principal dimensions, configuration of components, weights of the unit and major items, center of gravity, operational and maintenance clearance dimensions and typical cross section views. 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.
2. Detailed drawings of components, sub-components or accessories. If these items are shown on separate drawings appropriate cross references shall be used.
3. Wiring diagrams (interlock and control) and electrical bill of material of each electrical equipment item furnished. Factory installed and field-installed wiring shall be indicated.
4. Certified fan performance curve with a clearly marked design operating point and operation points for different opening angles of inlet box damper.
5. Certified fan sound power levels for eight octave bands.
6. Structural design information including forces and moments at every equipment support interface, support hardware and bracket details, required anchor bolt sizes, anchor bolt locations, required anchor bolt materials, and specific anchor bolt torquing requirements. (Where there are no specific torquing requirements, the SUPPLIER shall so state). The SUPPLIER shall make provisions for appropriately transmitting any tension or shear loads to the anchor bolts.

7. List of used materials with ASME or ASTM number and grade.
8. Any limitations regarding installation of the unit or its components.
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;
8. Test procedures;
9. Test reports showing conformance to all testing procedures;
10. Cleaning procedures;
11. Packaging, handling and storage procedures;
12. Vendor technical manual;
13. List of recommended spare parts with MECL data tables filled in (see Attachment 6);
14. Statement of shelf life and operational life of the units;
15. Certificate of conformance with the requirements of this Specification;

5.4 Final Documentation

The SUPPLIER shall submit the original and one (1) electronic copy (CD, DVD, flash memory media) of the final technical documentation.

6 DESIGN REQUIREMENTS AND DESIGN INPUTS

6.1 General

The air handling units shall be designed in accordance with codes and standards listed in the section 3 of this Specification. The main design code shall be ASME AG-1.

Air handling units shall be designed for safe, continuous operation under the ambient conditions listed in the Air Handling Units Performance Data List.

Seismic qualification shall be performed in accordance with the requirements of IEEE 344, specification SP-S702 and the OSC Applicable OBE and SSE Floor Response Spectra Figures taken from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1, see Attachment 2.

Each air handling unit shall be designed for a 40-year life under the following conditions:

Routine maintenance at 3-month intervals.

An average testing cycle of 25 starts per year.

Air handling units shall be blow-through type with the following components:

1. Inlet and outlet expansion joints;
2. Prefilter section;
3. Filter section;
4. Damper section;
5. Fan section;
6. Diffuser section;
7. Water cooling coil with demister;
8. Electric heating coil;
9. Sound attenuator's section (silencer section);
10. Electrical power supply;
11. Instrumentation;

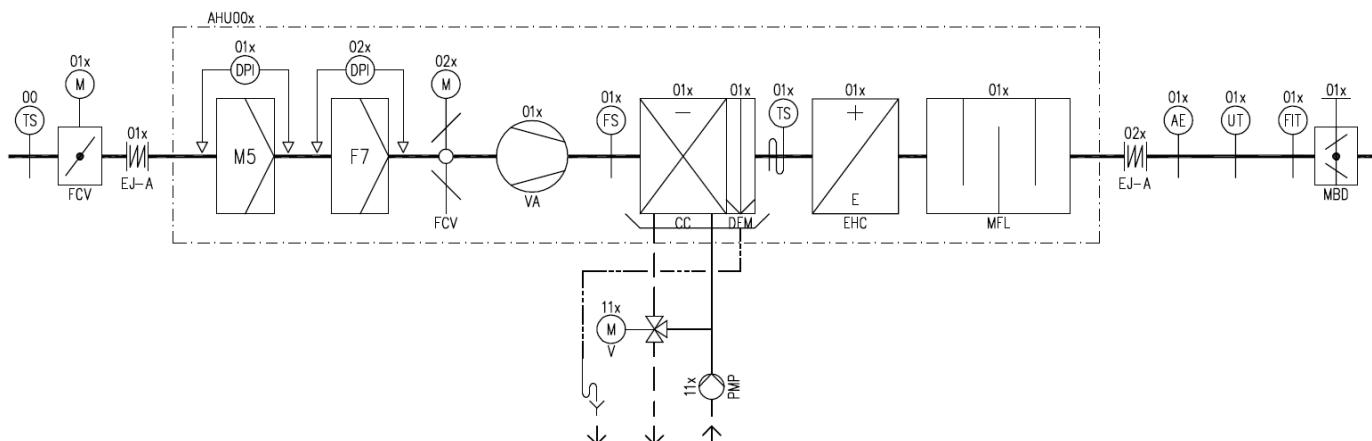
Arrangement of components is shown on the reference drawings SS-906-781-2 Rev.0 and SS-906-781-3 Rev.0 in the Attachment 3.

Each unit shall be provided with expansion joints for connection to adjacent ductwork at both intake and discharge sides.

The SUPPLIER shall warrant that the equipment covered by this Specification shall perform in accordance with the requirements specified in the Air Handling Units Performance Data List. Performance shall be determined taking into account dirty

filter pressure drops.

Figure 1: Conceptual flow diagram of AHU units



Ventilation system contains two air handling units AHU001 and AHU002. Both subsystems shall have the same configuration and shall be sized for 50 % of the total air flow capacity.

A conceptual flow diagram which shows air handling units, as well as the auxiliary equipment is shown on Figure 1.

6.2 Environmental Conditions

The air handling units 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).

6.3 Housing

Air handling units shall be constructed of stainless steel structural frame with stainless steel panels. Structural members shall conform to AISI Specification for Design of Cold-Formed Stainless Steel Structural Members.

The housing shall be constructed as solid double wall insulated panels attached to the structural frame. Thickness of insulation shall be 50 mm. Insulation shall have a flame spread rating not higher than 25 and a smoke developed rating not higher than 50 in accordance with NFPA 90A.

Access panels constructed as solid double wall insulated panels of the same material as housing shall be provided on accessible sections for access to internal components for maintenance and inspection.

Moreover, the housing shall be designed and manufactured to structural capability pressure of 0.36 psig (2500 Pa) with no permanent deformation or damage. The housing shall also be designed to withstand the seismic loads specified in the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1. For additional requirements for seismic qualification refer to the section 11.2.

Lighting shall be provided in accessible sections for maintenance and inspection of internal components. Lighting switch shall be mounted on suitable location on casing exterior.

Air handling units shall be placed on support base frame capable of being secured firmly to the floor. The base frame shall be fitted with lifting lugs or eyes.

The components, structural frame and housing shall be rustproofed (stainless steel).

Air handling units shall be constructed in sections as large as can be handled, shipped, and installed. Joints required for field assembly shall be flanged, suitable for field welding. Each section shall be provided with lifting lugs or eyes as required for installation and shall be clearly match-marked.

6.4 Filters

Filter cells shall be disposable, either a flat panel filter type or an extended media bag filter type, with a MERV rating in accordance with ASHRAE 52.2, as indicated on the Air Handling Units Performance Data List.

Filter cells shall carry a UL label indicating compliance with requirements of UL 900.

6.5 Fans

Fans shall be double width, double-inlet centrifugal type, with backward curved or airfoil blades, rated in accordance with AMCA 210 for performance and AMCA 300 for sound.

Bearings shall be self-aligning; grease lubricated and shall have an L-10 service rating life of at least 200,000 hours in accordance with ABMA 9 or 11. Concealed bearings or bearings in inaccessible locations shall be provided with grease fittings, usable in accessible areas without interrupting fan operation.

Fans shall be statically and dynamically balanced. Dynamical balancing shall be performed at factory in accordance with AMCA 204 at fan design operating speed to Fan Application Category BV-4, Balance Quality Grade G2.5.

Fans shall be provided with variable inlet internal (nested) vanes complete with linkage and actuator. The vane-activating mechanism shall be operated by one lever mounted on the fan housing with a connecting rod between the fan inlets.

The actuator shall be electric (230V/1ph/50Hz), spring opposed to open vanes (fail

open) on loss of electrical power supply and controlled by an external input signal 4-20 mA provided by SUPPLIER. The actuator shall be provided with travel stops incorporated in the actuator mechanism to limit the travel in either direction. The actuator torque shall be at least 150 % of the maximum torque required to actuate the blades.

6.6 Fans Electric Motors

Motors shall conform to the requirements of Specification SP-E311. Motors shall be single speed.

Fan and motor shall be mounted on a common steel base. Motor shall be mounted on slide rails. The base shall be mounted on vibration isolators.

6.7 V-Belt Drives

V-belt drives shall have not less than two belts and shall have sufficient belt capacity to start and drive the fan if one belt is broken. Each drive shall include an adjustable pitch sheave to accommodate a ± 10 % variation of the design speed. Each drive shall be provided with a removable belt guard which has a test hole at each shaft for insertion of a tachometer.

6.8 Diffuser Sections

A diffuser section with perforated diffuser plate shall be provided immediately downstream of the fan to break up and spread the jet of air to the whole cross section of the air handling unit.

6.9 Cooling coils

Cooling coils shall be constructed in accordance with the requirements of ASME Code Section VIII, Division 1 and shall be suitable for working pressures of 150 psig (1.02 MPa). Cooling coils nozzle forces and moments including load combinations are defined in Exhibit A of design specification DSP-513-044687-000.

Cooling coils rating shall be in accordance with ASME AG-1; CA-5211.1 (ASHRAE 33 and AHRI 410).

Cooling coils shall have seamless copper tubes with a 5/8 inch outside diameter (preferred dimension) and copper fins permanently bonded to the tubes by a mechanical expansion or tensioning process.

Casing shall be of stainless steel.

Cooling coils shall have cleanable headers. Header assembly shall be provided with a vent and drain connection. Both supply and return end connections shall be located on the same side of the coil.

An insulated drain pan shall be provided for removal of condensate from cooling coils and demister. The drain pan shall be provided with a suitable connection to allow

complete drainage. The drain pan should be either placed on housing floor or integrated into housing floor panel.

6.10 Demisters

Demisters shall be factory assembled, replaceable rigid cartridges of stainless steel mesh with stainless steel frames and handle. The units shall be sized nominally at 24" x 24" x 2" (610 x 610 x 50 mm) deep.

Each demister cartridge shall carry the Underwriter's Laboratories Class I listing and UL label indicating full compliance with the requirements of UL-900.

Each demister cartridge shall be designed for removing of moisture drops from a nominal air flow of 2000 cfm (3400 m³/h).

The demister bank mounting frame shall be all welded stainless steel conforming to ASTM A479, Type 304.

6.11 Electric Heating Coils

Electric heating coils shall be designed in accordance with the structural requirements of ASME AG-1, Article AA-4000.

Electric heating coils shall be designed following the guidelines of ANSI/NFPA 70 and UL 1096, but need not bear the UL label.

Capacity control shall be provided by a step controller, on the basis of room temperature. Room temperature signal 4 – 20 mA, shall be provided by SUPPLIER.

Electric heating coils shall be capable of meeting the applicable technical requirements of ASME AG-1, Subsubarticle CA-4420 and the structural requirements of ASME AG-1, Subsubarticle CA-4430.

6.12 Sound Attenuator's Section (Silencer Section)

Rectangular Straight Silencers shall be made of 316/304 stainless steel and shall contain no acoustic media of any kind. Attenuation shall be achieved by with controlled impedance membranes and tuned resonators.

Interior baffles and bullet for standard rectangular straight silencers shall be made of not less than 18 gauge and properly stiffened to ensure structural integrity; lock form quality, perforated steel, Type 316/304 stainless steel.

Acoustically absorptive fill silencers shall be inorganic glass fiber of a proper density to obtain the specified acoustic performance and be packed under not less than 5% compression to eliminate voids due to vibration and settling. Material shall be inert, vermin and moisture proof and impart no odor to the airstream.

Combustion ratings for the standard silencers with acoustic fill shall be not greater

than the following when tested to ASTM E84, NFPA Standard 255, UL 723, or ULC S102:

Flame spread Classification20

Smoke Development Rating20

Acoustic Spacer shall be flame and erosion resistant

6.12.1 Construction

Units shall be constructed in accordance with SMACNA standards for the pressure and velocity specified for the duct system which it is installed. Rectangular casing longitudinal seams shall be in the corners of the silencer shell to provide maximum unit strength and rigidity. Interior partitions shall be fabricated from perforated sheets and shall have radius entrance shapes so as to provide the maximum aerodynamic efficiency and minimum self-noise characteristics in the sound attenuator. Interior partition tail sections shall be configured so as to provide pressure-regain. Silencers shall not fail structurally when subjected to a differential pressure of 8 inches WG.

Sound attenuating units shall not fail structurally when subjected to an internal static pressure of ± 8 inches water gauge. Airtight construction shall be welded (factory applied).

6.12.2 Acoustic Performance

All silencer ratings shall be determined in a duct-to-reverberant room independent, nationally recognized, accredited laboratory that provides for airflow in one direction and sound in both directions through the test silencer in accordance with ASTM Specification E-477. The test set-up and procedure shall be such that all effects due to end reflection, directivity, and flanking transmission standing waves and test chamber sound absorption are eliminated.

Acoustic rating shall include dynamic insertion loss (DIL) and generate noise levels (GNL) both for forward flow (air and noise in same direction) and reverse flow (air and noise in opposite directions) with no airflow and, minimum, three additional airflow rates.

6.12.3 Aerodynamic Performance

Airflow measurements shall be made in accordance with ASTM specification E-477 and applicable portions of ASME, AMCA, and ADC airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented.

6.12.4 Certifications and Submittals

With submittals, the manufacturer shall supply certified test data on dynamic insertion loss, self-noise power levels, and acoustic performance for reverse and forward flow test conditions. Test data shall be for a standard product. All rating tests shall be conducted in the same independent facility, shall utilize the same silencer, and shall be open to inspection upon Purchaser's request.

The manufacturer shall supply submittals specific to the silencer installed conditions. The submittals shall include the overall silencer dimensions and module quantity and sizes, an actual picture detailing baffle location and quantities, dynamic insertion loss

and generated noise levels, silencer pressure loss and construction. The DIL values shall account for the differences between unlined and lined fill.

6.13 Pumps

Pumps shall be designed, manufactured and tested in accordance with the requirements of ASME Code, Section VIII, and ASME B31.1. 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 temperature in the evaporator cooling circuit.

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 (PMP111, PMP112) and motor size that are required to meet the design requirements of air handling unit cooler (AHU001, AHU002) with three-way water cooling circuit valve (V111, V112). See below right side of the Figure 1 showing AHUs cooling heat exchangers, AHUs pumps, and three-way valves connected to the common cooling water accumulator.

6.14 Three-way valves

Three-way shall be designed, manufactured and tested in accordance with the requirements of ASME B16.34. Valves nozzle forces and moments including load combinations are defined in technical specification SP-G508A Rev.1.

Three way valves shall be designed and manufactured as mixing and not diverting valve type.

Valve ANSI pressure rating shall be Class 150.

Valve actuator shall be electric (230V/1ph/50Hz), Class 1E, spring opposed to open valve to coil on loss of electrical power supply and controlled by a control signal of 4 – 20 mA provided by the SUPPLIER.

The SUPPLIER shall select the valve type (V111, V112) and materials that are required to meet the design requirements of water chiller cooling circuit.

6.15 Electrical Power Supply

Electrical power supply and instrumentation cables, circuits and devices shall be

electrically and mechanically separated.

Cables and wiring (power supply and control) shall be 600 V, 90 °C rated insulation (flame retardant-self-extinguishing; low-smoke; no PVC-polyvinyl chloride) or better.

All components shall be wired on terminal strips; internal wiring shall be factory assembled and tested.

Wiring shall be made flexibly and run in sufficiently dimensioned cable trunks. All interconnections shall be terminated in an appropriately marked terminal box (NEMA 4 enclosure) mounted on the front side of the air handling unit.

The Contractor shall be responsible for all materials and their procurement specification. All current carrying parts shall be copper made. Control, instrumentation and alarm wiring shall be a minimum of 14 AWG 7-strand copper conductors, 600V 90°C flame retarding insulation. Where wire is subjected to flexing on hinged panels 14AWG 41-strand extra flexible, copper conductors with 600V, 90°C flame-retardant insulation shall be used. Any insulation used shall be free from halogens (chloride, etc) and made from non-combustible materials. All electrical power interfaces shall be of minimum 4x 8 AWG size, screw type terminals. Control interfaces size shall be 14 AW and 16 AWG for instrumentation – both types also screw terminals.

6.15.1 Switch off in case of fire

Air handling unit must be shut-off in case of fire. A fire alarm system is in the building. The fire control panel has an output interface. This relay is dry contact 24V DC/ 4A. Relay can be programmed either contact closed or contact open upon the fire. The air handling unit must read this relay contact to shut-off the unit. Upon reset of fire panel air handling unit must not start by itself..

6.16 Instrumentation and Control

6.16.1 General

Instrumentation and control design shall be hardwired. Detailed design of instrumentation and controls shall be responsibility of the SUPPLIER.

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.

A thermal airflow measuring stations with dual analog outputs (4 to 20 mA) for airflow and temperature shall be provided to be bolted to the inlet or outlet of the each AHU. The sensor pattern shall be supplied as equal area with honeycomb flow straighteners

Thermometer sensing air temperature shall be located at the outlet side of the each AHU unit or shall be provided separately to be installed in outlet ductwork by OTHERS.

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.

Local differential pressure gauges and differential pressure transmitters shall be provided for both filter banks and for total differential pressure drop across the whole air handling unit. Differential pressure gauges shall have a display scale in mm of water column.

Differential pressure gauges shall be completely piped and mounted on the front side of the air handling unit.

The fan shall be provided with a vibration transmitter interlocked with the AHUs control system.

All transmitters shall be wired and terminated to a marked instrumentation terminal box on the front side of the air handling unit. Local differential pressure gauges and differential pressure transmitters may be combined into a single component.

6.16.2 Air Handling Units Control

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

The chilled water pumps shall be provided with a cooling water flow switch which shall be interlocked with the AHUs control system. Three way valves shall be controlled with the AHUs control system as well.

The control panel shall provide controls to safely and efficiently shall operate the AHUs on-off inlet dampers actuators powered with 230V/3ph/50hz (see Figure 1 shown as FCV), monitoring sensors, actuators, relays and switches. Start of cooling system components (chilled water pumps, condenser fans, etc.) shall be possible from the AHUs control panel.

As a minimum, the control panel shall be provided with the following:

1. Controls:
 - a. Unit circuit breaker;
 - b. Motor starter;
 - c. Leaving air temperature set point adjustment;

2. Displays and readouts:
 - a. Operation and alarm mode status;
 - b. Leaving air set point temperature;
 - c. Entering and leaving air temperatures;
 - d. Electric heater current draw
 - e. Fan motor electrical current draw;
 - f. AHU inlet damper open or closed position
3. Protections:
 - a. Loss of air flow;
 - b. 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.

7 PERFORMANCE REQUIREMENTS

The performance requirements of the air handling units required under this Specification are given in the Air Handling Units Performance Data List form in the Attachment 1.

8 MATERIALS AND DETAILS OF CONSTRUCTION

Materials used in the construction of fan components and accessories shall conform to requirements of ASME AG-1, Articles HA-3000 and CA-3000.

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

Certified mill test reports shall be provided for materials used in the construction of the fans.

All materials shall be capable of withstanding a cumulative radiation level of up to 10 Gy.

9 FABRICATION AND ASSEMBLY

Fabrication shall be in accordance with the requirements of ASME AG-1, Articles AA-6000 and HA-6000.

Water cooling system pressure-retaining components such as 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.

Written fabrication procedures shall be established and used during the manufacture. All heat treating requirements shall be indicated on drawings or in the fabrication procedures.

Welding of pressure retaining components designed and fabricated in accordance with ASME Code shall meet the requirements of the ASME Code Section IX. Welders and welding procedures shall be so qualified.

Installation of electric components shall be in accordance with NFPA 70 National Electric Code.

If air handling units are shipped in separate sections, each shipping section shall be match marked and dismantled after fabrication. Shipping sections shall be as large as possible and so designed that final assembly at the JOBSITE can be made without special tools or measurements.

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, each unit shall meet the performance requirements specified in the Air Handling Units Performance Data List.

10.2 Housing

The following factory tests in accordance with ASME AG-1, Article HA-5000 shall be performed by the SUPPLIER after completion of construction of each air handling unit:

1. Visual inspection in accordance with ASME AG-1, Subsubarticle TA-3510, to verify that the unit is designed and constructed in accordance with applicable design codes and standards and this Specification.
2. Housing pressure test at the structural capability pressure in accordance with ASME AG-1, Paragraph TA-3522. Upon completion of the test, there shall be no permanent distortion or breach of integrity.

10.3 Cooling Coils

Cooling coils shall be pressure tested after fabrication in accordance with the requirements of ASME AG-1, Subsubarticle CA-5220.

Cooling coil performance shall be determined and certified in accordance with ASME AG-1, Paragraph CA-5211.

10.4 Electric Heating Coils

Electric heating coils shall be tested after fabrication in accordance with ASME AG-1, Subarticle CA-5400.

10.5 Fans

The SUPPLIER shall submit the following documentation for each fan:

Certified shop performance curves, developed from tests in accordance with AMCA 210 in an AMCA approved laboratory for each fan. The curve shall indicate efficiency, flow-head characteristics, and brake-horsepower requirements over the entire fan operating range.

Sound test data in accordance with either AMCA 300 or ASHRAE 68.

Upon completion of unit assembly each fan shall be operated at full operating speed with its own motor and drive. During this operation, the SUPPLIER shall:

1. Measure and record air flow rate (cfm, m³/h) and discharge head (in w.g., Pa).
2. Measure and record the fan motor current drawn.
3. Measure and record fan vibrations. Fans with excessive vibrations shall be rebalanced and retested.

After completion of the operation the fan shall be inspected to determine any sign of excessive wear or mechanical defect.

10.6 Seismic Tests

Seismic tests, if applicable, shall be performed in accordance with the requirements of SP-S702 and the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1, applicable seismic floor response spectra as defined in Attachment 2 and SUPPLIER's test procedures approved in advance by the PURCHASER.

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).

The SUPPLIER shall design the equipment to perform its intended function under specified environmental conditions (mild), supported by a maintenance schedule of the availability of equipment to perform its intended 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 IEEE 344, 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. Operating basis earthquake (OBE) floor response spectra and applicable safety shutdown earthquake (SSE) floor response spectra that are given in the Attachment 2 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 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 ANSI/ASME NQA-1, Part II, Subpart 2.1.

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 number as indicated on the Air Handling Units Performance Data List form;
- NEK Purchase Order number;
- Design air flow rate;
- Total electrical consumption.

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 of the air handling units shall be in accordance with the requirements of ASME AG-1, Article AA-7000 and/or CA-7000 and ANSI/ASME NQA-1, Part II, Subpart 2.2. Protection level shall be level C.

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, the 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 the 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:

Records are technically correct in accordance with applicable procedures.

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.

Corrections to data have properly been made. Corrections to data shall include the data and the identification of person authorized to make the corrections.

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:

- Provide the SUPPLIER with all available documentation upon request.

- Provide any special requirements applicable to the installation of equipment.

- 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

The 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 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 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 subsuppliers 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 in accordance with the requirements of ASME AG-1, Article AA-7000 and/or CA-7000 respectively and shall provide the PURCHASER with appropriate procedure, which shall explain and emphasize them in detail.

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

22 SHELF LIFE

The SUPPLIER shall not ship any item that has less than one-year remaining shelf life at time of shipment.

The SUPPLIER shall provide shelf life data as follows:

Expiration date;

Cure date or manufacturing date;

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, 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 component 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 NON-CONFORMANCE REPORTS

The SUPPLIER shall provide a copy of all nonconformance reports disposed as "repair" or "use-as-is" generated during manufacture or processing of this Specification. 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 this Specification shall be approved by the PURCHASER prior to the shipment of the affected item. Further engineering and/or manufacturing after detection of non-conformances, prior to the PURCHASER's approval shall be at the SUPPLIER's risk.

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

28 REPAIR RECORDS

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

1. Summary of repair/refurbishment work that has been performed on the equipment.
2. Brief analysis of the reason for failure of the equipment.
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 equipment.

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 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, Article AA-7000 and CA-7000 and ANSI/ASME NQA-1, Part II, Subpart 2.2. Protection level shall be Level C.

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 tests
2. 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 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. Storage;
2. Installation;
3. Operating instructions;
4. Maintenance instructions and servicing schedule;
5. Troubleshooting;
6. Replacement parts;
7. Special tools and instrumentation;
8. Drawings of components and related equipment.

The SUPPLIER shall also provide drawings for all components and related equipment with a list of components, appertaining "part numbers" and their materials as part of the manual together with the list of recommended spare parts.

Table of contents of the vendor technical manual is given as a guideline in the Attachment 6.

34 TRAINING

Not applicable.

35 ATTACHMENTS

Attachment 1: Air Handling Units Performance Data List form (2 pages)

Attachment 2: Applicable Floor Response Spectra Figures from the Appendices A and B of the OSC Seismic Analysis 1056-NA-L-PZI-3/1-A1 (4 pages)

Attachment 3: Reference drawings SS-906-781-2 Rev.0 and SS-906-781-3 Rev.0 (3 pages)

Attachment 4: Equipment Specification Exceptions form (1 page)

Attachment 5: Air Handling Units Data List form (3 pages)

Attachment 6: Pump Equipment Data Sheet (2 pages)

Attachment 7: Valve Equipment Data Sheet (2 pages)

Attachment 8: Vendor Technical Manual Guideline (1 page)

Attachment 9: MECL Data Tables (2 pages)

ATTACHMENT 1
AIR HANDLING UNITS PERFORMANCE DATA LIST
KRŠKO NUCLEAR POWER PLANT

1.	Tag numbers	VA781AHU-001 VA781AHU-002
2.	Quantity required	2 (one above another but mirror image)
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.	Air handling unit type	Horizontal Blow through
9.	Operating conditions	
a.	Air flow capacity, acfm (m ³ /h)	6000 (10200)
b.	Air flow temperature, °F (°C)	68-79 (20-26)
c.	Air flow relative humidity, %	30-60
d.	External pressure drop, inch w.g. (Pa)	4.82 (1200)
10.	Prefilter section	
a.	Filter type	Flat panel or extended media
b.	Filter efficiency per ASHRAE 52.2	MERV 9-10
11.	Filter section	
a.	Filter type	Flat panel or extended media
b.	Filter efficiency per ASHRAE 52.2	MERV 13-14

12.	Fan section	
a.	Fan type	<u>Centrifugal-DWDI</u>
b.	Blade type	<u>Backward curved or airfoil</u>
c.	Variable inlet vanes required	<u>Yes</u>
d.	Inlet vanes actuator electrical characteristics, V/phase/Hz	<u>230/1/50</u>
e.	Inlet vanes damper actuator control signal characteristics	<u>4-20 mA DC</u>
f.	Fan vibration isolators required	<u>Yes</u>
g.	Preferred motor horsepower, hp (kW)	<u>10.1 (7.5)</u>
h.	Motor electrical characteristics, V/phase/Hz	<u>400/3/50</u>
i.	Nuclear radiation – resisting motor insulation required	<u>Yes</u>
13.	Electric heating coil	
a.	Entering air temperature, °F (°C)	<u>50 (10)</u>
b.	Heating capacity, btu/h (kW)	<u>129661 (38)</u>
c.	Maximum coil face velocity, fpm (m/s)	<u>500 (2.5)</u>
d.	Heating coil electrical characteristics, V/phase/Hz	<u>400/3/50</u>
14.	Cooling coil section	
a.	Max. entering air temperature, dry bulb/wet bulb, °F (°C)	<u>88.2/70.7 (31.2/21.5)</u>
b.	Min. leaving air temperature, dry bulb, °F (°C)	<u>57.2 (14)</u>
c.	Total cooling capacity, btu/h (kW)	<u>276383 (81)</u>
d.	Max. coil face velocity, fpm (m/s)	<u>500 (2.5)</u>
e.	Cooling medium	<u>Water</u>
f.	Cooling medium min. entering temperature, °F (°C)	<u>44.6 (7)</u>
g.	Cooling medium flow rate for 5 K temp. difference, gpm (m ³ /h)	<u>54.2 (14.6)</u>
h.	Max. cooling medium pressure drop, ft w.g. (kPa)	<u>8.27 (25)</u>
		<u>SS-906-781-2 (VA781AHU-001),</u>
		<u>SS-906-781-3 (VA781AHU-002)</u>
15.	Reference drawings	

ATTACHMENT 2

**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 1 (nivo 1) 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” (+/-0,00m = altitude +157,85m a.s.l. = NEK altitude 102,650m):

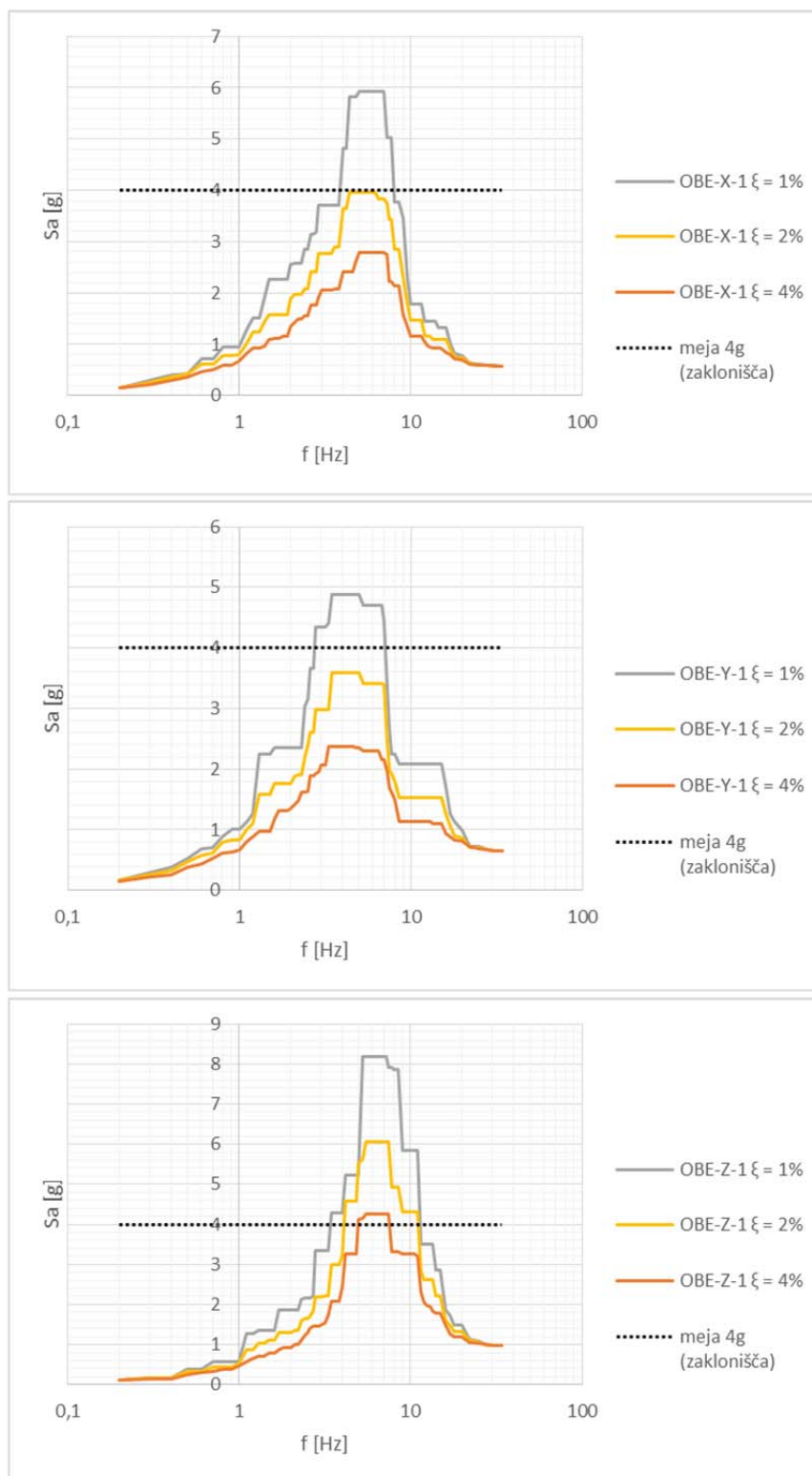
- Level 1 = Slab's axial elevation corresponds to NEK altitude 101,800m;

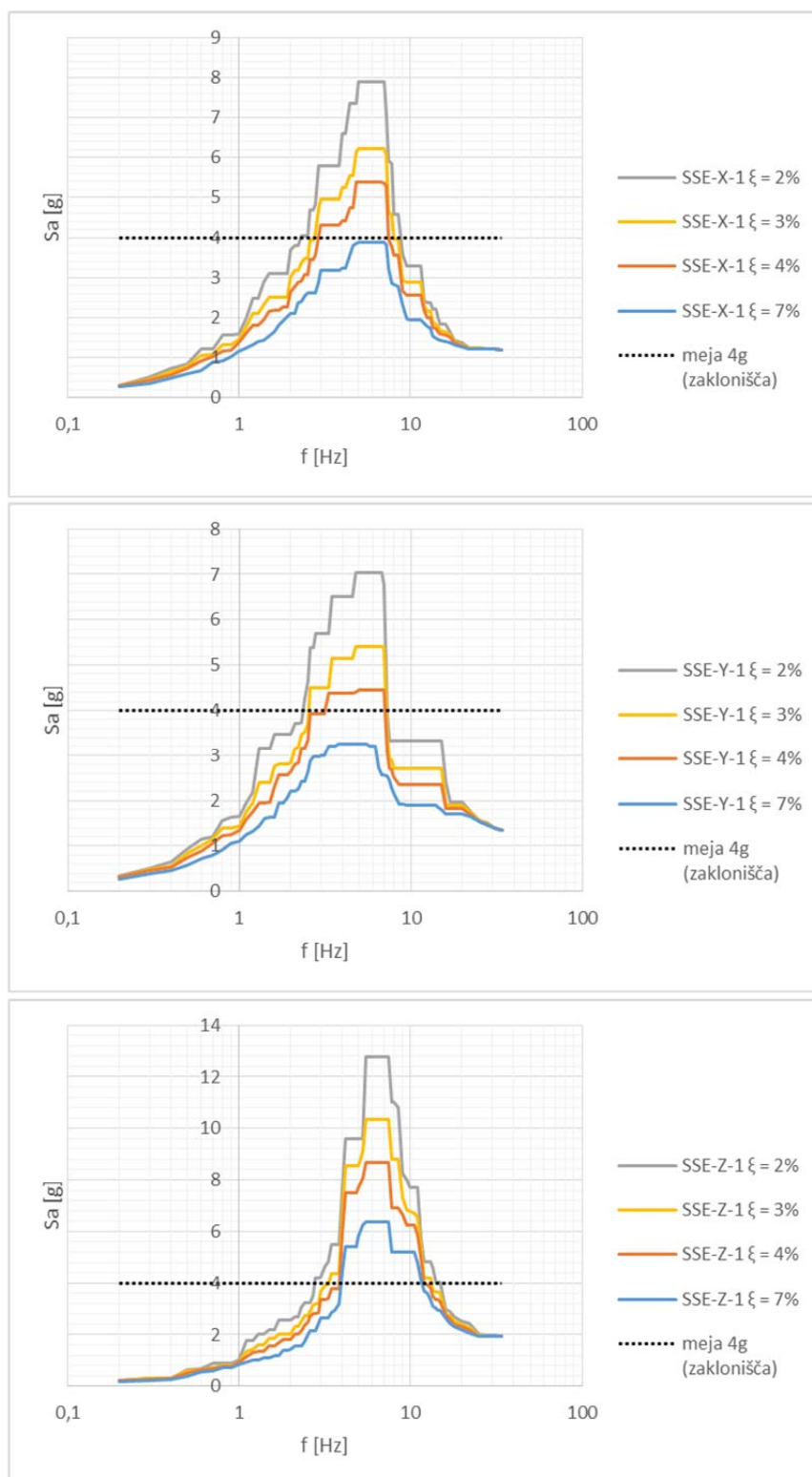
OPC building is considered as shelter, that is why there is a rule for minimum value of equipment accelerations (shown on each FRS chart as “meja 4g (zaklonišča)”):

- 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).

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

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

ATTACHMENT 3

Air handling units reference drawings

Unit VA781AHU-001: SS-906-781-2 Rev.0

Unit VA781AHU-002: SS-906-781-3 Rev.0

						<p>NUKLEARNA ELEKTRARNA KRŠKO NUCLEAR POWER PLANT KRŠKO</p> <p>BUILDING SERVICE HVAC EQUIPMENT LAYOUT CRITERIA</p> <p>OSC HVAC AND HABITABILITY SYSTEM</p> <p>OSC AIR HANDLING UNIT (VA781AHU-001)</p>		<p>DATE: 22.2.2017</p> <p>DRAWING NUMBER: SS-906-781-2</p> <p>REV: 0</p> <p>PAGE NO: 1/1</p>																			
		<p>NOTES:</p> <ol style="list-style-type: none"> REF. TECH. SPEC. SP-B3008 ALL DIMENSIONS IN MM, EXCEPT AS NOTED ELECTRICAL AND CONTROL CABINETS ARE SEPARATE PARTS, ATTACHED TO THE UNIT OR MOUNTED AT SEPARATE LOCATIONS 		<p>PRELIMINARY DATA</p> <p>SHUTDOWN SYSTEM <input checked="" type="checkbox"/></p> <p>ENGINEERED SAFETY FEATURE <input type="checkbox"/></p> <p>SAFETY CLASS SC-1 <input type="checkbox"/></p> <p>SC-2 <input type="checkbox"/></p> <p>SC-3 <input type="checkbox"/></p> <p>NON-NUCLEAR SAFETY <input type="checkbox"/></p> <p>AUGMENTED QUALITY <input checked="" type="checkbox"/></p> <p>SHUTDSEIZMIC CATEGORY <u>1</u></p>																							
<p>TOP VIEW</p> <p>140 564.3 140</p> <p>1220 1320</p> <p>1650</p> <p>EXHAUST</p> <p>INTAKE</p> <p>PROVIDE CONDENSATE DRAIN</p>		<p>EQUIPMENT TYPE:</p> <p>AIR HANDLING UNIT WITH FILTERS, HEATING COIL AND COOLING COIL</p>		<p>EQUIPMENT CAPACITY:</p> <p>10200 CMH; 6000 CFM</p>		<p>TEMPERATURE:</p> <p>41° F (5° C) MIN AMBIENT</p> <p>104° F (40° C) MAX AMBIENT</p>		<p>DESIGN PRESSURE:</p> <p>SEE TECH. SPEC. SP-B3008</p>																			
		<p>OTHER:</p> <p>ONE UNIT REQUIRED LEFT ACCESS SIDE</p>		<p>PRELIMINARY UNIT SELECTION:</p> <ol style="list-style-type: none"> N/A N/A N/A 																							
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<p>MAINTENANCE REQUIREMENT:</p> <p>FILTER REPLACEMENT, INSTRUMENT CHECKS, SCHEDULED MAINTENANCE</p>		<p>CABLE/PIPING INTERFACE:</p> <p>ELECTRICAL CONNECTIONS, CONDENSATE DRAIN CONNECTIONS</p>		<p>LOCATION:</p> <p>OSC BUILDING P36 - TECHNICAL AREA, EL. 101.80</p> <p>F.S.D. NO.: D-906-781</p>		<p>REMARKS:</p> <p>INSTALLATION IS PROVIDED ABOVE THE UNIT VA781AHU-001</p>																					
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ATTACHMENT 4
EQUIPMENT SPECIFICATION EXCEPTIONS
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
BIDDER'S AIR HANDLING UNITS DATA LIST
KRŠKO NUCLEAR POWER PLANT

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

BIDDER'S NAME

MANUFACTURER'S NAME

QUOTATION NUMBER

	Overall dimensions				Largest shipping package			
Filter plenum Tag number	Length (m)	Width (m)	Height (m)	Total weight (kg)	Length (m)	Width (m)	Height (m)	Shipping weight (kg)
VA781AHU-001								
VA781AHU-002								

1. Tag number _____
2. Air flow capacity, acfm (m³/h) _____
3. External pressure drop, inch w.g. (Pa) _____
4. Weight, lb (kg) _____
5. Prefilter section
- a. Filter area _____
- b. Filter efficiency per ASHRAE 52.2 _____
- c. Max. clean pressure drop, inch w.g. (Pa) _____
- d. Final pressure drop, inch w.g. (Pa) _____
6. Filter section
- a. Filter area _____
- b. Filter efficiency per ASHRAE 52.2 _____
- c. Max. clean pressure drop, inch w.g. (Pa) _____
- d. Final pressure drop, inch w.g. (Pa) _____
7. Fan section
- a. Fan type _____
- b. Blade type _____
- c. Direction of rotation _____
- d. Fan speed, rpm _____
- e. Wheel diameter inlet/tip, inch (mm) _____
- f. Wheel material and ASTM no. _____
- g. Fan scroll material and ASTM no. _____
- h. Fan shaft diameter, inch (mm) _____
- i. Fan shaft material and ASTM no. _____
- j. Bearings L-10 service rating life, hours _____
- k. Motor rating, hp (kW) _____
- l. Brake horsepower at fan speed, hp (kW) _____
- m. Motor speed, rpm _____
- n. Electrical characteristics, V/phase/Hz _____
- o. Nuclear radiation – resisting motor insulation _____

- p. Inlet vanes actuator electrical characteristics, V/phase/Hz _____
- q. Inlet vanes control signal characteristics _____
8. Electric heating coil section
- a. Entering air temperature, °F (°C) _____
- b. Leaving air temperature, °F (°C) _____
- c. Air pressure drop, inch w.g. (Pa) _____
- d. Heating capacity, btu/h (kW) _____
- e. Electrical characteristics, V/phase/Hz _____
- f. Current drawn, A _____
- g. Primary protection device cut-out temperature, °F (°C) _____
9. Cooling coil section
- a. Entering air temperature, dry bulb/wet bulb, °F (°C) _____
- b. Leaving air temperature, dry bulb/wet bulb, °F (°C) _____
- c. Cooling capacity, btu/h (kW) _____
- d. Coil face area, ft² (m²) _____
- e. Coil face velocity, fpm (m/s) _____
- f. Air side pressure drop, inch w.g. (Pa) _____
- g. Tube material and ASTM no. _____
- h. Tube outside diameter, in (mm) _____
- i. Tube thickness, in (mm) _____
- j. Fin material and ASTM no. _____
- k. Fin thickness, in (mm) _____
- l. Fin spacing, in (mm) _____
- m. Number of rows _____
- n. Coil connections, number/inch (number/mm) _____
- o. Cooling medium _____
- p. Cooling medium entering temperature, °F (°C) _____
- q. Cooling medium leaving temperature, °F (°C) _____
- r. Cooling medium flow rate, gpm (m³/h) _____
- s. Cooling medium pressure drop, ft w.g. (kPa) _____

ATTACHMENT 6
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 7
VALVE 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 valve type and size.

BIDDER'S NAME

MANUFACTURER'S NAME

QUOTATION NUMBER**1. General data**

- a. Tag number
- b. Valve type
- c. ASME code class
- d. ANSI Pressure rating, Class

2. Service conditions

- a. Fluid, radioactive
- b. Maximum pressure, psig (MPa)
- c. Maximum temperature, °F (°C)
- d. Cv at full open

3. Body

- a. Nominal size, in (mm)
- b. End connections – sch
- c. Body and bonnet material
- d. Bonnet seal type
- e. Stem material
- f. Stem packing material

4. Trim

- a. Plug form
- b. Plug/disc material
- c. Seat material

5. Accessories

- a. Operator
- b. Bonnet tap
- c. Bonnet O-ring stem seal
- d. Position locking device
- e. Leakoff
- f. Backseat
- g. Manual override
- h. Limit switch
- i. Position indicator
- j. Position stop

6. Motor operator data

- a. Power supply, V/ph/Hz
- b. Control signal, mA
- c. Failure position on loss of power
- d. Stroke time open (max.)
- e. Stroke time close (max.)
- f. Max. diff. pressure valve to close against, psig (kPa)
- g. Max. diff. pressure valve to open against, psig (kPa)

ATTACHMENT 8
VENDOR TECHNICAL 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 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			N/A
43	AMPS N/A			N/A
44	HP KW N/A N/A		N/A	N/A
45	RPM N		N/A	

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				